C. A. P. TURNER.

STEEL SKELETON CONCRETE CONSTRUCTION.

APPLICATION FILED OCT. 19, 1910.

985,119. Patented Feb. 21, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

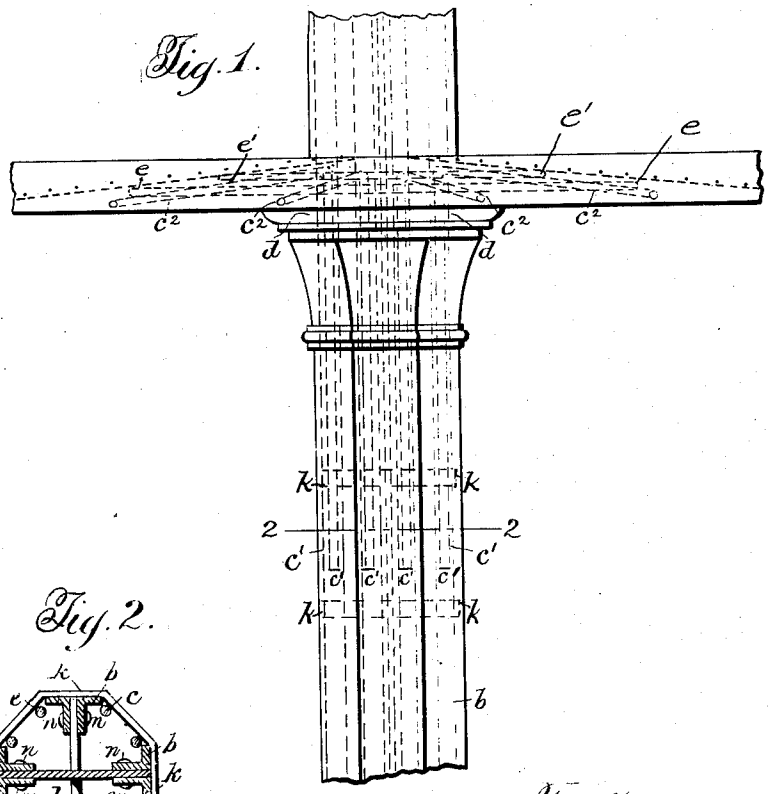


Fig. 2.

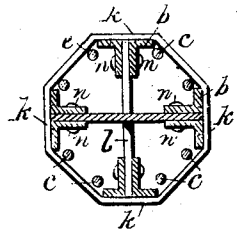
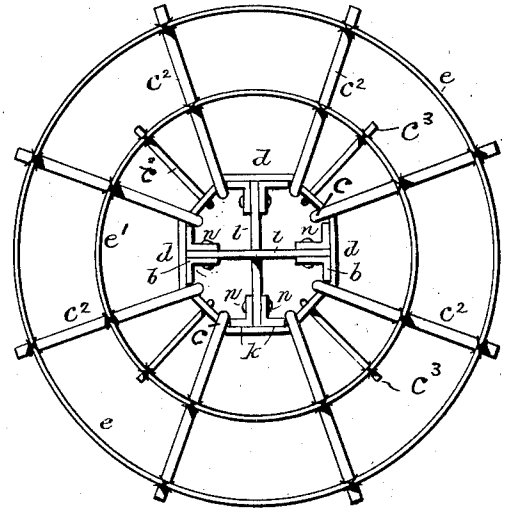


Fig. 3.



Witnesses:

Jastè Mulchinson.

Agnes I. Hayes.

Inventor:

Claude A. P. Turner

By Chas. J. Williamson

Attorney.

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3 SHEETS—SHEET 2.

Fig. 4.

