

June 26, 1934.

E. W. LESHER

1,964,473

WALL CONSTRUCTION

Filed Aug. 6, 1929

3 Sheets-Sheet 1

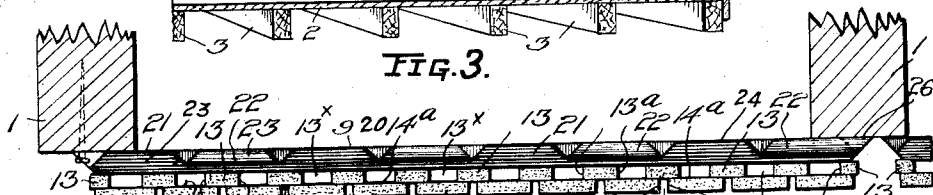
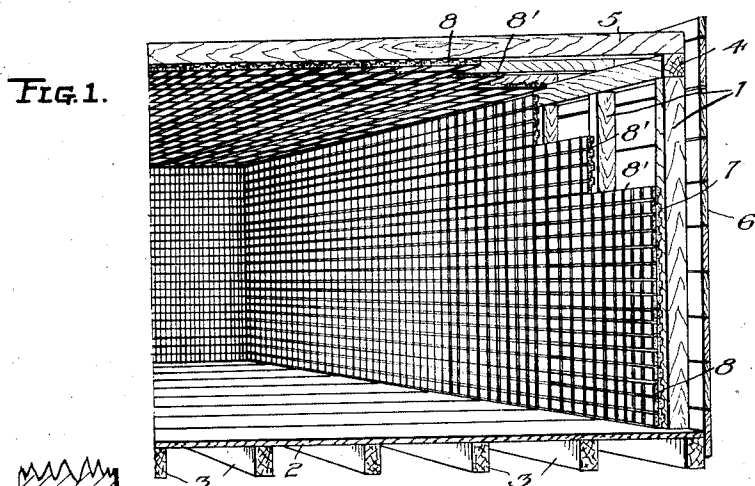
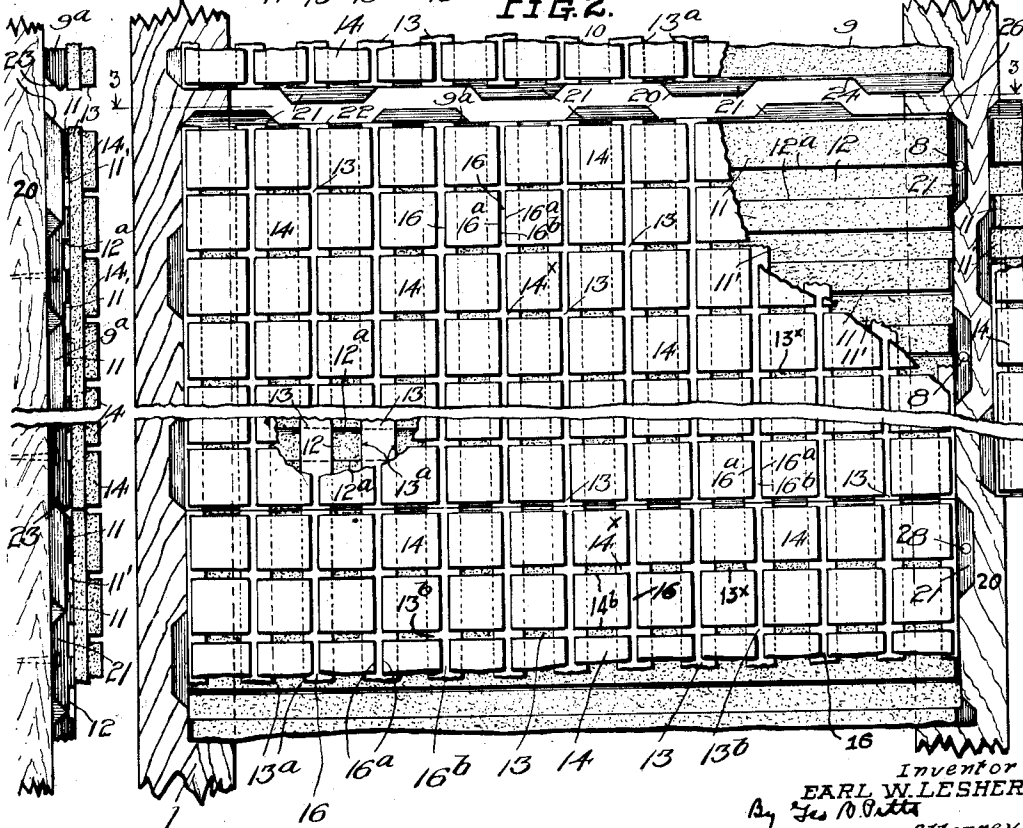


