

Patented June 7, 1910.

960,305.

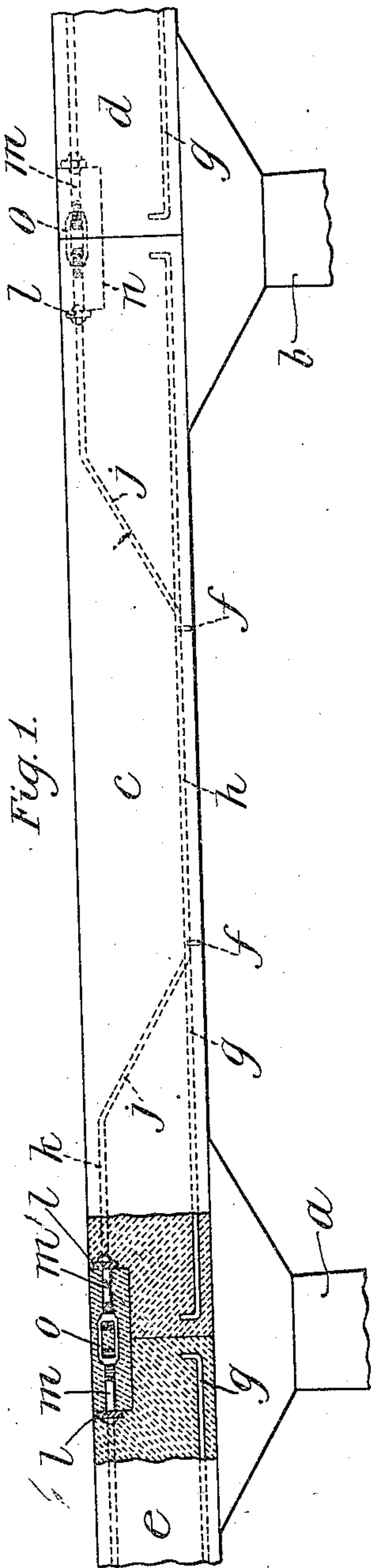


Fig. 1.

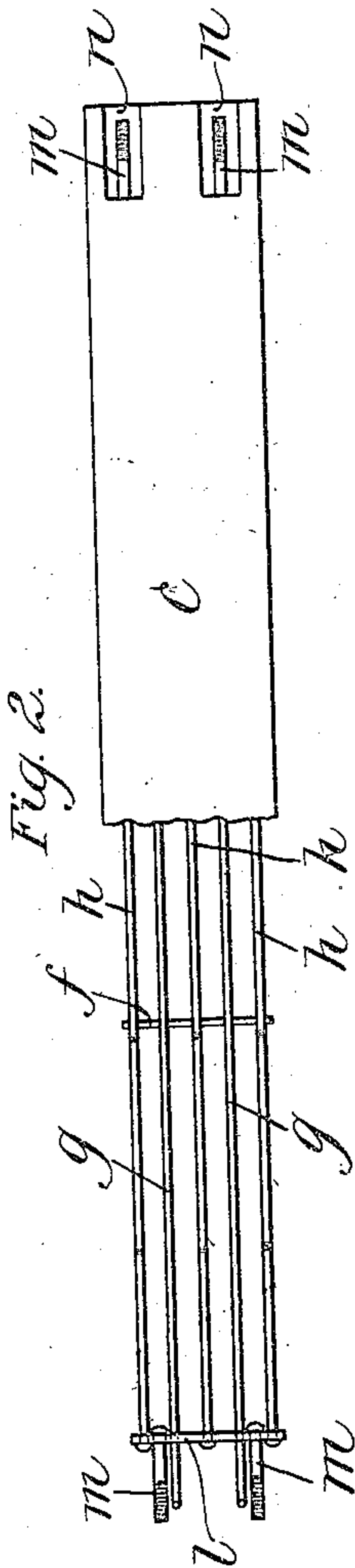


Fig. 2.

