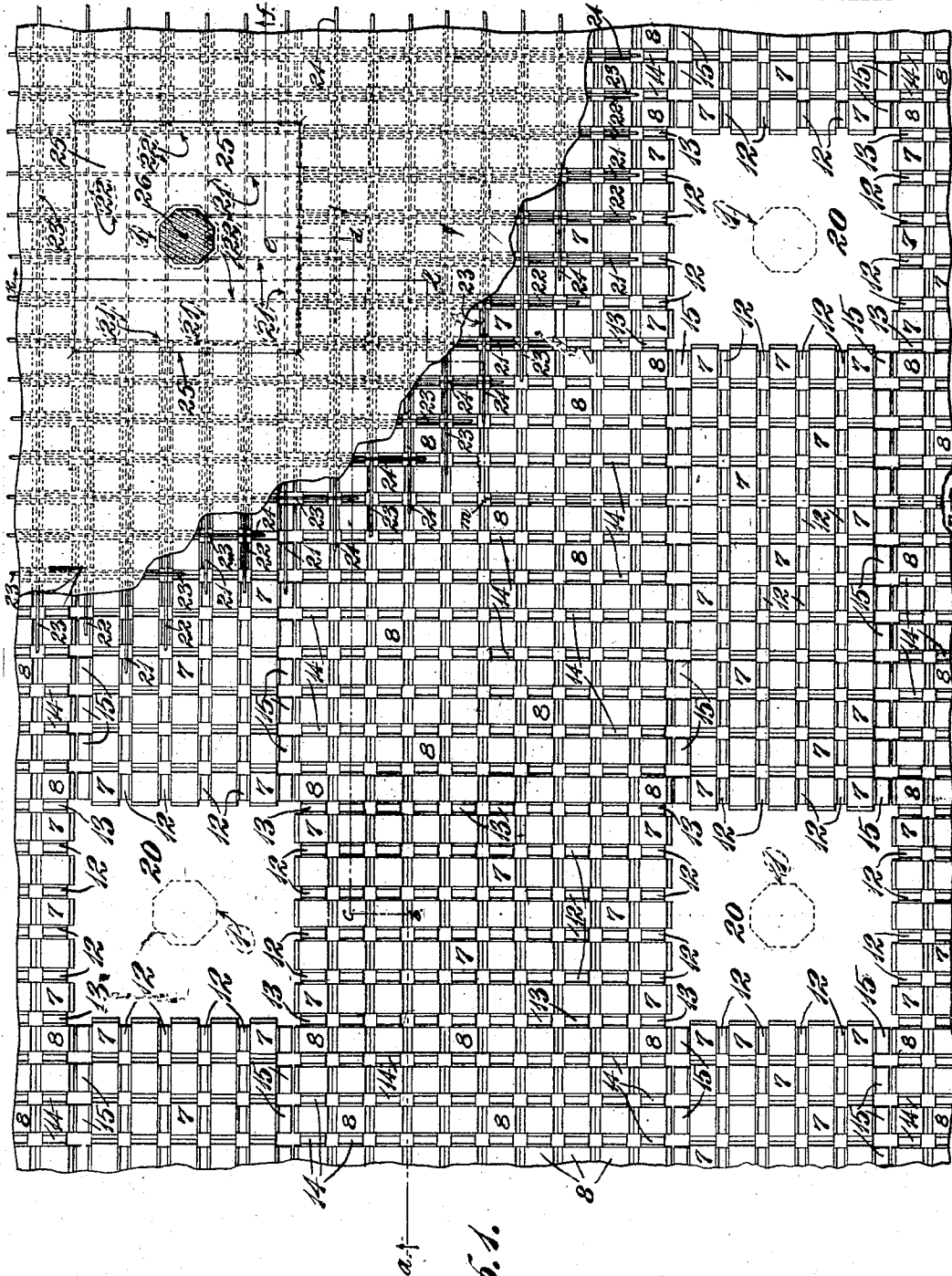


A. E. LINDAU.
FLOOR CONSTRUCTION.
APPLICATION FILED SEPT. 18, 1911.

1,060,104.

Patented Apr. 29, 1913.

