C. A. P. TURNER.

REINFORCED CONCRETE CONSTRUCTION.

APPLICATION FILED JAN. 19, 1911.

1,036,384.

Patented Aug. 20, 1912.

4 SHEETS—SHEET 1.

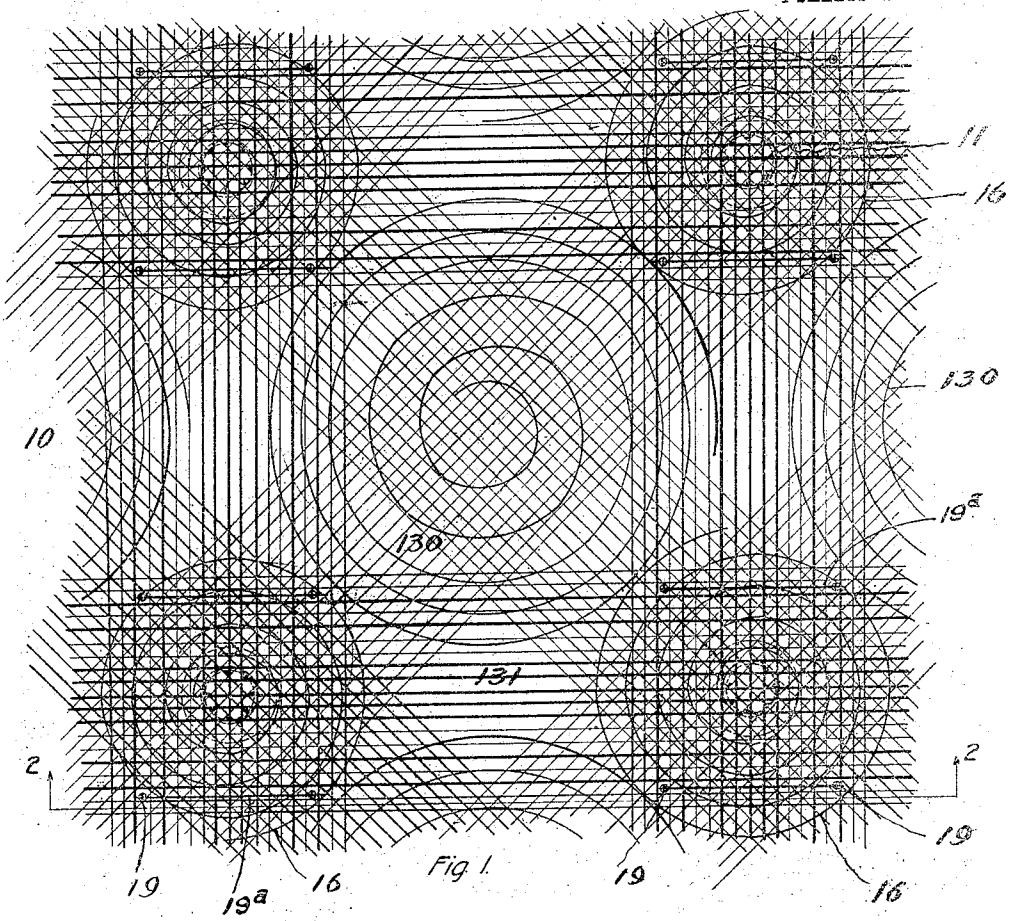


Fig. 1.

