Jan. 8, 1935. J. OEHRLEIN ET AL 1,987,537

CEILING CONSTRUCTION

Filed June 11, 1932 2 Sheets-Sheet 1

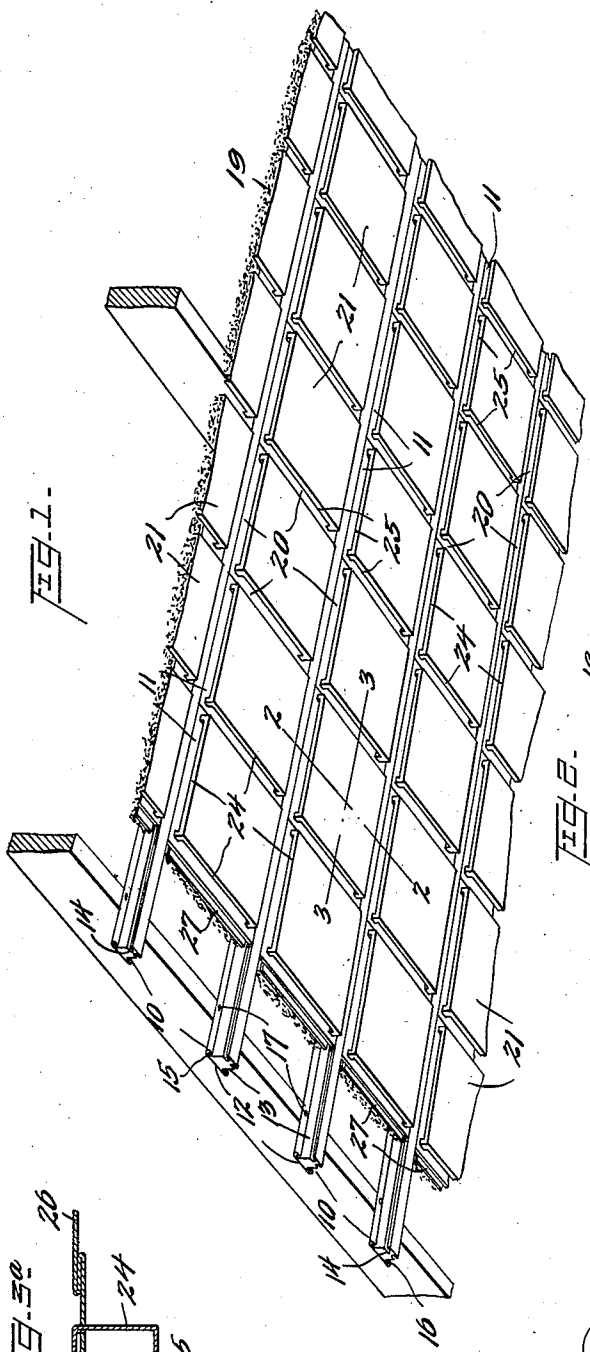


FIG. 1.

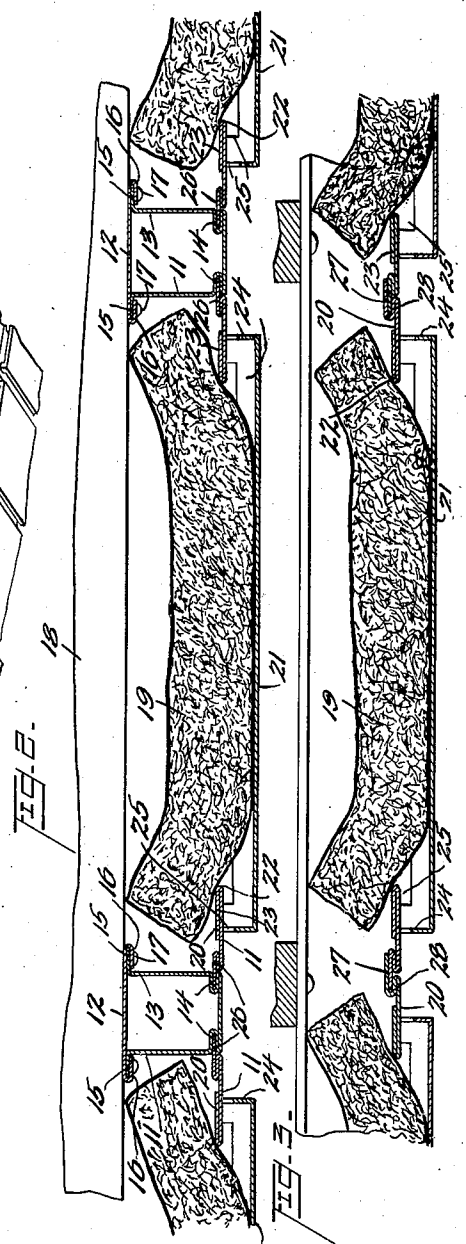


FIG. 2.

