

H. BRUSSEL.

SYSTEM OF CENTERING FOR REINFORCED CONCRETE CONSTRUCTION.

APPLICATION FILED JUNE 4, 1909.

954,165.

Patented Apr. 5, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

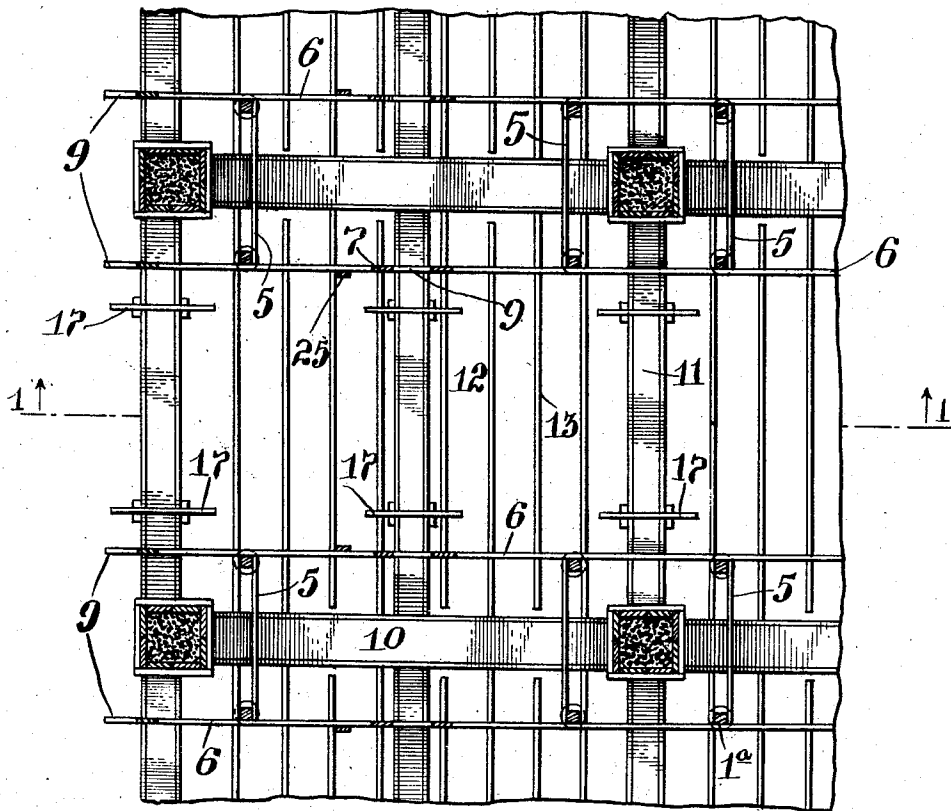


Fig. 4.

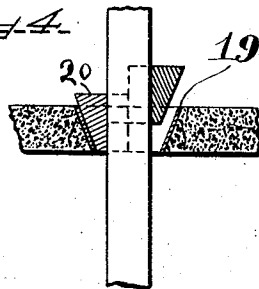
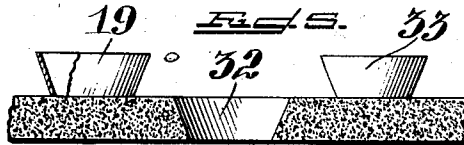


Fig. 5.



