J. WUNDER.

REINFORCED CONCRETE CONSTRUCTION.

APPLICATION FILED SEPT. 3, 1910.

1,036,049. Patented Aug. 20, 1912.

3 SHEETS—SHEET 1.

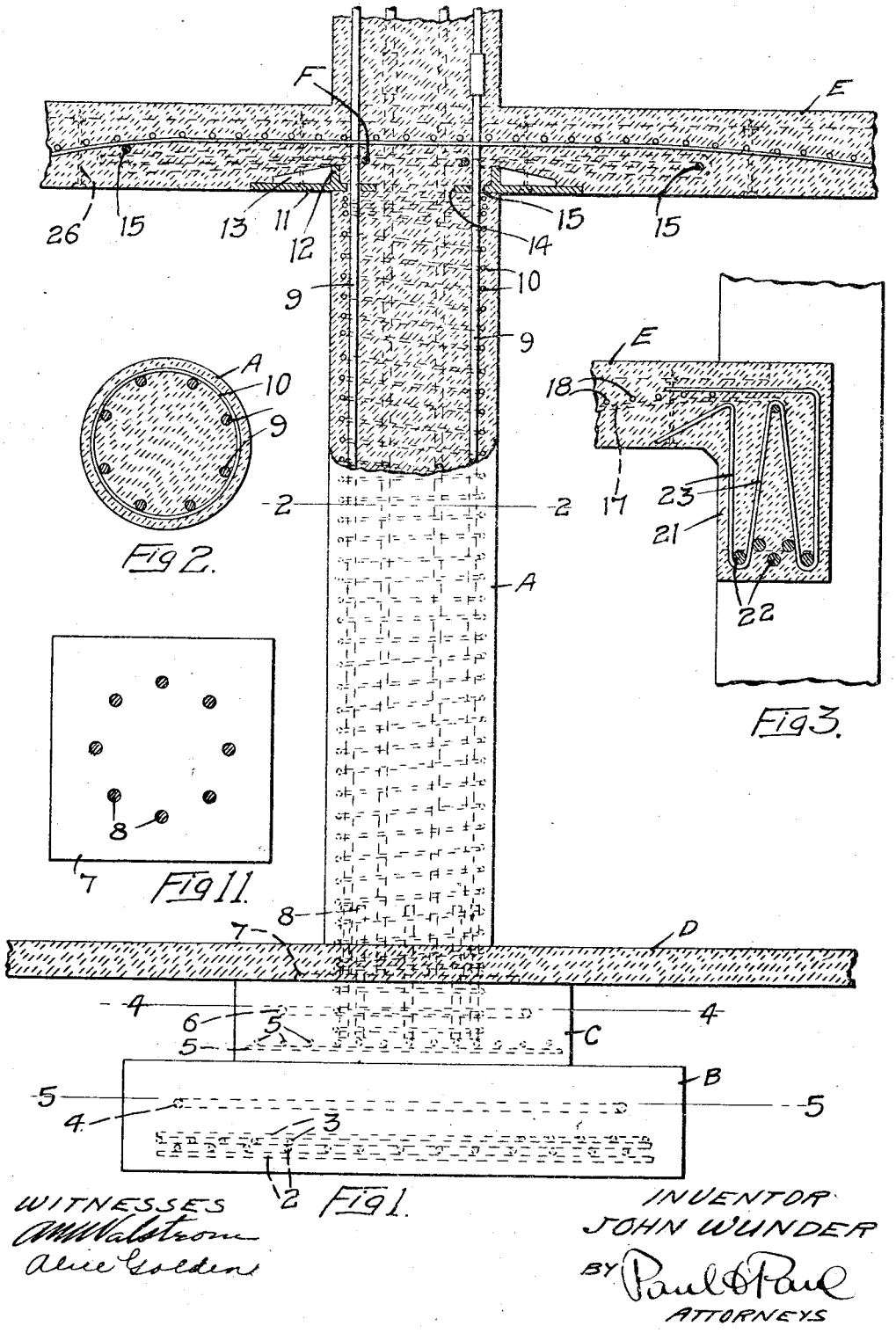

Fig 2.