4 SHEETS—SHEET 1.

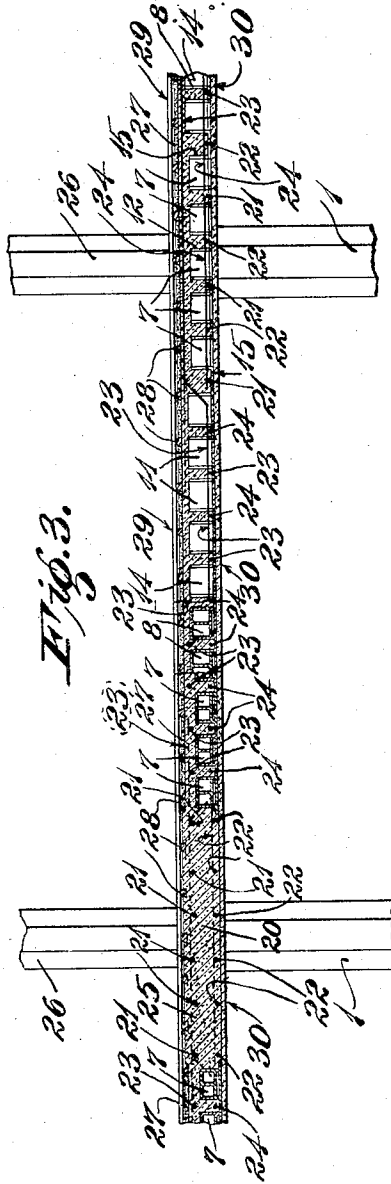
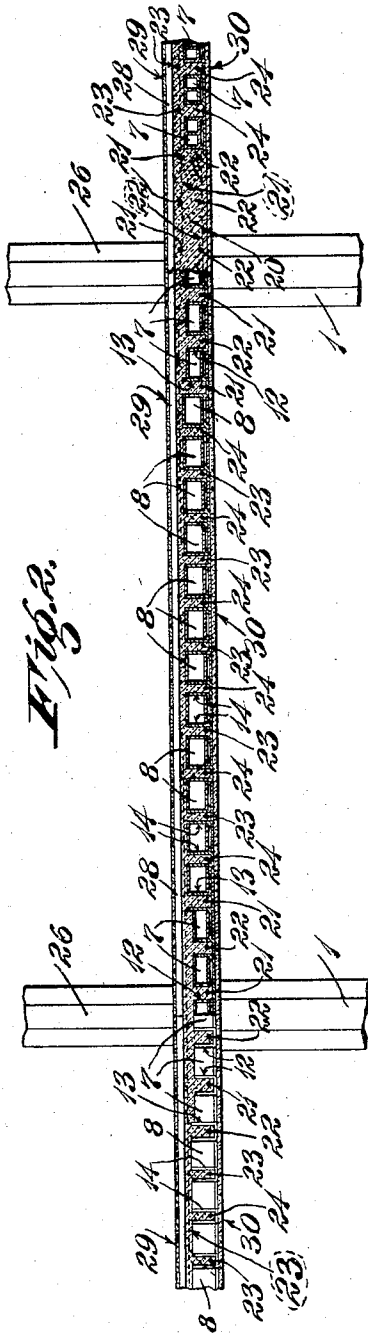


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Fig. 1.

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1,060,104.



