

April 14, 1931.

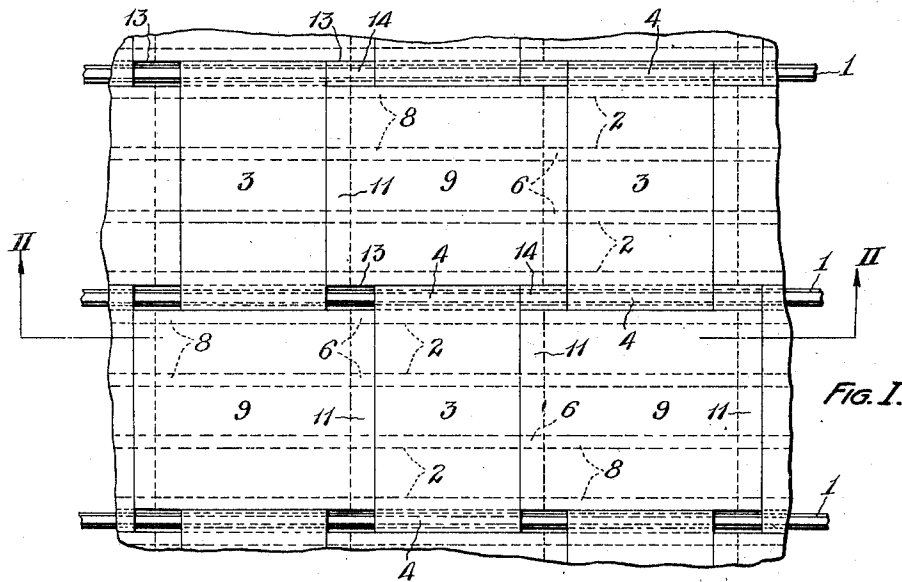
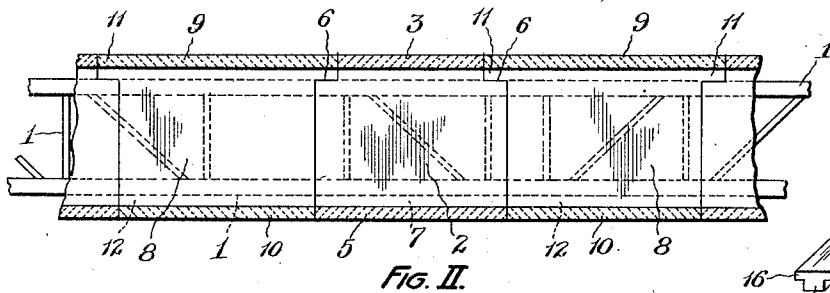
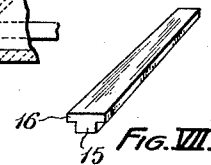
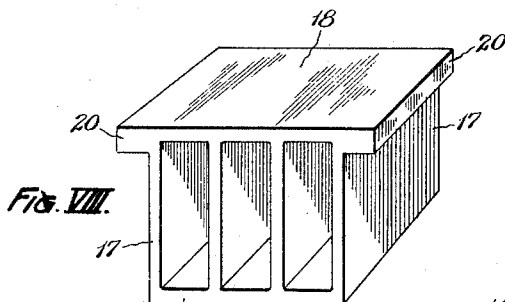
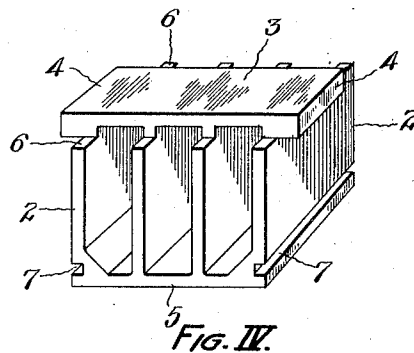
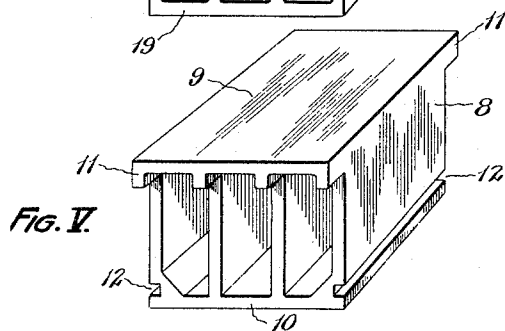
W. B. MILLER

1,800,951

FLOOR AND COMPONENT ELEMENTS THEREOF

Filed April 4, 1925

2 Sheets-Sheet 1



INVENTOR:
WILLIAM B. MILLER

By his att'y.

