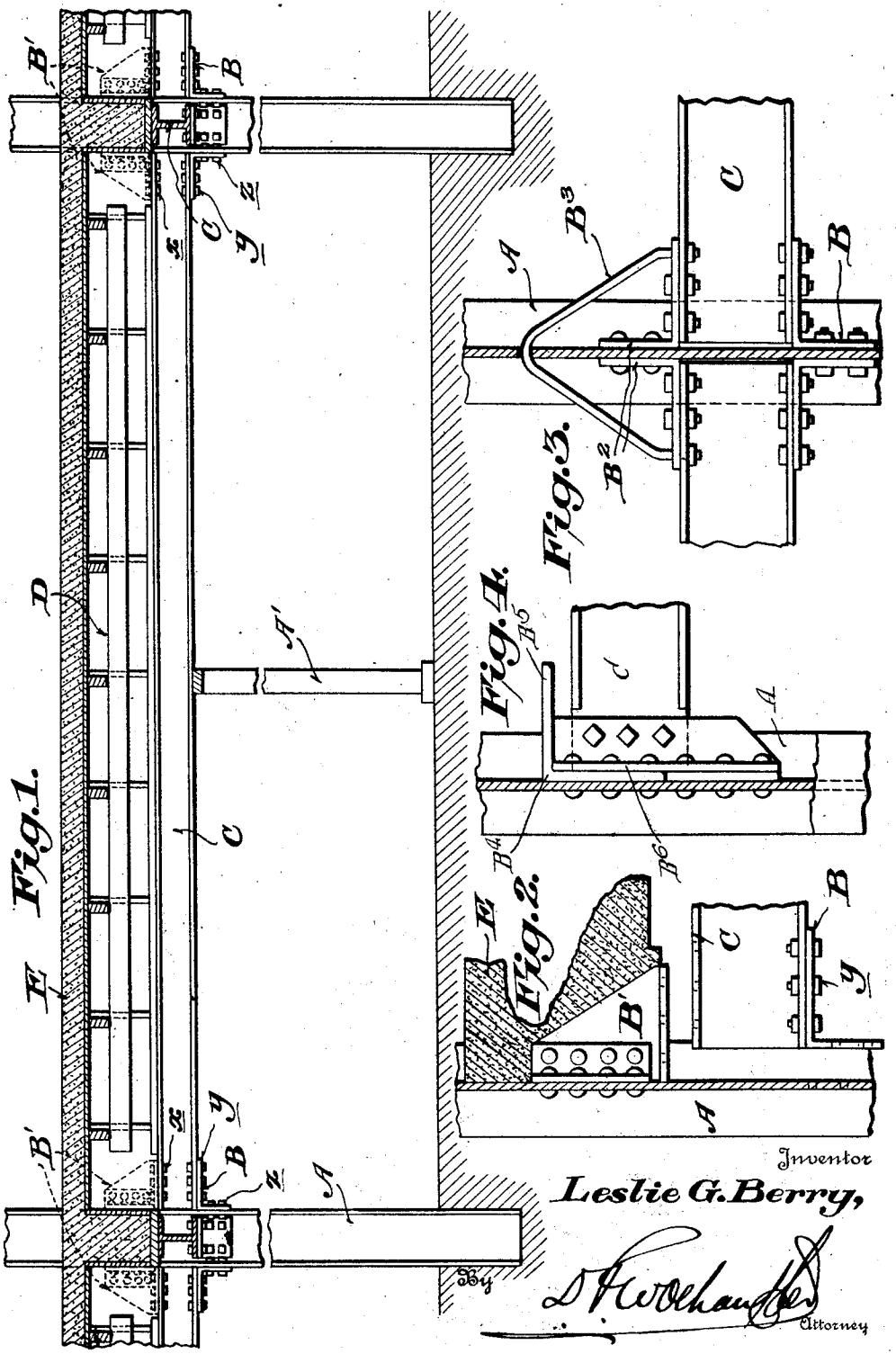
May 3, 1927. 1,627,009

L. G. BERRY

METHOD FOR CONSTRUCTING FIREPROOFING BUILDINGS

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METHOD FOR CONSTRUCTING FIREPROOFING BUILDINGS

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Fig. 5.

