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G. E. OTIS ET AL

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RADIATOR FOR HEATING PURPOSES

Filed June 21, 1923

Fig. 1

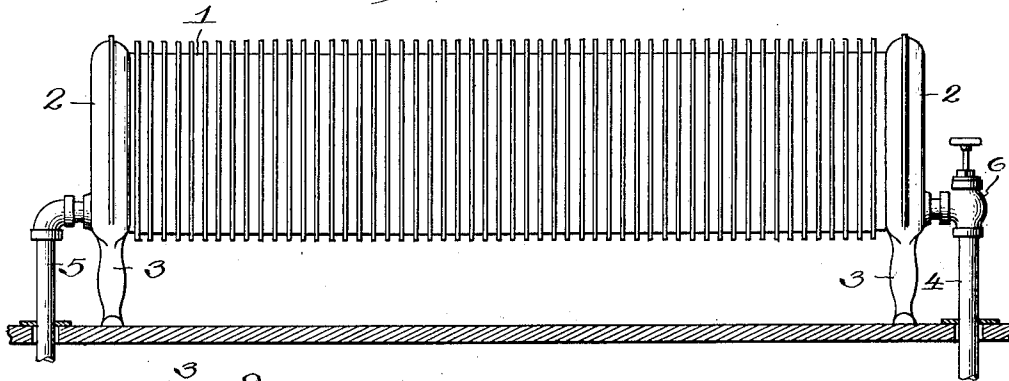


Fig. 2

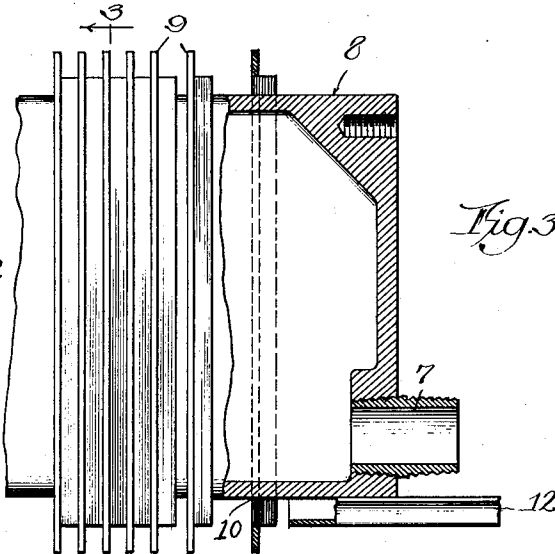


Fig. 3

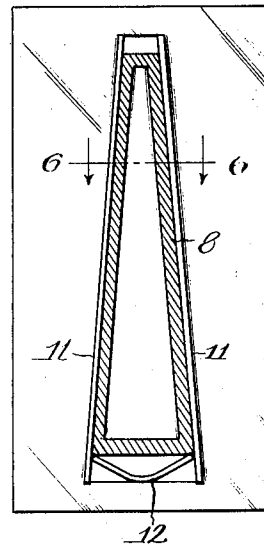


Fig. 4

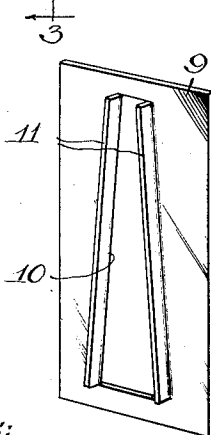


Fig. 5

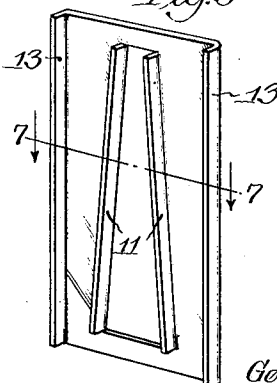
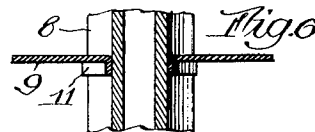


Fig. 7



Fig. 8



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UNITED STATES PATENT OFFICE.

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RADIATOR FOR HEATING PURPOSES.

