No. 768,285. PATENTED AUG. 23, 1904.

J. KAHN.

FIREPROOF FLOOR OR CEILING.

APPLICATION FILED MAY 18, 1904.

NO MODEL.

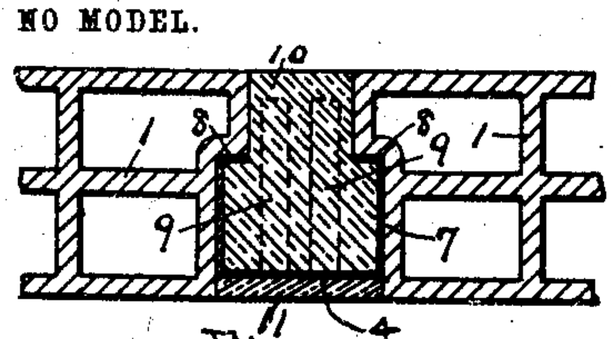

Fig. 1.

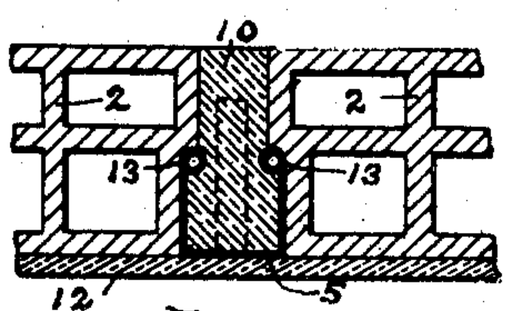

Fig. 2.

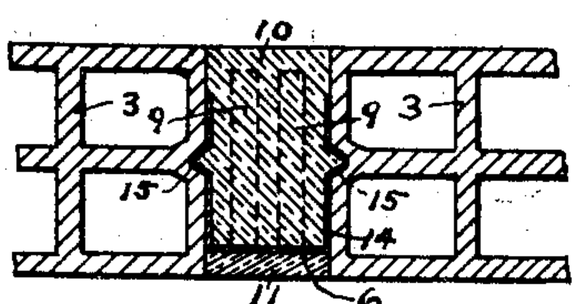

Fig. 3.

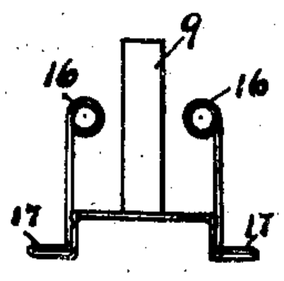

Fig. 4.

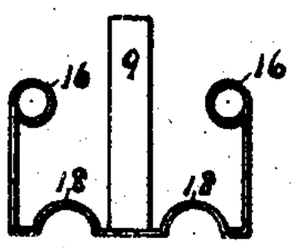

Fig. 5.

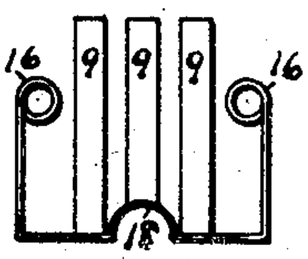

Fig. 6.

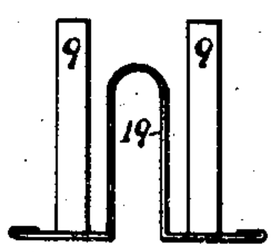

Fig. 7.

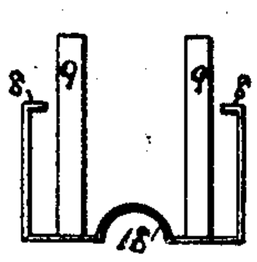

Fig. 8.

