March 26, 1929. L. BUCK 1,706,769

HEAT INSULATING WALL

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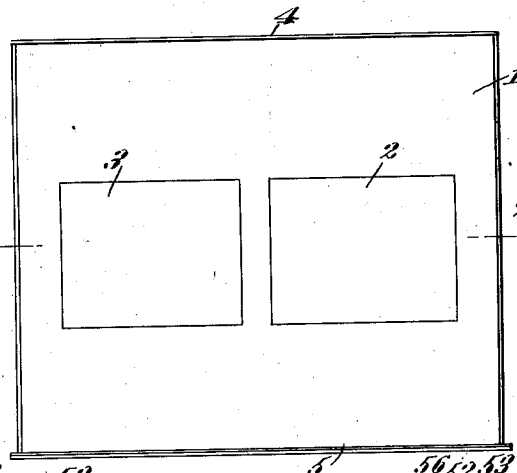


Fig. 1

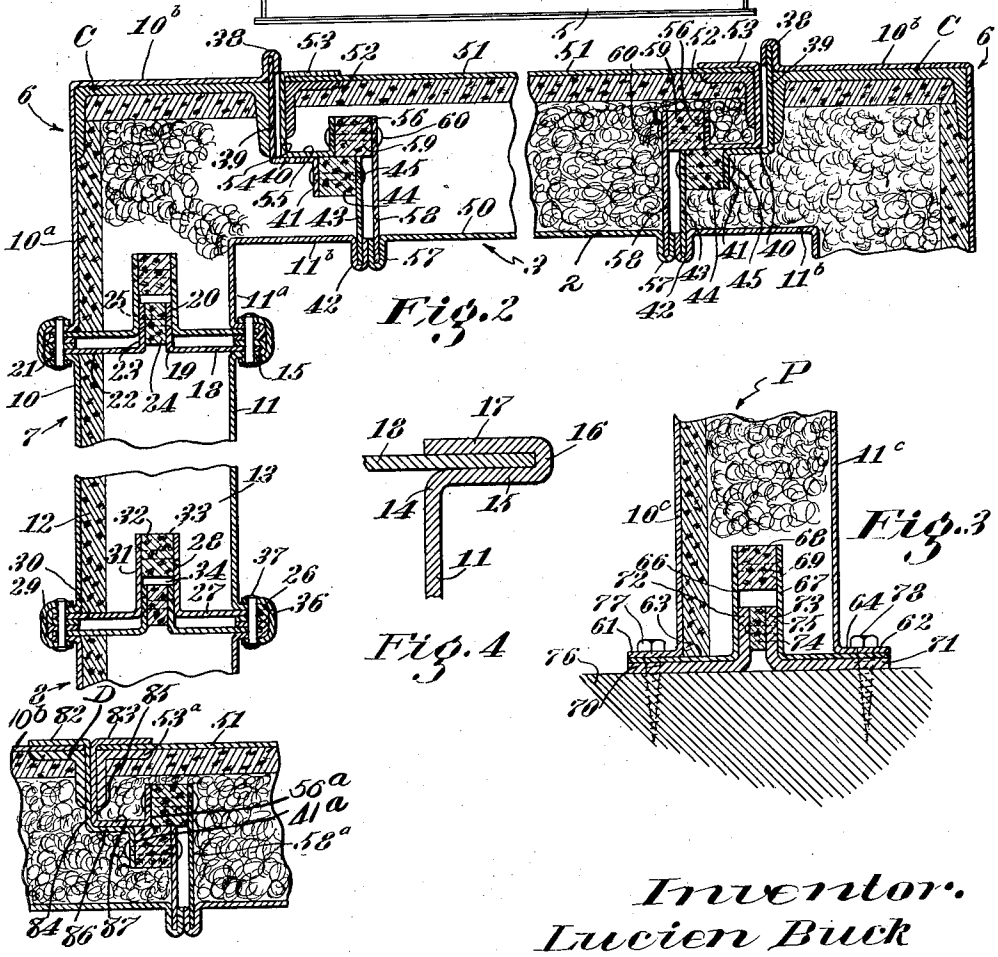


Fig. 2

Fig. 4

Fig. 3

Fig. 5

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HEAT-INSULATING WALL.