FIG. 3a.

FIG. 3.

Inventors
Julius Oehrlein and
Julius Oehrlein

By Watson, Cole, Morse & Grindle
Attorneys

Jan. 8, 1935. J. OEHRLEIN ET AL 1,987,537

CEILING CONSTRUCTION

Filed June 11, 1932 2 Sheets-Sheet 2

FIG. 4.

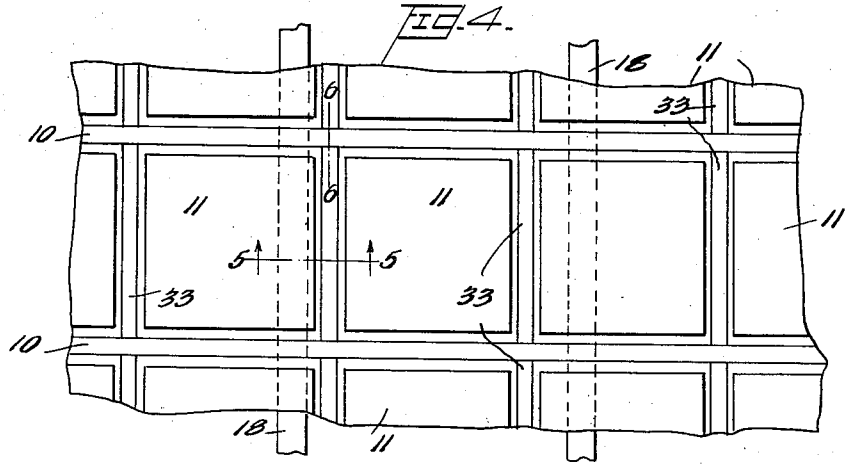


FIG. 5.

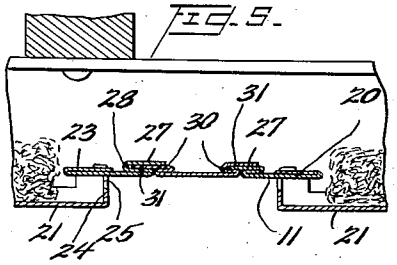


FIG. 6.

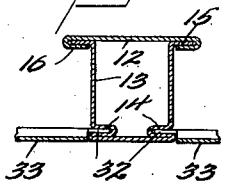


FIG. 7.

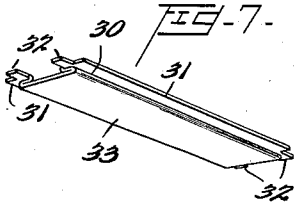


FIG. 8.

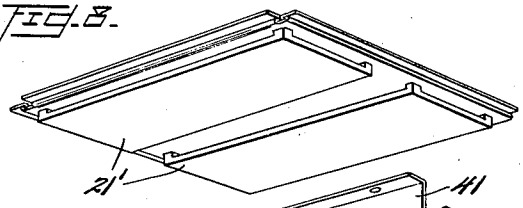


FIG. 9.

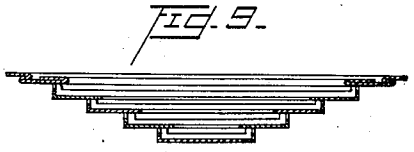


FIG. 10.

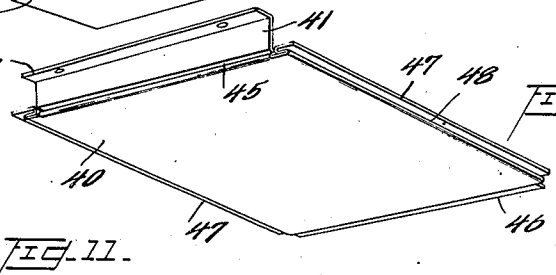
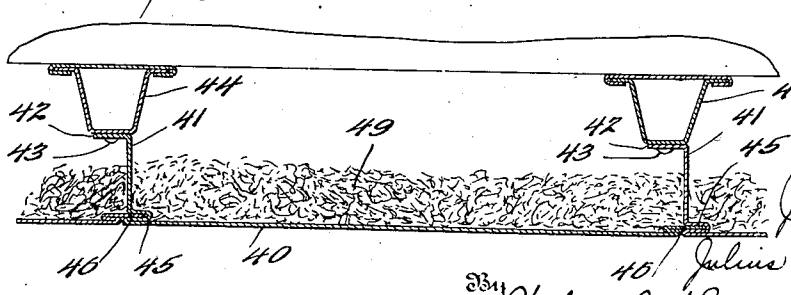


FIG. 11.