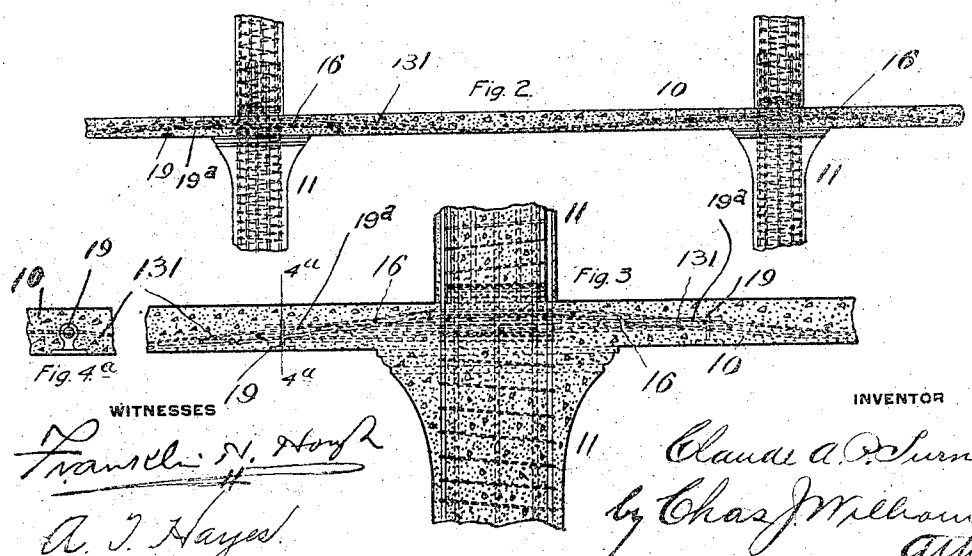


Fig. 2.

Fig. 3.

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4 SHEETS—SHEET 2.

Fig. 4

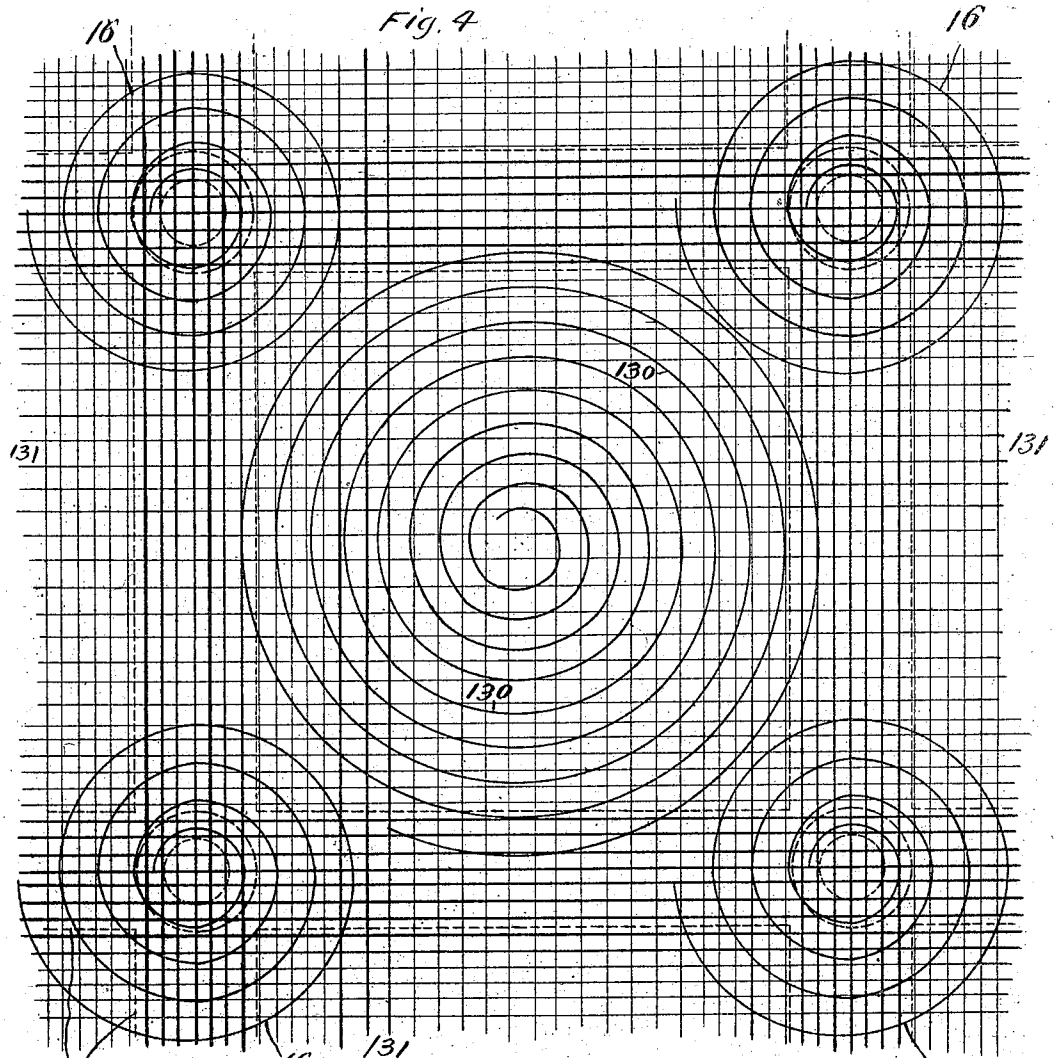
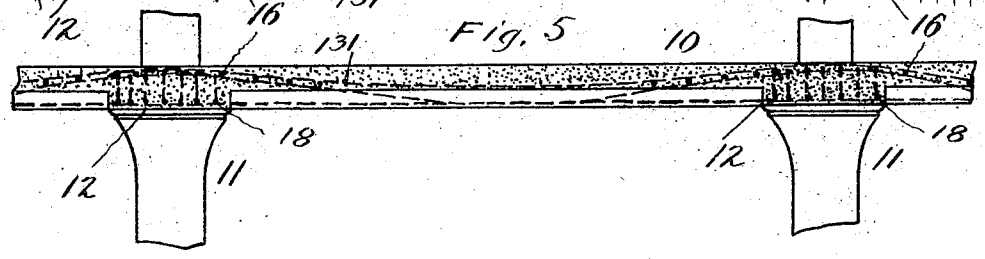



