June 14, 1932. A. H. TASHJIAN 1,863,258

LIGHT FLOOR CONSTRUCTION FOR SKYSCRAPERS

Filed Nov. 20, 1930 2 Sheets-Sheet 1

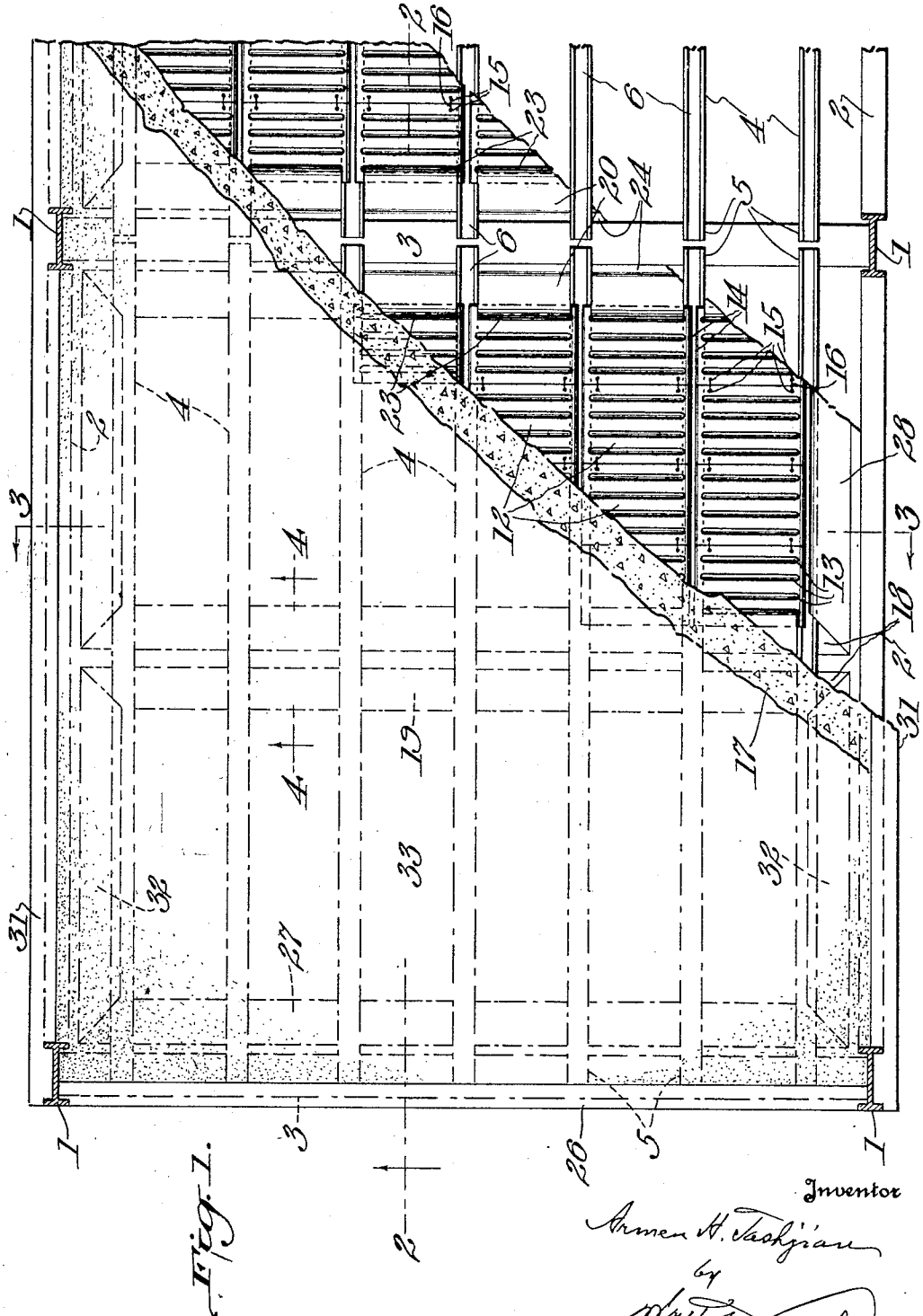


Fig. 1.

