Sept. 10, 1935. C. W. ATTWOOD 2,014,035

INSULATING WALL UNIT

Original Filed Dec. 2, 1930 3 Sheets-Sheet 1

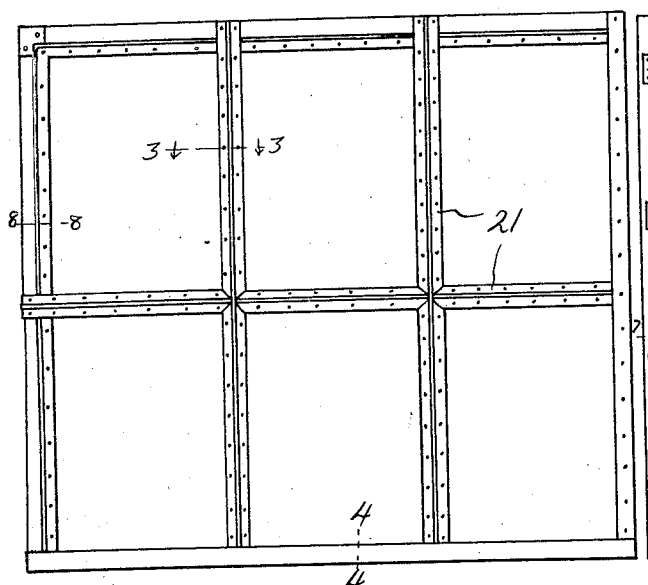


Fig. 1.

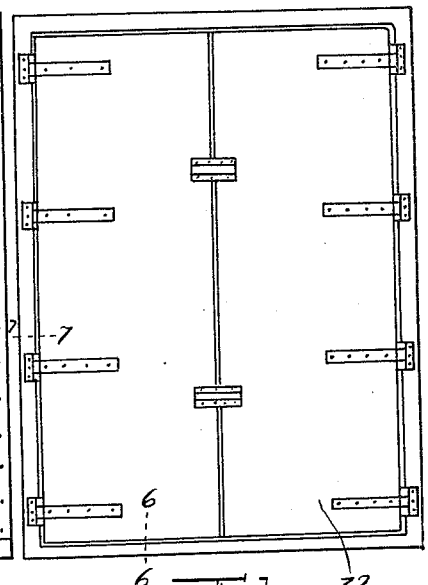


Fig. 2.

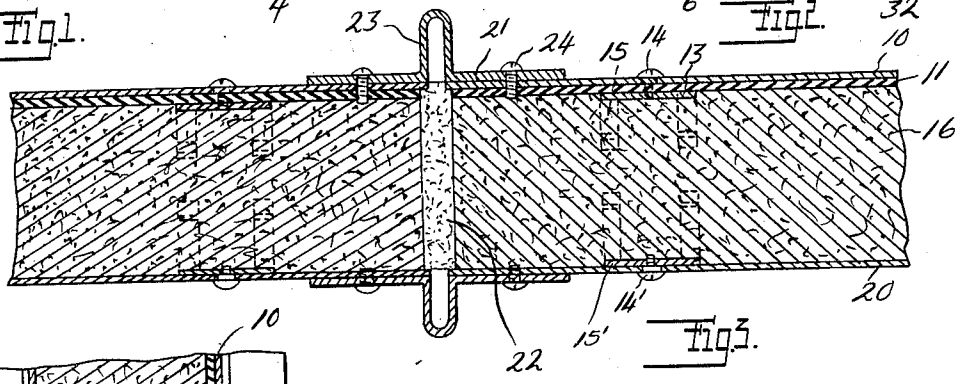


Fig. 3.

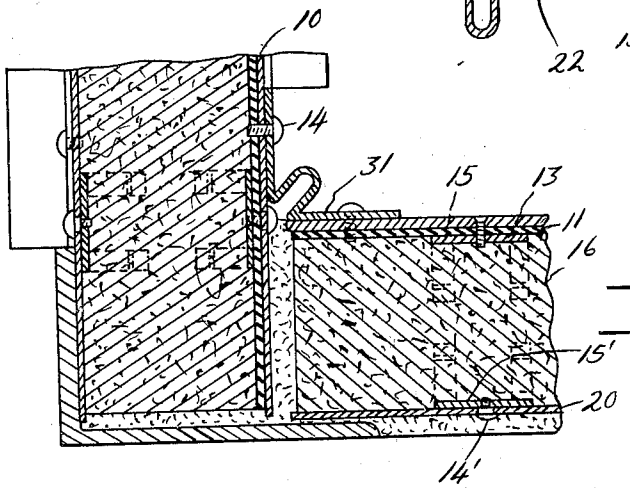


Fig. 4.