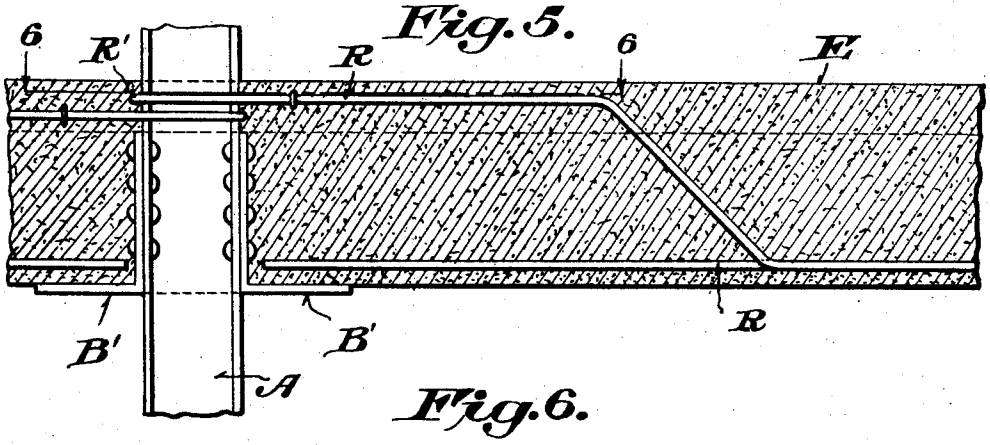


Fig. 6.

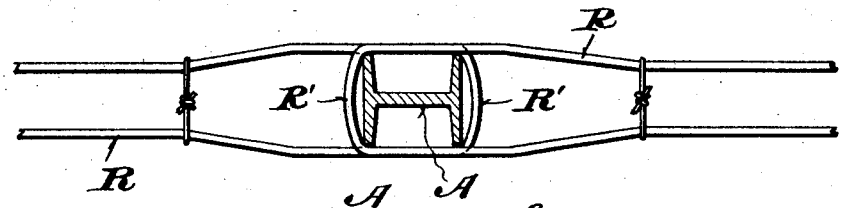


Fig. 7.

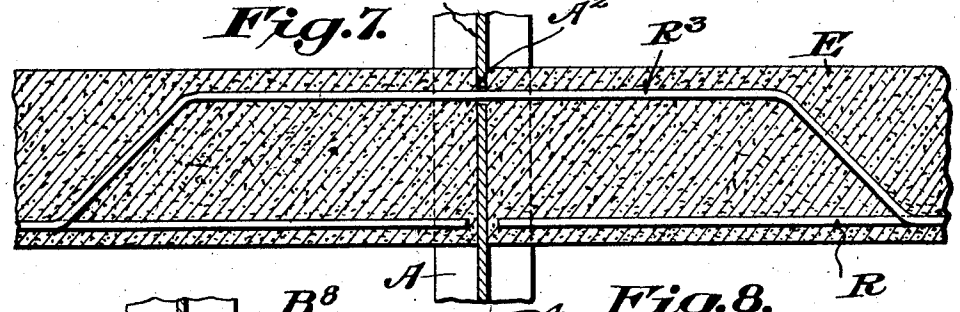
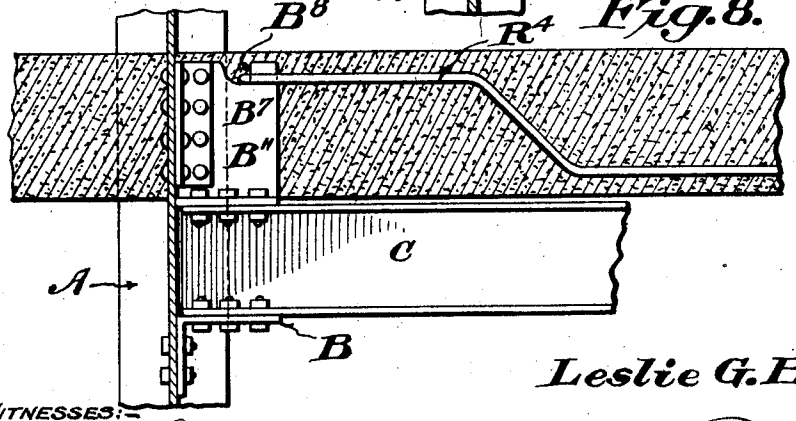


Fig. 8.



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METHOD FOR CONSTRUCTING FIREPROOFING BUILDINGS

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Fig. 9.

