March 27, 1928. 1,664,171

W. W. HICKS

ELECTRICAL BASEBOARD HEATER

Filed Dec. 17, 1925 4 Sheets-Sheet 1

FIG. 1.

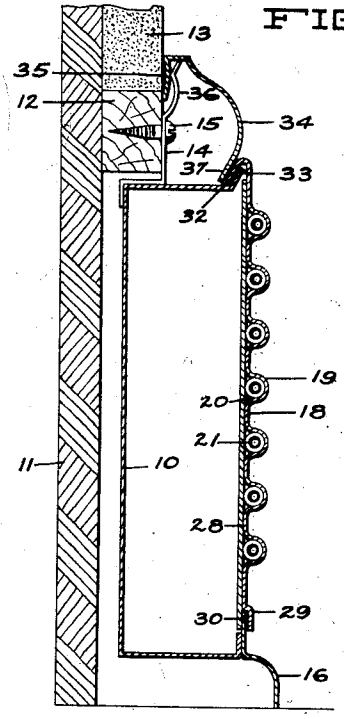


FIG. 2.

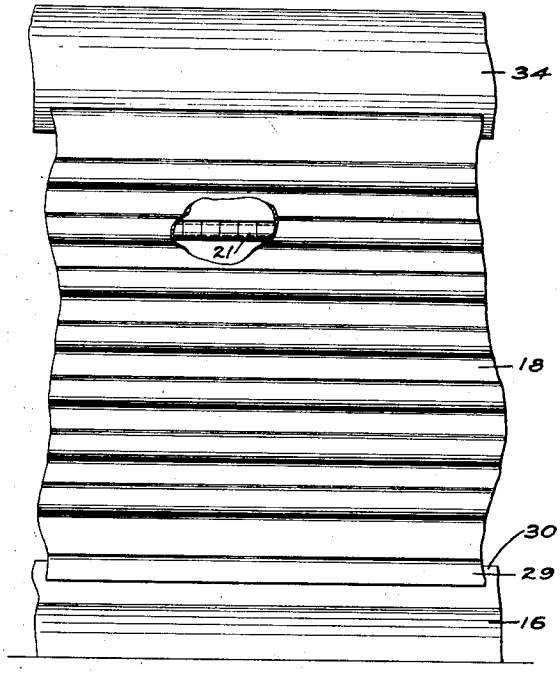


FIG. 3.

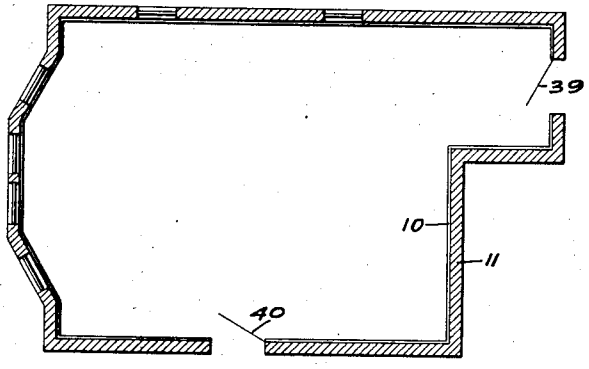


FIG. 4.

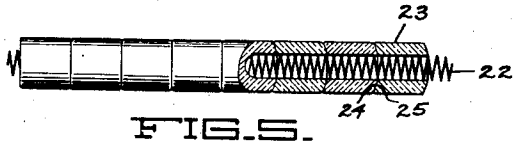


FIG. 5.

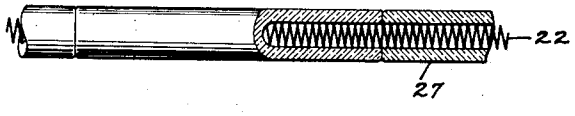
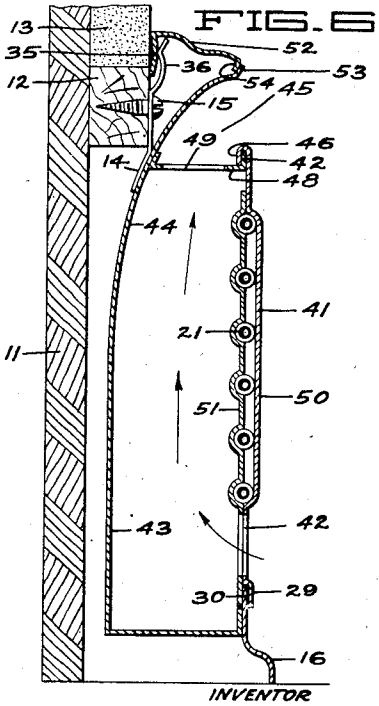


FIG. 6.



