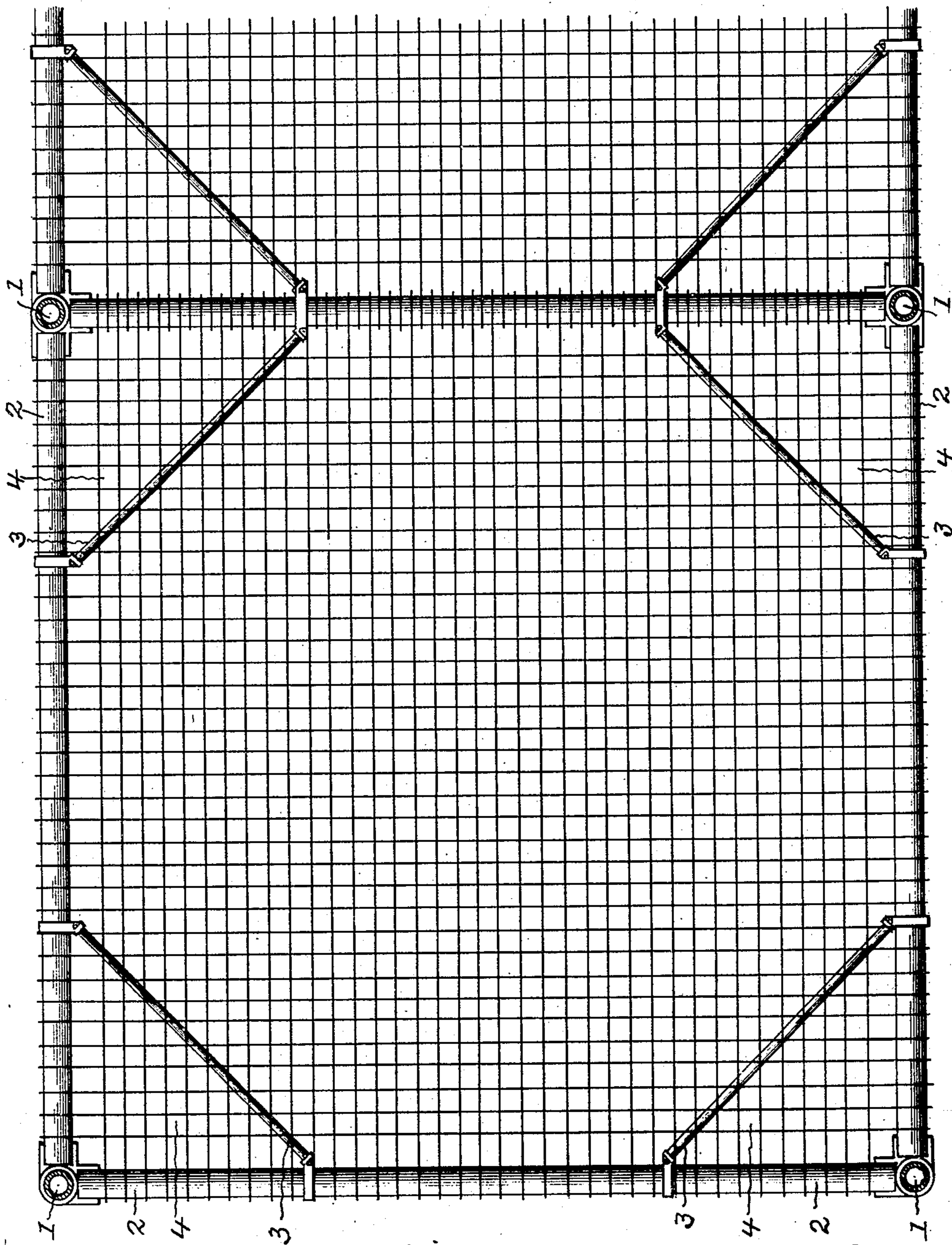


G. M. GRAHAM.  
REINFORCING FRAME FOR CONCRETE STRUCTURES.  
APPLICATION FILED DEC. 10, 1907.

938,661.