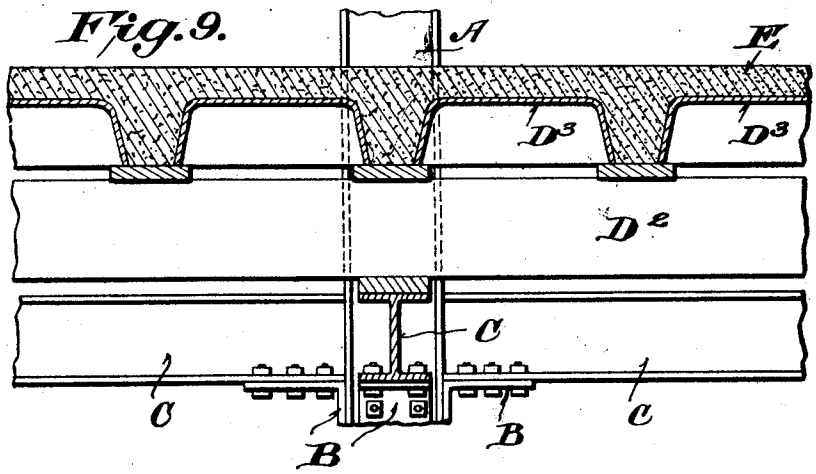


Fig. 10.

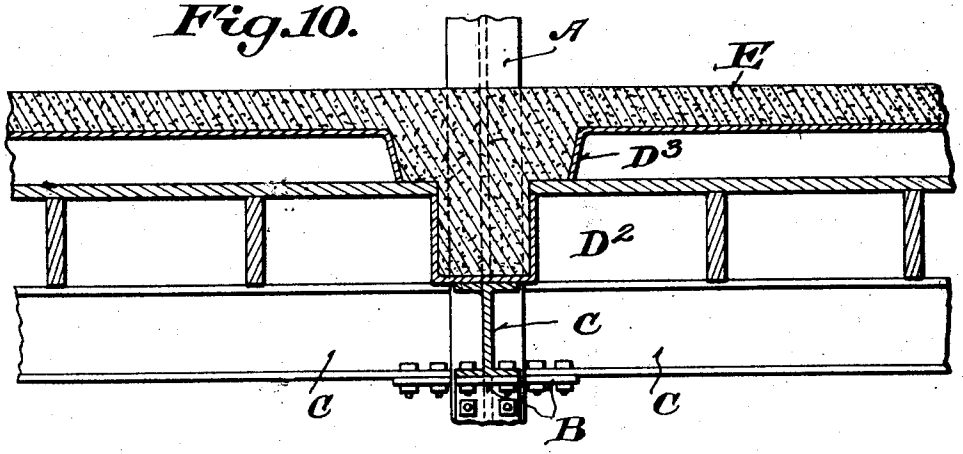
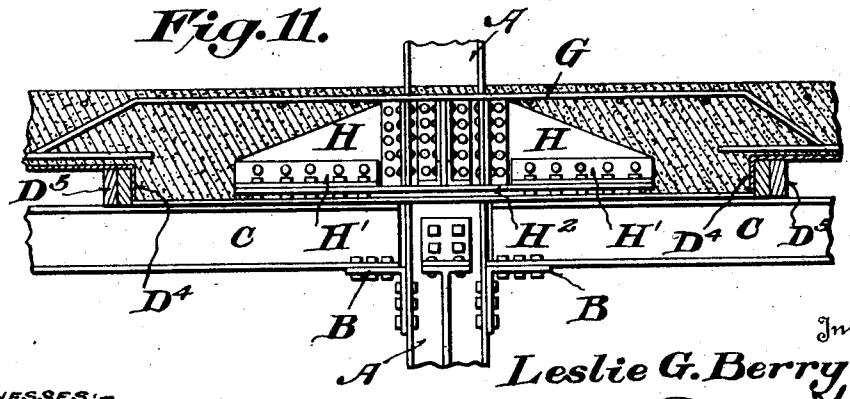


Fig. 11.



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UNITED STATES PATENT OFFICE.

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METHOD FOR CONSTRUCTING FIREPROOFING BUILDINGS.

Application filed May 29, 1925. Serial No. 33,801.

This invention relates to a novel method and means for constructing reinforced supporting areas such as concrete floors and roofs of the type now employed in various systems of reinforced concrete construction combinations of concrete with metal tile; combinations of concrete and clay tile; and also flat slab construction and the like.

