G. ALLEN.

REINFORCED CONCRETE.

APPLICATION FILED JULY 21, 1909.

966,291.

Patented Aug. 2, 1910.

2 SHEETS—SHEET 1.

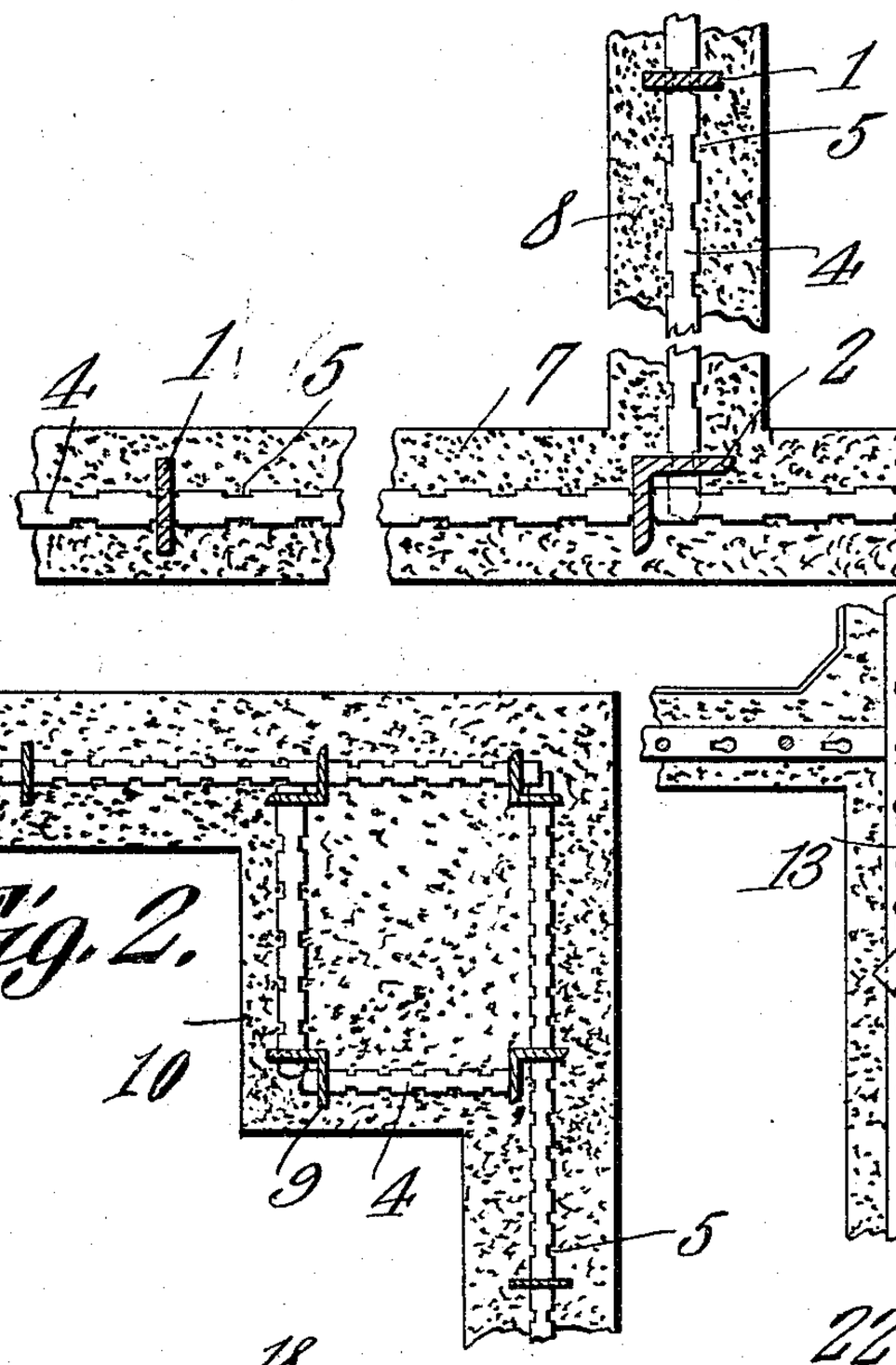

Fig. 1.