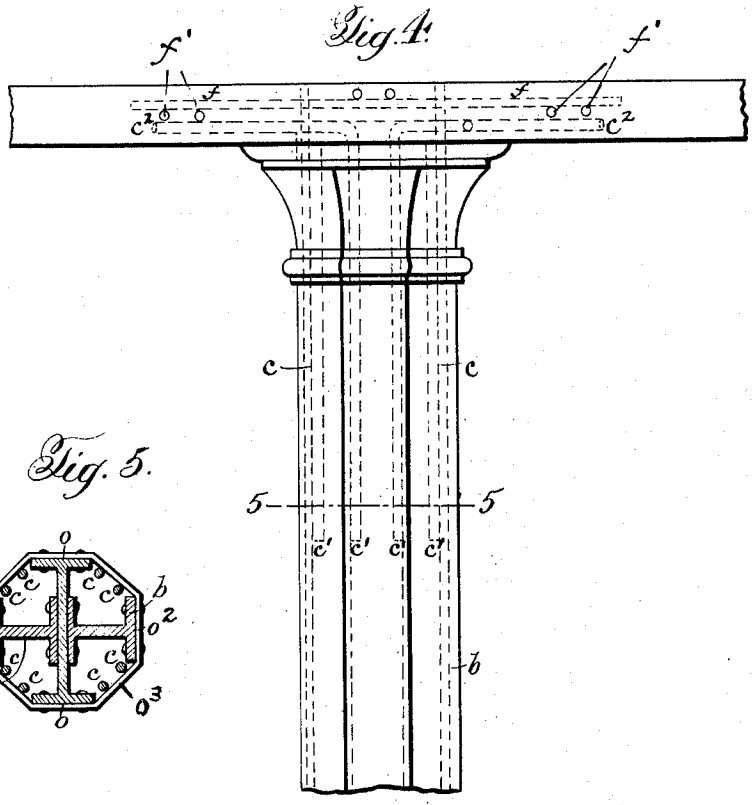
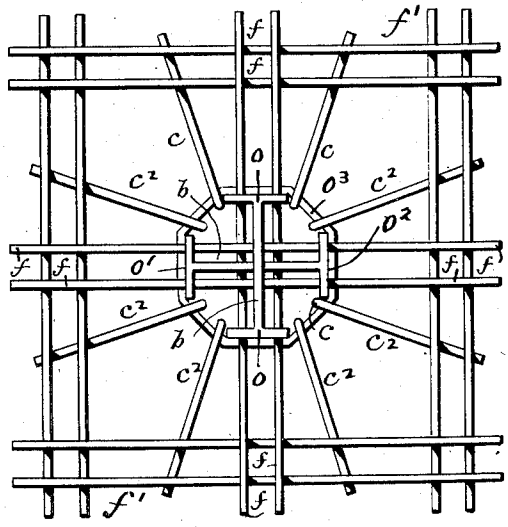


Fig. 5.

Fig. 6.



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Jas. E. Hutchinson

Agnes I. Hayes.

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By Chas. J. Williamson, Attorney.

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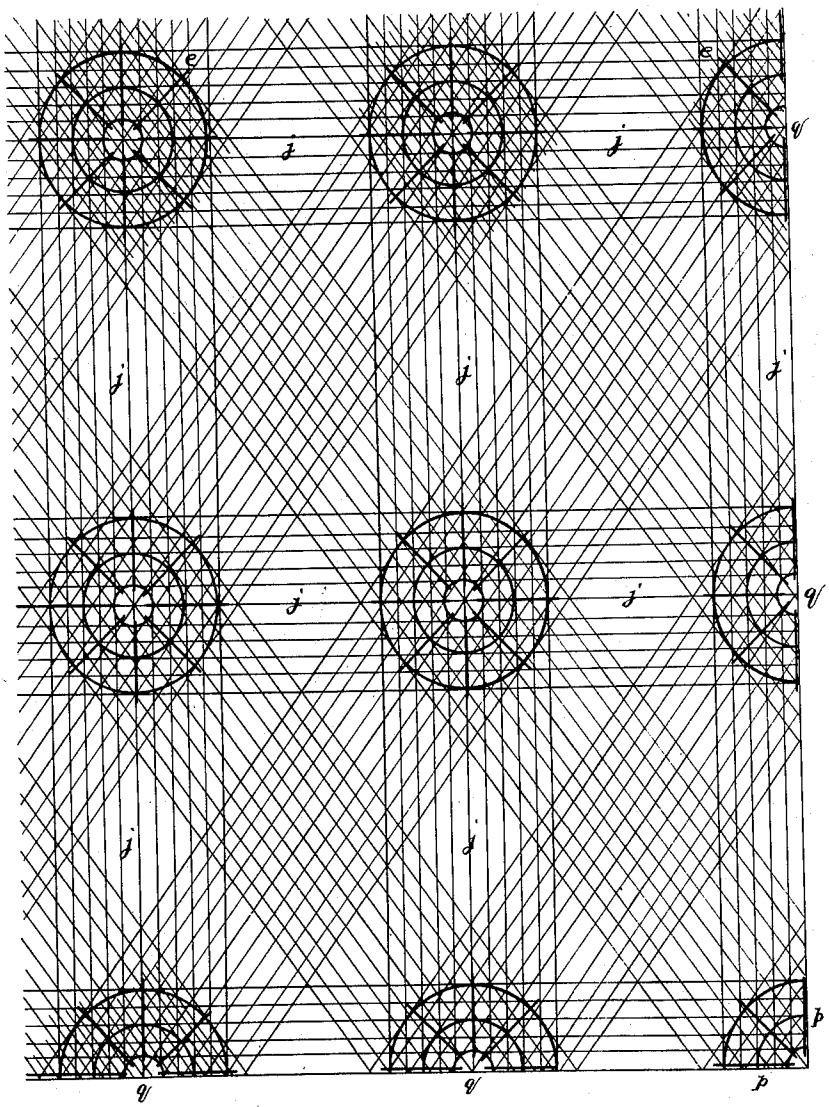
3 SHEETS—SHEET 3.

