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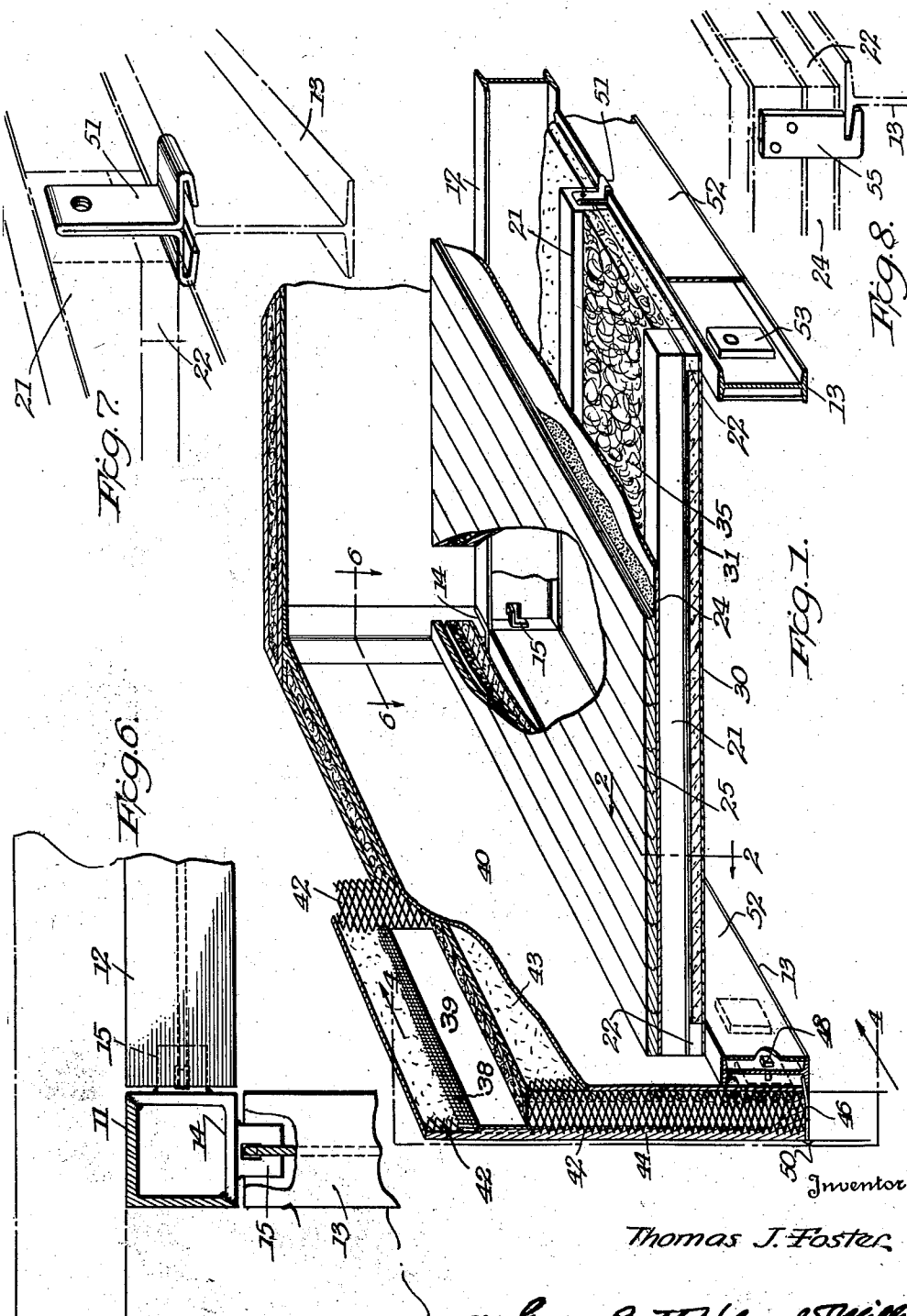
T. J. FOSTER