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This invention relates to improvements in radiators for heating purposes, although the novel features hereinafter claimed for it make it especially desirable for heating and ventilating apparatus or units.

The common type of radiator used for hot water or steam heating is made up of a plurality of cast iron sections, the radiating surface being substantially limited to the exterior surface of the sections, although in some instances the radiating surface is increased by the provision of integral fins or webs projecting from the surface of the sections. These sections being cast, the length of the fins is necessarily limited, due to difficulties attending the casting process to the end that increased size and weight are necessary in order to attain effective heating. Radiators made up of thin sheet metal with soldered steam joints have been proposed that were light in weight but the life was so short owing to the leaks developed from strains and expansion, that they have proved impracticable in use except for automobiles.

The effective transmission of heat from a primary heating element or core to the secondary heating elements or plates is conceived to be largely dependent upon the establishment of an intimate contact between the contacting surfaces, not necessarily a permanent one, but rather one that provides for the maximum area of contact and the elimination of air gaps or spaces between the surfaces. The foregoing suggests the possibility of soldering, welding, or otherwise securing the plates or fins to the core, although in the present disclosure the plates are fitted onto the core in such a way that the contacting surfaces are drawn or forced into close and intimate contact. This allows for a more flexible method of manufacture, and use of metals difficult to solder, aside from being less expensive.

The several features will be brought out more in detail in connection with the drawings illustrating a preferable embodiment of the invention:

Figure 1 is a view in elevation of a radiator unit,

Figure 2 is an enlarged detail view of one end of a radiator unit, partially in section and showing the method of assembling,

Figure 3 is a view in vertical section through the radiator unit, as taken on line 3, 3 of Figure 2,

Figure 4 is a perspective view of a single plate showing the formation thereof,

Figure 5 is a perspective view of a similar plate with the added feature of flanges at the vertical side edges,

Figure 6 is a view in horizontal section, taken on line 6, 6 of Figure 3,

Figure 7 is a cross-sectional view of the plate shown in Figure 5 taken on line 7, 7 of said figure, and

Figure 8 is a perspective view of a portion of the wedge member.

In disclosing the subject matter of the invention we contemplate that the radiator structure may be adapted for use wherever hot water, steam, or other fluid is used as a heating medium and to include the ordinary method of direct heating as well as indirect heating wherein the radiator is enclosed within a housing or cabinet having direct connection with the outside atmosphere, the air being drawn into the cabinet by means of gravity or of a blower and thence forced or drawn through the radiator and discharged into the room to be heated.

In Figure 1 the application of the invention is shown in connection with a radiator designed for use in the ordinary systems of direct heating, the same being supported upon the floor of a room with inlet and return pipes connecting at the ends of the radiator. In this form of radiator the central section or unit 1, which embodies the structure of the invention, is interposed between two end sections 2, 2, preferably of the usual cast metal construction, and provided with legs 3, 3, which support the entire unit. Connected with the sections are the inlet or supply pipe 4 and the return pipe 5, a valve 6 being located in the supply pipe 4 and at the usual position.

When used in connection with other systems of heating, and particularly where the radiator is supported and enclosed within a cabinet or housing, the end sections 2, 2, shown in Figure 1, may be eliminated entirely and the pipe connections made directly with the ends of the central section 1, as shown at 7, in Figure 2.

Referring now to the structure constituting the complete heating unit or radiator, the same comprises a core or hollow shell 8 of a cast metal construction, and preferably of a cross-sectional contour which may be generally termed wedge-shaped, as shown in

Figure 3, that is to say, the core tapers from a substantial width at its base to a comparatively narrow width at its top, so that the side walls converge or are inclined to the vertical or major axis.

This core is preferably made of a light metal and substantial structure with particular attention given to the obtaining of as smooth and finished outer converging surfaces as the casting or machining process will permit.

