

July 25, 1939.

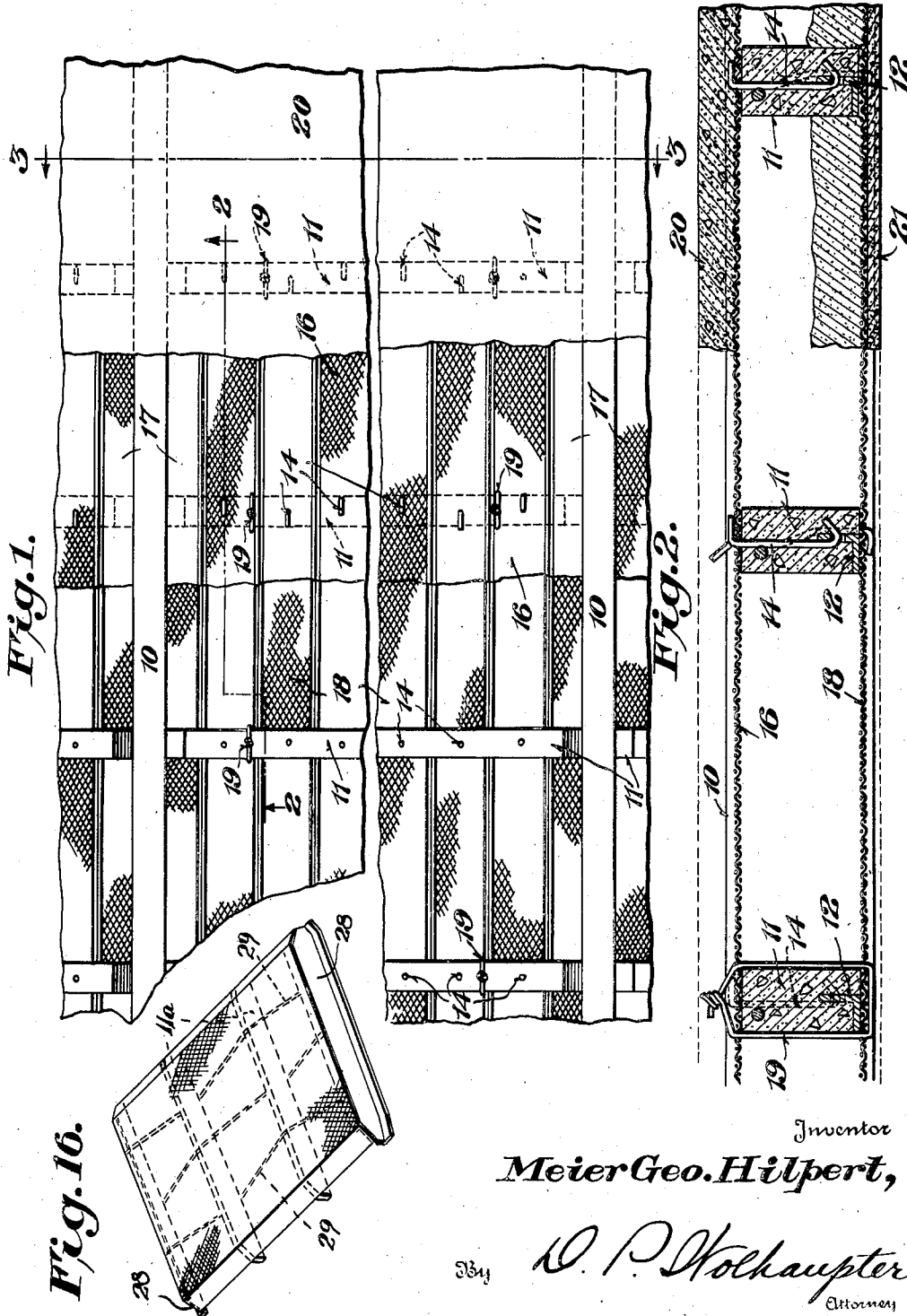
M. G. HILPERT

2,167,208

FLOOR OR ROOF CONSTRUCTION

Filed Feb. 3, 1937

4 Sheets-Sheet 1



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July 25, 1939.

