June 13, 1933. A. H. DAVIS, JR., ET AL 1,914,196

RADIATOR

Filed Sept. 11, 1931 3 Sheets-Sheet 1

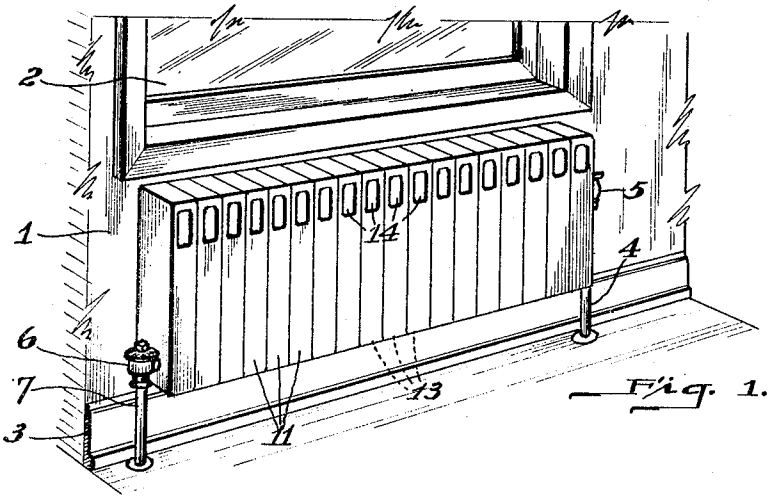


Fig. 1.

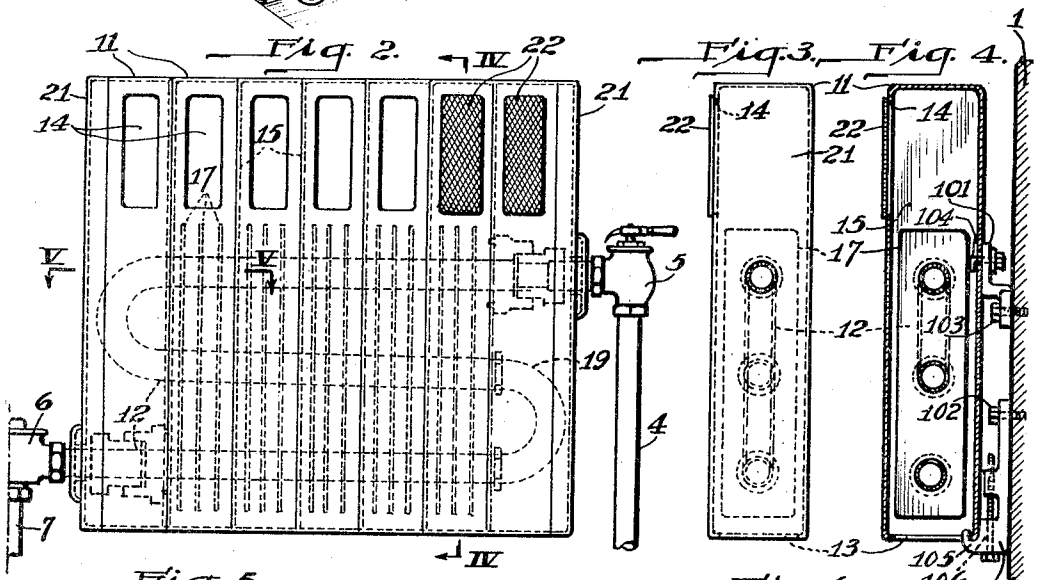


Fig. 2. Fig. 3. Fig. 4.

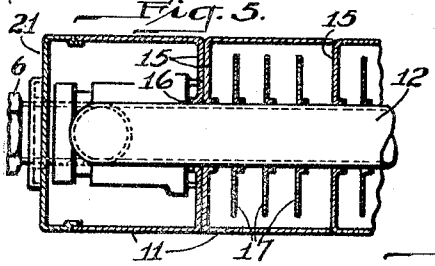


Fig. 5.

