June 2, 1959 B. LE B. MUSGRAVE 2,889,439

ELECTRIC HEATING DEVICES AND THE LIKE

Filed July 29, 1955 3 Sheets-Sheet 1

Fig. 1

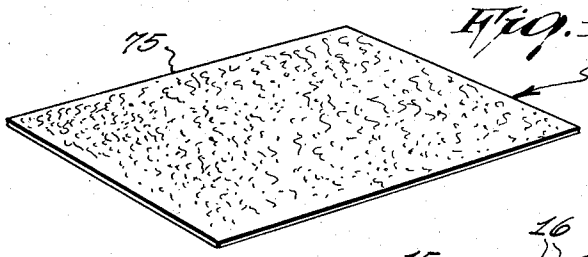


Fig. 2

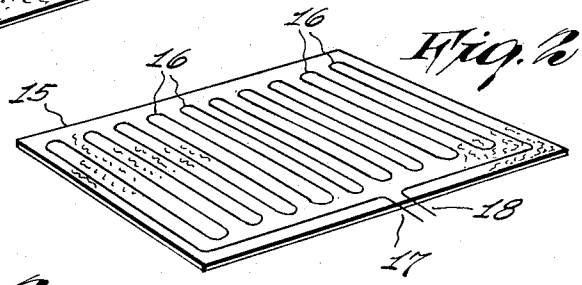


Fig. 3

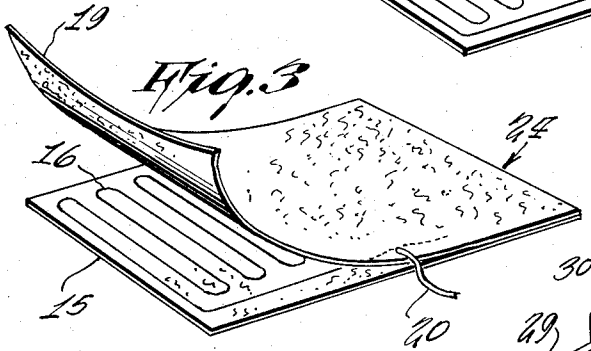
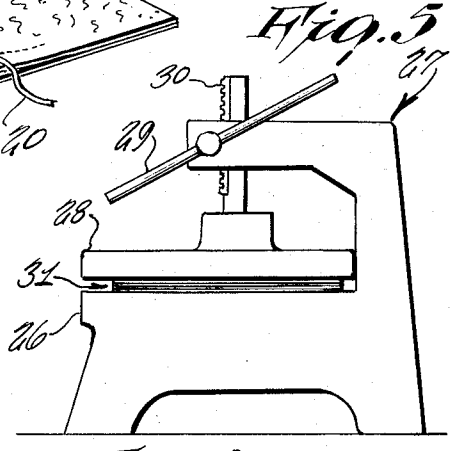


Fig. 5



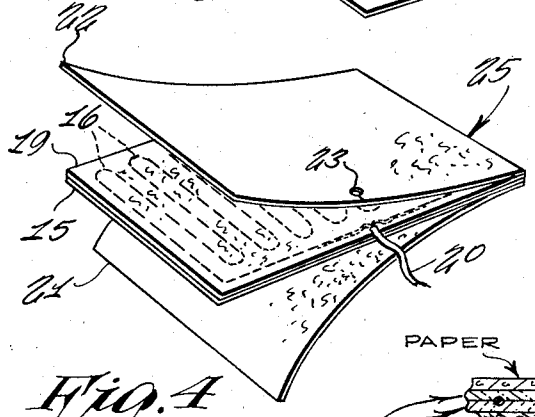


Fig. 4

Fig. 7

ASBESTOS PAPER IMPREGNATED WITH PHENOLIC RESIN

Fig. 8

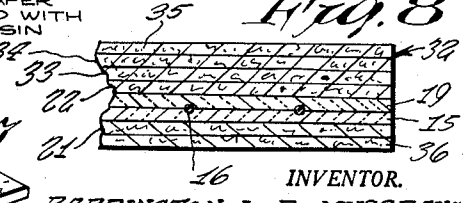
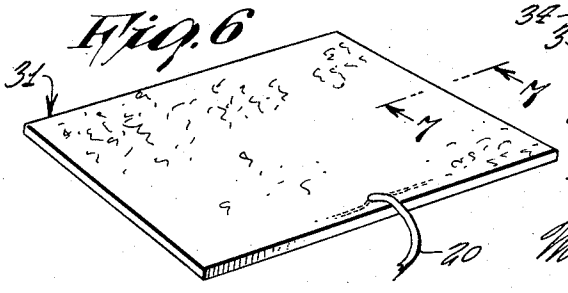