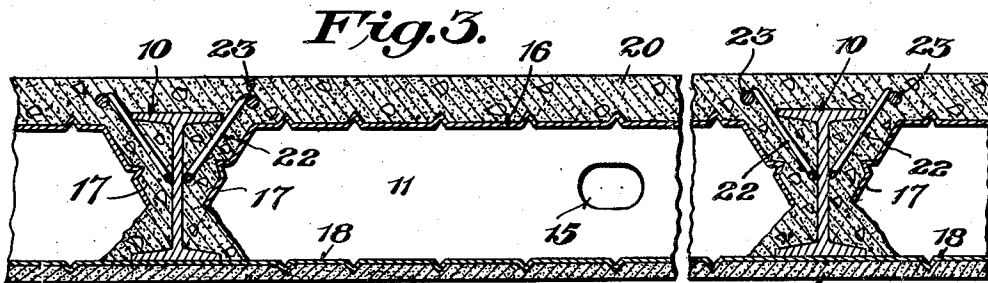
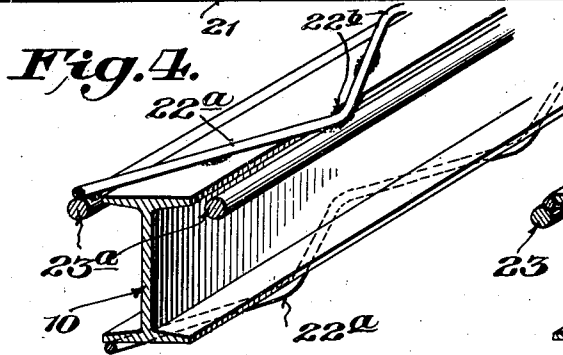
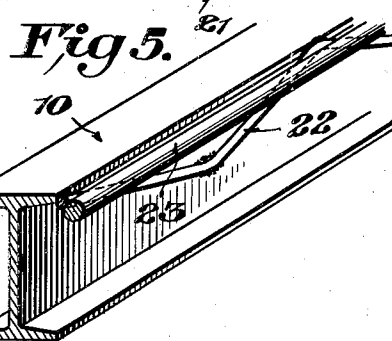
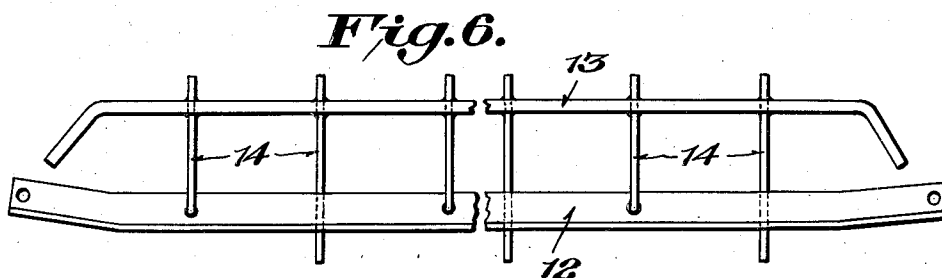
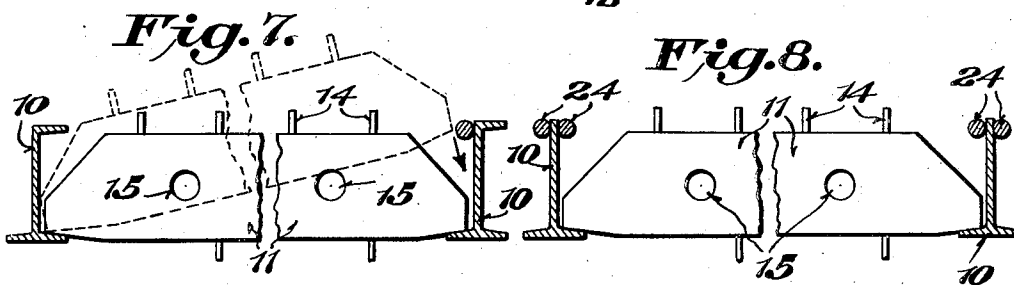
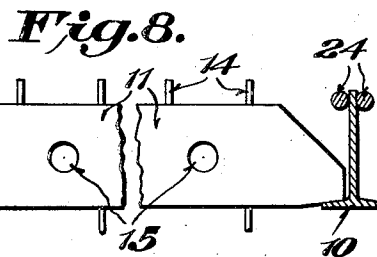
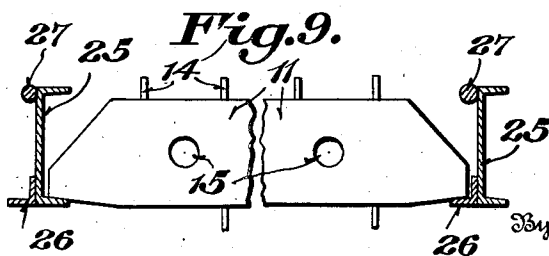
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FLOOR OR ROOF CONSTRUCTION