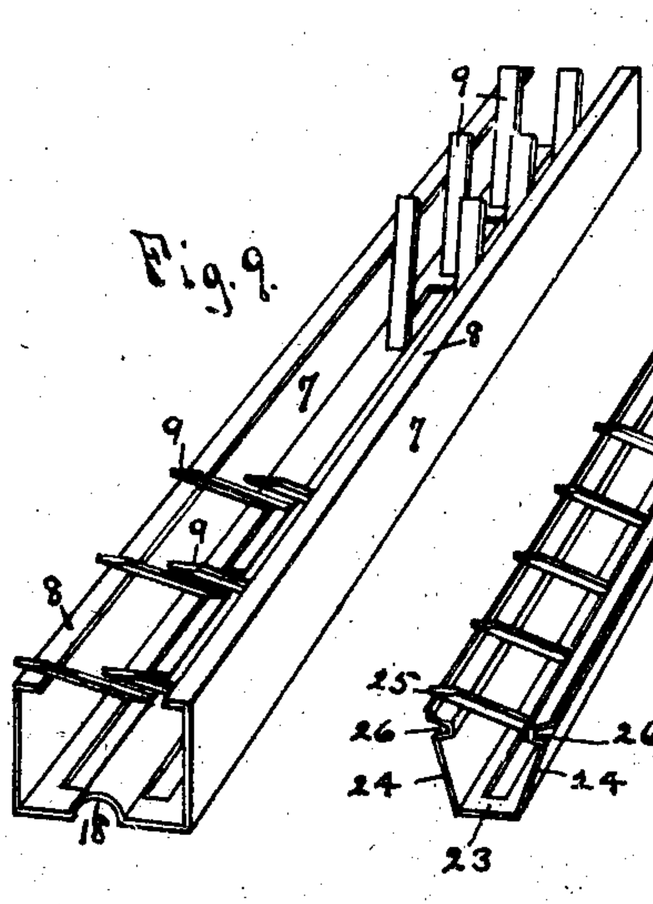

Fig. 9.

Fig. 10.

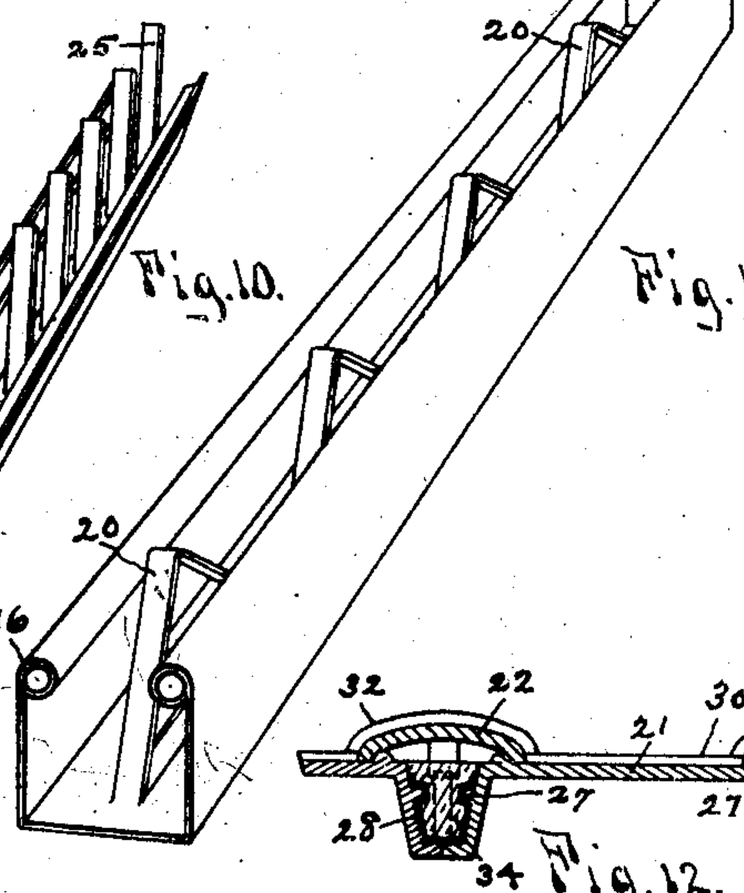

Fig. 11.

Fig. 12.