Fig. 2.

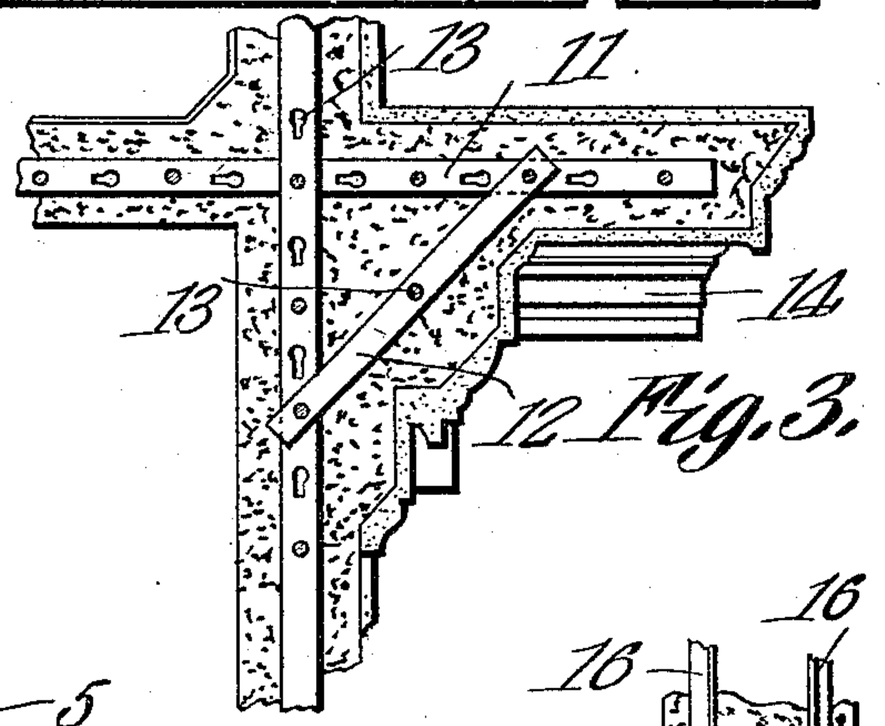

Fig. 3.