Fig. 6



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ELECTRIC HEATING DEVICES AND THE LIKE

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Fig. 9

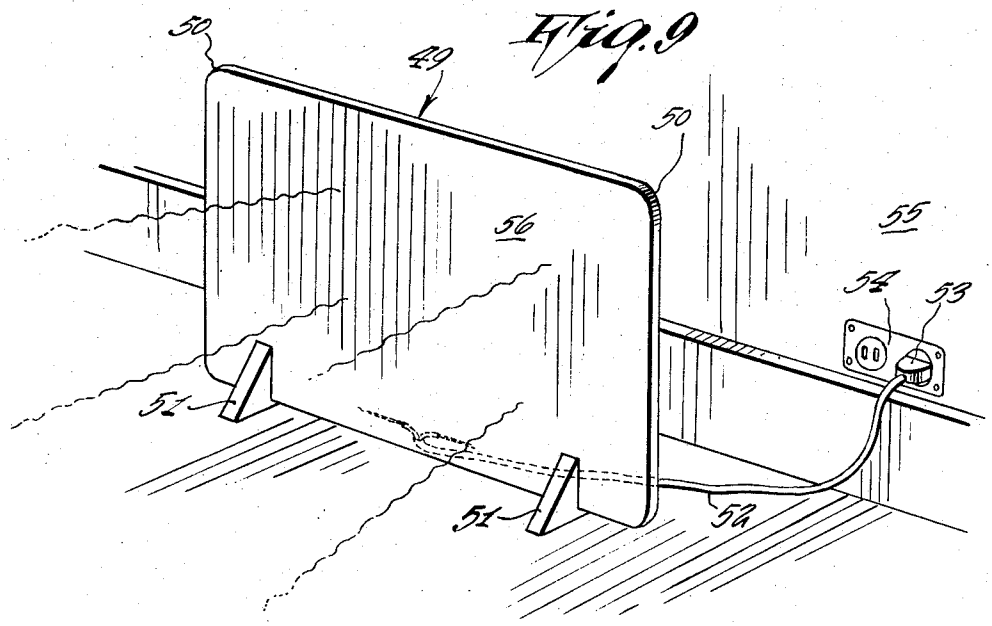


Fig. 10

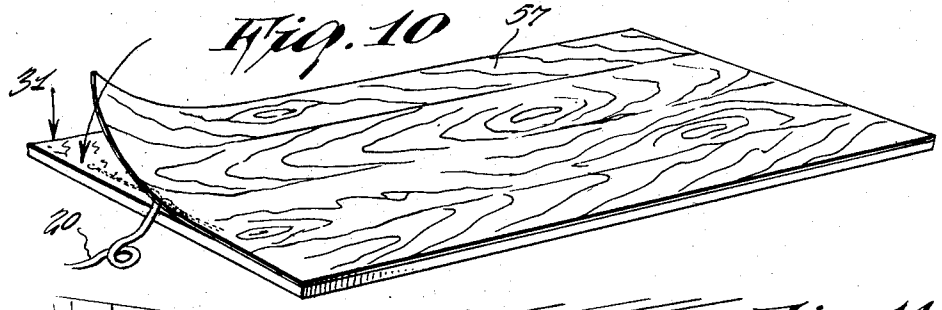
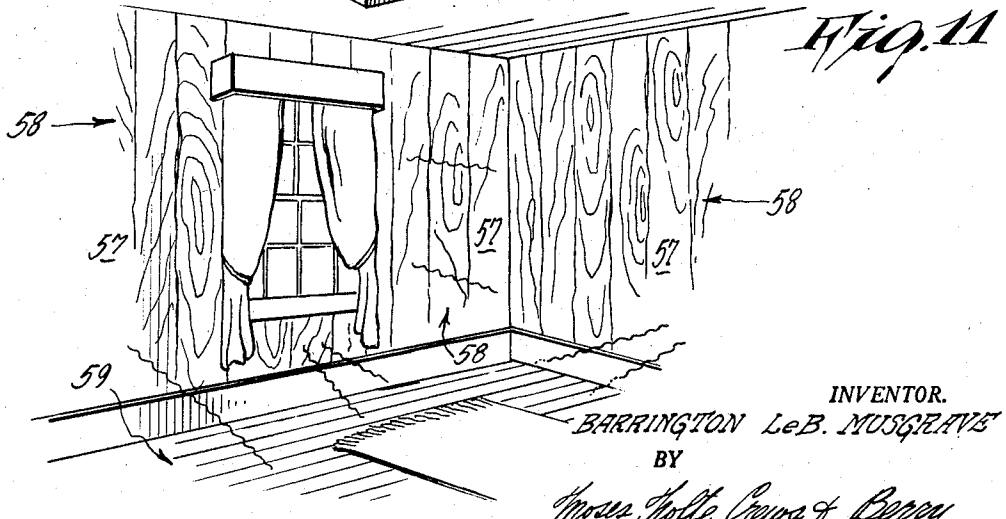


