Nov. 22, 1932. F. H. AUSTEN 1,888,900

RADIATOR

Filed April 11, 1928 3 Sheets-Sheet 1

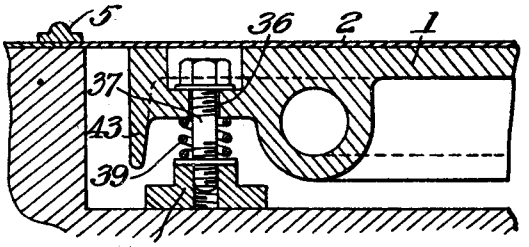


Fig. 12

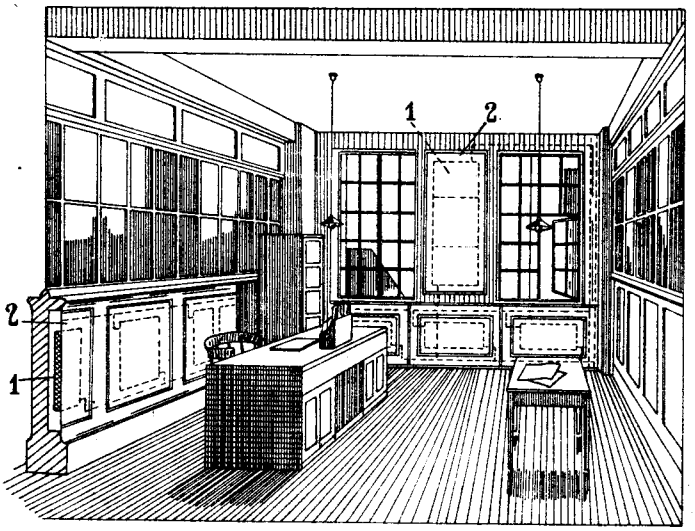


Fig. 1

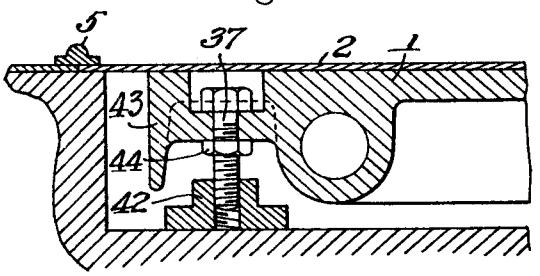


Fig. 13

J. H. Austen
INVENTOR

By: Marks & Clark
Attys.

Nov. 22, 1932. F. H. AUSTEN 1,888,900

RADIATOR

Filed April 11, 1928 3 Sheets-Sheet 2

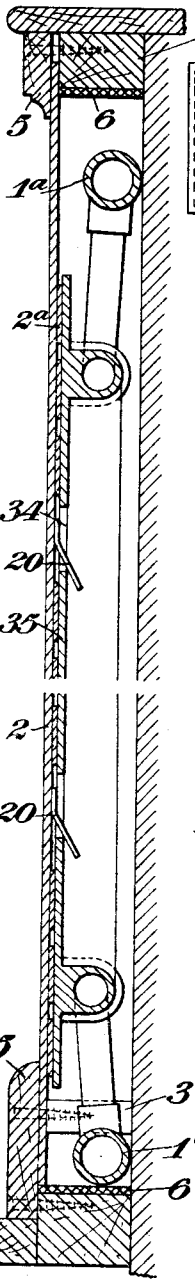


Fig. 2.

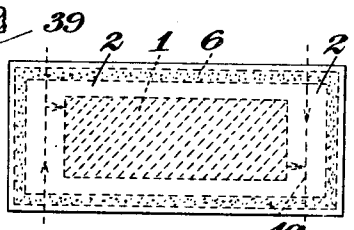


Fig. 3.

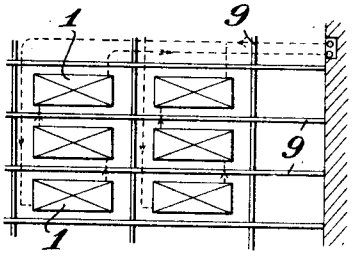


Fig. 4.

