Apr. 24, 1923. 1,452,677

L. DAVIDSON

REENFORCEMENT FOR REENFORCED CONCRETE FLAT SLAB CONSTRUCTION

Filed June 9, 1919

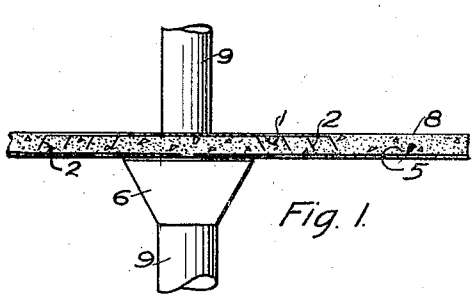


Fig. 1.

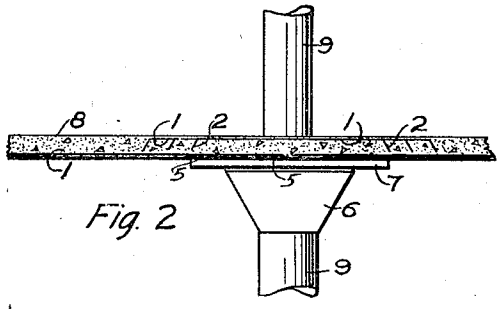


Fig. 2.

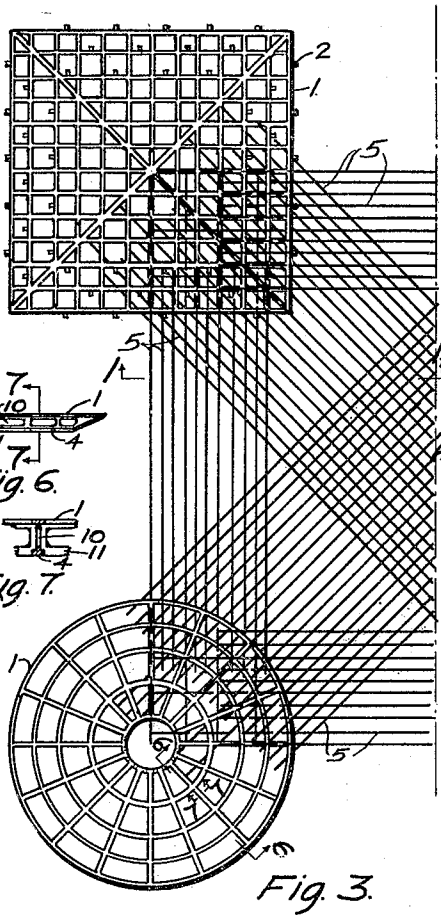


Fig. 3.

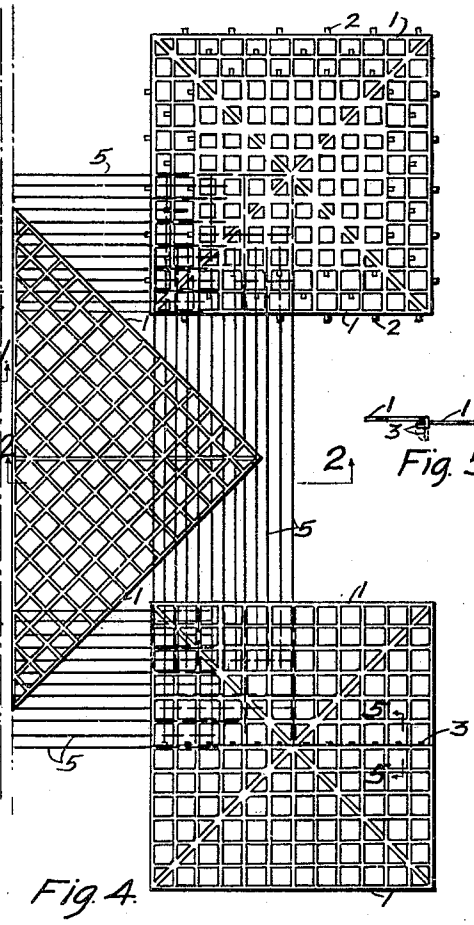


Fig. 4.



Fig. 6.



Fig. 7.



Fig. 5.

Inventor

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# UNITED STATES PATENT OFFICE.

LOUIS DAVIDSON, OF NEW YORK, N. Y.

## REENFORCEMENT FOR REENFORCED-CONCRETE FLAT-SLAB CONSTRUCTION.

Application filed June 9, 1919. Serial No. 302,946.

*To all whom it may concern:*

Be it known that I, LOUIS DAVIDSON, a citizen of the United States of America, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Reenforcements for Reenforced-Concrete Flat-Slab Construction, of which the following is a specification.

My invention relates to improvements in reeenforcement for economically and expediously placing reenforcement in reenforced concrete flat slab construction.

The objects of my invention are, first, to eliminate the use of bent rods, because of the expense involved in bending them, and because of the time and expense involved in erecting these rods into a complicated system of network; second, I obtain economy in the quantity of material required; and third, to standardize the perforated plates for quantity production.