Fig. 11



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ELECTRIC HEATING DEVICES AND THE LIKE

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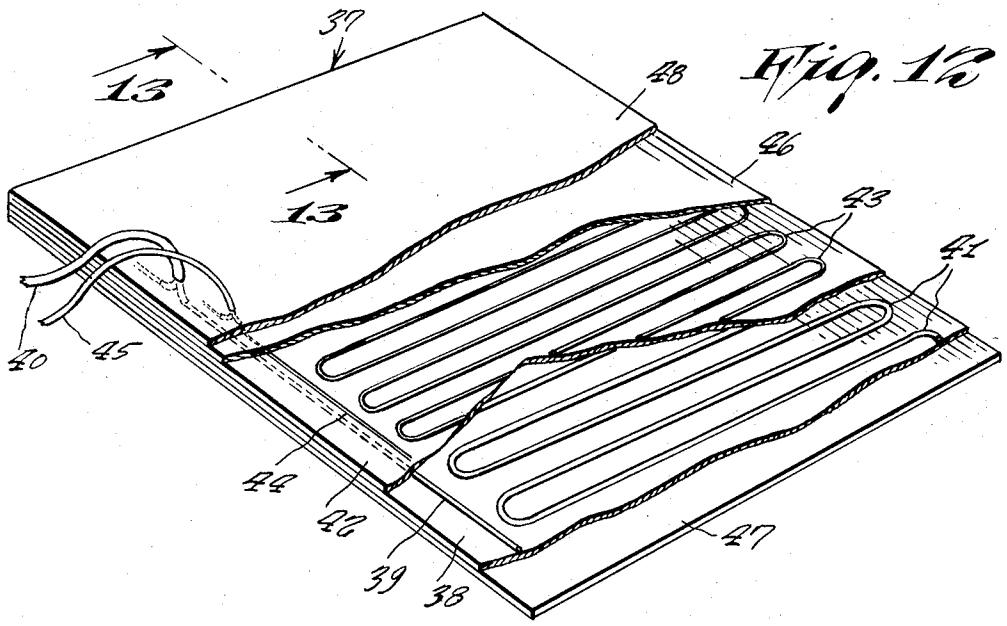