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4 Sheets-Sheet 2



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FLOOR OR ROOF CONSTRUCTION

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4 Sheets-Sheet 3

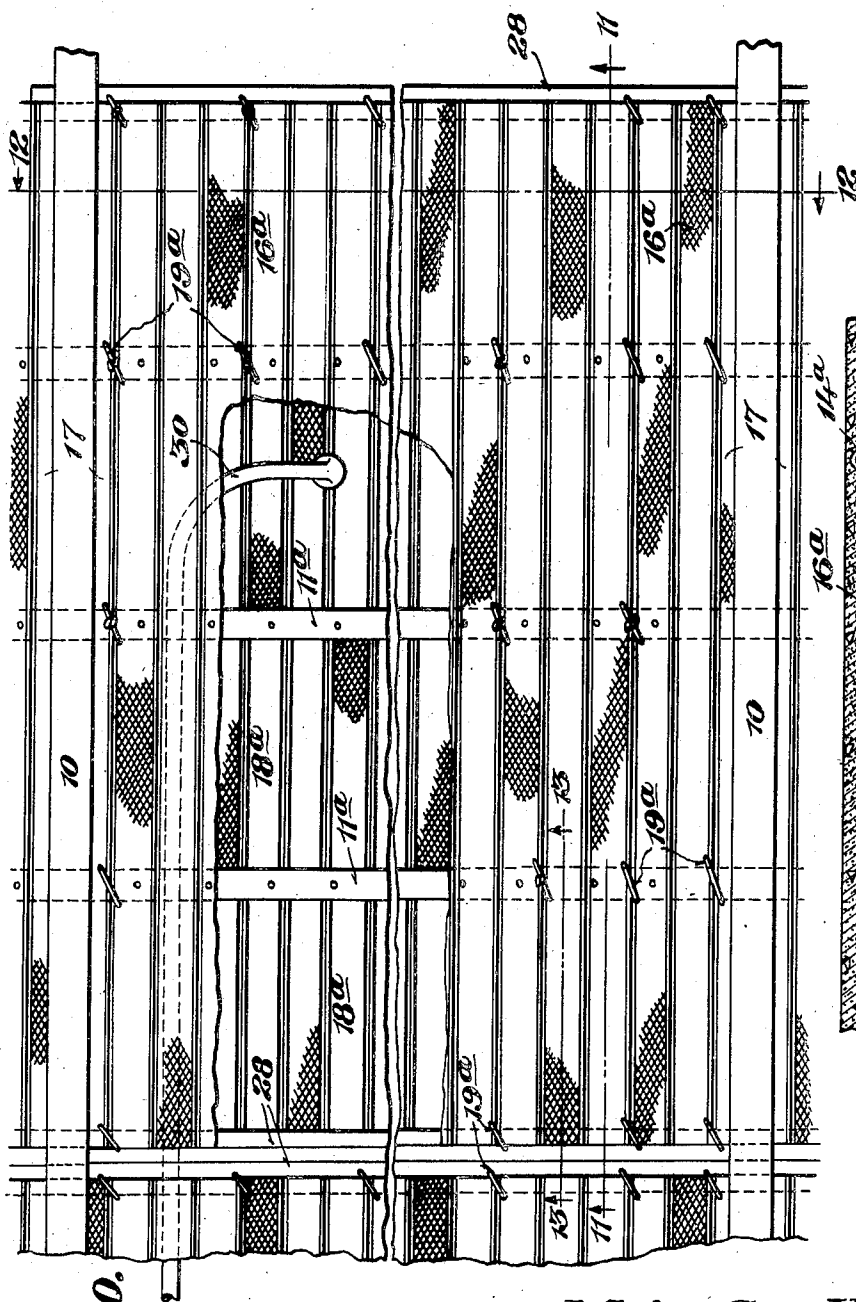


Fig. 10.

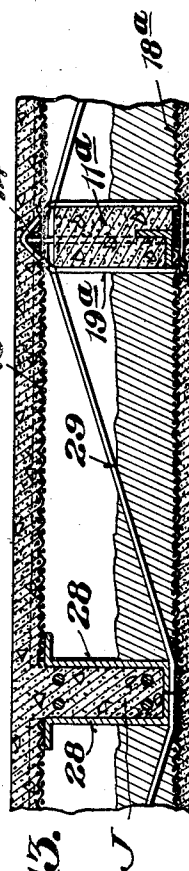


Fig. 13.

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FLOOR OR ROOF CONSTRUCTION

Filed Feb. 3, 1937

4 Sheets-Sheet 4

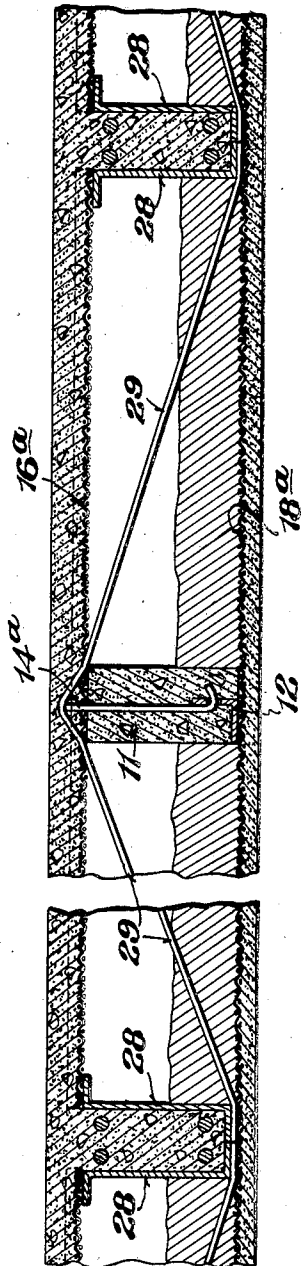


Fig. 11.

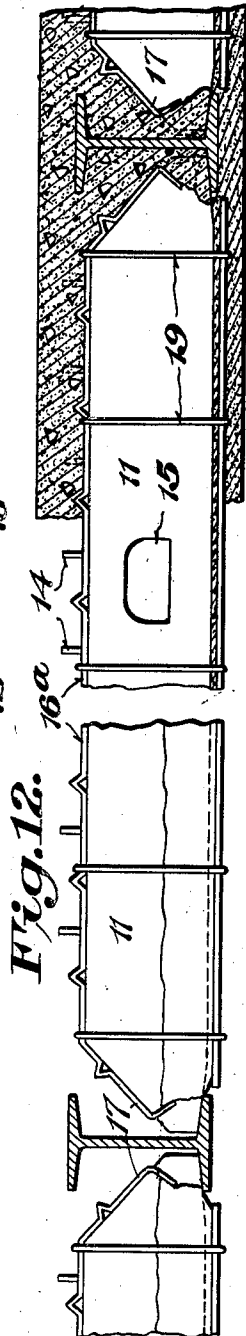


Fig. 12.

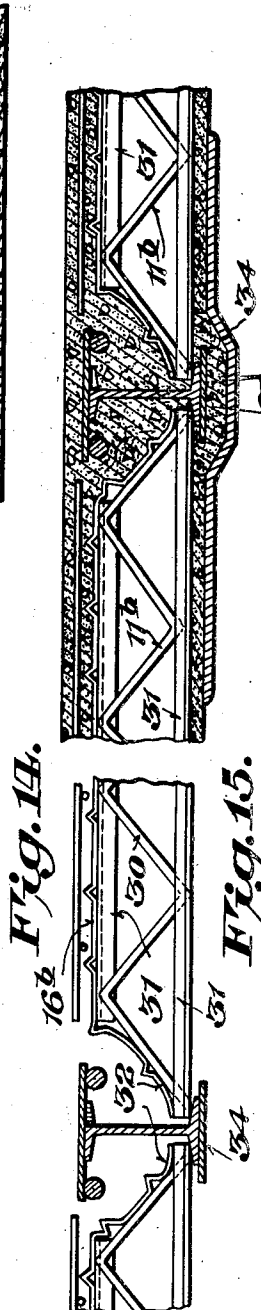


Fig. 14.