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ELECTRICAL BASEBOARD HEATER

Filed Dec. 17, 1925 4 Sheets-Sheet 2

FIG. 7.

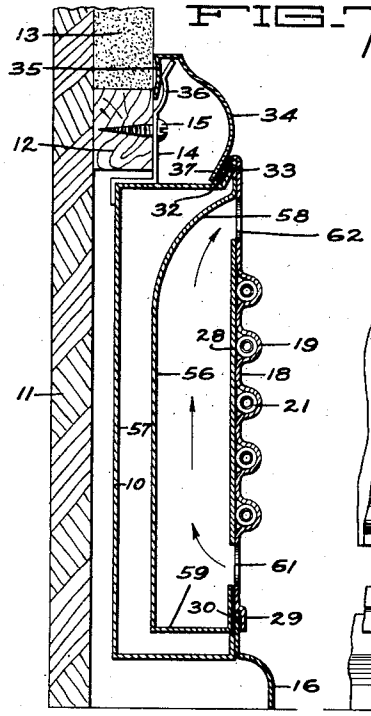


FIG. 8.

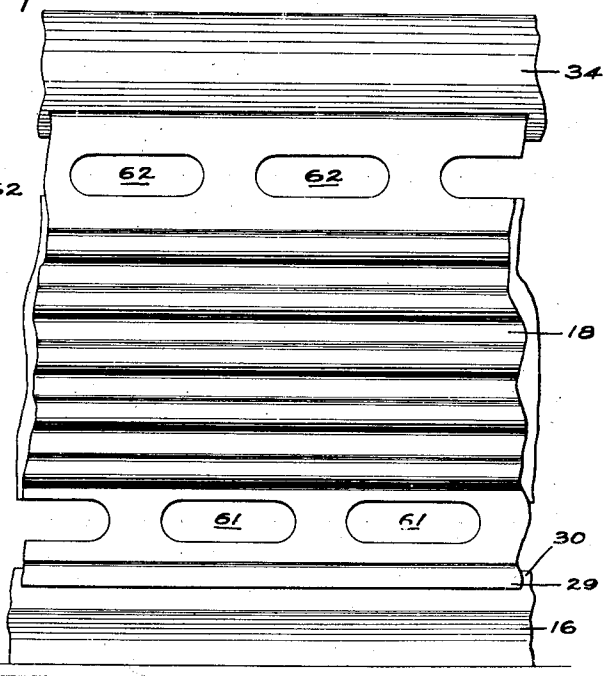


FIG. 9.

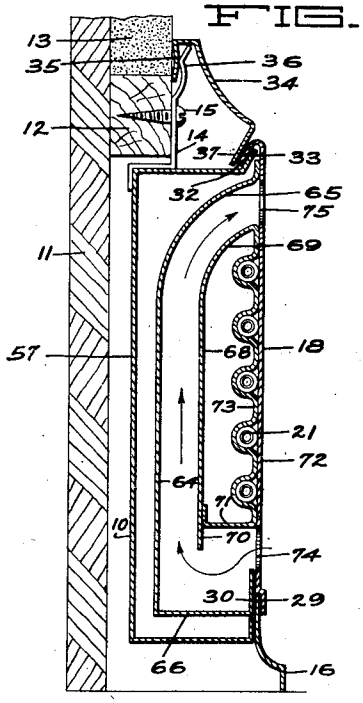
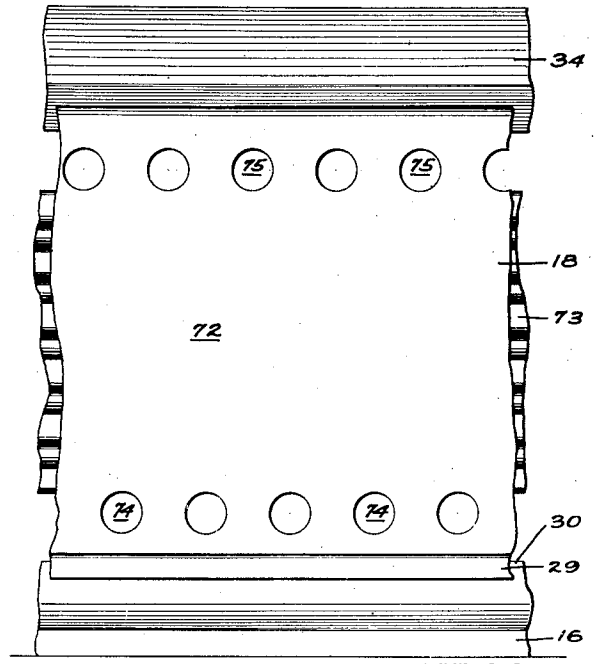


FIG. 10.