Patented Nov. 2, 1909.

3 SHEETS—SHEET 1.



Attest:  
John Enders.  
Henry Moss.

Fig. 1.

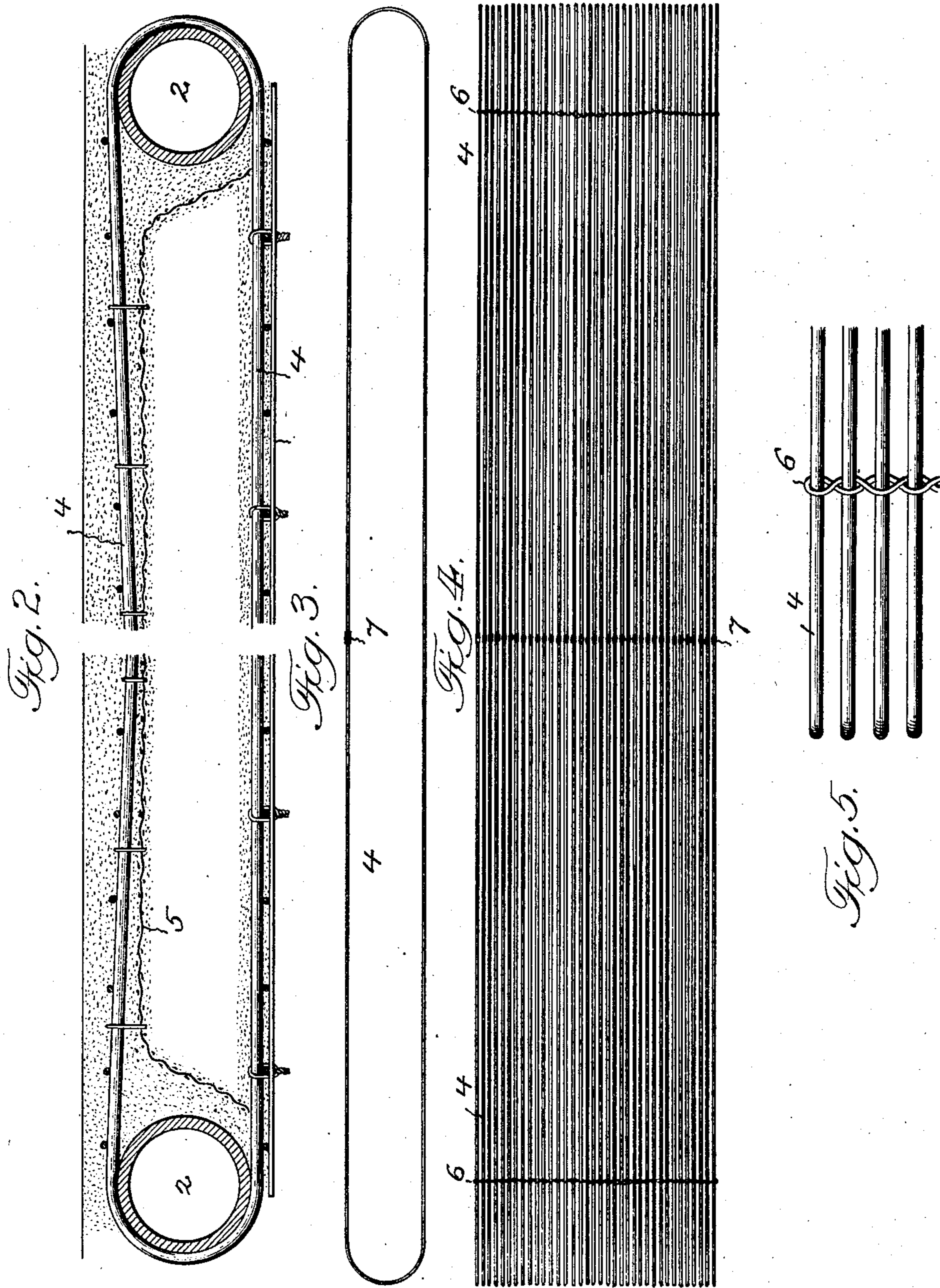
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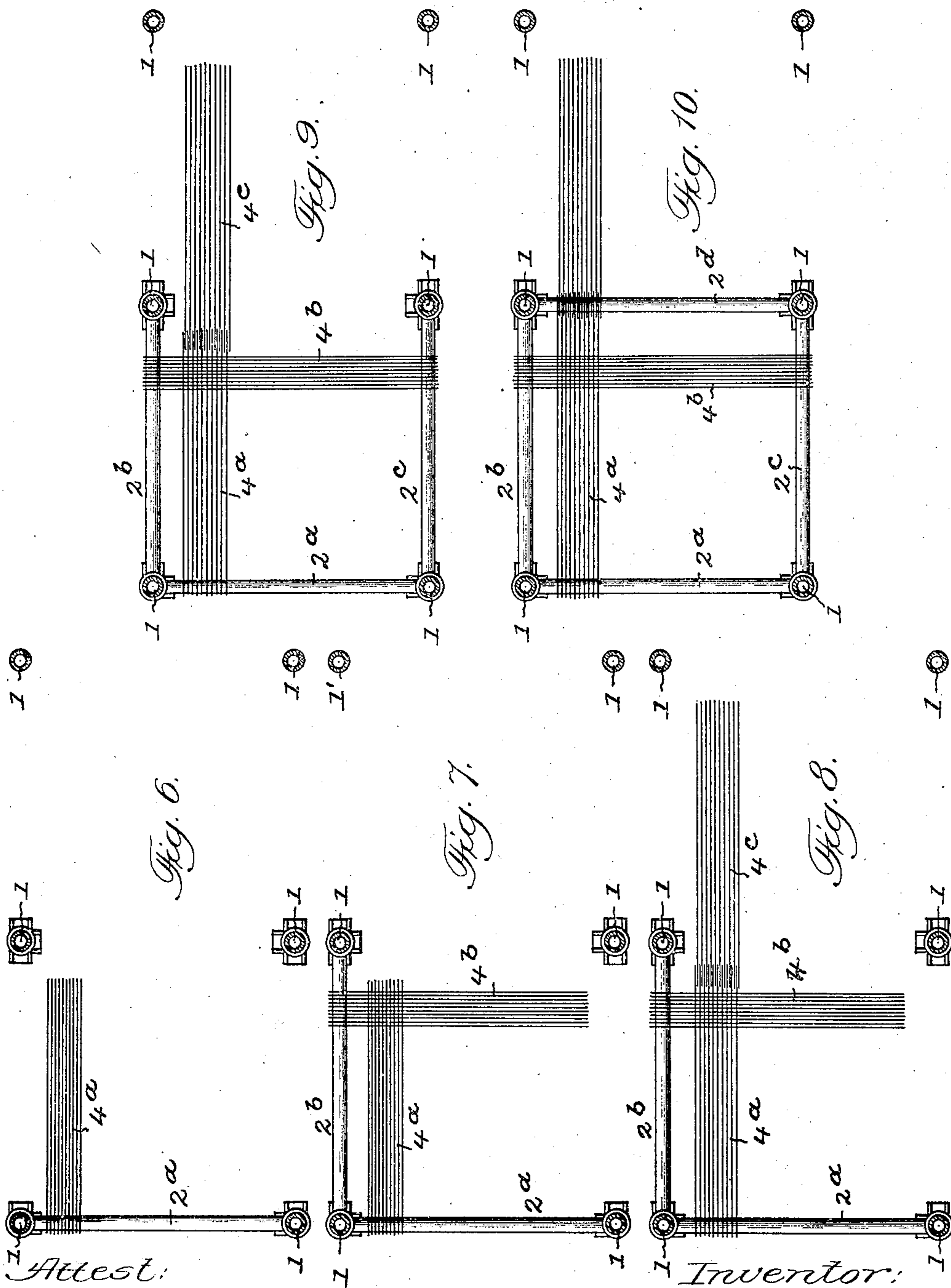
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3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

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## REINFORCING-FRAME FOR CONCRETE STRUCTURES.