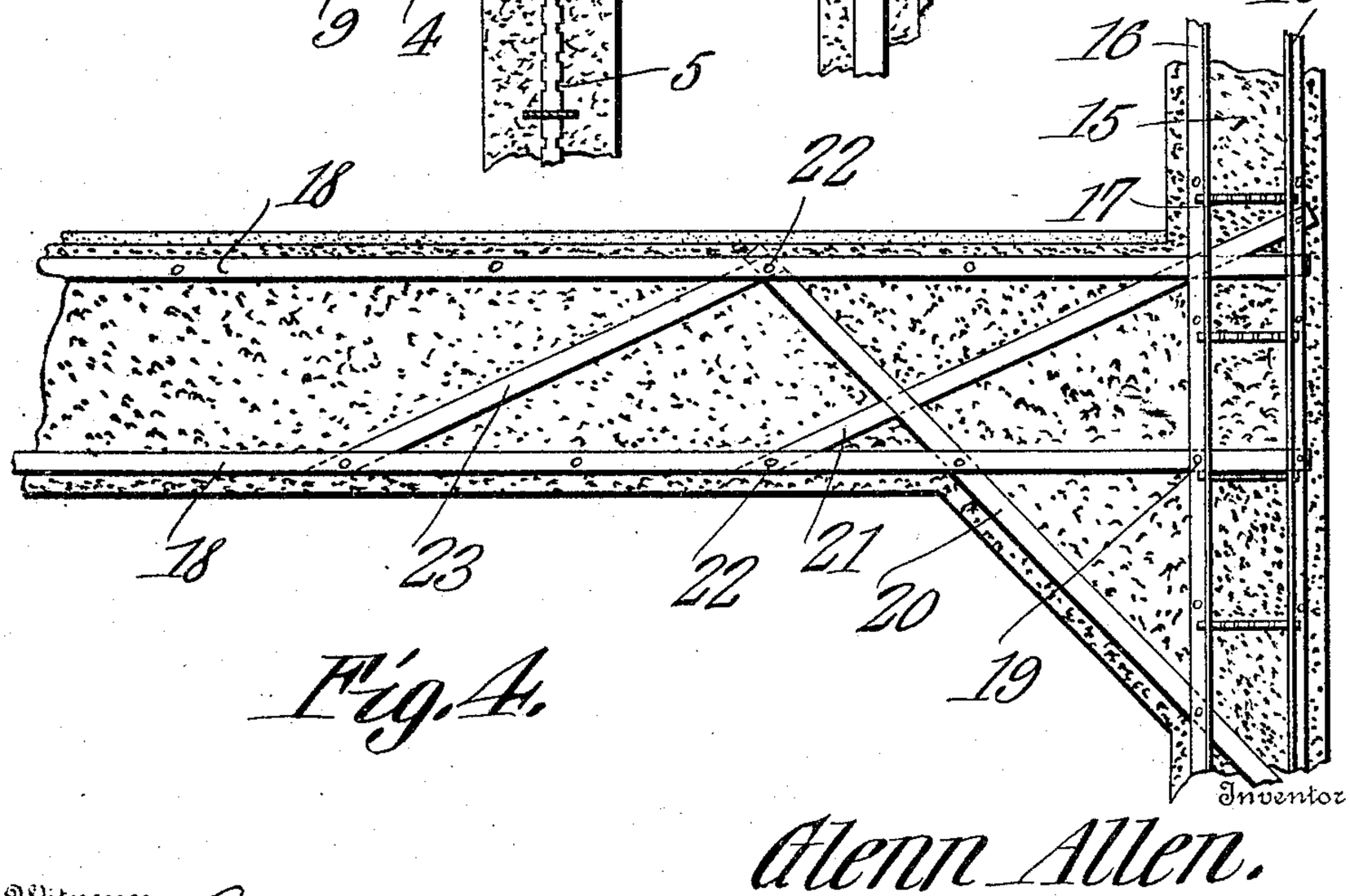

Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 6.

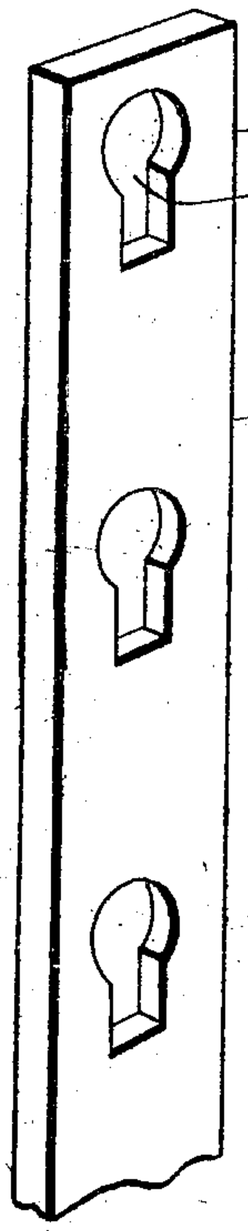


Fig. 8.