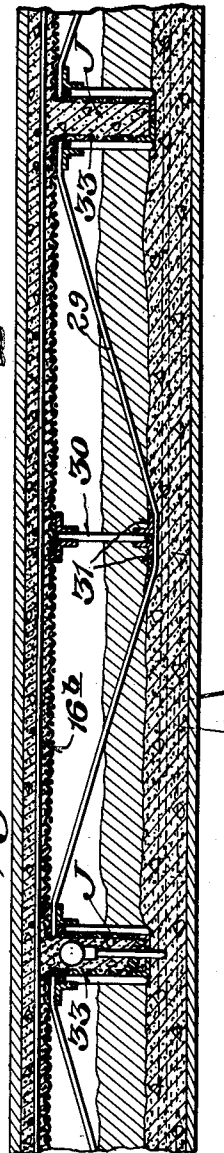


Fig. 15.

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UNITED STATES PATENT OFFICE

2,167,208

FLOOR OR ROOF CONSTRUCTION

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Application February 3, 1937, Serial No. 123,932

18 Claims. (Cl. 72-71)

This invention relates to improvements in floor and roof structures of the type which include steel beams to support the principal loadings, and has particular reference to the construction intermediate of and about said beams.

One important object of the invention is to provide a strong, light-weight floor or roof construction intermediate of and about the principal load supporting steel beams thereof, which construction materially assists said beams in carrying live loads and serves to reinforce said beams against deflections.

Another important object of the invention is to provide a floor or roof construction intermediate of and about the principal load supporting steel beams thereof, which construction serves effectively to fire-proof said beams and may readily be made to meet the fire-proofing requirements of various different building codes.

Another important object of the invention is to provide a floor or roof construction intermediate of and about the principal load supporting beams thereof, which construction includes a major number of isolated air spaces of major size consistent with the depth or thickness and required strength of the floor or roof, affording, in themselves, effective thermal and sound insulation and being designed to accommodate bulk or other insulating material to afford additional insulation in any desired case.

Another important object of the invention is to provide a floor or roof construction intermediate of and about the principal load supporting beams thereof, which construction is cheap and easy to produce and may be produced either in situ, or, in major part, as low cost pre-fabricated units capable of rapid and easy installation in a building structure.

With the foregoing and various other objects and purposes in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in the various novel features of construction, combination and arrangement as will be hereinafter more fully described, illustrated in the accompanying drawings and defined in the appended claims.

In the drawings, wherein like characters of reference denote corresponding parts in related views:

Figure 1 is a top plan view illustrating an in situ embodiment of the present floor or roof construction, parts being broken away to show the underlying construction.

Figure 2 is a longitudinal section through the construction shown in Fig. 1,

Figure 3 is a transverse section through the construction shown in Fig. 1.

Figure 4 is a detail perspective view illustrating a beam carried reinforcement for bonding in the plastic material adjacent to the beam.

Figure 5 is a view similar to Fig. 4 illustrating an alternative form of beam carried reinforcement.

Figure 6 is a side elevation of the reinforcement means for one of the joists.

Figures 7, 8 and 9 are detail sectional views illustrating alternative forms of beams specially designed to be used with the present pre-fabricated construction intermediate and about the same.

Figure 10 is a view similar to Fig. 1 illustrating an embodiment of the invention in which the construction intermediate the principal load supporting beams is comprised mainly by pre-formed elements.

Figure 11 is a longitudinal section through the construction shown in Fig. 10.

Figure 12 is a transverse section on the line 12-12 of Fig. 10.

Figure 13 is a detail longitudinal section illustrating an alternative form of end piece which may be used in the pre-formed elements; and

Figures 14 and 15 are views similar to Figs. 12 and 11 respectively, illustrating an alternative form of joist which may be used in lieu of the joists illustrated in Figs. 1 to 12.

Figure 16 is a perspective view of the improved unit of construction.

In modern building structures having steel frames it is usual to provide steel floor and roof beams to support the principal floor and roof loadings. Usually these beams are of the I-beam type and extend horizontally, or substantially horizontally, in parallel, spaced relationship between columns or wall beams to which they are secured at their ends. The accompanying drawings illustrate a pair of such beams, designated as 10, 10, disposed horizontally in spaced, parallel relationship. However, as will later become apparent, it is not necessary that said beams be disposed either horizontally or parallel, as the present floor or roof construction is readily capable of being formed between them whether they slope or are inclined to the horizontal and whether they are or are not disposed parallel to each other.

In carrying out the present invention there are provided a suitable number of reinforced concrete joists 11 to extend between the beams 10. These joists 11 are preformed either at the building site or at any other suitable location,

and each includes a concrete body of preferably vertically elongated, rectangular shape in cross section having embedded therein a suitable reinforcing steel frame comprising, for example, an angle iron tension member 12 disposed near the bottom of the joist and extending longitudinally thereof, a compression member 13 in the form of a rod or the like disposed near the top of the joist and extending longitudinally thereof, and a plurality of upright rods or the like 14 connecting the members 12 and 13 at points suitably spaced therealong. Conveniently, certain of the uprights 14 may be extended laterally at their lower ends through holes formed in the upright flange of the tension member 12 and may be welded to said tension member, and near their upper ends may be welded to the compression member 13. However, any or all of said uprights 14 may be secured to the members 12 and 13 in any other suitable or desired manner. Moreover, all or some of said uprights extend short distances above the top of the completed joist and some may extend below the bottom of the completed joist for purposes which will later appear.

