June 14, 1932. A. H. TASHJIAN 1,863,257

COMBINATION STEEL JOIST AND DECKING FOR FLOOR CONSTRUCTION

Filed March 28, 1929 2 Sheets-Sheet 1

Fig. 1.

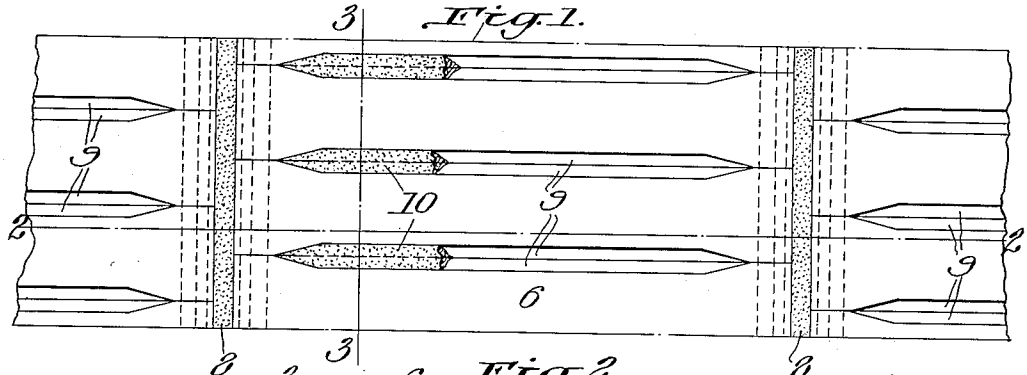


Fig. 2.

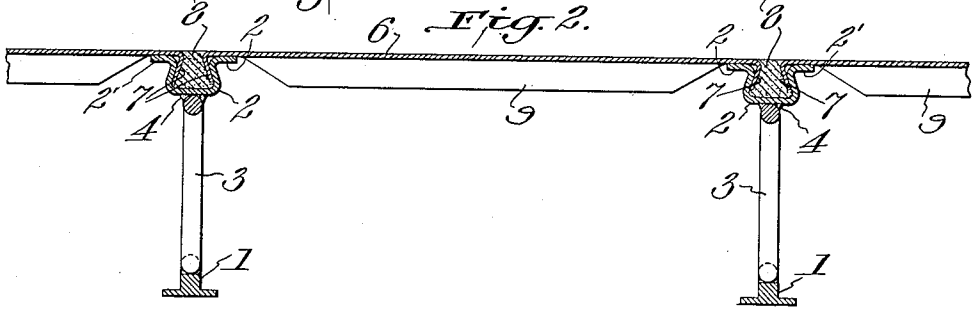
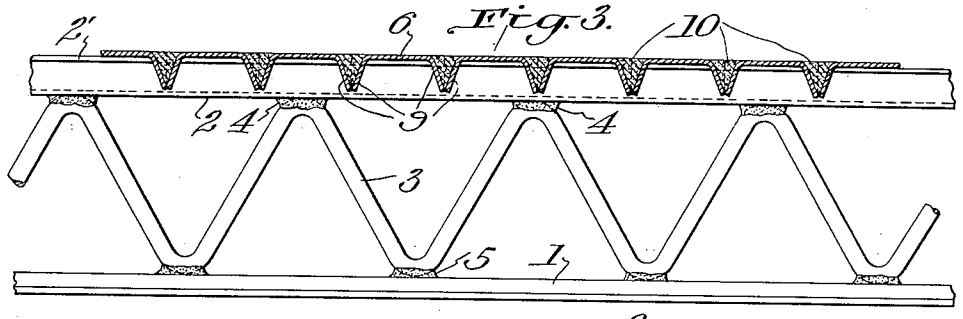


Fig. 3.