FIG. 4.



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FIG. 5.

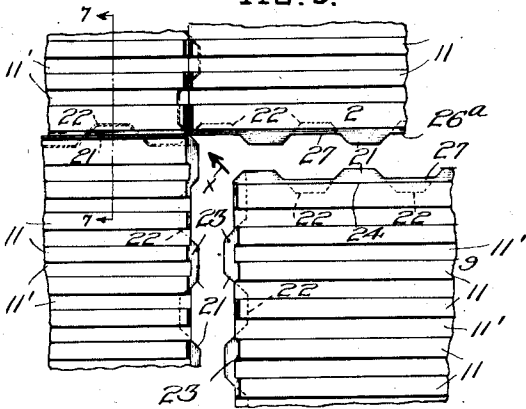


FIG. 6.

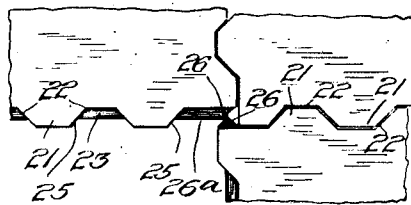


FIG. 8.

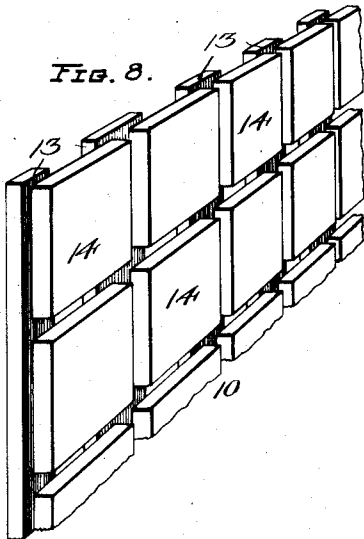


FIG. 9.

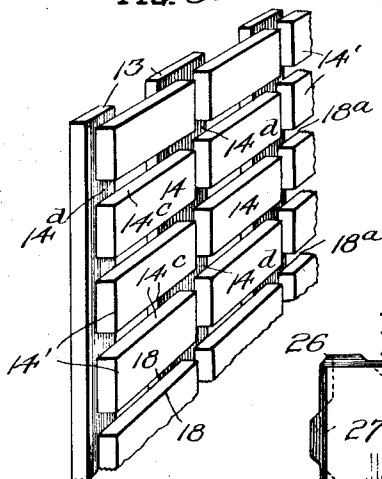


FIG. 7.

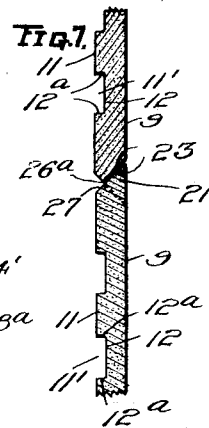
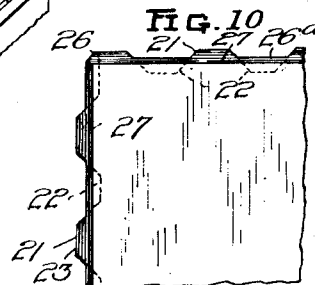
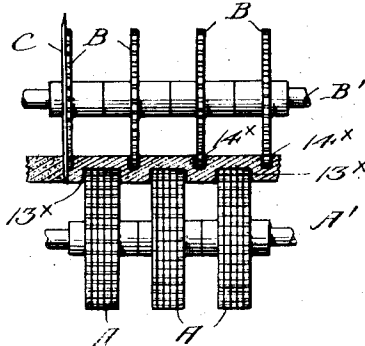


FIG. 13



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FIG. 12.