2,069,755

BUILDING CONSTRUCTION

Filed Oct. 9, 1935

2 Sheets-Sheet 1



by *Ernest B. Bledsoe & Miller*
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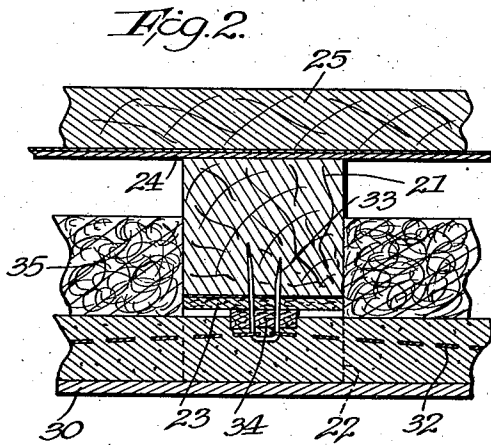
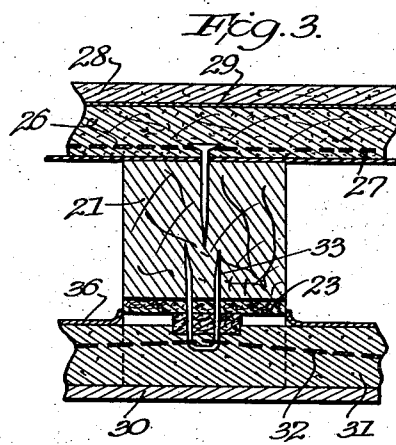
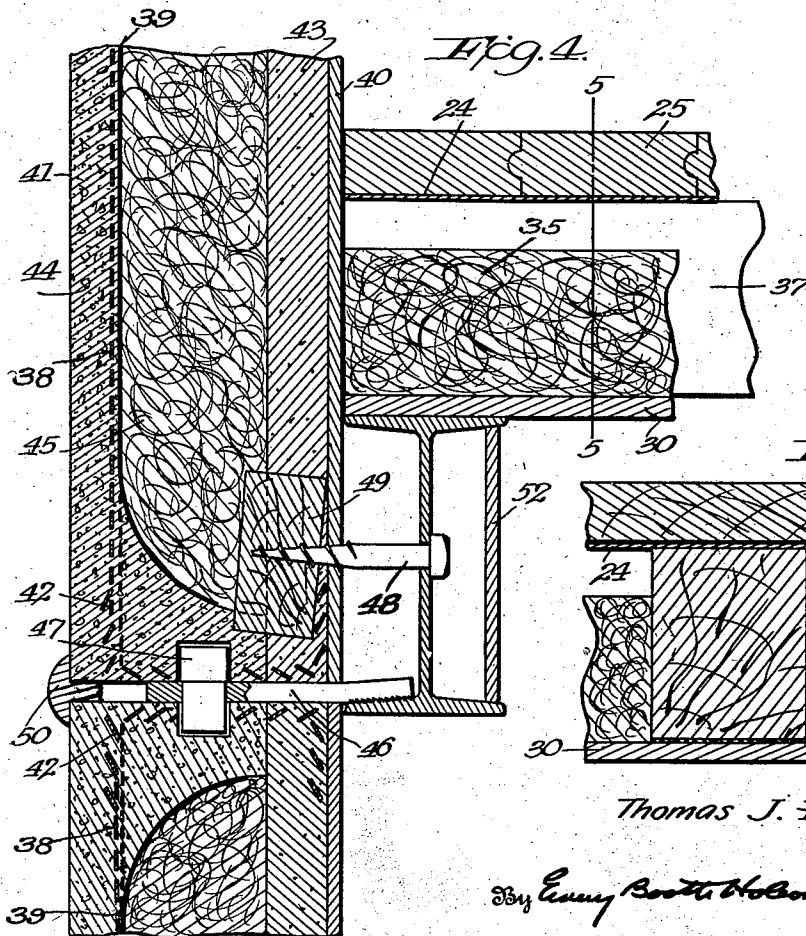
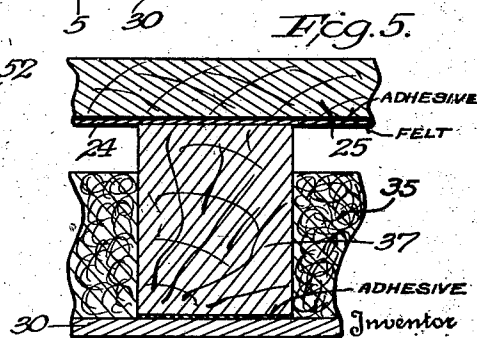
T. J. FOSTER

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BUILDING CONSTRUCTION

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,069,755

BUILDING CONSTRUCTION

Thomas J. Foster, Ridgewood, N. J.

