June 2, 1942. H. W. SCHICK 2,284,923

REINFORCED CONCRETE BUILDING CONSTRUCTION

Filed April 12, 1941 2 Sheets-Sheet 1

Fig. 1

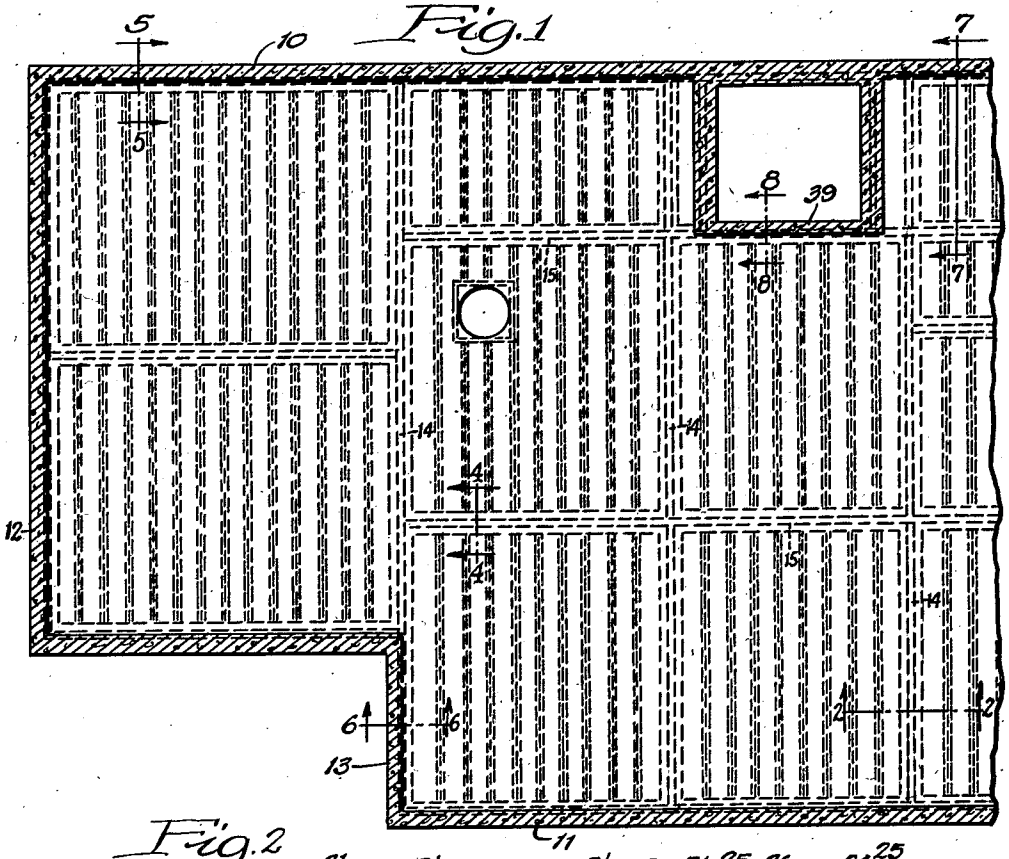


Fig. 2

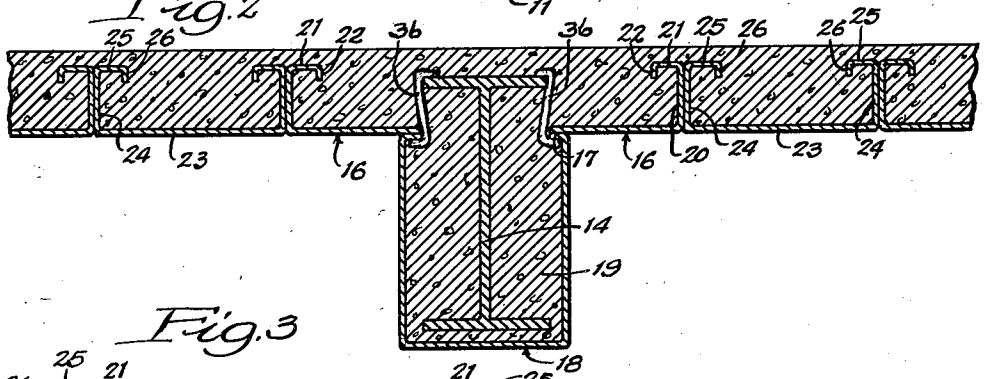
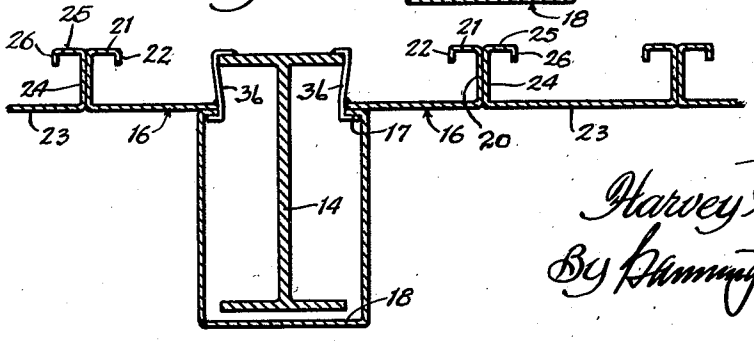