938,661.

Specification of Letters Patent.

Patented Nov. 2, 1909.

Application filed December 10, 1907. Serial No. 405,888.

*To all whom it may concern:*

Be it known that I, GEORGE M. GRAHAM, a citizen of the United States of America, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Reinforcing-Frames for Concrete Structures, of which the following is a specification.

This invention relates to that class of reinforced concrete structures in which the skeleton reinforcing frame is provided with skeleton centers formed by series of links, of an elongated hoop type, arranged in separated and crossed relation upon the marginal members of the skeleton frame. And the present improvement has for its object to provide a simple and efficient method by which an expeditious and economical erection of the skeleton reinforcing frame of a concrete structure can be attained, all as will hereinafter more fully appear.

In the accompanying drawings illustrative of the present invention: Figure 1, is a horizontal section of a portion of the skeleton reinforcing frame of a concrete building, with the wire webs or centers in place thereon. Fig. 2, is a fragmentary detail vertical section of the same, showing a completed portion of a floor or like horizontal part of a building. Fig. 3, is a detail side view of the wire web or center. Fig. 4, is a detail plan view of such wire center secured together for ready shipment and handling. Fig. 5, is an enlarged fragmentary plan of same. Figs. 6, 7, 8, 9 and 10, are diagram views illustrating the series of steps employed in erecting a reinforcing frame of the present type.

Similar numerals of reference indicate like parts in the several views.

The general form and arrangement of the reinforcing frame parts, skeleton wire centers and masses of concrete, set forth in my prior patent No. 865,490 of September 10, 1907, is employed in the present improvement, and comprises a general arrangement of the parts as follows:—

1 represents a series of vertical cylindrical posts or columns, supported on the usual ground footings, and extending the height of the building, either as single pieces or a series of sections secured together end to end by suitable couplings.

2 are a series of horizontal cylindrical girders arranged in the usual right-angle re-

lation, and secured together and to the adjacent vertical posts 1, by suitable fittings, preferably of the type illustrated in my prior patents Nos. 865,489 and 865,490 of September 10, 1907. Four of such girders 60 coupled together forms the border frame for a single unit of the skeleton reinforcing frame of a concrete structure and, as in my former patented construction, additional units will utilize in their formation, a girder 65 of the next adjacent unit or units, as illustrated in Fig. 1.

3 are diagonal brace members for each unit aforesaid, and arranged at the respective corners thereof as shown. 70

4 is the skeleton webbing or centering for each unit aforesaid, and which as used in the present method consists of a multiplicity of independent wire links of the hoop type which encircle the cylindrical border mem- 75 bers of a building unit, in spaced relation, and in crossed or opposite directions, to afford an open web like center to unite and to which the concrete mass forming the main portion of the floor or other portion of the 80 structure is attached, as usual. Such links are initially formed as a bundle having the elongated hoop form shown in Fig. 3, with each individual link of a uniform size and form and secured together side by side as a 85 compact bundle by twisted tie wires 6 near the respective ends of the bundle as shown in Figs. 4 and 5. As so arranged the individual links of the bundle will have a spaced relation to permit of an interleaving 90 of the adjacent ends of two bundles together in the erection of the skeleton reinforcing structure. Such construction and arrangement of the links forms the subject matter of Letters Patent No. 910,470, dated January 95 19, 1909.

5 are sheets of perforated lathing attached to the aforesaid webbing or centering 4, of a unit, and adapted to afford a support for the concrete mass, in the application and set- 100 ting thereof.

In the manufacture of said links an electric weld 7 is preferred for imparting the required endless nature to said links during the process of making the same of a uniform and 105 standard size, other usual and suitable fastening means may however be employed without departing from the spirit of this part of the present invention.