Application October 9, 1935, Serial No. 44,264

28 Claims. (Cl. 72—1)

This invention relates to low cost heat and sound proof buildings of fire-resisting materials constructed of prefabricated sections, such as the slabs and panels made in accordance with my Patents Nos. 1,825,346, 1,964,728, 1,989,798 and 2,001,605, and aims to improve the construction thereof and to provide a rigid skeleton frame and improved connections between the floor and wall sections and frame for such buildings.

An important object of the invention is to lessen the cost of constructing and erecting buildings of the fire-resisting type without sacrificing strength, watertightness and long serviceability.

The invention also aims to improve the wall construction by providing adequate and uniform weatherproofing and heat and sound insulation throughout the entire area while permitting use of such exterior and interior finish as may be desired.

The invention further aims to improve the floor construction by lightening the weight and increasing the sound and heat insulating properties as compared with existing practice.

Further aims and advantages of the invention appear in connection with the description of the illustrative embodiments shown in the accompanying drawings, wherein

Fig. 1 is a perspective view of the interior corner of a building partly in cross-section, depicting the construction of the steel frame members, floor and wall panels;

Fig. 2 is a vertical cross-section of a portion of the floor construction shown in Fig. 1 on the line 2—2 looking in the direction of the arrows;

Fig. 3 is a view similar to Fig. 2, showing a modified form of the invention.

Fig. 4 is a vertical cross section through an outer wall panel on the line 4—4 in Fig. 1, illustrating another form of the floor panel;

Fig. 5 is a vertical cross section of the floor shown in Fig. 4, on the line 5—5 therein;

Fig. 6 is a horizontal cross section on the line 6—6 in Fig. 1, showing the steel frame before assembling the panels;

Fig. 7 is a perspective view of a securing clip, showing in dotted lines the beam and slab which it connects; and

Fig. 8 is a similar view of another form of securing clip suitable for connecting the ends of the slabs to the supporting beams.

For residences, schools, apartments, hospitals and other lightly loaded types of buildings, the skeleton frame is advantageously constructed with steel columns, girders and beams for supporting the floors and walls and resisting wind

pressure, wholly prefabricated from channels, angles and light weight I-beams connected by interengaging parts formed integral therewith or welded thereto, as described in my copending application Serial No. 723,985, thereby eliminating any welding or riveting when the frame is erected, although a riveted or welded steel frame may be used if desired.

The frame construction illustrated comprises columns 11 supporting girders 12 and floor beams 13 arranged in parallel bays, the beams 13 being spaced about four feet apart and extending from girder to girder with their top flanges level with the top flanges of the girders. Preferably the corner columns are angles with the outer faces of the legs facing outward, and provided at each floor level with an interior angle 14 welded thereto for supporting the ends of the beams and girders. The edges of the columns and the angles 14 are welded edge to edge, as shown in Figs. 1 and 6, and the angle brackets 15 which support the beams and girders are welded to the adjacent faces of the column angles. The ends of the webs of the girders and beams are notched to provide hook shaped supports for engaging over the brackets 15 and interlocking with openings therein to hold them securely in place. Such columns, girders and beams may be completely fabricated in advance of reaching the job, and readily assembled and secured in place without special tools or skilled workers such as welders and riveters, thereby saving much of the expense of erecting a steel frame for buildings of this type.

