

Jan. 3, 1961

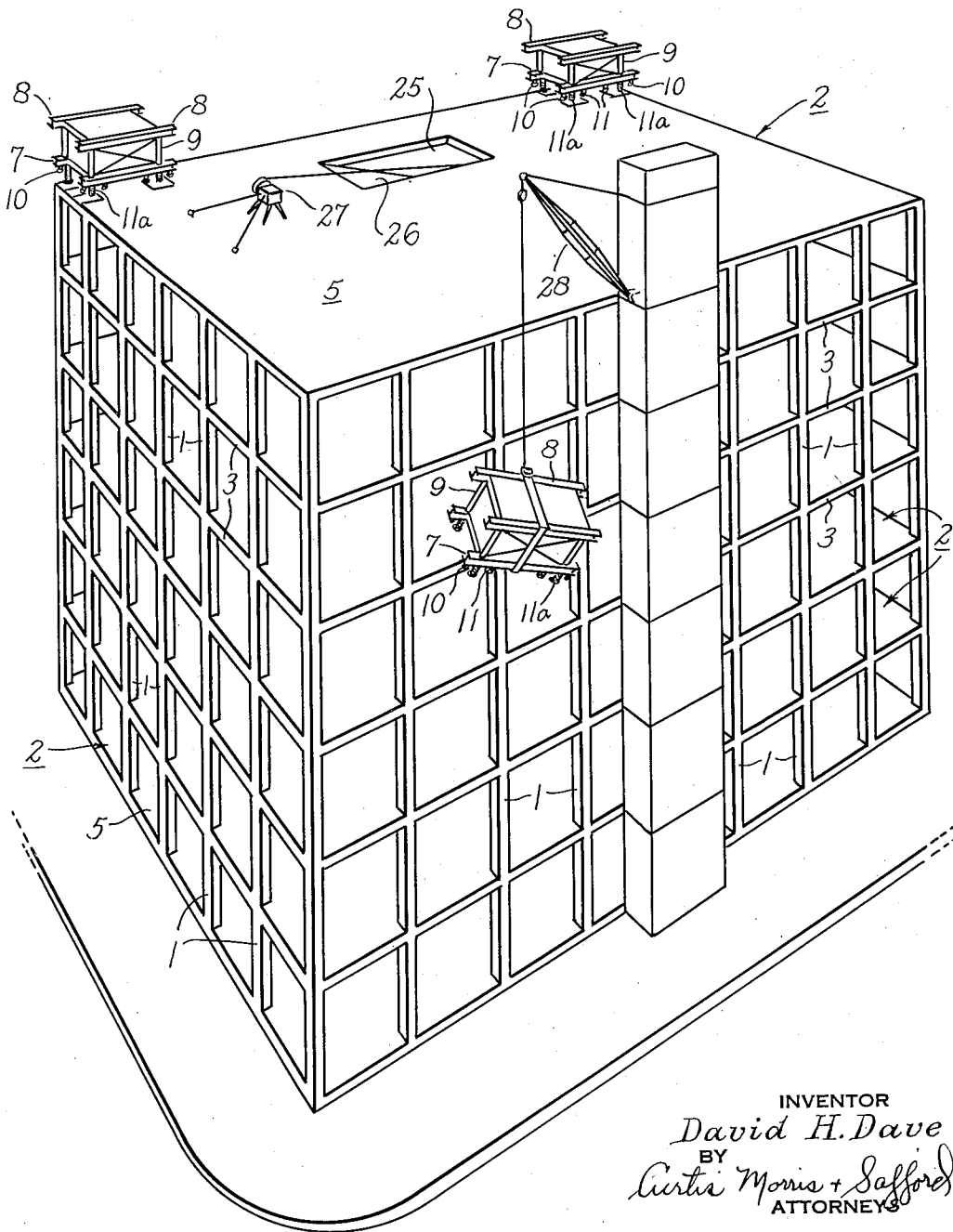
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METHOD FOR THE INSTALLATION OF REINFORCED CONCRETE
FLOORS IN MULTI-STORIED BUILDINGS

2,966,718

Filed Nov. 6, 1956

5 Sheets-Sheet 1

Fig. 1.