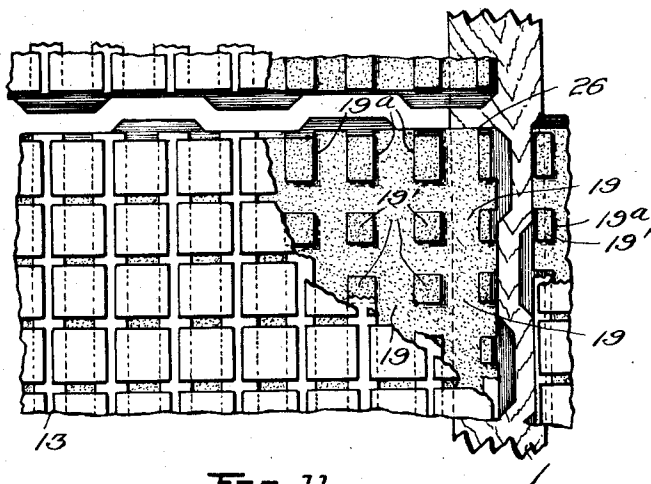


FIG. 11.

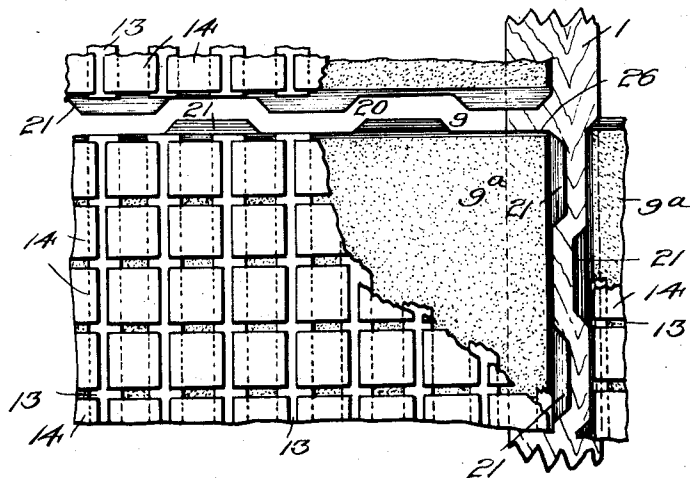
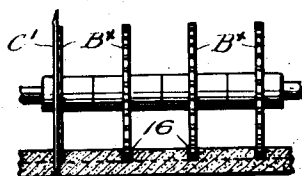


FIG. 14.



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1,964,473

WALL CONSTRUCTION

Earl W. Leshner, Lakewood, Ohio

Application August 6, 1929, Serial No. 383,799

13 Claims. (Cl. 20-4)

This invention relates to wall and ceiling constructions, more particularly to blocks, mats or sheets therefor adapted to serve as surfacing for walls or ceilings or as structural members or portions thereof applied directly to studding, ceiling beams and like elements; furthermore, when the blocks, mats or sheets embodying my invention are made of porous material, a large increase in surface area, per unit area of wall surface, results, and on account of the sound absorbing or trapping character of the material, such blocks, mats or sheets operate to absorb to a maximum extent sound or sound waves, prevents reverberations and echo and improves to a marked extent the acoustical properties of the room, auditorium and the like having its walls formed therewith.

One object of the invention is to provide an improved block, mat or sheet capable of use as a wall or ceiling, or as surfacing therefor.

Another object of the invention is to provide improved wall or ceiling blocks, each so constructed that the area exposed to sound or sound waves is increased several times as compared to the wall area covered by the blocks.