Fig 3.

Fig 11.

Fig 1.

WITNESSES

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3 SHEETS—SHEET 2.

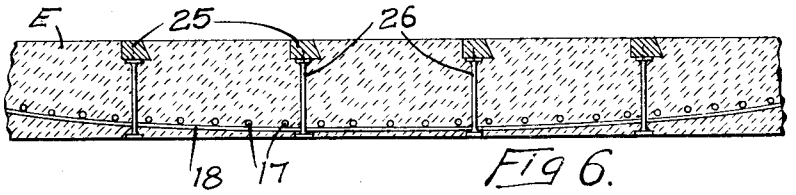

Fig 6.

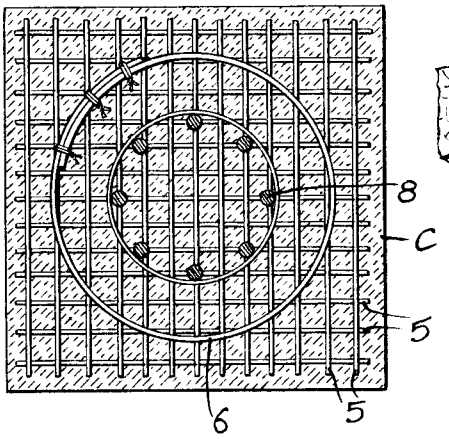

Fig 4.

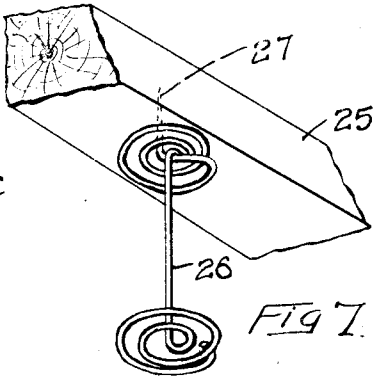

Fig 7.

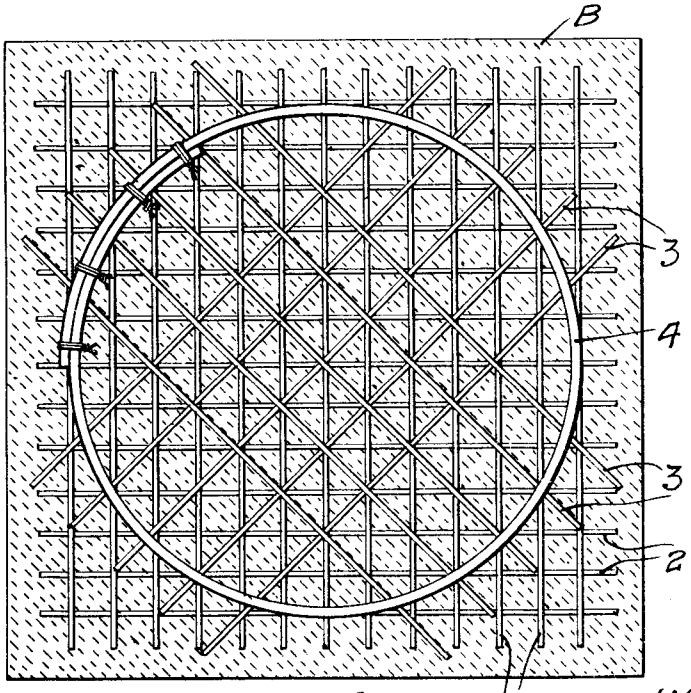

Fig 5.

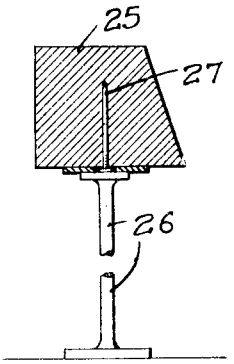

Fig 8.

WITNESSES

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3 SHEETS—SHEET 3.