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INSULATING WALL UNIT

Original Filed Dec. 2, 1930 3 Sheets-Sheet 2

Fig. 5.

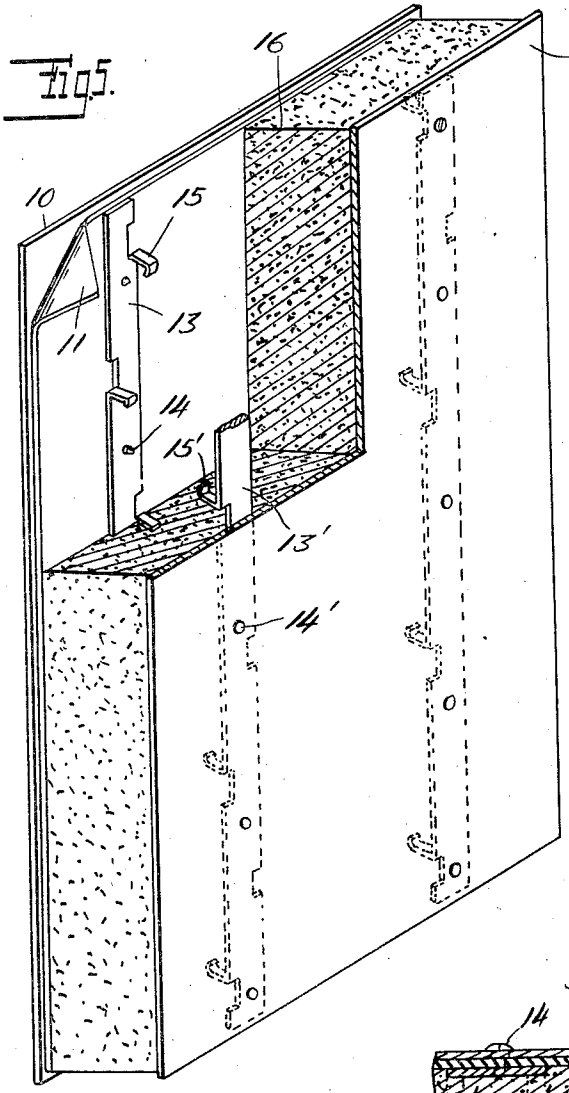
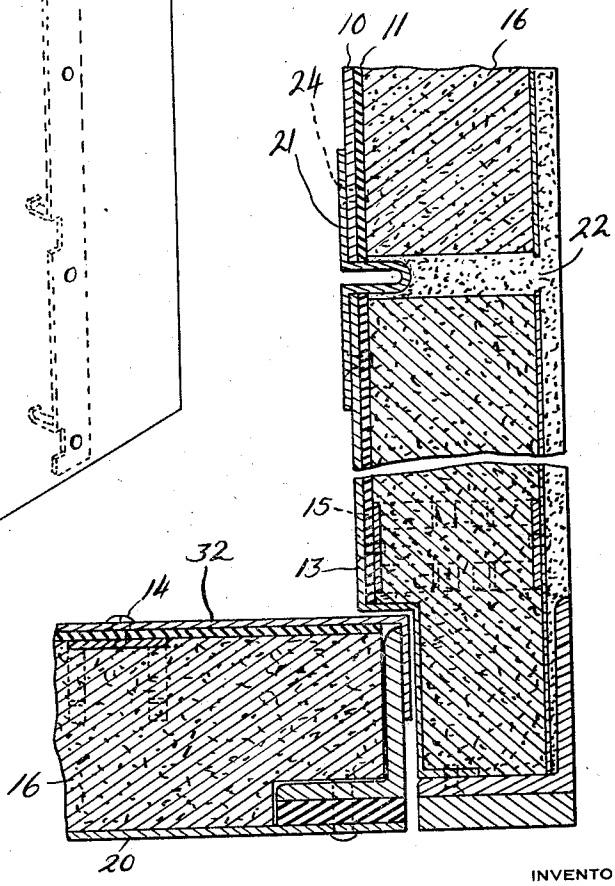


Fig. 6.



