C. B. GRADY.

CONCRETE STRUCTURE.

APPLICATION FILED APR. 13, 1908.

1,102,580.

Patented July 7, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

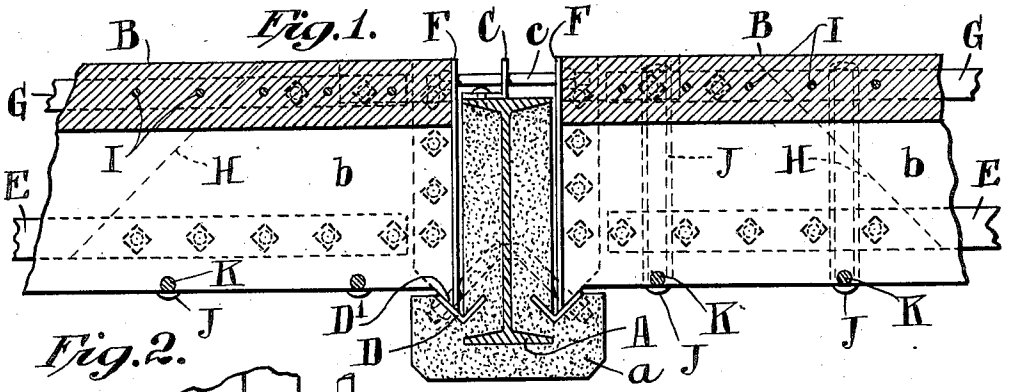


Fig. 2.

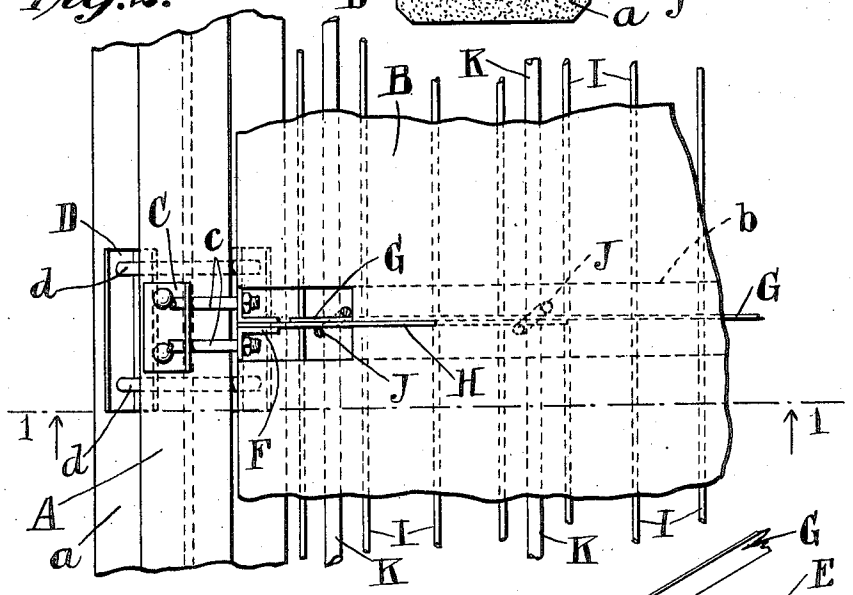
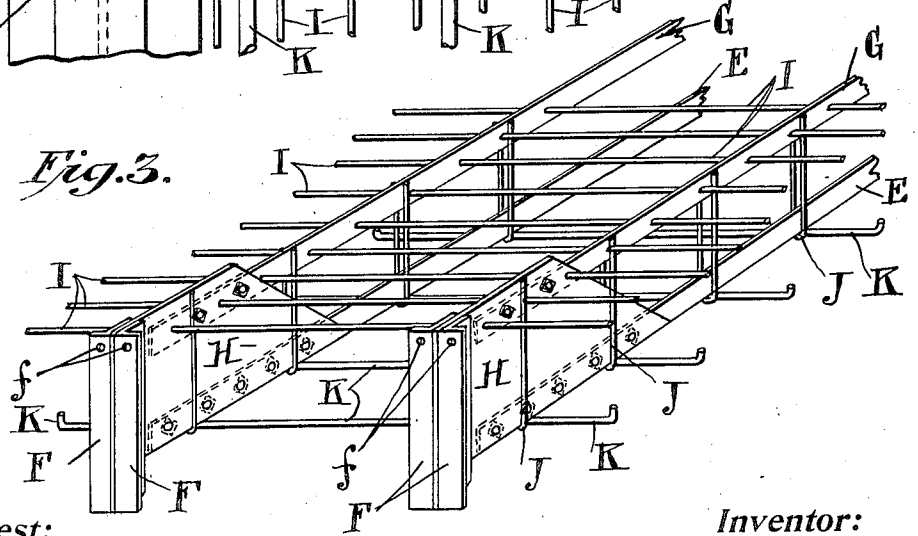