Inventors

Julius Oed and

Julius Oehrlein

By Watson, Coit, Morse + Grindle

Attorneys

Patented Jan. 8, 1935

1,987,537

UNITED STATES PATENT OFFICE

1,987,537

CEILING CONSTRUCTION

Julius Oehrlein, Westchester County, and Julius Oed, Bronx, N. Y., assignors of two-thirds to Julius Oehrlein, Inc., New York, N. Y., a corporation of New York, and one-third to said Julius Oed

Application June 11, 1932, Serial No. 616,690

3 Claims. (Cl. 189—88)

The present invention relates to sound absorbing building structures and particularly to improvements in structures for lining or covering the ceilings and walls of rooms, stores, offices, large halls, auditoriums, theatres, etc.

Primarily the invention is concerned with the provision of an improved type of ceiling, or wall covering construction, of the built-up panel type by the use of which the walls or ceiling, but particularly the overhead structure or ceiling of a room, may be quickly, easily, and inexpensively covered, so as to be more attractive in appearance, and which at the same time has sound absorbing properties so that the acoustics of the room to which the newly suggested covering is applied are greatly improved. Sound deadening structures for room lining purposes have heretofore been designed or suggested, such as wall board of fibrous structure, but, generally speaking, the structures of this type which have actually been put into use have not been attractive in appearance but have, on the other hand, caused the walls and ceilings to appear more or less unfinished and, on account of the roughness of their finish, are more or less dirt catchers. In accordance with the present invention, a wall or ceiling covering of the built-up panel type is provided which is at the same time highly ornamental and thoroughly efficient in absorbing sound and which can be painted or sprayed without decreasing its efficiency in absorbing sound.

A further and important object of the invention, however, is to provide a room lining structure which is more attractive in appearance and more fireproof than the ordinary and usual wall and ceiling lining constructions heretofore employed, whether the improved lining structure has or has not the capacity to absorb or dampen sound vibrations.

Due to the materials used in modern construction, such as steel, tile, terrazzo floors, and hard smooth plaster surfaces, the majority of buildings are poorly equipped from an acoustic standpoint. The acoustic conditions in such rooms, offices, etc., can be corrected efficiently, quickly, and economically by the installation of a type of ceiling constructed in accordance with the present invention. The improved ceiling is attractive in appearance and presents a smooth painted surface to the eye. It can be washed, sprayed, and repainted innumerable times without lessening its acoustical efficiency.

Many methods of acoustical correction employ perforated surfaces, such as fibrous board or felt substances covered with porous cloth. This method is unattractive and, due to the exposed porous surface, is a dust catcher, needing frequent and expensive cleaning, and cannot be repainted without losing some of its effectiveness due to the closing of the surface pores by the paint. Another advantage of the smooth painted or baked enamel surfaces of the improved ceiling is that they have a maximum efficiency for reflecting light, there being no exposed perforated or porous material to absorb the light.

Several forms of ceilings embodying my improvements will be described hereinafter, which forms are illustrated in the accompanying drawings, but it will be understood by one skilled in the art that the various embodiments set forth are presented by way of example only and that, without departure from the spirit and scope of the invention, the design and arrangement of its component elements may be considerably modified in adapting the same to different conditions and varying types of supporting structures.

In the drawings:

Figure 1 is a perspective view of a portion of a ceiling construction embodying the invention, viewed from below;

Figure 2 is a section on line 2—2 of Figure 1;

Figure 3 is a section on line 3—3 of Figure 1;

Figure 3ª is a section through a portion of one of the ceiling panels;

Figure 4 is a view, looking upwardly, of a portion of a ceiling construction of somewhat different type;

Figure 5 is a section on line 5—5 of Figure 4;

Figure 6 is a section on line 6—6 of Figure 4;

Figure 7 is a perspective view of one of the dividing strips shown in Figures 4, 5, and 6;

Figure 8 is a perspective view of a sound deadening panel having a construction somewhat different from that of the panels shown in Figures 1, 2, and 3;

Figure 9 is a sectional view of a still further form of panel;

Figure 10 is a similar view of a panel of somewhat different type, not designed or intended for use in sound deadening constructions; and

Figure 11 is a section through a portion of a ceiling structure showing the manner of assembling panels of the type illustrated in Figure 10.