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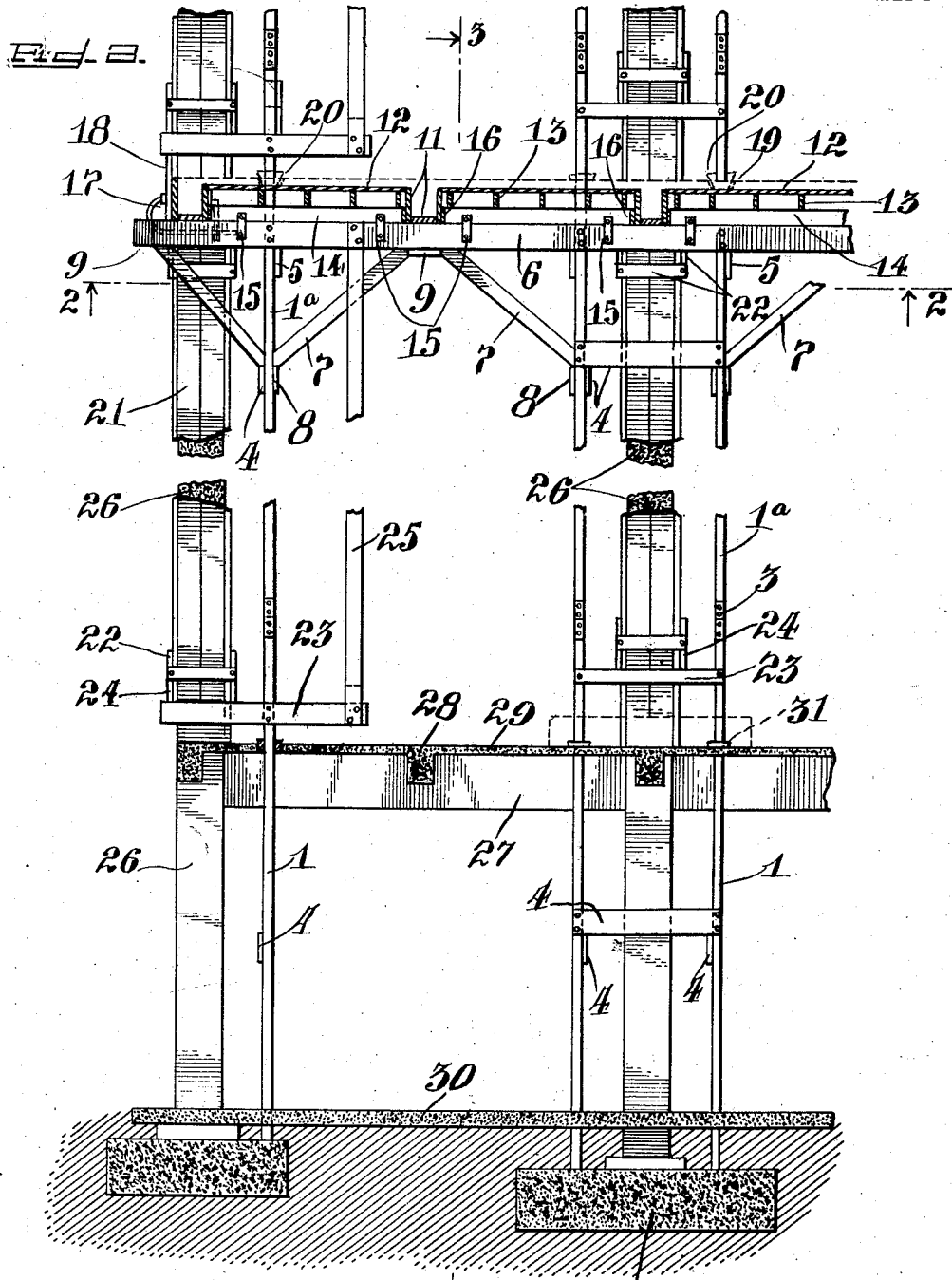
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3 SHEETS—SHEET 2.