Another object of the invention is to provide improved blocks which lend themselves for use for wall or ceiling constructions or as liners between the inner wall or sheathing and the external covering or sheathing of a building, where heat insulation or air circulation or both are desired.

A further object of the invention is to provide an improved wall or ceiling block that is (a) formed of a material capable of absorbing sound waves and (b) constructed to expose a relatively large area, whereby increased efficiency results.

Other objects of the invention will be apparent to those skilled in the art to which my invention relates, from the following description taken in connection with the accompanying drawings, wherein

Fig. 1 is a fragmentary view showing a room having its ceiling and side walls formed of blocks embodying my invention.

Fig. 2 is a fragmentary view of a wall or ceiling showing one of the blocks in position (somewhat enlarged) and portions of adjacent blocks spaced therefrom to illustrate the interlocking elements between the blocks and the manner in which they are positioned or assembled when constructing the wall.

Fig. 3 is a section on the line 3-3 of Fig. 2.

Fig. 4 is a side view of the parts shown in Fig. 2.

Fig. 5 is a fragmentary view of a plurality of

base members in related position to illustrate the manner in which the blocks are assembled; the surface members of the blocks being omitted.

Fig. 6 is a rear view of certain of the parts shown in Fig. 5.

Fig. 7 is a fragmentary section on the line 7-7 of Fig. 5.

Fig. 8 is a perspective view of a portion of one of the surface members.

Fig. 9 is a perspective view of a portion of one of the surface members embodying a modified form of construction.

Fig. 10 is a fragmentary view of a base member embodying a modified form of construction.

Fig. 11 is a fragmentary view, similar to Fig. 2, but showing a block having a base member constructed as shown in Fig. 10.

Fig. 12 is a fragmentary view similar to Fig. 2, but embodying another modified form of construction.

Figs. 13 and 14 are fragmentary views illustrating the process of making the surface members.

In the use of the term wall or walls herein it is understood to comprehend the side walls and ceilings of rooms, auditoriums and halls or portions thereof, and in the use of the term blocks it is understood to refer to wall and ceiling units of any desired size, whether the same are used for and constitute the walls or ceiling of a room and the like or are used as surfacing for walls and ceilings, since the same may be applied to or upon the surfaces thereof for decorative purposes and acoustical purposes, either or both.

In some instances blocks embodying my invention may be used as above set forth for decorative purposes, in which event they may be made of any desired material, but by preference, such blocks are constructed of suitable sound absorbing material and on account of their improved structural characteristics they are peculiarly adapted for the walls and ceilings of rooms and the like where perfect acoustic conditions are desired. For the latter reason, I prefer to form the blocks embodying my invention from a fibrous material, such as "Celotex" boards or sheets consisting of a felted mass of bagasse fibers or "Insulite" boards or sheets formed from wood pulp. These and similar fibrous materials are relatively light in weight and so compacted in their manufactured form that they may be readily cut, sawed, drilled or gouged and also nailed.

Furthermore, their surfaces may be readily coated, when desired, with paint and other surfacing materials.

As is well known, boards or sheets made from

these materials have, throughout their mass, numerous air cells or interstices, which are capable of receiving sound waves, so that by gouging out portions of such boards according to my process I am enabled to expose to the sound waves a multiplicity of surfaces, per unit of area, upon or over which the walls of the cells or interstices have been broken down to the end that the sound waves may freely enter these cells and interstices and penetrate into and throughout the remaining mass of material.

In the manufacture of these materials into commercial form, they are made from wet pulp and squeezed or pressed into boards or sheets. As a result of this process, a film or skin is formed on their opposite faces so that the cells or interstices thereon are substantially closed, but in my form of construction and in carrying out my process a relatively small amount of these surfaces are utilized; on the other hand a relatively large area of the interior mass of these boards is exposed to the sound waves so that maximum absorption thereof results.