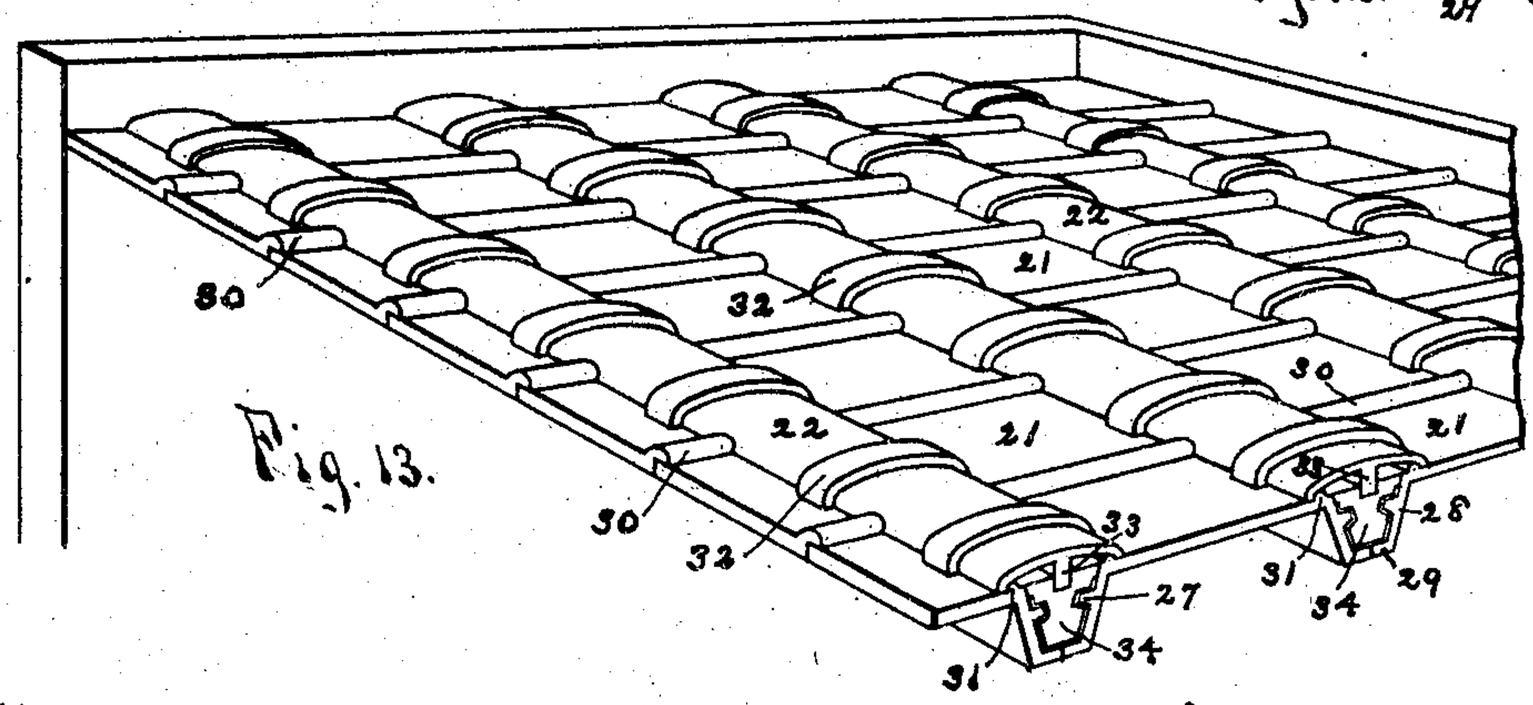

Fig. 13.

Witnesses.
Geo. W. Barnes.
Emma Peterson.

Inventor.
Julius Kahn.
by Edward N. Pagelsen.
his Attorney.

No. 768,285. Patented August 23, 1904.

UNITED STATES PATENT OFFICE.

JULIUS KAHN, OF DETROIT, MICHIGAN.

FIREPROOF FLOOR OR CEILING.

SPECIFICATION forming part of Letters Patent No. 768,285, dated August 23, 1904.

Application filed May 18, 1904. Serial No. 208,508. (No model.)

To all whom it may concern:

Be it known that I, JULIUS KAHN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and Improved Fireproof Floor or Ceiling, of which the following is a specification.

