No. 865,336. PATENTED SEPT. 3, 1907.

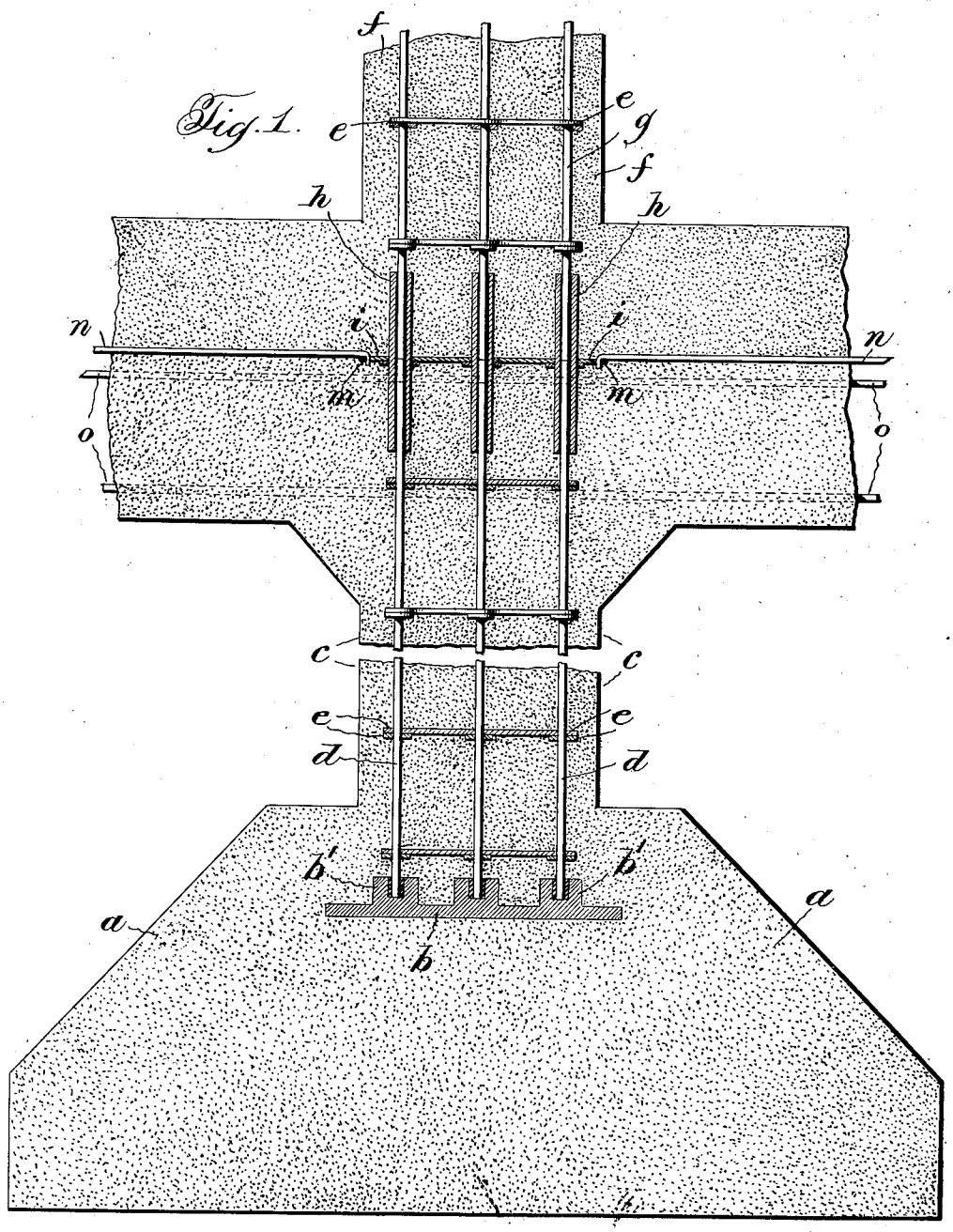
H. S. GARDNER.

BUILDING STRUCTURE.

APPLICATION FILED JUNE 18, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Jas. E. Hutchinson.

E. G. Roderick

Inventor:

Howard S. Gardner

By Hall & Hopkins & Co. Attorneys.

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3 SHEETS—SHEET 2.

Fig. 2.