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

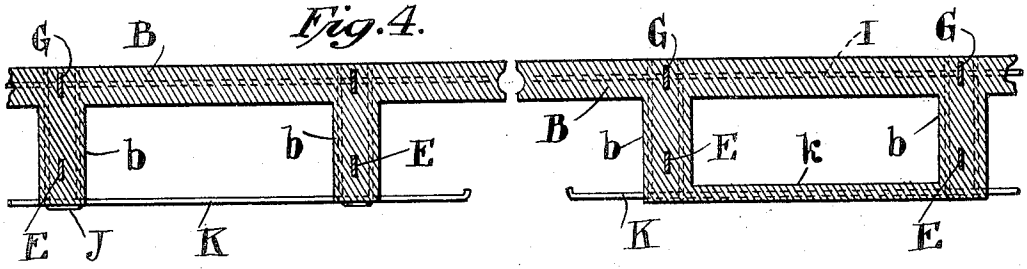


Fig. 5.

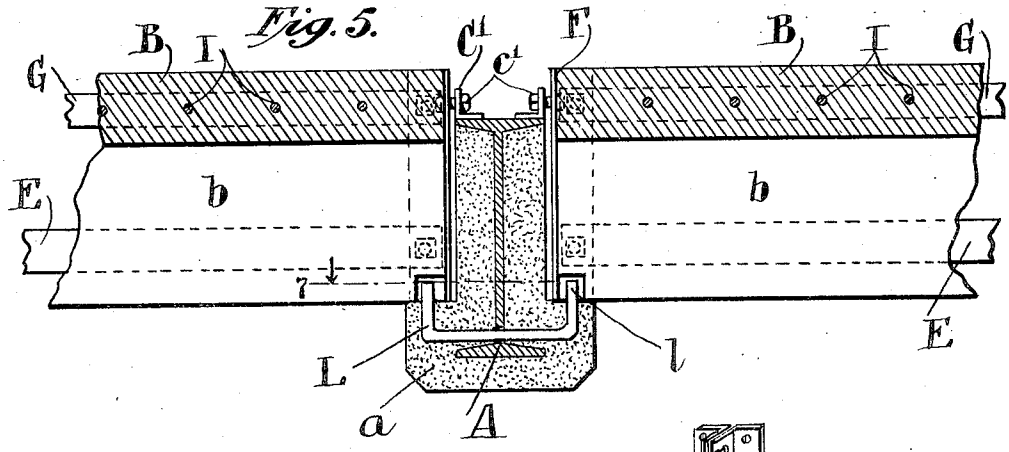


Fig. 6.

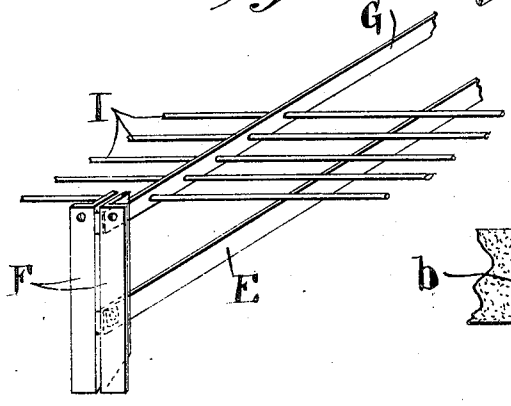
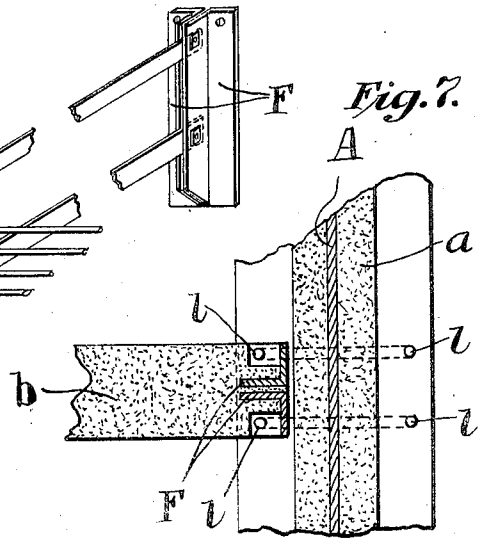


Fig. 7.