In the drawings, 1 indicates studding or uprights mounted on suitable flooring 2 or on beams 3 and connected at their upper ends by a horizontal member 4. The studding may be braced by cross members or diagonals (not shown). 5 indicates ceiling rafters carried by the horizontal member 4. 6 indicates a sheathing forming part of the external wall of the structure. The parts described illustrate one example of the structural elements forming a wall and ceiling construction. 7 indicates the side wall and 8 indicates the ceiling, each made up of blocks 8' embodying my invention and showing their application to or mounting directly upon the studding 1 and rafters 5. Where the wall and ceiling are complete, that is covered with plaster, beaver boards, Celotex boards, Insulite boards, wooden sheathing, sheet metal or other form of wall and ceiling construction, my blocks may be applied thereto with equal facility.

Each block 8' consists of a composite unit or section comprising a base member 9 and a surface member 10, each formed from fibrous material, such as above described, and having a length equal to the distance between centers of adjoining studding 1 and rafters 5. The base member 9 shown in Figs. 2, 3, 4, 5 and 6, consists of a basal portion 9a and a plurality of spaced strips 11, preferably disposed in parallel relation and extending from end to end of the basal portion, to form sound wave receiving or circulating channels 11', the bottom 12 and sides 12a of each of which provide exposed sound wave absorbing areas or surfaces. The strips 11 are preferably integrally connected with the basal portion 9a. The first step of my process consists in forming the base member 9. In carrying out this step, a board of fibrous material is fed relative to a plurality of spaced cutters or gouging devices (such as shown at A, Fig. 13) which remove or cut out the material from the board and form the channels 11'. While the fibrous material herein referred to may be molded to any desired shape, I prefer to gouge out the material since in this latter method the surfaces of the channels are not covered with a film or skin, which, in molding would result from contact with the mold walls, but are left or finished in a more or less rough state with the inherent air cells and interstices on these surfaces open.

Each surface member 10 comprises a plurality of superposed layers of spaced elements 13, 14,

those elements of one layer extending at an angle to those of the other layer, preferably at right angles, with the inner layer 13 extending at any angle, preferably at right angles, to the strips 11. As shown, the spaced elements 13 extend continuously from one side edge to the opposite side edge of the member; whereas the elements 14 are preferably cut away transversely, as will later appear. In this arrangement, (a) the side walls 13a of the elements 13, (b) the bottom or inner walls 14a of the elements 14 between the side walls 13a, (c) the upper surfaces 13b of the elements 13 between the elements 14, forming channels 14x, (d) the side walls 14b of the elements 14 and (e) the edge portions 13c of the elements 13 along the lateral sides of the base member form exposed sound wave absorbing areas or surfaces. Also, by preference, the elements 14, instead of being continuous from edge to edge of the member, are cut away along transverse lines midway between the side walls 13a to form transverse channels 16, the side walls 16a and bottom walls 16b of which provide additional or auxiliary sound wave absorbing areas or surfaces.

In addition to the areas already referred to, the outer faces of the elements 14 form sound wave absorbing areas.

By reason of the spaces or channels 14x between the elements 14, which channels extend at an angle to the channels (designated 13x) between the elements 13, sound waves pass into the latter channels; and as these channels 13x extend at an angle to the channels 11', the sound waves are free to pass into these latter channels. As the channels 13x and 11' extend from end to end of the block, the sound waves may circulate freely therethrough while being absorbed.

In the construction above described, certain of the areas are in opposed relation one to another and certain other of the areas are at right angles to each other. In this arrangement, the waves in passing through the openings between the elements 14 to the channels 13x between the elements 13 and to the channels 11' impact against and are deflected from one wall or area to another, so that their energy is taken up by such impact and deflection.

In my construction the inlet spaces leading to the channels 13x and 11' are relatively small so that danger of the waves emerging from the channels is greatly reduced.

In some instances I may modify the form of construction by omitting the sound absorbing areas 12, 12a. In this form of construction, the upper surface of the base member 9 is planular, as shown in Fig. 10 and the elements 13 and 14 are laid directly thereon, as shown in Fig. 11.