According to present practice fireproof buildings are usually constructed either of steel framing with hollow tile concrete or similar floors, all of the steel framing being designed and intended to become a permanent part of the building, or, on the other hand, the buildings are constructed entirely of reinforced concrete or reinforced concrete and hollow tile combinations. Ordinarily, the steel framing type of building may be quickly erected as compared with the poured concrete type of building construction, and although the latter is on the whole somewhat cheaper than the steel framing type of building construction, nevertheless, a considerable item of cost in reinforced concrete structure is due to the use of wood forms for the columns and floors as well as the intermediate shoring and bracing for the floor system.

Accordingly, the present invention has primarily in view a novel method of constructing a fireproof building which essentially utilizes a combination of permanent steel columns and concrete floors, thereby doing away with the necessity of building concrete columns, and the concrete floors being supported on temporary steel beams or struts running from column to column to which they are detachably connected below the level of the finished concrete floor thereby to accommodate and support the wood or other form for the concrete girder, beam or slab systems, or other forms of floor construction.

A further object of the invention is to provide a building construction wherein the design of the vertical steel column is made in accordance with the usual recognized standard practice for steel frame construction, and also to use any type of reinforced concrete floor construction designed in accordance with the usual practice, or that required by the most conservative engineering practice. In that connection the invention also aims to provide a construction that can be erected more speedily than other forms of fireproof construction at present in general use, while the item of costs is very little, if any, greater than in an all reinforced concrete building.

A still further object of the invention is to provide a building construction utilizing floors erected on forms supported by vertical steel columns instead of concrete columns, thereby having the advantage of utilizing a a steel column which is not only more dependable than concrete but occupies much less floor space.

With the above and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

While the novel method proposed herein may be carried out in connection with various forms of apparatus or construction, nevertheless, by way of illustrating a preferred and practical way of carrying the same into effect, reference may be made to the accompanying drawings, in which:—

Figure 1 is a vertical sectional view of a floor span between two columns illustrating the manner of carrying the invention into effect.

Figure 2 is a detail diagrammatic view illustrating the step of removing the temporary strut or beam.

Figure 3 is a detail view illustrating a modified form of top bracket which forms a part of the temporary support for the horizontal steel beams and also remains in the reinforced concrete construction to tie the concrete beam to the capital of the column.

Figure 4 is a detail view similar to Fig. 3 illustrating a further modified form of bracket for supporting the temporary steel beam and also subsequently supporting the concrete beam.

Figure 5 is a detail view of a reinforced concrete girder constructed in accordance with the present method and illustrating the manner of supporting and reinforcing the ends of same at the vertical steel columns.

Figure 6 is a detail horizontal sectional view taken on the line 6—6 of Figure 5.

Figure 7 is a sectional view illustrating another type of reinforcement for the concrete beam where it is supported at the position of the columns.

Figure 8 is a sectional view illustrating a modified form of top bracket for supporting the temporary steel beam which remains

embedded in the concrete floor construction to provide an anchor for reinforcing the elements.

Figures 9 and 10 are sectional views illustrating the application of the construction to a combination metal tile and concrete joist construction.

Figure 11 is a detail sectional view showing a type of construction of the column capital.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

As previously indicated, the present invention contemplates a method of constructing fireproof buildings which consists in using steel columns equipped with specially designed brackets for supporting temporary horizontal steel beams or struts which in turn support the wooden or other floor forms, and certain of said brackets being detachable thereby to permit of the removal of the steel beams and all floor forms so that they may be available for use on upper tiers of columns, while others of said brackets remain on the columns to receive and aid in permanently supporting the reinforced concrete floor. In this type of building construction the steel struts serve a double purpose, namely, that of a strut and tie in the erection of a steel column to support and keep the column in perfect alinement; and also, to build the forms on and to support the same together with the concrete when it is poured. Since the steel struts are used only in the process of construction and do not become a permanent part of the structure, it will be apparent that by standardizing these struts and providing adequate adjustments they may be used over and over again on the upper tiers of the same building and also for other buildings.

Accordingly, it is proposed to first erect the vertical steel columns A, which may be of H-beam or other suitable design in accordance with the accepted and approved standards for erecting such steel columns, to the proper floor height for each floor. At the proper location the said steel columns are equipped with suitable brackets B—B′ adapted to provide a support for the temporary steel struts or beams C that span the distance from one column to another and support the wooden forms D of wood and constructed in accordance with present practice thereby to receive the poured concrete floor E.