The joists 11 obviously are capable of easy and economical production, either singly or in pluralities, in suitable forms or molds. They are formed with downwardly and outwardly inclined ends and with upwardly and outwardly inclined bottoms adjacent to their ends so that when they are subsequently disposed between the beams 10 with their ends resting upon the laterally extending bottom flanges of said beams in accordance with the invention, their bottom faces are disposed flush, or substantially flush, with the bottom faces of said beams and spaces for the reception of concrete, aerocrete or the like are formed between their ends and the webs of said beams. In producing said joists suitably symmetrical openings 15 are formed therethrough to accommodate conduits for electrical wiring or the like when the joists are embodied in a building.

According to the in situ embodiment of the invention illustrated in Figs. 1 to 3, a series of the joists 11 are placed between the beams 10 in suitably spaced apart, preferably parallel relationship and are covered by expanded metal lath or similar material 16 which extends across the tops of the spaces between said joists. At its sides this material 16 is extended downwardly, as indicated at 17, over the downwardly and outwardly inclined ends of the joists 11 and across the spaces between the joists to points such that, when concrete or the like is poured between the webs of the beams 10 and the metal lath, the concrete or the like will spread out over the bottom flanges of the beams and to either side of the joists and, upon hardening, will fireproof the lower flanges of the beams and serve at the same time to fix the joists in spaced relationship. The upper ends of the uprights 14 extend through the material 16 and some of them are bent downwardly upon said material to hold it securely in place.

Beneath the joists 11 and the beams 10 is arranged a ceiling reinforcement in the form of relatively light weight metal ceiling lath 18 or other suitable material which extends across the bottoms of the spaces between said joists and beams and is secured thereto in any suitable manner, as, for example, by means of tie wires 19 or by having bent upwardly thereagainst the lower ends of such of the uprights 14 as extend below the joists.

After the joists 11 have been placed in position

between the beams 10 and the materials 16 and 18 have been placed in the positions described relative to said joists and beams, flooring or roofing concrete, "Haydite" or the like, designated as 20, is poured into the spaces between the beams 10 and the downturned side portions of the material 16, and also over the top of the material 16 and over the tops of the beams 10 to any suitable or desired depth, some of the concrete, "Haydite" or the like flowing over the bottom flanges of the beams 10 and thus fireproofing said bottom flanges and fixing the joints in place as previously stated. Previously, or at any desired time, suitable ceiling forming material, such as plaster-board or preferably a plaster mortar, designated as 21, is applied to the lath or similar material 18. Thus, there is formed a floor or roof construction of hollow or cellular form having sound and thermal insulating qualities in itself and which may have been additionally insulated, had that been desired, by placing bulk insulation or insulation of any other desired type within the air spaces or cells thereof prior to covering said air spaces or cells by the material 16. Moreover, due to the beams 10 being completely encased by the materials 20 and 21, they are effectively fireproofed and may be fire-proofed to any desired extent in conformity with any given building code simply by varying the thicknesses of the materials 20, 21. Furthermore, the material 20, when set and bonded to the joists 11 by the uprights 14 and the material 16, not only serves to prevent lateral deflections of the beams 10, but provides, in itself, an effective concrete T-beam cooperating with the beams 10 to provide a composite beam which is exceptionally effective to sustain loads to which the floor or roof may be subjected. Also, it is obvious that by having the top portions of some or all of the uprights 14 bent over into the flooring or roofing material 20, the necessary bonds are provided to make effective composite T-beams of the joists and the flooring or roofing 20. Furthermore, since the ends of the joists are firmly embedded in the material 20 and consequently are rigid with respect to the beams 10, it is evident that said joists in conjunction with the material 20 will carry additional loads due to the arch actions from the bottom flanges of the beams 10 through the joists and the material 20. Also, since the material 20 flows to either side of the ends of the joists and thereby stays the joists against lateral movement, the entire construction, panel by panel between beams 10 and sub-panel by sub-panel between joists, becomes one integral construction capable of supporting heavier loads for the materials used than if the beams and joists operated singly.

While it is not essential that the beams 10 have top elements in addition to their top flanges for embedment in the material 20 to reinforce said beams, it is, nevertheless, desirable to provide said beams with such elements. In this connection, Figs. 3, 4 and 5 illustrate that crimped rods 22 are welded to and extend from the webs of the beams 10 upwardly and outwardly across the edges of the top flanges of said beams, to which flanges they also are welded, and that said rods have welded thereto, outwardly of the outer edges of the top flanges of said beams, other rods 23 extending longitudinally of said beams for embedment in the material 20 and for cooperation with the rods 22 to reinforce the said beams by bonding with the material 20 encasing the top portions of said beams and making composite T-beams thereof. Alternatively, and

as illustrated in Fig. 4 of the drawings, each beam 10 may be provided with a single crimped rod 22^a disposed flatly on top thereof and welded thereto and having extending beyond the edges of the top flange of the beam portions 22^b to which are welded rods 23^a similar to the rods 23. In fact, the beams 10 may carry any suitable means at their tops in addition to their top flanges for embedment in the material 20 to reinforce said beams. Similarly, instead of applying a mortar or plastic material 21 to the lath 18 and allowing said material to set, a plasterboard or pre-formed slabs of any suitable ceiling material may be employed and may be secured in place in any desired manner, as, for example, by nailing the same to the joists 11, it being pointed out in this connection that the base of the concrete material comprising said joists and also the flooring or roofing 20 may be cinders or the like permitting the driving of nails into the same and affording good sound insulating qualities. In any event, the ceiling material 21 for in situ placement preferably has either a plaster base or is in the form of a good commercial plasterboard so that any finishing coat, or coats, of plaster will effectively adhere thereto.