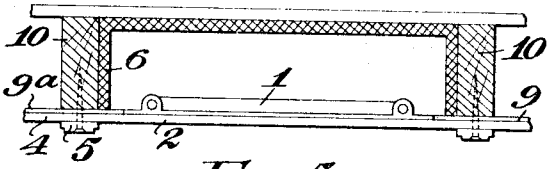


Fig. 5.

Fig. 6.

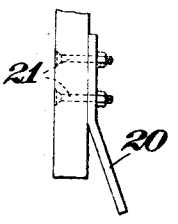


Fig. 7.

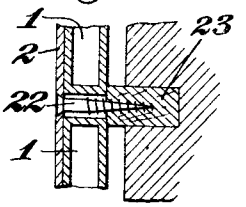


Fig. 8.

F. H. Austen
INVENTOR

By: Marks & Clerk
Attys.

Nov. 22, 1932. F. H. AUSTEN 1,888,900

RADIATOR

Filed April 11, 1928 3 Sheets-Sheet 3

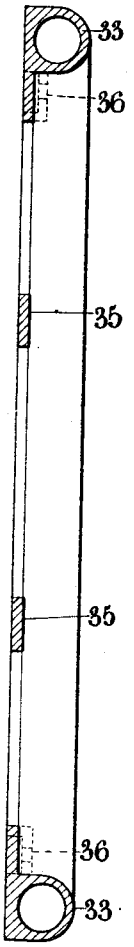


Fig. 11.

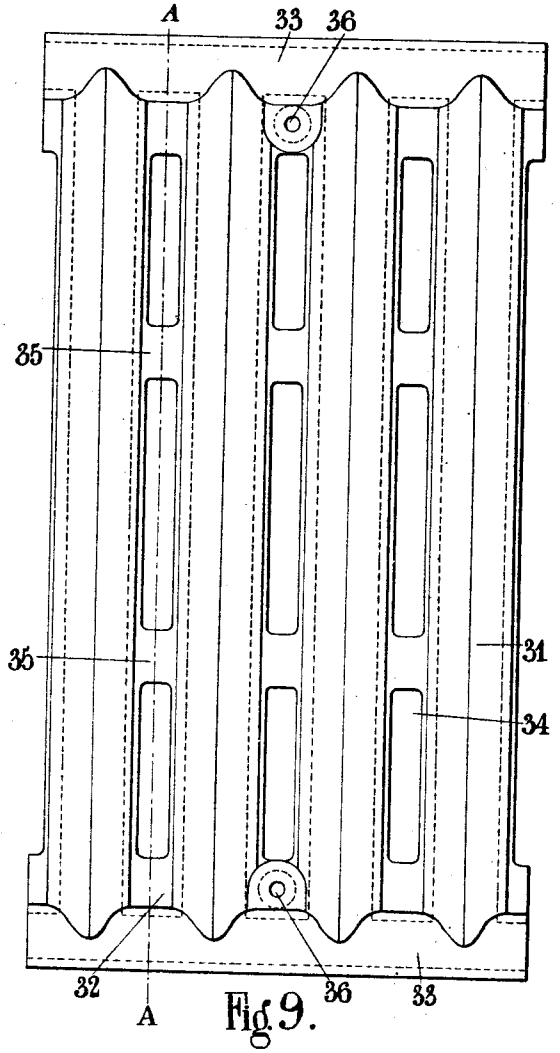


Fig. 9.

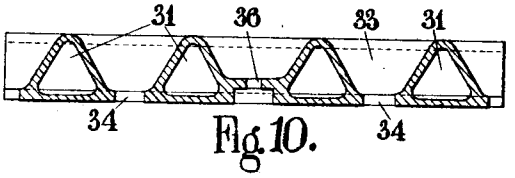


Fig. 10.

F. H. Austen INVENTOR

By: Marks & Clark ATTYS.