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1,664,171

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ELECTRICAL BASEBOARD HEATER

Filed Dec. 17, 1925

4 Sheets-Sheet 3

FIG. 11.

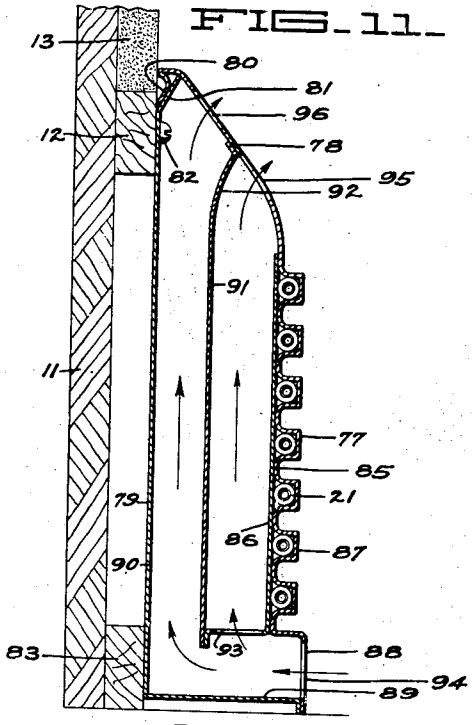


FIG. 12.

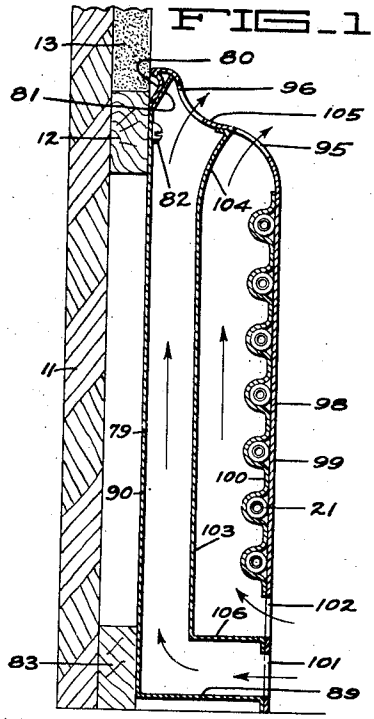


FIG. 13.

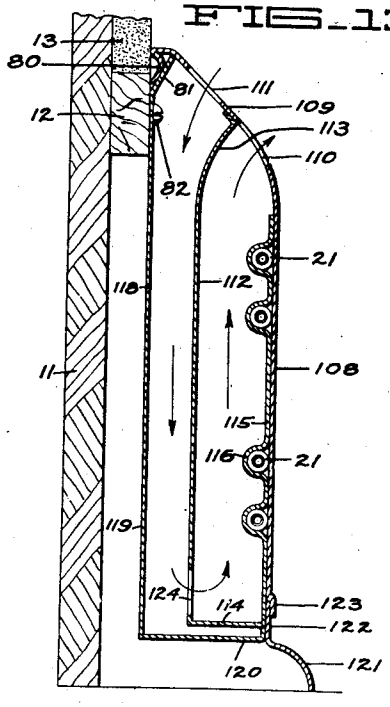
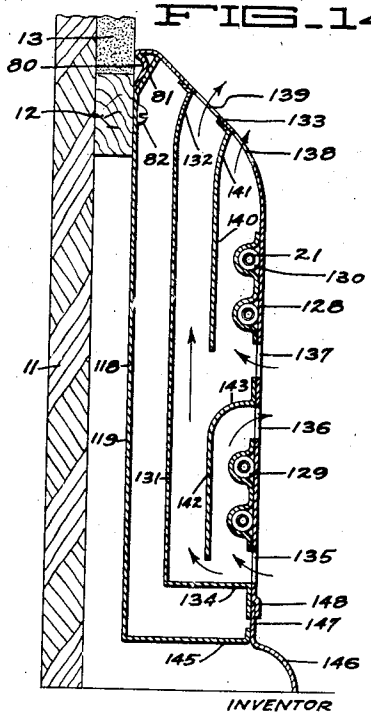


FIG. 14.



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March 27, 1928. 1,664,171

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ELECTRICAL BASEBOARD HEATER

Filed Dec. 17, 1925 4 Sheets-Sheet 4

FIG. 15.

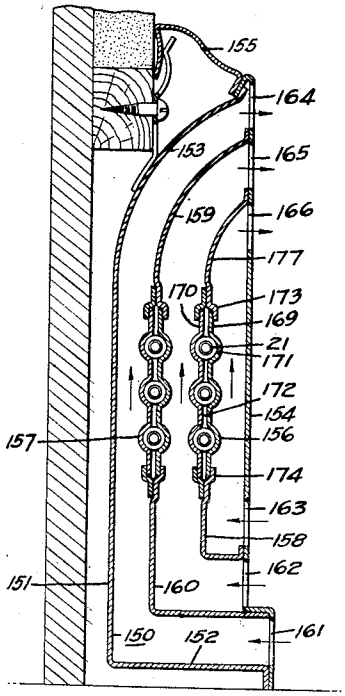

FIG. 16.