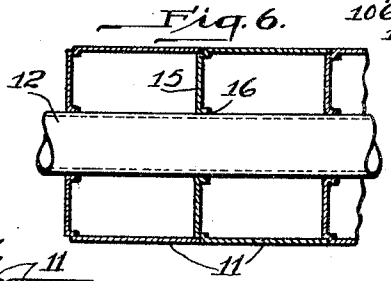


Fig. 6.

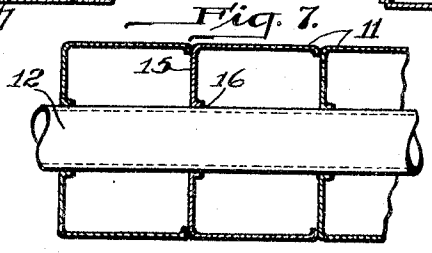


Fig. 7.

WITNESSES

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RADIATOR

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Fig. 8.

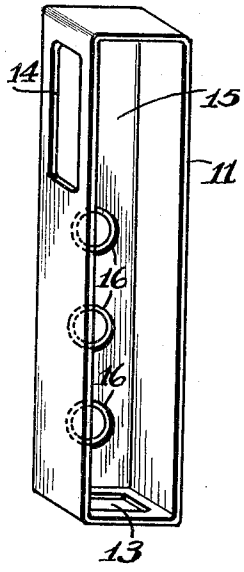


Fig. 9.

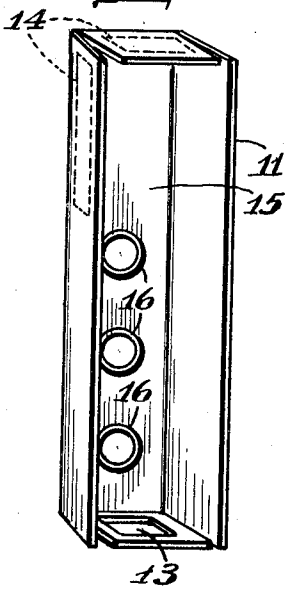


Fig. 10.

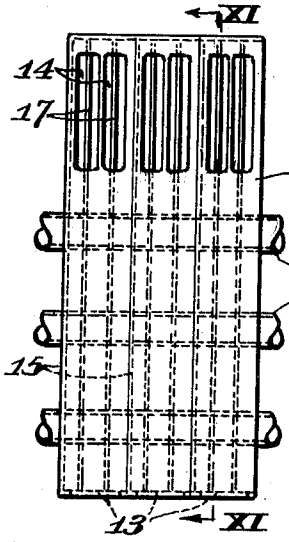


Fig. 11.

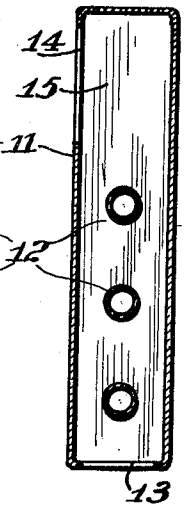


Fig. 13.

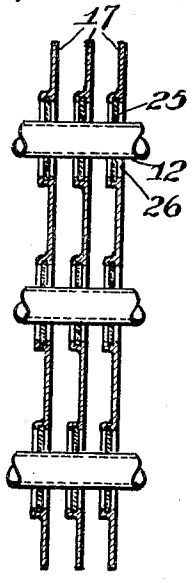


Fig. 12.

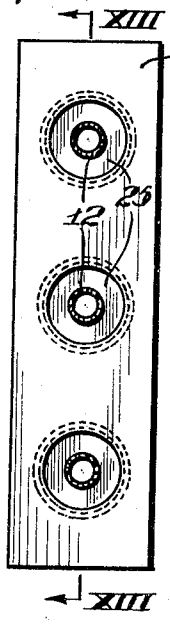


Fig. 21.

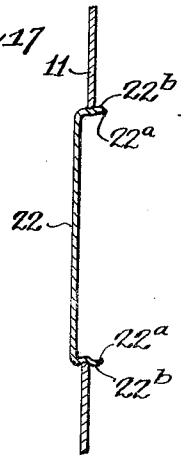


Fig. 15.