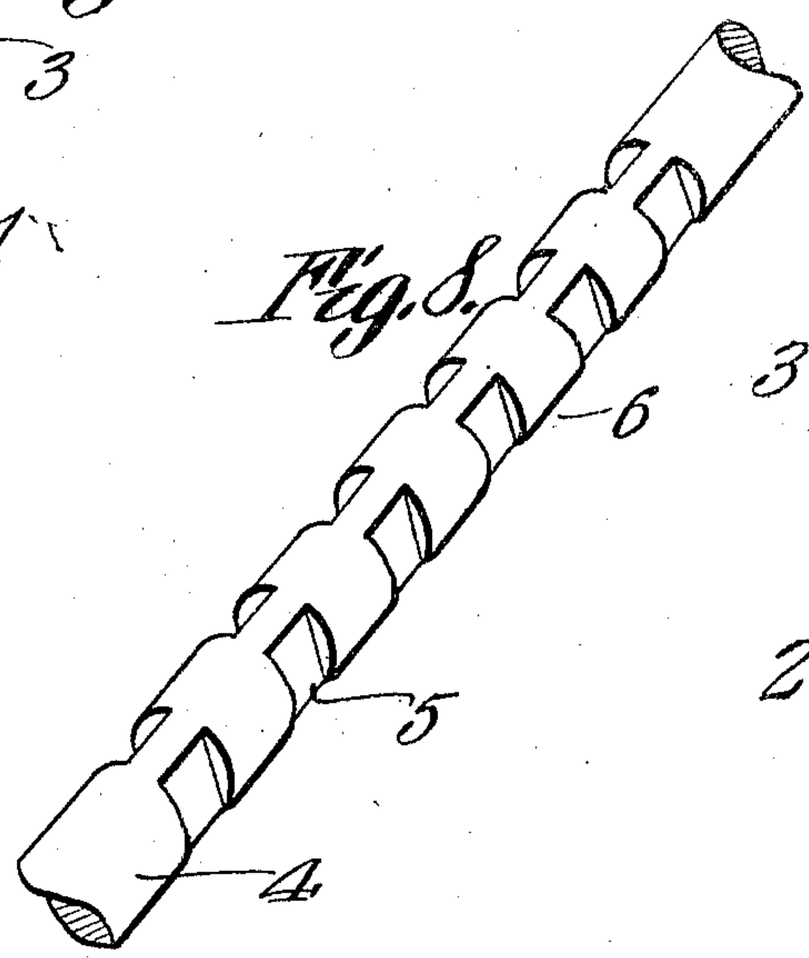


Fig. 7.