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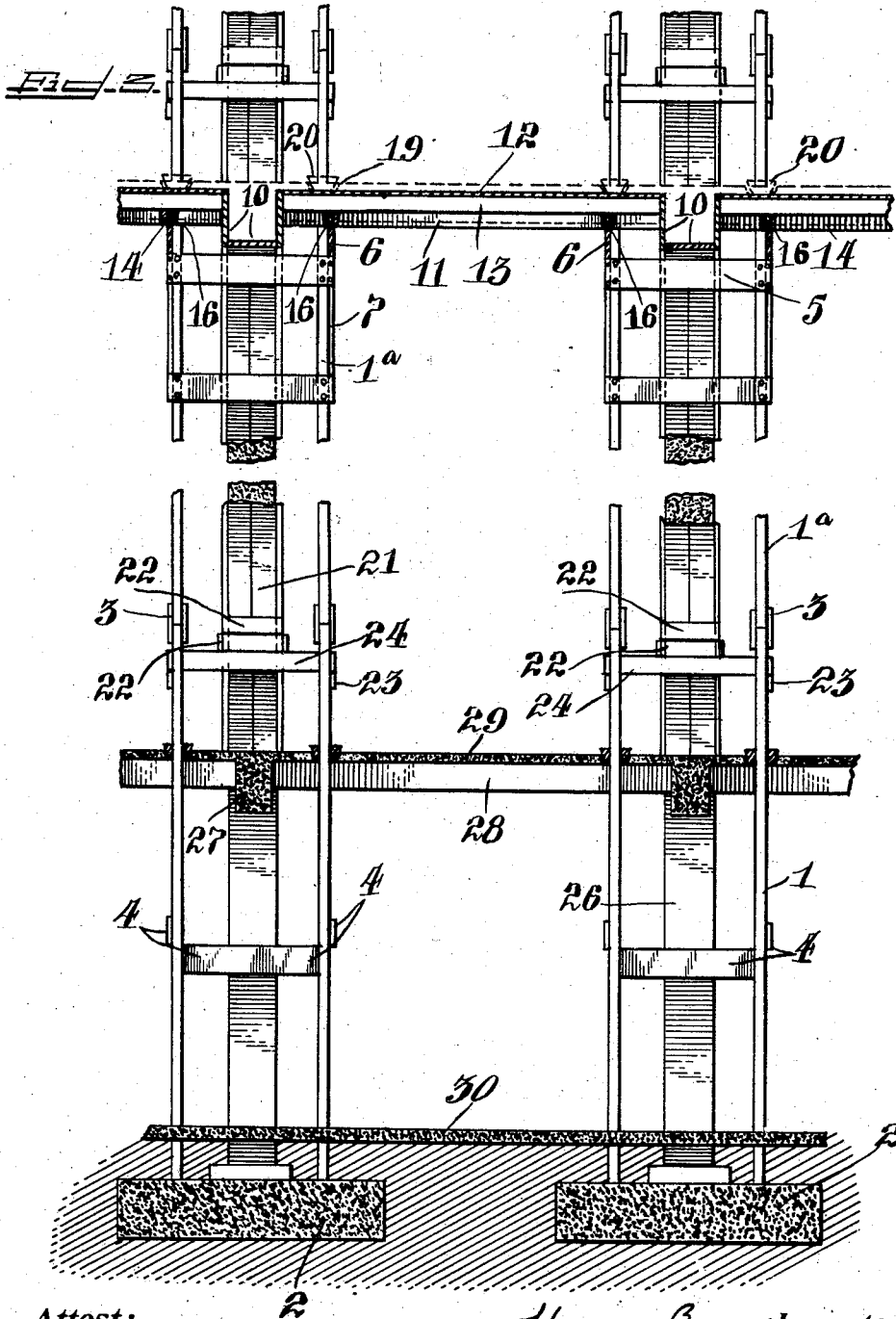
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

HUGUES BRUSSEL, OF ST. LOUIS, MISSOURI.

SYSTEM OF CENTERING FOR REINFORCED CONCRETE CONSTRUCTION.

954,165.

Specification of Letters Patent.

Patented Apr. 5, 1910.

Application filed June 4, 1909. Serial No. 500,150.

To all whom it may concern:

Be it known that I, HUGUES BRUSSEL, a citizen of the Republic of France, and resident of the city of St. Louis, in the State of Missouri, have invented a certain new and useful System of Centering for Reinforced Concrete Constructions, of which the following is a specification.

