

R. McWILLIAMS.
 REINFORCED CONCRETE CONSTRUCTION.
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1,353,770.

Patented Sept. 21, 1920.

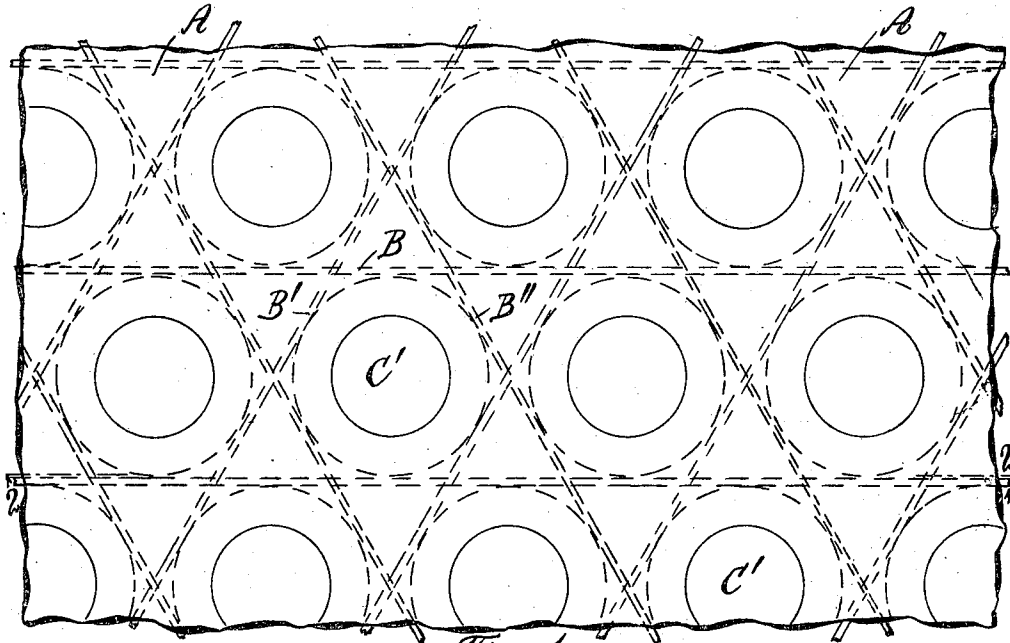


Fig. 1.

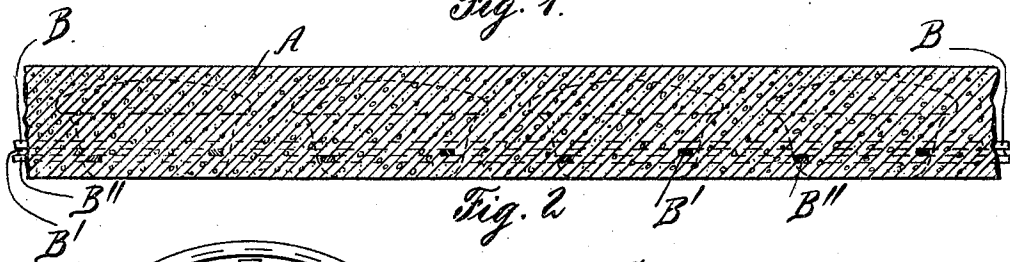


Fig. 2.

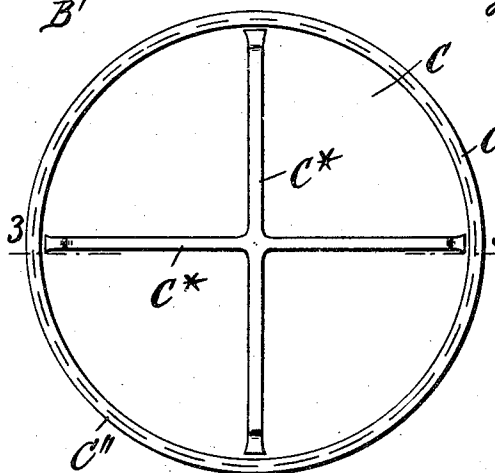


Fig. 4.