Patented Nov. 22, 1932 1,888,900

# UNITED STATES PATENT OFFICE

FREDERICK HUGH AUSTEN, OF LEICESTER, ENGLAND

## RADIATOR

Application filed April 11, 1928, Serial No. 269,138, and in Great Britain May 9, 1927.

This invention relates to systems and plant for heating or cooling buildings, rooms and the like, of the kind generally known as "centralized" wherein radiator units are provided which are supplied with heating or cooling medium including not only water, steam or air circulated from a central heat source but the use of electricity or gas for the local production of heat in a radiator, and more particularly the invention has reference to proposed systems or installations wherein radiators are mounted behind wall or ceiling surface elements or applied sheets as distinct from "built-in" systems of the kind having radiator elements embedded in plaster and the like. It may be noted that it has previously been proposed to position radiators within wall recesses and to cover the recesses with panelling or the like spaced away from the radiators so that the air of the sealed space acts to heat the panelling or escape into the room.

Although the invention includes the dissemination of cold it will be referred to and described hereinafter for the sake of convenience solely as applied for heating purposes.

An object of the present invention is to provide an improved system and plant whereby radiator or like heating units are covered or disguised, and wall and like surface areas are caused to constitute an efficient heat disseminating medium while adapted to afford freedom for architectural building or decorative treatment.

Another object of the invention is to provide a system and plant akin to the built-in type, which can not only be installed inexpensively but also provides for accessibility, enabling inspection, repairs or removal of radiator units and their associated parts or pipe connections readily to be carried out, and further enabling constructional alterations, re-decoration or like work to be effected without the drastic breaking down and reconstructive operations such as are inherent to or attend upon the installation of built-in or plastered-in heating coils.

A further object of the invention is to provide an improved form of radiator which is efficient and may be constructed at low cost and one, moreover, particularly suited to the purposes of the present invention or other purposes where architectural or decorative treatment are factors in view.

According to the invention a radiator is formed with a substantially flat face or faces integral therewith and arranged to transmit heat to a veneer or surface element (hereinafter referred to as a "panel") adapted to act as a heat radiating surface, means located within the area of the radiator being provided for detachably securing the said element in heat transference relationship with the said face.

Further features of the invention will be hereinafter described and more particularly defined in the claims.

By "heat transference relationship" is meant such intimate association of the radiator and panel as to afford the panel approximately the same temperature as that of the radiator surface, or a temperature such as is recognized as useful for room-heating purposes.

It is preferred that the veneer should act as the heat disseminating medium mainly by radiation in contradistinction to systems in which heat is disseminated by convection as in the case of radiators standing in a room or where air from coils or heating units enclosed by wall surfaces or otherwise is free to circulate into a room. With this end in view the area around and at the back of radiator units may be sealed from the room or building by the veneer and adjacent wall areas so that circulation of air cannot take place; further, the relationship between the radiator units and the veneer as to the area of heat transmission or other adjustments referred to hereinafter may be varied to afford the required temperatures for the veneer surface.

While usually it is preferred that the veneer or panel presents an integral front, in some cases it may be convenient or desirable to form the panel slotted or grilled so that direct radiation from the radiator takes place through apertures therein.

According to the invention a radiator may comprise a single radiator element or an as-

sociated series of such elements. The disposal and distribution of radiators will be arranged according to the heating requirements and radiator elements may be coupled together by short pipe lengths or by close coupling nipples, or again they may be formed in sections so that they abut one against the other so that a series of sections may be united together to provide the required size of radiator. The term "radiator" employed in the claims is to be understood in this sense.

A further feature of the invention resides in providing that the panel and a radiator unit are secured or mounted in resilient or yieldable relationship whereby the surfaces of the radiator and the panel are drawn towards one another and afford mutual accommodation and in certain cases relieve the radiator units of undue weight or pressure. It is preferred to secure the panel within the area covered by the radiator unit by aid of clips or like members which are adapted to operate with a wedging or like action, or a resilient wedging action, adapted to draw the panel and unit together.