The invention relates to reinforced concrete construction; more particularly to means for and methods of constructing and supporting the centering or falsework required for molding the several members of reinforced concrete buildings, especially when divided by horizontal partitions or floors into two or more stories. The method heretofore employed in construction work of this character has been to start from the foundations and mold first the supporting columns and then the floor members of the first-floor in boxes and upon sheeting supported from below by uprights distributed more or less uniformly over the entire area of the structure, and then to mold the members of the next, and of each succeeding floor in turn, upon centering built up from and similarly supported upon the completed floor immediately below. This mode of procedure is objectionable on several grounds. In the first place, it is necessary to allow the concrete of one floor to set before starting the erection of the centering of the floor above, thus alternately interrupting the work of the carpenters and of the steel workers and concrete men and rendering the progress of the work very slow. The interference and added expense thus occasioned are particularly felt in the case of buildings covering a small ground area. Another and more serious objection is due to the fact that green concrete has little strength and requires a considerable period of time, depending upon its size and shape, weather conditions, and other considerations, to thoroughly dry out and harden. A newly molded floor must therefore be supported by temporary shoring in order to enable it to sustain the weight of the wet concrete poured into the molds of the floor above; and a premature striking of the centering or too early removal of such props may endanger not only the safety of the entire structure but the lives of the workmen, and has caused a large percentage of the acci-

dents which have occurred, in the past, in this form of construction.

The object of the present invention is to provide improved means and methods for constructing and supporting the necessary centering and thereby to reduce to a minimum the amount of material required, to expedite the work, and to increase the safety both of the construction itself and of the workmen employed during the period of construction.

To this end my invention consists, broadly stated, in certain novel features in the arrangement and location of temporary uprights and horizontal carriers upon which the centering for the floor is supported and also, where the construction comprises more than one story, in what may be called a system of continuous centering wherein the entire centering for the second and each succeeding floor is mounted upon and carried by—not the newly molded floor immediately below, as formerly, but—temporary uprights which from suitable foundations below are extended up through the centering of the intermediate floor or floors.

The uprights which constitute the supports for the centering are set upon suitable foundations, the footings of the columns so far as practicable, and preferably extend above the first floor level. They are usually and preferably so disposed that four will form substantially a rectangle about each of the interior columns, or, rather, positions for such columns with a column at the center and with sides parallel to the sides of the building and of a length about equal to two-fifths of the span in each direction, thus leaving a space about equal to three-fifths of the span between each group, while two uprights are set on the inner side of each outer or wall column or column-position and at about the same distance therefrom and from each other as in the case of the interior columns, the other pair being here either omitted or, if found desirable, placed inside of the first pair. This disposition of the uprights provides ample space for setting up the column-boxes or molds, insures an even distribution of the load which the uprights have to carry, and avoids the placing of any of them outside the limits of the building.

The uprights of each group, and of the different groups, are tied together and held

in position by horizontal members which are so secured to the uprights and at such a height thereon that they may serve as carriers for the boxes and sheeting required for molding the beams and floor-slabs of the first floor, the uprights and carriers being stiffened and strengthened by knee-braces secured in place so as to be readily removable. The usual boxes for the principal girders and cross girders or beams are secured in place upon the carriers, the sheeting which constitutes the platform upon which the floor-slabs are molded is laid upon joists which are also set in place upon the carriers and assembled thereto, if desired, and the boxes for supporting columns are set up. The floor-sheeting is cut away so as to fit around the uprights, which, as stated, extend above the floor level; and, after it is in place, a sleeve of any suitable material and preferably tapering inwardly from its upper end is slipped down over or molded around each upright to prevent its being embedded in the floor-slab and to provide an opening therein through which it can later be readily removed. Either after or, usually, before this first floor has been molded, the uprights are built up above the next floor level in any suitable manner, and these extensions are in turn tied together by horizontal carriers upon which the beam boxes and floor-sheeting for the second floor are assembled and sleeves are placed or formed around the uprights in the same manner as before. The boxes for the second floor columns are supported, preferably, upon additional carriers suitably secured to the uprights for the purpose. In a similar manner, the centering for each succeeding floor in turn, and finally for the roof, is built up upon and is carried by the same uprights. Since each floor has to carry only its own weight the molded concrete is soon hard enough so that the centering for the floor may be struck and the carriers removed, the uprights having first been properly wedged within the sleeves, or in the openings left in the floor-slabs by the sleeves, to prevent any lateral movement. And if, for any reason, as to allow the work of the interior finishing to proceed, it is desired to remove the lower section or sections of some or all of the uprights, this may be done, when the concrete of the lower floors has sufficiently hardened, after securing the uprights to horizontal supports laid upon the hardened beams of the floor above or of several consecutive floors, according to the load to be carried. After the removal of the uprights therefrom, the openings left in the floor slabs are filled up with concrete in any suitable way; for example, by pieces molded, either in advance or after their removal, in the sleeves used to form such openings. It is thus possible, and is usual in practice, for workmen to be removing the