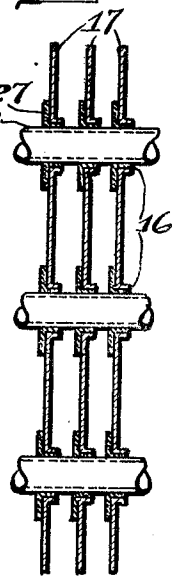
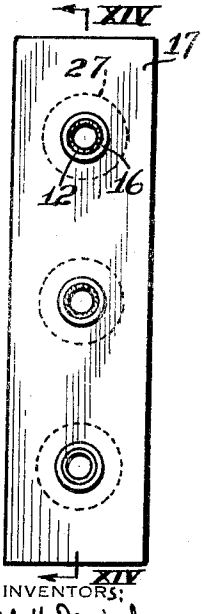


Fig. 14.



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RADIATOR

Filed Sept. 11, 1931 3 Sheets-Sheet 3

Fig. 16.

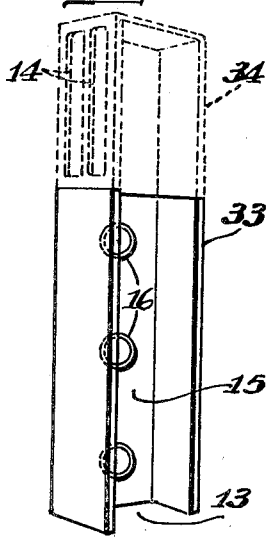


Fig. 17.

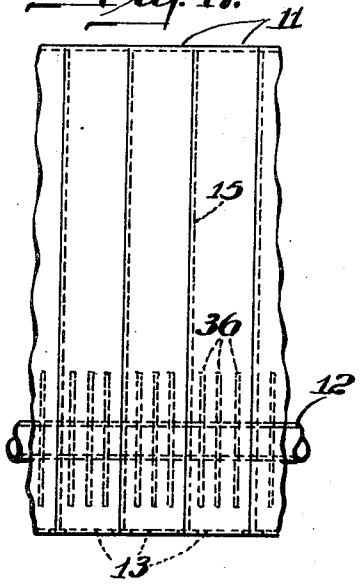


Fig. 18.

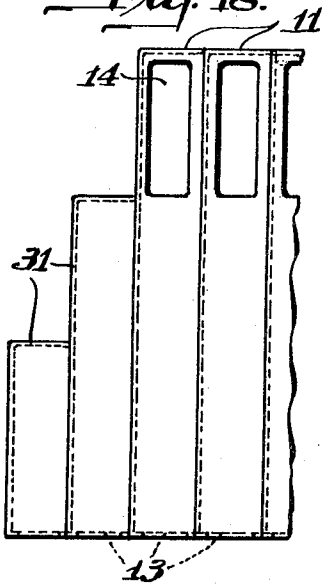


Fig. 19.

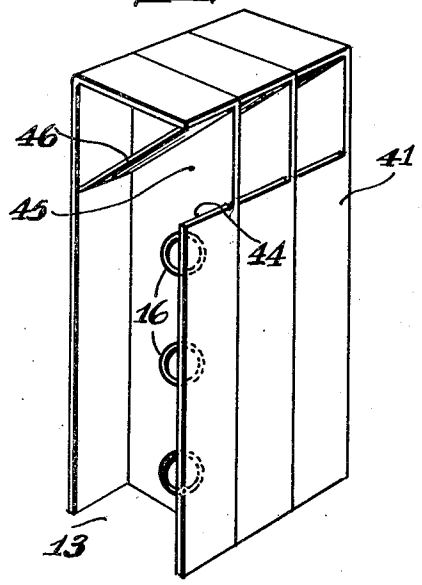
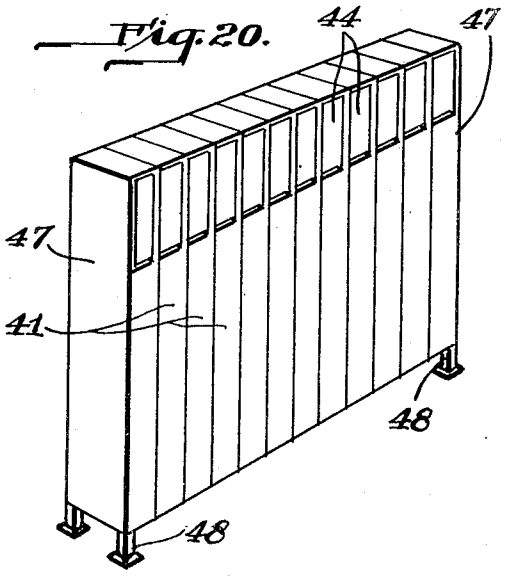


Fig. 20.