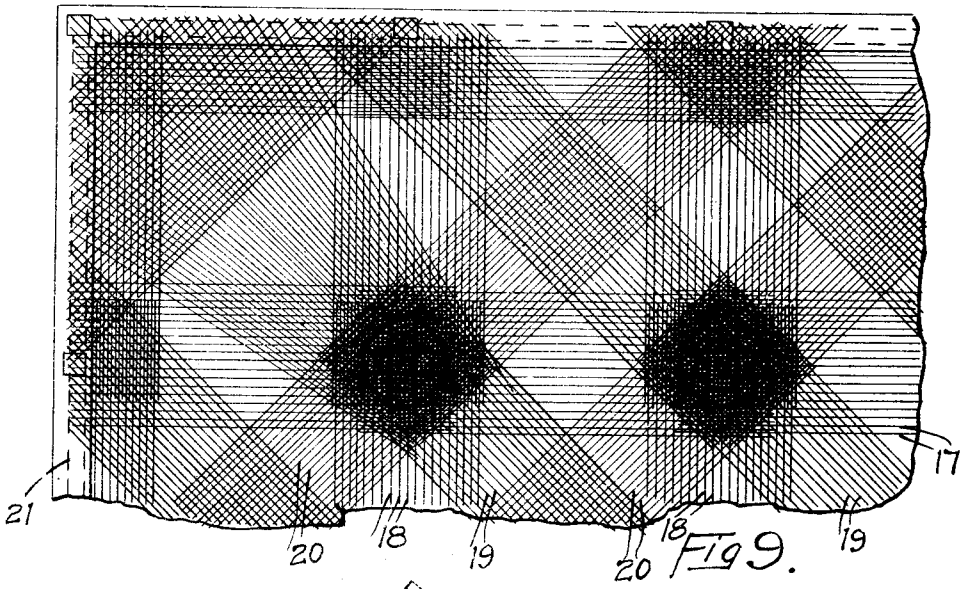

FIG 9.

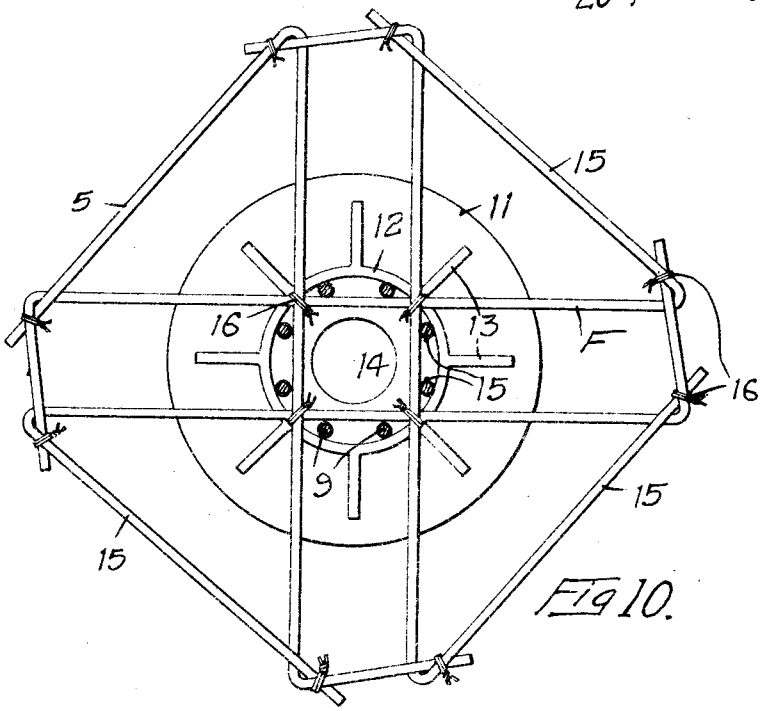

FIG 10.

WITNESSES

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UNITED STATES PATENT OFFICE.

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REINFORCED CONCRETE CONSTRUCTION.

1,036,049. Specification of Letters Patent. Patented Aug. 20, 1912.