As will be observed from Fig. 1 the brackets B—B′ may be bolted to either the outside flanges of the vertical column A or to the webs within the channels of the beam, thereby to support the horizontal struts or beams C in the desired directions laterally from the column. The top bracket B′ serves as a top connection for the steel strut or beam C through the medium of the bolts x, while the bottom bracket B constitutes a shelf angle adapted to be temporarily bolted to the bottom of the strut C by the bolts y. Thus, after the vertical columns A are erected the horizontal struts or beams C may be secured thereto by connecting the ends of said beams with the brackets B and B′, and in order to permit of the desired adjustment between the ends of the temporary beams and the brackets B and B′ it will be observed that a plurality of bolts x and y cooperating with suitable holes punched in the flanges of the beams C and the horizontal parts of the brackets B and B′ permits of the selection of the desired registering openings in the beam flanges in the brackets to receive the bolts. By punching a greater number of holes in the beam flanges and the brackets it will be apparent that a greater range of adjustment may be provided for connecting the ends of the beams with the columns, and also to provide for a relative vertical adjustment of the temporary beams C suitable shims or fillers (now shown) may be placed between the flanges of the temporary beams and the brackets.

After the temporary beams C have been secured to the brackets B and B′ by the bolts x and y the floor forms D may be constructed on the temporary beams C which constitute a removable support for the wooden or other floor forms. Before the concrete is poured in the forms or before other forms of masonry are placed in the forms the bolts x are removed. Where a reinforced concrete floor is used the concrete then fills in around the top bracket B′ which becomes embedded in the concrete and remains in place as a part of the permanent floor structure.

However, after the floor has set to the proper degree or is otherwise self-sustaining without the further aid of the forms D, the bolts y which connect the lower flanges of the beams C with the bottom bracket B may be removed or these bolts may be left in place and the bolts z removed thereby to permit of the removal of the brackets B from the columns A thereby to drop the temporary beams C and the forms D. Obviously, the beams C and the forms D may then be raised to the floor above, and be used over again.

As will be observed from Fig. 1 if the dead load on the temporary beams C is too great to be carried thereby, an intermediate timber support or shore A′ may be used. This shore member is merely temporary and would only be required, if at all, on large spans.

Figure 3 of the drawings illustrates a modified form of top bracket for supporting the temporary beam C. This bracket includes the angle member B^2 and the support-

ing member B^3 which preferably passes through an opening in the web of the column A over to the opposite member B^2 on the other side of the column, thereby serving to more adequately reinforce the top brackets B^2 and enable them to more effectually key into the end of the concrete girder which is poured thereabout and on top of the horizontal part of the bracket B^2.

Figure 4 illustrates the use of a single bracket for supporting a temporary beam C as well as the permanent concrete beam and to that end an angle member B^4 is bolted to the column A with its horizontal flange B^5 arranged in the plane of the bottom of the concrete beam. This bracket also includes a flange portion B^6 to which the web of the temporary beam C is adapted to be connected. In this case it is necessary to cut away the top and bottom flanges of the temporary beam C to permit of the connection of its web with the support B^6. In this arrangement the top of the temporary beams C is located below the level of the flange B^5 thereby to take care of the thickness of the wooden forms which are supported on the beams C so that when they are removed the concrete will rest directly on the shelf portion B^5 of the bracket which remains as a permanent part of the structure.

Since reinforced concrete floor systems are monolithic, and all tests prove that they act as rigid structures it is essential to provide for negative moments at the column heads. This is a well recognized practice in the design of all reinforced concrete as well as the floor. However, no such provision has heretofore ever been attempted or applied where steel columns have been used.

Accordingly, Figures 5, 6, 7 and 8 of the drawings show novel means for running bent bars in the top of reinforced concrete beams and girders at the steel column heads.

In these figures the vertical columns A provided with the permanent brackets B′ may also be provided with the reinforcing bars R, portions of which may be looped around the vertical columns as indicated at R′ as shown in Figs. 5 and 6.

Figure 7 illustrates a further form of reinforcement wherein the concrete reinforcing bars R^3 pass through suitable openings A^2 in the web of the column A thereby to provide continuity of reinforcement.

Figure 8 of the drawings illustrates a further modified form of top bracket B″ previously referred to but is also provided with an anchoring flange portion B^7 having a notch B^8 for receiving the reinforcing element R^4.

Figures 9 and 10 of the drawings illustrate the application of the invention to a combination metal tile and concrete joist construction. In these figures the method of constructing the floor is the same as in Figs. 1 and 2 of the drawings but in addition to the wood forms D^2 made of wooden joist the metal tiles D^3 may be also utilized, thereby showing the adaptability of the present method of construction to approved forms of building construction.