Various forms of prefabricated sections for the floors and walls may be secured to the skeleton frame, depending upon the purpose for which the building is to be used or the architectural treatment desired. In the floor construction illustrated in Figs. 1 and 2, each section comprises a series of layers adhering together and strengthened by sleepers or cross-supports 21 made of wood or other suitable materials and supported at their ends on vibration absorbing and heat insulating cushions or springs 22 which may rest directly over the top flanges of the frame members 12, 13. In the forms of construction more clearly shown in Figs. 2 and 3, the transverse supporting members 21 are faced on their under sides with strips of felt 23, and in the construction shown in Fig. 2 they are covered on their upper sides with a continuous layer of felt 24, or similar insulating material. Any suitable floor finish may be applied to the top face of the panel, that illustrated in Fig. 2 being a hard

wood floor 25 to which the felt 24 is cemented on its under side, and that illustrated in Fig. 3 being a thin concrete plate 26 with embedded reinforcement 27 and faced with linoleum 28 secured thereto by a layer of suitable adhesive 29. A continuous sheet of heavy paper or like insulating material is advantageously placed over the supports 21 for supporting the concrete layer when being formed and for additional heat and sound insulation between the floor and ceiling.

In both forms of floor slab a heat and sound proof ceiling is secured beneath the transverse supports in such manner as not to transmit vibration thereto. This ceiling may consist of a plaster board finish 30 or any suitable ceiling finish upon which is poured a layer of aerated gypsum or any light plastic material 31 embedding a wire mesh or other suitable reinforcement 32 attached to the underside of the transverse supports by staples 33 passing through felt washers 34. If desired, for additional heat insulation, the space between the ceiling and floor may be partly filled by rock wool 35, as shown in Fig. 2. Polished sheet metal constituting sound and heat reflecting surfaces 36 may be substituted for the rock wool, if desired, as shown in Fig. 3, or this may be omitted entirely.

The floor slab or panel illustrated in Figs. 4 and 5 is suitable where a fire proof ceiling is not important, no gypsum or rock wool being used. The layer of felt 24 cemented on the under side of the flooring 25 provides substantial sound and heat proofing, and the plaster board or ply wood layer 30 adhesively secured beneath the cross-supports 37 provides additional sound proofing as well as heat insulation.

The wall panels advantageously have wall board or plaster board or ply-wood inner faces 40 and cement, stucco, or other suitable exterior finish 41 on the outer faces, depending on the type of building and effect desired. These panels are reinforced by channel-shaped open work metal reinforcement 42 surrounding the edges and crossing the panel intermediate the edges at suitable intervals, the flanges being embedded in the body material of the panel to tie the faces together. Aerated gypsum, or other light heat insulating material, is advantageously used for the inner body portion 43 of the exterior wall panels, and cement or concrete for the outer body portion 44, the intervening space being filled with rock wool 45, or left open, as desired. Heat and sound reflecting surfaces like the polished metal sheets 36 shown in Fig. 3 may be used on the inner sides of the faces 43, 44 in place of the insulation 45. The entire body layer 44 is preferably stiffened with reticulated sheet metal or wire mesh sections 38 backed by a layer of waterproof paper 39.

At the ends of the wall panels the cement or concrete layer is preferably thickened at the places where it is to fasten to the steel frame, as shown in Fig. 4, and the wall panels are supported at their lower ends on steel plates or bars 46 welded to the flanges of the adjacent beams or girders, being held in position by dowels or pins 47 which engage in suitable recesses formed in the lower ends of the upper tier of panels and in the upper ends of the lower tier of panels. Lag screws 48 extending through the web of the adjacent beam or girder into spaced wood blocks 49 embedded in the inner layer of plastic material (see Figs. 1 and 4) secure the wall panels to the steel structure and also prevent twisting of the beam or girders due to the weight of the panels

on the supports 46. The joints 50 between the lower ends of the upper panels and the upper ends of the lower panels may be filled with cement or other plastic waterproof material to embed the supports and fill the space to keep out the weather.

The floor slabs are preferably held in place at their ends by suitable fastenings secured to the beams. In the form shown in Figs. 1 and 7, metal clips 51 are provided having their ends bent around the upper flanges of the beam and an intermediate part doubled up between the ends of the slabs. These clips may be suitably spaced to line up with the ends of the transverse supporting members 21 in adjacent panels and secured to the first panel laid by nails or screws driven through the clips into the transverse members before the next panel is put in place. As the succeeding slabs are laid in place they may be toe-nailed to the preceding ones by nails driven through the ends of the abutting transverse members and concealed beneath the flooring. The cracks between the abutting ends of the panels may be filled with plastic material, strips of wood, or other heat and sound proof packing.