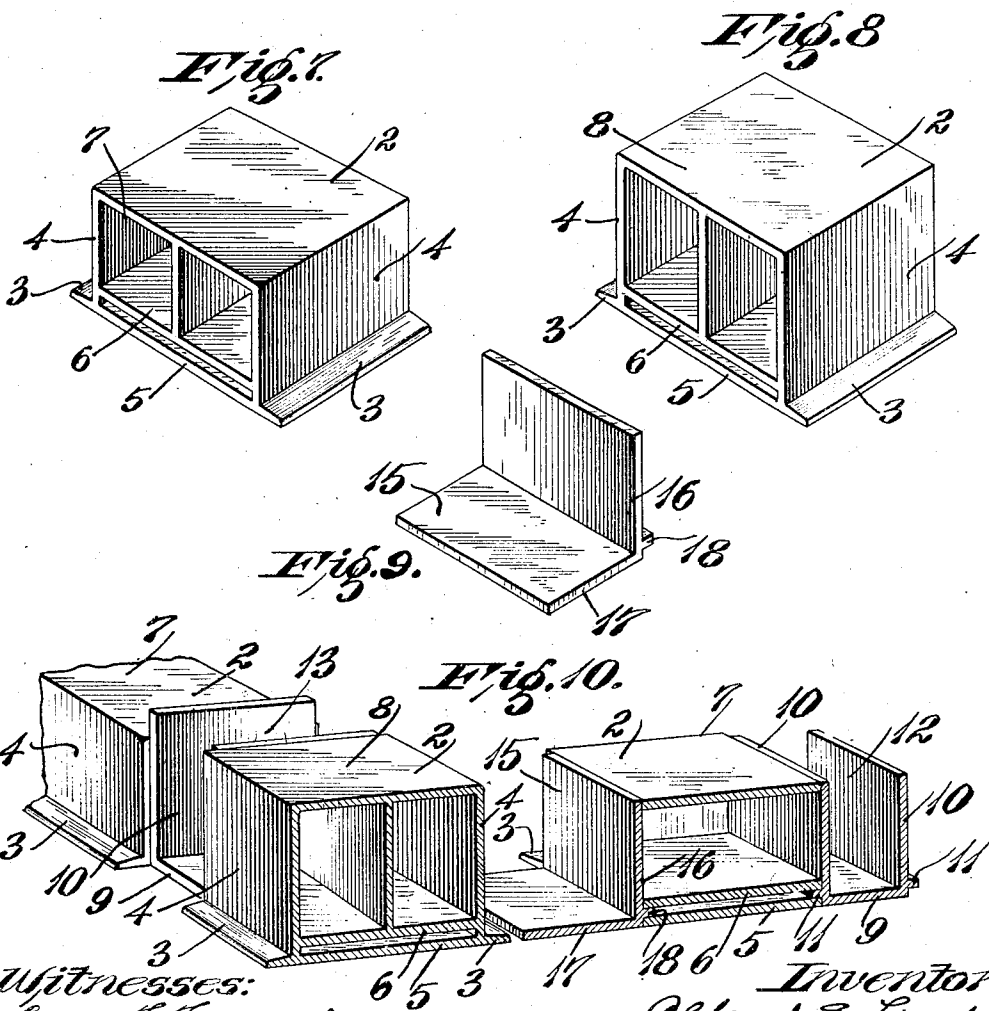
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APPLICATION FILED SEPT. 18, 1911.

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4 SHEETS—SHEET 3.