Fig. 7.



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Jas. E. Hutchinson.

Agnes T. Hayes.

Inventor:

Claude A. P. Turner

By Chas. J. Williamson Attorney.

UNITED STATES PATENT OFFICE.

CLAUDE A. P. TURNER, OF MINNEAPOLIS, MINNESOTA.

STEEL-SKELETON CONCRETE CONSTRUCTION.

985,119. Specification of Letters Patent. Patented Feb. 21, 1911.

Original application filed June 11, 1907, Serial No. 378,444. Divided and this application filed October 19, 1910. Serial No. 587,959.

To all whom it may concern:

Be it known that I, CLAUDE A. P. TURNER, of Minneapolis, in the county of Hennepin and in the State of Minnesota, have invented a certain new and useful Improvement in Steel-Skeleton Concrete Construction, and do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to buildings or structures erected of reinforced concrete, and the object of my invention is to provide an arrangement of reinforcement for column and slab or floor construction, requiring a minimum of concrete and reinforcement, but having all necessary strength, to the end that the cost of erection, both in respect to material and time required, may be substantially reduced and to secure certain important advantages which result from the structure which may be produced in accordance with my invention.

In the accompanying drawing—Figure 1 is a fragmentary side elevation of a reinforced column and floor slab, constructed in accordance with my invention, the reinforcement being shown by dotted lines; Fig. 2 a detail thereof, being a cross section of Fig. 1 taken on the line 2—2; Fig. 3 a top or plan view of the column reinforcement, and portions of the floor slab reinforcement belonging therewith; Fig. 4 still another fragmentary side elevation of a reinforced column and floor slab, constructed in accordance with my invention, but of another modified construction, the reinforcement being likewise shown by dotted lines; Fig. 5 a detail being a cross section of Fig. 4 taken on the line 5—5; Fig. 6 a top plan view of the column reinforcement, and of the floor slab reinforcement belonging therewith; Fig. 7 a top or plan view of the major part of the floor slab reinforcement.

Briefly described, my invention comprehends, in its preferred form, column reinforcement that extends continuously through vertically alining columns, or columns situated one above the other in successive stories of the structure, with cantaliver column heads of reinforcing material separate from the column reinforcement, and groups of slab reinforcing rods extending crosswise of the column heads.

First referring to the form shown in Figs. 1, 2 and 3 of the drawings, it will be seen that the column reinforcement consists of a number of vertically disposed angle irons or bars b assembled to form a skeleton framework and, as clearly shown in Fig. 1, extending continuously through vertically alining columns, fragments of columns below and the same floor slab being shown in Fig. 1. The bars b are shown disposed in pairs and the pairs are united by surrounding bands k, to which said bars may be riveted as shown, and the pairs of angle irons are also united by transversely disposed connections l. The cantaliver head, in this form of the invention, comprises a plurality of cantaliver rods which are wholly independent of the reinforcements b of the column, and which, as shown in Fig. 2, are disposed between said column reinforcements. As illustrated, and as designated at c, the cantaliver rods are in the form of elbow rods with the lower portions c' extending downwardly in the columns to a distance less than the length of the column, and embedded therein, and other portions c^2 extending laterally in the slab. The portions c^2 are radially disposed to form a circular head concentric with the column, and said radiating portions are connected by one or more supporting bars preferably in the form of rings e, e'. The outer ring e is supported at or near the outer ends of the portions c^2, and the inner ring e' is supported midway between the ends of the portions c^2, and by supplemental bracket or brace rods c^3. Superimposed upon the cantaliver head is the slab reinforcement which may consist of belts of direct and diagonally disposed slab rods of reinforcement covering the area between the columns, substantially, and lying nearer to the top of the slab at the columns than between the same, the slope of the slab reinforcement being clearly illustrated in Fig. 1.