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Patented June 13, 1933

1,914,196

UNITED STATES PATENT OFFICE

ARCHIBALD H. DAVIS, JR., OF NEW CASTLE, AND PAXSON WINSBOROUGH, OF PITTSBURGH, PENNSYLVANIA, ASSIGNORS TO SHAW-PERKINS MANUFACTURING COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

RADIATOR

Application filed September 11, 1931. Serial No. 562,305.

This invention relates generally to heat exchange apparatus and particularly to radiators of improved construction for heating the rooms of buildings.

It is an object of this invention to provide a self-contained radiator and cabinet so constructed that it constitutes a unitary article. Another object of the invention is to provide a unitary radiator structure that presents a smooth and attractive exterior surface, functioning both as a cabinet and as an active radiating surface. A more general object of the invention is to provide a heating radiator that may be economically manufactured, the heating surfaces of which may be easily cleaned, and so constructed that its exposed parts are not heated to objectionably high temperatures in operation with normal low pressure steam or hot water. Another object is to provide a radiator made up of sections, the front, back and top of each section being formed from one sheet of metal. A further object is to provide a self-containing radiator and cabinet, constructed of similar sections joined to constitute a unitary structure.

In accordance with this invention in constructing a radiator, there is used, a heating element such as a tube for conducting heated fluid, and enclose the heating element in a sectional cabinet or extended surface structure, each section of which preferably constitutes a continuous front, top, and back portion, preferably supported by means of a transverse plate mounted on the heating element. Suitable openings are provided for ingress and egress of air to permit circulation through the sections, and intermediate vertically disposed plates are provided in each section to aid in transferring heat from the heating element to the air within the section.

The foregoing and other objects of the invention that will become apparent upon further considering this specification, may be achieved by the structures described herein and shown in the accompanying drawings, in which

Fig. 1 is a general perspective view of a radiator embodying our invention mounted on the wall of a room;

Fig. 2 is a view in front elevation of the radiator, with interior parts indicated in dotted lines, showing the construction in greater detail;

Fig. 3 is a view in end elevation of the radiator shown in Fig. 2.

Fig. 4 is a view in vertical cross-section showing wall attachments, taken on the plane represented by the line IV—IV in Fig. 2;

Fig. 5 is an enlarged view in cross-section of a portion of the radiator taken on the plane represented by the line V—V in Fig. 2;

Fig. 6 is a view in horizontal section, similar to Fig. 5, showing another type of joint between the sections of the radiator;

Fig. 7 is a view similar to Fig. 6 showing another type of joint between the sections;

Fig. 8 is a view in perspective of one section of the radiator structure of a preferred structure without edge joints;

Fig. 9 is a view, similar to Fig. 8, of a section of a radiator made in accordance with a modification of our invention;

Fig. 10 is a view in front elevation of a portion of a modified type of radiator showing intermediate plates extending to the top of each section;

Fig. 11 is a view in vertical section of the radiator shown in Fig. 10 taken on the plane represented by the line XI—XI;

Fig. 12 is a view in elevation of a modified intermediate plate adapted to be joined to the heating element by an inserted disc;

Fig. 13 is a view in vertical section taken on the plane represented by the line XIII—XIII in Fig. 12;

Fig. 14 is a view similar to Fig. 12 of another modification of the intermediate plate;

Fig. 15 is a view taken on the plane represented by the line XV—XV of Fig. 14;

Fig. 16 is a view in perspective of a section of a radiator embodying a modification of the invention;

Fig. 17 is a view in front elevation of a portion of a modified radiator having a single heating tube;

Fig. 18 is an elevation of a portion of a radiator having a modified end section;

Fig. 19 is a view in perspective of sections of a radiator embodying a further modification;

Fig. 20 is a view in perspective of a radiator made up of the modified sections shown in Fig. 19, and

Fig. 21 is a vertical section of a detachable grilled plate adapted to be inserted in the openings in front of the radiator cabinet as shown in Figs. 2, 3 and 4.