The embodiment of the invention illustrated in Figs. 1 to 3 is particularly adaptable to rapid and economical construction because successive beams 10 may be placed and supported in their final permanent positions preparatory to construction of the floor proper between them. On the other hand, in some cases it may not readily be possible to operatively position the joists 11 between a pair of the beams 10, particularly if the joists 11 are embodied in pre-formed slab skeletons to be placed between fixed beams. Accordingly, the beams 10 may be modified or constructed to permit quick and easy placing of the joists 11, or slab skeletons including said joists, in operative position between said beams by an operation involving first engaging one end of a joist, or one side of a slab skeleton, with the bottom flange of one of the beams and then lowering the other end of the joist, or the other side of the slab skeleton, as the case may be, into engagement with the bottom flange of the other beam. In this connection, Fig. 7 illustrates that the top flange of each beam 10 may be removed, either entirely or in part, at one side of the web of the beam, thereby to permit the joists 11, as embodied in a pre-formed slab skeleton, to readily be lowered into position in the manner stated to rest upon the bottom flanges of said beams. As an alternative construction, Fig. 8 illustrates that the beams 10 may be of inverted T-shape in section and may have narrow compression members at their tops formed by welding rods 24 against opposite side faces of their webs. This figure also suggests that an equivalent beam may be formed by only partially removing the top flanges of an I-beam or by recessing either or both top flanges at a point or points of least moment, to permit the joists first to be lowered onto the beam bottom flanges and then to be slid along said bottom flanges to desired final positions. As a further alternative construction, Fig. 9 illustrates that the beams 10 may be formed each from a channel section 25 having an angle 26 welded to its bottom to provide a bottom tension member of inverted T-shape, and further having a rod 27 welded to the top thereof for cooperation with the top flange to provide a compression member. Other beam constructions, of which the foregoing merely are examples, obvious-

ly may be devised to afford necessary strength and to permit the joists to be assembled therewith in the manner stated. Alternatively, the joists and lath materials if placed insitu, or pre-fabricated skeleton units, may be placed at one end on the bottom flange of beam 10 and this intermediate construction may be supported on horses resting on the floor construction below and the adjacent floor beam 10 may then be swung into its final position with its bottom flange below the said intermediate construction at its other end, after which said joists or units may be lowered permanently onto the bottom flange of the last placed beam 10.

As previously indicated, the present floor or roof construction intermediate the beams 10 may be comprised in major part by pre-formed slab skeletons corresponding in all essentials to the in situ slab skeletons formed by practicing the invention as described in connection with the illustration in Figs. 1 to 3. A construction embodying pre-formed slab skeletons is illustrated in Figs. 10 to 13 and will be observed to comprise a plurality of slab skeletons disposed in end to end relationship between the beams 10. These skeletons may be of any suitable length and are of a width determined by the spaced apart relationship of the beams 10. As shown, each slab skeleton comprises any desired plurality of joists 11^a which may be duplicates of the joists 11 and which may be disposed in any desired spaced apart, parallel relationship. The two outermost joists of each slab skeleton are spaced inwardly from the ends of the slab skeleton and at the ends of the slab skeleton are sheet metal elements 28 having the profile or side elevational shape of the joists 11^a to preserve the cross-sectional shape of the slab skeleton at its ends and to cooperate with the corresponding elements at the ends of adjacent slab skeletons to provide forms for the pouring of joists between the ends of adjacent slab skeletons. In this connection and as illustrated in Figs. 10 to 12, the elements 28 are of channel shape in cross section and have inwardly directed top and bottom flanges. Alternatively and as illustrated in Fig. 13, said elements may be of substantially Z-shape in cross section, each having an inwardly directed flange at its top and an outwardly directed flange at its bottom. Alternatively, said elements may be of any other suitable sectional shape. In any event, the joists 11^a and the elements 28, and the spaces between said joists and elements, are covered by expanded metal lath or the like 16^a which is extended downwardly over the downwardly and outwardly inclined ends of said joists and elements and between the same may be tucked inwardly to better preserve the spacing of said joists. Similarly, the bottoms of said joists and elements, and the bottoms of the spaces therebetween, are covered by metal lath, wire mesh or the like 18^a fastened in place by tie tires 19^a or by the uprights 14^a. In addition, stays or braces 29 extend from the tops of alternate of the joists and the elements 28 to the bottoms of the remaining joists and elements to hold the joists and the elements 28 properly positioned and to impart rigidity to the slab skeletons.

Following fabrication of the slab skeleton they preferably are lowered into a thin layer of liquid cement and cinders or Haydite which, enmeshing the wire mesh 18^a and hardening, forms the ceiling plaster base. Thus, such base, being applied under factory conditions, will be of economical thickness and uniform texture for its purpose.

Obviously the width of such precast plaster base must register as desired with the distance center to center of the supporting beams 10 and the length must be of the exact length center to center of the formed in situ joists designated as J.