WITNESS:
Charles A. Mathe

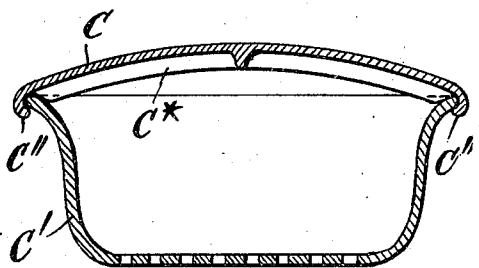


Fig. 3.

INVENTOR
 Rowland McWilliams
 by *John Lotka*
 Attorney.

UNITED STATES PATENT OFFICE.

ROWLAND McWILLIAMS, OF GLEN RIDGE, NEW JERSEY.

REINFORCED CONCRETE CONSTRUCTION.

1,353,770.

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To all whom it may concern:

Be it known that I, ROWLAND McWILLIAMS, a citizen of the United States and resident of Glen Ridge, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Reinforced Concrete Construction, of which the following is a specification.

My invention relates to reinforced concrete constructions, and particularly reinforced concrete floors, and has for its object to provide a very strong construction of very light weight and ready adaptability to various conditions. The peculiar characteristics and advantages of my invention will be fully set forth in the description following hereinafter, and the features of novelty pointed out in the appended claims.

Reference is to be had to the accompanying drawings, in which Figure 1 is a bottom view of a reinforced concrete floor constructed according to my invention; Fig. 2 is a vertical section on the line 2—2 of Fig. 1; Fig. 3 is a vertical section of one of the filler bodies or inserts, taken through its center; and Fig. 4 is a bottom view or inside view of the upper member of the filler or insert.

The improved floor, wall, or other structural element comprises a series of hollow filler bodies or inserts, a layer of concrete A in which they are embedded, and reinforcing rods B, B', B'' also embedded in said concrete layer. In the particular example illustrated, I employ three sets of reinforcing rods, arranged in superposed planes, the rods of each set forming angles of 120° with those of the other two sets. The rods are placed in such a manner as to form hexagonal spaces and small triangular spaces adjacent to each hexagon side, substantially after the fashion of a six-pointed star; that is, each rod of one set intersects the rods of the other sets at different points, and there is no point at which rods of the three sets meet or intersect. The hollow filler bodies or inserts which fit into, or register with, the hexagonal spaces just mentioned are of circular cross section at every level between top and bottom, and are preferably made of two members C, C'. Preferably at least the lower member C' is made of fireproof material, and its lower surface, which is approximately plane, is generally roughened so as to better hold plaster that may be applied thereto. This

roughening may be obtained by recesses or corrugations, or, as shown, by perforations. Making the fillers or inserts of two members facilitates their shipping, since like members can be stacked readily, to take up less space than if the fillers or inserts were shipped complete. The connection of the two members is effected in any suitable way; for instance, the upper member C may have a somewhat elastic inturned lower edge C'' adapted to be sprung over the upper edge of the lower member C'. For the sake of greater strength, the upper member C may be provided on its inner surface with radiating ribs C*, the outer ends of which may be arranged to engage the inner surface of the lower member C'. In vertical section, the upper member C is dome-like, and the entire insert shows a convex curve at its upper portion, down to a point where the diameter is greatest, and the lower portion exhibits a contraction according to a concave curve, the diameter of such lower portion being smallest at its bottom. Fiber is a suitable material for both the upper and the lower members of the filler or insert, but I do not wish to restrict myself to this particular material.