Referring more particularly to Fig. 1 of the drawings, the radiator embodying our invention may be mounted on the wall 1 of a room in any convenient position, for instance beneath a window 2 and above a base-board 3. Steam or other heating fluid may be admitted to the radiator through a supply pipe 4 having a control valve 5 connected in the usual manner to one end of the radiator. At the other end of the radiator is connected a trap 6 and a condensation return pipe 7 for draining liquid from the radiator. The radiator may be installed with fittings of other types or connected directly to the pipes without a valve or trap according to standard practice

As best shown in Fig. 2, the radiator comprises a plurality of similar sections 11, each of which constitutes a continuous front, top and back portion. When joined together as shown, the sections constitute a smooth and substantially continuous exterior cabinet-like structure. Within the cabinet thus formed is provided a heating element, preferably a tube 12 of drawn copper, comprising one or more runs as shown in Fig. 2 in dotted lines connected to the valve 5 through which the steam or other heating fluid from the supply pipe 4 circulates.

To permit air to pass upward through the sections, the bottom of each section 11 is left open as shown in Fig. 4 to provide an inlet opening 13. Suitable outlet openings 14 are provided in convenient position at or near the tops of the sections, preferably in the front thereof as shown in Fig. 2. Each section thus constitutes in effect a flue for inducing the circulation of air past the hot tube 12.

In addition to the heat provided by convection currents through the sections, the exterior of each section radiates heat directly into the room.

As shown in Fig. 8, each section 11 is provided with a side wall or cross plate 15 integrally joined to one edge of the front, top, and back portion, and provided with a plurality of openings 16 through which the runs of the tube 12 pass. The openings 16 are provided with pressed flanges which engage the exterior of the tubes 12 to make heat-transferring contact therewith in such manner that heat is conducted from the tube 12 through the transverse plate 15 to all surfaces of each section 11.

When steam is the heating medium within the tube 12, the exterior of the section 11, being spaced some distance from the tube, is not brought to the temperature of the steam, but remains at a substantially lower temperature. This gives full effective air heating but avoids the danger of personal contact with hot steam pipes. In this manner the sections constitute a guard for the high temperature tube 12. This is particularly desirable in the event that the radiator is used in a system employing high pressure, high temperature steam, as direct radiation from an exposed high temperature heating element is uncomfortable to persons near the heating element.

The tube 12 is preferably made of drawn copper, or other non-corrosive metal, and in this instance it is bent and joined in such manner that it is doubled back upon itself to make a plurality of turns or runs longitudinally of the radiator as shown in Fig. 2. Any number of runs of tubing may be used, or the heating element may comprise a single tube only, as shown in Fig. 17.

To assist in transferring heat from the tube 12 to the air within the radiator, a plurality of intermediate plates or fins 17 are provided within each section. As best shown in Figs. 4 and 5, the intermediate plates 17 are provided with openings 18 that register with the openings 16 in the sections 11 for receiving the various runs of the tube 12. The intermediate plates 17 may be somewhat smaller than the side plates 15 of the sections 11 and consequently they may be suspended on the tube 12 without engaging the interior of the sections 11 or they may be made to fit tightly within the sections as shown in Fig. 10.

In the specific embodiment shown in Fig. 5 each section 11 is provided with three intermediate plates, but any convenient number of intermediate plates may be provided as circumstances may suggest, or for certain conditions the intermediate plates may be dispensed with.

The intermediate plates 17 may extend the entire height of the sections 11 as shown in Figs. 10 and 11, in which case they provide a grill at the openings 14 that enhances the appearance of the radiator. Or they may be limited in height, as shown in Figs. 2 and 4 to such extent that they do not pass above the bottom of the outlet openings 14 in the sections.