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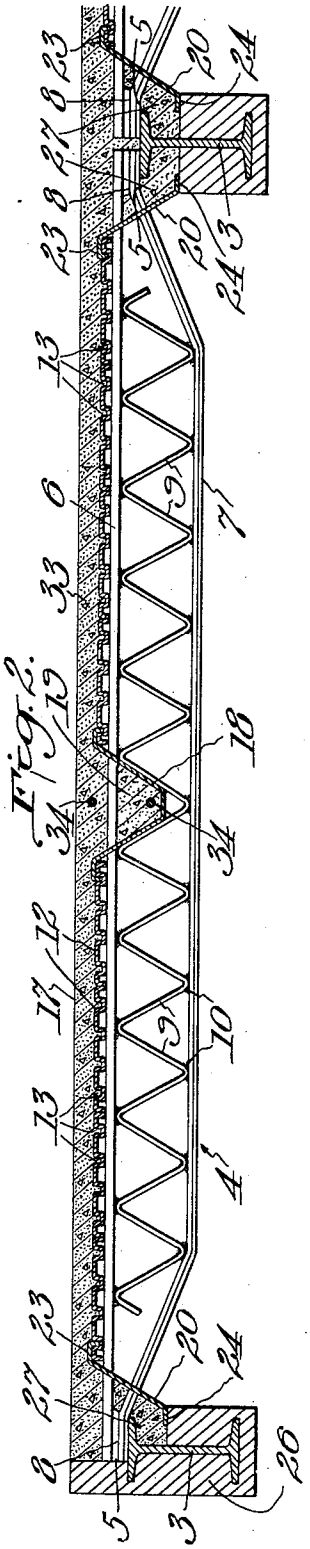


Fig. 2.

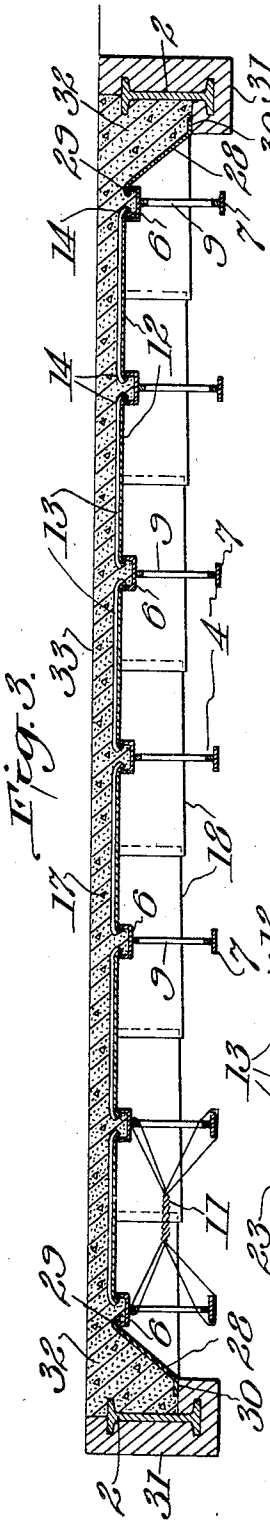


Fig. 3.

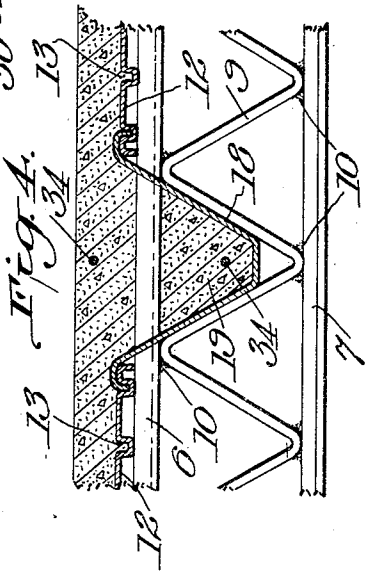


Fig. 4.

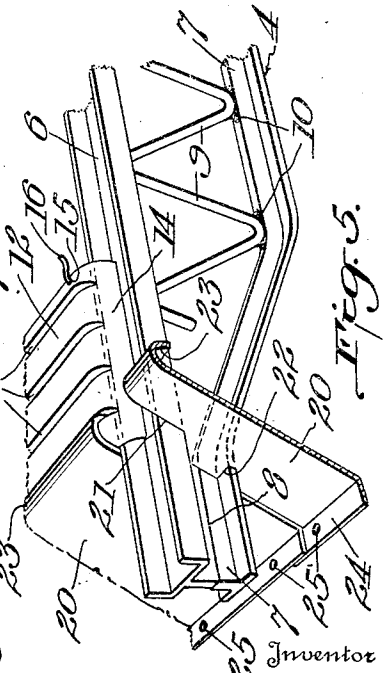


Fig. 5.

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UNITED STATES PATENT OFFICE

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LIGHT FLOOR CONSTRUCTION FOR SKYSCRAPERS

Application filed November 20, 1930. Serial No. 496,961.

This invention relates to a light floor construction for buildings, particularly buildings of the steel frame skyscraper type, which are normally subjected to lateral wind pressures.