The invention is particularly adapted for use in covering overhead structures and to give the ceilings of buildings of all types acoustic linings of ornamental and finished appearance. It is illustrated and will be described as applying particularly to ceilings, but it will be understood

that, at least in certain of its aspects, it is well adapted for use in covering walls.

The embodiment of the invention illustrated in Figures 1, 2, and 3 of the drawings comprises essentially a plurality of parallel supporting rails or strips 10 and a plurality of panels 11 arranged in rows between such strips. The strips 10 are preferably hollow sheet metal structures substantially rectangular in cross-section. While these supporting strips may be fabricated in various ways, the form shown is entirely satisfactory for general purposes, each strip comprising two members rigidly secured together, a base member 12 and a channel-like member 13, both members being preferably formed of sheet metal but the base 12 being of somewhat heavier gauge metal than that used in the fabrication of the channel member.

The side walls of channel members 13 are exteriorly grooved adjacent their lower edges, as at 14, 14, to receive and support the edges of adjacent panels, and the upper margins of these side walls are outwardly turned to form flanges 15, 15 which are clamped, respectively, between the lower surface of the base and the flanges 16, 16, formed by bending the lateral margins of the base through angles of substantially 180°. Nails, bolts, or screws 17 may be used to secure the completed strips 10 to the overhead structure of a room, such nails, bolts, or screws being passed through the side flanges of the strips and into overhead beams such as indicated at 18, which beams may be of wood, concrete, or steel. Other means may, of course, be employed to secure the strips 10 to the overhead structure, the invention being nowise limited in this respect and it being intended that the improved ceiling may be attached to all types of overhead structures, whatever the details of construction may be and whatever the materials. Obviously the strips 10 may be readily affixed to a plastered ceiling.

The details of construction of the panels may be clearly seen from an inspection of Figures 2 and 3. Each panel comprises a generally flat structure preferably formed of sheet metal and having a lower face rendered ornamental by painting, the upper face or surface of the panel being adapted to support a body, indicated at 19, of fibrous material such as mineral wool or wood fiber preferably having both fire resisting and sound absorbing properties. The panel selected for illustration in Figures 1, 2, and 3 is formed of two separate sheet metal members rigidly secured together, a back piece or member 20 and a front piece or member 21. The back piece is rectangular in outline, in fact square in the embodiment illustrated, but has its central portion entirely cut away, leaving a large rectangular opening, the edge of which is indicated at 22. In forming this opening, marginal portions of the metallic member 20 lying along the edges of the opening are turned back, as indicated at 23, these portions or backwardly turned flanges constituting stiffening elements.

Member 21 is also rectangular, is disposed parallel to the back piece 20 of the panel, and is larger than the opening 22 formed in member 20, the margins of member 21 projecting outwardly beyond the edges 22 of the opening in member 20, as clearly shown in Figures 2 and 3. The margins 24 of member 21 are turned at right angles to the body of this member to form flanges. These flanges are centrally cut away along their upper edges as at 25, 25, but the ends of each flange are preferably left intact so that they extend above edges 25 and may be used as means for securing member 21 to member 20. Thus these corner posts, so to speak, may be welded to member 20 or may be passed through apertures formed in member 20 and headed or clinched over if desired, as shown in Figure 3ª. In effect, therefore, members 20 and 21 comprise a single rigid and generally flat panel but which has a central portion which lies forwardly of and is spaced from the back plate. This central portion 21 comprises a complete closure for the aperture in the back plate except in that elongated slots or openings are left between the edges 25 of member 21 and the adjacent faces of the back plate 20. In the panel shown there are four of these slots, but each slot may be broken up into smaller openings if desired.

Two parallel edges of each panel are provided with tongues 26 adapted to extend into the mutually facing grooves 14 of two adjacent supporting strips 10, and the other two parallel edges, disposed at right angles thereto, are formed as shown in Figure 3, one such edge having a groove, indicated at 28, formed by crimping or bending the edge of the plate as shown in Figure 3, and the other edge having a tongue 27 formed therein and which projects within the mating groove 28 formed in the adjacent edge of the neighboring panel. By forming these edges of the panels in the manner just described, it is possible, in assembling the ceiling structure, to interlock the meeting edges of the panels, the tongue of one panel being received in the groove provided for that purpose in the next adjacent panel. In this manner each row of panels comprises, when the ceiling structure is completed, in effect, a continuous sheet, there being no apertures between panels, and the structure being thereby made more rigid, free from vibration and rattling, and impervious to vertical drafts of air.

