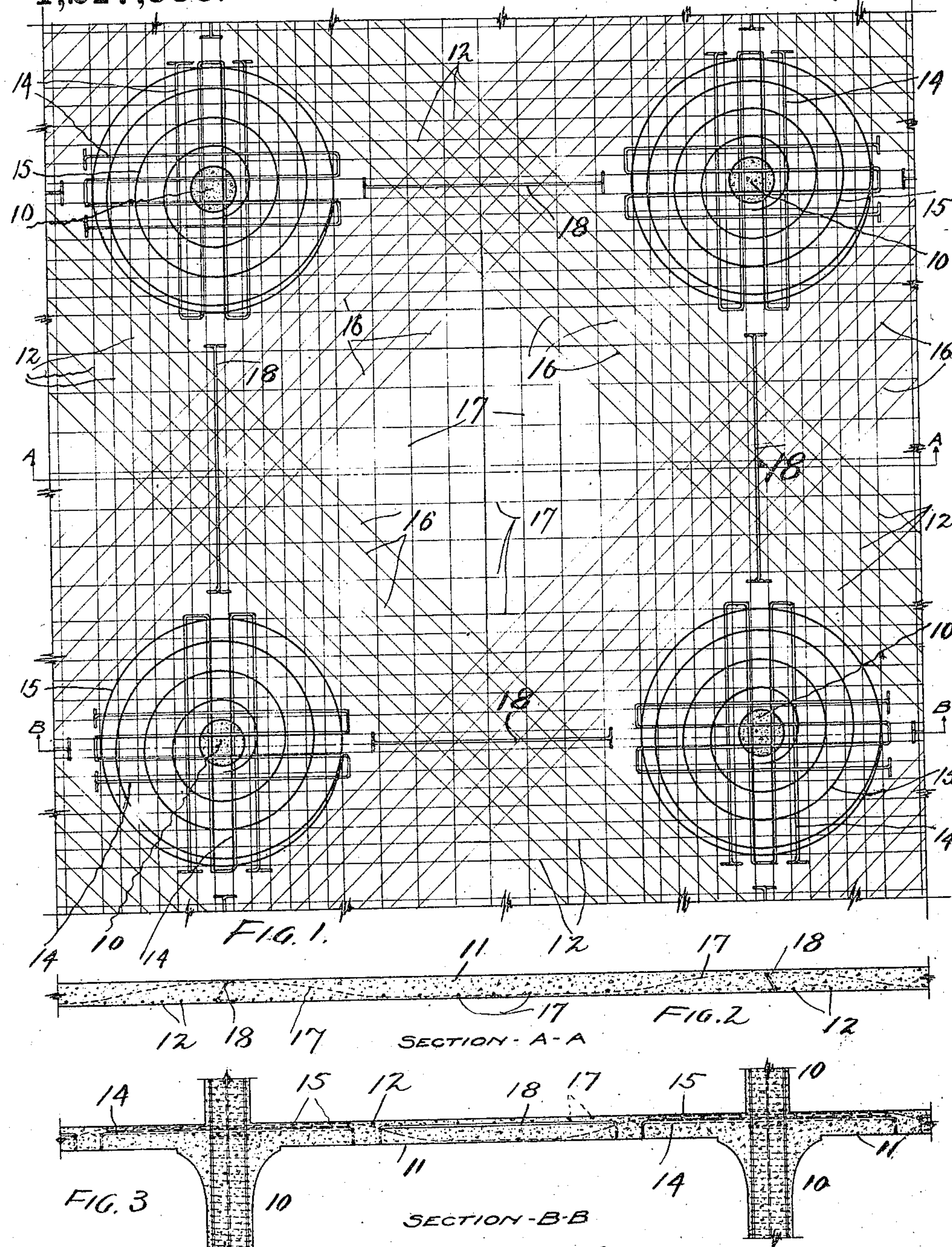
C. A. P. TURNER.
FLAT SLAB FLOOR.
APPLICATION FILED APR. 20, 1915.

1,217,536. Patented Feb. 27, 1917.



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FLAT-SLAB FLOOR.

1,217,536. Specification of Letters Patent. Patented Feb. 27, 1917.

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To all whom it may concern:

Be it known that I, Claude A. P. Turner, a citizen of the United States, and resident of Minneapolis, in the county of Hennepin, and in the State of Minnesota, have invented a certain new and useful Improvement in Flat-Slab Floors, and do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to flat plate, column-supported members of building and other structures of concrete so reinforced as to imitate the action of a flat plate of homogeneous material. Plate action in such a member—a floor for example—is brought about by bond shear resistance, that is the resistance to horizontal shear between the reinforcing rods, running in intersecting directions, and the concrete matrix, which results in the generation of lines of force corresponding to compressions and tensions in the concrete at forty-five degrees to the rods, the lines of force from one rod being neutralized by opposing lines of force from an adjacent intersecting rod. Bond shear resistance is greatest where the increment of moment is greatest and is zero where the moment passes through a maximum. The especial object of my invention is to place the reinforcing metal in those portions of the slab where the action of bond shear is intensified, and in the zones or regions of greatest indirect stress, and thereby most efficiently to utilize the metal.