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This invention pertains to heat insulating walls such for example as are employed in the construction of ovens, refrigerators and the like and wherein the heat insulating material is confined between inner and outer sheathings of sheet material, for example metal, and in its more specific aspects relates to insulating walls of sectional type comprising panels adapted to be assembled to produce the desired structure.

In accordance with usual constructional methods the insulating material, for example sheets or layers of felt, cork, asbestos, etc., or loose fibrous material such as fibrous asbestos, mineral wool, or the like, or combinations thereof, are confined between inner and outer walls or sheathings of sheet material, for example steel or other metal, the assemblage being held together by means of bolts, rivets or other fastener devices extending through the entire thickness of the walls and engaging both inner and outer sheathings. Moreover, when the walls are of sectional character, that is to say built up by assembling previously constructed panels, the sheathing material usually extends from the inner to the outer surface of the sheathings at the joints, since the sheathing of each panel ordinarily covers its edges as well as its inner and outer faces.

When it is attempted to maintain a high temperature difference between the space within the insulating enclosure and the space outside, it is found that the heat is conducted through the numerous rivets or other connecting means, and through the metal at the joints between adjacent sections, in such quantity as seriously to affect the efficiency of the apparatus.

In accordance with the present invention the transfer of heat from one side to the other by conduction in the manner just referred to is practically prevented or at least reduced to an inconsequential minimum since substantially all direct metallic connection between the inner and outer surfaces of the walls is eliminated. The present improved construction which will hereinafter be more fully disclosed is admirably adapted to the building of ovens, for example enameling ovens, in which a high temperature must be maintained since it not only provides the desired heat insulating joint between the sections but is also adapted to be incorporated in doors or other closures forming portions of the oven walls, and in heat insulating connections between the vertical walls and the floor plate or top of the structure.

In the accompanying drawings Fig. 1 is a front elevation, diagrammatic in character, or an oven or other structure provided with doors in its front wall, and illustrating one application of the present invention;

Fig. 2 is a fragmentary section substantially on the line 2—2 of Fig. 1 but to larger scale, showing doors designed to swing outwardly;

Fig. 3 is a fragmentary vertical section illustrating a desirable form of joint between the vertical wall of the oven and a horizontal member, for example a floor plate;

Fig. 4 is a fragmentary section on the same plane as that of Fig. 2, but to larger scale, showing details of the panel construction; and

Fig. 5 is a fragmentary section on substantially the same plane as Fig. 2 showing a modified door construction.

Referring to the drawings the numeral 1 designates an oven or other insulated structure having doors 2 and 3, a top 4, and a bottom 5. While this structure is referred to as an "oven" it is to be understood that the invention is not in any way limited to employment in devices of this specific type, but is applicable to structures of all types and sizes in which heat insulation is an important desideratum.

Referring more particularly to Figs. 2 and 4 the left-hand side wall of the oven is shown as comprising a plurality of independent panels 6, 7, 8 etc. arranged edge to edge and with the joints between them extending vertically. While the vertical joint has herein been shown in detail, it is manifest that horizontal joints between the panels may be made in the same manner and it is contemplated that if the panels can not conveniently be made of the desired height to reach from the top to the bottom of the structure, the horizontal meeting edges of adjacent panels will be provided with joints substantially such as herein disclosed.

Referring more particularly to panel 7 which is typical of the plane panels employed in the side walls of the structure, it comprises outer and inner walls or sheathings 10 and 11. These sheathings are preferably of sheet material and may conveniently be made of sheet metal, for example

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sheet steel. These outer and inner sheathings 10 and 11 are spaced apart and while it is possible and may at times be desirable to leave the space between these members substantially vacant, it will usually be found preferable to fill this space more or less completely with some material adapted to prevent conduction of heat or transfer of heat by convection from one wall to the other. Such material may consist of layers 12 of felt, air cell asbestos, or other insulating material commonly furnished in sheets or layers, or the space may be filled with loose fibrous material 13, for example asbestos or mineral wool. As here shown a combination of these two arrangements is employed.

Referring to Fig. 4 the upper end of the sheathing 11 is bent outwardly at 14 to provide the out-turned flange 15. Preferably this flange is bent back upon itself at 16 to provide the member 17 parallel to the member 15. While this construction is preferred it is not essential to the broader aspects of the invention.