Ans B. Fuller.

April 14, 1931.

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FLOOR AND COMPONENT ELEMENTS THEREOF

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2 Sheets-Sheet 2

Ernst B. Muller.

UNITED STATES PATENT OFFICE

WILLIAM B. MILLER, OF LAKEWOOD, OHIO

FLOOR AND COMPONENT ELEMENTS THEREOF

Application filed April 4, 1925. Serial No. 20,662.

My invention pertains to a flooring and the art of laying it. More particularly, my ideas comprehend improvements in the laying of floors of buildings of steel construction in association with indurated material. An incidental feature is the design of individual floor elements to be gravitationally supported between joists.

What have come to be known as steel joists are steadily coming into favor, because of less weight than solid concrete. A great many types of steel joists are on the market, but the use of all of them has involved disadvantages, among which are:

1. The necessity of having wire mesh supported thereby in order to provide a plastering surface to constitute a ceiling, and which not only involves the labor of attaching the screen or mesh, but the added difficulty of laying the plaster, because of the yielding action of the screen. Frequently repeated, often three plastering operations are required.

2. The practice heretofore, when using fabricated steel joists, has left the spaces between joists unoccupied, which acts as a sort of sound box and an increase in noise, frequently to a disturbing and unpleasant degree. Also, when the space between joists is left vacant the fabricated steel joists are necessarily left exposed to moisture and hence become subject to deterioration or danger accomplished by rusting. Rusting inevitably occurs in such construction in the event of the condensation or leaking of any water or steam pipe.

My invention proposes the use with steel joists for floor elements, preferably hollow tile, which are fashioned with flanges adapted to rest on the joist and which have depending portions adapted to be suspended and to substantially fill the spaces between aligned joists, thereby providing both an under-floor surface and a ceiling plastering surface. The tile elements may be laid in many different ways, the preferred form exemplified by the drawings, showing alternate tile of any one row suspended across a pair of joists and other interjacent tile of the same row suspended in turn from a pair of the joist suspended tile. The lower opposed edges of the tile of adjoin-

ing rows may be widened to extend laterally partially underneath a particular joist and thus provide a key-stone shaped channel for the progressive sliding insertion of soffit tile to fill in the space underneath the joist and to complete the continuity of the plastering surface.

Furthermore, my object has been to originate a flooring scheme which will, (a) require no shoring, (b) provide a solid surface upon which to spread the ceiling plaster, (c) increase the speed of erection, (d) reduce the cost of plastering and (e) shorten the time interval prior to undertaking different work while using the newly laid floor surface. Added to the above, my invention presents the advantage of less weight, protection to steel joists and as a noise insulation.

I realize that the scope of my invention comprehends many equivalent constructions. The showing of the drawings and the particular description are merely specific exemplifications of a plurality of mechanical embodiments. For instance, it should be understood that this invention may be applied to roofs, bridges, or any kind of deck or other form of room covering.

Adverting to the drawings:

Fig. I is a top plan view of a flooring composed of tile elements embodying my invention and assembled on joists according to my allegedly new method.

Fig. II is a section on line II—II of Fig. I, looking in the direction of the indicating arrows.

Fig. III is a perspective view of a flooring embodying the principles of my preferred form, in combination with a specific type of joist, and corresponding to Fig. I.

Fig. IV is a perspective view of one of two differing tile elements incorporated in Figs. I and III.

Fig. V is a perspective view of the other cooperating form of tile illustrated in Figs. I and III.

Fig. VI is a perspective view of a comparatively small filler-block for fitting between the other tiles above the joists.

Fig. VII is a perspective view of a soffit

tile for connection with the other joists underneath the joists.

Fig. VIII is a perspective view of a modified form of floor tile designed for use with duplicates thereof when a different type of joist is employed.

Fig. IX is a perspective view showing tiles, like those of Fig. VIII, gravitationally assembled as a flooring carried by metal joists having a wider upper surface.

Tile elements have been embedded between concrete joists so as substantially to fill the spaces between the joists, but shoring was required to hold them in place during induration. I believe I have originated the apparently simple, but highly advantageous expedient, of providing tile elements adapted to be gravitationally carried, as for instance, with flanges adapted to rest directly upon the joists so that the tile are suspended between the joists and are ready to be used as a floor as rapidly as laid.