The clips 55 shown in Fig. 8 may be stamped from sheet steel and nailed to the ends of the side stiffener bars in each panel as laid.

The open sides of the I-beams between the top and bottom flanges are preferably covered with strips of sheet rock 52 nailed to blocks 53 held in place on opposite sides of the beams by bolts or adhesive.

Further details of the panel and slab designs and methods of constructing them will be found in my Patents Nos. 1,825,346, 1,964,728, 1,989,798 and 2,001,605, and in my pending application Serial No. 740,705, filed August 20, 1934, for manufacture of cementitious slabs; and further details of the joints and connections between the columns, girders and beams will be found in my pending application Serial No. 723,985, filed May 4, 1934, for metal framing for building construction.

My invention is applicable to buildings of various kinds by suitable changes in the slabs and panels to adapt them to the conditions of use. For residences where the basement is dry and ordinarily quiet, the damp-proofing and noise-proof ceiling may be omitted. For hospitals, additional noise-proofing may be secured by greater thickness of the ceiling layers and more felt in the sub-floor combined with a rubber tile or other form of silent floor surface. Roof finishes may be adapted to the size and purpose of the respective rooms by utilizing different floor and wall materials, such as various kinds of hardwood flooring, tile, rubber, linoleum, terrazzo, cement and other plastic substances, and ply-wood, sheetrock, wallboard, plaster, canvas, paper and other sheet material suitable for painting or decorating on the interior walls, or waterproof wearing surfaces of stucco, wood, metal, composition, cement or slate for exterior wall and roof panels.

The laminated construction of the slab and panel sections in the floors, walls and roof, provides an effective insulation against sound by causing the vibrations to pass from dense to rarer media and vice versa, and as heat and sound have different vibration characteristics and periods, materials may be selected because of their heat insulating or sound insulating properties, as desired.

The absence of solid metallic connections extending through the section is an important fea-

ture of my invention because of its effect on the sound and heat proof properties, there being nothing to conduct the sound and heat from one face to the other; and the thickness of the several insulating layers being the same throughout the entire area contributes to satisfactory service and low cost of maintenance.

The connections between the slab and panel sections and the frame members serve to stiffen the latter and take the place of wind bracing. These connections are quickly made without special tools, and if it is desired to strengthen the frame against extraordinary storms or earthquake shocks, the joints may be welded after the frame has been completely assembled and lined up before the panels and slabs are placed, at comparatively small expense.

It is evident that my invention provides for uniform heat and sound insulation in controllable measure throughout the entire section to suit its purpose as wall or roof or floor slab or panel, and at the same time provides a wall panel with an interior surface that is pleasing in appearance and easily decorated and maintained and an exterior surface that is impervious to rain and not injured by frost, and provides a floor slab made of strong materials of little weight with a wide variety of floor and ceiling finishes, all said sections being made of cheap materials, simple of construction and light enough to be easily handled and assembled in a building.

I claim the following as my invention:

1. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated unitary sections supported thereby, said sections having their surface layers adheringly secured to the inner body portion with a layer of insulating material intervening, said body portion including a layer of light weight heat resisting material and embedded stiffening members spanning the spaces between supporting frame members.

2. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated unitary sections supported thereby, said sections having their surface layers adheringly secured to the inner body portion with a layer of insulating material intervening, said body portion including a layer of light weight heat resisting material, and heat and sound insulating bearing blocks embedded therein at points of attachment to said frame.

3. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated floor slabs supported thereby, said slabs having their surface layers adheringly secured to the inner body portion with a layer of sound insulating material intervening, said body portion including a layer of light weight heat resisting plastic material, transverse stiffening members for spanning the spaces between supporting frame members, and heat and sound insulating bearing blocks embedded in said light weight plastic material at the ends of said transverse stiffening members to insulate them from said frame members.

4. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated floor slabs supported thereby, said slabs having their surface layers adheringly secured to the inner body portion with a layer of sound insulating material intervening, said body portion including transverse stiffening members spanning the spaces between supporting frame members and heat and sound insulating bearing

blocks at the ends of said transverse stiffening members to insulate them from said frame members.

5. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated floor slabs supported thereby, said slabs having their surface layers adheringly secured to the inner body portion with a layer of sound insulating material intervening, said body portion including transverse stiffening members spanning the spaces between supporting frame members and heat and sound insulating bearing blocks at the ends of said transverse stiffening members to insulate them from said frame members, in combination with securing means attached to said frame members and positioned intermediate the ends of said slabs and engaging therewith to retain said slabs in place on said frame members.

6. In a steel frame and prefabricated wall panel building construction, a support for an outside wall panel comprising a lug secured to the outer flange of an exterior frame member and projecting outwardly therefrom, a locking member carried by said lug, and mating recesses in the top and bottom ends of adjacent panels to receive said locking member.

7. A steel frame and prefabricated wall panel building wherein the panels are supported by and stiffen the frame, comprising flanged metal beams, outwardly projecting lugs welded to the lower flange of the wall beam, wall panels with their lower ends resting on said lugs, and securing means extending through the web of the adjacent beam and into said wall panels to cooperate with said lugs in securing said parts rigidly in place.

8. A steel frame and prefabricated wall panel building wherein the panels are supported by and stiffen the frame, comprising flanged metal members, outwardly projecting lugs welded to the flanged members, wall panels with their lower ends resting on said lugs, wood blocks embedded in said wall panels, and screw bolts extending through the web of the adjacent flanged member and into said wood blocks to cooperate with said lugs in securing said parts rigidly in place.

9. In a steel frame and prefabricated wall panel building construction, a support for an outside wall panel comprising a lug secured to the outer flange of an exterior frame member and projecting outwardly therefrom, a locking member carried by said lug, and mating recesses in the top and bottom ends of adjacent panels to receive said locking member, said locking member being removable from its lug to permit erection of the lower panel.

10. A steel frame and prefabricated wall panel building comprising flanged metal members, laterally projecting lugs secured thereto, said lugs having holes to receive locking pins for the panels, and wall panels having recesses in their ends and supported on said lugs with their lower end recesses in register with locking pins in said supporting lugs and their upper end recesses in register with the holes in the lugs on the next higher story frame members, and locking pins in the holes in said lugs below and above said panels to hold them securely in place.

11. A steel frame and prefabricated wall panel building comprising flanged metal members, laterally projecting lugs secured thereto, said lugs having holes to receive locking pins for the panels, and wall panels having recesses in their ends and supported on said lugs with their lower end

recesses in register with locking pins in said supporting lugs and their upper end recesses in register with the holes in the lugs on the next higher story frame members, and locking pins in the holes in said lugs below and above said panels to hold them securely in place, in combination with securing means extending through the web of an adjacent frame member and into said panels intermediate their ends to secure the same laterally.

12. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated wall panels supported thereby, said panels having inner and outer body layers of hardened plastic material connected by transversely disposed strips of reticulated metal reinforcement embedded therein, a substantially continuous layer of light weight heat insulation intervening between said body layers, said inner body being made of heat insulating material of substantially uniform thickness and supporting an inner finish layer of uniform material and thickness, and said outer body being made of dense material reinforced with metal and continuous over the entire area of the panel.

13. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated wall panels supported thereby, said panels having inner and outer body layers of hardened plastic material connected by transversely disposed strips of reticulated metal reinforcement embedded therein, a substantially continuous layer of light weight heat insulation of uniform thickness intervening between said body layers, said inner body layer being made of heat insulating material of substantially uniform thickness and supporting an inner finish layer of uniform material and thickness, and said outer body being made of dense material reinforced with metal and continuous over the entire area of the panel, said outer body carrying an outer finish of weatherproof material of uniform thickness, whereby the entire area of the panel is equally insulated and protected against external conditions.