A closure member 18 is disposed between the members 15 and 17, to which it may be secured in any desired manner, as for example, by pressing the members 15 and 17 together in a manner common to sheet metal construction. Alternatively this closure member may constitute an integral continuation of the part 17. The closure member 18 is preferably of sheet material, for example sheet steel, and extends inwardly substantially perpendicular to the plane of the sheathing 11 to form a wide flange constituting a partial closure for the space within the panel. At the point 19 the member 18 is bent outwardly beyond the edge of the panel to provide the member 20 which is substantially parallel to the sheathing 11.

The sheathing 10 is likewise provided at its edge with an out-turned flange 21 to which the edge of a closure member 22 is connected. This closure member 22 lies substantially in the same plane as the member 18 and is furnished with the up-turned portion 23 parallel to the member 20, but spaced therefrom. Between the members 20 and 23 a strip of heat insulating material 24 is placed. This strip may consist of asbestos or other suitable insulation and is held in place by means of a rivet 25 which rigidly connects the members 20 and 23, said members with the interposed insulation constituting a projecting tongue.

At the opposite edge of the panel 7, the sheathing 11 is furnished with the outturned flange 26 to which the closure member 27 is secured. This closure member is generally similar to the closure member 18 above described except that its portion 28, which corresponds to the part 20 of the closure 18, is somewhat longer than the part 20 and extends inwardly into the space within the panel. The opposite edge of the sheathing 10 is likewise provided with an out-turned flange 29 to which the closure member 30 is attached. The member 30 has the part 31 parallel to and spaced from part 28. The parts 28 and 31 form the opposite walls of a socket or groove 34 adapted to receive the projecting tongue of the next adjacent panel. The inner wall of this groove consists of a strip 32 of insulating material interposed between the walls 28 and 31 and held in position by the rivet 33 which connects such walls.

While but a single rivet 25 is herein illustrated as connecting the opposite walls 20 and 23 of the tongue, and a single rivet 33 connecting the walls 28 and 31 of the groove, it is to be understood that since the panels are of substantial width a plurality of such rivets may be employed at the intervals necessary properly to connect the walls of the tongue and groove respectively.

When the panels are assembled the tongue of one panel enters the groove 34 of the other thus forming a tight joint between adjacent panels. When thus assembled adjacent panels are rigidly connected by fitting a U-shaped sheath 36 over the out-turned flanges of adjacent sections so that the side walls of the channel embrace said flanges. Suitable rivets or bolts 37 are then passed through the side walls of the channel and through the flange embraced between them.

The panels may thus be united rigidly so that they can not spread apart but at the same time providing a broken joint and eliminating all direct metallic connections between the inner and outer sheathings, except such relatively slight connection as is afforded by the rivets 25 and 33. As these rivets are subjected to but little strain they may be relatively small and spaced substantial distances apart. On the other hand the rivets 37 which form the real connection between the sections may be placed as closely together as desired since they do not conduct heat between the inner and outer walls.

Referring to the upper part of Fig. 2, the corner panel 6 comprises the outer sheathing 10^a and the inner sheathing 11^a which are disposed substantially in the plane of the sheathings 10 and 11 of the plain side wall panel. The sheathings 10^a and 11^a are bent to provide the portions 10^b and 11^b at right angles to the planes of the parts 10^a and 11^a, respectively. If the panel 6 were to constitute a plain corner, the parts 10^b and 11^b would terminate at their right-hand ends, as viewed in this figure, in the same way as the sheathings 10 and 11 to provide a tongue adapted to engage a groove or socket in the next panel. As herein illustrated, the corner panel 6 is provided with a door opening which is closed by door 3. Preferably the corner panel is braced and the edge of the

door opening defined by a channel bar C. The edge of the sheathing 10^b at the opening is preferably furnished with an outstanding flange 38 which receives the edge of the closure member 39 substantially perpendicular to the part 10^b. This closure member 39 is bent at right angles to provide the part 40 and then again at right angles to furnish the part 41. The corresponding edge of the sheathing 11^b is also furnished with the outstanding flange 42 to which is attached the edge of the closure member 43 parallel to the member 41. Between the members 41 and 43 insulating material 44 is arranged which is held in position by means of rivets 45 connecting the parts 41 and 43.