Application filed September 3, 1910. Serial No. 580,427.

To all whom it may concern:

Be it known that I, JOHN WUNDER, of Minneapolis, county of Hennepin, and State of Minnesota, have invented certain Improvements in Reinforced Concrete Constructions, of which the following is a specification.

This invention relates to improvements in reinforced concrete constructions for buildings, and particularly the type known as "flat slab" constructions.

The object of my invention is to provide a flat slab construction, that is, a construction in which beams or girders are dispensed with, that shall be simple and economical in construction and in which the entire reinforcing means is arranged either in the columns themselves or in the flat floor slabs, so that it is not necessary to employ reinforced capitals, enlargements or brackets on the columns below each floor. By this means I am enabled to produce a column that is straight and of the same area in cross section throughout its length and to which the floor slabs are directly joined, and all reinforcing means are arranged directly in the column itself, or within or between the upper and lower surfaces of the flat floor slabs.

My invention consists generally in the constructions and combinations hereinafter described and particularly pointed out in the claims.

In the accompanying drawings forming part of this specification, Figure 1 is a vertical section of a reinforced column and a portion of a flat floor slab formed integrally therewith and embodying my invention. Fig. 2 is a transverse section of the column on line 2—2 of Fig. 1. Fig. 3 is a section showing a fragment of the floor and the means for supporting it at the outer wall of the building. Fig. 4 is a horizontal section of the upper footing of the column taken on line 4—4 of Fig. 1. Fig. 5 is a horizontal section of the lower footing of the column taken on line 5—5 of Fig. 1. Fig. 6 is a partial section through the floor in a plane at a right angle to the section of Fig. 1, showing the manner of embedding the wooden strips to which a wooden floor may be nailed or otherwise secured. Figs. 7 and 8 are details showing the means for supporting the wooden strips on the false work while the concrete floor slab is being poured. Fig. 9 is a plan view of a portion of the floor slab showing the manner of arranging the reinforcing rods or wires. Fig. 10 is a plan view showing the metal plate that is located at the top of each column and the series of rods forming a column head, embedded within the floor slab. Fig. 11 is a plan view of a metal bearing plate on top of the upper footing.

In all of the drawings A represents one of the reinforced concrete supporting columns. B the lower footing and C the upper footing for the columns.

D represents the basement floor of the column.

E represents one of the flat slab floors formed integrally with and supported upon a series of the columns A and at its outer edges, formed integrally with and supported upon the outside walls of the building.

The present invention has to do principally with the construction of the reinforced columns and the flat slab floors formed integrally therewith.

The construction of the lower footing B is shewn clearly in Figs. 1 and 5 of the drawings. Each lower footing consists of a reinforced concrete block or slab, having preferably a series of rods or bars 2—2 arranged at right angles to each other and a second series of bars or rods 3—3 also arranged at right angles to each other and diagonally to the bars or rods 2. A hoop or ring 4 (one or more) is also preferably arranged in the block B at any desired point therein. The upper footing C is arranged upon the lower footing B and it consists of a reinforced concrete block, having preferably the reinforcing rods 5—5 arranged at right angles to each other and the ring or hoop 6 preferably arranged above the rods 5—5 as indicated by dotted lines in Fig. 1 of the drawings.

A steel plate 7 having a series of holes therein, is arranged preferably on top of the upper footing C and a series of stub rods 8 are inserted in the holes in the plate 7, and they are embedded preferably for about half their length in the block C, forming the upper column footing. These rods are embedded in the upper footing, as said footing

is formed and then project above the basement floor and determine the position at which the superimposed column is to be located.

I have represented a basement floor D, resting on top of the upper footing C. This floor will be properly reinforced, but I have not thought it necessary to show in the drawings or to describe at length therein, the structure or method of reinforcing this basement floor.

The columns A are provided with a series of vertical rods 9 that are of sufficient length to bring their upper ends above the top of the first flat slab floor. Their ends preferably rest upon the steel plate 7 that is on top of the upper column footing C. Any desired number of these vertical reinforcing column rods may be employed. I have shown in the drawings eight such rods, but a greater or less number may be used as may be required by the character of the building and the load that it is designed to carry.