Fig. 12

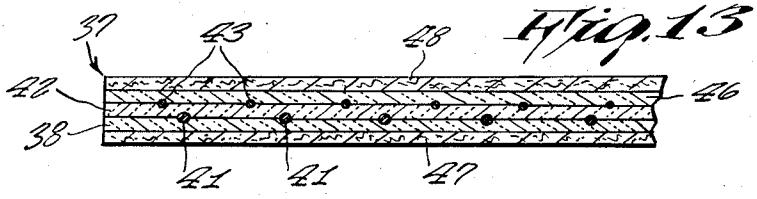

Fig. 13

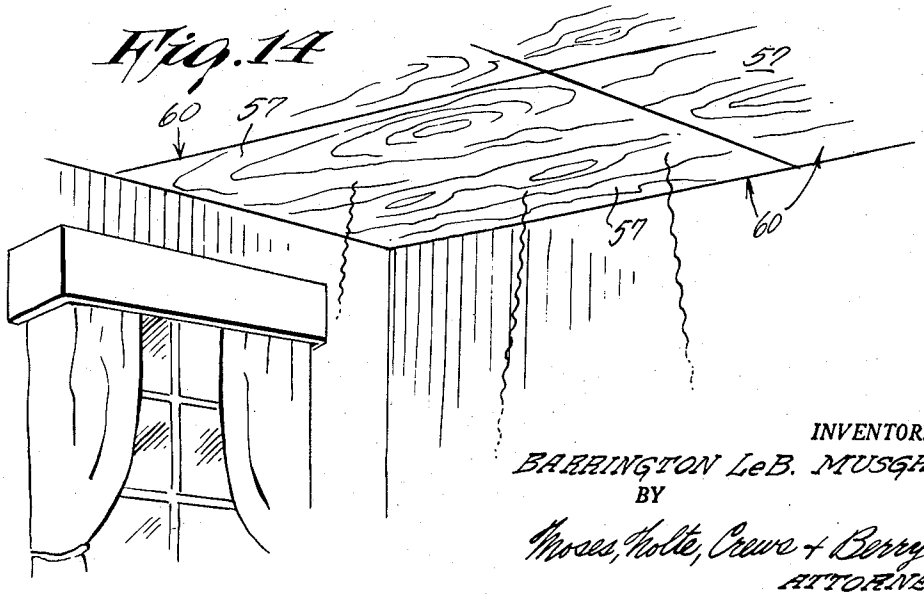

Fig. 14

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United States Patent Office

2,889,439

Patented June 2, 1959

2,889,439

ELECTRIC HEATING DEVICES AND THE LIKE

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Application July 29, 1955, Serial No. 525,263

3 Claims. (Cl. 219—19)

This invention relates to electric heating devices and the like, and particularly to a high temperature radiant electric heat panel.

The main object of the invention is to provide a completely insulated electric heating panel for general use which is safe and fire proof, as well as economical and convenient.

Another object of the invention is to provide a type of electric heating panel that may be used in various applications, such as wall or ceiling panels or movable standing panels and the like.

A further object of the invention is also to provide such a heating panel that has at least two distinct heating wire elements which may be independently used or connected in parallel or in series.

Yet another object is to provide such a heating panel that has a predetermined thickness of insulation upon one side for the heating element or elements and a different thickness of such insulation upon the other side in order to produce a greater or speedier heating upon one side than the other of the panel.

It is also an object of the invention to have a novel method of making the electric heating panel indicated.

An object of this invention is also to form the electric heating panel indicated by embedding electric resistance wire in several layers or laminations of insulating material.

Other objects and advantages of my invention will appear in further detail as the specification proceeds.

In order to facilitate ready comprehension of this invention for a proper appreciation of the salient features thereof, the invention is illustrated on the accompanying drawings forming part hereof, and in which:

Fig. 1 is a perspective view of a sheet or lamination of insulating material that has been treated by a plastic preparatory to receiving a series of resistance wire loops thereon;

Fig. 2 is another perspective view of the sheet or lamination with the loops of resistance wire applied thereto;

Fig. 3 is a further perspective view showing the application of a covering sheet of insulating material being applied to the sheet of Figs. 1 and 2 to overlie and cover the resistance wire thereof, in order to form a partially constructed electric heating panel;

Fig. 4 is likewise a perspective view of the same panel with a pair of outer insulating sheets being applied thereto to finish it;

Fig. 5 illustrates the step of pressing the sheets or laminations with the embedded resistance wires into a composite panel unit;

Fig. 6 is a perspective view of the finished electric heating panel ready for use;

Fig. 7 is a transverse section taken on line 7—7 in Fig. 6;

Fig. 8 is a section of a modification of the panel;

Fig. 9 illustrates the electric heating panel embodied in a movable standing floor panel for rooms and offices;

Fig. 10 is a perspective view of a heating panel forming part of a floor for a room;

Fig. 11 is a perspective view of a room interior showing the floor and walls built up of electric heating panels of the character indicated for heating the room from below and from the sides;

Fig. 12 is a perspective view of a modification with portions torn away;

Fig. 13 is a section of the same modification as taken on line 13—13 in Fig. 12; and

Fig. 14 is a portion of a room interior showing the ceiling provided with electric heating panels according to the invention.