Fabricated steel joists (1), are alined, as shown in Fig. I, and will be supported upon beams not shown. The steel joist (1), exemplified in Figs. I, II, and III, is what is known as a rivet-grip and it will be noticed that it has a comparatively narrow upper surface, indeed, so narrow that I consider that it is wise to use its entire width for supporting an individual tile, as exemplified, over a longitudinal distance corresponding to the width of the tile which is to extend across its upper surface. However, that necessitates otherwise supporting interjacent tiles, which latter must, moreover, be of different shape. Accordingly, the composite flooring, shown in Figs. I and III, uses the three types of tile, shown in Figs. IV, V and VI.

The one form of tile shown in Fig. IV will be mainly proportioned according to the established distance between the rows of joists and, as illustrated, is hollow and formed with four upright walls or webs (2), the distance between the two outside surfaces of the two webs (2), which are farthest apart, being slightly less than the distance between the widest portions of two joists. The tile shown in Fig. IV includes a top surface (3) narrower than the lengths of the webs (2) though longer than the distance between the outer webs, both of which it overhangs at portions (4), which I have called flanges, because they are to have the function of a supporting medium by extending across and each resting directly upon the top of the joist (1). The bottom (5) of the tile shown in Fig. IV is flat and continuous and its size is determined by the length of the webs (2) and their combined width. The tops of the tiles shown in Fig. IV by reason of being cut away on opposite sides crosswise of the direction of parallelism of the webs (2) provides exposed upper web surfaces (6), to each

quadruple row of four of which I have chosen to refer collectively as a ledge. Each of the outer webs (2) is fashioned on its outer side and near the bottom (5) with a channel (7) extending from end to end, the purpose of which will hereinafter appear.

The other style of tile shown in Fig. V is to cooperate with the tile shown in Fig. IV. It comprises a plurality of upright walls (8), the exemplification disclosing four, which support a top (9) and a bottom (10) likewise integrally formed therewith. The distance between the two outer walls (8) will be determined so that the tiles loosely fit between opposed lateral defining planes of two parallel joists (1). The top (9) is longer than the walls (8) by reason of projecting beyond them at both ends to form what may be called flanges, shoulders or lugs (11) which are purposed each to rest upon one of the ledges (6). Near the bottom (10), both of the outer walls (8) are similarly fashioned each with a longitudinally extending channel (12) extending continuously from end to end and adapted to be opposed in spaced relation, each to one of the channels, 7, positioned as shown in Fig. III.

It will be observed that the flanges (4) rest across the joists (1) and that the tiles shown in Fig. IV are alternately arranged between any particular pair of joists with the tiles shown in Fig. V, which latter in turn are supported by gravitationally resting upon the ledges (6). In consequence, like tiles appear in staggered relation in composite flooring built upon more than two parallel joists. As shown in Fig. III, the lower surfaces of the bottoms (5) and (10) are positioned enough lower than the lower surfaces of the joists so that the opposed channels (7) and (12) are entirely below the lower surfaces of the joists. As the two kinds of tile are arranged in Fig. III, rectangular holes or gaps (13) will be left between corner portions of the tiles. These are to be filled with the filler-blocks (14) shown in Fig. VI. More often, it will probably be elected to grout the upper surfaces of my composite flooring with a rather thin cement to be brushed into the interstices between the tiles so as to tie them together, or enough concrete may be poured through the holes 13 to completely embed the joists before insertion of the blocks 14 to effect a seal preferred by some fire insurance underwriters. However, for certain types of buildings the upper surfaces of the tiles might be given more finished surfaces and a varied pattern effected by the use of different colors with the three distinct kinds of tile neatly cemented together in any approved manner. It should be understood that in the row of tile between the two joists nearest any end wall of the building the flanges (4) at one end of the tops (3) may be of somewhat different shape for

appropriate cooperation with a girder fire-proof beam tile or other support at the end of the building.

Finally, soffit tile (15) provided under opposite longitudinal ledges with flanges (16) are progressively slid into place under the joists (1) to complete the fire proof construction, the flanges (16) loosely fitting one in a channel (7) and the other in a channel (12) as clearly appears in Fig. III.

It will be seen that my invention has incidentally provided a flat floor surface which may or may not be covered by a layer of concrete and also a continuous plastering surface below the joists.

I am aware that tiles have heretofore been positioned between joists, but, so far as my knowledge extends, only in cooperation with concrete joists with which they were connected by an indurated material after erection of an intricate and time consuming shoring structure. I believe I am the first to conceive of a self-sustaining floor assembly for an induratable filler and covering purposed to unify the assembled elements and to cause the initially supporting joists to become reinforcing members fulfilling the function of trusses with reduced moment at the middle of their span the simple expedient of gravitationally supporting the tile upon some part of the joists.