centering of the first floor while, simultaneously, concrete men are molding the second floor, steel workers are setting the reinforcement for the floor above, and carpenters are building up the centering for a floor still higher up.

The means and methods employed in carrying out my invention, as above set forth, are illustrated in the accompanying drawings, in which, similar reference characters being used throughout to indicate similar parts—

Figure 1 is a horizontal section on the line 2 2 of Fig. 2, showing the under side of the centering of one of the upper floors of a building in course of construction: Fig. 2, a vertical section on the line 1 1 of Fig. 1, showing the centering and supports of an upper floor and the completely molded first floor from which the centering has been struck; Fig. 3, a vertical section on the line 3 3 of Fig. 2; and Figs. 4 and 5, enlarged details, partly in section, of an opening through a floor-slab around an upright, showing means for forming, wedging the upright within, and finally filling up such opening.

As here illustrated, the uprights 1, usually wooden timbers four inches square for spans of ordinary length and correspondingly larger for longer spans, rest upon the column-footings 2 and, extending up to a convenient height (say three feet) above the first floor level, are built up above the level of the second floor and of each succeeding floor in turn, by extensions 1^a which are joined on to their upper ends by cleats 3, or in any other suitable manner. The uprights are tied together and stiffened by horizontal tie-pieces 4 secured thereto at a suitable distance below a floor-level and, above these tie-pieces and immediately below the floor level, by the main girder-carriers 5 and the secondary girder- or beam-carriers 6; and the skeleton structure thus formed is further stiffened and strengthened by knee-braces 7 which at their lower ends abut against the tie-pieces 4 and blocks 8 upon the uprights and at their upper ends against blocks 9 on the lower edges of the beam-carriers 6. The girder-boxes 10 and the beam-boxes 11, both of the usual construction, rest upon and are carried by the girder-carriers and beam-carriers, respectively, while the sheeting 12, forming a platform upon which the floor-slabs are molded and cut away so as to fit around the uprights, is laid upon joists 13 which, extending between the girder-boxes parallel to the beam-boxes, are assembled and rest upon riser-strips 14 mounted upon the upper edges of the beam-carriers between the beam-boxes in any suitable manner, as by cleats 15. The sides of the girder-boxes are braced by the ends of the joists 13 which, if not of the full length required, are set

with their ends staggered, while wedges 16 inserted against the ends of the riser-strips brace the sides of the beam-boxes. The ordinary iron clamps 17 may be used in addition, if necessary or considered desirable. The outer sides of the end or spandrel beam- and girder-boxes are prevented from spreading, when the concrete is poured, by vertical pieces 18 which are secured at their lower ends by clamps, or otherwise, and at their upper ends to the column-carriers 23 or otherwise tied to the uprights. A sleeve 19, of metal, cardboard, or other suitable material, surrounds each upright and rests upon the floor-sheeting, wedges 20 serving to hold the sleeves in place around the uprights until the floor has been molded and thereafter to keep the uprights from buckling. The sleeves, if made of a length equal to the thickness to be given to the floor slabs, may be used as guides for the straight-edge employed in leveling off the top of the molded floors. The column-boxes 21, bound together by the usual cleats 22, are supported upon cross-pieces 24 which are laid, beneath the cleats, across column-carriers 23 secured to the uprights. In the case of a wall column, where there is only a single pair of uprights adjacent thereto, the column-carriers are extended inwardly past the uprights and braced to the beam-carriers above by vertical ties 25.