I attain these objects by the reenforcement illustrated in the accompanying drawing in which—

Fig. 1 is a vertical section view of a conventional flat slab with a capital showing a one half bay with my improved reenforcement;

Fig. 2 is a vertical section view of a conventional flat slab with a drop panel and capital showing a one half bay with my reenforcement;

Fig. 3 is a plan view of the assembled reenforcement for a flat slab construction showing one half bay, and for simplicity the concrete here is omitted;

Fig. 4 is another plan view of the assembled reenforcement for a flat slab construction, showing one half bay, and for simplicity the concrete here is omitted;

Fig. 5 is a vertical section view taken on line 5—5 of Fig. 4;

Fig. 6 is a vertical section taken on line 6—6 of Fig. 3;

Fig. 7 is an enlarged section taken on line 7—7 of Fig. 3.

Similar numerals refer to similar parts throughout the several views.

The perforated plate is marked 1, and 2 is a lug bent down from the plate to increase the shearing strength of the concrete and obtain a better integral reenforced concrete mass. 3 is a lug bent down from one plate and around an adjacent one to make one plate of smaller units by clamping them together, as shown in Figs. 4 and 5.

Flange 4 in Fig. 7 is a modification as in a cast perforated plate, with perforated webs 10 radially located below the plate, and a bulb like projection 4 on the edge of said webs 10 to take compression and relieve the surrounding concrete.

Ordinary reinforcing rods are 5; 6 is the conventional capital; 7 is the conventional drop head; 8 is the floor slab; 9 is the column; 10 are perforated webs radially located below the plate; and 11 are perforated webs circumferentially located.

Actual tests for stresses existing in flat slabs subject to live loading have demonstrated that the slab at the column head or capital acts like a cantilever approximating a circle in outline. Tensile stresses exist in the top and compression stresses in the bottom of the slab at the column due to negative moment, and, between these cantilevers the slab is in suspension with positive moment creating tension in the bottom and compression in the top of the slab. The point of inflection is where the moment changes from positive to negative. To relieve excessive compressive stresses in the concrete the drop heads and capitals are added.

I prefer to make my invention out of steel plate. The thickness of the plates will depend on the thickness of slab, the thickness of slab and drop head combined, and the size of the perforations. Under average conditions the thickness will vary between the limits of about one-eighth of an inch to about one-half of an inch. The plates can be made of relatively small units for convenience in handling, and then connected as shown in Figs. 4 and 5 by 3, or can be bolted together. The perforations may consist of round, square, octagonal or any other shaped holes that will most efficiently satisfy the construction and economic requirements, and of a size that will permit the concrete to flow freely through them.

All of the rods 5 should run to a point of about one foot inside the drop head, but under special conditions it is advisable to run a few to the center of the column.

By inverting my reenforcement and placing it at the bottom of the slab over the column the drop head can be dispensed with

in many cases, and often both the drop head and capital. Lug 2 is especially advisable under the latter conditions.

Figure 4 shows my reenforcement centrally located in the bottom of a panel taking the place of bottom diagonal reenforcement bars 5.

It is evident that my invention can be used with the so called two way and four way systems of reenforcements. Other combinations can be made.

In the systems of reinforcing as used at the present time, there are four layers of rods in the top of the slab over the column bent up from the bottom rods, and in some cases two layers. Waste of material results because of lack of control of ineffective overlapping of rods, and also because the rods are not properly laid together.

In my perforated plate invention only one layer of steel is used in the top of the slab over the column, and, therefore, for a given over-all depth less steel is required because the effective resisting lever arm is increased in length. By varying the size of the perforations in the plate as shown in Fig. 4, top, the quantity of steel is regulated so that it is put just where it is required. The plate is made of a size so as to about be on the theoretical line of inflection around the column.

In setting steel with my improved reenforcement it is only necessary to put in place my plate and ordinary straight rods of a minimum number, instead of the usual required complicated system of bent rods to form an interwoven mass as at present used.

If desired the surface of these plate can be made deformed.

As a further measure of economy, the rolled plates used can be of the type having beveled edges.

It is evident from the several plate outlines and different shape perforations that many modifications can be made, and I do not intend to be understood as limiting myself to the outlines and shapes shown in the drawing. The essential principle of my invention as illustrated in the accompanying drawing may be varied within the limits of the appended claims.

I claim as my invention:—

1. A flat plate with perforations consisting of holes for use over columns in reenforced concrete flat slab construction, perforated radial and circumferential web members perpendicular to said plate, and a bulb like projection at the edge of said perforated radial member, forming a complete unit for taking the tension in the top of the slab, and increasing the compressive capacity in the bottom of the slab.

2. A flat plate with perforations consisting of holes for use over columns in reenforced concrete flat slab construction, perforated radial and circumferential web members perpendicular to said plate, and a bulb like projection at the edge of said perforated radial and circumferential members, forming a complete unit for taking the tension in the top of the slab, and increasing the compressive capacity in the bottom of the slab.

LOUIS DAVIDSON.