These round fillers or inserts are preferably used in connection with three sets of reinforcing rods B, B', B'' as referred to above, and the inserts are so placed that their centers or vertical axes will be at the vertices of equilateral triangles, see Fig. 1. The fillers or inserts are located in the concrete layer A in such a manner that the widest portion of the several inserts will be exactly or approximately in the so-called neutral surface or neutral plane of the floor, that is to say, the surface within which the material is subjected neither to compression (as it is above such surface, in the case of an ordinary floor) nor to tension (as it is below such surface). At this point, only a small amount of concrete is required, just sufficient to overcome the horizontal shear. In a slab of reinforced concrete such as shown, the neutral surface is considerably nearer to the upper surface of the slab than to the lower surface, say about one-third from the top. The insert decreases in diameter gradually both up and down from this neutral surface, and the concrete layer exhibits a corresponding gradual increase in horizontal cross section, thus affording the proper strength to resist tensile and com-

pression stresses. The circular form of the insert, and the gradual change of its diameter, insure the perfect transmission of stresses in all directions from the center of each insert, and from the top surface of the floor to its bottom surface. The arrangement of the reinforcing rods in three sets as described above also assists in distributing the tensile stresses in every direction. The inserts being in staggered arrangement, a more uniform distribution of concrete is obtained. A very efficient "slab" action is insured by the shape of the inserts, that is, the stresses are transmitted with practical uniformity in every radial direction from the center or axis of the insert. The hollow character of the inserts not only reduces weight, but adds to the sound-proofing and fire-proofing qualities of the floor or other structural element. A considerable economy in the amount of reinforcing steel (rods B, B', B'') is also effected by my invention. Not only the shipment, but the manufacture and the handling of the inserts are facilitated by making them of two (or more) members. While I have described and shown inserts of circular cross section, I desire it to be understood that approximations to this shape will produce practically the same result, and an insert of polygonal cross section, particularly when the polygon has a large number of sides, may be considered an approximation to, and an equivalent of, an insert of circular cross section, and I desire the appended claims to be interpreted accordingly. Various modifications may be made without departing from the nature of my invention as set forth in the appended claims.

It will be understood that in some cases the occurring stresses may make it advisable to use the inserts in an inverted position, with the member C' as the upper member.

I claim as my invention:

1. A floor or other structural element, comprising spaced inserts of circular cross section from top to bottom, the cross sectional area of said inserts being greatest in the neighborhood of the neutral surface of said element, and the plane of such greatest cross section of each insert being much nearer to the top of the insert than to the bottom thereof, the cross section of the insert decreasing gradually from said plane both upwardly and downwardly, and a body of reinforced concrete in which said inserts are embedded.

2. A floor or other structural element, comprising spaced inserts of circular cross section from top to bottom, and of a cross sectional area which is greatest in the neighborhood of the neutral surface of said element and decreases gradually in both directions from said surface, the upper portion of each insert being of dome-like curvature, and the bottom approximately plane, and a body of reinforced concrete in which said inserts are embedded.

3. An insert for concrete structures, comprising a member of dome-like curvature provided on its inner side with ribs terminating short of the edge of said member, said edge being bent to form a flange, and a mating member the meeting edge of which is adapted to be fitted against the first-named member, exteriorly of said ribs and interiorly of said flange.

4. A floor or other structural element, comprising a body of concrete and reinforcing tension members embedded in said concrete body and arranged in three sets, all members of the same set being parallel to one another, but at an angle to the members of the other two sets, the members of each set intersecting those of the other two sets at different points so as to form spaces some of which are triangular and some hexagonal.

5. A floor or other structural element, comprising a body of concrete and reinforcing tension members embedded in said concrete body and arranged in three sets, all members of the same set being parallel to one another, but at an angle to the members of the other two sets, the members of each set intersecting those of the other two sets at different points so as to form spaces some of which are triangular and some hexagonal, and inserts of circular cross section, disposed in said hexagonal spaces.

6. An insert for concrete structures, said insert being of circular cross section from top to bottom, having an approximately plane surface at one end and a dome-like curved surface at the other end, the insert being of a diameter which is greatest at an intermediate point nearer to the dome-like surface than to the plane surface and decreasing from said point toward both ends.

7. A floor or other structural element, comprising a body of concrete and reinforcing tension members embedded in said concrete and arranged in three sets, the members of the same set being parallel to each other but at an angle to the members of the other two sets, and the members of each set intersecting those of another set at certain points, and those of the third set at different points only, to form spaces some of which are hexagonal and others triangular.

In testimony whereof, I have signed this specification.

ROWLAND McWILLIAMS.