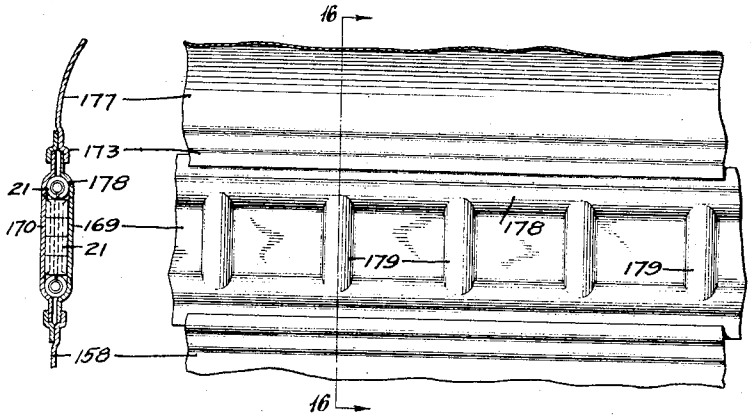

FIG. 17.

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Patented Mar. 27, 1928. 1,664,171

UNITED STATES PATENT OFFICE.

WILLIAM WESLEY HICKS, OF SAN FRANCISCO, CALIFORNIA.

ELECTRICAL BASEBOARD HEATER.

Application filed December 17, 1925. Serial No. 76,033.

This application is a division in part of my copending application No. 743,061, filed Oct. 11, 1924, and relates to heaters for heating the air within a room of a dwelling or other building and particularly to electrical air heaters. Such heaters occupy a minimum of space and must be constructed so as to eliminate all fire hazard. In several particulars this invention departs radically from what has been considered as established practice in the art of electric heaters. As a result certain disadvantages which are inherent in the usual type of electric air heaters are obviated.

It is an object of this invention to construct a combination wall base and air heater so that the heater will appear as an ordinary base board. It is proposed to construct the heating elements of this base in the form of a panel and to employ this panel as the front wall of the base.

It is a further object of this invention to devise an electric air heater in the form of a casing having an electrically heated panel forming the front wall thereof and to provide for the circulation of convection currents of air into and out of the casing to contact with the inner surface of the panel. It is also proposed to insert means between the panel and the back wall of the casing to shield the back wall from the heat of the panel.

It is a further object of this invention to construct a heater in the form of a casing having a warm panel for a heating element, the panel being a surface of relatively large area and being maintained at a temperature sufficiently low to prevent injury to the body upon contact with the same.

Another object of this invention is to devise a novel method of heating a room whereby the air in the room is substantially surrounded by a heated surface adjacent the floor, the surface being of relatively low temperature compared to the usual practice in air heaters.

Other objects of the invention will appear in the following detailed description where I have set forth the preferred embodiment of my invention.

Referring to the drawings:

Figure 1 is a transverse cross sectional view of one embodiment of the invention.

Fig. 2 is a front view of the air heater shown in Fig. 1, certain of the parts being broken away to show the construction of the resistance element.

Fig. 3 is a diagrammatical plan view showing the invention applied to the room of a dwelling.

Fig. 4 shows one form of heating resistance element which may be incorporated into the invention.

Fig. 5 shows another form of resistance element.

Fig. 6 is a transverse sectional view of a modified form of air heater in which the air is allowed to circulate into and out of the casing.

Figs. 7 and 8 are transverse cross sectional and front views respectively of another modification of the invention.

Figs. 9 and 10 are transverse cross sectional and front views respectively of a further modification of the construction shown in Figs. 7 and 8.

Fig. 11 is a transverse sectional view showing another modification of the invention.

Fig. 12 shows a modification of the structure shown in Fig. 11.

Fig. 13 is a transverse sectional view of a further modification in which the circulating convection currents of air pass into and out of the casing adjacent the upper portion thereof.

Fig. 14 is a transverse cross sectional view of a modified construction in which duplex heating elements are employed.

Fig. 15 is a transverse cross sectional view of a modified construction in which a plurality of heating panels are employed.

Fig. 16 shows a modified construction for the heating panels shown in Fig. 15.

Fig. 17 is a side view of the panel shown in Fig. 16.