The radiator unit according to the invention may comprise a flat face presenting a superficial area or areas lying substantially in one plane or in a curved plane in conformity with the shape or curve required by the panel according to architectural features. These surfaces may be smooth, ribbed, reticulated or embossed, with a view to securing the degree of temperature required for the panel bearing in mind that the aim is to secure (without undue heat wastage or loss) for the panel or parts thereof the temperature of the radiator or adjacent heat-transmitting parts thereof.

In the accompanying drawings:—

Figure 1 is a perspective diagram of a room or office exemplifying an application of the invention to wall or partition areas.

Figure 2 is a sectional elevation of a radiator in position, and

Figure 3 is a diagram indicating the arrangements of an insulating wall or boundary for a radiator to prevent the heat from spreading beyond the panel area or to parts where it is not required.

Figure 4 is an underneath plan diagram of a ceiling showing the arrangement of radiators and strip mounting means for the panel ceiling surfaces.

Figure 5 is a fragmentary cross sectional view showing an application of the invention to a ceiling.

Figure 6 is a cross-sectional view illustrating clip means for mounting panels according to the invention in association with radiators.

Figure 7 is a detail view of clip mounting means for the panel.

Figure 8 is a fragmentary sectional elevation or plan illustrating a mode of securing a veneer between or through radiator elements.

Figure 9 is an elevation and Figure 10 a sectional plan of a preferred form of radiator comprising waterways located upon one side of a flat surface area.

Figure 11 is a sectional elevation taken on the line A—B of Figure 9.

Figure 12 is a fragmentary cross-sectional elevation illustrating a radiator having resilient mounting means according to the invention.

Figure 13 is a fragmentary cross-sectional elevation showing an alternative adjustable mounting.

In carrying the invention into effect as described by way of example with reference to the treatment of wall areas, radiators 1 (see Figure 1) are mounted in or upon wall or partition areas and are covered by sheets of veneer or panelling 2 which may extend beyond the area of the radiators and are adapted to form part of the wall surface or lining of the room. The radiators may be positioned in any suitable situations to afford the requisite heating area for the room, with appropriate pipe line connections running behind and covered by the panels and in accommodation provided in the wall or partition as indicated in dotted lines in the figure. For example, the radiators may be provided in a partition, such as seen on the left of Figure 1, or between or underneath windows or in any other appropriate situation as illustrated at the end of the room in the drawings. The panel elements as will be observed are erected so as to be indistinguishable from the remainder of the wall surface area or lining of the room and any junctions between separate surfaces may be covered by beading, moulding or the like, and the panel may be moulded or adapted to conform to the architectural or decorative treatment of the room.

The radiators 1 may be let into recesses or may be superimposed on existing wall surfaces so that the panel elements and surrounding wall areas are built as or constitute a false front to the original or structural wall of the building as will be referred to hereinafter. Further, the recessing or making up as a false front may be combined so that the radiators are partly recessed and partly stand out from the wall, according to the circumstances of the application or installation conditions.

It may be desirable in certain cases to adjust the temperature of the panel by reducing the contact area over the radiator, or by spacing the face of the radiator from the panel a fraction such as to produce the desired temperature. As another alternative, distance pieces of heat insulating material, or a material adapted moderately to conduct

heat, are introduced between the radiator face and the panel. These distance pieces may be in the form of spaced strips or in the form of a lattice, or again the radiators may be wholly covered with a sheet of material lying as an intermediate panel element.