The columns 26, girders 27, beams 28, and floor-slabs 29, of the first floor have been molded, and, the concrete having hardened, the centering has been struck, leaving only the tie-pieces 4, which may serve as carriers for a temporary platform for use in removing the centering above, to keep the uprights from buckling. The concrete floor 30 has also been laid, and the concrete has been poured for the columns above the first floor. The reinforcement of the concrete work has not been shown, as it forms no part of the present invention. After the removal of the uprights the sleeves are removed from the floor-slabs and the openings 32 formed therein are filled with concrete blocks 33, which have been cast in the sleeves, or in any other suitable manner.

The following succession of steps in the erection of the continuous centering of my invention has been found best in practice, and is therefore recommended. The uprights, or their extensions, are first set up and, once plumb, the horizontal ties are solidly spiked thereto. The girder- and beam-carriers, the latter with the riser-strips mounted thereon, are then spiked or bolted to the uprights. The joists are next set and the floor-sheeting is laid thereon, leaving openings for the girder-, beam- and column-boxes. Then, using the floor-sheeting as a platform on which to work, the girder- and beam-boxes are set. The knee-braces are

then put in below, their setting affording means for rectifying levels. And the column-boxes for the supporting columns below are set last, so as to make sure that there will be nothing to get them out of plumb.

While I have stated, shown, and described my invention as it has actually been practiced and in what I now regard as the best mode of application, in cases where a reinforced concrete floor construction comprises main girders, cross-beams, and floor-slabs supported by wall and interior columns, it will be understood that it may be variously and widely modified in its details, as by changing the form and arrangement of the several parts or by substituting equivalents therefor, or by omitting some of the parts entirely, without departing from the spirit or sacrificing the advantages thereof. For example, since floors of reinforced concrete are constructed in certain cases without girders or without beams or even without any soffits whatever, the centering for a floor, as that term is herein used, will comprise floor-sheeting either with or without girder- and beam-boxes, according to circumstances.

Other modifications may be made, within the scope of the appended claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. A system of removable centering for concrete constructions wherein the centering for one floor is supported by a plurality of temporary uprights located in groups adjacent to the permanent supports of the construction and adapted to be extended above the level of said floor to support the centering for the floor or floors above.

2. A system of centering for reinforced concrete constructions wherein the centering for a floor is carried upon horizontal carriers which are supported by uprights, extend parallel to lines formed by the permanent supports of the construction; and are distant from said permanent supports substantially one-fifth of the length of the span.

3. A system of centering for reinforced concrete constructions wherein the centering for a floor is carried upon horizontal carriers which are supported by uprights and which extend substantially parallel to the outer walls of the construction and are located adjacent to the inner sides of the wall columns and around the interior columns and distant from the centers of the columns substantially one-fifth of the length of the span.

4. A system of centering for reinforced concrete constructions which comprises a plurality of uprights arranged in groups around the column-positions, horizontal girder-carriers secured to said uprights, girder-boxes mounted upon said girder-carriers, horizontal beam-carriers secured to said uprights at right angles to said girder-

carriers, beam-boxes mounted upon said beam-carriers, risers mounted upon said beam-carriers between said beam-boxes and furnishing support for the sides thereof, joists mounted upon said risers and furnishing support for the sides of said girder-boxes, and floor-sheeting mounted upon said joists.

5. A system of centering for reinforced concrete constructions wherein the centering for two or more consecutive floors is carried upon and supported by temporary uprights which are suitably supported below and extend up through the centering of the intermediate floor or floors.

6. A system of centering for reinforced concrete constructions comprising a plurality of temporary uprights which carry the centering for a lower floor and extend up through sleeves resting upon the said centering and carry the centering for an upper floor.

7. A system of centering for reinforced concrete constructions comprising a plurality of temporary, removable uprights which are set within the ground area of the construction, extend up through the centering of one or more floors and carry the centering for an upper floor or floors.

8. In a system of centering for reinforced concrete constructions, the combination with the centering for the members of two or more consecutive floors of temporary, removable uprights arranged and adapted to act as common supports therefor.