The invention contemplates generally the provision of a heating unit within a wall base so that the air heater will simulate the appearance of an ordinary base board. This wall base preferably takes the place of the ordinary base board and extends sustantially around all the walls of a room. Thus, as shown in Figs. 1 and 2 of the drawings, there is provided a wall base in the form of a casing 10 which is adapted to be positioned adjacent the lower edge of a wall 11. The wall 11 is preferably provided with a securing strip 12 which borders the lower edge of the plastering 13. The casing

10 may be secured to the wall by any suitable means such as an extension bracket 14 which is secured to the casing 10 by any suitable means such as spot welding and is fastened to the securing strip 12 as by a screw 15. Secured to the lower front edge of the casing 10 there is a strip of floor molding 16 which takes the place of the ordinary molding provided for the usual base board.

Associated with the casing 10 there is a heating element preferably in the form of a panel 18 which also is employed to form the front of the casing 10. This panel is preferably formed of a piece of sheet metal 19 which is corrugated to provide grooves 20 to receive resistance elements 21. It is of course obvious that any form of resistance element may be employed although it is preferable to employ elements such as shown in Figs. 4 and 5. In Fig. 4 the resistance element comprises a convoluted resistance conductor 22 which has threaded thereon a plurality of contiguous insulating beads 23. These beads 23 are provided with interfitting convex surfaces 24 and concave surfaces 25. In that form of resistance element shown in Fig. 5 the convoluted resistance conductor 22 has threaded thereon a plurality of tubular insulating members 27 which are also formed of suitable refractory substance. As previously explained these resistance elements 21 are positioned within the grooves 20 and are retained in the grooves by suitable means such as a plate 28, which plate is suitably secured to the front portion 18 as by spot welding. In order to secure the heating element in operating position on the casing 10 it is preferably provided with a bifurcated portion 29 along its lower edge which fits over the projecting edge 30 of the floor molding 16. The upper portion of the heating panel is also provided with a downturned edge portion 32 which hooks over the upturned edge portion 33 of the casing 10. In order to cover the upper portion of the casing 10 and to enhance the appearance of the heater a strip of metal molding 34 is provided. This molding is preferably retained in position by means of a downwardly extending flange 35 which is clamped to the wall surface 13 as by suitable means such as a clip 36 formed as an extension of the bracket 14. The lower edge portion 37 of the molding 34 extends behind the upturned end portion 33 of the casing 10.

As shown in Fig. 3 the invention is intended to be applied to entirely surround the walls of a room. The continuity of the casing 10 need only be interrupted to provide for the doors 39 and 40. In this way it is possible to obtain a relatively large amount of panel surface exposed to the air in a room and therefore it is not necessary to maintain the temperature of the panel sufficiently high to cause injury to the body upon contact therewith. It is therefore one feature of this invention to provide a relatively high resistance path for the currents in the resistance elements so that the heating elements are not heated to a sufficiently high temperature to cause injury to the body upon contact. In the usual form of electric heater the heating elements are maintained at a relatively high temperature and have a relatively small surface area so that a portion of the heat is radiated and the remainder is taken up by convection currents of air which must pass in large quantities in contact with the heating element. Such an arrangement has many inherent disadvantages. Because of the high temperatures employed unusual precautions must be taken in order to shield the walls from the heat in case the heater is attached or arranged adjacent the wall of a room. Also since heaters of this type occupy a relatively small portion of a room comparatively large quantities of convection currents of air must move in and out of the heater casing so that perceptible drafts are produced. A further disadvantage is that because of the glowing temperature to which the resistance element must be heated, the resistance conductor must be formed of a special alloy to withstand these temperatures. In this invention since the heating element is maintained at a relatively low temperature it is a comparatively simple matter to guard against fire hazard. Furthermore, since the convection currents of air are formed along all the sides of the room there will be no perceptible draft produced. A further advantage is that the resistance conductor may be maintained at a relatively low temperature so that it is not necessary to employ special and expensive alloy metals. Operating the resistance conductor at a relatively low temperature will also prevent the peculiar burning odor which is always produced by the usual type of air heater which employs relatively high temperature heating elements.

It is of course to be understood that a number of different modifications can be employed in the construction of such a heater. For example, as shown in Fig. 6, the heater may be adapted to allow convection currents of air to pass into the lower portion thereof and out the upper portion. In this modification the panel 41 is provided with apertures 42 adjacent its lower edge. The casing 43 in this case is provided with a forwardly curved upper portion 44 which serves to guide the convection currents of air out of the upper portion of the heater. The upper edge of the panel 41 is adapted to terminate short of the upper edge of the inclined portion 44 to allow free egress of the convection currents of air out through the opening 45. The upper edge of the heat-

ing panel is supported by suitable means such as by a downturned edge portion 46 formed on the upper edge of the panel and engaging an upturned portion 42 which is provided on the outer end of a bracket strip 48. This bracket 48 is provided with apertures 49 to allow free passage of the convection currents and is suitably secured to the casing 43 as by spot welding. In this instance the heating panel is constructed with an outwardly bulged portion 50 which is adapted to retain the resistance element 21. A corrugated clamping plate 51 serves to retain the resistance element in position adjacent the wall 50. As in the construction shown in Fig. 1, the upper portion of the casing 43 may be covered by means of a strip of metal molding 52 which as in the case of the element 34 of Fig. 1, is secured in position by means of a clip 36 and also by means of an upturned edge portion 53 on the inclined portion 44 adjacent a downturned strip 54 on the lower edge of the molding 52.