If desirable the plates may be made still shorter to engage only the single tube shown in Fig. 17, or plates of various lengths and sizes may be intermixed.

In constructing a radiator in accordance with our invention, each section 11 may be individually formed, as shown in Fig. 8 by

pressing, drawing and punching it from a suitable single sheet of metal. By another method, the sections may be made from flat material by cutting and folding it as shown in Fig. 9.

Any suitable workable sheet metal may be utilized, but we prefer to make the sections 11 of sheet steel because of lower cost thereof. The intermediate plates 17 may be stamped from suitable sheet material such as sheet copper, aluminum, or steel. We have found that the inexpensive grades of sheet steel may be utilized for manufacturing the intermediate plates with satisfactory results.

After the individual sections and plates have been formed they may be assembled and held in their relative positions by any suitable frame, and the tube 12 inserted through the openings 16 and 18 in the cross plates 15 and the intermediate plates 17 respectively.

As shown in Fig. 2, the tube 12 is preferably made in two or more parts, one part being bent in U-shape and another part being a plain straight tube. The U-shaped part may be inserted from one end of the structure through two of the openings 16 and joined at the other end of the radiator, by a suitable return bend connection 19, to the straight portion of the tube that constitutes the third run or turn thereof through the radiator. Although only three horizontal runs of tubing are shown, any suitable number may be utilized as desired.

After the sections 11 have been thus assembled on the tube 12, suitable end plates or end sections 21 may be fitted to each end of the radiator. The end plates 21 are adapted to fit within the open sides of the sections 11 and to enable them to be attached at each end of the radiator, one of the sections 11, shown at the left end of the radiator in Fig. 5, is reversed.

After the radiator has been assembled, the various parts may be held together by various means. For instance, the entire radiator may be dipped in a galvanizing bath, the joints may be individually soldered, or the tube 12 may be expanded by fluid pressure to tightly engage the openings 16 and 18 in the sections and intermediate plates.

The outlet openings 14 may be left plain, or suitable perforated detachable grill plates 22 may be applied to them in any desired manner, as shown in Fig. 2, to provide decorative effect. By varying the design of grill plates 22 the appearance of the radiator may be changed to secure special decorative effects. These grilled plates may be conveniently attached by having integral tongues 22*a* formed at the top and bottom thereof. These tongues are bent to form a hump 22*b*, which is adapted to snap into engagement with the bounding edge of the openings 14, as shown in Fig. 21.

The edges of each section 11 may be left plain and permitted to abut against the rounded corners of the next section as shown as shown in Fig. 5, or the corners of each section may be indented or recessed as shown in Fig. 6 to receive the edges of the adjacent section in such manner that they are firmly supported against injury from externally applied forces.

If it is desirable to provide a panelled effect to the exterior of the radiator, the edges of the sections 11 may be bent inwardly, as shown in Fig. 7, to match the rounded corners of the adjacent section and to provide a smooth seam or line on the surface of the radiator.

To promote the transfer of heat from the tube 12 to the intermediate plates 17 or to the transverse plates 15, disks or plates 25, of copper or other metal of high heat conductivity and having central openings, may be secured within relatively large openings 26 in the plates 17, as shown in Figs. 12 and 13. The tubes 12 are passed through the central openings in the disks 25, and, because of the high conductivity of the metal in the disks, heat is readily transmitted from the tubes 12 through the disks to the plates 15 and 17, which are ordinarily made of steel.

A similar effect may be obtained by means of the structure shown in Figs. 14 and 15, in which the transverse plates 17 are provided with enlarged flanged openings 16 for receiving the tubes 12. Disks 27 of copper or similar material, having flanged openings 28 of diameter somewhat smaller than the openings 16, are fitted within the flanges of the plate 15 and abut against the plate in such manner as to engage the tube 12 and assist in transmitting heat from the tube to the plate 15.