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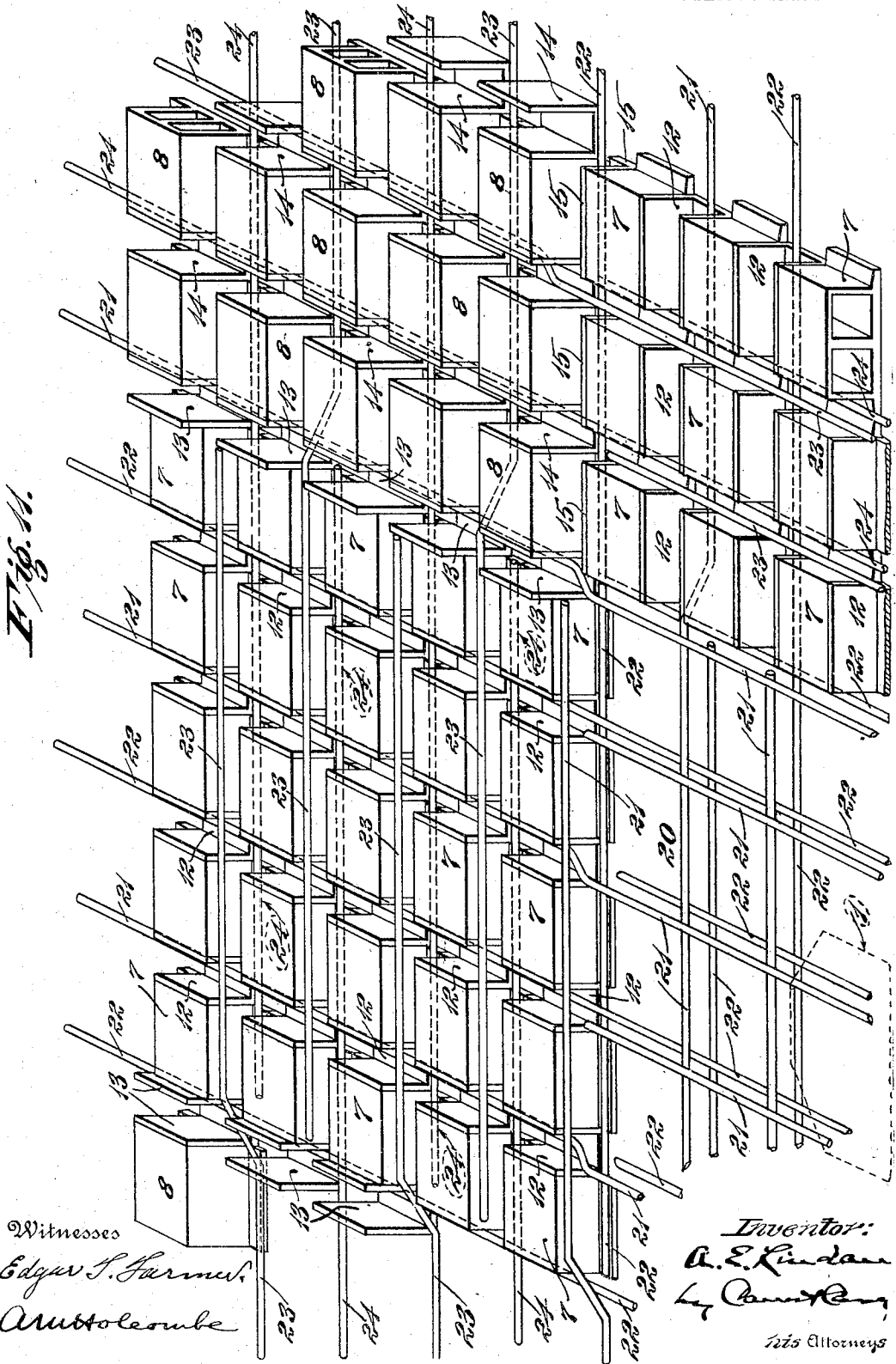
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4 SHEETS—SHEET 4.

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UNITED STATES PATENT OFFICE.

ALFRED E. LINDAU, OF ST. LOUIS, MISSOURI, ASSIGNOR TO CORRUGATED BAR COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

FLOOR CONSTRUCTION.

1,060,104.

Specification of Letters Patent.

Patented Apr. 29, 1913.

Application filed September 18, 1911. Serial No. 649,887.

To all whom it may concern:

Be it known that I, ALFRED E. LINDAU, a citizen of the United States, and a resident of the city of St. Louis and State of Missouri, have invented a new and useful Improvement in Floor Constructions, of which the following is a specification.

My invention relates to fireproof floor construction, particularly to tile-concrete floors supported on columns, without beams or girders projecting below the under surface thereof; and has for its object the production of a light, fireproof floor, of considerable thickness and great strength, and free from beams or girders projecting below its lower surface.

A further object of the invention is the construction of the floor of special tiles in such a way as to avoid the necessity for employing skilled labor, reduce the amount of falsework or forms for the concrete required, economize materials of construction, and dispense with much of the labor of spacing the reinforcing rods in proper position ready to receive the concrete.

I attain these objects by forming the entire floor of hollow tiles of sizes suited to the location of the respective tiles with regard to the supports of the floor, and by filling in the spaces between the tiles with concrete reinforced with metal rods.

The shape and size of the respective tiles used determine the amount of concrete and its relative position in the floor, and also largely control the arrangement of the metal reinforce, and so by properly choosing the form of tile to be used in each part of the floor much of the labor of erection of forms, molds and spacing devices for the concrete and metal reinforce is dispensed with, and a light, strong floor insured.

Further details of my invention will appear in connection with the description of the embodiment thereof illustrated in the accompanying drawings, in which like characters designate like parts throughout the several views, and will be particularly pointed out in the appended claims.