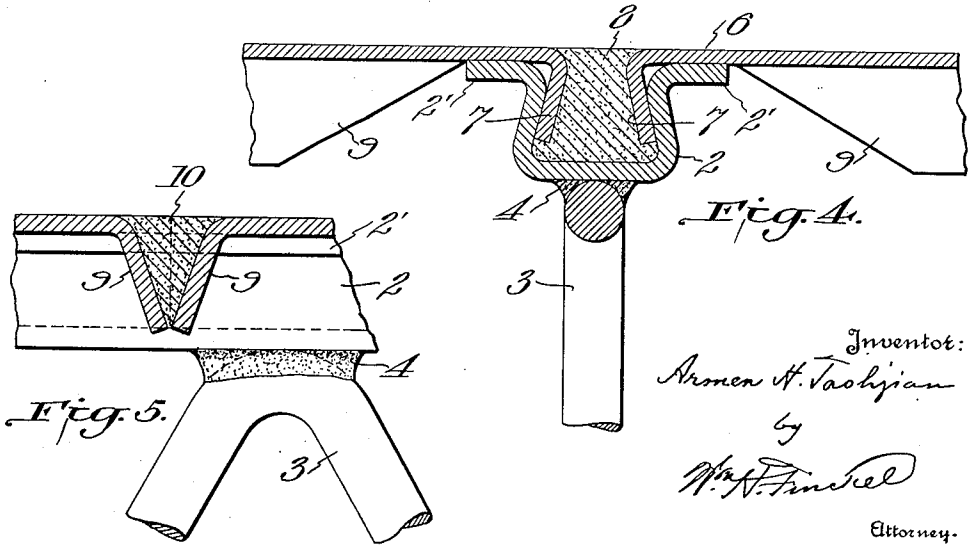


Fig. 4.

Fig. 5.

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Fig. 6.
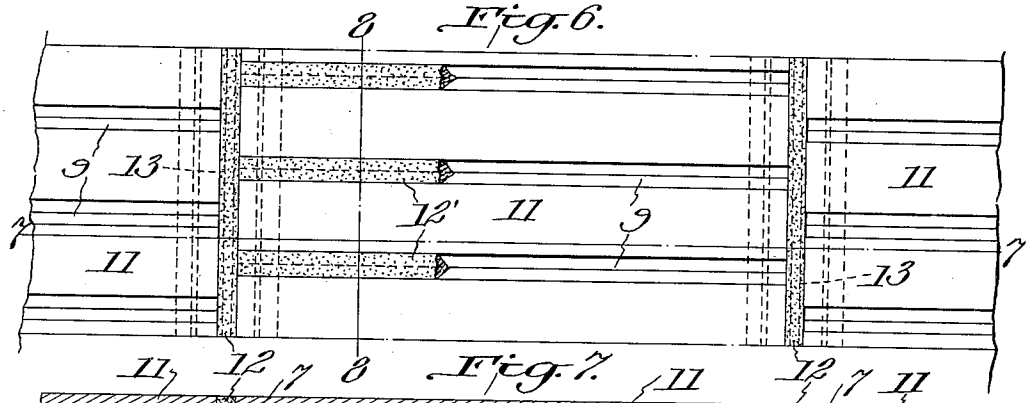


Fig. 7.

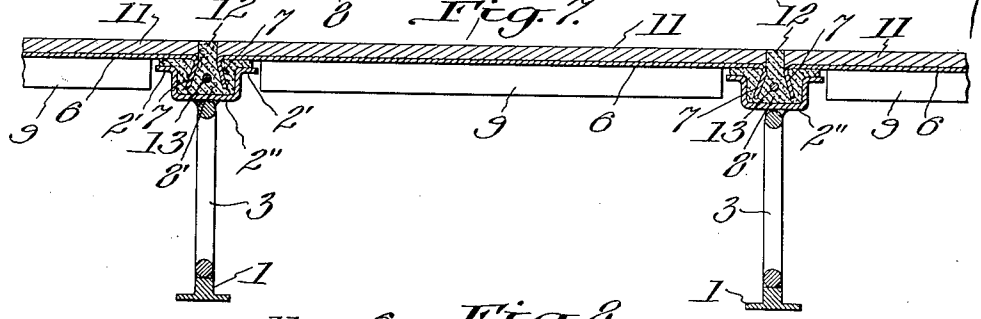


Fig. 8.

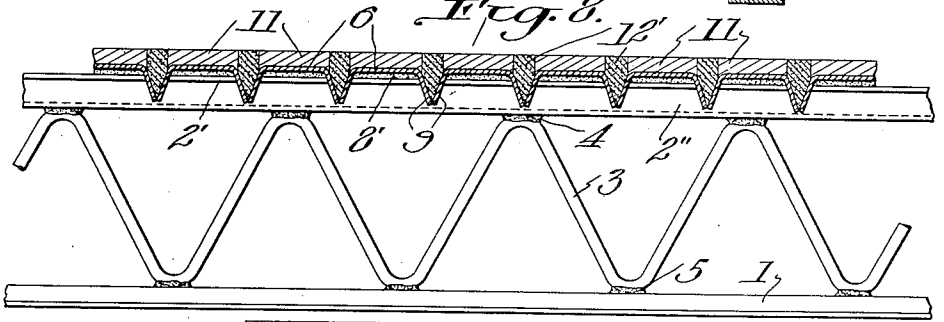


Fig. 9.