Fig. VIII illustrates a modified form of tile including any desired number of walls (17) together with tops (18) and bottoms (19). It will be seen that the tops (18) project at opposite ends beyond the outer wall (17) to form equivalent flanges (20). The tops (18) have a width corresponding to the length of the walls (17) so that end surfaces of both are flush. Fig. IX illustrates employment of the tile shown in Fig. VIII with a different type of metal joist (21) similar to the marketed constructions known as the Berger and Truscon. This type of metal joist is enough wider, as shown, to enable the tiles to be duplicated throughout and the flanges (20) to rest on substantially one-half the width of the top surfaces of the joists, thereby incidentally making unnecessary the provision of ledges over half of the tile to furnish support for the other half as well as avoiding the need of corner filling tiles. As shown in Fig. IX, the bottoms (19) of the tiles may be substantially level with the bottoms of the joists to form in conjunction therewith a plastering surface. It should be understood that, if desired, the distance between the tops (18) and bottoms (19) may be increased so that if channels be provided as shown in preferred form, soffit tiles may be similarly carried underneath the joists (21).

I would have it understood that I do not mean to have my invention limited in its patented protection, either to the illustrated

method of resting tiles on the very top surfaces of the joist, nor to the illustrated use of soffit tile for enclosing the bottoms of the joists. The tiles might be designed to rest on joist surfaces intermediately of the top or bottom of a joist and another element might be employed in cooperation with plaster for sealing in the bottoms of the joists. The tiles might straddle the joists and depend on opposite sides thereof, or have flanges both above and below the joists and slipped in endwise while one end of the joist is held up, or the top flanges on one side staggered with reference to one or more flanges on the opposite side. The preceding suggestions are enough to evidence my recognition that the floor elements might be infinitely varied in shape and adapted for supporting on many different portions of as many different styles of joists, involving altered methods of insertion for support upon the joists or upon cooperating tile designed in conjunction therewith to enclose the joists with or without a sealing with concrete, cement or plaster.

I claim:

1. The combination with a pair of spaced floor joists, of two series of differently shaped hollow tiles alternately arranged in a single row and adapted substantially to fill the space between said joists, one series all resting crosswise upon each of said joists and relatively transverse edges of the other series upon pairs of tiles of the first series and yet so that the upper surfaces of both series are flush.

2. The combination with a pair of floor joists of a composite flooring comprising a row of differing floor elements alternately arranged and carried all of one series solely by said joists and all of the other series suspended from those of the first series, one series of elements of one row being staggered with respect to like elements of an adjoining row.

3. The combination with a pair of floor joists of a composite flooring comprising a row of differently shaped hollow floor tile alternately arranged and together substantially filling the space between said joists, the tile of one series being provided with flanges resting solely upon said joists respectively and being also provided with ledges, the tile of the other series being provided with flanges resting solely upon the ledges of the first series.

4. The combination with parallelly extending joists, of a plurality of rows of complete floor tiles collectively adapted substantially to enclose all sides of said joists and to be held in position solely by gravity some by resting upon both joists and others by resting upon distinct tiles of said joist carried tiles.

5. In a flooring, parallel joists disposed as a row and tiles adapted gravitationally to

be supported thereby by insertion from above, said tiles being of different shape and provided with differently located supporting flanges whereby to leave holes for the entry of grouting material.

6. As a new article of manufacture, a floor element adapted to constitute a part of a floor surface and fashioned along lateral upper edges with flanges for resting upon the upper surfaces of a pair of definitely spaced joists respectively, the entire remaining lower section of said element being of less width than the shortest distance between said joists whereby to permit of suspending insertion between said joists from above, said remaining lower section being fashioned on each of two opposite sides with a ledge intended to support adjacent floor elements.

7. In combination with a pair of alined floor joists in spaced relation, a plurality of tiles arranged as a spaced row and having at their tops laterally spaced flanges, one of which flanges rests on each of said joists, said tiles being fashioned on opposite ends with ledges extending crosswise of said row and with the upper surfaces of said ledges depressed a predetermined distance relative to the upper surface of said tiles and a plurality of other tiles alternatively arranged in said row and each having at their tops end flanges corresponding in thickness to the extent, of depression of said ledges and resting upon opposed end ledges of a pair of said first mentioned spaced tiles.