Fig. 5

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4 SHEETS—SHEET 3.

Fig. 6

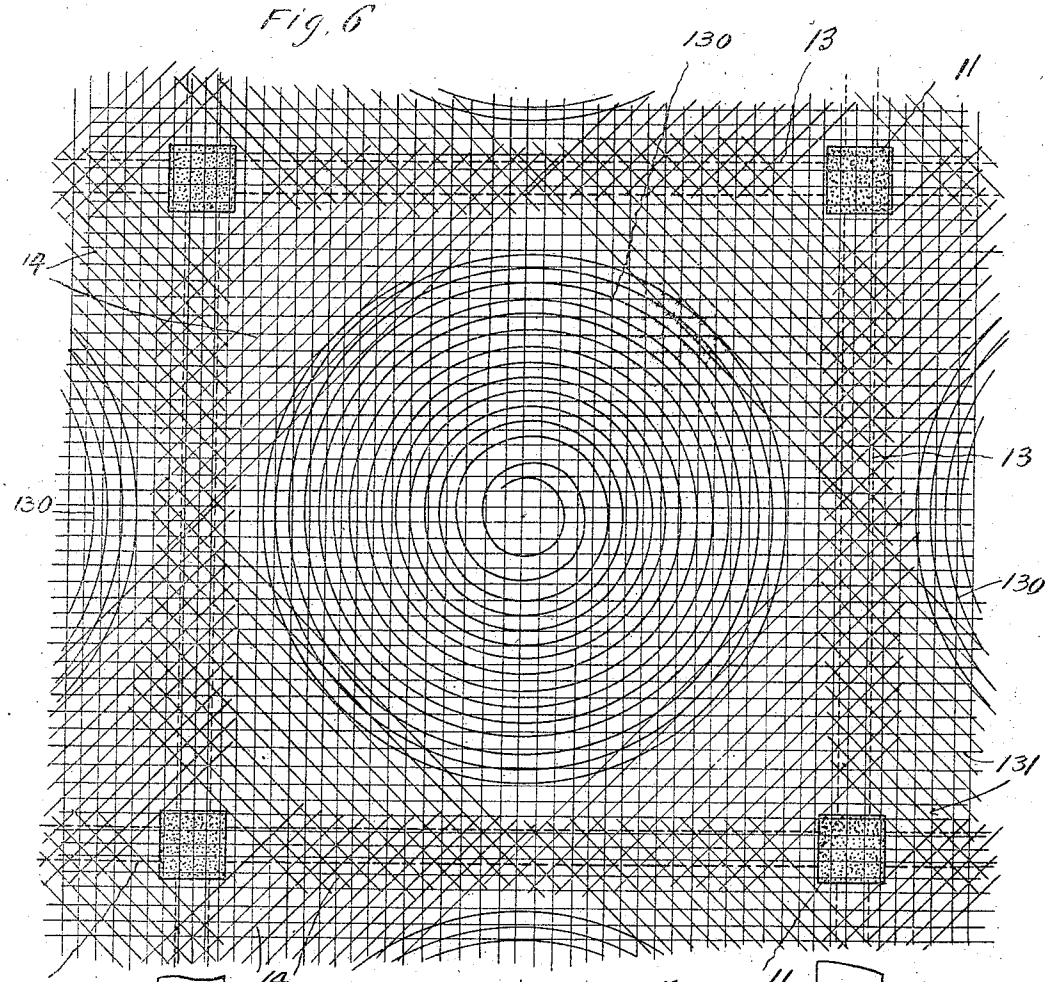
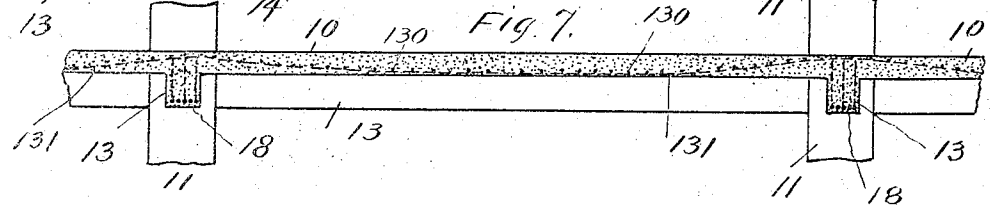