The panels just described are particularly designed and intended to support upon their upper surfaces layers of sound deadening material, fireproofing material, or materials which possess both sound deadening and fireproofing properties, such, for instance, as mineral wool. Such material is deposited in the form of a body having desired area and requisite depth. It is, of course, mainly supported by the lower plate 21 and substantially fills this plate as well as overlying plate 20. It may be placed in position loosely packed in sacks or bags of loosely woven material such as muslin, as shown in the drawings.

The ceiling structure just described may be erected in various ways. One strip 10 is, in any instance, however, first placed in position, preferably along and parallel to the side walls of the room. The first row of panels may then be positioned by inserting the tongues 26 of these panels in groove 14 of the supporting strip and causing the meeting edges of the the panels to interlock. A second supporting strip may then be positioned, the aligned free edges of the completed panel row being inserted in the appropriate groove 14 of the second strip prior to the time when the strip is secured to the overhead supporting structure. A second row of panels may then be placed in position, followed by a third supporting strip, and so on across the room. Under some conditions, all of the supporting strips may first be positioned and the panels themselves thereafter properly positioned by sliding them endwise of the supporting strips, the supporting strips serving as guides and trackways for the panels as they move into final position.

The exposed faces of the panels may be suitably decorated as by painting or enameling, either before or after they are finally positioned, and the completed ceiling is highly ornamental in appearance. The improved ceiling structure possesses valuable sound deadening properties, the sound waves resulting from disturbances in the room being largely damped out by reason of the fact that they will pass, or large portions of them will pass, through the slots formed in flanges 24 of the bottom plates 21 and thence into the mineral wool or other sound deadening backing. The slots in members 24 may, of course, vary in area to suit conditions, or, as has previously been pointed out, these slots may be dispensed with and openings of other shapes and sizes formed in flanges 24. Being composed of metal and preferably with the addition of fireproofing material such as mineral wool, it is furthermore fireproof in character and will offer a very considerable resistance to the passage of flame, thus protecting the overhead structure from which the ceiling is supported.

In the embodiment disclosed in Figures 4, 5, 6, and 7, provision is made for the addition to the ceiling shown in Figures 1, 2, and 3 of cross strips or dividing strips intermediate the panels and bridging the space between adjacent supporting strips or rails 10. One of these strips is shown in perspective in Figure 7 and is seen to comprise an elongated member having along one edge a panel engaging groove 30 and along the opposite edge a tongue 31, together with axial projections 32 adapted to enter the grooves formed in members 10. The manner of interlocking the edges of the dividing strips shown with the edges of adjacent panels is shown in section in Figure 5. In this figure the projecting tongue 31 of the dividing strip is received in groove 28 of one adjacent panel, and the groove 30 of the dividing strip receives the tongue 27 of the other adjacent panel, the dividing strip being thus interlocked with the panels on both sides. In Figure 4 the dividing strips are indicated at 33, and from this view it may be seen that the effect of the dividing strips in the ceiling is to lead the observer to believe that the supporting framework of the panels comprises two systems of supporting beams or rails which are disposed at right angles to each other. By coloring the dividing strips similarly to the longitudinal supporting strips 10 and by differently coloring the panels, a very attractive effect may be obtained.

In Figure 8 a panel having two lower or front plates instead of a single front plate is disclosed, these front plates being indicated at 21'. If desired, the panels may be formed with three or more of these front plates, each covering a slightly smaller aperture formed in the main or back plate. By increasing the number of front plates, the total area of the gaps or slots provided to permit the penetration of sound waves into the space above or in rear of the panel may be increased as desired. This is of great advantage in designing a ceiling particularly intended to absorb sounds in a room of given size or where machinery of peculiar nature is located or activities of certain types are carried on.