The door 3 preferably consists of inner and outer spaced sheathings 50 and 51 and may if desired be provided with a frame consisting of angle irons 52 suitably secured to the outer sheathing 51. A closure member 53 is secured to the outer surface of the member 51 at its edge and is bent at right angles to provide a part parallel to the closure member 39. It is then bent to provide the part 55 parallel to the member 40 and again bent to provide the portion 56 substantially at right angles to the sheathing 51. The sheathing 50 is provided at its edge with a flange 57 receiving the edge of a closure member 58 parallel to the member 56. Insulating material 59 is interposed between the members 56 and 58 and the latter are connected by a rivet 60.

It may be understood that the opposite edge of the door and the opening which receives it may be constructed in similar fashion, as well as the upper and lower edges thereof.

This construction, in which the edges of the door and its opening have offset portions, provides a broken joint which substantially eliminates direct flow of heated air, since the members 40 and 52 may if desired be caused to engage one another when the door is closed. At the same time direct conduction of heat is substantially eliminated since the only metallic connections between the inner and outer sheathings are furnished by the infrequent rivets 45 and 60.

Referring to Fig. 3 there is illustrated a desirable construction useful in attaching a vertical panel to a horizontal member, for example a floor plate or oven top. In this view the vertical panel P is provided with spaced parallel outer and inner sheathings or walls 10^c and 11^c respectively, it being understood that the space between the panels may or may not be filled with insulating material as preferred. The lower edge of sheathing is turned outwardly to provide a flange 61 and the lower edge of the sheathing 11^c is likewise turned outwardly to form the flange 62. A closure member 63 engages the flange 61 and a similar closure member 64 is secured to the flange 62. These closure members extend inwardly toward each other across the space between the side walls of the panel and are then bent upwardly to provide the parallel members 66 and 67 constituting the opposite walls of a socket. Insulating material 68 is disposed between these walls which are rigidly connected by means of rivets 69. Members 70 and 71, as shown, are disposed beneath the members 62 and 64 respectively and are furnished with parallel outstanding portions 72 and 73 forming the walls of a tongue adapted to enter the socket between the members 66 and 67. Insulating material 74 is interposed at members 72 and 73 which are connected by the rivets 75.

The flanges 61 and 62 and the parts immediately beneath them may be secured if desired to a base plate 76 by means of suitable bolts or screws 77 and 78, it being understood that the member 76 is representative of any horizontal part such for example as a metallic or other floor plate or top member, it being further understood that under certain circumstances one or the other of the members 70 and 71 may in itself constitute such floor or top, in which event the tongue member which enters the socket would be carried wholly by such members 70 and 71.

In Fig. 5 a slightly modified door construction is illustrated adapted for use in a position in which the door is not adjacent to a corner panel. In this view 10^b indicates the outer sheathing of a plane panel reinforced at its edge by means of an angle bar D. The door is provided with a sheathing 51 in the same way as previously described with respect to Fig. 2 and may be furnished with the reinforce frame 53^a in the same manner. In this case the edge of the sheathing 10^b stops substantially flush with the edge of the reinforce member D, and the closure member 82 overlaps the outer surface of the sheathing 10^b and then extends inwardly to provide the parts 84, 86 and 41^a. Likewise a closure member 83 overlaps the outer surface of the sheathing 51, then extends inwardly to provide the parts 85, 87, and 56^a corresponding with the part 56 previously described. The remainder of this structure corresponds to that disclosed in Fig. 2 and need not be described in detail.

While certain specific arrangements have herein been disclosed it is to be understood that various changes in proportion of parts and in their relative arrangement may be made as circumstances may warrant without departing from the spirit of the invention.

I claim:

1. An insulating wall having spaced inner and outer sheathings, and means connecting said sheathings, said means comprising elements secured to the respective sheathings, said elements extending into the space

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between the sheathings, a spacer member of heat insulating material separating said elements, and a device of small cross-sectional area extending through said elements and the spacer member and uniting them.