This prefabricated skeleton or unit having a solidly supported base or bottom allows of adding under factory control the required thickness of bulk or other type of insulation as indicated for the permanent position in building of said prefabricated floor unit. The insulation may be introduced through the ends between the joists under the downward extending mesh 16^a or by lifting a central top section of the mesh 16^a as previously arranged for. This factory introduction of the insulation eliminates a tedious operation under the many unfavorable conditions obtaining when placing insulation between the beams at the building site and expedite erection of the building proper. This prefabricated unit allows alternates as the substitution of commercial plasterboards or the like in place of the factory cast plaster base, said board being fastened to the underside of said joists 11^a and to end members 28 and, if desired, being wired to the edges of the mesh 16^a. Such alternates will obviously provide the base desired for factory placing of insulation, for fireproofing the webs and bottom flanges of beams 10 and for the ceiling plaster finishing coats.

In constructing a floor or roof by employing slab skeletons as described, the slab skeletons are placed between the beams 10 in end to end relationship with the ends of the joists 11^a resting upon the bottom flanges of the beams. In this connection, if end elements 28 as illustrated in Fig. 13 are used, the outwardly directed bottom flanges of said elements at adjacent ends of adjacent slabs are disposed in abutting relationship, thereby to close the bottoms of the spaces between the webs of said elements. On the other hand, if the elements 28 do not have outwardly directed bottom flanges, said elements are held properly spaced apart, and the spaces between them are closed at their bottoms in any suitable manner, as for example, by means of a suitable extension of a pre-cast plaster base held in place by the wire mesh 18^a or otherwise. In any event, after placing the slab skeletons between the beams, concrete, "Haydite" or the like is poured into the spaces between the elements 28 at adjacent ends of the slab skeletons, thereby forming an additional joist at the adjacent ends of each two adjacent slab skeletons. At the same time, concrete, "Haydite" or the like is poured into the spaces between the beams 10 and the downwardly directed and inwardly tucked side portions of the metal lath 16^a and over said metal lath and said beams to a desired thickness or depth with the same advantageous results as described in connection with Figs. 1 to 3 of the drawings. Thereafter, or previously, if desired, the ceiling finishing coating, or coatings, is, or are, applied. In this connection it will be understood, of course, that conduits 30 for electric wires or other purposes may be embodied in the slab skeletons either during construction of the same or at any time thereafter and that connections between said conduits may be made in the spaces between adjacent ends of the slab skeletons prior to pouring of the concrete. It will also be understood that the joists formed between the ends of adjacent skeleton sections may be reinforced in any desired manner.

It is not essential that the joists 11 or 11^a be of the construction heretofore described or even of reinforced concrete construction. On the contrary, said joists may be of any suitable construction, and in this connection Figs. 14 and 15 illustrate one alternative construction which may be especially desirable in certain installations. As illustrated in said figures, the joists, designated generally as 11^b, are of all metal construction and are characterized by webs 30 formed of rods which are crimped to provide successive V-shaped and inverted V-shaped formations as viewed in side elevation. Such of said joists as are intended to be used intermediate the ends of pre-formed slab skeletons preferably have top and bottom compression and tension members, respectively, each of which is comprised by two pieces of angle iron 31 disposed to opposite sides of the web 30, respectively, and welded to the apices of the V-shaped formations of said web. On the other hand, such of said joists as are intended to be used at the ends of preformed slab skeletons may have top and bottom compression and tension members, respectively, each comprised by a single piece of angle iron at the inner side of the web of the joist. Alternatively, the bottom member may be comprised by two pieces of angle iron and the top member by only a single piece of angle iron at the inner side of the web; or, the top member may be comprised by a single piece of angle iron at the inner side of the top of the web and the bottom member may be comprised by a single piece of angle iron at the outer side of the bottom of the web. In this connection it is apparent that in any case where the bottom member consists of or includes a piece of angle iron at the outer side of the web, the outwardly directed flanges of adjacent slab skeletons cooperate to close the bottom of the space between the slab skeletons. Obviously the joists illustrated in Figs. 13 and 14 may be used either individually in the manner described in connection with the joists 11 of Figs. 1 to 3, or in forming slab skeletons of the character described in connection with Figs. 7 to 13. As shown, said joists are longer at their bottoms than at their tops, and when embodied in slab skeletons the metal lath or the like 16^b covering them and the spaces therebetween extends downwardly over their ends as at 32 and also over their sides, as at 33. In other respects said slabs and slab skeletons, and floors or roofs embodying the same are, or may be, of the same construction set forth in connection with Figs. 1 to 3 and 7 to 13.

Any of the joists may be formed so that when they are seated at their ends on the bottom flanges of the beam 10 their top and bottom faces may be disposed at any desired levels relative to the top and the bottom faces of said beams. Moreover, in any case where the bottoms of the joists are disposed at elevations such that a ceiling coating of normal thickness applied thereto does not effectively cover the bottoms of the beams 10, the said bottoms of said beams may be covered and effectively fireproofed by a stepped ceiling formation as illustrated in Fig. 14 and including, for example, a plank 34 of suitable insulating material, such as gypsum, wired or otherwise secured against the bottom of each beam.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing

from the spirit of the invention and scope of the appended claims.

I claim:

1. In a building structure, spaced floor or roof beams, joists extending between said beams, a plastic material supporting sheeting covering said joists and the spaces therebetween and partly covering the ends of said joists and the spaces between such ends, and plastic material disposed over said beams and said sheeting and extending downwardly between the ends of said joists and the webs of said beams and providing in cooperation with said beams and joists a composite beam structure.