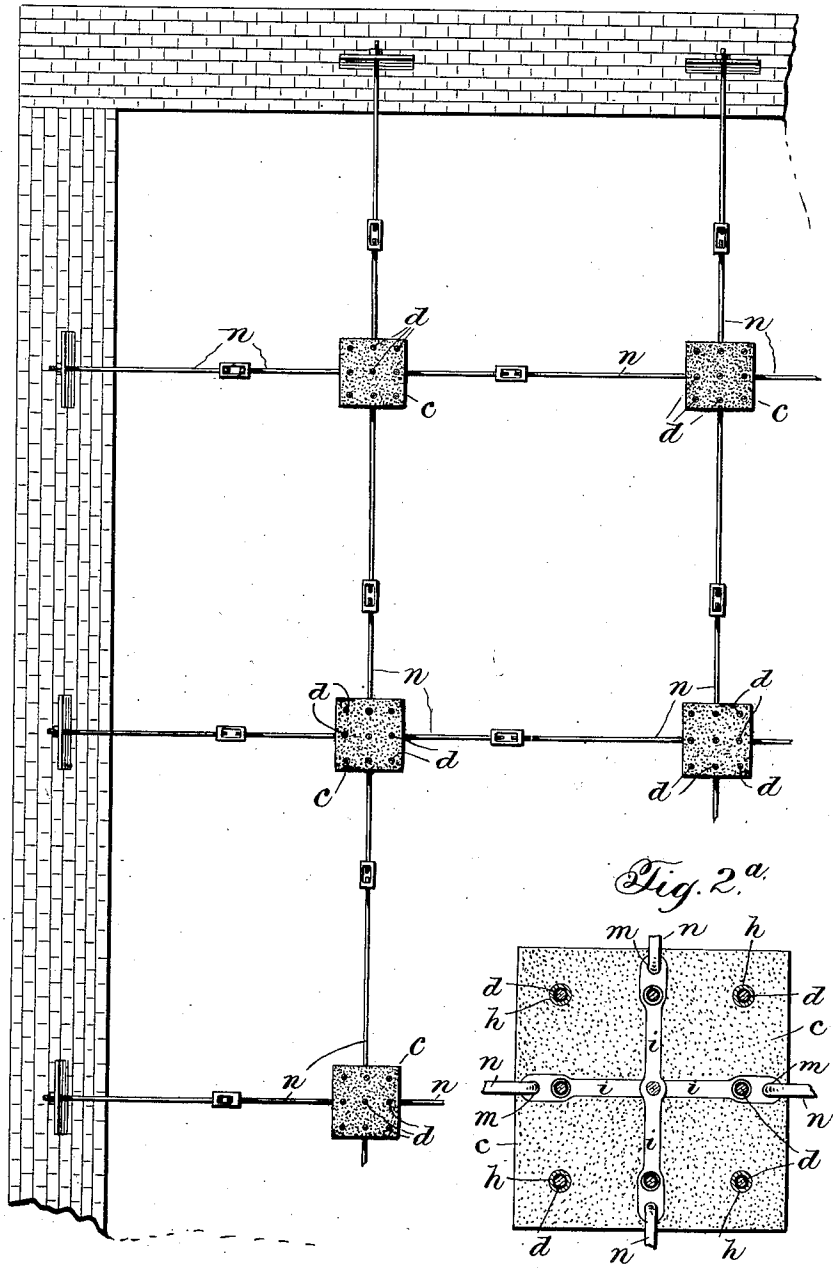

Fig. 2a.

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3 SHEETS—SHEET 3.

Fig. 3.