Throughout the views, the same reference numerals indicate the same or like parts.

There are certain places where steam is not available for heating, and in fact where central heating is absent, although electric current is available. When the current supply is had at reasonable cost, it pays to use such a source for supplying the heat, but preferably not by using small portable electric heaters, due to possible fire hazards and lack of economy in small heaters. Instead, I propose to use special electric heating panels, either as part of a floor, ceiling or wall, or either two or all three in a room, and even a standing heater panel, if desired, as will now be described.

Hence, in the practice of my invention, and referring also again to the drawings, a heater unit is preferably made by starting with an asbestos paper or board in the form of a sheet 15 of one or two ply thickness and impregnated with a sufficient amount of phenolic resin or plastic to allow compacting the sheet under heat and pressure (Figures 1 and 2) and overlaying it with a series of resistance wire in loops 16, 16 terminating in a pair of leads 17 and 18. This wire may be that known as Nichrome or the like or any other desired, and the sheet, after thus being provided with a resistance wire, is covered with a second sheet of asbestos paper or board 19 similarly impregnated with phenolic resin, the leads 17, 18 being combined in a cable 20 to be connected to a supply cable preferably provided with a plug adapted to be inserted into a wall outlet or the like.

Thereafter, the initially assembled sheets may be provided upon one side or both sides with additional outer sheets 21 and 22, if desired, having a slot 23 in the upper sheet 22 to accommodate cable 20 when this sheet is brought down on sheet 19. With or without these outer sheets, the assemblage 24 or 25 (Figures 3 and 4) is laid on the table 26 of a laminating press 27 and the pressure plate 28 brought down heavily on the assembly by handle 29 operating plunger 30. If the sheet assembly is temporarily heated to about 375° F., just before insertion into the pressure zone of the press, the whole mass becomes congealed into a planar block generally indicated at 31 in Figure 7, which may hereinafter designate any form of the heater sheet or block, irrespective of the surface color or finish or use thereof, except for the composite block of Figures 8, 12 and 13. In Figure 8, the heater block 32 includes the original two sheets 15 and 19, heater wires 16, cover sheets 21 and 22, but also includes additional sheets 33, 34, 35 on top, for example, and sheet 36 beneath, or any other desired arrangement may be made to suit conditions required. Of course, when many sheets are disposed on one side, that side will be slower in giving off heat, while the side having the fewer sheets will radiate the major portion of the heat produced by the resistance wire when energized by electric current supplied through cable 20.

In Figures 12 and 13 are shown another multiple sheet heater panel generally indicated at 37 having multiple electric heater wires therein instead of the single series of wire loops described. Thus this panel comprises a basic sheet or layer 38 of asbestos, for example having a series of resistance conductor loops arranged thereon with

the leads 39 (one shown in full lines) forming a terminal cable 40 through which current may be supplied to the wires 41. Upon sheet 38 and its resistance wire is laid a second sheet of similar material 42 which is independently provided with another series of wires 43 of electrically resistant alloy of the same or of different type and size than wires 41 of the first layer or series. To this second series of wire loops are connected terminal wires 44 (one shown) issuing to the outside in the form of cable 45. Upon this second sheet lies in turn a third sheet 46, while beneath the lowest sheet 38 lies an outer bottom sheet 47 of paper or special padding cardboard, and upon the uppermost sheet 46 lies the top sheet 48, also of paper or cardboard. Of course, if desired, not only the three sheets 38, 42 and 46 in actual contact with the active electrical heating wires 41 and 43 should be made of asbestos paper or board, but the outer sheets 47 and 48 also, if desired.

It is to be noted that the wires 41 may be heavy in order to carry a large current for producing a great amount of heat, while the other wires 43 may be of lighter caliber for carrying a smaller current and creating a smaller amount of heat. These two sets of wires with terminal cables 40 and 45 may be independently energized by current at different times or simultaneously, and connected in parallel or in series or be supplied from two different current sources. The entire ensemble is, of course compacted and pressed into a composite panel 37 in a manner similar to the method followed for first panel 25 or 31. On the other hand, the method may be used in either case disclosed in Patent No. 1,993,348, dated March 5, 1935, if desired.