In the form of the invention illustrated in Figs. 4, 5 and 6, the column reinforcement is formed of a framework consisting of I-beams o, o', o^2, the I-beams o, having a cross section equal to one cross-sectional dimension of the column, and the I-beams o', and and o^2 have a cross-sectional dimension substantially half that of the columns, and joined to the I-beams o. The skeleton reinforcement may be completed by bands o^3 to which the I-beams may be riveted. In this form of the invention the I-beams, constituting the column reinforcements, extend

into the slab and the cantaliver head is formed in part of rods *f*, extending over the columns and through the flanges of the I-beams *o*, *o'*, *o²*, as clearly shown in Fig. 6. The cantaliver head in this form of the invention also includes elbow rods *c* having portions of their length embedded in the columns and other portions extending into the slabs and, as shown, in supporting relation to crossed outer cantaliver rods *f'*, which, as illustrated, cross the cantaliver rods *f* and form the outer boundary of the heads. It will be seen that in this construction the cantaliver head is formed wholly of elements which are separate from and which do not form a part of, or extension of, the column reinforcements.

Fig. 7 illustrates the direct and diagonal slab reinforcement *j* which extends from column to column in a manner to substantially cover the area between the same.

It will be seen from the foregoing descriptions that my invention includes cantaliver bars which are separate and distinct (not necessarily separated) from the reinforcements of the columns, and it will be further obvious that while portions of the elbow rods extend into the columns, their primary function, as far as the cantaliver head is concerned, is to perform the office of an anchorage for the cantaliver head. Great advantages accrue from this and among one of the most important advantages is the fact that the cantaliver heads may be constructed in accordance with the shearing strain imposed thereon, and irrespective of the number or size of the reinforcing rods in the columns. In a building consisting of a number of stories, a greater number of column rods, forming the column reinforcement is required in the lower stories, than in the columns of the upper stories, and in the upper stories the number of column rods is not sufficient in number to make up a satisfactory head. Besides the economy resulting from the advantage of constructing the cantaliver heads with independent parts, with respect to the reinforcements of the columns, it is sometimes a material gain in time and convenience to be able to construct the cantaliver heads independently of the framework of reinforcement constituting the reinforced columns.

I have illustrated several embodiments of my invention in order that it may appear that variations in form and details may be made without departure from the scope of my invention.

I am able to dispense with the use of beams on the under side of the floor slab. This is an immense advantage in every way. It is economical in the use of concrete; it is also economical in that it renders unnecessary the expensive forms for making the beams, and it means greater rapidity of work. As far as the finished structure is concerned, the absence of beams on the under side of the floor slab enable partitions to be placed anywhere that it may be found desirable to place them. It results in better illumination from the windows, and there are no dirt-collecting corners, which exist where beams or girders are employed. Another very important advantage resulting from the provision of a ceiling that is smooth, or free from beams or projections, is in the matter of fire protection. In fighting a fire with a stream of water from a hose, the obstruction offered by ribs or beams is obviously serious, since a rib may stop short a stream of water, whereas a flat, smooth surface against which the stream is directed at an angle, will deflect and spread the water, causing it to descend to the floor over a wide area and to the best possible advantage. Where sprinkler heads are used in a ceiling, the cost of equipment by such a system of fire protection is substantially reduced, because fewer sprinkler heads are required with a flat or smooth ceiling than one where there are beams or ribs on the under side of the ceiling.

In warehouses or similar buildings, my invention is of special value because in order to afford aisles or passageways, the load is naturally concentrated around the columns, and it is at these points, where the load therefore is greatest, that the greatest strength of the structure exists, by reason of the enlarged capitals of the columns, and their integral construction or formation with the slabs, and the heavy reinforcements of the slab structure immediately at and adjacent to the column. The provision of the capitals on the columns by gradually increasing the diameter of the columns at the top, and making them and the slab an integral mass, takes care of the strains in the concrete which are the greatest over the columns.