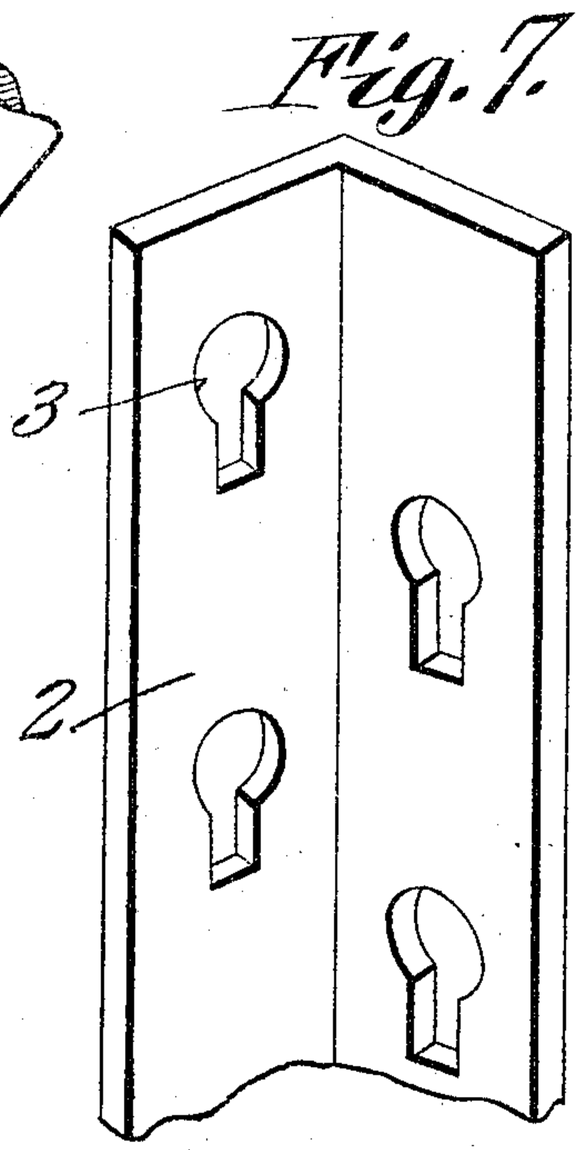
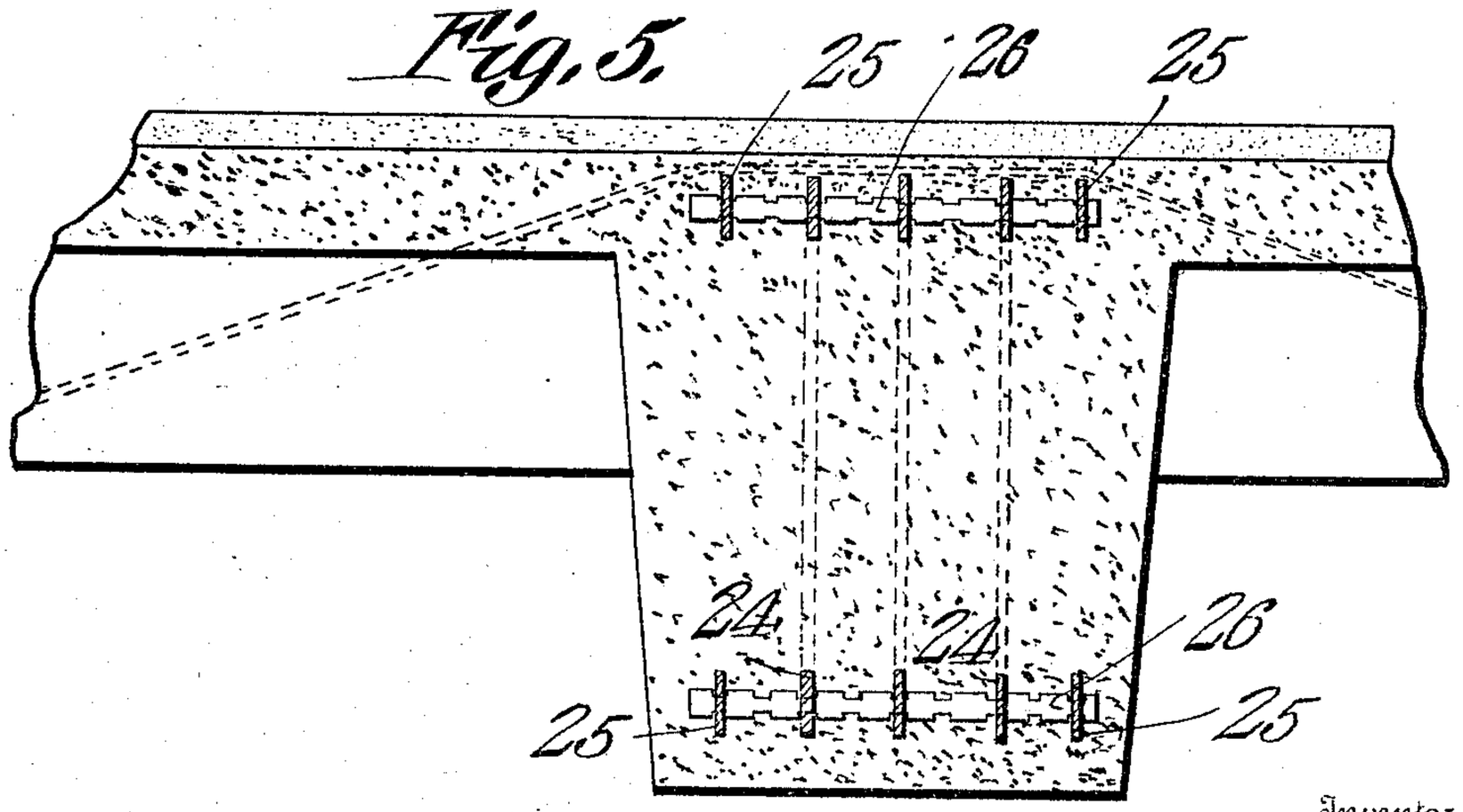


Fig. 5.