2. In a building structure, spaced floor or roof beams having webs and bottom flanges, joists extending between said beams and resting at their ends on the bottom flanges thereof, the ends of said joists being spaced from the webs of said beams, a plastic material supporting sheeting covering said joists and the spaces therebetween and extending downwardly over portions of the ends of said joists and over portions of the spaces between the ends of said joists, and plastic material covering said sheeting and said beams and extending into the spaces between the webs of the beams and the downwardly extending portions of said sheeting.

3. In a building structure, spaced floor or roof beams having webs and bottom flanges, joists extending between said beams and resting at their ends on the bottom flanges thereof, the ends of said joists being downwardly and outwardly inclined, a plastic material supporting sheeting covering said joists and the spaces therebetween and extending downwardly over portions of the ends of said joists and over portions of the spaces between the ends of said joists, and plastic material covering said sheeting and said beams and extending into the spaces between the webs of the beams and the downwardly extending portions of said sheeting.

4. In a building structure, spaced floor or roof beams having laterally extending top and bottom compression and tension members, respectively, joists extending between said beams and supported thereon, a plastic material supporting sheeting extending over said joists and over the spaces therebetween, and partly covering the ends of said joists and the spaces between such ends, the side marginal portions of said sheeting being directed beneath the top compression members of said beams in spaced relationship thereto, and plastic material covering said beams and said sheeting and extending into the spaces between the top compression members of said beams and the underlying marginal portions of said sheeting.

5. In a building structure, spaced floor or roof beams having laterally extending top and bottom compression and tension members, respectively, joists of reinforced concrete extending between said beams and supported thereon, a plastic material supporting sheeting extending over said joists and over the spaces therebetween, parts of the joist reinforcements extending from said joists through and above said sheeting, the side marginal portions of said sheeting being directed beneath the top compression members of said beams in spaced relationship thereto, and plastic material covering said beams and said sheeting and extending into the spaces between the top compression members of said beams and the underlying marginal portions of said sheeting and having the aforesaid parts of the joist reinforcements embedded therein.

6. In a building structure, spaced floor or roof beams having webs and bottom flanges, joists extending between said beams and resting at their ends on the bottom flanges thereof, the ends of said joists being spaced from the webs of said beams, a plastic material supporting sheeting covering said joists and the spaces therebetween and extending downwardly over portions of the ends of said joists and over portions of the spaces between the ends of said joists, and plastic material covering said sheeting and said beams and extending into the spaces between the webs of the beams and the downwardly extending portions of said sheeting and downwardly over the bottom flanges of said beams.

7. The combination as set forth in claim 6 including ceiling lath material secured against the bottoms of the joists and extending across the bottoms of the spaces therebetween, and plastic ceiling material extending across the bottoms of the beams and the joists and across the bottoms of the spaces between said beams and joists and having said ceiling lath material embedded therein.

8. The combination as set forth in claim 6 including ceiling material extending across the bottoms of the spaces between the beams and the joists and cooperating with the plastic material covering said spaces to provide a hollow or cellular floor or roof structure.

9. The combination as set forth in claim 5 in which ceiling lath and ceiling material extend across the bottoms of the spaces between the beams and the joists, and in which some of the joist reinforcements extend below the joists and serve to fasten the ceiling lath to the joists.

10. The combination as set forth in claim 2 in which the beams have top flanges and in which additional flange members and composite beam bonds for the plastic material are carried by and extend laterally from the top flanges of the beams and are embedded in the plastic material.

11. A pre-fabricated unit for the reinforcement of floors, roofs and the like formed from plastic material, said unit comprising laterally spaced joists, and foraminous metal attached to said joists and extending across the space between the tops of said joists and downwardly across the upper portions of the spaces between the ends of said joists.

12. A pre-fabricated unit for the reinforcement of floors, roofs and the like formed from plastic material, said unit comprising laterally spaced joists, and upper and lower sheets of foraminous metal attached to the tops and the bottoms of said joists and extending respectively across the spaces between the tops and the bottoms of said joists, the end portions of the upper sheet extending downwardly across the spaces between the upper portions of the ends of the joists.

13. A pre-fabricated unit for the reinforcement of floors, roofs and the like formed from plastic material, said unit comprising laterally spaced joists the tops of which are shorter than their bottoms, and metal lath extending across the tops and ends of said joists and across the space between the tops and partly across the space between the ends of said joists and fastened to said joists.

14. A pre-fabricated unit for the reinforcement of floors, roofs and the like formed from plastic material, said unit comprising at least one joist intermediate the ends of the unit, sheet metal members at the ends of the unit having the side elevational shape of the joist, and metal lath

material extending over said joist and said members and over the spaces therebetween.

15. A pre-fabricated unit as set forth in claim 14 in which the sheet metal members at the ends of the unit have outwardly directed bottom flanges for cooperation with the companion flanges of adjacent units to close the bottoms of the spaces between the end members of adjacent units.
16. A pre-fabricated unit for the reinforcement of floors, roofs and the like formed from plastic material, said unit comprising a plurality of spaced, parallel joists having downwardly and outwardly inclined ends, and metal lath material extending across the tops of said joists and across

the spaces between the tops of said joists, downwardly over the ends of said joists and partly over the spaces between the ends of said joists, and downwardly over the sides of the two outermost joists.

17. A pre-fabricated unit as set forth in claim 16 in which the joists comprise top and bottom compression and tension members, respectively, and rods connecting said compression and tension members.

18. A pre-fabricated unit as set forth in claim 11 including stays between the joists holding them spaced and upright.

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