In the modification shown in Figs. 7 and 8 there has been provided a shield to prevent the back wall of the casing from becoming sufficiently heated to cause a fire hazard. Thus a shell 56 has been interposed between the heating panel 18 and the back wall 57 of the casing 10. This shell is provided with a forwardly curved upper portion 58 and a bottom wall 59 which are secured to the panel 18 by any suitable means such as spot welding. The heating panel is provided with lower apertures 61 and upper apertures 62 which are preferably formed elongated in staggered relationship and which serve to allow convection currents of air to pass into the lower portion of the casing up between the shield and the inner surface of the heating panel and out again at the upper portion of the casing.

In Figs. 9 and 10 there is shown a separate modification in which an independent path or flue is provided for convection currents of air passing into and out of the casing. Thus, the panel 18 has suitably secured thereto a shell 64 having a forwardly curved portion 65 and a lower bottom wall 66. Arranged between the inner space of the panel 18 and the shell 64 there is a second shield 68 having a forwardly curved portion 69 and a lower end portion 70 which is secured to the panel 18 in spaced relation as by means of a bracket 71. As in the other modifications the panel 18 is made in two sheets but in this case the front sheet 72 is made plane while the inner sheet 73 is corrugated to receive resistance element 21. The panel is provided with suitable passages or openings 74 to allow air to pass into the casing and is also provided with upper openings 75 to allow air to escape from the casing after passing upward between the shield 68 and the rear wall of the shell 64. Fig. 10 shows the apertures 74 and 75 as being circular and placed in staggered relationship.

As shown in Figs. 11 to 14 inclusive, means may be provided for allowing a plurality of paths of convection currents to pass into and out of the casing. As shown in Fig. 11 the panel 77 is provided with an upper rearwardly inclined portion 78 which is secured to the casing 79 by suitable means such as a downwardly extending edge portion 80 which engages behind a forwardly inclined strip along the upper edge of the casing 78. The casing 79 is preferably secured directly to the strip 12 on the wall 11 by suitable means such as the screw 82. A bottom strip 83 may also be provided to space the lower portion of the casing 79 from the wall 11. In this modification the panel 77 is preferably formed of two sheets, front sheet 85 and a rear sheet 86. The front sheet 85 is provided with right angled corrugations 87 to receive the resistance elements 21. The lower portion of the panel 77 is provided with a forwardly and downwardly extending floor molding 88 which is adapted to be suitably secured to the bottom wall 89 of the casing 79. Between the back wall 90 of the casing 79 and the panel 77 there is disposed a shield wall 91 having an upper forwardly curved portion 92 suitably secured to the rearwardly inclined portion 78 of the panel 77, and having its lower portion suitably secured in spaced relationship to the panel 77 as by means of the apertured bracket 93. Apertures 94 are provided in the base portion 88 and two rows of apertures 95 and 96 are provided in the upper rearwardly inclined portion 78. Thus as shown by the arrows, air is allowed to circulate into the casing adjacent the lower portion thereof through the apertures 94 upwardly between the rear wall 90 of the casing 79 and the shield wall 91, and between the shield wall 91 and the inner surface of the panel 78 and out again adjacent the upper portion of the casing through the apertures 96 and 95. In this manner one path is provided for relatively cool convection currents to maintain the back wall 90 sufficiently cool to prevent fire hazard and another path is provided for conducting currents between the shield wall 91 and the panel 77 for allowing the air in the room to become heated through circulation.

The modification shown in Fig. 12 is somewhat similar to that shown in Fig. 11 although the structural details are somewhat modified. In this case the panel 98 is formed from a front plane sheet 99 and a rear corrugated sheet 100 as in case of the construction employed in Fig. 9. Instead of providing a single row of openings in the lower portion of the casing the panel 98 is provided with two rows of apertures

101 and 102. Also instead of providing a shield wall between the panel 98 and the back wall 90 there is provided a shell 103 which is provided with a suitably forwardly curved portion 104 which is secured to the upper rearwardly inclined portion 105 of the panel 98, and which is provided with a bottom wall 106 which is suitably secured to the front plate 99 of the panel 98 between the apertures 101 and 102. In this arrangement the two paths provided for the convection currents are entirely separate and independent.