Mounted on the core are a plurality of rectangular plates 9 made of a light metal such as pure aluminum, although where a maximum heat radiation is desired, pure copper plates may be substituted. These plates are preferably stamped from relatively thin sheet metal with a rough surface not polished as compared with the flanges which are ordinarily cast on radiator sections. As clearly shown in Figure 4, a wedge-shaped opening 10 is formed in each of the plates, there being provided along the converging sides of each opening to space the air flues and increase the metal to metal contact surfaces marginal flanges 11, 11. In shape and size, these openings conform substantially to the external sectional contour of the core 8, although, as clearly shown in Figure 3, the vertical or longitudinal dimensions of the openings are somewhat in excess of the corresponding dimensions of the core. The width of the plates, it will be observed, is preferably three times the width of the cast core, considering their mean transverse dimensions.

As clearly shown in Figure 2, the plates 9 are assembled onto the core by passing them one after another over the end of the core, with the flanges 11, 11 of all the plates extending in the same direction. Thus, when the plates are applied the full length of the core, the edges of the flanges 11, 11 of one plate abut against the adjacent plate, and thus serve as spacing members.

Thus it is seen that the unit consists of the central core or primary heating element and the multitude of separate plates, constituting the secondary heating elements. As already explained, the conductivity of heat from the central cast core is dependent upon the establishment of an intimate contact between the two, it being well known that metal offers very little resistance to the conduction of heat and that it is the presence of air gaps which interrupt, and therefore materially reduce, the conduction of heat from a primary heating element to a secondary element in contact therewith.

With this explanation, the reason for the specific shape of the core 8 and the openings 10 in the plates 9 may now be pointed out. Assuming, that the mere physical contact between core and the plate flanges 11 when the fit must be loose enough to slide

over easily, would not produce that intimate contact necessary to obtain efficient heat conduction, it is conceived that by forming the core in wedge shape, thereby providing converging inclined or beveled contact faces, the plates after being initially loosely applied to the core may be driven or forced downwardly, and by reason of the wedging action that would result, the contact surfaces are brought into very close and intimate contact, the idea being, of course, to eliminate any air spaces or gaps, no matter how minute, between the surfaces.

While the application of pressure at the upper edge of the plates will bring the plates into contact with the core, it is further desirable to maintain this pressure by inserting a wedge or key 12 into the space immediately below the core, as shown in Figures 2 and 3. This wedge is preferably a narrow strip of metal preferably made of the same material constituting the plates, and bent into V-shape. This strip is inserted endwise with its lateral edges extending upwardly and bearing along the flanges 11, 11 at the base of the core, and the apex of the strip bearing downwardly against the lower edges of the openings 10 of the plates. This wedge strip being more or less resilient, exerts a constant downward pressure on the plates, thereby holding them in close contact with the core.

It will be observed from Figures 4 and 5 that the formation of the plate may be slightly modified by the provision of flanges 13, 13 along the longitudinal or vertical edges of each plate, these flanges being turned in the same direction as the inner flanges 11, 11, and of the same length. Thus, in assembling the plates these outer flanges 13, 13 will abut against the edge of the adjacent plate, thus providing a radiator structure which is sealed along both sides, thus forming vertical passages on either side of the core with openings at the top and bottom. This formation is particularly desirable in a radiator structure designed for use in heating apparatus of the indirect type and especially where the apparatus is designed so that the air is forced vertically through the radiator and its travel confined within definite paths, and is more compact for the same plate surface.

A heating unit construction of a central cast core with separate multiple plates applied thereto in the manner described may be made in any desirable length or size, although by reason of its structure the actual space occupied by a unit of a given capacity is much less than that occupied by a radiator of the common cast iron construction of the same capacity. This is accounted for by the fact that the plates 9, by reason of their multiplicity and dimensions relative to the cross-sectional contour of the core, pre-

sent an exceptionally large area of radiation, thus making it possible to confine the entire unit within a comparatively small size. Furthermore, by reason of the fact

contour of said core, and contact flanges along the converging edges thereof, and means for maintaining said plates in wedging contact with said core.

3. A radiator for heating purposes comprising a hollow core having converging side walls, a plurality of plates adapted to be fitted onto said core, through the medium of apertures having flanged edges converging in conformity to the side walls of said core and extending between said plates in contact therewith, and means for maintaining said plates in wedging contact with said core.