Fig. 7.

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4 SHEETS--SHEET 4.

Fig. 8.

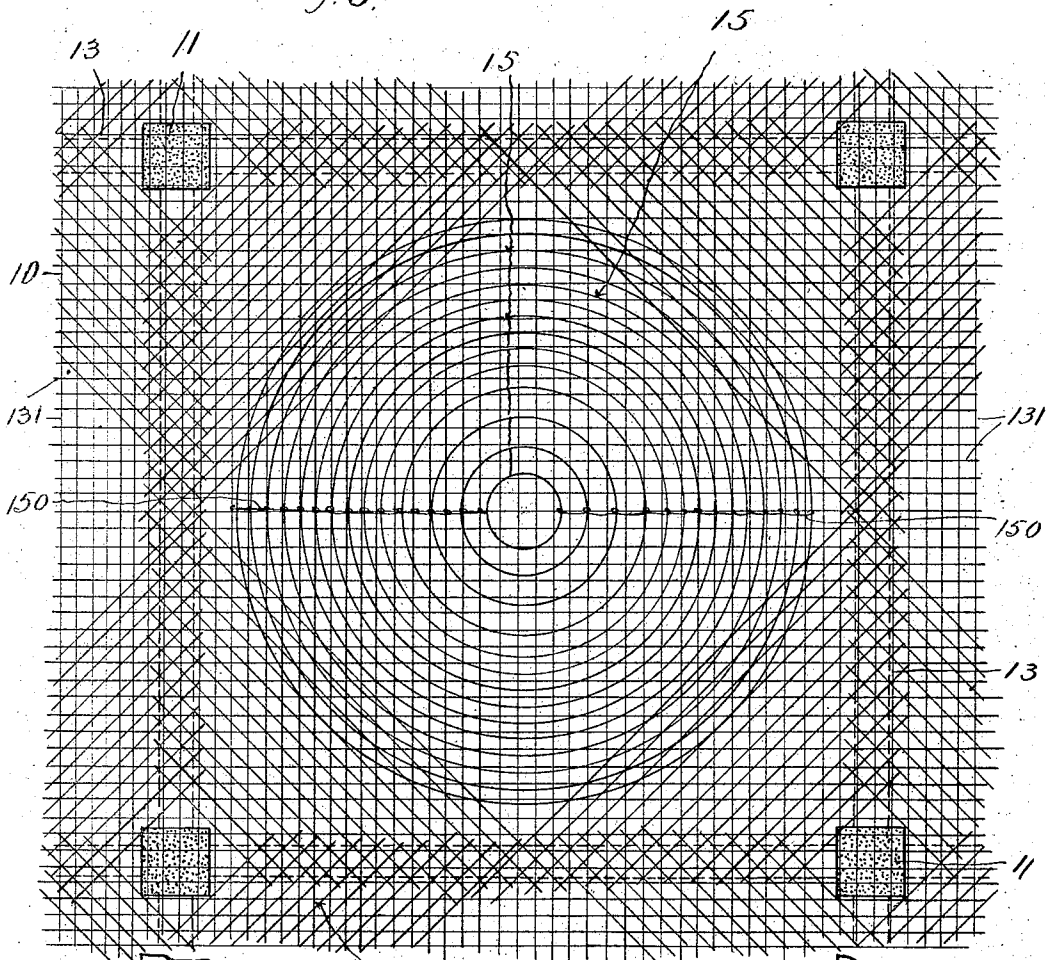


Fig. 9.