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CONCRETE STRUCTURE.

1,102,580. Specification of Letters Patent. Patented July 7, 1914.

Application filed April 13, 1908. Serial No. 426,669.

To all whom it may concern:

Be it known that I, CHARLES BENEDICT GRADY, a citizen of the United States, whose residence and post-office address is West Orange, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Concrete Structures, of which the following is a specification.

My invention relates to concrete structures, and more especially to concrete-and-metal floor girders; to concrete-and-metal floor slabs; to the relative arrangement of said girders and slabs and the means of interconnecting them.

I will first describe a form of concrete structure embodying my invention, and then point out the novel features in the claims.

In the accompanying drawings, Figure 1 is a vertical cross section through a floor girder and also through two floor slabs connected to said girder on either side, said girder and slabs embodying features of my invention, and said section being taken on the plane 1—1 of Fig. 2. Fig. 2 is a top view of the structure shown in Fig. 1, with the floor slab at the left, however, omitted. Fig. 3 is an isometric view of one end of the metal part of the slab of Figs. 1 and 2, the concrete being omitted. Fig. 4 is a vertical cross section taken at right-angles to that shown in Fig. 1; the left hand side of Fig. 4 showing the identical construction of Figs. 1, 2 and 3, while the right hand portion of Fig. 4 shows a modification. Fig. 5 is a view similar to Fig. 1, but indicating modified means of assemblage or connection between the floor slab and girder. Fig. 6 is an isometric view similar to Fig. 3, but showing a modification in the arrangement of the metal skeleton embedded in the concrete. Fig. 7 is a section on 7, Fig. 5.

Similar letters of reference designate corresponding parts in the several figures of the drawings.

Referring to Figs. 1, 2 and 3, and the left side of Fig. 4, showing the main form of my invention, the girder appears as consisting of a standard metallic shape A for extending from column to column, and concrete *a* embedding said shape A, with some metal left exposed as will hereinafter be explained. Each floor slab is intended to extend from girder to girder, and thus dispense with the usual floor beams; and each slab consists of a concrete mass B embedding a metallic frame, the metal projecting in such way as to be readily secured to the girder. The upper corners of the slabs are to be attached preferably by bolts or similar metallic means at the top or upper side of the girder, and the lower corners of the slabs, while not necessarily attached by metallic means, are to be seated on specially formed projections of the girder. To these ends my girder has metallic attaching means at its top such as metal clips or angle-irons C secured thereto, with which the slab securing bolts *c* engage.

The metallic shape A is shown as an upright I-beam, and as one way of providing a seat for the lower corner of the slab I form the concrete mass *a* extending vertically from the top downwardly until near the lower end it is enlarged or projected laterally, as seen in Fig. 1, forming a sort of inverted T in cross section. Combined with the concrete projection is a metal seat D, there being one on each side, and a cross bolt, such as the bent bolt *d*, engages the seats, strengthening their connection with the concrete *a* and I-beam A.

The slanting side of the metal seat D is for coaction with a corresponding bevel formed at D′ at the lower corner of the floor slab. The mere depositing of D′ in D in the process of erection forms a secure seat, in fact a very rigid union, and one which not only prevents the slab separating from the girder at the bottom, but precludes the twisting of a girder which sometimes occurs, with bad results, during erection. The seat D preferably consists of an angle iron with both legs pointing upwardly, thus forming a pocket for receiving part of a slab, for example, the bottom portion of the end member F of the metallic structure embedded in the slab. As shown in Figs. 1 and 2, the cross bolt *d* extends from seat D upwardly and inwardly toward the center of the girder and engages the metal portion of said girder, and thus said bolt *d* transfers a portion of the load imposed on seat D to the metal of the girder.