One of the well recognized factors in the design of tall building structures is to develop in the structure resistance adequate to withstand wind stresses. Part of such resistance is taken care of by the structural steel framework of the building, but a portion of it has to be taken care of by the floor panels which act as diaphragms or plates, to resist horizontal or lateral distortion of the structural framework. It is important, therefore, that the floor panels be of such form as to rigidly support and brace the adjacent steel framework in such manner as to effectively resist any tendency for such horizontal or lateral distortion.

In tall structures, it is of the utmost importance that the component parts be of light weight so as to reduce to a minimum the load carried by the building. Much of this lightness may be gained in the construction of the floors of the building.

One of the lightest types of floor construction now in use is the so-called bar-joist construction. In this construction, light weight steel trusses are so arranged that their bearing ends ride freely upon the structural steel framework of the building, and supported by these joists is a concrete slab, suitably reinforced, and usually of a thickness of from two to four inches. In this construction, it is obvious that the structural steel framework beneath and carrying the floor is free to distort laterally, as no means is provided for resisting such distortion.

One of the objects of my invention is to provide a light floor of the so-called bar-joist construction type in which means are provided for effectively resisting this horizontal or lateral distortion. Another object of the invention is to provide in a floor of this type integral cross bridging elements, which will not only aid in preventing lateral or horizontal distortion, but will also effectively prevent buckling of the floor structure due to such horizontal distortion.

A further object of the invention is to provide means whereby a floor structure having the characteristics referred to may be easily and economically constructed.

The invention consists in a relatively light weight and thin panel floor construction for buildings, in which each floor panel is provided at its edges with downwardly flaring aprons bonding the ends of the floor joists and the members of the building framing adjacent thereto, to thus form an inverted tray-like panel the aprons or flanges of which form a rigid distortion-preventing bearing against the adjacent members of the building framing, and each panel is also provided with an integral bridging member, preferably in the form of a depressed web, arranged transversely relatively to the floor joists and merging into the floor aprons at its ends to aid in preventing lateral distortion and to prevent buckling of the thin panel, as will be hereinafter more particularly explained and finally claimed.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a sectional plan view of one complete floor panel and a part of an adjacent panel of a floor structure constructed in accordance with the invention, portions thereof being broken away in the interest of clearness. Fig. 2 is a vertical longitudinal section taken on the line 2—2 of Fig. 1. Fig. 3 is a vertical transverse section taken on the line 3—3 of Fig. 1. Fig. 4 is an enlarged fragmentary sectional detail of the bridging web taken on the line 4—4 of Fig. 1. Fig. 5 is an enlarged fragmentary sectional perspective view of the members for providing the floor panel aprons.

The steel framework of the building includes the usual columns 1, longitudinal tie-beams 2 and transverse girders 3. Arranged in suitable spaced relation between the longitudinal beams 2 are the joists 4, the bearing ends 5 of which rest upon the transverse girders 3.

These joists, in the form illustrated (see particularly Fig. 5) comprise top chord members 6 of channel form and bottom chord

members 7 of T form joined at their bearing ends as indicated at 8, preferably by welding, and appropriately separated throughout the major portion of their length and held in spaced relation by web members 9 welded to them as indicated at 10.

During the positioning of these joists they may be suitably temporarily braced by means of the customary wire bridging, as indicated at 11, Fig. 3.

Upon the top chord members 6 of the joists, and spanning the spaces between them, are arranged pan-like deck members 12 preferably corrugated, as indicated at 13, to strengthen them and form a means for their intimate bonding with the concrete later applied, and having their ends downturned as indicated at 14 to engage in the channels of the top chord members. Holes 15 are provided adjacent to the abutting edges of the deck members for the passage of wires 16 by which the deck members may be fastened to each other and to the top chord members 6 of the joists 4.

These deck members 12, together with the aprons and cross bridging members hereinafter referred to form a complete deck for the panels, and provide a casting surface upon which the concrete 17 is poured. Moreover, the deck members form a rigid deck for mechanics to work on.

At preferably the transverse center of each panel a space is left in the surface formed by the deck members, and in this space and supported by the deck members 13, as shown in Fig. 4, I position a plurality of overlapping form members 18 arranged to form a mold for the transverse bridging web 19.

Adjacent to the ends of the joists are arranged overlapping form members 20 provided with cutouts 21 and 22 to embrace the top and bottom chord members, respectively, of the joists. These form members 20 have hook-like upper ends 23 adapted to hook into the depressions formed by the corrugations 13 of the deck members. The lower edges of the form members 20 are turned outwardly as indicated at 24, and are provided with holes 25 by which they may be nailed or otherwise affixed to the fire-proofing 26 of the girders 3. The form members 20, when thus arranged, provide a means for casting the down flaring transverse aprons 27 which abut against the girders 3 and are bonded therewith and with the ends of the joists 4. Form members 28 similar to the form members 20 are arranged with their hooked upper ends 29 engaging the flanges of the top chord members of the adjacent joists, as shown in Fig. 3, and their outturned bottom edges 30 secured to the fireproofing 31 of the beams 2. These form members provide a means for casting the longitudinal aprons 32 which abut against and are bonded with the beams 2.