At the ends of the radiator, the valve 5 and the trap 6 may be left exposed, as shown in Fig. 2, in accordance with the usual practice, or they may be housed within special end sections 31, as shown in Fig. 18. The special end sections 31 are of the same general cross section as the main sections 11 and may be attached to the main body of the radiator by any suitable means. If it is desired to make the radiator of rectangular shape in general outline, the end sections 31 may be made equal in height to the main sections 11 and they may be provided with outlet openings 14, or their front panels may be left plain without openings, as shown.

To provide another effect to the exterior of the radiator, one or more end sections 31 of height less than the height of the radiator may be applied as shown in Fig. 18, thereby giving a stepped or setback appear-

ance in accordance with the modern tendency in architectural design.

A modification of the radiator is shown in Fig. 16 in which main sections 33 are formed by bending a flat plate to provide front and back walls with the top and bottom open. In height the sections 33 may be substantially equal to that of the intermediate plates 17, as shown, or they may be made of any suitable height for receiving any desired number of runs of the tube 12. The radiator may be made up of sections 33 and plates 17 mounted on tubes 12 and suspended in such manner that the top and bottom are disposed to permit circulation of air. If desired, a top or cabinet portion 34 may be applied to the sections 33 to enhance the appearance of the radiator. The top 34 may be in sections corresponding to the sections 33 or it may be in one unit extending the full length of the radiator and fastened in position in any suitable manner.

As shown in Fig. 17, the radiator may be made with a heating element that comprises a single tube 12 extending from one end to the other, preferably along the bottom of the radiator. Small intermediate plates 36 may be utilized with the single tube, as shown. The tube may, if desired, have a return bend or bends above the plates 36. This gives increased stack effect, and a lighter structure.

The radiator may be constructed in another form as shown in general in Figs. 19 and 20. The radiator there shown is made up in a manner similar to that shown in Fig. 2 with the exception that the individual sections 41 are made with square corners instead of being rounded. As shown, each of the sections 41 is somewhat narrower than the sections 11, and at its upper end, a portion of the front wall is entirely cut away to provide an air outlet opening 44. By making the sections 41 somewhat narrower, their sides or transverse plates 45 are brought closely together and if it is desired to do so the intermediate plates may be dispensed with all together. To assist the circulation of air through the sections a suitable baffle plate 46 may be mounted in the upper part of each section as shown in Fig. 19. The sections 41 may be secured to the tubes 12 in any suitable manner and suitable end sections 47 may be attached to enclose the tube bends at the ends of the radiator.

The radiators may be mounted on a wall by brackets similar to those shown in Fig. 4, or legs 48 may be applied, preferably to the end sections 46 as shown in Fig. 20, for supporting the radiator on the floor in the usual manner. As shown in Fig. 4, the radiator may be attached to a wall by means of lower bracket 100 and upper bracket 101, attached to the wall by screws 102 and 103, respectively. A hook-bolt 104 engages the rear radiator wall. A seating member 105, adjustable in height by a threaded member 106, supports the under rear edge of the radiator.

Although I have shown specific embodiments of our invention and described them in considerable detail to make a full disclosure thereof in accordance with the patent statutes, it will be understood that the descriptive terms utilized are for purposes of explanation only and that they are not to be interpreted as limiting the scope of the invention defined in the appended claims.

We claim:

1. A radiator comprising a tube for conducting fluid, a housing for the radiator formed from an integral sheet of metal constituting front, top, back and end portions, said end portion being in heat-conducting engagement with the tube.

2. A self-contained cabinet radiator comprising pressed metal sections each constituting integral front, back and top portions, and fluid-conducting tubes connected in heat-conducting relation to the metal sections.

3. A self-contained cabinet radiator comprising pressed metal sections each constituting integral front, back and top portions, fluid-conducting tubes connected in heat-conducting relation to the metal sections, and an opening near the top of each section for permitting egress of heated air from the radiator.

4. A radiator of the extended surface type comprising a tubular heating element, and plates in heat-conducting contact with said heating element and extending substantially at right angles thereto, the edges of said plates being formed at right angles to the main surface of the plates, said formed edges extending substantially to the next plate to form a back, top and front inclosure around the tubular heating element, and having openings to allow entrance to and exit of heated air from the interior of said inclosure.