It has already been set forth that the panel, which is virtually a heater sandwich is mainly built up of sheets or layers of impregnated asbestos paper or board with outer surface sheets of paper or cardboard, but I may instead use sheets of glass wool or cloth impregnated in similar manner by phenol resin or the like, in either panel 25, 31 or in panel 37. The surface sheets covering the insulating sheets at 21 and 22 in panel 31 and at 47 and 48 in panel 37 are preferably of some selected surface material, at least the uppermost sheets 22 or 48, so as to present a wood panel finish, for example, or any other finish desired. In any event, the panel is a highly compressed and consolidated board in which either one or several electric heating wire systems are deeply embedded in such fashion that when the leads from these wires are connected to the current source, the panel is heated to a sufficiently high temperature to radiate heat from the surface thereof. If then one side of the panel has a larger number of sheets of asbestos or glass cloth together with other padding sheets than the other side, the heat will be mainly radiated from the side having the relatively few sheets covering the heating wires, which should also be the side having the selected surface finish.

In Figure 9 is shown a panel stand or heater 49 similar to panel 31, but rounded at the corners 50, 50 to facilitate handling and avoid injury to a person having occasion to shift the device, the latter being provided with the feet 51, 51 upon which it is mounted to stand vertically, and with a cord 52 and plug 53 adapted to be inserted into a wall outlet 54 in wall 55. In whatever position the panel heater stand is disposed, it will radiate heat from its flat surface 56, and suffices to heat a room when large enough and supplied with a sufficient current for this purpose.

In Figure 10 is illustrated an example 31 of the panel having a wood panel finish 57 with current supply cable 20 leading off from this panel independently of surface sheet 57. This panel may be used at 58, 58, etc., as wall paneling in a room as shown in Figure 11, and could be used at 59 upon the floor, also if desired, although in most cases, the walls will suffice. As likewise shown in Figure 14, the panel just described may be applied at 60, 60, etc., to the ceiling of the room 61 with the wood finish alone appearing at 57, 57, the heat radiating downwards into the room. In either case, whether the heater panels are located upon the walls or in the ceiling, the room is warmed by radiation without any visible source of heat, but may be controlled from one or more wall switches (not shown).

From the foregoing, it is evident that an electric heater panel may be built up of several sheets or layers of fibrous insulating material impregnated with a plastic of the phenol resin type, electric heater wire of appropriate size embedded in the layers, the whole heated to a proper temperature ranging from about 250° to about 375° F., and the assembly pressed under high pressure in a laminating press into a consolidated board or panel, with terminal leads leading to the interior resistance wires and serving for supplying heating current to the panel. As has been brought out, this panel may be used as a heater stand or as wall or ceiling paneling, and in every case capable of supplying clean, dry heat without the slightest danger from fire hazard, and likewise obsolescing steam radiators, oil or gas heaters and coal stoves as well, not to mention that the invention introduces new conveniences previously unknown in the heater art.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. An electric panel heater including a consolidated board of at least three sheets of asbestos paper, a separate electric heater including wire elements arranged between each two sheets, each of said elements having separate terminal leads independent of the terminal leads of the other element leading from its associated element to the exterior of said panel for insertion into a circuit of a current source, said sheets and said elements being impregnated with a resin and formed into a planar block under high pressure and controlled heating, and an outer covering over said planar block of sheets.

2. An electric panel heater according to claim 1, wherein the panel is provided with a surface finishing sheet upon at least one side and the opposite side has at least one padding sheet incorporated therein whereby to prevent the main portion of heat generated by the heater wire from escaping from said opposite side and to control radiation of heat to the first mentioned one side of said panel.

3. An electric panel heater including a consolidated board of asbestos paper of at least three layers impregnated with a phenol resin as a binder and having an electric heater wire sandwiched therein between each two layers so as to include at least two separate heater elements within said panel including at least a separate set of terminal leads for each heater, said panel being formed into a block under high pressure and controlled heating and including an outer covering surface sheet concealing the asbestos paper therein, said electric heater wire of at least one heater being of higher heat output than the others.

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