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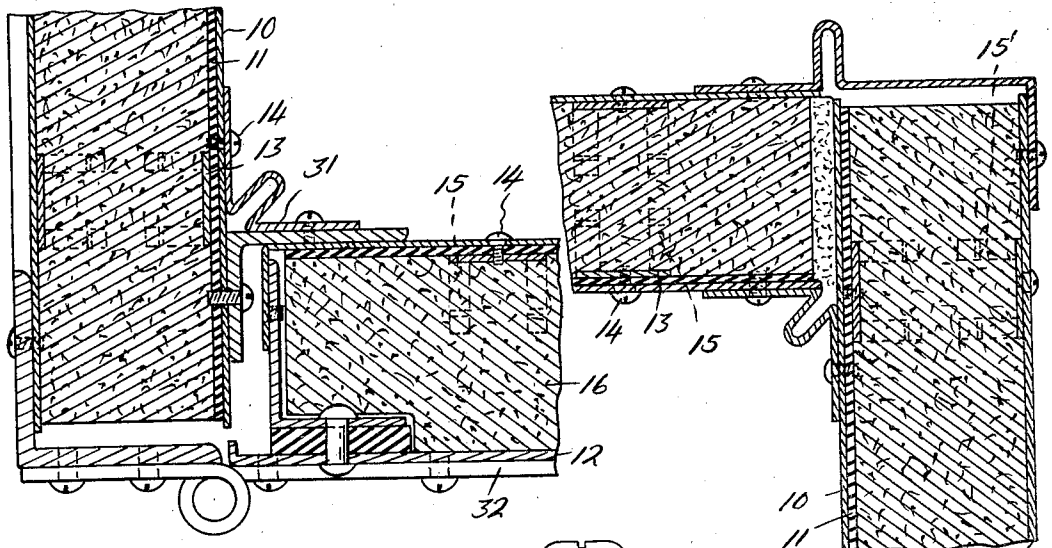


Fig. 7.

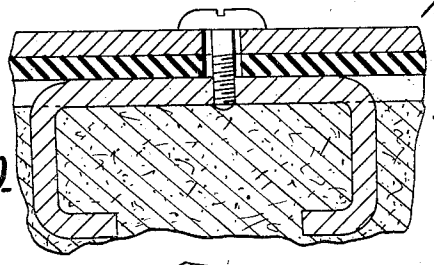


Fig. 8.

Fig. 10.

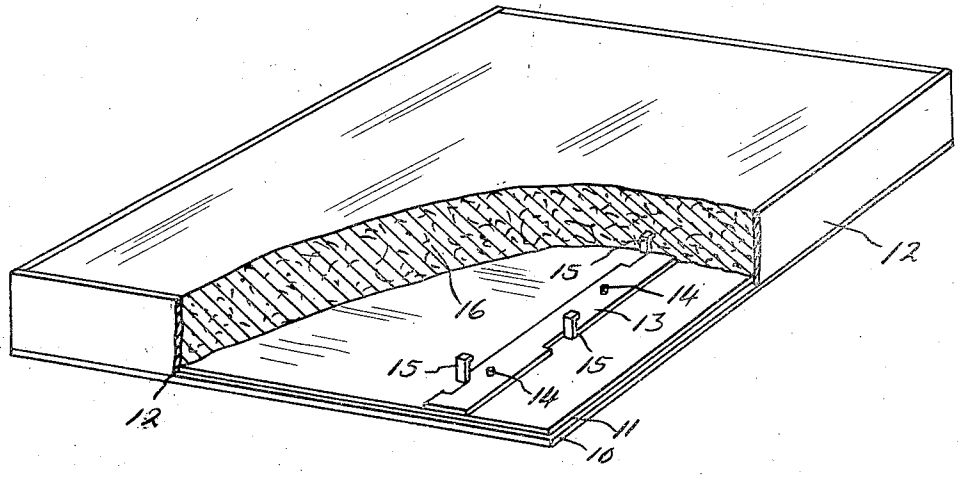


Fig. 9.

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UNITED STATES PATENT OFFICE

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INSULATING WALL UNIT

Charles W. Attwood, Wayne, Mich.

Application December 2, 1930, Serial No. 499,526
Renewed February 7, 1935

9 Claims. (Cl. 72—16)

This invention relates to built-up wall structures, and more particularly to built-up walls which contain insulating means adapted to minimize the conduction of heat therethrough.

One object of my invention is the provision of a built-up insulating wall which may be repeatedly subjected to relatively high heats and intermediate coolings without injurious consequences resulting from the consequent alternate expansion and contraction.