With the form members 12, 18, 20 and 28 properly arranged, as described, the concrete 17 of the floor panel is poured, thus forming an integral floor panel slab 33 provided with an apron flaring downward from the plane of the slab and surrounding the panel upon its four sides and abutting against and bonded to the beams 2 and girders 3, and an intermediate transverse bridging web 19 extending between and bonded to the beams 2.

By thus forming the floor panels with offstanding or flaring aprons at their perimeters, such aprons abutting against and bonded to the adjacent frame members or girders of the structural framing of the building, it will be seen that a very rigid though relatively light construction is obtained. Moreover, the aprons 27 and 32 and the bridging web 19 provide such horizontal or transverse rigidity in the several panels of the floor structure that horizontal or transverse distortion of these panels and of the frame of the structure will be prevented.

Moreover, the form and manner of arrangement of the form members 12, 18, 20 and 28 is such that the slab of the panel may be cast with ease and economy.

Obviously suitable reinforcing rods, such as those indicated at 34 may be provided in the bridging web 19, and other reinforcing elements such as wire mesh or the like suitable material may be incorporated in other portions of the slab of the panel as desired.

Various changes are contemplated as within the spirit of the invention and the scope of the following claims.

What I claim is:—

1. A floor panel for buildings, including a structural framework and a slab of plastic material, said slab provided at its edges with aprons flaring from the plane of the slab and with a bridging web intermediate said aprons, said aprons and web providing a means for withstanding lateral pressure applied to the building.

2. A floor panel for buildings of steel frame type, including a structural framework of bar-joist type carried by the frame of the building, and a slab of plastic material carried by said framework and provided at its edges with aprons flaring from the plane of the slab and bonded with said building frame and panel framework, said aprons providing a means of reinforcing said floor panel and building frame against laterally applied pressure.

3. A floor panel for buildings of steel frame type, including a structural framework comprising a plurality of longitudinally arranged metallic joists supported by the building frame and a slab of plastic material applied to and carried by said joists, said slab provided at its perimeter with aprons flaring from the plane of the slab and bonded with said building frame and structural framework, and provided also with a transverse

bridging web, said aprons providing a means of withstanding pressure applied laterally to the building and said web adapted to prevent buckling of said panel.

4. A floor structure for steel frame buildings, including a plurality of floor panels as determined by the building frame, each of said panels comprising a plurality of longitudinally arranged metallic joists supported at their ends by members of the building frame, and a slab of plastic material carried by said joists, each slab having at its marginal edges a downwardly flaring integral apron, bonded with said joists and with the adjacent building frame members, and each slab having also a transverse bridging web bonded with said joists and with members of said building frame, said aprons and webs providing a lateral bracing for said panels and for the building frame to resist wind pressure to which the building may be subjected.

5. A floor panel for buildings, having a supporting framework, and a cast slab of plastic material provided with flaring marginal aprons and a transverse bridging web, said framework including joists, deck members carried by said joists and on which said slab is cast, and form members complemental to said deck members and providing forms for said aprons and web, whereby said slab including said aprons and web may be cast integrally.

6. A floor panel for buildings, having a supporting framework, and a cast slab of plastic material provided with flaring marginal aprons, said framework including joists, deck members carried by said joists and on which said slab is cast, and form members complemental to said deck members and providing forms for said aprons, whereby said slab and aprons may be cast integrally.

7. A floor panel for buildings, having a structural framework including joists and deck members, and a superimposed slab of plastic material cast upon said deck members, form members arranged at the edges of said framework and cooperating with said deck members, said slab provided at its edges with aprons cast on said form members and flaring from the plane of said slab, said aprons providing a means for withstanding lateral pressure applied to said floor panel.

8. A floor structure for buildings, including a plurality of floor panels, each of said panels having a structural framework supported by the frame of the building and including joists and deck members and a superimposed slab of plastic material cast upon said deck members, form members arranged marginally of said panels and cooperating with the deck members thereof, said slabs provided at their perimeters with aprons cast on said form members and flaring from the plane of the slabs, said aprons bonded with the slabs and with the frame of the building and providing a means for withstanding lateral pressure applied to the building.

In testimony whereof I have hereunto set my hand this 18th day of November A. D. 1930.

ARMEN H. TASHJIAN.