9. In a system of centering for reinforced concrete constructions, the combination with a plurality of temporary uprights set in groups around and adjacent to the permanent column-positions and extending upwardly above the level of the lower of two or more consecutive floors, of means for supporting thereupon the centering for the members of the said floors.

10. In a system of centering for reinforced concrete constructions, the combination with the centering for a lower and upper floor of temporary, removable uprights which are suitably supported below and extend upward through and above the centering for the lower floor and which support the centering for both floors.

11. In a system of centering for reinforced concrete constructions, the combination with a plurality of temporary uprights arranged in groups around and adjacent to the permanent column-positions of horizontal carriers secured thereto at different levels and adapted to carry and support the floor-sheeting, girder-boxes and column-boxes for two or more consecutive floors, respectively.

12. In a system of centering for reinforced concrete constructions, the combination with floor-sheeting and a plurality of temporary uprights which support the floor-

sheeting and, from foundations below, extend up through the floor-sheeting of sleeves which surround said uprights above the floor-sheeting and are adapted to serve as guides in leveling off the molded concrete floor as well as molds for providing openings therein for the removal of the uprights.

13. In a system of centering for reinforced concrete constructions, the combination of uprights 1 arranged in groups around and adjacent to the permanent column-positions, girder-carriers 5 secured to said uprights, beam-carriers 6 secured to said uprights at substantially right angles to said girder-carriers, girder-boxes 10 mounted upon said girder-carriers, beam-boxes 11 and joists 13 mounted upon said beam-carriers, and floor-sheeting 12 mounted upon said joists.

14. In a system of centering for reinforced concrete constructions, the combination with the temporary uprights 1 which rest upon suitable foundations below and extend up above the level of a lower floor of centering for the said lower and an upper floor, the said centering comprising the girder-carriers 5 and the beam-carriers 6 secured to said uprights, and the girder-boxes 10, beam-boxes 11, joists 13, floor-sheeting 12, and sleeves 19 assembled upon and carried by said girder- and beam-carriers.

15. The art of reinforced concrete construction, which comprises supporting the entire centering for a floor upon horizontal carriers which are mounted upon temporary uprights and extend parallel to lines formed by the permanent supports of the construction and are distant therefrom substantially one-fifth of the length of the span.

16. The art of reinforced concrete construction, which comprises setting a plurality of temporary uprights in groups adjacent to the permanent supports of the construction, mounting upon said supports a horizontal framework of carriers and cross-carriers which extend parallel to lines formed by said permanent supports and distant therefrom substantially one-fifth of the length of the span and supporting on said horizontal framework the entire centering for a floor.

17. The art of reinforced concrete construction, which comprises mounting the centering for an upper floor or floors upon temporary uprights which extend up through the centering of the floor or floors below.

18. The art of reinforced concrete construction, which comprises setting a plurality of temporary uprights reaching above the level of a floor in groups around the permanent column-positions, mounting thereon the centering for the several members of said floor, and then extending said uprights above the level and mounting on said extensions the centering for the several members of each succeeding floor in turn.

19. The art of reinforced concrete construction, which comprises setting temporary uprights which extend above a floor level in groups around and adjacent to the column-positions, mounting thereon the floor-sheeting and girder- and beam-boxes for said floor, surrounding said uprights with sleeves resting upon said floor-sheeting, and then extending said uprights and mounting on said extensions the floor-sheeting and girder- and beam-boxes for the floor above.

20. The art of reinforced concrete construction, which comprises setting a plurality of temporary uprights within the limits of the ground area of said construction, mounting thereon the centering for a lower floor and then molding the concrete members of said floor while at the same time

mounting upon the said uprights the centering for a higher floor.

21. The art of reinforced concrete construction, which comprises setting a plurality of uprights, mounting thereon the centering for several consecutive floors, molding the lower floor or floors, and then securing the uprights to horizontal supports resting upon one or more of the molded floors and removing portions of the uprights below the said horizontal supports.

In witness whereof, I have signed my name in the presence of two witnesses.

HUGUES BRUSSEL.

Witnesses:

L. VITEBO,
J. WALSH.