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REINFORCED CONCRETE.

966,291. Specification of Letters Patent. **Patented Aug. 2, 1910.**

Application filed July 21, 1909. Serial No. 508,727.

To all whom it may concern:

Be it known that I, GLENN ALLEN, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and useful Reinforced Concrete, of which the following is a specification.

This invention relates to reinforced concrete construction, and the object of the invention is to provide a reinforcement which may be fitted together without the use of rivets, bolts or wires, and which when in position will possess great strength and afford a firm anchorage for the concrete.

With this object in view the invention consists primarily in the provision of reinforcing elements and connecting or tie rods which are constructed to form an interlocking engagement with the said reinforcing elements. The invention also consists in certain novel features of construction and arrangement of parts, all of which will be hereinafter fully described and pointed out in the claims.

In the annexed drawings, which fully illustrate my invention, Figure 1 is a horizontal sectional view of a concrete wall with a concrete meeting wall or partition showing my improved reinforcement in position therein. Fig. 2 is a similar view showing a corner which is constructed to present a column. Fig. 3 is a vertical sectional view showing a cornice with my improved reinforcement applied thereto. Fig. 4 is a vertical sectional view illustrating a girder and wind bracing connecting the girder with an outside wall. Fig. 5 is a transverse section of a girder or beam. Figs. 6 and 7 are detail perspective views showing different forms of the reinforcing elements, and Fig. 8 is a detail perspective view of a portion of the connecting or tie rod.

In carrying out my present invention I employ reinforcing elements 1 and 2 which are similar in construction but differ in that the plate 1 is a flat plate, while the plate 2 is angular in cross section. Both the said reinforcing elements are constructed with key hole slots 3 and the key hole slots in the different flanges of the reinforcing elements 2 are arranged in alternate planes, as shown in Fig. 7, so that when the slots are engaged by the tie rods, the ends of the said rods may not abut against each other. The connecting or tie rod 4 is a bar of circular cross section having notches 5 formed in its sides at intervals throughout its length so that the bar may be inserted through the circular portion of the key hole slots 3 in the reinforcing elements, and the notches 5 brought into alinement with the vertical portions of the said slots, after which the tie rods may be lowered so as to bring the notches into engagement with the said vertical portions of the key hole slots so that the shoulders 6 presented by the notches will engage the sides of the reinforcing elements and thereby lock the connecting rods against lateral movement with respect to the reinforcing elements. The reinforcing elements and the tie rods being connected in the manner described and set up to form the frame of the building, the concrete is poured in around the frame within suitable molds and will entirely envelop the frame, and will fill the notches in the tie rods which are not in engagement with the reinforcing elements, and will also flow through and fill the circular portions of the key hole slots in the said reinforcing elements, the result being that the concrete filling will be firmly anchored to the frame at a large number of points throughout the same so that the desired tensile strength will be imparted to the structure, and the concrete firmly held to the frame.

In the drawings, I have illustrated several applications of the invention in order that the advantages of the same may be thoroughly appreciated. In Fig. 1 a wall 7 with a partition 8 is illustrated, and it will be observed that the flat reinforcing elements 1 are arranged at intervals along the wall, and the reinforcing elements of angular cross section, denoted by the numeral 2 are arranged at the meeting points of the wall and partition so that the tie rods 4, when connected to the reinforcing elements, will extend longitudinally of both the wall and the partition. It will be readily observed from the said figure that the concrete will enter and fill the notches 5 of the tie rods so that the tie rods will be firmly embedded in the concrete and will effectually support the same. In Fig. 2 a similar arrangement of the reinforcing elements and tie rods is illustrated with the addition of reinforcing elements of angular cross section disposed a short distance from the corner of the building and connected by tie rods extending inwardly from the outer faces of the wall so as to engage an inside reinforc-

ing element of angular cross section, denoted by the numeral 9 so that when the concrete is filled in around the frame an inside column 10 will be formed. It will be readily observed upon reference to Fig. 2 that the metallic reinforcement extends around the sides of the column so as to effectually support the concrete forming the same and detached columns may be constructed in the same manner.