Where it is desired to increase the sound wave absorbing areas I may cut additional material out of the elements 14, preferably along lines 18, 18, as shown in Fig. 9, forming channels 18a between the resulting elements 14'. In this form of construction the side walls 14c of the elements 14' and the increase in exposed areas of the strips 13, as shown at 14d, provide auxiliary wave absorbing areas.

In Fig. 9 I have shown but one channel 18a in each element 14, but it will be understood that additional channels may be provided where increase wave absorbing areas are deemed desirable. Increased sound wave absorbing areas may also be provided by cutting away those portions

of the strips 11 disposed between the elements 13, as shown at 19 in Fig. 12, the sides 19a of the resulting lands or portions 19' serving as supplemental wave absorbing areas; and the lands 19' serving to support the elements 13, being secured thereto as hereinafter set forth.

When desired, surface members such as shown in Fig. 9 may be assembled with base members of the construction shown in Fig. 12 to form composite blocks.

In forming the base member of the form shown in Fig. 12, the board may be fed relative to a series of cutters as already described to form the channels 11' and then turned 90° and fed relative to the cutters to cut away spaced portions of the strips.

To construct the surface members 10, I provide a machine (see Fig. 13) having two sets of cutters A, B, on parallel shafts A', B', with the cutters in alternate arrangement and the shafts so spaced that the peripheries of the cutters extend to or intersect a plane disposed midway between the opposite sides or faces of the boards to be cut and shaped. In this machine, a portion only of which is shown, the sets of cutters extend from edge to edge of the board and the outer cutters B of the upper set are provided with knives C which sever the section and trim its side edges. By preference, the cutters A are relatively wide to provide wide channels between the elements 13. The next step in my process consists in feeding the board stock relative to the cutters A, B, such operation being shown in Fig. 13. In carrying out this step of my process, the channels 13x are formed in one face of the board stock and channels 14x are formed in the other face thereof. Next, I turn the board stock a distance of 90° and feed it relative to a set of cutters such as the set Bx (Fig. 14), bringing that face of the board having the channels 14x into engagement with the cutters; this operation forming the channels 16 and the knives C' on the outer cutters serving to trim the side edges of the section. In carrying out this step the cutters and the supporting surface for the stock are so spaced that the cutters cut through that portion of the stock above the channels 13x, that is, these cutters intersect the channels 13x, so as to provide openings therein.

In carrying out these last described steps, the cutters and the knives C, C' are so arranged that the board stock will be cut into sections of the desired length and width, thereby making it unnecessary to subject the stock to an additional cutting or trimming operation; furthermore, both operations are effected upon the same portion of the stock so that the resulting spaced elements 13, 14, are integral. When the surface member 10 is to be formed with channels 18a, it is fed to a set of cutters similar to the cutters B in the desired spaced relation.

Next, the base member 9 and surface member 10 are assembled and secured together, to form a composite block 8'. To secure the members together I use a suitable glue or paste, coating the same on those portions of the strips 11 and elements 13 that contact face to face and if desired pressure may be applied to the members to insure their adhesion.

In addition to the steps already described I may perform an auxiliary step on each member in forming or shaping it.

In forming and shaping the base member 9 I provide it along its side edges with complementary interlocking elements 20, these elements