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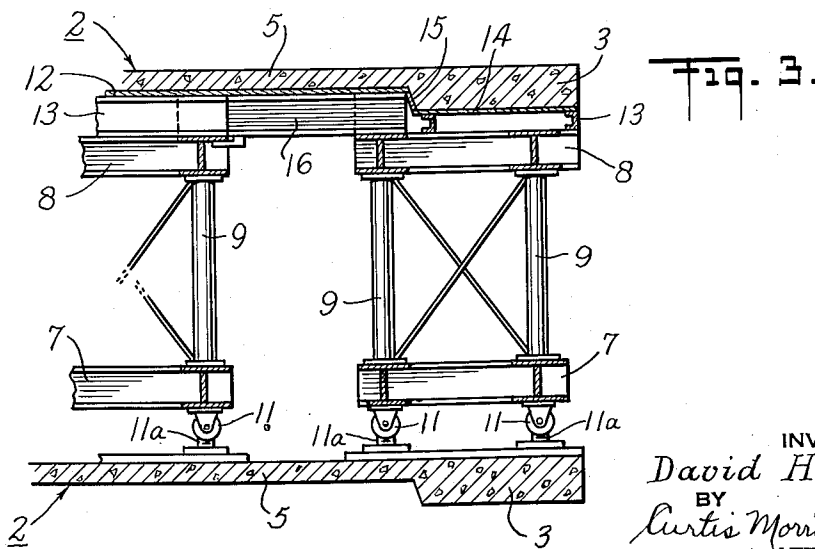
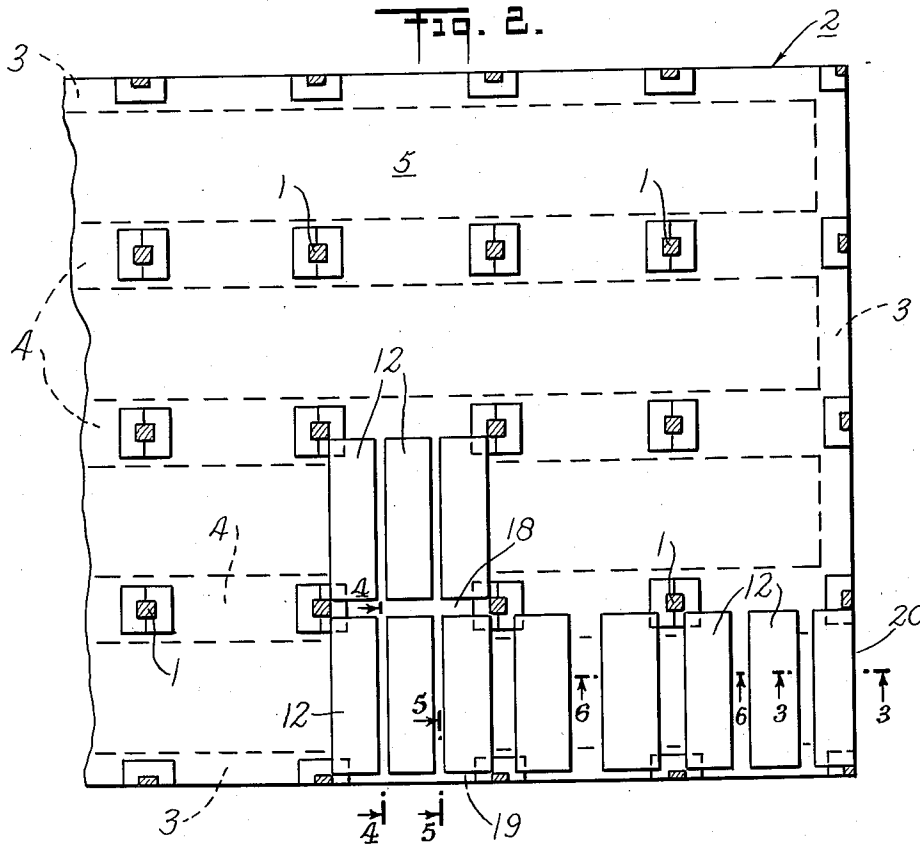
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Fig. 4.