14. In a light weight heat and sound resisting building construction, a series of wall panels having each an inner body layer of hardened plastic material strengthened by a surface layer of cementitious finish forming a continuous uniform inner wall, an outer body layer of hardened plastic material reinforced with substantially continuous metal reinforcement embedded therein and supporting an outer finish layer of weatherproof material forming a continuous, uniform outer wall, a layer of heat insulation between said inner and outer body layers, and transversely disposed stiffeners of reticulated metal embedded at their inner and outer edge portions in said body layers to secure them together and retain said heat insulation in proper spaced relation thereto, providing continuous uniform heat and sound insulation throughout the entire area of said panels.

15. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated wall panels supported thereby, said panels having inner and outer body layers of hardened plastic material connected by transversely disposed strips of reticulated metal reinforcement embedded therein, said inner body being made of heat insulating material of substantially uniform thickness and supporting an inner finish layer of uniform material and thickness, and said outer body being made of dense

material reinforced with metal and continuous over the entire area of the panel to maintain its rectangular shape, and means associated with said panels for securing them to said frame.

16. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated floor panels supported thereby, said panels having top and bottom body layers of hardened plastic material connected by transversely disposed stiffening members to which said body layers are secured, said bottom body layer being made of heat insulating material of substantially uniform thickness and supporting a ceiling finish of uniform material and thickness, and said top body layer being made of dense material reinforced with metal and continuous over the entire area of the panel, and means associated with said stiffening members for securing said panels to said frame.

17. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated floor panels supported thereby, said panels having top and bottom body layers of hardened plastic material connected by transversely disposed stiffening members to which said body layers are attached, a substantially continuous layer of light weight heat insulation intervening between said body layers, said bottom body layer being made of heat insulating material of substantially uniform thickness and supporting a ceiling finish of uniform material and thickness, and said top body layer being made of dense material reinforced with metal and continuous over the entire area of the panel to promote uniformity of temperature throughout, and means independent of said metal for securing said panels to said frame.

18. A light weight heat and sound resisting building construction comprising a steel frame and prefabricated floor slabs supported thereby, said slabs having top and bottom body layers of hardened plastic material connected by transversely disposed stiffening members to which said body layers are secured, a substantially continuous layer of light weight heat insulation of uniform thickness intervening between said body layers, said bottom body layer being made of heat insulating material of substantially uniform thickness and supporting an under finish layer of uniform material and thickness, and said top body layer being made of dense material reinforced with metal and continuous over the entire area of the slab, said top body layer carrying an upper finish of wearproof material of uniform thickness, whereby the entire area of the slab is equally insulated and protected against external conditions.

19. In a light weight heat and sound resisting building construction, a series of floor panels having each a bottom body layer of hardened plastic material strengthened by a surface layer of cementitious finish forming a continuous uniform ceiling, an upper body layer of hardened plastic material reinforced with substantially continuous metal reinforcement embedded therein and supporting a top finish layer of wearproof material forming a continuous, uniform floor, a layer of heat insulation between said body layers, and transversely disposed stiffeners of reticulated metal secured at their inner and outer faces to said body layers to secure them together and retain said heat insulation in proper spaced relation thereto, providing continuous uniform heat and sound insulation throughout the entire area of said panels.

20. In a light weight heat and sound resisting building construction having spaced beams bridging the floor areas, a series of floor slabs each comprising spaced cross supports of wood or
 5 other self-sustaining material, a ceiling of self-sustaining heat and sound insulating sheet material adhesively secured to the under sides of said cross supports, a floor of hard wood boards or
 10 other self-sustaining wear resistant flat surface material nailed or otherwise rigidly secured to said cross supports, and a layer of felt-like heat and sound proofing material beneath said floor
 15 and between it and the cross supports, said layer being cemented to the under side of said floor across the entire area of said slab, said floor slabs being supported at the ends of said cross supports upon said beams.

21. A heat and sound resisting slab comprising spaced cross supports of wood, a ceiling of self-sustaining heat and sound insulating sheet material adhesively secured to the under sides of said cross supports, a floor of hard wood boards nailed to said cross supports, and a layer of felt-like
 25 heat and sound proofing material beneath said floor and between it and the cross supports, said layer being cemented to the underside of said floor across the entire area of said slab, forming a light strong, sound proof floor or roof section.