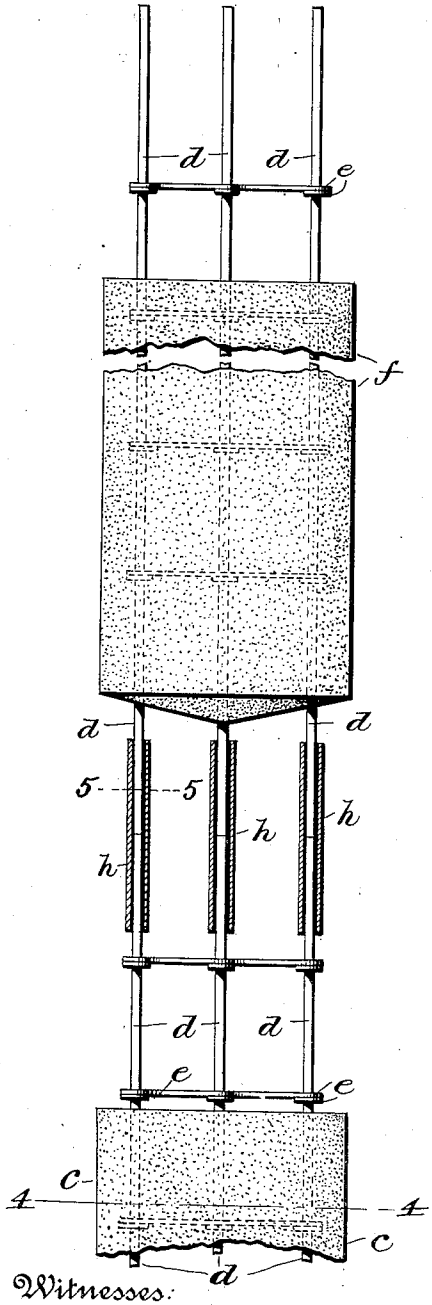


Fig. 4.

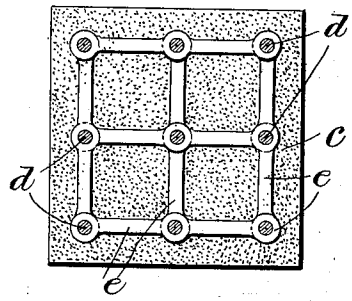


Fig. 5.

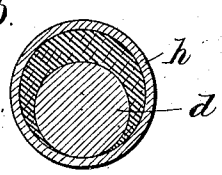


Fig. 6.

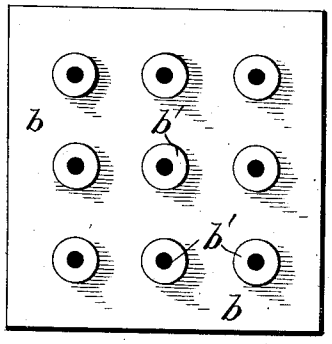
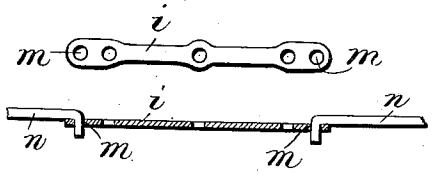


Fig. 7.



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UNITED STATES PATENT OFFICE.

HOWARD S. GARDNER, OF CAPE MAY, NEW JERSEY.

BUILDING STRUCTURE.

No. 865,336. Specification of Letters Patent. Patented Sept. 3, 1907.

Application filed June 18, 1906. Serial No. 322,337.

To all whom it may concern:

Be it known that I, HOWARD S. GARDNER, a citizen of the United States, residing at Cape May, in the county of Cape May and State of New Jersey, have invented certain new and useful Improvements in Building Structures, of which the following is a specification.

My invention relates to building constructions and one of the primary objects thereof is to provide a structure which will admit of a skeleton frame work of reinforced plastic, cementitious or concrete material being erected in a manner similar to that now commonly employed in erecting steel or iron frame works for buildings, particularly large buildings such as are used for offices, hotels, apartment houses and the like.

In the method of constructing a building, according to my invention, I contemplate erecting the main vertical supporting columns of reinforced cementitious or concrete material and tying the same together to form a complete or substantially complete frame work and thereafter placing in position the floors of the several stories which are also preferably constructed of reinforced plastic material.

In carrying out my method, the complete columns are erected in sections, each of which is of a length substantially equal to the height of one story of the building; the columns of one story are placed in position, tied together and made plumb and then the sections of the next story are placed into position, the latter sections being superimposed upon the first and this procedure is repeated until the complete skeleton frame is built up. Each section is intended to be molded complete or substantially complete before being placed in position in the building and the floors may be molded in place as soon as the section columns of two stories are erected and thus the lower stories of a building may be completed while the frame work of the upper stories is in course of erection.