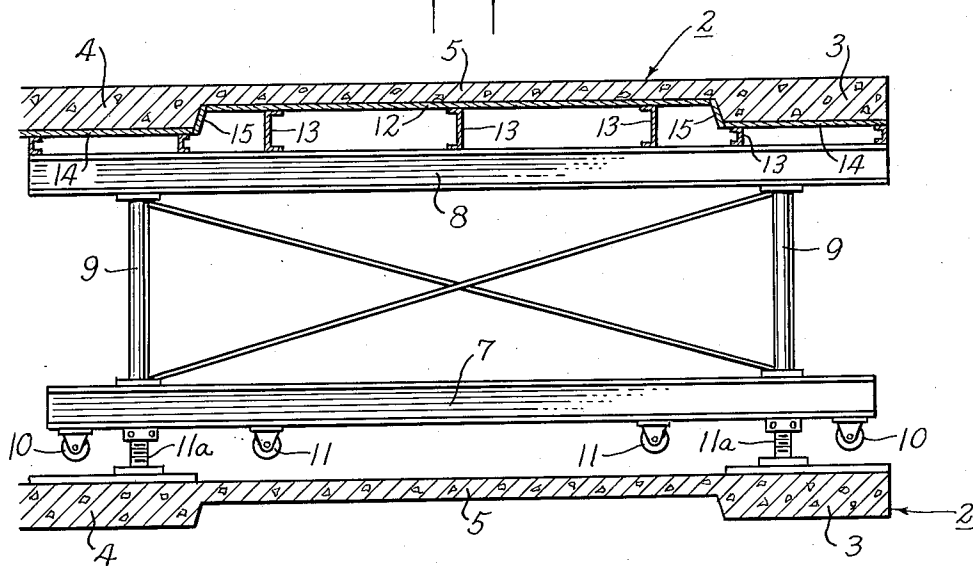
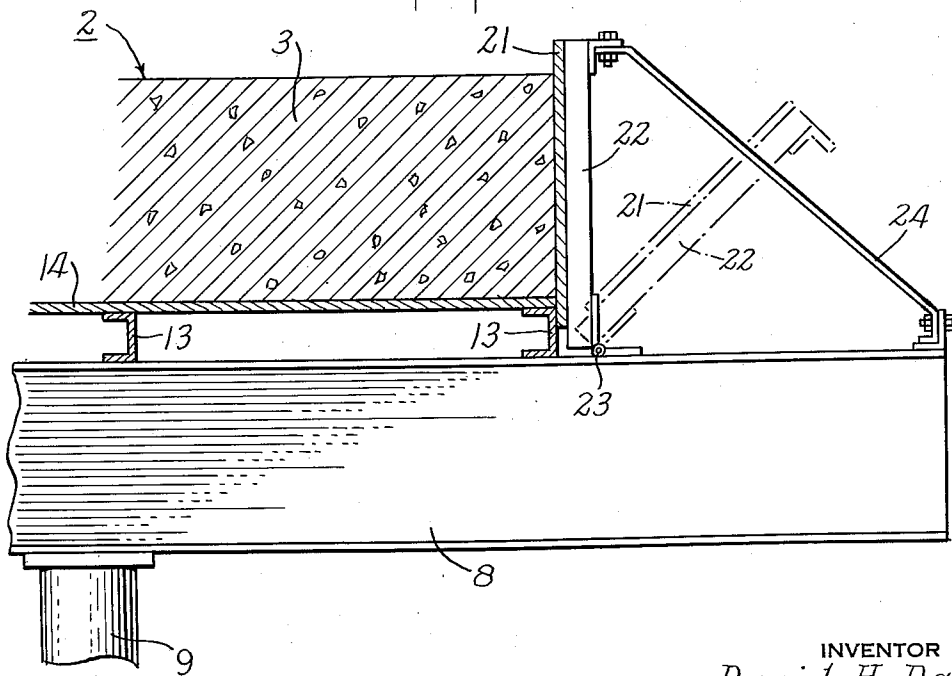


Fig. 5.