Fig. 3



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Fig. 4

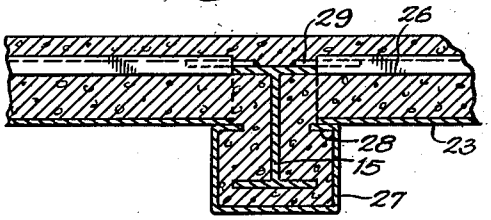


Fig. 5

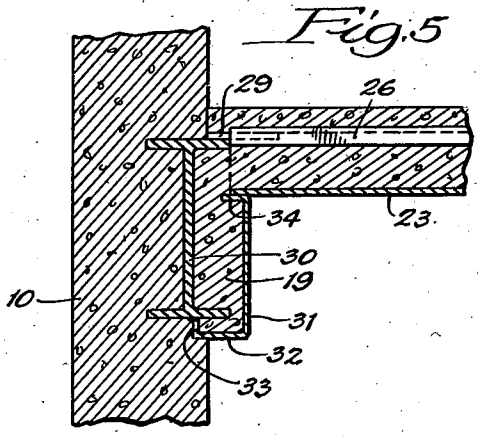


Fig. 6

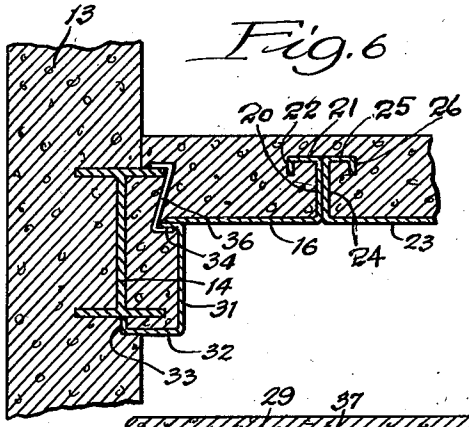


Fig. 7

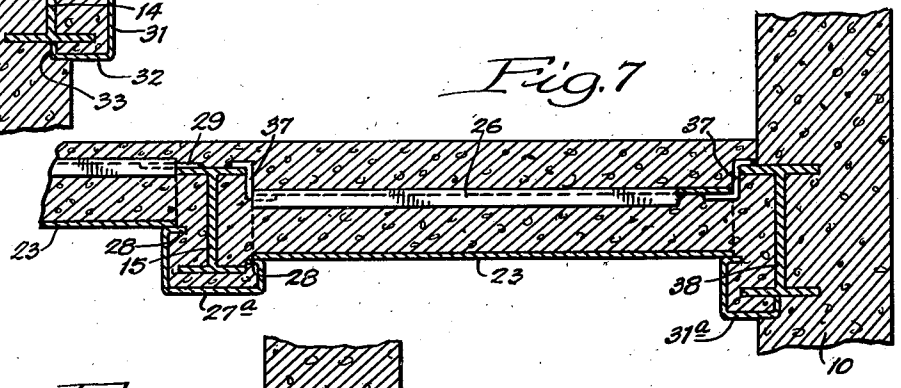
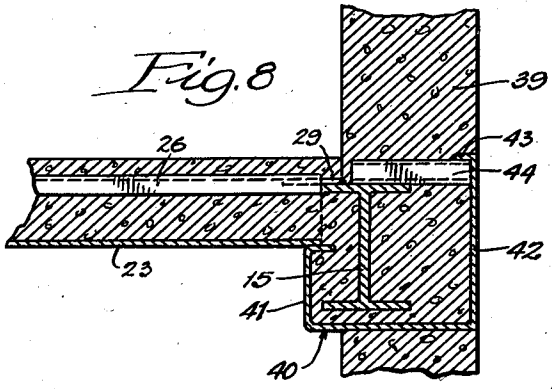


Fig. 8



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Patented June 2, 1942 2,284,923

UNITED STATES PATENT OFFICE

2,284,923

REINFORCED CONCRETE BUILDING CONSTRUCTION

Harvey W. Schick, Chicago, Ill.

Application April 12, 1941, Serial No. 388,225

6 Claims. (Cl. 72—70)

This invention is directed to improvements in a concrete and steel floor construction, which makes it possible to conceal a portion of the cross supporting beams and girders in the flat concrete slab, and which utilizes the steel floor sections between the girders as forms to receive the concrete fireproofing, with provision for the embedment of the girders within the concrete in the formation of a reinforced monolithic structure.

In carrying out this method of construction, the steel floor sections, in the form of pans, are rigidly attached to the girders by means of projecting lugs, which serve to unite all portions of the floor structure in such a way as to provide the necessary strength and rigidity and to permit the employment of light weight concrete as a filler, which reduces the dead load of the floor system and affords better fireproofing and protection than that afforded by the use of ordinary concrete.

Furthermore, the metallic floor sections, together with the box shaped girder casings which are united therewith and which provide for the reception of the concrete embedding the girders, in conjunction, provide a smooth uniform finish which requires no plastering, and at the same time protects the enclosed concrete from disintegration due to fire or other causes.