A still greater total area of available openings or apertures for the passage of sound waves, per unit of area of ceiling, may be had by providing each panel back plate with a plurality of spaced front plates, as shown in section in Figure 9. In this case there are four front plates of different sizes, the smallest being lowermost and covering a central aperture formed in the plate next above, and this latter plate covering an aperture in the next superposed plate, and so on, slots, gaps, or openings being left between the edges of each plate and the surface of the plate above. The several plates support a relatively large body of mineral wool or the like and are very efficient in deadening sounds. Panels of this type are also quite ornamental in appearance when applied to a ceiling structure and may be used to create designs or figures in the ceiling structure by utilizing a number of them in conjunction with a number of panels of other types, for instance, panels of the type shown in Figures 1, 2, and 3.

While the acoustic panels thus described are preferably formed in two or more portions rigidly secured together, the invention is not limited to any particular panel construction or method of making the same. Thus the panels may be formed of one piece by a suitable pressing operation wherever this may be found possible or, should the panels be molded of some material other than metal, can also be made in one piece. Within the spirit and intent of the invention, numerous expedients can be resorted to in effecting the speedy manufacture of the individual panels at low cost.

The panel illustrated in perspective in Figure 10 is not primarily intended for sound absorbing purposes but may be employed where an inexpensive fireproofing or heat insulating ceiling is desired. Each panel 40 is provided with an upturned flange 41, which flange in turn terminates in a lateral flange 42 which may be secured, as by screws 43, to a longitudinal metallic strip 44 of slightly different type from that form of supporting strip shown in the previous forms of the invention described. The lower edge of flange 41 is grooved as at 45, and the parallel remote edge of the panel is provided with a tongue 46. The lateral edges are provided with tongues 47 and grooves, one of which is indicated at 48.

In erecting a ceiling made up of panels such as that just described, the supporting members 44 are first erected and thereafter the panels applied individually, the operator preferably working transversely of the room and inserting each tongue 46 into the groove 45 of the panel just previously positioned. In this manner a ceiling of great simplicity may be quickly erected. The panels need not be applied in any definite sequence, but it will be obvious that, inasmuch as each panel is to be locked to adjacent panels along its lateral edges as well as along the edges which run parallel to the supporting strips 44, it will be most convenient to proceed to add panels in such manner that each may be simultaneously fitted to two adjacent panels by a diagonal movement of the panel into contact with the exposed edges of two previously erected panels. A body of some material such as mineral wool may be placed upon the upper surface of each panel as it is finally positioned, as indicated at 49. It is obvious, of course, that the panels shown in Figures 10 and 11 may be provided with front plates, apertures, and sound deadening backings if desired, that is, may be converted into acoustic panels. In other words, the acoustic panels shown in Figures 1 to 9 of the drawings may be affixed to a ceiling by the specific means disclosed in Figures 10 and 11. Still other means for attaching acoustic panels of the type described to the overhead structure of a room may be employed if desired.

The panels need not be rectangular in shape

but may be round or may have irregular outlines. For large ceilings the panels may be in the form of strips of considerable length, which strips may be fabricated and assembled at relatively low cost. By using larger units in ceiling construction, the time required for assembly may, of course, be minimized. To give a room provided with such a ceiling a finished appearance, suitable moldings or cornices may be employed to cover the joints between the edges of the ceiling and the walls of the room. Where the acoustic panels are employed to line or cover the side walls of a room or where the ceiling is inclined, the sound absorbing or deadening material is preferably confined by any suitable means to prevent sliding or displacement relatively to the panels.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:—

1. A panel for use with a body of sound absorbing material as a member of a sound absorbing lining for a room, comprising a generally flat sheet having a portion cut away, a second sheet disposed parallel thereto and so as to cover the aperture formed in the first sheet, and means connecting said sheets, said means being discontinuous and leaving openings between the margins of the second sheet and the face of the first sheet.

2. A panel for use with a body of sound deadening material as a member of a sound absorbing lining for a room, comprising a substantially flat base plate having its central portion cut away, a plurality of substantially flat members disposed parallel thereto and progressively decreasing in size, the outermost member being imperforate and the intermediate members also having their central portions cut away, and means rigidly securing said members to said base plate with the edge of each plate spaced from the body of the next larger plate.

3. A ceiling panel for use with a body of sound absorbing material as a member of a sound absorbing ceiling of a room, said panel comprising a flat member, the margins of which may be attached to a supporting structure, said member having a relatively large central aperture formed therein for the passage of sound waves, and means positioned upon that side of the member which faces the room interior when the panel is in use which comprises a complete cover for said aperture, said means being imperforate in a direction normal to the said member, and having a plurality of perforations, the axes of which are substantially parallel to said member, through which sound waves may pass to the central aperture in said member.

JULIUS OEHRLEIN.
JULIUS OED.