The metal work of the slab may be varied, but that shown in Fig. 3 is effective when the slab has a top part and two ribs *b*, *b* (Fig. 4). This metal work consists of a strong built-up frame having a bottom member E for each downwardly projecting concrete rib *b*; an end member F which connects with the girder and is shown as consisting of a pair of angle-irons; a reinforcing bar G near the top of the slab; and two vertical plates H, shown trapezoidal in form, one at each end, to which members E, F and G are bolted or attached. Additionally, the slab concrete is shown as embedding a series of horizontal rods I which pass through holes in bars G, and at their ends may connect with corresponding rods I in the next slab. Also a series of vertical rods J which help reinforce the concrete ribs *b*, and which are preferably formed U-shape, and embrace the members E and G. The metallic members F extend beyond the slab concrete, as explained, and at their lower ends are beveled at D', Fig. 1, to engage and lock with the inclined metallic seat D of the girder. At their upper ends the members F have holes *f* constituting means for securing them to the girder. The bolts *c* already described engage said holes and engage the angle-iron C on top of the girder and also preferably the next slab, as in Fig. 1.

Completing the description of Figs. 1, 2 and 3, K represents furring rods, see also left hand of Fig. 4. Ordinarily in making plastered ceilings, a series of furring strips are attached to the bottom of floor beams by wires or clamps, laths being then secured to the strips and plaster applied against the laths. In my new preformed slab, however, the furring strips K are attached in the process of manufacture so as to extend from rib *b* to the next rib, and sufficiently beyond. I preferably use U-rods for securely holding the strips K, and in fact, the same U-rods J already described which reinforce the concrete rib or web of the floor slab. Passing to the right of Fig. 4, the strips K' will be seen to be embedded in concrete at *k*, thus carrying further forward the ideas already described. The method of manufacturing this slab will be to cast the concrete in suitable molds, or between boards, and the hollow interior can be produced by a knock-down box arrangement removable after the concrete is hardened. Important features in my mode of manufacturing these slabs are (1) the inverted position of the slab during manufacture, and (2) the indenting, scratching or otherwise roughening the upper surface (to become the lower surface when in place) by a roller or abrading tool, at a stage when the concrete is still "green", or not completely set, thus giving a surface to which plaster will directly adhere, and with applying grease to permit the separation of concrete and form.

In the modification of Fig. 5, the seat formed on the girder is not metal lined nor with inclined sides, but is preferably reinforced by a rod L, whose ends *l* may project up and engage in the concrete of the slab, or within the angles of the members F of the slab. Also the bolt *c* at the top for securing the slabs is replaced by two small bolts *c'*, *c'*, each connecting one slab with an angle-iron C'. Also the slab reinforcement is as shown in Fig. 6.

Fig. 6 indicates how the trapezoidal plate H may be dispensed with, by connecting the bars E and G directly with the member F. The modifications of Figs. 5 and 6 are only preferable where the load is comparatively light.

What I claim and desire to secure by Letters Patent is:

1. A floor comprising opposite girders, concrete slabs set between said girders, each slab having embedded therein at least one metallic structure, each of said metallic structures comprising an end member as F secured to said girders, a horizontal tension member as E and plates as H connecting members E and F together.

2. A floor comprising opposite girders, concrete slabs set between said girders, each slab having embedded therein at least one metallic structure, each of said metallic structures comprising an end member as F secured to said girders, a horizontal tension member as E and plates as H connecting members E and F together, and a depending concrete rib inclosing the lower portion of each metallic structure.

3. A floor comprising opposite girders, concrete slabs set between said girders, each slab having embedded therein at least one metallic structure, each of said metallic structures comprising an end member as F, engaging said girders, a horizontal tension member as E, and a horizontal top member as G placed above and parallel to E, and bolts fastening members E, F and G together.

4. A floor comprising opposite girders, concrete slabs set between said girders, each slab having embedded therein at least one metallic structure, each of said metallic structures comprising an end member as F, engaging said girders, a horizontal tension member as E, and a horizontal top member as G placed above and parallel to E, and means for fastening members E, F and G together, and a depending concrete rib inclosing the lower portion of each metallic structure.

5. A floor comprising opposite girders, concrete slabs set between said girders, each slab having embedded therein at least one

metallic structure, each of said metallic structures comprising an end member as F, engaging said girders, a horizontal tension member as E, a horizontal top member as G placed above and parallel to E and plates as H connecting members E, F and G together.

In testimony whereof, I have hereunto set my hand this 10th day of April, 1908.

CHARLES BENEDICT GRADY.

Witnesses:
OLIVE B. KING,
CHARLES A. HOWARD.