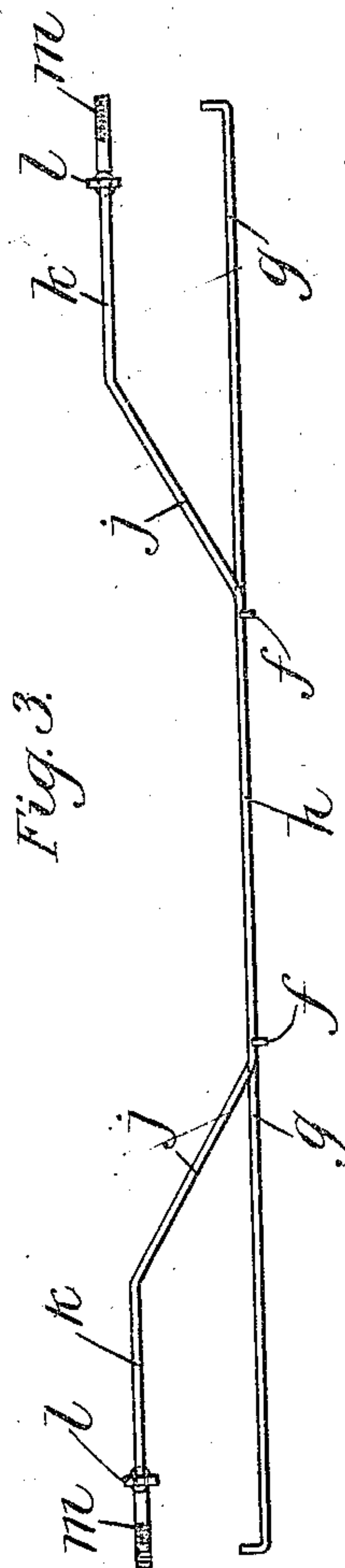


Fig. 3.

Witnesses.
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UNITED STATES PATENT OFFICE.

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CONCRETE CONSTRUCTION.

960,305.

Specification of Letters Patent.

Patented June 7, 1910.

Application filed September 25, 1906. Serial No. 336,143.

To all whom it may concern:

Be it known that I, FRANK B. GILBRETH, a citizen of the United States, residing at New York, in the county and State of New York, have invented an Improvement in Concrete Construction, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to concrete construction and more particularly to such concrete structural bodies as beams, girders or the like and to the reinforcement therefor.

In the construction of a concrete beam, girder or the like it is the usual practice to mold the structure in its designed location, suitable reinforcement having been previously placed and suitably located within the mold. This reinforcement for suitably reinforcing the structure against continuous beam action at and between its supports should extend uninterruptedly from one end of the structure to the other and should be properly positioned to reinforce the same against maximum tension on its unsupported side at and adjacent the supports and against maximum tension on its supported side between the supports.

It is sometimes desirable previously to mold such a structure out of place or away from its designed location and after transferring it to its place of use, there to set it in position. In the case of a continuous beam or girder, however, the structure is usually of such great length as compared with its dimensions as to make its transfer and handling impracticable, and, if constructed or assembled in sections, such sections lack the continuous reinforcement and act as separate rather than continuous, beams or girders.

My invention contemplates the provision of a continuous reinforced beam, girder, or other like structure, of such construction, however, that it may be molded previously and elsewhere than in its intended position of ultimate use, such girder in the preferred embodiment of my invention being formed in sections separately and previously molded, but each with its reinforcement so arranged and so united with that of the adjacent sections as to form a single continuous

structure, effectively reinforced against continuous beam action.

My invention will be best understood by reference to the following description, when taken in connection with the accompanying illustration of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings,—Figure 1 shows in side elevation a portion of a continuous girder, constructed according to one form of my invention; Fig. 2 shows a single section of the same girder with the concrete partially removed to show the reinforcement, and Fig. 3 shows in side elevation the reinforcement employed in a single section of the girder illustrated in Fig. 1.

Referring to the drawings and to the particular embodiment of my invention there illustrated, I have shown in Fig. 1 that portion of a continuous girder which extends over and between the upright column supports *a* and *b*. In the illustrated form of my invention this girder is constructed of previously molded sections, one of which, *c*, spanning the column supports *a* and *b*, is shown in full, the adjacent sections *d* and *e*, which extend to the next adjacent supports (not shown) being partly broken away.

The shape or dimensions of the girder sections is immaterial and will of course be varied to suit the requirements in each case. The sections may be molded at any desired place, either near the place of designed use or at a distance, and after being allowed to set or harden, may be transported and placed in position. In molding, however, which molding may be performed according to any usual or suitable processes, there is molded into and within the concrete of the section, reinforcement suitably proportioned and positioned to reinforce the completed and assembled girder against continuous beam action. In the illustrated form of the invention such reinforcement comprises a reinforcing frame formed of a plurality,—here in five,—longitudinal reinforcing rods arranged side by side and held separated at one or more points by suitable separating members *f*. These rods may be arranged in any suitable way best to meet the estimated load. In the girder illustrated they com-

prise a pair of substantially straight rods g , provided with upturned ends which provide anchorage within the concrete, and extending substantially the entire length of the section adjacent the lower side thereof.