8. The combination with spaced floor joists, of two series of differently shaped hollow tiles arranged one series in one row and each adapted substantially to fill a measure of space crosswise of a pair of said joists and all resting crosswise upon each of said joists, edges of the other series of tiles resting upon projections carried by the tiles of the first series and yet so that the upper surfaces of both series are substantially flush, whereby collectively to constitute a floor surface.

9. A composite flooring comprising parallel joists and tiles provided along two oppositely disposed edges with laterally projecting flanges resting on said joists respectively and the upper surfaces of which are flush, and provided along another pair of oppositely disposed sides with ledges the upper surfaces of which are below the upper surface of the tile together with other unlike tiles forming with said first mentioned tiles a row extending lengthwise of said joists, said last mentioned tiles each fitting between said joists and likewise provided with flanges resting solely upon the ledges of the first mentioned tiles respectively.

10. In combination with a pair of alined floor joists in spaced relation, a plurality of elements each resting upon each of said joists in separated relation between said joists, and a plurality of elements alternately arranged

with relation to the first mentioned elements and likewise between said joists, said second mentioned elements all carried solely by said first mentioned elements.

11. In combination with a pair of alined floor joists in spaced relation, a plurality of elements arranged as a spaced row and each resting on both joists, said elements being fashioned on opposite ends with depressed ledges extending crosswise of said row and a plurality of elements alternately arranged in said row and each resting only upon opposed ledges of a pair of said first mentioned elements.

12. The combination with three alined joists, of a plurality of floor elements gravitationally carried between adjacent pairs of said joists and with the bottoms of said floor elements below the bottom of said joists, said elements being fashioned with channels having their openings opposed to each other below and on opposite sides of a particular joist together with additional soffit elements provided with flanges adapted for sliding insertion in said opposed channels and gravitationally resting therein.

13. In a flooring, a plurality of parallel joists, tiles directly insertable from above and each substantially enclosing separated sections of corresponding area of opposed sides of each adjacent pair of said joists and gravitationally supported thereby as a spaced row and so as to extend substantially from the top to the bottom thereof and other differently shaped tiles carried alternately between said first mentioned tiles and substantially enclosing the remaining sections to opposed sides of said joists while leaving opening at the top for the entry of grouting material against the joists.

14. In a flooring, the combination of differing supports, differing tiles carried some by one kind of said supports and others being carried by the same kind of said supports and also by the tiles which are supported solely by one kind of said supports, said tiles being alternately arranged in rows and defining in conjunction with said supports a series of gaps and means occupying said gaps for holding said tiles in position.

15. A self-supporting floor structure adapted to span the distance between a plurality of supports, comprising the combination of spaced substantially parallel supports, a series of elements gravitationally carried in predetermined regularly spaced relation with respect to said supports and each other, each of said elements including a surface adapted to occupy a portion of a defining plane of the composite structure and also including projections having surfaces disposed at a different elevation than said first mentioned surfaces of said elements, another series of elements gravitationally carried by said first mentioned elements and

likewise each including a surface adapted to occupy a portion of a defining plane of the composite structure and grouting material filled in the interstices provided between said differing kinds of elements and adapted to constitute complemental portions of one of the defining planes of said composite structure.

16. A flooring comprising supports, different kinds of tiles carried thereby, said tiles each having a pair of end flanges and the flanges of one kind of tiles projecting transversely relative to the direction of projection of the flanges of the tiles of the other kind, tiles of one kind being staggered, and grouting material occupying the spaces defined by corner portions of four sides of four tiles, two of each kind, whereby to complete the top floor surface.

17. In combination, primary parallelly spaced supports, elements each directly hung from a pair of said supports and as a spaced row therebetween and a structure including pieces gravitationally carried by adjacent pairs of said elements so as to be alternately arranged in the same row with said elements, said pieces furthermore extending crosswise of said row substantially from one of said supports to the other.

18. A flooring comprising parallelly spaced joists and different kinds of tiles carried as a row therebetween and with their top surfaces flush, tiles of both kinds being staggered and with corner edge portions spaced apart over said supports to form holes there, and grouting material occupying said holes.

19. In combination, parallelly spaced substantially horizontal supports, elements gravitationally carried in spaced relation by said supports as rows depending therebetween and having upper sides adapted to constitute a part of an upper surface, and other gravitationally carried elements likewise having upper sides adapted to constitute a part of an upper surface and alternately arranged in the rows of said first mentioned elements, said other elements being partly of different width than said first mentioned elements measured crosswise of said rows whereby to provide gaps over said supports and between distinct rows, and indurated grouting material filling said gaps and adapted to bind together each support with the elements composing the rows on opposite sides of said support.