The skeleton frame work of a building constructed in accordance with my invention includes generally a series of vertical columns of reinforced concrete or cementitious material, each column comprising a series of sections of molded concrete or cementitious material in which suitable reinforcing frames or reinforcing strands are embedded, the ends of the reinforcing frames or strands projecting beyond the ends of the cementitious or concrete portion of each section, the projecting portion of such strands or frame being coupled to the adjacent projecting portions of the frames or strands of the superimposed sections, and transversely extending tie bars engaged at their ends with the reinforced frames or strands of adjacent columns, said tie bars connecting the several columns to one another. These tie bars are preferably arranged in sets, a set, connecting all of the columns to one another, being provided for each set of column sections, being preferably located in the planes of the several floors and being preferably embedded in the latter when the same are molded in place.

The concrete or plastic part of each column section is preferably of a length approximately equal to the distance between two floors or between the surface of a floor and the adjacent ceiling so that the exposed parts of the reinforcing frames or strands of the columns occur at the points where the floors are located so that when the latter are molded in position they are formed about these exposed portions, filling the spaces between the adjacent ends of the plastic portions of the sections and thus the floor when molded of cementitious or plastic material becomes in effect an integral part of the columns.

One embodiment of the invention is illustrated in the accompanying drawings in which

Figure 1 is a vertical elevation of a fragment of a skeleton frame work of a building constructed in accordance with my invention, parts being shown in sections. Fig. 2 is a transverse sectional view of a part of the skeleton frame work of a building constructed in accordance with my invention. Fig. 2ª is a sectional view of a column. Fig. 3 is a detail elevation of a portion of a column constructed in accordance with my invention. Fig. 4 is a transverse sectional view of the same on the line 4—4 of Fig. 3. Fig. 5 is a transverse sectional view on the line 5—5 of Fig. 3. Figs. 6 and 7 are detail views.

In the accompanying drawings *a* designates suitable footings for the columns, the same being preferably built up of plastic material upon a natural or made foundation. A metallic foot plate *b* is preferably embedded in each footing *a*, each plate being provided with sockets *b'* corresponding in number and spacing to the number and relative location of the reinforcing strands of the column associated therewith.

The column sections of the first story are designated by *c* and each section comprises a concrete portion of the desired cross-sectional shape in which is embedded longitudinal extending metallic strands *d*; which are held in spaced relation by transversely extending tie-bars or links *e* arranged in sets and spaced distances apart throughout the lengths of the sections. The bars *e* are preferably made of sheet metal and are provided with eyes through which the strands *d* pass. The lower ends of the strands *d* of the bottom sections of the columns are seated in the sockets of the plates *b*, when such plates are provided, and are secured in these sockets by pouring molten lead into the latter about the ends of the strands. The upper ends of the strands *d* of the lower-

most sections of the columns project above or beyond the upper end of the concrete portions of the sections, these concrete portions terminating approximately at the ceiling line of the adjacent floor partition.

The column sections of the floor above are designated by *f* and are superimposed upon the sections *c*. The sections *f* are formed in a similar manner to the section *c*—each comprising a concrete portion having embedded therein longitudinally extending strands *g* corresponding to the strands *d* which, like the latter, project beyond the ends of the concrete portions of the sections. The lower ends of the strands *g* are coupled to the registering strands *d* in any suitable manner, preferably by slipping over the contiguous ends a suitable sleeve *h* into which molten lead is poured and permitted to set.

As before premised, the columns are tied to one another by horizontally extending tie-bars and in the preferred method of constructing a building in accordance with my invention a set of these bars is provided for each set of column sections. The tie-bars associated with the lowermost set of column sections are designated in the accompanying drawings by *n*, the same being arranged substantially in the horizontal plane of the connecting point between the column sections at the floor line and in substantially the plane of the floor partitions. In the illustrated exemplification of my invention a set of spacing and connecting plates *i*, similar to the plates *e*, is located in the plane of the couplings between the column sections at each floor line, these plates *i* being provided with openings to receive the sleeves *h* and being provided with additional openings *m* to one side of the first named openings. The tie-bars proper designated by *n*, are provided at their ends with hooks or like coupling members designed to engage with openings *m* and are each provided intermediate of its ends with a suitable turn-buckle in order that the length of the bar may be adjusted. As before stated, these tie-bars are located in sets one set being arranged in substantially the plane of each floor partition so that when the latter is molded in place the tie-rods are embedded therein and in addition to serving to tie the columns together and holding the same plumb, they assist in supporting the floor partitions in which they are embedded.