2. An insulating panel having spaced inner and outer sheathings and means connecting the edges of said sheathings comprising a piece of sheet material extending from the edge of each sheathing into the space between the sheathings, each such piece of sheet material having a part disposed parallel to and spaced from its respective sheathing and spaced from the corresponding part of the other piece of sheet material, heat insulating material interposed between said parts, and rivets connecting said parts.

3. A heat insulating panel having spaced side walls of sheet metal with heat insulating material between them, a closure for the edge of the panel comprising pieces of sheet material extending inwardly from the edge of the respective side walls and then turning at substantially right angles to provide parallel members, heat insulating material interposed between said members, and fasteners extending through such heat insulating material and said members to unite the latter.

4. In an insulating panel having spaced inner and outer sheathings, a piece of sheet metal secured to the edge of each of the respective sheathings, each such piece of metal having a part disposed substantially perpendicular to the plane of its corresponding sheathings to form an edge closure for the panel, said pieces of metal each having a part disposed substantially parallel to the plane of its respective sheathing, said latter parts being spaced and projecting beyond the edge of the panel, and heat insulating material interposed between said projecting parts and together with the latter constituting a tongue which projects beyond the edge of the panel.

5. In an insulating panel having spaced inner and outer sheathings, a piece of sheet material extending into the space between the sheathings from the edge of each sheathing respectively, said pieces of sheet material having opposed substantially parallel parts spaced to provide a groove at the edge of the panel, heat insulating material interposed between said parallel parts and constituting a bottom for the groove, and fastener means connecting said insulating material to said parallel parts.

6. In an insulating panel having spaced inner and outer metallic sheathings, a piece of sheet metal extending inwardly into the space between the sheathings from an edge of each sheathing respectively, each of said pieces of sheet metal having a part disposed perpendicular to the plane of its corresponding sheathing and a part substantially parallel to such plane, said latter parts being spaced to provide the walls of a groove extending inwardly from the edge of the panel, heat insulating material filling the inner portion of said groove, and means connecting the walls of said groove.

7. A heat insulating panel having spaced substantially parallel side walls of sheet material, said walls having out-turned flanges respectively at their edges, means closing the space between the side walls at the edge of the panel comprising pieces of sheet material attached respectively to the out-turned flanges and having parts disposed in parallel relation, insulating material disposed between said parallel parts, and means rigidly connecting said parts.

8. A heat insulating wall having independent sections disposed in edge to edge relation, each section comprising spaced sheathings, the edge of each sheathing of each section being turned outwardly to form a flange, connecting means engaging the flanges of each section, said connecting means comprising means substantially preventing the conduction of heat from one sheathing to the other of a given section, a substantially U-shaped sheath embracing the adjacent out-turned flanges of adjoining sections, and a fastener device extending through the walls of said sheath and the flanges embraced between them to unite the sections.

9. In a heat insulating wall of the type having separate panels united with tongue and groove joints, a panel comprising spaced inner and outer sheathings, a tongue projecting from one edge thereof and having parallel members united respectively to the inner and outer sheathings and having material interposed between said parallel members and substantially insulating them from each other, a groove in another edge of said panel having side walls united respectively to the inner and outer sheathings and means substantially insulating said side walls from each other.

10. In a heat insulating wall of the type having spaced inner and outer walls and separate panels, a tongue and groove joint for uniting the edges of adjacent panels comprising pieces of sheet material extending perpendicularly from the walls of both edges and thence parallel to said walls, the parallel portions of the tongue edge protruding from its edge and the parallel portions of the groove edge retreating within its edge, both tongue and groove portions having material interposed between said parallel members and substantially insulating them from each other.

11. A heat insulating wall having independent sections disposed in edge to edge relation, each section comprising spaced

sheathings, the edge of each sheathing of each section being turned outwardly to form a flange, connecting means engaging the flanges of each section, said connecting means comprising pieces of sheet metal extending inwardly from said flanges and thence parallel to said sheathings, said parallel portions protruding from the edge of one section and retreating within the edge of the other section, both sets of parallel portions being separated by heat insulating material, a substantially U-shaped sheath embracing the adjacent outturned flanges of adjoining sections, and a fastener device extending through the walls of said sheath and the flanges embraced between them to unite the sections.

Signed by me at Boston, Massachusetts, this 4th day of September, 1926.

LUCIEN BUCK.

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