Another object of this invention is the provision of such a built-up insulating wall which may be provided with exterior protective sheathing having a different coefficient of expansion from the interior insulation, yet supported by the insulation rather than serving as a support for it, as is the common practice, and so arranged that the complete assembly may be subjected to relatively high heats without the varying coefficients of expansion causing any dangerous strain to be exerted upon either the sheathing or the insulation because of either the heating or cooling thereof.

Another object of this invention is the provision of such built-up wall units which may be completely assembled at the time and place of their manufacture, in such manner that, at the place where they are to be used in constructing any desired structure which is to be provided with insulating walls, it is merely necessary to join them after the manner of common building blocks or bricks, and with or without auxiliary expansion joints.

A further object of this invention is the provision of such insulating wall units in which the heat conduction from one surface to the other will be rendered unusually low, by reason of the elimination of all metallic elements extending from one surface to the other, which might serve as heat conducting media between the faces.

A further object of this invention is the provision of an insulating wall particularly useful in making commercial ovens, where the inner sheathing may be subjected to temperatures of, say, 600° F. while the outer sheathing is exposed to ordinary room temperatures only. With my improved wall structure such varying temperatures will not damage the wall, and the heat will be effectively retained within the oven.

Other objects and advantages will be apparent from the following description, wherein reference is made to the accompanying drawings illustrating a preferred embodiment of my invention and wherein similar reference numerals designate similar parts throughout the several views.

In the drawings:

Figure 1 is a side elevational view of the built-up wall of an industrial oven embodying my improved built-up insulating wall sections, illustrating a typical commercial application of the principles of my invention.

Figure 2 is a front elevational view of the same oven.

Figure 3 is a horizontal sectional view taken substantially on the line 3—3 of Figure 1, looking in the direction of the arrows.

Figure 4 is a vertical sectional view taken substantially on the line 4—4 of Figure 1.

Figure 5 is a perspective view of one of my improved insulating wall sections, a portion being broken away to show its interior construction.

Figure 6 is a vertical section taken substantially on the line 6—6 of Figure 2.

Figure 7 is a horizontal section taken substantially on the line 7—7 of Figure 2.

Figure 8 is a horizontal section taken substantially on the line 8—8 of Figure 1, and

Figure 9 is a perspective view of one of my wall units in the process of being molded, showing the mold which I preferably employ, and the method of assembling and parts assembled in the mold in preparation for pouring the insulating medium, the insulating medium being shown already poured but partly broken away to bring out structural details.

Figure 10 is a fragmentary detailed section of the fastening means by which the sheathing is secured to the block.

Referring now to the drawings:

As the basis for my improved wall unit I employ a mouldable composition which may be maintained in a liquid state while containing a relatively large percentage of water, but which may be hardened by driving off the moisture, as in a dry kiln. This substance must of course have relatively high and efficient heat-insulating characteristics, and I preferably employ a mixture of several insulating materials, including gypsum and asbestos. In moulding the units, one of the sheet steel surface plates (10) is preferably laid substantially flat, and a moulding frame, as 12, is placed about its edge. The moulding frame may either be placed on top of the plate, as shown in Figure 9, or it may fit about the edge. I preferably place it on top, as shown, in order that any desired overlap of the plate may be provided. On top of the sheet metal plate 10, and preferably fitting snugly within the mould frame 12, I place a sheet of material having high heat insulating characteristics, such as asbestos, 11, although this

is optional, and may be dispensed with if less efficient heat insulation is satisfactory, or in the interests of economy. Upon the insulating sheet 11 are placed relatively narrow anchor strips 13, any desired number of which may be used, depending upon the size of the units and the weight of the steel or other sheet surfacing plate which it is desired they support. I preferably assemble the surface plate 10, insulating sheet 11, and anchor strips 13 before the moulding operation, as by means of machine screws 14. The anchor strips are preferably formed with spaced struck-up tangs 15, which may be terminally bent, substantially as shown, to insure their firm engagement with the insulating material, which is designated 16, (Figure 9). It will be seen that the indicated manner of forming the struck-up tangs 15 renders them flexible in the direction of the strip's length. Thus they may give and bend under expansion and contraction of the strip, which is mainly lengthwise. The machine screws 14 are formed with relatively large heads, and their stems pass through apertures in the surface plate 10 which are of considerably greater diameter than the stems of the screws. The screw heads are of course not clamped down tightly against the sheet, so that the latter is free to move by reason of the enlarged apertures in the plate through which the screws pass. The insulating mass is not bonded to the sheathing plate, so despite their being secured together, the plate may move slightly relatively to the block. Thus if the wall unit is subjected to heat, and expansion of the sheet causes its movement with respect to the insulating-supporting mass 16, it is free to move without straining or pulling out the screws 14 or damaging the insulating material. The apertures in the anchor strips 13 in which the screws engage are threaded to receive them, either preliminarily, or by employing self-tapping screws.