The present construction is superior to the usual method of fireproofing the beams where the concrete slab is poured flush with the top of the beam, and shelf angles are riveted to the web of the beam to carry the slab. It is also superior to the ordinary method of constructing a deck which requires that the steel sections be placed on top of the beams and which renders it necessary in the fireproofing of the beams to first build forms around the beams and girders and pour the concrete fireproofing around the beams before placing of the steel floor.

In the present invention, the employment of steel floor sections, in the form of open-ended pans, in conjunction with girder shells secured to the pans, permits the pouring of the concrete into the pans by a single continuous operation, from which it will flow into the girder shells located at a lower level, so that all portions of the metallic frame structure will be embedded within the concrete filling of monolithic character, which eliminates the necessity for the use of temporary pouring forms and greatly simplifies the character of the metallic reinforcing structure, thus securing the requisite strength and rigidity and permitting the use of light weight concrete, with the attendant advantages of such a structure.

Further objects and details will appear from the description of the invention in conjunction with the accompanying drawings, wherein,

Figure 1 is a plan view of one of the floors of a typical building, showing in dotted lines the position of the girders and pans;

Fig. 2 is an enlarged sectional elevation, taken on line 2—2 of Fig. 1;

Fig. 3 is a similar view, with the concrete filling omitted;

Fig. 4 is a sectional elevation, taken on line 4—4 of Fig. 1;

Fig. 5 is a similar view, taken on line 5—5 of Fig. 1;

Fig. 6 is a similar view, taken on line 6—6 of Fig. 1;

Fig. 7 is a similar view, taken on line 7—7 of Fig. 1; and

Fig. 8 is a similar view, taken on line 8—8 of Fig. 1.

It will be understood that the building arrangement shown is merely illustrative of the principles involved and serves to illustrate varying conditions encountered in the employment of the features of the present invention.