In the drawings Figure 1 is a plan view of a partly built floor, showing the arrangement of tiles, and showing reinforcing rods and concrete in place in one corner thereof, the column at that corner being shown in section; Fig. 2 is a transverse section through the completed floor on the line *a b*

c d e f in Fig. 1; Fig. 3 is a transverse section through the floor shown in Fig. 1 on the line *h i m n* therein; Figs. 4 to 9, inclusive, are perspective views of tiles used in my floor, showing the approximate relative proportions thereof; Fig. 10 is a perspective view of several tiles showing how they may be assembled to form hollow units with spaces for concrete ribs left between them; and Fig. 11 is a perspective view of a portion of a partly constructed floor in which the tiles and reinforcing bars have been assembled in position ready to receive the concrete.

In constructing a floor according to my invention false work having a flat upper surface is erected between the columns 1 flush with the tops thereof. On this flat surface are arranged open end box tiles having flat tops 2 and provided with lateral flanges 3 adjacent to the lower extremities of the side walls 4 thereof, and which may be provided with intermediate webs 6 parallel with the bases 5. These tiles are of two heights, as shown in Figs. 7 and 8, the tiles 7 being of less height than the tiles 8, and the former are arranged in rows adjacent to the margins of the floor panels, while the latter are arranged in rows across the central portion thereof, the rows in each case comprising tiles of uniform height with their lateral flanges in contact, and each two rows separated by a space. In the spaces between the rows extending in the same direction channel tiles having bases 9 and side walls 10 provided near the bases with flanges 11 are arranged with the side walls 10 closing the open ends of the box tiles. The flanges 11 fit into the narrow spaces between the bottoms 5 and intermediate webs 6 of the box tiles and lock the tiles together to insure their remaining in proper spaced relation. These channel tiles are of various heights and widths, as shown in Figs. 4, 5 and 6, the tiles 12 and 13 being wider than the tiles 14, and the tiles 12 being shallower than the tiles 13 and 14. Angle tiles 15, shown in Fig. 9, each having a vertical flange 16, a base 17, and a lateral flange 18 projecting from the vertical flange near the base, are arranged with the vertical flanges closing the ends of the box tiles in the marginal rows transverse to the rows across the center of the panel, the lateral flanges 18 projecting into the spaces between the bases

5 and intermediate webs 6 of the box tiles as previously described with respect to the channel tiles.

The marginal rows of tiles terminate short of the columns, leaving spaces 20 without any tiles therein adjacent to the columns. These spaces when filled with concrete become integral parts of the floor panels and serve as corner supports therefor.

The spaces between adjacent tiles form intersecting channels extending throughout the entire floor panel, parallel with its four margins, and in line with similar channels in adjacent panels. In these channels corrugated bars or other reinforcing rods are arranged, which are later embedded in concrete to form reinforced concrete ribs between the tiles. The reinforcing bars may be arranged in various ways, but I prefer to use straight bars 22, 24, alternating with bars bent up at the ends 21, 23, in consecutive channels across the panel in each direction. These bars may be extended into the adjacent panels, in which case I prefer to arrange the straight and bent bars in such a way that a bent bar from one panel and a straight bar from the adjacent panel overlap in the respective channels at the marginal region of the panels, the straight bar being at the bottom of the channel and the bent bar being at the top of the channel, as shown in Figs. 2 and 3. In arranging the straight and bent bars in the channels, those crossing the panels in the direction of the longer span are placed in position first and rest upon the bases or base flanges of the tiles, thus bringing the plane of the neutral axis of the panel near the bottom surface thereof. These bars having been placed, those crossing the panel in the direction at right angles thereto are arranged in position resting upon those already placed, the straight and bent bars alternating as before. The bars 21, 22, adjacent to the margins of the panels and lying in the spaces formed by the wider channel tiles 12 and 13, may be made of larger cross-section than the bars 23, 24, across the midportions of the panels, or a plurality of bars may be arranged in each of these wider channels, as may be found convenient. In either case the reinforced concrete ribs in these marginal channels will have a greater cross sectional area of concrete and metal reinforce than those across the midportions of the panels. The object of this arrangement is to stiffen the floor and reduce the deflections of the portions of the panels between the columns, thus lessening the tension stresses in the top of the floor slab over the columns.