In Fig. 13 a form of panel heater is shown in which air is allowed to enter into the casing adjacent the upper portion thereof and again pass out of the casing adjacent the same portion. In this construction the heating panel 108 is provided with an upper rearwardly inclined portion 109 which is provided with two rows of openings 110 and 111. A shell 112 is provided to surround the inner surface of the panel 108 and is provided with an upper forwardly curved portion 113 which is suitably secured to the upper rearwardly inclined portion 109 between the openings 110 and 111. The bottom wall 114 of the shell 112 is suitably secured to the panel 108. As shown in this figure, the shell 112 may be a continuation of the rear sheet 115 of the panel 108. A modified construction of the heating panel 108 is also shown in this view in that the rear sheet 115 is provided with two spaced groups of corrugations 116 which are adapted to retain the resistance element 21. As in case of the construction shown in Figs. 11 and 12 the upper rearwardly inclined portion 109 is suitably secured to the casing as by means of a downwardly extending edge portion 80 provided on the portion 109 and which engages the outwardly inclined strip 81 provided on the back wall of the casing 118. The bottom wall 120 of the casing has suitably secured thereto a strip of metallic molding 121 which is provided with an upwardly extending portion 122 adapted to engage with the lower bifurcated edge 123 provided on the panel 108. The lower portion of the shell 112 is provided with openings 124 whereby convection currents of air may circulate downwardly between the shell 112 and the back wall 119 through the openings 124 and upwardly between the shell 112 and the inner surface of the panel 108 to escape again out through the openings 110. It is of course understood that since the air which passes between the shell 112 and the panel 108 will be heated to a higher temperature than that passing between the shell and the back wall 119 it is possible to cause air to circulate into and out of the casing adjacent the same end thereof.

Instead of providing a single heating element within the casing a duplex arrangement may be provided. Thus, as shown in Fig. 14, a duplex arrangement is shown whereby the two separate heating elements are employed and means are provided for circulating separate convection currents of air into contact with different elements. In this arrangement the heating panel 128 is provided with two separate groups of heating elements 129 and 130 each being of construction similar to the construction shown in Fig. 7. The casing 118 is similar to that shown in Fig. 13 and has positioned between its back wall 119 and the panel 128 a shell 131. This shell has an upward forwardly curved portion 132 which is suitably secured to the upper rearwardly inclined portion 133 of the panel 128. Also the bottom wall 134 of the shell 131 is suitably secured to the lower portion of the panel 128. The panel 128 is provided with four rows of apertures, a lower row 135, two intermediate rows 136 and 137, and two upper rows 138 and 139. In order to confine the separate convection currents there is provided an upper shield 140 disposed between the heating element 130 and the shell 131 and which is provided with an upper forwardly curved portion 141 which is suitably secured to the upper rearwardly inclined portion 133 intermediate the two rows of openings 138 and 139.

Also disposed between the lower heating element 129 and the shell 131 there is a shield 142 which is provided with an upper forwardly curved portion 143 which is suitably secured to the front panel between the intermediate openings 136 and 137. As in the case of Fig. 13, the casing 118 is provided with a metallic molding 146 which is suitably secured to the front edge of the bottom wall 145. This metallic molding is provided with an upwardly extending edge 147 which engages the bifurcated portion 148 which is provided on the bottom edge of the panel 128. To the upper rearwardly inclined portion 133 of the panel there is suitably secured to the casing 118 as by means of members 80 and 81 as in the case of Figs. 11 to 13 inclusive. The operation of this modification is as follows: The air entering the lower openings 135 is caused to branch into two paths, one path being between the shield 142 and the shell 131 and the other path being between the shield 142 and the heating element 129. The air currents following this latter path are caused to leave the casing through the openings 136. Air may also enter the casing through the openings 137 and flow upwardly between the shield 140 and the heating element 130 to leave the casing again through the openings 138. A portion of the air entering through the opening 137 may also branch and pass upwardly between the shield 140 and the shell 131. All of the air passing upwardly

between the shell 131 and the shields 142 and 140 is allowed to escape from the casing through the openings 139.

Fig. 15 shows a modified construction in which the casing is provided with a wall in front of the heating means and in which a plurality of heating panels are employed. Thus a casing 150 is provided with a back wall 151, bottom wall 152 and forwardly curved top wall 153. A front wall 154 is suitably secured to this casing. A strip of molding 155 may be employed to cover the upper portion of the casing in the manner explained in connection with Fig. 1. Behind the front wall 154 are arranged a plurality of heating panels 156 and 157 in spaced relationship. Panel 156 is secured in position by means of an upper forwardly curved guide wall 177 and a lower forwardly projecting guide wall 158 while panel 157 is secured by similar guide walls 159 and 160. To provide for circulation of convection currents of air the front wall is provided with lower openings 161, 162 and 163 and also upper openings 164, 165 and 166 whereby air may pass upwardly thru the casing between the panel 157 and the back wall 151, between the two panels, and between the panel 156 and the front wall 154.