When the upper portion of the building is being constructed and a cornice is to be formed the ends of some of the horizontally disposed reinforcing elements are extended outward beyond the line of the building, as indicated at 11 in Fig. 3, and a reinforcing element 12 is disposed diagonally between this extended portion 11 and the adjacent vertical reinforcing element so as to constitute a brace, as will be readily understood. These several parts are joined by tie rods 13, as will be readily understood, and the cornice structure will be formed around the same, as shown at 14 in said Fig. 3.

In constructing large buildings, it is desirable to supply wind bracings in the connection of the outside wall and the girders of the building, and to effect this result I employ the arrangement shown in Fig. 4. The outside wall 15 will be provided with pairs of vertical reinforcing elements 16 which will be connected both transversely and longitudinally by tie rods 17 and the horizontally disposed reinforcing elements 18 of the girder will be extended into the outside wall and connected to the vertical reinforcing elements of the wall, as clearly shown at 19. Braces 20 and 21 will be secured to these reinforcing elements 18 by means of tie rods 22 and will be carried diagonally outward, and downward and upward respectively into the outside wall and there connected to the vertical reinforcing elements 16, as clearly shown. An additional brace 23 will be arranged within the girder and will extend between the reinforcing elements 18 of the same, the outer end of the said brace being connected to the upper reinforcing element 18 at the same point where the brace 20 is connected, it being understood that the braces are of the same construction as the reinforcing elements and are fitted in position by means of tie rods in the same manner.

In Fig. 5 I have illustrated the manner of reinforcing a large girder which consists in disposing a series of reinforcing elements 24 vertically within the girder and another outer reinforcing element 25 horizontally within the girder, these reinforcing elements being connected by transverse tie rods 26, as shown and as will be readily understood.

It will readily be seen from the foregoing description, taken in connection with the accompanying drawing that I have provided a reinforced concrete construction in which the metallic reinforcement will be firmly fitted together without the use of any rivets or bolts or wiring and in which the parts may be rapidly joined together and will provide an extensive and strong anchorage for the concrete, the arrangement and construction effecting a saving of labor and expense in construction. The parts of the reinforcement cannot be disengaged while the concrete is being filled in around the same and, consequently, reinforcing of the structure will be uniform throughout. The provision of the key hole slots in the reinforcing elements and the notches in the sides of the tie rods permit the same to be used in any desired numbers and at regular or irregular intervals as may be necessary to conform to the plan of the building so that it will not be necessary to provide a special construction of the reinforcement in order to accommodate various window openings or columns of different size or some peculiar arrangement of the girders and beams. The bent or reinforcing elements effectually hold together the tie rods of meeting walls and partitions or columns, as will be readily understood, and wind bracing, cornices and other parts of the building may all be constructed rapidly without any sacrifice of the lateral strength.

Having thus described my invention, what I claim is:

1. The combination with reinforcing elements of angular cross section provided with key-hole slots in both flanges, the slots in one flange registering with the spaces between the slots in the other flange, of tie rods circular in cross section inserted through the said key-hole slots and provided in their sides with notches adapted to engage the straight portions of the key-hole slots.

2. The combination with reinforcing elements provided with key-hole slots, of tie rods circular in cross section inserted through said slots and provided on their sides with straight walled notches adapted to engage the straight portions of the key-hole slots, the width of the notches being approximately equal to the thickness of the reinforcing elements.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

GLENN ALLEN.

Witnesses:
C. S. MARSHALL,
LOUIS K. HAGENKAMP.