A spirally wound rod or wire 10, surrounds the series of rods 9 and extends through the column from the plate 7 to the under side of the first flat slab floor. In forming these columns a suitable mold or false work is put up around the column reinforcing rods and the plastic concrete is poured into these molds and thereby is caused to surround and embed all of the reinforcing wires and rods in the column and when the concrete becomes hard the false work or molds may be removed and a series of strong and durable columns will be formed in position for receiving the flat floor slab designed to be formed integrally with the tops of said columns.

On the top of each column and with its lower surface flush with the lower surface of the flat slab, forming each of the floors above the basement, I place a metal plate 11, having an upwardly projecting flange 12, and a series of diagonally arranged ribs 13 (see Fig. 10.) This plate has a central hole 14 (see Fig. 10), and a series of smaller holes 15 designed to receive the upper ends of the vertical column reinforcing rods. This plate is put into position after the false work is erected so that its lower face preferably rests directly upon the false work, and the ends of the column reinforcing rods project through the holes in said plate. These rods preferably extend a short distance above the top of the floor slab E. I form integrally with the column thus described a flat slab floor provided with reinforcement sufficient to carry any desired load. In constructing this flat slab floor I prefer to provide a reinforcing head F arranged above the plate 11, but preferably resting on the top of the flange 12 of said plate. This head preferably consists of a series of similarly bent rods or bars 15, hooked together and preferably suitably tied by wires 16. This head, as before stated, preferably rests directly upon the top of the flange 12 of the plate 11 and forms a cantilever in every direction from the center of said column. The head F resting directly upon the flange 12 of the plate 11 forms a reinforcing cantilever head that is located directly within the floor slab itself (see Fig. 1). Several series of reinforcing rods or wires may be arranged over said head as shown in Figs. 1 and 9 of the drawings. These wires are preferably arranged to extend in four directions across the top of the head, that is to say, I provide a series of rods or wires 17, which extend longitudinally across the heads and through the floor slabs; a series of rods or wires 18 that extend at right angles to the wires or rods 17 through the floor slabs, a series of rods or wires 19 that extend diagonally across said heads and through the floor slab, and a series of rods or wires 20 that extend also diagonally across the said heads and through the floor slab and substantially at right angles to the rods or wires 19.

At the wall of the building a beam or girder 21 is preferably provided and the ends of the rods or wires extending to this girder are suitably anchored therein. This girder is also provided with suitable reinforcing rods and wires 22 and 23 arranged in any preferred manner.

The rods or wires passing over the embedded column heads are preferably arranged to pass near the lower surface of the floor slab in the centers of the panels as indicated in Figs. 1 and 6 of the drawings. I do not limit myself, however, to any particular arrangement of the reinforcing rods or wires extending through the flat floor slabs. I also prefer to provide in the flat floor slabs a series of wooden strips or bars 25, which are embedded therein as the concrete is poured, and which have their upper surfaces flush with the upper surface of the concrete slab. These strips provide suitable means to which the wooden floor covering the concrete slabs may be nailed. For the purpose of properly locating the strips 25 I provide a series of spacing standards 26 which may be formed of wire bent into proper shape and having a sharp point 27 that may be driven into the under surface of the bar 25, or may be formed of metal with a sharp point 27 that may be driven into the bar 25 as shown in Fig. 8. With either construction, before the concrete for the floor slab is poured, these bars 25 are put in position on the false work and are supported by the standards 26 in proper position, so that when the concrete is poured the standards will be embedded therein and the bars will be properly located with reference to the surface of the floor.