Figure 11 of the drawing illustrates a type of construction at the column capital. This head or capital construction is designated as G and preferably consists of a plurality of plates H carried by the column A and projecting laterally therefrom and reinforced by stiffener angles H′. The lower part of the stiffener angles H′ may carry therewith a suitable plate H^2 of any desired contour and extent, this plate being slipped over the column after having an opening made therein corresponding to the cross-sectional shape of the column by a suitable oxy-acetylene welding torch or the like. The brackets B may be preferably spaced from the underside of the plate H^2 of the capital G thereby to support the temporary beams C, which as in the other forms of construction, support the metal tiles D^4 and wooden supports D^5 which form a mold for the floor.

In pursuing the present method of building construction it may be pointed out that the steel columns may be used throughout, or they may be used for the central supporting columns of the building while the outside columns are made of reinforced concrete. Thus the present invention consists of a novel method of constructing buildings wherein various well known and recognized building features may be employed but the distinctive feature thereof resides in the combination of structural steel or cast iron columns, using temporary steel beams running between the columns, at suitable intervals in height that assist in the erection of the columns for temporarily carrying the floors of roof during construction, after which the temporary steel beams may be removed.

In connection with the vertical metal columns A it may be pointed out that with the present method of construction it is not necessary to encase the columns in concrete. According to building codes in different locations metal beams or columns must be surrounded with a fireproof covering, and where such requirements must be met it will of course be understood that the vertical columns A may be protected with a sheathing or facing of 2″ terra cotta or other approved fireproofing material after the frame is erected complete. According to the customary practice, the encasing of columns in concrete is very expensive, but by using the hollow tile or like means for fireproofing exposed metal surfaces the cost of construction may be carried out at about one-third of the cost of the concrete method.

From the foregoing it will be apparent that the present invention contemplates the provision of a building construction which includes vertical steel columns and horizontal beams temporarily secured thereto for the purpose of supporting the desired type of floor forms depending upon the character of the floor construction. Aside from the fact that the floor system is supported by the temporary steel beams, the same does not constitute a part of the present invention. A building constructed in accordance with the present method has the advantage heretofore pointed out, and it is also believed that without further description other features and advantages will be apparent to those skilled in the art.

I claim:—

1. A method of constructing steel and concrete buildings which consists first in erecting upright metal columns forming a permanent part of the building structure, then rigidly connecting said columns by transverse temporary metal supporting members separably fastened thereto, next forming a concrete floor base upon said temporary supporting members, then forming the concrete floor on said base, and subsequently removing said members and base.

2. A method of tier construction for steel and concrete buildings which consists first in erecting upright metal columns forming a permanent part of the building structure, then rigidly connecting said columns by transverse temporary metal supporting members separably fastened thereto, repeating said operations for each floor until the tier is completed, next forming a concrete floor base upon said temporary supporting members, then forming the concrete floor on said base, and subsequently removing said temporary members and said floor base.

3. A method of constructing steel and concrete buildings which consists first in erecting upright metal columns forming a permanent part of the building structure, then rigidly and separably connecting said metal columns by temporary steel members, building floor forms on said members, forming the floor on said floor forms, and subsequently removing the temporary members and forms.

4. A method of constructing steel and concrete buildings which consists first in erecting upright structural metal columns forming a permanent part of the building structure and said columns having permanent brackets thereon, then rigidly and separably connecting the vertical metal columns by horizontal members at the location of said permanent brackets, building floor forms on said temporary horizontal members, then pouring concrete in said forms to envelope said permanent brackets, and subsequently removing the temporary horizontal members and floor forms.

5. A method of constructing steel and concrete buildings which consists in erecting permanent vertical metal columns and rigidly but separably connecting them by horizontal members, building floor forms on said horizontal members, pouring the concrete in said forms, and subsequently removing said horizontal members and forms and using them at higher floor levels to connect and tie additional vertical metal columns together.

6. A method of constructing steel and concrete buildings which consists in erecting vertical metal columns and securing permanent offset bracket elements thereto, next rigidly and separably connecting the spaced vertical metal columns by horizontal temporary supporting members, then constructing concrete forms on said temporary horizontal members, pouring concrete in said forms around and about said permanent bracket members, and subsequently removing the temporary supporting members and forms to be reused at higher elevations.

In testimony whereof I hereunto affix my signature.

LESLIE GRAHAM BERRY.