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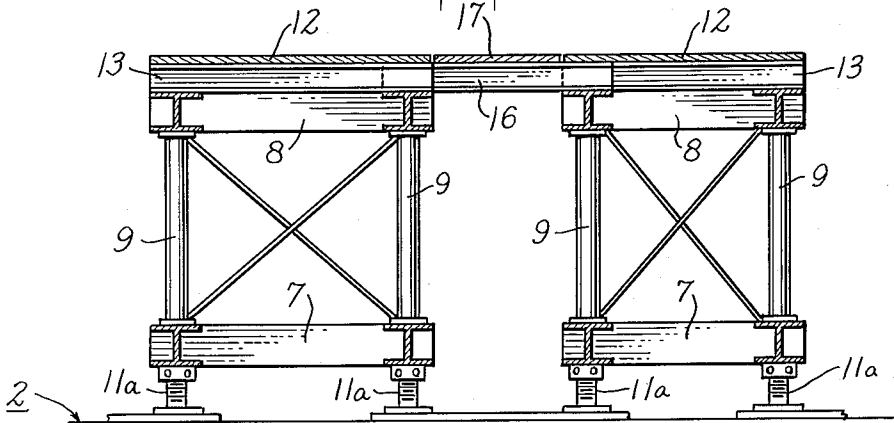
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Fig. 6.



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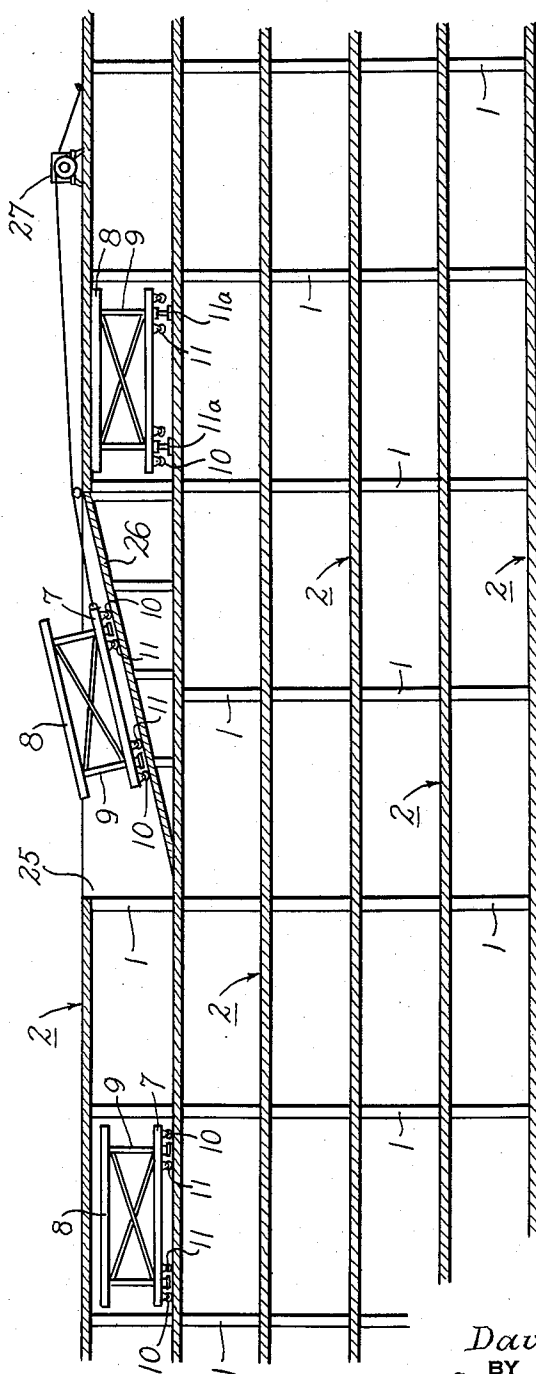
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Fig. 7.



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METHOD FOR THE INSTALLATION OF REINFORCED CONCRETE FLOORS IN MULTI-STORIED BUILDINGS

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2 Claims. (Cl. 25—155)

This invention relates to a method for the installation of reinforced concrete floors in multi-storied buildings.