The series of vertical posts 1 are first 110

erected. The initial bundle of wire links 4<sup>a</sup> is slipped upon the initial girder 2<sup>a</sup>, after which said girder is raised and coupled to its supporting posts, as illustrated in Fig. 6.

5 The second bundle of wire links 4<sup>b</sup> is then slipped inside or over the initial bundle 4<sup>a</sup>, as found most convenient, and in right-angle relation, after which a second girder 2<sup>b</sup> is passed through one end of the last mentioned bundle 4<sup>b</sup> and then coupled in place

10 on and to its supporting posts as illustrated in Figs. 7 and 8. At this stage in erecting a building structure of two or more units in adjacent relation, the bundle of wire links 4<sup>c</sup> of the next adjacent unit will be interleaved with the wire links of the bundle 4<sup>a</sup>, as illustrated in Figs. 8, 9 and 10, previous to the next operations now to be described. The

15 third girder 2<sup>c</sup> is then slipped into the bundle of links 4<sup>b</sup>, and the fourth girder 2<sup>d</sup> through the interleaved links of the bundles 4<sup>a</sup> and 4<sup>c</sup>, after which said girders 2<sup>c</sup> and 2<sup>d</sup> are moved to place and coupled to their supporting posts, to finish the preliminary erection

20 of the first unit. The succeeding units being erected by a repetition of the operations above set forth. With the completion of such preliminary erection of one or more units the links comprising the center thereof

25 are spread apart into the required spaced relation shown in Fig. 1, and the required or predetermined tensioning of the same is effected by imparting in a manual and individual manner, more or less obliqueness to

30 the links in relation to the marginal frame.

The practical as well as commercial merit of the present improvement over what is disclosed in my prior patent No. 865,490 of September 10, 1907, consists in an avoidance

35 of the costly and laborious operation of winding the wire, constituting the skeleton center, around the columns and girders after the same are erected, and so that the skeleton wire centers can be made in an accurate and

40 economical manner at a properly equipped factory, thence transported to the place of use, applied, and properly spaced upon the skeleton frame as the erection progresses.

A marked advantage of the present

45 method consists in maintaining the series of links together as a bundle until the last step of moving them into spaced relation is performed in the completion of the skeleton frame.

50 Having thus fully described my said invention what I claim as new and desire to secure by Letters Patent, is:—

1. The herein described method of erecting reinforcing frames for concrete structures which consists, in initially assembling

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as a compact bundle having an elongated form the series of wire links constituting the skeleton center of a building unit, successively inserting cylindrical frame members through said bundle, coupling said members together as a border frame, and finally separating the individual links to form a skeleton center for said border frame and to impose at the same time the required tension on the links.

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2. The herein described method of erecting reinforcing frames for concrete structures which consists, in initially assembling as compact bundles having an elongated form the series of wire links constituting the skeleton center of a building unit, arranging

65 pairs of said bundles in crossed relation, successively inserting cylindrical frame members through said bundles, coupling said members together as a border frame, and finally separating the individual links to form a skeleton center for said border frame and to impose at the same time the required tension on the links.

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3. The herein described method of erecting reinforcing frames for concrete structures which consists, in initially assembling as a compact bundle having an elongated form the series of wire links constituting the skeleton center of a building unit, successively inserting cylindrical frame members through said bundle, coupling said members together and to a series of vertical columns to constitute a border frame, and finally separating the individual links to form a skeleton center for said border frame and to impose at the same time the required tension on the links.

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4. The herein described method of erecting reinforcing frames for concrete structures which consists, in initially assembling as compact bundles having an elongated form the series of wire links constituting the skeleton center of a building unit, arranging

80 pairs of said bundles in crossed relation, successively inserting cylindrical frame members through said bundles, coupling said members together and to a series of vertical columns to constitute a border-frame, and finally separating the individual links to form a skeleton center for said border frame and to impose at the same time the required tension on the links.

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Signed at Chicago, Illinois, this 29th day of November, 1907.

GEORGE M. GRAHAM.

Witnesses:

ROBERT BURNS,  
HENRY MOE.