As will be seen by reference to the drawings, the rods forming the framework or head at the top of the column extend laterally into the slab substantial distances beyond the sides of the column, and as the rods are anchored in or supported at their inner ends by the column structure, the arrangement is that of a cantaliver, so that I avail myself of a cantaliver for supporting the slab. It will be observed that there is a concentration of the rods at each column, and the rods extend or radiate from the point of concentration at the column into the floor slab.

Where in the claims I use the term circumferential as applied to the rings or rods that lie upon the radially extended arms or rods to form the cantaliver head, it is to be understood that I do not thereby mean a circular or true ring form, but comprehend

in this term polygonal or such forms as in the broad sense are meant by circumferential.

This application is a division of my application No. 378,444 filed June 11, 1907.

Having thus described my invention what I claim is:—

1. In flat slab and column construction of concrete the combination of a concrete slab, and concrete columns formed in an integral mass, cantaliver heads situated in the slab at the tops of the columns and extending into the slab and having members extending downward into the column below the slab, said members being supported in the column independently of the column reinforcement, and formed of reinforcing material, column reinforcements other than the portions of the heads therein, and groups of rods extending through the slab in different directions over said heads.

2. A flat slab and a column construction of concrete, comprising a cantaliver head in the form of a frame-work of rods a portion of which extends laterally into the slab, and a portion downward into the column but partially therethrough, column reinforcements, other than said rods, and slab reinforcement extending from said framework.

3. In flat slab and column construction of concrete the combination of column reinforcement composed of connected angle bars extending vertically therethrough, a wide-spreading cantaliver head extending into the slab beyond the column formed of crossed rods, supplemental vertical slab and column-reinforcing rods ending in outwardly bent portions at the column top, and slab reinforcements formed of rods extending in different directions crosswise of the column heads.

4. In flat slab and column construction of concrete the combination of a concrete slab, concrete columns in vertical alinement above and below the slab, column reinforcement extending continuously through a vertical line of columns, cantaliver heads separate from the column reinforcement, comprising, each, crossed rods embedded in the slab and extending laterally outward from the column in different directions, rods extending from said head downward into the column and groups of rods extending crosswise of the head through the slab from column to column in direct and diagonal lines, said rods being toward the bottom of the slab between columns.

5. A cantaliver head, for flat slab and column construction of reinforced concrete, comprising, as an article of manufacture, spaced, radiating rods, a circumferentially extending rod or rods, means connecting the latter and said radiating rods, and column-engaging means at the center of the head for positioning and supporting said head in relation to the column reinforcement.

6. In flat slab and column construction of concrete the combination of a concrete slab, columns in vertical alinement above and below the slab, column reinforcement extending continuously through the vertically alining columns, groups of rods constituting slab reinforcement extending across the columns and from column to column in different directions, and supplemental slab and column reinforcement consisting of vertical rods situated in the columns that terminate in the slab, in outwardly bent upper ends.

7. In flat slab and column construction of concrete, the combination of a vertically disposed column and a floor supported thereby, vertical reinforcing rods in said column, separate reinforcing rods in said column bent laterally outwardly and extending radially into said floor, carrying rods resting upon and supported by the radial portions of said separate bent rods, and horizontal rods in said floor arranged upon said carrying rods, said horizontal rods extending directly from column to column, substantially as shown and described.

8. In flat slab and column construction of concrete, the combination of a plurality of concrete columns and vertical reinforcements therein, of a separate and distinct set of reinforcing elements embedded in the column and principally supported thereby, the ends of said separate set of reinforcing elements being separated so as to radiate from the column into the floor slabs toward substantially all parts thereof, and a concrete floor slab embedding and supported by said radiating means.

9. A flat slab and column construction of concrete, including a cantaliver head formed of elbow rods having portions thereof embedded in the slab, and other portions thereof extending into the columns a distance less than the height of the columns.

In testimony that I claim the foregoing I have hereunto set my hand.

CLAUDE A. P. TURNER.

Witnesses:

CHAS. J. WILLIAMSON,

AGNES T. HAYES.