An object of the invention is to provide a method by means of which multi-storied reinforced concrete framed buildings or multi-storied structural steel framed buildings can be constructed in a safer, quicker and more economical manner than heretofore has been possible. Heretofore, it has been the general practice in constructing multi-storied concrete buildings of either reinforced concrete or the structural steel types to erect wooden formwork on a foundation or an already poured concrete floor to provide a form on which the next succeeding higher floor may be poured. This wooden formwork has been erected in a more or less piecemeal fashion by workmen, who are relatively unskilled in the engineering of supports, with the result that the design of the formwork varies from time to time and oftentimes from floor to floor, the latter being occasioned, in many instances, by the injury to the wooden elements in their removal after a floor has been poured and the concrete has developed its strength.

Furthermore, the stripping of the formwork of the type above referred to from the concrete of the poured floor in many instances results in the breaking or injury of formwork components because of the manner in which the stripping necessarily is accomplished.

In any event, the erection and disassembly of wooden formwork of this type consumes an inordinate amount of time.

Modern efficiently designed multi-storied concrete buildings of either reinforced concrete or structural steel types have typical layout designs, insofar as formwork requirements are concerned. They comprise columns, interconnecting beams, spandrel bands and floor slabs.

The present invention contemplates the use of prefabricated apparatus including relatively large prefabricated main forms which, with appropriate prefabricated fill-in forms, will, when mounted on a mobile carrier, form a deck on which the concrete for the beams, spandrel bands and floor slabs may be poured, and on which such elements as reinforcing steel, electrical conduits and other elements, necessary in the construction of a building, may be supported for embodiment into the concrete. It contemplates, also, the concurrent use of multiple apparatuses of this type in number and position to permit the pouring of a complete floor and which are so operable as to permit an efficient, effective and quick stripping of the forms from the poured floor after the concrete has become self sustaining. Additionally, it contemplates the moving of these apparatuses, as unit, from floor to floor to provide for the pouring of succeeding upper floors.

The method also contemplates the provision of a well in each floor only slightly larger than the dimensions of an apparatus unit, and the erection of a ramp in relation to each said well to permit the transportation of the apparatus units from one floor to the next above floor for use in pouring successive floors.

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In Figure 1 of the drawing, I have illustrated, diagrammatically and in perspective, a portion of a building of the type which may be erected by the use of my invention and which comprises columns 1 and floors 2 having spandrel bands 3;

In Figure 2, I have illustrated, diagrammatically, a portion of a poured concrete floor of such a building as disclosed in Figure 1, the concrete spandrel bands or beams 3 and the beams 4, which extend between the vertical columns and transmit all loads to them, being indicated in dotted lines, and the positions of several of the apparatuses being indicated;

In Figure 3, I have illustrated, partly in section, the apparatus for and the manner of forming certain of the spandrel bands, the section being taken on line 3—3 of Figure 2;

In Figure 4, the cross sections of portions of two adjacent floors are illustrated and disclose the spandrel bands or beams 3 and the beams 4 that extend between the columns 1 as of greater vertical thickness than the floor slabs 5, the section being taken on line 4—4 of Figure 2;

Figure 5 is an enlarged view, partly in section, taken on line 5—5 of Figure 2;

Figure 6 is an end view partly in vertical section taken along line 6—6 of Figure 2; and

Figure 7 is a diagrammatic longitudinal vertical section of a portion of the building being erected and certain of the apparatuses shown on the ramp and indicating the manner in which they are drawn from one floor to the next higher floor.

In its broad aspect, the herein method comprises the steps of arranging on an already poured floor or foundation a plurality of apparatuses in such number and adjacent relationship that forms carried thereby may provide in effect a continuous deck to support the poured concrete of the next upper floor which includes the beams, the spandrel bands or beams and the slabs, said upper floor being substantially complete except for a well or opening of predetermined shape and size erecting a ramp extending from the lower floor to the next upper floor successively conveying the individual apparatuses from the lower to the upper floor; pulling up the ramp, after all of the apparatuses have been conveyed to the upper floor, closing the well in the upper floor with poured concrete; arranging the apparatuses on said upper floor in the manner heretofore described; and repeating the heretofore described steps until all desired floors have been poured; assembling the apparatuses on the uppermost of the poured floors; and transporting these apparatuses to the ground by means of a derrick or otherwise.