There are many advantages arising from this construction. I am enabled to do away with capitals, or projections, or protuberances of any kind at the tops of the columns beneath the flat slab floors. This is especially desirable in office buildings and other light constructions where numerous partitions are to be employed. The usual reinforced heads below the flat slab floor employed in other constructions are decidedly disadvantageous where partitions are to be erected. The columns erected in this manner may be accurately lined up and as the concrete is poured into the columns before the flat slabs for the floors are poured, there is no danger of getting any debris in the column forms, as so often occurs where the floors and columns must all be poured at the same time. If ornamental caps are desired on the columns, the same can be placed thereon after the columns are erected and without any reinforcement being placed in them. If heavy loads are to be carried the ribbed metal plates at the tops of the columns may be inverted so as to have the ribs on the under side of the plates. This increases the strength of the plates and enables them to carry bigger loads than when they are put in the position shown in the drawings with the ribs on the upper side.

The rods forming the reinforcing head do not cross the center of the column, over the hole in the metal plate, but at one side thereof, so that the concrete is integral from the column below the plate into the extension thereof above the plate. The floor slab is, therefore, made homogeneous and monolithic with the column. The footing constructions having the rings therein prevent the spreading outward and upward of the concrete of the footing, and enables a very heavy load to be carried thereon.

The rods 19 and 20 which extend over the head in diagonal directions, but at right angles to each other, are extended under the portions of the rods 15 that are at right angles to themselves so as to avoid the piling up of the rods in the center of the columns, thus leaving all of the members of metal in the form of a spider web at the column head.

Many other advantages will be obvious to persons familiar with concrete building construction. I do not limit myself to the details of construction as the same may be varied in many particulars without departing from my invention.

I claim as my invention:

1. In a reinforced concrete structure, the combination with a series of reinforced columns having vertical rods embedded therein and a reinforced floor slab formed integral with said columns, metal plates for the columns, said plates being embedded in the tops of the columns and extending laterally beyond the outer faces thereof into the floor slab, and having holes through which the rods extend, each of said plates having a central opening formed therein of less diameter than the diameter of the columns through which the concrete for the columns may be poured.

2. In a reinforced concrete structure, the combination with a series of reinforced columns having vertical rods embedded therein, and a reinforced floor slab formed integral with said columns, of metal plates for the columns, said plates having holes through which the rods extend, and a central opening through which the concrete for the columns may be poured, said plates being located at the tops of the columns and extending laterally beyond the outer face of the columns into the floor slab, said plates being formed with an annular rib, and with radial ribs extending outwardly from said annular rib, said ribs being formed integral with the plate.

3. In a reinforced concrete structure, the combination with a series of reinforced columns having vertical rods embedded therein, and a reinforced floor slab formed integral with said columns, of metal plates for the columns, said plates having holes through which the rods extend, and a central opening through which the concrete for the columns may be poured, said plates being located at the tops of the columns and extending laterally beyond the outer face of the columns into the floor slab, said plates being formed with an annular rib, and with radial ribs extending outwardly from said annular rib, said ribs being formed integral with the plate, and reinforcing members arranged above the plate and extending laterally into the floor slab.

4. In a reinforced concrete structure, the combination of a series of reinforced columns and a reinforced floor slab formed integral with the tops of the columns, vertical rods embedded in the columns and extending above the top thereof, of metal plates, said plates located at the tops of the columns and level with the under face of the floor slab, each of said plates extending beyond the outer face of the columns, an annular rib formed on the upper face of said plate, and radial ribs extending outwardly from said annular rib, and formed integral with said plate, said plate having a central opening therein through which the concrete for the column may be poured.

5. In a reinforced concrete structure, the combination of a series of reinforced columns and a reinforced slab formed integral with the tops of the columns, vertical rods embedded in the columns and extending above the top thereof, of metal plates located at the tops of the columns and level with the under face of the floor slab, each of

said plates extending beyond the outer face of the columns, an annular rib formed on the upper face of said plate, and radial ribs extending outwardly from said annular rib, and formed integral with said plate, said plate having a central opening therein through which the concrete for the column may be poured, and reinforcing members arranged above said plate and extending laterally into the floor slab.

In witness whereof, I have hereunto set my hand this 26th day of August, 1910.

JOHN WUNDER.

Witnesses:
ALICE GOLDEN,
A. C. PAUL.