In Figure 2 the radiators are accommodated in a space built out from the original wall or structure, and the panelling and adjacent wall surface is arranged as a false front or wall. In Figure 2 is illustrated a radiator and panel construction applied as a dado for a room. The wall is provided, for example, with battens which are adapted to carry the false front and leave a space for the radiator 1 which is mounted so that its flat face is more or less flush with the rear plane of the false front. Over the radiator and extending beyond the same (either laterally or vertically or in both directions) is a panel element 2 which may take an abutment upon the adjacent batten and cross-batten 3*a*. The junction of the panel 2 with a similar board or wall surface element or plaster is preferably arranged to take place over a batten and this junction may be covered by beading or moulding pieces or by any suitable covering or disguising material or cloth. According to the application shown in Figure 2, the covering piece takes the form of a dado capping or skirting board. The junction should allow for the expansion and contraction of the panel element 2 and to this end the securing means for the moulding may pass through slots or enlarged holes in the panel 2 or at the joint in the space between boards. The space between the battens which enclose the radiator is preferably isolated by the provision of a framing or boundary 6 of heat insulating material adapted to stop off the heated area or prevent the heat escaping the regions where it is not required. The radiator is coupled to horizontal service pipes 1*a* by shorter pipe lengths or other appropriate connections (see Figure 2).

If desired, in order to save space the wall in rear of the radiator may be partially recessed. Spacing strips 2*a* may be arranged between the panel 2 and the face of the radiator 1 for the purpose previously described but such strips may be omitted, if desired, i. e. the panel may be in direct contact with the face of the radiator.

It will be appreciated that the above application of the invention more particularly applies to the installation of plant in existing rooms or buildings. Where new buildings are to be treated, during their construction, recesses may be left or formed in the walls for the reception of the radiator 1, the panel element 2 being applied to the flat surface of the radiator and extended to suitable marginal abutment pieces and made to join up with plastering or other finishing material for the wall, the join being covered by moulding 5 as already indicated in connection with Figure 2. The recess may be lined as a lateral boundary or throughout the sides and back, with heat insulating material 6 made up to the height of the rear of the panel as previously described for isolating the heating area of the radiator.

Figure 3 may serve diagrammatically to illustrate a suitable relationship (front elevation) of a radiator 1, pipe connections 1*a*, insulating boundary 6, and panel surface 2.

Means for securing the veneer in relation to the radiator as described with reference to Figures 1 to 6 and also with reference to subsequent figures, are in all cases located within the area of a radiator as hereinbefore defined, although in certain cases such securing means are not shown in the drawings.

Preferred forms of securing means for the veneer will be described hereafter.

In carrying the invention into effect as applied by way of example to ceilings, it will be appreciated that the invention may be applied both to existing ceilings and to ceilings in the course of construction. It is preferred in most cases to provide strips or slats 9 to aid in the securing of panels and associated ceiling surface elements, as shown for example in Figure 4 where a series of radiators 1 are shown with their connections in relation to one another and the strip elements 9. The ceiling surface may be composed of panel elements in the locality of the radiators and elsewhere may comprise metallic or other sheet elements or boards.

The radiators may be mounted in the spaces between ceiling joists (see Figure 5) or may be located in the space provided below the joists.

In Figure 5 the radiator 1 is located between a pair of joists 10 and the cavity may be sealed or enclosed by insulating material 6 formed as an inverted box or moulded in situ so as to confine the heat of the radiator in the required quarter. The strips 9*a* are secured to the joists and are terminated to provide for the introduction of the radiator 1 and may be arranged to accommodate the pipe connections. Alternatively, the strips may be blocked out from the joists by distance pieces to leave space for the pipe connections. Over the face of the radiator the panel element 2 is laid and appropriately secured (as referred to hereinafter), the joint between it and adjacent boards or ceiling surface 4 being covered by beading or moulding 5 after the manner indicated hereinbefore and illustrated in Figure 5.

The invention may be applied to existing ceilings by the application of a false front or ceiling by packing out after the manner described.

One attachment means according to the invention comprises clip members 20 secured to

the panel elements 2 as illustrated diagrammatically in Figure 6. These clip members are preferably of spring-strip-gunmetal, steel or other suitable metal (although they may be rigid members) and are also preferably formed and mounted so that they lie obliquely to the panel or are otherwise disposed so that they exercise a wedging action or other equivalent action adapted to draw the panels towards the radiators.