I will now describe one form of an apparatus that I contemplate using in carrying out the above method and the more specific steps of the method which will later be described.

Basically, such an apparatus comprises a mobile carrier including a rectangular base which may be constructed of steel beams 7, a form supporting framework which may be constructed of similar beams 8, and vertical supports 9 which extend from the base of the form supporting framework comprised by the beams 7.

The base of each such carrier is provided with casters 10 at each of its corners and, optionally, with intermediate casters 11. Additionally, lift jacks 11a are carried by or otherwise associated with the base and are adjustable vertically to permit the carrier to be supported by the casters or to raise the carrier from the caster maintain and support it in a stationary operative position, as upon removable plates 11b which in greater part rest on floor beams 3 and 4, Figure 5, thus tending to distribute the load primarily over the beam and column head areas.

As disclosed in Figures 3 and 4, each such apparatus is of greater length than width, the actual dimensions being dictated, to some extent, by the dimensions of the bays between the columns.

This basic form of apparatus includes a carrier which supports the concrete forms or decks which are, preferably, of plywood.

However, since different conditions are encountered in different locations, this basic apparatus is adapted to the different conditions, as later will be described.

Each of the apparatuses includes a form 12, preferably of plywood which extends longitudinally and transversely of the carrier and is supported thereon by transverse beams 13 (see Figure 4). On these forms the plastic concrete mass for the floor slabs may be poured.

Where the apparatus is positioned in use adjacent the location of a beam or spandrel band and it is intended to produce a similar beam or spandrel in the next floor portion above, the forms 12 include depressed or offset portions 14 which are connected to the main portions of the form 12 by inclined walls 15, which make it possible to strip the forms from the set concrete upon the lowering of the forms without fracturing the nearly hardened concrete. In other words, the initial lowering of the forms separates them from the concrete without dragging any portion of the forms along the surface of the concrete.

In constructing a floor, the apparatuses are arranged, preferably, in the manner illustrated diagrammatically in Figure 2 where several of the apparatuses are located within a bay.

As will be seen in Figure 2, the longitudinal edges of the forms 12 are somewhat spaced from each other, and the spaces between the forms may be filled in with suitable preformed fillers comprising beams 16 and plywood form sections 17 (see Figure 6) which beams may rest upon the beams 8 of the apparatuses and be suitably secured thereto. A similar arrangement of filler sections may be utilized between the adjacent ends of the forms as at 18 (Figure 2) where the beams are to be formed. In this connection, of course, the plywood form sections will be depressed as shown at 14 in Figure 4.

Where the spandrel bands are to be formed adjacent the ends, such as 19 (Figure 2), the forms will be, preferably, of the construction shown at the right end of Figure 4. When, however, the spandrel bands are to be formed along a longitudinal edge of one of the apparatuses, such as 20 in Figure 2, the forms will be constructed as illustrated in Figure 3.

In order that the edges of the spandrel bands either along the short sides or the long sides of the apparatuses may be formed, I provide a vertical form member 21 which is carried by a frame 22 that is hinged at 23 to the beam 8 or an extension of the beam (see Figure 5). This vertical form section 21 and the frame 22 are held in their vertical positions during the pouring of the concrete by suitable braces 24 which are, however, removable so as to permit the frame 22 and the form section 21 to be lowered about their pivot during the stripping of the forms from the set concrete.

In carrying out the method, the apparatuses are arranged between the columns but within the bays, as diagrammatically illustrated in Figure 2, over substantially the entire floor or foundation that has previously been formed, and the preformed filler sections heretofore referred to are placed so as to fill the spaces between adjacent longitudinal edges and adjacent transverse edges of the forms. However, sufficient of these apparatuses are omitted so that, after the floor mass is poured, a well opening remains which is of a shape and size through which the apparatuses may be drawn on a ramp 26 sequentially from the poured floor on which they rest to the next floor above for a repetition of the arrangement. This well which is indicated at 25 in Figures 1 and 7 is only sufficiently large to permit the passage of said ap-

paratuses upwardly on a ramp 26 which will extend from a lower to the next adjacent upper floor as illustrated in Figure 7.

