No. 869,724. PATENTED OCT. 29, 1907.

E. NICHOLS.

REINFORCED CONCRETE CONSTRUCTION.

APPLICATION FILED JULY 8, 1907.

3 SHEETS—SHEET 1.

Fig. 1.

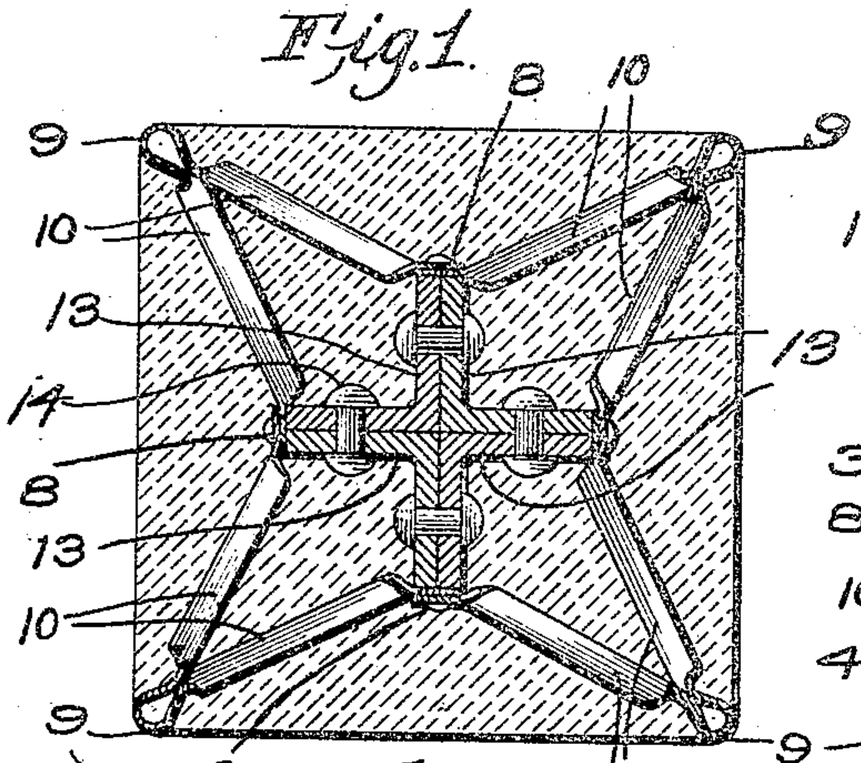


Fig. 2.

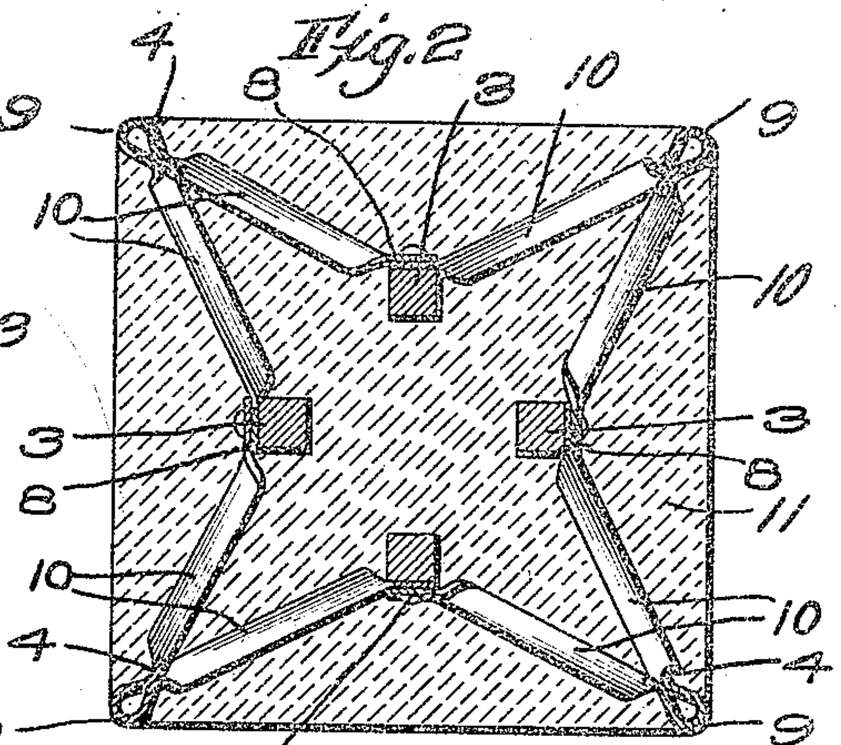


Fig. 3.