5. A radiator of the extended surface type comprising a tubular heating element, primary plates in heat-conducting contact with said heating element and extending substantially at right angles thereto, the edges of said plates being formed at right angles to the main surface of the plates; a secondary series of narrower plates also in heat-conducting contact with said heating element and interposed between said primary plates, the formed edges of each primary plate extending substantially to the next primary plate to form a back, top, and front inclosure around said heating element and around said secondary plates and having openings to allow entrance to and exit of heated air from the interior of said inclosure.

6. A radiator comprising a heating element and a cabinet composed of a plurality of sections each having a wall constituting a substantially continuous outside surface forming a back, top, and front inclosure around the heating element, said outside surface being connected at intervals to the interior heating element by heat-conducting contacts and having openings for the exit of heated air from the interior of said cabinet.

7. A radiator comprising a heating element, a series of sections constituting a cabinet inclosing the heating element, said sections comprising a series of plates the edges of which are formed at right angles to the main surface and with the formed edge of each section extending substantially to the next section, the said formed edges of plates forming the front, top, and back of the cabinet, the unformed surface of said sections being attached in a heat-conducting manner to the said heating element.

8. A combination radiator and cabinet comprising a tubular heating element, groups of flat plates in heat-conducting contact with said heating element, and a series of cabinet sections each of which forms a back, top, and front inclosure around a portion of the tubular heating element and one group of plates, said cabinet sections being individually connected to the tubular heating element in a heat-conducting manner, each cabinet section being provided with an opening to allow the exit of heated air from the interior of the section.

9. A radiator comprising a tube for conducting heated fluid, and extended surface plates mounted in heat-transferring manner on said tube, the vertical edges of said plates being bent to form vertical flues and a separate box-like cabinet structure having air outlet openings mounted on the upper ends of said plates.

10. A radiator comprising tubes for conducting a heat-transferring fluid, a cabinet for said tubes, comprising sheet metal sections each bent to form a front and back wall and a transverse wall adapted to engage the tubes, and a separate top member having openings for exit of hot air adapted to seat on said sections and to complete the cabinet.

11. A radiator comprising a tubular member for conducting a heating fluid, a sheet metal shell surrounding the tubular member forming flues extending thereabove and having openings near the tops of said flues, and detachable grilled plates adapted to seat in said openings, whereby to vary the decorative effect of said radiator exterior.

12. A self-contained cabinet radiator comprising pressed metal sections each constituting integral front, back and top portions, fluid-conducting tubes connected in heat-conducting relation to the metal sections, an opening near the top of each section for permitting egress of air from the radiator, and heat-conducting plates threaded on said tubes between but out of contact with said sections and having their upper ends positioned beneath said openings.

13. A self-contained cabinet radiator comprising pressed metal sections each constituting integral front, back and top portions, fluid-conducting tubes connected in heat-conducting relation to the metal sections, the upper portions of the front wall of each section being cut free except at the upper front edges thereof, said cut-free portion being bent inward and backward to form an inclined partition extending across the sections constituting an outwardly deflecting wall leading to an opening in the front wall of the section formed by the displacement of the said folded back portion.

14. A self-contained cabinet radiator comprising pressed metal sections each constituting integral front, back and top portions, fluid-conducting tubes connected in heat-conducting relation to said metal sections, each section being formed of a seamless box-like member having openings in its lower end for admission of air, and in its front wall for egress of air, and in its side wall for passage of the heat-conducting tubes therethrough.

15. A self-contained cabinet radiator comprising pressed metal sections each constituting integral front, back, and top portions, and fluid-conducting tubes connected in heat-conducting relation to said metal sections, said sections having side and end members integral with the body portion thereof and folded to perpendicular position with respect to the main body portion of the blank to form a box-like section.

16. A radiator comprising a tube for conducting heated fluid, sheet metal collars of high heat-conductivity characteristics attached edgewise to the tube and extending radially therefrom, and extended surface plates attached to the outer edges of the collars.

In testimony whereof, we hereunto sign our names.

ARCHIBALD H. DAVIS, JR.
PAXSON WINSBOROUGH.