The building, as shown, comprises side walls 10 and 11, an end wall 12 and an inwardly offset wall 13. Within the enclosure thus afforded are located what may be referred to as longitudinal girders 14 and intersecting transverse girders 15. The girders are supported by columns or the like (not shown) at the points of intersection, where the span is of a length to require interior support, although it will be understood that such interior support, if used, constitutes no portion of the present invention, and that, for fairly long spans, the pans of the present invention, in conjunction with the girders and monolithic concrete filling, will afford sufficient strength and rigidity without intermediate columns or the like.

The longitudinal girder 14, as illustrated on the section line 2—2, extends between the walls 10 and 11 and is of I-beam formation and cooperates on each side with an open sided, open ended marginal pan 16, the inner open edge of which is welded to the inturned flange 17 of a girder shell 18 of relatively deep troughlike formation, which surrounds the girder and is held in spaced relation on all sides therefrom so as to constitute a pouring form for the complete enclosure and embedment of the girder, being suspended from the girder by Z-shaped brackets

36 which are welded to the girder and to the flanged edge of the shell. The marginal pans immediately adjacent all of the longitudinal girders are similarly formed, arranged and united to the girder shells, preferably by welding along the overlapped edges, so that, when a concrete or similar plastic filling 19 is poured into the marginal pans, it will flow down into and surround and embed the adjacent girder, thereby forming a monolithic filling within the marginal pans and the girder shell.

The marginal pans 16, on their outer edges, are provided with side walls 20, whose upper edges are turned inwardly to afford horizontal flanges 21 terminating in downturned edge flanges 22. The marginal pans 16 cooperate with a group of parallel elongated open ended intermediate pans 23 having side walls 24 which are inturned to provide horizontal flanges 25 terminating in downturned edge flanges 26 identical with the wall construction of the marginal pans. The walls thus formed abut together and are preferably united by welding or the like to afford a T-shaped construction which extends throughout the length of the abutted pans and affords a series of closely spaced reinforcing elements in the nature of I-beams, in which the bottoms of the pans constitute the bottom flanges of the I-beam structure. This arrangement enables relatively long pans to be employed, which run parallel with the longitudinal girders and find end support either from the exterior walls or from the interior girders, or from both, as the case may be.

Fig. 4 illustrates the manner in which the inner ends of a series of pans are supported in unison from one of the interior transverse girders 15. This girder, as shown, is of less depth than the longitudinal girder 14, and is surrounded by a girder shell 27 in all respects like the one first described, save in the matter of depth, which shell is provided with inturned flanges 28 which afford a shelf or support for the ends of a series of intermediate pans 23 with the accompanying marginal pan 16. The pans are supported from the girders by the employment of short lugs 29, which underlie and are welded to the flanges of the pan and project beyond the ends of the pans in position to rest upon the upper flanges of the girders to which they are welded, thus suspending the ends of the pans and affording a strong and rigid metallic framework for the reception of the concrete and eliminating the use of shelf angles or the like for the support of concrete slabs.

Where the ends of the pans extend to the exterior wall, as for instance the wall 10 in Fig. 5, I provide for their support by partially embedding a girder beam 30 of I-beam formation partially in the wall, so that its lower flanges project outwardly on one side, with the lower flange surrounded by a wall girder shell 31 having a bottom 32 terminating in a marginal flange 33 which abuts against the base of the wall girder beam and is partially embedded within the wall. The outer wall of the shell terminates in an inturned flange 34 which furnishes a shelf or support for the ends of the pans, which are additionally supported by welded lugs 29. As shown, the web of the girder beam 30 is inset sufficiently within the wall so that the concrete filling 19 within the girder shell will lock into the wall itself, furnishing a rugged anchorage for he ends of the pans with their concrete filling and serving to tie the wall and floor structures closely together.