4. A radiator for heating purposes comprising a hollow core elongated vertically and of substantially wedge-shaped contour, a plurality of separable plates having apertures conforming to the sectional contour of said core and provided with marginal contact flanges bearing against the side walls of said core and extending transversely between said plates with the flanges of each plate in contact with an adjacent plate, and a resilient wedge member inserted between said core and the edges of said apertures transverse to said contact flanges.

5. A radiator for heating purposes comprising a hollow core elongated vertically with its side walls inclined to form a substantially wedge-shaped sectional contour, a plurality of plates having central openings conforming substantially to the sectional contour of said core, and provided with contact flanges adapted to bear against the side walls of said core, and a wedge member adapted to be inserted between one end of said core and the adjacent edges of the apertures of said plates.

6. A radiator for heating purposes comprising a hollow core elongated vertically with its side walls inclined to form a wedge-shaped sectional contour, a plurality of plates having central openings conforming substantially to the sectional contour of said core, and provided with contact flanges bearing against the inclined walls of said core, and a substantially V-shaped wedge member inserted between the base of said core and the adjacent edges of the apertures of said plates.

7. A radiator comprising a hollow core having converging side walls, a plurality of plates provided with apertures conforming substantially to the cross-sectional contour of said core, and provided with flanges along the converging edges of said apertures and along the corresponding outer edges thereof, said plates fitting on to said core with the flanges of one plate in abutting contact with the adjacent plate and means for maintaining said plates in close contact with said core.

8. A radiator comprising a hollow core of substantially wedge-shaped sectional con-

that the efficiency of heat conduction from the core to the plates is increased to the maximum, the heat losses of conduction from core to plate are minimized with the result that the use of separate multiple plates does not affect the efficiency of the heat transmission thereto. From a practical standpoint these considerations are very material. In the first place, a radiating unit of the construction herein shown is much lighter in weight than the ordinary cast iron radiator of the same heating capacity and therefore can be shipped, handled, and installed with much less labor and expense. Moreover, when installed, the unit occupies a much smaller space and therefore is less conspicuous. And so too, the supporting of a radiator is always an important consideration due to the weight so that whereas ordinarily the cast iron radiator must have a firm support and therefore ordinarily rests upon the floor, a unit of the improved construction may be easily supported upon the wall or even the ceiling.

In the field of indirect heating apparatus a radiator unit of this type is particularly advantageous in that the radiator can be mounted in the heating unit at the place of manufacture, and the entire apparatus shipped complete, whereas, in the use of cast iron radiators the same must be shipped separately and the apparatus assembled at the place of installation. Moreover, the matter of weight where a cast iron radiator is used, makes it necessary, in the construction of indirect types of heating apparatus, to support the radiator upon the floor and to surround it with the housing. By the use of the improved construction, the radiator can be built into and supported by the housing, thus making an apparatus which may be shipped and installed at a decreased expense and without the amount of labor that would otherwise be required.

Having illustrated and described a preferred embodiment of the invention, we claim:

1. A radiator comprising a core, a plurality of separate plates mounted on said core in spaced relation and provided with apertures conforming substantially to the sectional contour of said core and each having flanges in bearing contact with said core and edgewise abutting contact with the adjacent plates, and means acting on said plates to promote close contact with said core.

2. A radiator for heating purposes comprising a hollow core having converging walls in opposite sides thereof, a plurality of plates having centrally disposed apertures conforming substantially to the sectional

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four, a plurality of plates extending at right angles to said core and provided with central apertures conforming to the sectional contour of said core and having flanges at two opposite edges thereof extending transversely between said plates and in contact with said core, each of said plates having flanges at two opposite outer edges adapted for abutting contact with each adjacent plate, and means for maintaining said plates in wedging contact with said core.

9. A radiator comprising a hollow core and a plurality of relatively thin plates separately mounted on said core in spaced relation through the medium of apertures having flanges along at least two opposite edges, and along the corresponding outer edges, the flanges of each plate having abutting contact with the adjacent plate, and a wedge member inserted between said core, and the edges of said apertures transverse to said flanges.