When this portion of the unit has been assembled in the manner shown and described, the insulating material is poured into the mould, and leveled off to form a smooth top surface. It is then best dried in a kiln, the open top surface assisting in this operation. Before placing in the kiln, however, additional anchor strips are positioned upon the top surface of the insulating material, with the tangs embedded in the soft plastic. Thus when the mass has dried, a hard block is formed, with the surface sheet and interposed insulating sheet 11 already secured to one side of the block, and the anchor strips already firmly affixed to its other side, enabling the attachment of sheathing thereto whenever desired. The frame 12 is then removed, and before affixing the surface sheathing sheet to the previously uncovered side of the block, this plate is also provided with larger holes than are necessary to enable passage of the stems of the stay bolts through it, to allow for relative movement between the sheet and the block under expansion and contraction. No interposed asbestos or other already prepared insulating sheet is ordinarily necessary upon this side of the block, which may be placed upon the cooler side of the insulating wall in which the block is employed, (Fig. 5).

The upper anchor strips, which are placed on top of the insulating material during the moulding operation, are designated 13', their tangs 15', and the machine screws which secure the outer surface plate to them, 14'. The second surface plate itself is indicated by the number 20.

As an optional method of forming the insulating blocks I have found it fully practicable to pour the central insulating plastic into a mould having a smooth bottom, and without placing therein either the lower sheathing sheet 10 or the prepared insulating sheet 11. In forming the blocks in this manner, only the anchor strips 13 are placed in the desired position in the mould, with the tangs projecting upwardly. The plastic is then poured into the mould and leveled off, as in the method first described, and the upper anchor strips are placed on top, with their tangs embedded in the mass in the same manner. The block may then be removed from the mould while still moist, and dried in the kiln, without having affixed to its surface anything but the anchor strips. This method possesses the advantage of allowing quicker drying in the kiln, as moisture is free to pass out through all the surfaces of the block; it of course necessitates, however, more careful handling of the block, since all supports must be removed from it while it is still in a more or less plastic condition.

Figures 1, 2, 3, 4, 6, 7, and 8 illustrate a typical commercial application of my invention, in this case to a built-up industrial oven which is designed to incorporate many advantages and be more efficient than those commonly constructed and now in use. For securing together a plurality of the units whose construction I have just described, coupling strips, such as 21 are my preferred means. In addition it is well to use heat-expansible cement or mortar (22) between adjacent blocks, and preferably the cement or mortar used should also possess insulating characteristics. As shown in Figure 3, the coupling strips are formed as expansion joints with bowed central portions 23, and, the metal of these bowed portions being relatively resilient, expansion and contraction of the adjacent surface sheets, which of course expand much more than the blocks under heat, relatively to each other and to the blocks is thus provided for. The coupling strips may be secured to the sheathing, as by means of the machine screws 24. The formation of a similar coupling strip for an interior corner is shown in Figures 4, 7, and 8, being designated 31. In commercial ovens it is frequently desirable that it be possible to wheel a truck upon its floor. In order to permit this, the coupling-expansion strips may be employed in the manner shown in Figure 6, in which it will be seen that the bowed expansion portion of the strip 21 is turned inwardly, leaving a relatively smooth surface at the floor, but enabling expansion of the sheets 10—13 and inward bowing of the looped portion of the member 21, which inward bowing will be seen to be unrestricted. Figure 6 also shows a preferred manner of providing for the meeting of the floor and a door of such an oven, the door being designated 32. Further details of a door mounting construction for such an oven are given in Figure 7. It will be seen throughout these views, upon a study thereof, that the possibility of heat conduction through the walls or at the doors of such an oven has been reduced to an unprecedented minimum by reason of the structural methods made possible by the use of my improved insulating wall unit.

Its advantages may of course be applied to the construction of an infinite variety of devices and structures in which it is desired to provide an insulating wall. The formation of the insulating material of such strength that it serves as the support for the sheathing, rather than forcing the sheathing to support the insulation, as is the

common practise, makes possible a construction in which the highest efficiency is attainable. In addition, the method of affixing the sheathing, in a manner enabling it to expand and contract freely and independently of the insulation, and in units independent of each other, eliminates straining and warping of the parts of an assembled structure so efficiently as to assure a much greater life and continued maintenance of its original form and efficiency. By reason of the unit construction, also, it becomes easily possible to add to or alter an already completed structure, and in event of radical changes of design the salvage value of the material is very high, as the individual units maintain their value and usefulness no matter how often or in how many different structures they may be used.