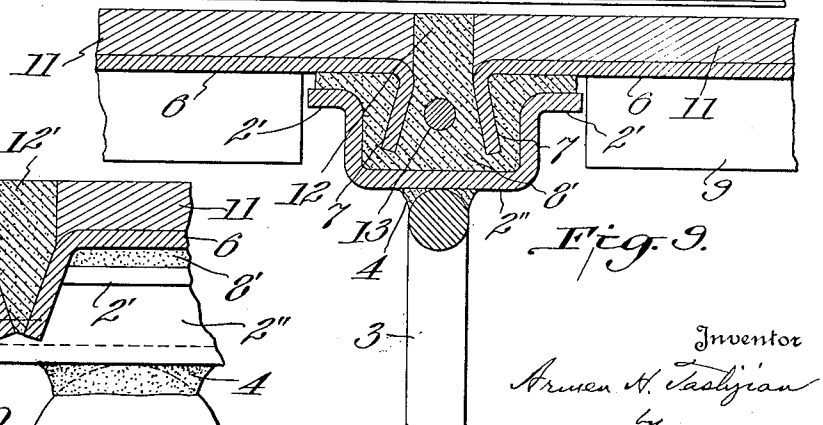
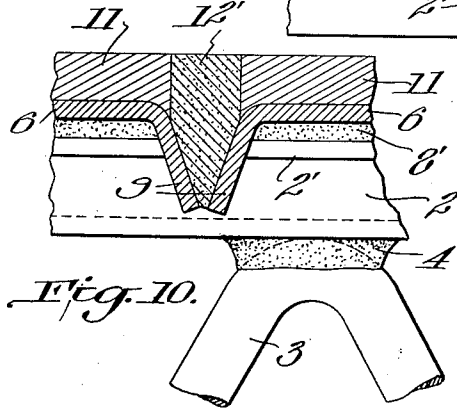


Fig. 10.



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Patented June 14, 1932 1,863,257

UNITED STATES PATENT OFFICE

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COMBINATION STEEL JOIST AND DECKING FOR FLOOR CONSTRUCTION

Application filed March 28, 1929. Serial No. 350,600.

The object of this invention is to provide an extremely light yet substantial and economical floor construction in which a combination of steel joists and steel or other decking, act cooperatively in substantially bracing, strengthening and supporting each other. Another object of the invention is to reduce to a minimum the field work of floor construction for buildings, thus making a substantial saving in building costs.

The invention consists of a floor construction made up of relatively light steel joists having grooved or channelled or U-shaped top chords and a finished decking composed of a series of metal or other preformed plates or tiles having their ends flanged and placed within the channels of the top chords and secured therein by a filling of grout, mastic or other suitable cementitious matter, thus producing a very light finished floor, wherein the interlocked flanges of the decking within the channels of the steel joist top chords together with the reinforced cement filling of the channels cooperatively act to increase materially the load carrying capacity of the floor construction as a whole, as I will proceed now to describe and finally claim.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a top plan view of a fragment of floor construction in which my invention is embodied, the spaces between the longitudinal edges of adjacent flanges being partly filled with cementitious matter. Fig. 2 is a longitudinal section taken on the line 2—2 of Fig. 1. Fig. 3 is a transverse section taken on the line 3—3 of Fig. 1. Fig. 4 is a longitudinal section, on a larger scale than Figs. 1, 2 and 3, showing a portion of a joist and its top chord with adjacent ends of aligned plates or tiles cemented in place. Fig. 5 is a transverse section on the same scale as Fig. 4, showing part of the chord member and the web member and the adjacent united sides of the plates or tiles and their cementing material. Fig. 6 is a top plan view of a fragment of floor construction illustrating some modifications; Fig. 7 is a longitudinal section taken on the line 7—7 of Fig. 6; Fig. 8 is a transverse section taken on the line 8—8 of Fig. 6; Fig. 9 is a longitudinal section, on a larger scale than Figs. 6, 7 and 8, showing a portion of the joist and its top chord with adjacent ends of aligned plates or tiles cemented in place, and Fig. 10 is a transverse section on the same scale as Fig. 9 showing part of the chord member and the web member and the adjacent united sides of the plates or tiles and their cementing material; Figs. 7, 8, 9 and 10 also showing the wearing tile of cement or composition cemented in place on the decking.