Following the positioning of the reinforcing bars, and any pipes, ducts or conduits for water, gas, electricity, compressed air, or other purpose whatsoever, concrete is laid in the spaces between the tiles and to

the desired thickness over the tops thereof, and thoroughly rammed into place to bond the tiles and reinforcing bars into a rigid composite unitary structure. The depth of the concrete adjacent to the columns may be made slightly greater than at any other place in the floor, thus forming pedestals beneath the columns supporting the floors above. Over the remaining portion of the concrete there may be placed cinders or other fireproof filling material, in which are embedded sleepers 28 upon which the wood flooring 29 is laid. The temporary false work having been removed, plaster or other finish 30 may be applied to the under side of the panels, completing the floor.

Although one of the objects of my invention is the elimination of beams or girders projecting below the lower surface of the floor panels, it is evident that my improved floor panels are not restricted to use in such a girderless floor, but are equally well adapted to floors in which girders are used.

Having described my improvement in all its parts, what I desire to claim as my invention and secure by Letters Patent is as follows:

1. In a tile-concrete floor panel, a section comprising a marginal row of open-end box tiles having lateral flanges adjacent to the bottoms of the sides thereof, said tiles being placed with their axes transverse to the row and their side flanges touching each other, L-shaped tiles spaced apart lengthwise alongside said row of tiles with their vertical members closing the adjacent open ends thereof and with their horizontal members in contact with the sides of spaced open-end box tiles comprised in a marginal row of a second section of said tile-concrete floor panel, said spaced open-end box tiles being placed with their axes parallel with the row, U-shaped tiles placed between the ends of the box tiles comprised in said marginal row in said second section with their vertical members closing the open ends of said box tiles, and a filling of concrete between said tiles.

2. In a tile-concrete floor panel, a marginal section comprising a row of open-end box tiles having lateral flanges adjacent to the bottoms of the sides thereof, said tiles being placed with their axes transverse to the row and their side flanges touching each other, L-shaped tiles arranged along the inner side of said row of tiles with their vertical members closing the adjacent open ends thereof and with their horizontal members in contact with the side flanges of open-end box tiles comprised in a marginal row of a central section of said tile-concrete floor, said last named box tiles being placed with their axes parallel with the row and with spaces between their ends, U-shaped tiles in said spaces with their vertical members

closing the open ends of said box tiles, said box tiles and U-shaped tiles comprised in said central section being of a different height from the box tiles comprised in said marginal section and L-shaped tiles, and a filling of concrete between said tiles and above those of lesser height.

3. A flat slab floor supported on rows of columns, said floor being of uniform thickness throughout its entire area except for the portions over and adjacent to the supporting columns, which portions are increased in thickness, said increased thickness being on the upper side of the slab, reinforcing rods extending through said floor along lines parallel to the rows of columns and crossing each other between and over the columns, some of the rods being in the upper part and some in the lower part of the slab in the thickened portions thereof near the columns whereby said floor slab simulates the action of a homogeneous flat plate.

4. A flat slab floor supported on rows of columns, said floor being of uniform thickness throughout its entire area except for the portions over and adjacent to the supporting columns, which portions are increased in thickness, said increased thickness being on the upper side of the slab, reinforcing rods extending through said floor along lines parallel to the rows of columns and crossing each other between and over the columns, some of the rods being in the upper part and some in the lower part of the slab in the thickened portions thereof near the columns, said rods overlapping one above the other in pairs, both rods of each pair being in the same vertical plane, but one of said rods being in the top part of the slab and extending in one direction and the other rod being in the bottom part of the slab and extending in the opposite direction whereby said floor slab simulates the action of a homogeneous flat plate.

5. In a tile-concrete floor construction, a floor panel comprising solid concrete corner portions, a tile-concrete central portion, marginal portions of less thickness than said corner portions and central portion, said marginal portions comprising concrete ribs extending from corner portion to corner portion and hollow tile embedded in the concrete, and said marginal portions being contiguous to similar portions of adjoining panels, and a slab of concrete overlying the marginal portions.

6. A floor panel comprising solid concrete corner portions, rows of hollow tiles and intervening concrete ribs connecting said corner portions around the margins of the panel, a tile concrete central portion, and a slab of concrete overlying the tiles, said slab being thicker over the marginal portions of the panel than over the said central portion.