being provided by subjecting each side edge to a series of cutters of the desired shape in cross section. The elements 20 on each side edge consist of alternately arranged projections 21 and recesses 22, each projection 21 on one side edge being aligned with a recess on the opposite side edge, so that when two members are related the projections 21 on one member interlock with the recesses in the other member. As shown, each of the elements 21, 22, has a beveled face 23 extending outwardly and inwardly, respectively, relative to corresponding end edges 24 on all of the side edges of the member; such bevel faces extending from the face of the member adjacent to or which terminates along the edges 24 to the opposite face of the member. By such arrangement the base members 9 are of uniform construction and interchangeable, and thus permit either longitudinal side edge to become the upper or lower side edge in positioning it, and where the composite blocks 8' are of rectangular shape, and where they are of square shape, as shown, they may be positioned without respect to any particular side edge. By preference, the sides of the projections 21 diverge and the sides of the recesses 22 converge relative to the edges 24 and the outer wall of that recess on each side edge which terminates at one end of such edge, is cut away as shown at 26, this form of construction permitting the blocks, after the first row is assembled, to be assembled, row after row, each block being moved into final position in the direction of the arrow x (Fig. 5) and providing an interlocking joint on all sides of each block, with the result that there is a uniform thickness of material over the entire wall area and the joints between the blocks are substantially closed. This interlocking joint has an additional advantage where the blocks are secured to spaced studding 1 or rafters 5, as shown in Figs. 1, 2, 3, 4, 11 and 12. In this form of construction the blocks are unsupported between the structural elements 1 and 5. By interlocking the side edges of the blocks together (that is, those side edges which extend at right angles to the studding and rafters), I prevent warping or sagging of the sections one relative to another. This form of joint construction is also advantageous where the base members 9 are to be used as sheathing units or plaster boarding, since the joint between the members on their outer faces is on a straight line along the edge 24, and the adjacent marginal portions of the members may be cut away as shown at 27 (Figs. 7 and 10) to form a keying groove. However, when the base members are to be used for this purpose, the beveled faces start from a line 26a, which is the inner edge of the cut-away 27.

In forming the surface member 10, end cutters B' of half thickness of the intermediate cutters B are provided at the inner side of the severing or trimming cutters C, so that in the resulting product the elements 14 along their outer sides are cut away inwardly from the ends and sides of the elements 13 a distance equal to one-half the width of the spaces or channels between them. As a result of this construction, when the blocks 8' are assembled, the ends and sides of the elements 13 abut and position the related elements 14 on adjoining blocks in the same spaced relation as the elements 14 occupy on each block. Accordingly, when the blocks 8' are assembled or laid, as shown in Fig. 1, the wall is uniform in construction and appearance throughout.

In laying the blocks, it is only necessary to nail the projections 21 along one side edge, to the studding 1, as shown at 28, since the interlocking elements between it and the side edge of the next block to be engaged therewith will secure the latter to the studding.

From the foregoing description it will be apparent that my improved block increases to a substantial extent the area that is exposed to the waves. For example, it may be assumed that the block 8' shown in Fig. 2 is 16 inches square, thus covering a wall area of 256 square inches. In the form of construction shown in this view, each channel 11' has a depth of $\frac{1}{4}$ inch and a width of $\frac{5}{8}$ inch and there are eleven channels in each base member; accordingly the areas 12—12a—12a, of these channels have a total area of 198 square inches. The elements 13 are $\frac{1}{4}$ inch thick and the spaces between them have a width of $\frac{5}{8}$ inch and the elements 14 are $1\frac{1}{4}$ inches square; accordingly the areas 13a—14a have a total area of $208\frac{1}{2}$ square inches. The elements 14 are $\frac{1}{4}$ inch thick and are spaced $\frac{1}{8}$ inch; and the elements 13 are $\frac{3}{4}$ inch wide; accordingly the areas 13b—14a and 16a—16a—16b, have a total area of $217\frac{1}{4}$ square inches. The elements 14 are $1\frac{1}{4}$ inches square and have a surface area of 225 square inches. These combined areas when added together give a total exposed area of $848\frac{3}{4}$ square inches for each block.

To those skilled in the art to which my invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope thereof. My disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. A combined acoustic and surfacing block formed of fibrous material for walls of rooms and the like having parallel channels formed in its opposite faces, those on one face being disposed at an angle to those on the other face, and each channel on one face intersecting or merging at its inner portion into the channel on the other face.

2. A wall member formed of fibrous material for walls of rooms and the like having a series of parallel channels formed in its rear face, a series of parallel channels formed in its front face, each parallel to and disposed in a plane intermediate the planes of adjoining channels in the rear face, and a series of channels formed in the front face extending at an angle to the other channels formed in said face and intersecting or merging into the channels on the rear face.