My invention relates to floors and ceilings composed of tiles of terra-cotta, cement, or other material supported by composite steel and concrete beams; and the objects of my improvement are to provide a fireproof floor or roof construction in which tiles may be set without the use of centering or false work, to provide a floor or ceiling that is self-sustaining from the first and that constantly becomes stronger, and to provide composite steel and concrete trussed beams that may be built up *in situ* without the aid of molds. These objects I attain in the construction set forth in the accompanying drawings, in which—

Figures 1, 2, and 3 are cross-sections of portions of floor beams and tiles of different constructions. Figs. 4, 5, 6, 7, and 8 are cross-sections of various forms of metal tension members for composite beams. Figs. 9, 10, and 11 are perspectives of various forms of tension members. Fig. 12 is a cross-section of part of a roof and its trusses; and Fig. 13 is a perspective of said roof, two walls being removed.

Until recently it was the universal and still is the prevalent custom in building steel-frame buildings to construct the floors out of rolled-steel beams and terra-cotta tiles carried by the beams. Where long spans are met, intermediate beams are used until the spaces between the beams are such that they can be conveniently and safely spanned by flat arches of tiles. The amount of metal in the beams must be considerable, and a moderate fire will cause the metal beams to buckle and dump the tiles. To obviate the necessity of using the large amounts of metal and to provide against the floor being destroyed because of the beams buckling under heat, engineers introduced beams of combined metal and concrete, which when properly constructed meet the requirements mentioned; but in using these composite beams it has been necessary to provide false work or centering to support the concrete until it has hardened sufficiently to carry the load, often a period of several weeks. The invention here shown overcomes the necessity for centering in that the metal of the tension member is so rolled that it will not only support the tiles of the floor or roof, but also forms a mold for the concrete that is to complete the trussed beam that shall be strong enough when the concrete hardens to carry the load expected.

The tension members for composite beams shown in the drawings are trough-shaped, being bent up from sheets of thin steel and having tongues or auxiliary tension members struck up from the metal forming the bottom of the trough and projecting above the walls. These tension members are in themselves box-girders and are constructed of sheets of sufficient thickness to form beams strong enough to support the tiles and the concrete that is to unite with the metal to form the composite beams. These box-girders are placed with their ends resting on the walls of the building or other floor or roof supports. They are spaced apart the requisite distance and building-tiles lowered down between them. In Figs. 1, 2, and 3 this combination is shown. The tiles 1, 2, and 3 are formed to fit the beams 4, 5, and 6. The beam 4 has upwardly-extending walls 7 and inwardly-extending flanges 8, upon which the tiles rest. The upwardly-extending auxiliary members 9 project above the flanges 8, as shown, and are embedded in the concrete 10, which fills the trough and the space between the tiles. To protect the lower flat portion of the metal beam from heat below it, I may have the tiles projecting below the lower plate and fill the space with cement or concrete, as at 11, or add an even thickness of cement or other cementitious substance 12 to the tile and plate, as in Fig. 2. As the tongues 9 are struck up from the bottoms of the troughs slots will be formed, through which the concrete 10 will be exposed, and a union with the cement 11 and 12 will be formed at those points. In Fig. 2 the walls of the trough are shown to terminate in cylinders 13, that support the tiles 2. In Fig. 3 the walls 14 are formed with pro-

jecting ridges 15, that fit grooves in the sides of the tiles. In constructing floors of these beams and tiles each beam must be finally positioned after the tiles between it and the preceding beam are placed.

Fig. 4 shows a construction where the tiles will rest on both the cylindrical flanges 16 and the flat flanges 17.

In Figs. 5, 6, and 8 the semicylindrical portions 18 of the bottoms serve to stiffen the beam—a desirable feature when constructing heavy floors.

Fig. 7 shows the construction of Fig. 8 exaggerated in that the semicylindrical portion has been extended to take the place of the side walls and forms an inverted trough 19, while the side walls are omitted. The bottom flange has turned-over portions to carry the tiles, and the concrete is intended to be molded between the tiles and the portion 19 and over the top of the same. This construction forms a very rigid beam.