10. In a radiator, the combination with a hollow core; of a plurality of plate-like fins mounted on said core, said fins being provided with flanged openings adapted to receive said core, with the flanges of the said fins embracing and engaging said core, and the flange of each fin engaging the next adjacent fin, and means for forcing and holding said flanges in intimate contact with the surface of said core.

11. In a radiator, the combination with a hollow core; of a plurality of plate-like members threaded on said core, said plate like members having flanges embracing said core and engaging the same, said flanges serving as spacing elements for said members; and means for forcing said flanges against the core and holding the same in intimate face contact with the core.

12. In a radiator of the character described, the combination with a hollow radiator member; of a plurality of fin like radiating elements threaded onto said member, each of said fin elements entirely surrounding the core, said elements having wedged frictional engagement with the member, said elements each including an integral flanged section adjacent and embracing the core member, said flanged sections acting as spacers for said elements when threaded on said member.

13. In a radiator unit, the combination with a hollow container member; of a plurality of plate-like fin elements supported on said member, each of said fin elements entirely surrounding the core, said elements having flanges embracing said member, said flanges serving as spacing means between said elements; and means for wedging the flanges of said elements into intimate face contact with the surfaces of said hollow member and retaining the same in said intimate face contact.

14. In a radiator, the combination with a hollow core; of a continuous thin plate-like fin member mounted on said core and entirely surrounding the same, said plate like fin member having a wall bearing on the outer surface of the core and means for wedging and holding said wall in intimate contact with the outer surface of said core.

15. In a radiator, the combination with a hollow container of predetermined uniform external cross section throughout its length; of a plurality of thin plate-like fins threaded on the container, each of said fins being provided with an opening adapted to receive the container, each of said plate like fins being continuous and entirely surrounding said container, extended portions of the walls of the openings of said fins being adapted to bear on the outer surface of the container; and wedge means for wedging and pressing said extended wall portions against the outer surface of the container and holding the fins on the container.

16. In a radiator, the combination with a hollow core of uniform exterior cross section throughout its length, said core having inclined opposed walls; of a plurality of thin plate-like fins threaded on the core, said fins having openings adapted to receive the core, said openings having opposed walls thereof inclined to correspond with the inclined walls of the core, each of said fins being continuous and entirely surrounding the core; and means for wedging said fins onto the core to draw the walls of said openings into intimate contact with the core walls and holding the fins on the core.

17. In a radiator, the combination with an elongated hollow core of substantially uniform exterior cross-section; of a plurality of heat-conducting elements threaded on said core, said elements being provided with inner and outer flanges, said inner flanges embracing the core, the inner flanges of each element engaging the next adjacent element to accurately space said elements on said core, said outer flanges forming the continuous outer wall of the radiator.

18. In a radiator, the combination with an elongated hollow core of uniform exterior cross-section; of a plurality of heat-conducting plates having inner and outer spaced continuous flanges, the flanges of each plate engaging the adjacent plate to form upwardly extending continuous walled passages between said plates, said inner flanges embracing said core and having contact with the same.

19. In a radiator, the combination with an elongated hollow core of substantially uniform exterior cross-section having side walls relatively inclined to present a wedge-shaped sectional contour; of a plurality of heat-conducting elements threaded on said core, said elements being provided with in-

ner and outer flanges, said inner flanges being correspondingly inclined to the side walls of the core and embracing said core, the flanges of said element engaging the
5 next adjacent element to accurately space said elements on said core; and means for wedging said inner flanges against the side walls of the core.

20. In a radiator, the combination with an
10 elongated hollow container having inclined side walls, said container being of uniform wedge-shaped central cross-section; of a plurality of heat-conducting plates having inner and outer spaced flanges, the inner

flanges of each plate being inclined to correspond to the inclined side walls of the hollow container, said inner and outer flanges being adapted to engage the next adjacent plate to form upwardly extending passages between said plates, and wedging
20 means for forcing said inclined inner flanges against said core walls.

In witness whereof, we hereunto subscribe our names this 14th day of June, A. D. 1923.

GERALD E. OTIS.
WILFRED SHURTLEFF.