By the side of the rods g , near the middle portion of the section, are arranged other rods h ,—herein three in number,—and in alternating lateral arrangement with the rods g . The rods h extend in the same lower plane with the rods g for a suitable distance either side of the center of the section, being then, however, inclined or deflected upwardly at j and terminating in the relatively short horizontal end portions k in an upper plane near the upper side of the girder section.

Where the reinforcement terminates near either end of the section there is provided means permitting its attachment or union to the reinforcement of the next adjacent section, such means herein being provided for the upper set of reinforcing rods k only, although obviously the lower rods g , or any other reinforcing members employed, may be attached to the corresponding members of the next adjacent section in a similar fashion. Such attachment may be effected in various ways but herein the rods k at each end of the section are provided with a transverse anchoring plate l , which is embedded within the concrete, and to which the rod ends are securely fastened, as by passing them through the plate and heading their ends over and against the same. To the plate are fastened one or more members such as the connecting bolts m , which are secured to the plate before molding, but which after molding present threaded, or otherwise suitably formed, exposed ends projecting toward the end of the section and in position to be coupled with corresponding members projecting from the end of the next adjacent section. Any suitable formation may be given the girder to provide for the proper presentation of these end members, which it will be observed are in effect a continuation of the main reinforcement, but herein there is molded at the end of the section on its upper side a pair of pockets n , which contain the projecting ends of the members m and align with corresponding pockets in the adjacent section.

After the several sections of the girder have been properly located upon their supports and brought into alinement one with another and with their ends substantially in abutment, the exposed end members of the reinforcement are firmly united one to another in any suitable way. In the illustrated girder this is accomplished by means of a turn-buckle o applied to the adjacent and alining end members m and so adjusted as to unite the members firmly to-

gether. The reinforcement being thus united between adjacent sections is rendered in effect continuous from one end of the girder to the other.

After the reinforcement has been united in the manner described, the pockets n and all spaces and interstices between the abutting ends of the sections are filled with fresh concrete, which, when hardened, unites the girder sections and renders the girder assembled from the same for all practical purposes a monolithic structure. The concrete filling entirely covers the union between the reinforcement so that none of the reinforcement remains ultimately exposed.

The reinforcement, which may be varied or added to as desired, is carried near the under side of the girder between the supports, that is, in a position to reinforce the girder against the maximum tension thereat, and near the upper side of the girder structure over the supports (where joined by the turn buckles), that is, in a position to strengthen the girder against maximum tension at the upper or unsupported side of the girder.

While I have shown and described one form of my invention as applied to a girder constructed and reinforced in a particular fashion, it is to be understood that the same is applicable to beams and other like structures of concrete or similar material and to other reinforcing means than the specific form here shown; also that the details and form and relative arrangement of parts here disclosed may be extensively modified and widely deviated from without departing from the spirit of the invention.

Claim.

1. A section of a concrete girder constructed to rest at its ends upon suitable supports and having cast longitudinally therein, near its lower surface, a series of rods with upturned ends extending nearly to the ends of the girder, and a series of rods alternating with the others and whose middle portions are parallel thereto and in the same plane through the middle portion of the section and whose end portions are upwardly deflected and terminate near the ends of the section near the upper surface thereof, transverse plates joined to these upturned deflected ends, bolts connected to said plates and turn-buckles connecting the bolts of one section to those of the abutting section whereby the sections may be connected together and constitute a continuous girder.

2. A girder made up of reinforced concrete sections, each section constructed to rest at its ends upon suitable supports and having recesses in its upper sides at its ends and having cast therein near its lower surface a series of straight rods with anchors

at their ends and another series of rods cast therein alternating with the former ones and whose middle portions are parallel thereto and in the same plane through the middle portion of the section and whose end portions are upwardly deflected and terminate near the upper surface of the section, transverse plates joined to these upturned deflected ends, bolts connected to said plates and lying in said recesses, turn-buckles connecting the bolts of one section to those of the abutting section, and con-

crete filled into said recesses and into the space between the abutting sections, whereby the sections are connected together and constitute a continuous girder, substantially as set forth. 15

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

FRANK B. GILBRETH.

Witnesses:

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R. P. HILDRETH.