3. A composite wall surfacing block formed of fibrous material for rooms and the like comprising a basal member having a plurality of spaced strips extending from one side edge of the block to the other side edge thereof and forming channels between them and a plurality of layers of spaced elements in superposed relation on said strips, the spaced elements of each layer extending at an angle to the spaced elements of the next adjoining layer, the spaces between the elements of each layer merging into the spaces between the elements of the next adjoining layer of elements.

4. A block for walls formed from fibrous material and comprising a base member provided with a plurality of spaced strips extending in parallel relation from one side edge to the op-

posite side edge and forming channels between them, and a surface member consisting of a plurality of inner spaced elements supported on said strips and extending at right angles thereto from one remaining side edge to the side edge opposite thereto and a plurality of outer spaced elements resting on the first mentioned spaced elements and bridging the spaces between them.

5. A block for walls formed from fibrous material and comprising a base member provided with a plurality of spaced strips extending in parallel relation from one side edge to the opposite side edge and forming channels between them, and a surface member consisting of a plurality of inner spaced elements supported on said strips and extending at right angles thereto from one remaining side edge to the side edge opposite thereto and a plurality of outer spaced elements resting on the first mentioned spaced elements and bridging the spaces between them, the last mentioned spaced elements being formed with a series of channels above and extending longitudinally of said first mentioned spaced elements.

6. A block for walls formed from fibrous material and comprising a base member provided with a plurality of spaced strips extending in parallel relation from one side edge to the opposite side edge and forming channels between them, and a surface member consisting of a plurality of inner spaced elements supported on said strips and extending at right angles thereto from one remaining side edge to the side edge opposite thereto and a plurality of outer spaced elements resting on the first mentioned spaced elements and bridging the spaces between them, the last mentioned spaced elements being formed with series of channels, one series extending longitudinally of said first mentioned spaced elements and the other series extending at right angles thereto and merging with the spaces between them.

7. A block as claimed in claim 4 in which the spaced strips are cut away throughout their portions between the inner spaced elements.

8. A composite wall block comprising a base member provided with a series of channels extending from side edge to side edge thereof, the bottoms and sides of the channels forming sound wave absorbing areas, and a surface member having a plurality of parallel elements extending at right angles to said channels and supported on those portions of said base member between the channels and a plurality of elements each supported on adjoining parallel elements and bridging the space between them, the last side elements being in spaced relation one to another, the side walls of said parallel elements and under surfaces of the last mentioned elements forming sound wave absorbing areas.

9. A unitary wall block formed of fibrous material for rooms and the like comprising a basal member and a member superposed thereon and having parallel channels formed in its opposite faces, those on one face being disposed at an angle to those on its other face and each channel on one face intersecting or merging at its inner portion into the channel on the other face.

10. An acoustic covering for a wall or the like comprising a panel member having on its exposed surface a plurality of grooves and having on its undersurface a plurality of grooves crossing the first mentioned grooves with said grooves cutting into each other where they cross to form apertures.

11. An acoustic panel comprising a panel member with a plurality of grooves on one side and a plurality of grooves on its opposite side extending angularly as regards the first mentioned grooves whereby to cross the same, with said grooves forming apertures through said panel member at the points of crossing.

12. An acoustic panel comprising a member with a plurality of substantially parallel grooves on its outer surface, a plurality of substantially parallel grooves on its under surface extending at right angles to the grooves on the outer surface, said grooves having a depth so as to cut into each other at the points of crossing so as to form apertures.

13. A tile or the like for covering a wall or the like for acoustic purposes comprising a fiber board inner member, spacer strips on the outer surface thereof, a fiber board outer member over the spacer strips with said members and spacer strips forming a chamber, said outer fiber board member having a multiplicity of grooves on its outer surface and a multiplicity of grooves on its inner surface extending in a direction whereby to cross the grooves on its outer surface, said grooves having such respective depth as to cut into each other at the points of crossing to form apertures through the outer fiber board which communicates into said chamber.

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