As shown in Figs. 1 to 5, the invention comprises a joist having a lower chord member 1 of inverted T-shape, proportioned for full load stresses, and an upper chord member 2 in the form of a groove or channel of substantially U-shape, proportioned for only field handling and field load stresses, and these two members are connected by a truss-like web 3 welded or otherwise secured, as at 4 and 5, to the upper and lower chord members.

The upper portions of the channels are formed with the laterally extending horizontal ledges 2′.

The decking is in the form of preformed plates or tiles 6 of steel or other suitable material, made in sections preferably of a length equal to the distance between joists, and having their ends flanged, as at 7, at an incline so as to extend into the upper chord member grooves or channels. After the decking plates or tiles are positioned in the channelled members, the space between is filled with grout, mastic, or other suitable cementitious matter 8, that will harden more or less readily.

The longitudinal edges of the plates or tiles are flanged as at 9, and these flanges are juxtaposed, but they are preferably so arranged as to leave an intervening space which is similarly filled with grout, mastic, or other suitable hardening and waterproof cementitious material 10 shown more particularly in Figs. 1, 3 and 5.

The cementitious filling at 8 and 8′ being wedge shape between flanges 7 furnishes an interlock between the steel trusses and the

decking plates or tiles and preventing them from lifting and causing them to act as a unit and materially stiffening both the decking and the top chords of the trusses, as well as strengthening the top chords of the trusses.

The plates or tiles may be of steel, as already described, or fiber, or of other composition, or metal, or may be of any other suitable material or composition. The principal feature is to provide for an interlocked combination of steel joist and floor decking.

It is to be noted that there is no riveting or welding of parts involving the filling level between the floor plates and the joists, but on the contrary, the assembly may be easily accomplished by simply placing steel joists at predetermined centers apart, dropping the decking plates in place, and filling the intervening spaces with the appropriate grout, mastic, or other cementitious matter.

As already sufficiently indicated, the invention relates to a so-called light steel joist floor construction. In all such prior constructions to me known, steel joists are placed at predetermined distances apart, and over these joints metal lath is placed and tied to the top chords of the joists, and over this metal lath, a concrete slab is poured, varying from two inches to four inches, the joists acting as structural carrying beams independently of the decking, and the metal lath and concrete acting as the floor deck, often with an additional finished floor laid on top of the structural slab. Such floors invariably crack badly.

The present invention provides a particular type of steel joist and preformed plate decking which will interlock with the top chords of the steel joists, making the whole act as a unit, at the same time furnishing a finished floor ready for use with carrying beams and finished floor decking combined.

The steel joists of this invention are made of two chords and a web welded or otherwise united and of regular standard type, but with the top chord preferably of grooved U-section, with the cross section of metal proportioned for field load stresses only, with a resultant saving of metal and cost. The floor plates are provided with two end edges 7 turned down or inverted, as flanges, to be inserted in the U groove or channel of the joist. In this way the floor plates are supported by the steel trusses or joists and in return support the top chord of the trusses or joists at predetermined centers apart and against side buckling. The balance of the top chord grooves or channels is filled with grout, mastic, cement, mortar, or other suitable filling and further reinforced with the introduction of a length of plain steel bar, presently mentioned, to furnish a finished interlock between the trusses and the floor plates and serving materially to strengthen and stiffen the trusses acting cooperatively with the trusses. The other two edges of the floor plates are turned down or inverted for strengthening the floor plates and the grooves between such turned down edges or adjacent floor plates are filled with mastic or other cementitious material to provide a watertight joint.

The steel joists and floor plates are so interlocked as to provide a positive construction, and thus produce a very stiff, strong, economical and extremely light floor construction with a finished floor decking ready for use.