7. A floor panel comprising rows of hol-

low tiles and intervening concrete ribs forming its marginal portions, said rows of tile and ribs extending parallel with the respective margins of the panel, and a central portion of spaced tile and intersecting concrete ribs positioned between said tile, said marginal tile being of less height than those in the central portion of the panel.

8. A floor panel of uniform thickness comprising marginal rows of hollow tiles and concrete ribs between said tiles, and a tile concrete central portion, the tiles over the marginal portions of said panel being of less depth than those over the central portion thereof, and a slab of concrete covering said marginal tiles and integral with the ribs extending between the same.

9. A floor panel comprising reinforced concrete ribs separated by hollow tile units, said ribs crossing the panel in series parallel with its four margins, said hollow tile units being of less depth adjacent to the margins of the panel than in the central portion thereof, and a slab of concrete integral with said ribs.

10. A floor panel comprising reinforced concrete ribs separated by hollow tile units, said ribs crossing the panel in series parallel with its four margins, the ribs adjacent to the margins being of greater width than those remote from the margins, and said hollow tile units being of less depth adjacent to the margins of the panel than in the central portion thereof, and a slab of concrete integral with said ribs overlying the marginal portions of said panel.

11. A concrete floor construction comprising columns and a rectangular panel supported thereby at its corners, said panel being of uniform thickness except at the corners, the corner portions being of concrete and thicker than the remainder of the panel, said remaining portion comprising a concrete slab and concrete ribs integral therewith, said ribs being separated by filler blocks of varying depth, the blocks adjacent to the margins of the panel being of shallower depth than those in the midportion thereof.

12. A concrete floor construction comprising supports and a panel of uniform thickness carried thereby, said panel comprising a slab of concrete of varying thickness having reinforced ribs integral therewith, and filler blocks of varying depth secured between said ribs, the filler blocks of shallower depth being arranged adjacent to the margins of the panel.

13. In a composite hollow tile and concrete floor panel, series of concrete ribs extending between the tile across the panel parallel with its side margins, reinforcing bars in the lower region of the respective ribs, said bars being some straight and some bent up at the ends to lie in the upper re-

gion of the respective ribs near the margins of the panel, said straight and bent bars being arranged in alternate ribs of each series across the panel.

5 14. In a composite hollow tile and concrete floor panel, series of concrete ribs extending between the tile across the panel parallel with its side margins, reinforcing bars in the lower region of the respective ribs, said bars being some straight and some bent up at the ends to lie in the upper region of the respective ribs near the margins of the panel, said straight and bent bars being arranged in alternate ribs of each series across the panel, the bars in the ribs adjacent to the side margins of the panel being of greater cross section than those remote from the side margins of the panel.

15 15. In a composite flooring comprising a plurality of panels, a system of reinforcing rods crossing the respective panels at right angles to the margins thereof and extending into the adjacent panels, a second system of reinforcing rods crossing the respective panels at right angles to the first mentioned system of rods and extending into the adjacent panels, said rods being straight throughout their lengths and positioned in the lower region of the respective panels, reinforcing bars alternating with the rods in each of the systems above mentioned and having their middle portions in substantially the same planes therewith respectively but bent up at the ends to lie in the top region of the panels adjacent to the margins thereof, the ends of said bent bars lying in

substantially the same vertical planes respectively as the ends of the straight rods in adjoining panels whereby said floor slab simulates the action of a homogeneous flat plate.

16. In a composite flooring comprising a plurality of panels supported at the corners thereof, a system of reinforcing rods crossing the respective panels at right angles to the margins thereof and extending into the adjacent panels, a second system of reinforcing rods crossing the respective panels at right angles to the first mentioned system of rods and extending into the adjacent panels, said rods being straight throughout their lengths and positioned in the lower region of the respective panels, reinforcing bars alternating with the rods in each of the systems above mentioned and having their middle portions in substantially the same planes therewith respectively but bent up at the ends to lie in the top region of the panels adjacent to the margins thereof, the ends of said bent bars lying in substantially the same vertical planes respectively as the ends of straight rods in adjoining panels, the respective rods and bars parallel with and adjacent to the respective side margins of the panels being of greater cross section than those remote from said margins.

Signed at St. Louis, Missouri, this 15th day of September, 1911.

ALFRED E. LINDAU.

Witnesses:

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M. A. SHELTON.