Fig. 6 shows the connection afforded between one of the open sided marginal pans and the adjacent wall 13. In this case, the lower end of the longitudinal girder 14 shown in Fig. 1 is embedded within the inner face of the wall section 13, and partially surrounded on its lower inner side by a girder shell 31 identical with that previously described, which is supported by Z-shaped brackets 36, hooking over the upper flange of the girder, which is the method of supporting the girder shells in all of the various modifications in structure herein described.

Fig. 7 illustrates a construction which is substantially identical with that of Fig. 4, save for the fact that the girder shell 27a is formed with lower walls on one side than on the other, to accommodate pans set at different levels on opposite sides of the girder to afford a thicker floor construction on the right hand side. In this case I have shown hangers 37 for supporting the lower set of pans at the right, while the pans at the left on a higher level are supported by lugs 29. The opposite ends of the pans in Fig. 7 are supported by a wall girder 38 embedded within the wall 10 and partially surrounded by a shell 31a similar to the shell 31, save as to the matter of depth. In other respects the construction is substantially identical with that shown in Fig. 5.

Fig. 8 shows a construction in which an interior wall 39 is employed, as for instance in an elevator shaft, and in which I have provided a girder shell 40 having inner and outer side walls 41 and 42, which are spaced sufficiently to bridge through the entire thickness of the wall and which surrounds the transverse girder 15. The outer wall 42 terminates in an inturned flange 43, which rests upon a supporting plate 44 overlapping the top of the girder, but in other respects the construction of Fig. 8 is similar to that previously described.

In erecting a floor by the employment of the pans and shells of the present invention, the outer walls will be erected of masonry or concrete of the proper height to receive the wall girders which are embedded at the proper levels, and the interior girders are erected and supported at the ends either by embedment in the walls or by additional interior support, and after the girder skeleton is thus erected, the ends of the pans are hung from and secured to the girders by the lugs welded thereto, and the bottoms of the pans are supported upon the suspended girder shells and welded, and the abutting walls of the pans are welded together until the entire structure has been united in condition to receive the concrete or other plastic filling.

As the concrete is poured into the open ended pans, and also into the open sided marginal pans, it will run down into the girder shells, inasmuch as the pans afford troughs or channels for directing the flow of concrete around the girders, and after the girders have been completely embedded, the pouring of additional concrete will continue until the concrete is of sufficient depth to overlie both the pans and the girders, thereby furnishing an unbroken top layer which extends throughout the entire floor and thus affords a substantially monolithic structure, partially divided, however, into slabs by the abutting walls of the pans, which furnish additional reinforcement throughout all portions of the floor structure. At the same time the edge portions of the floor will be firmly and continuously united and anchored to the exterior walls of the building. The edges of the pans will be firmly and perma-

nently embedded within the concrete, and the bottoms of the pans themselves, in conjunction with the girder shells, will afford the ceiling finish, which will present a smooth and unbroken appearance, save for the joints between the pans and the depending offset form of the girder shells. The metallic surface thus exposed may be painted, enameled, or otherwise finished, to display the desired color and appearance.

The invention is one which permits the pans and shells to be fabricated and cut to the intended lengths and sizes at the mill, and when so cut, the erection of the building can proceed rapidly and without the necessity for providing forms or scaffolding or other temporary expedients of the character ordinarily required in the pouring of concrete.

Although the invention has been described with particularity as to detail, it will be understood that the description here given relates to typical forms ordinarily employed in the erection of a building in a manner conformable to the present invention, but that various additional modifications may be made without departing from the spirit of the invention.

I claim:

1. In reinforced concrete building construction, the combination of longitudinal and transverse girders, each of the girders having its lower portion surrounded by a shell of open topped boxlike formation having a base and side walls, the side walls being spaced in relation to the enclosed girder and terminating below the top of the girder, and means engaging the side walls of each shell for suspending the shell from the enclosed girder, a marginal pan having a side wall at its outer side only and having the inner edge of its base resting upon and supported by the proximate side wall of the longitudinal girder shell, the marginal pan being open at its end and having the end of its base supported upon the margin of the transverse girder shell, and a filler of plastic material extending continuously within the marginal pan and around and into the longitudinal and transverse girder shells and serving to embed the girders within said shells, the shells and base of the pan in conjunction furnishing the under surface finish for the structure.