As shown in detail in Figs. 2 and 4, the sides of the channelled upper chord of the truss converge and are in metal-to-metal facial contact of substantial extent with the flanges 7; and those portions of the flanges 9 adjacent to the trusses are cut off at an incline. In the construction shown in Figs. 7 and 9, the sides of the channelled truss member are shown as vertical and out of metal-to-metal contact with the flanges 7; and the cementitious material 8′ extends between and separates not only the flanges but also intervenes between the ledges 2′ and the floor plates, thus serving to sound-deaden the parts. Also as shown in Figs. 7 and 8, the lateral flanges of the floor decking are cut off straight with a vertical notch, instead of at an incline.

As shown particularly in Figs. 6 to 10, the finished floor preferably is composed of relatively small preformed plates or tiles 11 cemented at the joints 12 and 12′ which will eliminate irregular cracking of the floor. The joints 12 and 12′ are complements of the joints 8 and 10 respectively, of the construction shown in Figs. 1 to 5.

In order to sound proof or otherwise prevent direct contact of metal decking and the truss channels, said channels may be filled with the cementitious matter in advance of the placing of the metal decking. While the cementitious matter is still plastic, the metal decking is put in place so that its flanges enter the cementitious matter in the channels and displace it between the flanges and the ledges of the channel, as shown in Figs. 6, 7 and 9. In this way, there is no metal contact between the channels and the floor decking.

As previously stated, a reinforcing bar 13 is dropped in the cement of the truss top chords and between the flanges of the floor decking, as also indicated in Figs. 6, 7 and 9, in order to reinforce the truss top chord.

By the foregoing construction and arrangement of parts, when the structure is put together, it acts as a unit and not merely as an aggregation of separate component parts. The resultant top chord of the finished structure is the truss top chord channel, the flanges of the decking, the reinforcing element 13 when used, and the cement filling of the

grooves, all of them acting together as a unit to carry the full load stresses of the construction, which results in a much stronger structure than the component parts separately considered. Conversely, the top chord of the truss can be made much lighter than otherwise.

The construction shown in Figs. 7 and 9 for sound-deadening purposes by breaking contact of the adjacent plates and flanges, gives an opportunity of properly levelling and aligning the floor plates, together with the additional reinforcing 13.

Variations in the details of construction are permissible within the principle of the invention and the claims following.

What I claim is:—

1. A floor construction, comprising steel joists, the upper chords of which are provided with longitudinal channels having converging sides, and decking plates having flanged ends engaged within the longitudinal channels and cemented therein, the flanged ends of said plates arranged in facial contact with the sides of the channels.

2. A floor construction, comprising steel joists, the upper chords of which are provided with longitudinal channels having converging sides, and decking plates having inclined flanged ends arranged within the longitudinal channels and in facial engagement with the channel sides, the channels with said flanged ends thus arranged being filled in with cementitious material providing an interlocking connection of the channels and plates.

3. A floor construction, comprising steel joists, the upper chords of which are provided with longitudinal channels, and decking plates having flanged ends arranged within the longitudinal channels, the decking plates having also longitudinal inclined converging flanges abutted against one another.

4. A floor construction, comprising steel joists, the upper chords of which are provided with longitudinal channels, and decking plates having flanged ends embedded within the longitudinal channels, the decking plates having also longitudinal inclined converging flanges abutted against one another, the spaces between the abutting edges filled with cementitious material.

5. A floor construction, comprising lightweight joists having their top chords provided with U shaped grooves, and decking plates having inverted inclined end flanges entered into and engaging with the grooved portion of the top chords of the joists, and also having inverted longitudinal flanges, the spaces between adjacent inturned end edges and lateral edges being filled with a water-proof cementitious material, and a finish of plates or tiles cemented upon the decking plates and filling.

6. A floor construction, comprising lightweight trusses having channelled top chords, decking plates having flanged ends placed in the channels of the top chords, said decking plates provided with longitudinal inclined converging flanges abutting at their lower ends, and cementitious material filled in the channels and between the abutting flanges and forming a structural unit.

7. The combination of an inwardly bent channel chord and steel decking having parallel bent flanges in facial engagement with said channel, and a wedge-shaped filler in the channel which engages both channel and flanges whereby upward lifting of the decking is prevented.

In testimony whereof I have hereunto set my hand this 26th day of March A. D. 1929.

ARMEN H. TASHJIAN.

CERTIFICATE OF CORRECTION.

Patent No. 1,863,257. June 14, 1932.

ARMEN H. TASHJIAN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 75, claim 7, after the word "chord" insert the word truss; 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 4th day of Octoober, A. D. 1932.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.