In the accompanying drawings—

Figure 1 is a top plan view of the reinforcement disposed, or arranged to achieve my invention in a column supported floor;

Fig. 2 is a section through the reinforced slab on the line A—A of Fig. 1;

Fig. 3 is a section through the slab on the line B—B of Fig. 1.

The columns 10 and slab 11 are, as usual, an integral body or mass of concrete, and from column to column on each of the four sides of the rectangle formed by a group of four columns I place direct belts of rods 12, spaced fairly close together, say six inches center, such rods being carried toward the bottom of the slab between columns, and toward the top of the slab over the columns so that they lie in the tension zones. At the columns the rods 12 rest upon supporting frames of manifolded or back and forth bent rods 14 in groups at right angles, having a cruciform arrangement, supplemented, if desired by a concentrically disposed spiral rod 15 that rests on said frame in the tension zone and over which the belts of rods 12 cross, thus providing the necessary metal for taking shear at the columns, and for producing the circumferential cantaliver action about the columns.

Bond shear action is a maximum about the circumference of the suspended central portion of the slab, and for that reason I run belts of parallel rods 16 obliquely between mid-span of one direct belt of rods 12 and the belt of rods 12 at right angles thereto, or parallel with the diagonals of the rectangle; but, obviously, without crossing the columns, and this results in forming rectangles that are respectively concentric with a column and with the suspended central portion of the slab, with the result that the action of bond shear is intensified where it is highly useful, and that the metal is concentrated at mid-span of the lines directly between columns, or at the zone of greatest stress in such lines. By "mid-span", as will be evident, I mean that portion of the span on the direct line from one column to another which lies between two adjacent columns on such direct line, and it will be seen that a belt of obliquely extending rods 13 thus reaches from one bay, or panel at mid-span continuously across an adjacent bay, or panel at the corresponding point.

Parallel with the direct belts of rods, I place more widely spaced parallel suspension rods 17, that, thus running in two directions intersect at the suspended central portion of the slab, dipping toward the bottom of such portion and rising toward the top of the slab on the direct lines between columns, where they are carried over a supporting rod 18, and thus provide the reinforcement necessary in that area of the slab at the central part thereof inclosed by the rectangle formed by the groups, or belts of oblique rods 16.

My invention is applicable to those cases where the slab at one or more sides reaches to and rests upon a beam or wall.

Having thus described my invention what I claim is—

1. A column-supported slab of concrete, having at the columns circumferential cantaliver elements and having slab reinforcement that includes obliquely extending belts

that cross each other at points between the columns, and extended across several adjacent panels crossing from one panel to another at points substantially at mid-span of the panel on direct lines between columns in lines at an angle to each other.

2. A column-supported slab of concrete, having at the columns circumferential cantaliver elements and having slab reinforcement that includes obliquely extending belts that cross each other at points between the columns, and extended across several adjacent panels crossing from one panel to another at points substantially at mid-span of the panel on direct lines between columns in lines at an angle to each other, and circumscribing areas about the columns and between them, said areas being crossed by other reinforcement.

3. A column-supported slab of concrete, having at the columns circumferential cantaliver elements and having slab reinforcement that includes obliquely extending belts that cross each other at points between the columns, and extended across several adjacent panels crossing from one panel to another at points substantially at mid-span of the panel on direct lines between columns in lines at an angle to each other, and belts that extend from column to column.

4. A column-supported slab of concrete, having slab reinforcement that includes obliquely extending belts that cross each other at points between the columns, and extended across several adjacent panels crossing from one panel to another at points substantially at mid-span of the panel on direct lines between columns in lines at an angle to each other, belts of rods that extend from column to column and cross each other thereat, and belts of rods that extend at right angles thereto and to each other that extend between points between the columns, the reinforcement at the columns being in the tension zone, and forming thereat with the concrete a circumferential cantaliver.

5. A column-supported slab of concrete, having slab reinforcement that includes obliquely extending belts that cross each other at points between the columns, and extended across several adjacent panels crossing from one panel to another at points substantially at mid-span of the panel on direct lines between columns in lines at an angle to each other, and belts that extend from column to column, and spiral rods at the columns, the reinforcement at the columns being in the tension zone, and forming thereat with the concrete a circumferential cantaliver.

6. A column-supported slab of concrete, having slab reinforcement that includes obliquely extending belts that cross each other at points between the columns, and extended across several adjacent panels crossing from one panel to another at points substantially at mid-span of the panel on direct lines between columns in lines at an angle to each other, and belts that extend from column to column, a frame of rods at the column, and a spiral rod at the column, the reinforcement at the columns being in the tension zone, and forming thereat with the concrete a circumferential cantaliver.

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

CLAUDE A. P. TURNER.