2. In reinforced concrete building construction, the combination of longitudinal and transverse girders, each of the girders having its lower portion surrounded by a shell of open topped boxlike formation having a base and side walls, the side walls being spaced in relation to the enclosed girder and terminating below the top of the girder, and means engaging the side walls of each shell for suspending the shell from the enclosed girder, a marginal pan having a side wall at its outer side only and having the inner edge of its base resting upon and supported by the proximate side wall of the longitudinal girder shell, the marginal pan being open at its end and having the end of its base supported upon the margin of the transverse girder shell, an open ended intermediate pan on the outer side of the marginal pan, said intermediate pan having inner and outer side wall, the inner side walls being secured to the adjacent side of the marginal pan and the base at the open end of the intermediate pan being supported upon the girder shell of the transverse girder, and a plastic filler extending continuously within the intermediate and marginal pans and embedding the longitudinal and transverse girders.

3. In reinforced concrete building construction, the combination of longitudinal and transverse girders, each of the girders having its lower portion surrounded by a shell of open topped boxlike formation having a base and side walls, the side walls being spaced in relation to the enclosed girder and terminating below the top of the girder, and means engaging the side walls of each shell for suspending the shell from the enclosed girder, a marginal pan having a side wall at its outer side only and having the inner edge of its base resting upon and supported by the proximate side wall of the longitudinal girder shell, the marginal pan being open at its end and having the end of its base supported upon the margin of the transverse girder shell, an open ended intermediate pan on the outer side of the marginal pan, said intermediate pan having inner and outer side walls, the inner side walls being abutted against and secured to the adjacent side of the marginal pan and the base at the open end of the intermediate pan being supported upon the girder shell of the transverse girder, and a plastic filler extending continuously within the intermediate and marginal pans and embedding the longitudinal and transverse girders and of a depth to overlie and embed the walls of the pans to afford an unbroken monolithic structure, and the bases of the pans and girder shells furnishing an under surface finish for the structure.

4. In reinforced concrete building construction, the combination of a wall, a girder partially embedded within said wall and having flanges projecting outwardly from the wall, a girder shell at least partially surrounding the lower portion of the girder and having a base and side wall in spaced relation to the girder the side wall terminating below the top of the girder, means suspending the girder shell from the girder, a marginal pan extending in parallel relation to the girder shell and having the inner edge of its base resting thereon and supported thereby and having a side wall along the outer margin of the base, and a plastic filler extending continuously within the pan and into the girder shell and serving to embed the exposed portion of the girder.

5. In reinforced concrete building construction, the combination of a wall, a girder partially embedded within said wall and having flanges projecting outwardly from the wall, a girder shell at least partially surrounding the lower portion of the girder and having a base and side wall in spaced relation to the girder the side wall terminating below the top of the girder, means suspending the girder shell from the girder, a plurality of open ended pans each having a base and a side wall, the side walls standing in abutting relation and being connected to one another and the ends of the bases resting upon the side wall of the girder shell, and a plastic filler within each of the pans and extending continuously down into the girder shell to embed the exposed portion of the girder, the girder and shell and bases of the pans in unison forming an under surface finish for the structure.

6. In reinforced concrete building construction, the combination of a girder of I-beam formation, a girder shell of open topped boxlike formation having a base and side walls, the side walls being in spaced relation to the enclosed girder and extending only partially to the top of the girder, hanger means secured to the walls of the girder shell and engaging the top portion of the girder for suspending the girder shell and

affording support for the load carried thereby, a plurality of open topped pans each having a base and a marginal wall partially surrounding the base, leaving the margin of the pan open in part, the pans standing in sidewise abutting relation with contiguous marginal walls rigidly secured to one another to afford vertical reinforcement, the base adjacent the open marginal portion of at least one of the pans resting upon and being supported by the top edge of the proximate side wall of the girder shell, and a plastic filler within the pans and extending into the girder shell and filling the space between the shell and the girder.

HARVEY W. SCHICK.