The clips may be fixed vertically, horizontally or otherwise. When fixed vertically the weight of the panel serves to maintain the wedging action but if preferred the horizontal arrangement may be adopted and the panel fixed at one side to ensure that any expansion tends to tighten the wedging action. For example, the clip element may be mounted upon the panel 2 so that it is adapted to wedge over the top flange of a radiator 1 (Figure 6) or, alternatively, the clips may be adapted to fit through or into sockets or slots in radiators or engage upon cross-bars, lips or the like, provided upon radiator units as will be referred to hereinafter. Clips may also be employed and located for securing the panel outside the area of the radiator, between radiator units or through slots therein, to pieces, plugs or wall brackets positioned for the purpose to receive the clips.

According to another method (see Figure 7) the clip elements 20 may be secured by countersunk bolts 21 to the panels the ends of which may be countersunk and covered or made up with plaster or cementing material, which may be finally hidden by the application of paint, paper or a thin surfacing veneer.

In some cases the panels may be secured by screw threaded means (see Figure 8); for example the panels may be provided with holes through which screws 22 (subsequently hidden by covering means) are passed and screwed into blocks 23 with which a wall may be plugged, or these screws may be secured to any suitable wooden or other fixing. Screw threaded means of this character may be particularly suitable for securing a panel where two radiator elements (as seen at 1 in Figure 8) lie adjacent one another so that the panel is securely held down to the periphery of the radiators. In employing clips or other securing means it has been found effective to locate the securing fixtures centrally of a panel and to provide for expansion outwardly therefrom. Figure 8 may also serve as an example of securing a panel where a radiator is provided with a throughway hole or slot and it will be observed that this hole or slot is adapted to provide clearance which will accommodate expansions and contractions. Where screw threaded or other means are employed, in order to provide for accessibility and detachment the position of the screws may be scheduled or marked upon adjacent framework or elsewhere.

The panel elements may be bedded upon radiator surfaces by aid of a cement, plastic composition or the like or by the aid of sprayed metal, paint or dust. Where detachability of a panel is desired the cement or composition should be of a non-adhesive variety. Furthermore, the cement or composition may comprise a metallic filling agent or metal filings or the like for the purpose of enhancing the heat conducting quality thereof. The provision of a cement as above indicated may serve as a convenient means for filling up or accommodating inequalities and may thus dispense with accurate finishing of castings to ensure the required contact surface or relationship for the panels.

The radiators according to the invention may be made in the form of boxes (preferably rectangular) comprising at least one flat face or a face having flat areas in one plane for panel reception or likewise. These boxes have an uninterrupted (or more or less uninterrupted) internal water circulating space or may have internal fins or baffles to aid in directing circulation. The radiators may be formed with flanges for the reception of means adapted to secure them to a wall or to any other structural feature.

These box-like radiators may be cast as single integral units or they may be cast in parts secured together according to any known means, or they may be formed of sheet metal stamped or pressed out to the desired shape and united by welding.

The box-like form may be such as to establish separate waterways; for example the part or face away from the panel may be deeply corrugated or of ridge form so as to divide the radiator into a series of waterways or conduits, the better to withstand pressure conditions, of triangular or D cross section so that facets are provided at an angle to one another or rounded surfaces are presented externally. The ridges may be adjoining or may be spaced from one another by flat portions, the ridge plate and the other part of the radiator being united together to form separate waterways or the like between header portions by welding or any other suitable means. Where the radiators are formed in separate waterways they may be spaced between transverse header portions integral with the ridges or between separate header sections at the top and bottom.