22. A heat and sound resisting slab for floors and roofs comprising spaced parallel supports having top and bottom faces of substantial width, a ceiling sheet adhesively secured to the under
 30 sides of said supports, a heat and sound insulating continuous layer arranged over said supports, and a flooring of self-sustaining material secured to said supports, the heat and sound insulating layer being adhesively secured beneath said floor-
 35 ing across the entire area of said slab, thereby deadening sounds on said flooring and preventing transmission thereof to the ceiling below.

23. A heat and sound resisting slab for floors and roofs comprising spaced parallel supports having top and bottom faces of substantial width, a ceiling sheet adhesively secured to the under
 45 sides of said supports, dry loose insulating material supported by said ceiling sheet in the spaces between said supports, a heat and sound insulating layer arranged over said supports, and a floor-
 50 ing of self-sustaining material secured to said supports, the heat and sound insulating layer being adhesively secured beneath said flooring across the entire area of said slab, thereby deaden-
 55 ing sound on said flooring and preventing transmission thereof to the ceiling below.

24. A heat and sound resisting slab for floors and roofs comprising spaced parallel supports having their top faces parallel, a heat and sound insulating continuous layer over said supports supported on their top faces, a ceiling layer of
 60 self-sustaining material secured beneath the bottom faces of said supports, insulating material supported by said ceiling layer in the spaces between said supports, a flooring of self-sustaining material on said upper insulating layer and se-

cured to said supports, said upper insulating layer being adhesively secured beneath said floor-
 ing across the entire area of said slab.

25. A light weight, heat and sound resisting, building construction comprising flanged steel
 5 beams, slabs resting on and fastened to the beams to brace their top flanges, the slabs being composed of transverse stiffening members spanning the space between the beams, a heat insulat-
 10 ing and ceiling element supported underneath the transverse stiffening members, a rigid flat wear- ing element secured to and bracing the transverse stiffening members to form a rigid load carrying
 15 floor, and a heat and sound insulating layer se- cured to the underside of said wearing element, whereby said beams and slabs are each structural-
 ly independent and mutually self-supporting in said building construction.

26. A light weight, heat and sound resisting, building construction comprising flanged steel
 20 beams, slabs supported on the top flanges of said beams and fastened thereto to brace them against sidewise displacement, the slabs being composed of transverse stiffening members spanning the
 25 space between the beams, a heat insulating and sound proofing ceiling element supported under-neath the transverse stiffening members and rest-
 ing on the top flanges of said beams, and a rigid floor element having a suitable wearing surface supported by said stiffening members and secured
 30 thereto for bracing and supplementing them to form a rigid load carrying floor, whereby said beams and slabs are mutually self-supporting and insulated from each other to reduce transmission
 35 of heat and sound through said floor structure.

27. A light weight, heat and sound resisting, building construction comprising steel beams, slabs resting on and fastened to the beams to
 40 brace their top edges, the slabs being composed of transverse stiffening members spanning the space between the beams, a heat insulating and ceiling element supported underneath the trans-
 verse stiffening members, a rigid flat wearing ele- ment secured to and bracing the transverse stiff-
 45 ening members to form a rigid load carrying floor, and a heat and sound insulating layer se- cured to the under side of said wearing element, whereby said beams and slabs are mutually self-
 50 supporting and non-conducting of heat and sound from one to the other.

28. A light weight, heat and sound resisting, building construction comprising steel beams, slabs resting on and fastened to the beams to
 55 brace their top edges, the slabs being composed of transverse stiffening members spanning the space between the beams, a heat insulating and ceil-
 ing element supported underneath the transverse stiffening members, and a rigid flat wearing ele-
 60 ment secured to and bracing the transverse stiffening members to form a rigid load carrying floor, whereby said beams and slabs are each structurally independent and mutually self-sup-
 porting in said building construction.

THOMAS J. FOSTER.

CERTIFICATE OF CORRECTION.

Patent No. 2,069,755.

February 2, 1937.

THOMAS J. FOSTER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 54, for the word "Roof" read Room; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of March, A. D. 1937.

(Seal)

Henry Van Arsdale
Acting Commissioner of Patents.