The auxiliary tension members 9 are preferably tongues, as shown in Figs. 9 and 10, that lie across the usual line of fracture of combined concrete and metal beams; but, if desired, they may be formed as shown in Fig. 11. In this construction the loops 20 are struck up from the bottom of the trough and project upward beyond the top of the sides of the trough. Concrete molded in the trough will be held in these loops, and any tensional stresses set up in the concrete will be transmitted to the metal of the trough.

In Fig. 13 is shown a roof composed of tiles 21 and 22 supported by composite beams of the same general character as above described.

The metal trough is shown in Fig. 10 and has a flat bottom 23, inclined sides 24, and upwardly-projecting tongues 25. The sides are formed with grooves 26 for the reception of the projections 27 on the tiles 21, by which projections the tiles are supported. The tiles 21 have downwardly-projecting sides 28 and flanges 29 projecting below the bottoms 23 to serve as fireproofing. They are also provided with overlapping portions 30 and with ridges 31 for positioning the auxiliary tiles 22. The tiles 22 have overlapping portions 32 and depending tongues 33, that are pushed into the still plastic concrete 34 and form a union with the same, thereby holding the tiles firmly in place. These tiles 22 serve to protect the concrete from the weather.

Having now described my improvements, what I claim as my invention, and desire to secure by Letters Patent, is—

1. In a composite beam, the combination of a metal tension member comprising a trough of uniform thickness having tongues struck up from the bottom and extending upward above the sides of the trough, and a cementitious body filling said trough and extending upward around and above the tongues, said tongues serving to transmit the tensional stresses in the cementitious body to the metal forming the trough.

2. In a composite truss-beam, the combination of a metal plate and upwardly-projecting grooved walls, and auxiliary tension members projecting upwardly from said plate beyond said walls, all of uniform thickness, and a cementitious body molded on said plate against said walls and around said auxiliary members and extending beyond the same, to form the compression member of said truss.

3. In a composite structure, the combination of a metal tension member of a truss of uniform thickness, comprising a base and upwardly-extending walls and having auxiliary tension members projecting upward, blocks of refractory material supported by said tension member, and a cementitious body united with said base, walls and auxiliary members and forming the compression member of the truss.

4. In a composite structure, the combination of a metal tension member of a truss of uniform thickness, comprising a trough having auxiliary tension members projecting upward from the bottom and grooved sides, tiles fitting against the sides of said trough and having projections to enter said grooves, and a cementitious body filling said trough to form the compression member of the truss, said tension member adapted to support the tiles and the cementitious body.

5. In a composite roof, the combination of metal tension members of uniform thickness comprising troughs having auxiliary tension members projecting upward from the bottoms and grooved sides, overlapping tiles fitting against the sides of adjacent troughs and having projections to enter said grooves, concrete filling said troughs to form the compression members of the trussed beams, and auxiliary tiles having overlapping ends forming covers for said trussed beams.

6. A metallic tension member for reinforcing concrete beams comprising a trough of uniform thickness and upwardly-extending auxiliary members struck up from the same the walls of said trough being grooved.

7. A metallic tension member for reinforcing concrete beams comprising a trough of uniform thickness and auxiliary members struck up from the bottom of the trough and extending beyond the walls.

8. A metallic tension member of uniform thickness for combined concrete and metal trusses, comprising a flat portion and corrugated walls at an angle to the same, and auxiliary tension members struck up from the same to form the diagonal members of the truss.

9. A metallic sheet-metal tension member for combined concrete and metal trussed beams, comprising a trough having a bottom

and side walls with inwardly-projecting portions, and auxiliary members struck up from the bottom of said trough.

10. A metallic sheet-metal tension member for combined concrete and metal trussed beams, comprising a trough having a bottom and side walls with inwardly-projecting portions, and auxiliary members extending upwardly from the bottom of the trough beyond to top of said walls.

11. In a composite structure, the combination of a metal tension member of a truss, comprising a trough having auxiliary tension members projecting upward from the bottom and grooved sides, tiles engaging said grooved sides and supported thereby, and a cementitious body filling said trough to form the compression member of the truss.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JULIUS KAHN.

Witnesses:
F. L. HALL,
EDWARD N. PAGELSEN.