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# UNITED STATES PATENT OFFICE.

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

## REINFORCED CONCRETE CONSTRUCTION.

1,036,384. Specification of Letters Patent. Patented Aug. 20, 1912.

Application filed January 19, 1911. Serial No. 603,562.

*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 Reinforced Concrete Construction, and do hereby declare that the following is a full, clear, and exact description thereof.

Practice has shown that the utilization of the principle of the circular flat plate in the floor slab of reinforced concrete construction results in economy of material—both concrete and steel—and the primary object of my invention is to provide an arrangement of reinforcement that will come as nearly as may be to the provision of reinforcement in the form of a continuous homogeneous plate of circular form, which is the basis of the mathematical flat plate theory, and whose peculiarity is the compensating action of the radial and circumferential stresses, which, of course, are those that enter into the problem of providing proper or adequate reinforcement for the floor slab of concrete. In connection with this object, my invention will be found to embody a peculiar character of reinforcement for the floor slab, whether supported by columns, or piers, either directly or through beams, or by walls.

My invention also has to do with a form of reinforcement in which the floor is supported on columns or piers, whereby the proper arrangement of the metal over the columns, or points of support, which is essential for the production of a cantaliver effect for supporting the intermediate slab may be secured, and in which connection there must be taken into account the radial and circumferential stresses that are developed under a load which bends a circular section of the floor concentric with the support downward and which results in the stretching or straining of the fibers in the upper, tension zone, both radially and circumferentially with the circumferential distortion being 3.1416 times the radial distortion.

In the accompanying drawings:—Figure 1, is a top plan view of a column supported floor slab embodying one form of my invention: Fig. 2, is a vertical section thereof on the line 2—2 of Fig. 1: Fig. 3, is a detail view, in section, in an enlarged scale: Fig. 4, is a top plan view similar to Fig. 1 of another embodiment of my invention: Fig. 4ª is a section on the line 4ª—4ª of Fig. 3; Fig. 5 is a vertical section of the construction shown in Fig. 4; Figs. 6 and 7 are, respectively, similar views to Figs. 1 and 2, of yet another embodiment of my invention: Figs. 8 and 9 are, respectively, similar views to Figs. 6 and 7, respectively, of still another form of my invention.

As I have already pointed out, as far as is concerned the matter of securing as close as possible an approximation to a circular continuous plate for reinforcement, (which would be the ideal, or theoretically perfect slab reinforcement) it is immaterial how the floor slab is supported. I accordingly in all the drawings show the floor slab reinforced by said close approximation to said continuous plate, variously supported. Thus in Figs. 1 and 2, it is directly supported, by columns 11; in Figs. 4 and 5, by columns 11 with intermediate broad beams 12, producing a panel effect on the ceiling or underside of the slab; and in Figs. 6 to 9 by columns 11 and interposed beams or girders 13. Said slab reinforcement consists of a circular, or substantially circular, open, framework concentric with the slab center between supports, and reaching well toward each of the sides of the slab, considering as its sides, lines running directly from support to support, and of any one of a varied arrangement of straight rods traversing the slab, including that portion immediately contiguous to said framework, and, preferably, beneath the latter. As illustrated in Figs. 1 to 7, said framework has the form of a spiral 130 bent or deflected axially but having all its coils within the slab from top to bottom thereof. The straight rods 131 may be simply a two-way arrangement, as shown in Figs. 4 and 5, in which they traverse the slab in parallel, intersecting lines at right angles; or a four-way arrangement as shown in Figs. 1 to 3, in which they traverse the slab in groups or belts extending from column to column directly, or in the shortest direction, and diagonally, or in the longest direction; or, as shown in Figs. 6 and 7, said rods may be the rods 131 arranged two-ways, as in Figs. 4 and 5, with groups of