20. In a deck, parallelly extending joists, tiles provided on opposite sides with flanges and arranged as a row between said supports, the maximum distance between the sides of said tiles measured crosswise of said row being less than the distance between juxtaposed sections of said supports and elements cooperating with said joists to support said tiles by projecting under the flanges thereof.

21. In a room-covering, parallel extending

joists, tiles provided on opposite sides with flanges and arranged as a spaced row between said joists, said tiles being narrower throughout measured crosswise of said row than the shortest distance between said joists; and two kinds of elements, one kind of elements alternately arranged in the row of tiles and the other kind of elements below the joists, said elements cooperating, the first kind to support said tiles by projecting under the flanges thereof and the second kind to enclose the bottoms of said joists.

22. In a floor, spaced joists, differing tiles, of which like tiles are laid in diagonally extending rows, some of the tiles of one kind having ends lapped with reference to the near ends of adjacent tiles respectively and means binding together all of the tiles of each parallelly extending row on both sides of any particular joists for maintaining the tiles in such position, said joists extending along opposite sides of each row composed of differing alternately arranged tiles and supporting some of said tiles at opposite sides of the latter and grouting material between said tiles and joists.

23. In a flooring, different kinds of tiles collectively arranged in relatively transverse rows, like tiles being laid in diagonally extending rows and each disposed in a pair of said relatively transverse rows, the alternate tiles of all rows of tiles having ends projecting beyond the correspondingly presented edges of adjacent tiles and means for maintaining the tiles in such position.

24. A flooring comprising joists and tiles carried thereby in rows between said joists and of varying top area and each top with a longitudinal dimension, tiles of one kind being in staggered arrangement, tiles of different kinds having their longer top dimensions relatively transverse, the tiles of one kind having their tops projecting crosswise beyond the ends of the tops of the other kind of tiles to provide gaps over said joists and grouting material occupying the space between opposed sides of the tiles and filling said gaps flush with said top areas.

25. A flooring comprising supports and different kinds of tiles carried thereby and with substantially flush top areas, tiles of one kind being in staggered arrangement and each having one longer edge projecting beyond a substantially parallel and shorter edge of another one adjacent thereto in any one row between said supports and each having two shorter edges in turn juxtaposed to the longer edges of two of the different tiles in two adjacent parallelly extending rows respectively, whereby to leave gaps adjacent to said supports defined by side walls of four tiles and grouting material filling the gaps and substantially embedding said supports.

26. The combination with three aligned joists, of a plurality of floor elements gravi-

tationally suspended by and between adjacent pairs of said joists and with the bottoms of said floor elements below the bottom of said joists, soffit members carried underneath said joists by said elements, groups of
5 four of said elements having upper edge portions of their corners defining gaps and forming in conjunction with said joists spaces open above through said gaps and
10 grouting material occupying all the space between said joists and elements to unify the whole structure.

27. The combination with three alined and spaced joists, of a plurality of different kinds
15 of floor elements, some being gravitationally suspended directly by the tops of said joists so as to cover portions thereof others of said elements being gravitationally suspended from said joist-suspended elements and all
20 of said elements depending between adjacent pairs of said joists, said floor elements having sides spaced from, and bottoms below the bottom of, said joists, the near upper corners of groups of four of said elements being
25 arranged to leave gaps over said joists, the lower sides of said elements being fashioned with channels having their openings opposed to each other in pairs on opposite sides of a particular joist together with additional
30 soffit elements enclosing the bottoms of said joists and held in place by said suspended elements and indurated material filling the spaces laterally adjacent each joist and above said soffit elements and also filling the gaps
35 above whereby to unify all assembled parts.

28. A gravitationally self-supporting floor structure adapted for use in concrete building construction comprising the combination
40 of a pair of fabricated metal joists, different kinds of flooring elements suspended some directly from said joists and others directly from said joist-suspended elements, said elements collectively occupying most of the space between said joists and forthwith furnishing in conjunction solely with said joists
45 a support for workmen and material during progress of their interfitted suspended arrangement, one kind of said elements including substantially flush upper surfaces, and
50 indurated material filling all interstices between the assembled units and providing a substantially level floor surface whereby the whole is unified and the joists as the primary initial supports ultimately become the embedded reinforcing members to fulfill the
55 function of trusses with reduced moment at the middle of their span.

Signed by me, this 31st day of March, 1925.

60 WILLIAM B. MILLER.