An appropriate form of cast radiator which is particularly suitable for carrying the invention into effect is shown in Figures 9 to 11. The radiator comprises a series of fluidways 31 the number and lateral dimensions of which being predetermined according to temperature and heating requirements, which fluidways may be triangular in cross section as seen in Figure 10, or of more or less D shape in cross section, spaced from one another and united by web members 32 so

that one of the faces of the fluidways and the web members together lie in the same plane whereby the radiator presents a flat face for panel reception on the other side of and integral with which the fluidways lie. The fluidways are formed with header members 33 at the top and bottom and it is preferred to cast the radiator so that it is in the form of a section which may be united at the left or right to corresponding sectional radiators. Between the water or fluidways in the web parts, spaces or slots 34 may be formed to afford bridge pieces, bars or lips for the engagement or reception of clips or other panel securing means. The area of the slots may be varied to suit the requirements of heat transference with associated panels. These slots (shown in Figure 9) may be provided with transverse bar members or ribs 35 adapted to receive clip members such as shown in Figures 6 to 7 of the drawings, the arrangement being such that the clips may be passed through the slots 34 and slid downwardly (see Figure 2 or 6) or laterally over bars or lips 35 so that the panels are drawn with a wedge or clipping action against the flat face of the radiator. In addition to providing the bar or lip members 35 the radiator may be provided with parts formed with recessed or countersunk holes 36 for the reception of bolt or like members for securing the radiators in position the recessing of the holes ensuring a flat face for the panel. These holes may be located in the central plane of the radiator or in any other suitable position.

According to one construction (see Figure 12) the radiators as applied to wall areas have screw bolts 37 which pass through the recessed holes 36 and are secured in any suitable bearer 42. Between the radiator and the bearer a coil or other spring 39 is introduced one end of which beds against the radiator while the other may lie upon a washer or other abutment bedded upon the bearer 42. The panel 2 may be held at its edges by beading 5 and is detachably secured to the radiator by any of the means previously described in connection with Figure 2. The adjustment of the screw with respect to the spring should be such that the radiator 1 stands away from the wall so that its waterways 31 and other parts are clear thereof and a space is provided as a clearance to permit the radiator to give or have an accommodating movement. This resilient mounting for the radiators serves to maintain the radiator and panel in their desired contact or intimate association over the whole of the surface of the radiator and not only enables the panels and radiators mutually to bed against one another but allows expansion of the radiators themselves and facilitates lining up or making ready the panel fixings. When resilient mounting is provided for radiators their pipe connections are arranged so as to permit the accommodation movement or adjustment referred to. This may be effected, for example, by special joints or by allowing flexure to take place in the pipe line connection.

As an alternative to the use of springs rubber or other resilient washers may be employed or the radiators may be backed by rubber or resilient pads.

The radiators may be provided with a flange such as that exemplified in Figures 12 and 13 at 43 which may serve to bed the radiator against another radiator or against any structural feature.

The arrangement shown in Figure 12 may be appropriately employed in connection with walls and ceilings.

In Figure 13 a non-resilient adjustable mounting is illustrated for a radiator. According to this mode of mounting a screw bolt 37 is adjustably secured in the mounting 42 and the radiator positioned on the bolt by aid of the nut 44. The face of the radiator may thus be adjusted with respect to the panel element 2.

The radiators as described above or for use in connection with this invention may be formed so as to receive at their backs a cement composition or insulation with a view to preventing loss of heat in building walls and the like. For this purpose the backs of the radiator may be formed with a surface offering appropriate keying facilities for the composition or insulation; for example, the surfaces may be cast roughened, stepped, reticulated or formed with any other suitable finish. Furthermore, the radiator may be formed with flanges (such as at 43, Figure 12) adapted to form a tray-like arrangement for receiving the composition or insulation.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. In combination, a radiator having a flat face formed integral with its front surface, such face being backed by heating fluidways and forming a large part of the front area of the radiator, a panel element concealing the radiator and having its rear side in contact with said flat face, said element being adapted to disseminate by radiation a substantial proportion of the heat, and securing means located within the area of the radiator for detachably engaging the panel element in heat transference relationship with the radiator.

2. In combination, a radiator having an interrupted flat face formed integral with its front surface, such face being backed by heating fluidways and forming a large part of the front area of the radiator, a panel element concealing the radiator and having its rear side in contact with said flat face, said element being adapted to receive through such contacting surfaces the greater part of the heat, and to disseminate the same by

radiation, and resilient means located within the area of the radiator for detachably engaging the panel element in heat transference relationship with the radiator.