parallel rods 14 obliquely traversing the slab at the corners slightly overlapping and beyond the spiral or circular framework. The circular framework, instead of being a spiral, may, as shown in Figs. 8 and 9, be in the form of independent, concentric rings 15, (the spiral, in substance, of course, being in effect a group of concentric rings) preferably tied together, by a suitable connection 150 between contiguous rings for convenience in handling and keeping the separate rings in place during the laying or pouring of the concrete. I prefer the spiral, however, because it is in one piece, so that the necessity of holding the rings in proper relation, as well as that of joining the ends of an independent ring, is avoided, the construction thus being both cheaper and more convenient to form and handle. The straight rod arrangement shown in Figs. 8 and 9 is the same as that shown in Figs. 6 and 7. The slab reinforcements are carried toward the top of the slab over the supports, and toward the bottom of the slab between supports, so that they are in the location to take the tensile stresses, which exist in the just noted portions of the slab.

As shown in Figs. 1 to 5, in which the slab is supported either directly by the columns 11, or by shallow, wide beams 12, I form a wide-spreading, cantaliver head at the top of each column by a spiral 16, concentric with the column, and the slab rods 13 crossing the spiral, the concentration of metal thus secured being wide-spread.

In Figs. 6 to 9, true beams or girders, 13, running from column to column are employed, and no circular, or like framework, such as the spiral 16, is used, and in this case, as well as that shown in Figs. 4 and 5, there are beam reinforcing rods 18, suitably placed to take the tensile strains.

As shown in Figs. 2 and 3, standards 19 are used that rest upon the forms or falsework, about the column, to support the rods traversing the slab thereat at the required height—the zone of tension—during laying or pouring of the concrete, and from said standards, the rods sag to the required position toward the slab bottom between the supports.

Said standards 19, are, as clearly shown in Fig. 1, arranged in alining pairs, and through the eyes of each pair, a rod $19^a$, the slab reinforcing rods rest and are supported.

In the finished slab, these rods $19^a$ act as spreader rods for the belts resting thereon to cause said rods to act together.

It, of course, will be evident that a circular contour to the open framework need not be adhered to as far as the broad scope of my invention is concerned, so that instead of circular shapes, such as I have illustrated and described, the shape or figure may be polygonal, and it is also understood that the bending or deflection of the spiral when the frame work is in the form of a spiral, which bending or deflection is illustrated in the drawings, is not necessary in all cases, for in some cases for example all the coils may lie in the same horizontal plane, and the scope of my claims is to be determined in the light of this statement.

The cantaliver head at the tops of the columns in the form of a spiral is not claimed herein, it being the subject of an application filed April 17, 1912.

Claims:

1. In reinforced concrete construction, the combination of a floor slab, floor slab supports, and slab reinforcement comprising an open framework formed of a group of spaced members of constantly increasing diameter spaced apart and arranged one within the other and situated in the portion of the slab between said supports, and reinforcing elements extending across said framework in substantially parallel lines, from support to support in multiple directions, and substantially coextensive with the area covered by said members.

2. In reinforced concrete construction, the combination of a floor slab, floor slab supports, and slab reinforcement comprising a circular, open framework, intermediate said supports comprising spaced circular members of different diameter, one within the other, and reinforcing elements extending across said framework in parallel, or substantially parallel lines, from support to support, in multiple directions and substantially coextensive, with the area covered by said framework.

3. In reinforced concrete construction, the combination of a floor slab, floor slab supports, and slab reinforcement comprising a circular, open framework intermediate said supports comprising spaced circular members of different diameter, one within the other, and reinforcing elements extending across said framework and extending beyond the same to said supports in parallel, or substantially parallel lines, from support to support, in multiple directions and substantially coextensive, with the area covered by said framework.

4. In reinforced concrete construction, the combination of a floor slab, floor slab supports, and slab reinforcement comprising a circular, open framework formed of spaced rings of different diameter, one within the other intermediate said supports, and reinforcing elements extending across said framework in parallel, or substantially parallel lines, from support to support, in multiple directions and substantially coextensive, with the area covered by said framework.

5. In reinforced concrete construction, the combination of a floor slab, floor slab sup-

ports, and slab reinforcement comprising a circular, open framework formed of a spiral intermediate said supports, and reinforcing elements extending across said framework from support to support and substantially coextensive with the area covered by said framework.

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

CLAUDE A. P. TURNER.

Witnesses:
CHAS. J. WILLIAMSON,
L. KING.