The sheathing used may be either metallic or non-metallic. As a non-metallic sheathing I have found the material commonly sold under the name "asbestos building lumber" satisfactory. The oven design herein shown and described of course contemplates use of metallic sheathing, which, having a materially greater coefficient of expansion than the blocks, should have, and is in my design allowed considerable freedom for independent movement.

While it will be apparent that the illustrated embodiment of my invention herein disclosed is well calculated to adequately fulfill the objects and advantages primarily stated, it is to be understood that the invention is susceptible to variation, modification and change within the spirit and scope of the subjoined claims.

What I claim is:

1. An insulating wall section comprising a solid block of insulating material, a relatively thin sheet sheathing carried by the surface of the block, means for securing the sheathing to the insulating material and simultaneously providing for relative movement between the sheathing and the insulating material, comprising anchor strips having projecting portions imbedded in the insulating material, and means slidably connecting the sheathing to the strip, whereby limited slidable movement between them under heat-induced expansion is permitted.

2. An insulating wall section comprising a solid block of insulating material, a relatively thin sheet sheathing carried by the surface of the block, means for securing the sheathing to the insulating block and simultaneously providing for relative movement between them, comprising securing members carried by the block and having portions overhanging parts of the sheathing but movable relatively thereto.

3. A sectional insulating wall unit comprising a central insulating homogeneous initially plastic mass having a pair of substantially parallel surfaces, a relatively thin sheet, and means for securing the sheet to the insulating mass comprising a metallic strip carrying spaced projections embedded in the mass before it has set, bolts threaded into the strip and passing through the sheet, said sheet having bolt holes therein larger than the stems but smaller than the heads of the bolts, thereby permitting limited slidable movement between the sheet and the strip.

4. An insulating partition comprising a central built-up wall formed of blocks of solid insulating material, a sheathing plate, and means securing the sheathing to the insulating wall but allowing their free relative sliding movement within desired limits.

5. An oven built of insulating wall sections and comprising a central insulating sectional wall of solid material, an inner sheathing, supporting means including lost motion connection securing said inner sheathing to the insulating wall but expansible and contractible independently of the wall, and an outer sheathing similarly supported by the insulating wall independently of the inner sheathing, the outer sheathing being thereby also expansible and contractible independently of the insulating wall, and the outer and inner sheathings being expansible and contractible independently of each other.

6. An oven built of insulating wall sections, comprising a central insulating sectional wall of solid material, an inner sheathing supporting means including lost motion connection securing said inner sheathing to the insulating wall, thereby enabling expansion and contraction of the sheathing independently of the wall, and an outer sheathing similarly supported by the insulating wall independently of the inner sheathing, and thereby also expansible and contractible independently of the insulating wall, the sheathing portions being formed of assembled sections having abutting but spaced edges, and resilient members so connecting said sections as to permit their expansion and contraction independently of each other.

7. A sectional insulating wall unit comprising a central insulating block, a sheathing member arranged adjacent the block, and means securing the sheathing to the block but allowing their limited, independent movement, comprising a securing member projecting thru and overhanging a portion of the sheathing, said sheathing having an enlarged aperture therein thru which the securing member extends.

8. An oven built of insulating wall sections, each section comprising a central block of solid insulating material having substantially parallel inner and outer surfaces, the blocks being cemented together to form the walls of the oven, a surface sheet arranged upon the inner surface of each block, lost motion connecting means securing the sheet to the block to permit expansion and contraction of the sheet independently of the block, another surface sheet similarly affixed to the outer surface of each block and expansible and contractible independently thereof, the inner sheets being independent of the outer sheets, and resilient connecting means comprising bowed sheet metal members substantially sealing the junctures of adjoining inner sheets and so joining the same that each section is independently expansible and contractible.

9. A sectional insulating wall unit comprising a block of insulating material, a sheathing plate, and means securing together said block and sheathing plate in a manner rendering them relatively slidable with respect to each other, comprising a metallic supporting element having portions embedded in the block and portions accessible from the surface thereof, and attaching means connecting said last mentioned portions and the plate and allowing relative movement thereof.

CHARLES W. ATTWOOD.