The construction of the heating panel shown in Fig. 15 differs from those shown in the preceding figures. In this case the panel is formed from a pair of sheets 169 and 170 which are provided with opposed corrugations 171 to receive the insulated resistance elements 21. Preferably the corrugations are sufficiently shallow to retain intermediate portions of the sheets in spaced relationship as indicated at 172. The upper edges of sheets are retained by a bifurcated portion 173 on the guide wall 177 while the lower edges are similarly retained by a bifurcated portion 174. Since the sheets 169 and 170 are similarly corrugated, the panel will not warp thru unequal expansion or contraction.

The modified form of heating panel shown in Figs. 16 and 17 is similar to that shown in Fig. 15. However, in addition to the horizontal corrugations 178, spaced vertical corrugations 179 are provided within which vertical resistance elements 21 may be disposed. This construction insures a rigid panel which will not warp in any direction.

While all of the modifications which have been illustrated show the use of a warm panel, that is, a panel which is maintained at a relatively low temperature, it is to be understood that the invention incorporates several novel features which are not limited to the use of such a panel. For example, the applicant considers his invention to be sufficiently broad to cover an air heater of ordinary construction which is incorporated into a wall base.

I claim:

1. A combined air heater and wall base comprising a hollow metallic casing adapted to extend along substantially all the walls of a room adjacent the floor thereof, and electrical heating means within said casing.

2. A combined air heater and wall base comprising a casing adapted to be positioned on substantially all the walls of a room adjacent the floor thereof, and electrical heating means associated with said casing, said casing simulating the appearance of an ordinary base board.

3. An electrical heater comprising a casing, and an electrically heated panel forming the front wall of said casing, said panel being maintained at a temperature sufficiently low to prevent injury to the body upon contact therewith.

4. An electrical heater in the form of a wall base adapted to extend substantially around the bottom edge of the walls of a room, said base comprising a casing, an electrically heated panel forming the front of said casing, and means for allowing convection currents of air to pass into and out of said casing.

5. An electrical heater in the form of a wall base adapted to extend substantially around the bottom edge of the walls of a room, said base comprising a casing, an electrically heating element secured to said casing, a shield positioned between said element and the back wall of said casing, and means for allowing convection currents of air to pass into said casing, upward between the shield and element, and out of the upper portion of said casing.

6. An electric air heater comprising a hollow metal casing adapted to be positioned along the bottom edge of a room, the front of said casing simulating the appearance of an ordinary base board and having apertures for the passage of convection currents of air, and electrical heating means associated with said casing.

7. An electric air heater comprising a hollow metal casing adapted to be positioned along the bottom edge of a room to take the place of a base board, said casing having a removable front wall, and electrical heating means mounted upon said removable front wall.

8. An electric air heater comprising a hollow casing, said casing having openings for the passage of convection currents of air, an upstanding heating panel associated with said casing, said panel comprising a pair of metal sheets and insulated resistance elements enclosed by said sheets.

9. A combined base board and air heater comprising a hollow metal casing extending substantially the length of a room wall adjacent the bottom edge thereof, the front of said casing simulating the appearance of an

ordinary base board, and electrical heating means associated with said casing, said casing having openings in the lower and upper portions thereof for passage of convection currents of air.

10. A combined base board and air heater comprising a hollow metal casing extending substantially the length of a room wall adjacent the bottom edge thereof, the front of said casing simulating the appearance of an ordinary base board, and electrical heating means associated with said casing, and spaced from the back wall thereof, said casing having openings in the lower and upper portions thereof whereby the air along the length of the wall may circulate into and out of said casing.

11. A combined base board and air heater comprising a hollow metal casing extending substantially the length of a room wall adjacent the bottom edge thereof, the front of said casing simulating the appearance of an ordinary base board, a metal panel arranged in upright position and spaced from the back wall of the casing, and electrical heating elements in thermal contact with said panel said casing having lower and upper openings whereby convection currents of air may flow into and out of said casing between said panel and back wall.

12. A combined base board and air heater comprising a hollow metal casing extending substantially the length of a room wall adjacent the bottom edge thereof, said casing having a front wall offset forwardly from the surface of the room wall and formed to simulate the appearance of an ordinary base board, and electrical heating means associated with said casing, said casing having openings in the lower and upper portions thereof for passage of convection currents of air.

In testimony whereof, I have hereunto set my hand.

WILLIAM WESLEY HICKS.