After the building of this ramp, the setting of the concrete floor, and the stripping of the forms from the floor, the apparatuses may be moved sequentially from the lower to the upper floor, being drawn from the former to the latter by a suitable apparatus such as a winch 27. After all of the apparatuses have been drawn from one floor to the next adjacent floor, the well 25 is closed by poured concrete supported by such framing as may be desirable, and the arrangement and setting up of the apparatuses on the upper floor is repeated. In this manner, one floor after another may be poured using the same apparatuses and the same forms. The setting up and stripping may follow a definite orderly procedure which it is not necessary to vary from floor to floor.

When the last upper floor is poured, as shown in Figure 1, the uppermost well 25 is closed by poured concrete on suitable forms, and the apparatuses may then be lowered to the ground in any manner desired as, for instance, by a crane 28.

Substantially the entire floor, including the panels or slabs, the beams and the spandrel bands may be poured in a single operation upon prefabricated apparatuses which are portable from floor to floor and which require no reconstruction from floor to floor but only rearrangement. Thus, the disadvantage of building the conventional forms for a floor that is to be poured, removing the forms after the concrete has set and rebuilding the forms on the next adjacent floor is obviated.

The use of this apparatus and of this method will greatly facilitate the construction of buildings of the type heretofore referred to, will economize time and money, and will obviate the ever present danger of collapsing.

While I have described a particular form of apparatus, it is, of course, to be understood that some modifications may have to be made in order to adapt a particular apparatus to a particular situation that is peculiar to the building that is being erected, and this will be understood by those skilled in the art.

What is claimed is:

1. The method of successively constructing concrete floors of a multi-storied concrete building wherein said floors comprising slabs, beams and spandrels are supported on and vertically spaced by columns located in supporting relation to said beams and spandrels which comprises providing a plurality of unitary, prefabricated mobile form carriers supporting horizontal concrete forms, arranging said carriers above in already poured and set concrete floor in a manner to span the slab portions thereof and to transmit the load primarily onto beam portions thereof and in positions adjacent to each other and covering substantially the entire floor area except for a space approximately the length and breadth of a carrier and with the concrete forms thereon constituting substantially the entire surface on to which concrete is to be poured, with the exception of said space which corresponds to a well area, thereafter immobilizing each of said carriers, raising the same to locate the concrete forms at substantially the level of the under surface of the floor to be poured, pouring concrete onto said forms to produce a floor which is continuous except for a well opening therein, retaining said carriers and forms in said positions until the poured concrete has set, lowering said forms to strip the same from the set concrete, mobilizing said carriers, providing a ramp leading from the floor below to said poured and set floor through said well opening, then successively transferring said carriers and forms from their initial operative positions on the lower floor to said poured floor by way of said ramp and said well opening, removing said ramp, pouring concrete to fill said well opening and repeating said steps of emplacement, pouring, stripping and trans-

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portation from poured floor to poured floor until the desired number of floors have been created.

2. The method of successively constructing concrete floors of a multi-storied concrete building wherein said floors comprising slabs, beams and spandrels are supported on and vertically spaced by columns located in supporting relation to said beams and spandrels which includes the steps of providing a plurality of unitary, prefabricated mobile form-carriers supporting horizontal concrete forms, arranging said carriers above an already poured and set concrete floor in a manner to span the slab portions thereof and to transmit the load primarily onto beam portions thereof and in positions adjacent to each other and covering substantially the entire floor area except for a space approximately the length and breadth of a carrier and with the concrete forms thereon constituting substantially the entire surface on to which concrete is to be poured, with the exception of said space which corresponds to a well area, thereafter immobilizing each of said carriers, raising the same to locate the concrete forms at substantially the level of the under surface of the floor to be poured, pouring concrete onto said forms to produce a floor which is continuous except for a well opening therein, retaining said carriers and forms in said position until the poured concrete has set, lowering said forms to strip the same from the set concrete,

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mobilizing said carrier, providing a ramp leading from the floor below to said poured and set floor through said well opening, then successively transferring said carriers and forms from their initial operative positions on the lower floor to said poured floor by way of said ramp and said well opening, removing said ramp, and repeating said steps of emplacement, pouring, stripping and transportation from poured floor to poured floor until the desired number of floors have been created.

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