3. In combination, a radiator having a flat face formed integral with its front surface, such face being backed by heating fluidways and forming a large part of the front area of the radiator, a panel element concealing the radiator and having its rear side in contact with said flat face, said element being adapted to receive through such contacting surfaces the greater part of the heat, and to disseminate the same by radiation, and concealed securing means located within the area of the radiator for detachably engaging the panel element in heat transference relationship with the radiator.

4. In combination, a radiator having a flat face formed integral with its front surface, a panel element concealing the radiator and having its rear side in contact therewith, said flat face being backed by heating fluidways and of sufficient extent to transmit substantially the whole of the heat to said panel element for radiation therefrom, means located within the area of the radiator for detachably securing the said element in heat transference relationship with the said face and means co-operating with the periphery of the panel element to confine movement thereof to expansion and contraction in the plane of said panel element.

5. In combination, a radiator having a flat face formed integral with its front surface, such face being backed by heating fluidways and forming a large part of the front area of the radiator, a panel element concealing the radiator, spacing members located between said panel element and the radiator and adapted to transmit the greater part of the heat to the panel for radiation therefrom, and securing means located within the area of the radiator for detachably engaging the panel element in heat transference relationship with the radiator.

6. In combination, a radiator having a flat face integrally formed therewith, a panel element adapted to disseminate a substantial proportion of the heat by radiation, clips associated with the panel element for detachably securing the same at points located within the area of the radiator, said clips having a wedging action with the parts they are adapted to engage and being secured by movement in the plane of the panel.

7. In combination, a radiator having a flat face integrally formed therewith, a sheet metal surface element adapted to disseminate a substantial proportion of the heat by radiation having a tongue arranged obliquely with respect to the surface element and adapted to engage a support located within the area of the radiator for detachably securing the said surface element in heat transference relationship with the said face.

8. In combination, a radiator having an integral flat surface on one side and outstanding heating fluidways on the other side, apertures in said surface, a panel element adapted to act as a heat radiating surface, and concealed clip means associated with said panel element and engaging in said apertures for detachably securing the panel in heat transference relationship with the radiator, said clip means being located within the area of the radiator.

9. In combination, a radiator having a flat face formed integral with its front surface, such face constituting a large part of the front area of the radiator, a panel element in heat transference relationship with said face and disseminating a substantial proportion of the heat by radiation, means located within the area of the radiator for detachably engaging said panel element to maintain it in a plane and adjustable supporting means for the radiator adapted to afford adjustment of the face thereof with respect to the plane of the panel element and its surrounding surfaces.

10. In combination, a radiator having a flat face formed integral with its front surface, a panel element adapted to act as a heat radiating surface and means connecting said radiator and said panel element having a resilient wedging action adapted to draw the panel and radiator together, the area of contact between the panel and the radiator being a large proportion of the area of the radiator such that substantially the whole of the heat is radiated from the said panel.

11. In combination, a radiator having a flat face formed integral with its front surface, a panel element adapted to act as a heat radiating surface, means engaging and supporting said panel element to maintain it in a plane and resilient supporting means for the radiator adapted to press the face thereof into contact with the panel element and maintain heat transference relationship therewith.

12. In combination, a radiator having a flat face formed integral with its front surface, a panel element adapted to act as a heat radiating surface, means engaging and supporting said panel element, a bolt mounted in a wall and passing through a hole in the radiator to support the same, means on the bolt for limiting movement of the radiator away from the wall and spring means between the radiator and the wall adapted to force the radiator outwardly and into contact with the panel element.

13. The combination with a radiator having an integral flat face transmitting heat through a removable panel element resiliently held in association therewith, of packing strips or material located between the radia-

tor and the panel element for modifying the temperature of the panel.

14. The combination with a radiator having an integral flat face transmitting heat through a removable panel element resiliently associated therewith, of exchangeable packing strips or material located between the radiator and the panel element for modifying the temperature of the panel.

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

FREDERICK HUGH AUSTEN.