In erecting a building, the column sections are molded complete upon the ground and after the footings *a* have been positioned the lowermost sections of the columns are erected and preferably tied to one another and to the side walls of the building by the tie-rods which are coupled to anchors built in said side walls thus making a complete tie through the building. Thereafter, the first set of superimposed sections of the columns are placed in position, coupled to the lowermost sections and tied together at their upper ends by the second set of tie-rods. The first floor partition may then be molded in position, if desired, or the complete skeleton frame work may be erected in its entirety and thereafter the several floors molded in position. By following the first plan, however, the lower stories of the building may be completed during the period the frame work for the upper stories is being erected, thus permitting the lower stories to be put into use while the upper ones are in course of erection. In building the floor partitions, the same is molded in substantially the manner now commonly employed, suitable strengthening bars or beams *o* being laid therein and the concrete or cementitious portion thereof being molded about the projecting ends of the longitudinally extending column strands, the said concrete or cementitious portion of the floor partitions filling the spaces between the adjacent ends of the concrete portions of the column sections so that the floors form in effect an integral part of the columns. The lower ends of the concrete portions of the columns will preferably be slightly convexed as such form will allow the concrete floors to be rammed in between said ends and thus form a solid monolith column from top to bottom.

I claim:—

1. A building structure comprising an outer wall, a plurality of columns spaced from one another and each including a cementitious part, a set of lengthwise extending strands formed in sections arranged end to end, coupling sleeves joining the adjacent ends of the sections of each strand, and sheet metal plates or bars for spacing the strands from one another, said bars or plates engaging the coupling sleeves, tie rods extending between the outer walls of the building to the plates or bars of adjacent columns and other tie rods extending between the several columns and engaging at their ends, the said plates or bars thereof.

2. A building structure comprising a plurality of columns and cementitious floor partitions, each of the columns including a series of superimposed sections, each section comprising a cementitious or concrete part and a plurality of longitudinally extending strands spaced from one another and having their ends projecting beyond the ends of said cementitious part, sleeves coupling the strands of adjacent sections to one another, connecting plates coöperating with the sleeves and horizontally disposed tie rods extending from the plates of one column to the plates of adjacent columns, substantially as described.

3. A frame work for buildings, comprising column footings, columns mounted thereupon of reinforced plastic material, each comprising a series of sections, each section being formed of plastic material with reinforcing strands having their ends projecting beyond the ends of the plastic material, the projecting ends at the upper ends of the sections and the projecting ends at the lower ends of the superimposed sections being coupled to one another, said points of coupling occurring substantially at the line of the floor partitions and a set of tie-bars located at each of said points of couplings, said tie-bars comprising plates having openings to receive the strands and additional openings outside of the first named openings and bars having hooked ends to engage the additional openings and adjusting means intermediate of their ends, substantially as described.

4. A building structure comprising a plurality of perpendicular columns, constructed of tiers of reinforced plastic column sections, a base for each column, the sections of the columns each having the reinforcing strands thereof projecting beyond the ends of the plastic portions of the same, the members of the first tier of sections having the strands at their lower ends held in the base associated therewith, means for coupling the projecting strands at the upper ends of the lower tier members to the projecting strands at the lower ends of the members of the second tier of sections, plates secured to the strands of the columns between the adjacent ends of the plastic sections thereof and tie-bars connecting the columns to one another, secured at their ends in said plates, substantially as described.

5. A building structure comprising a plurality of columns of cementitious material reinforced by longitudinally extending strands, each column comprising a plurality of sections having the ends of the strands associated there-

with extending beyond the ends of the cementitious portion of the same; the contiguous registering ends of the strands being coupled together by encircling sleeves, a filling for the sleeves rigidly retaining the ends therein, tie rods for holding the columns plumb and a foundation plate for each column provided with sockets for the lower ends of the strands of the columns with which it is associated, said strands extending into said sockets and being held therein by a filling, substantially as described.

In testimony whereof, I have hereunto signed my name in the presence of two witnesses at Cape May, in the county of Cape May, and State of New Jersey, this 24" day of May 1906.

HOWARD S. GARDNER.

Witnesses:
LEONARD H. DAVIS,
SAMUEL F. ELDREDGE.