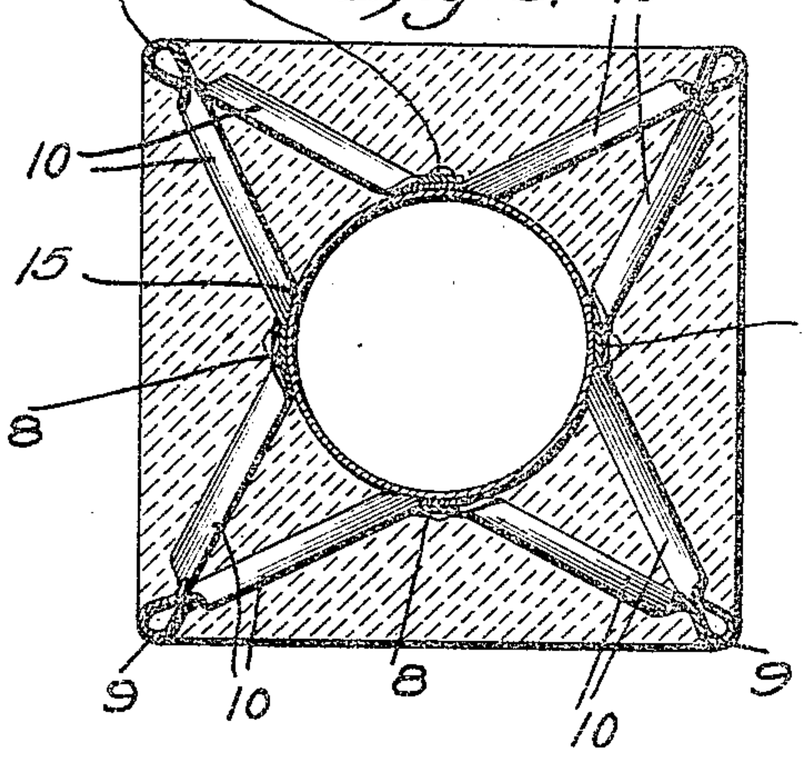


Fig. 4.

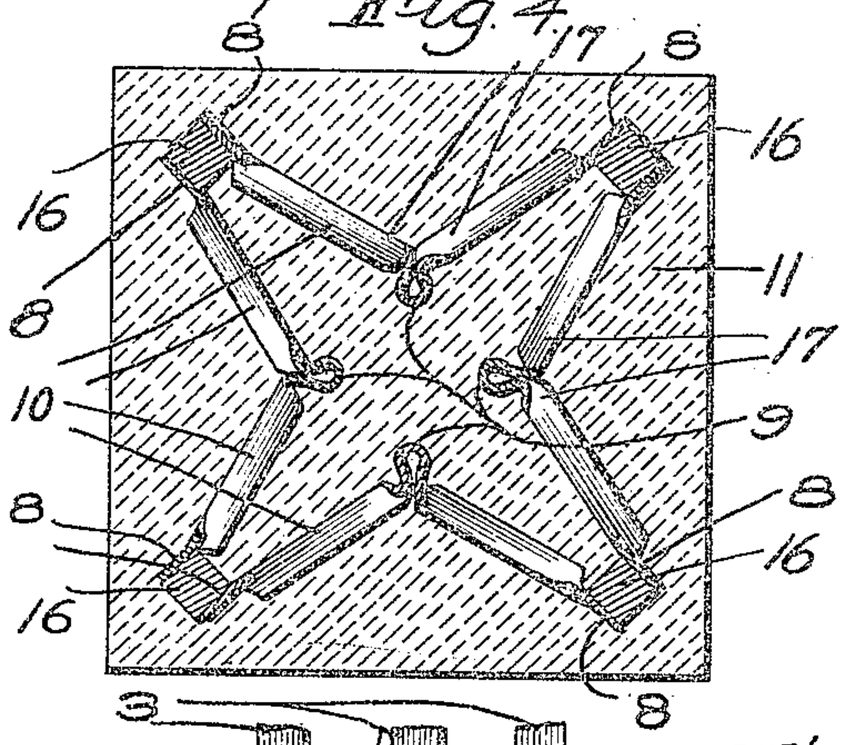


Fig. 5.

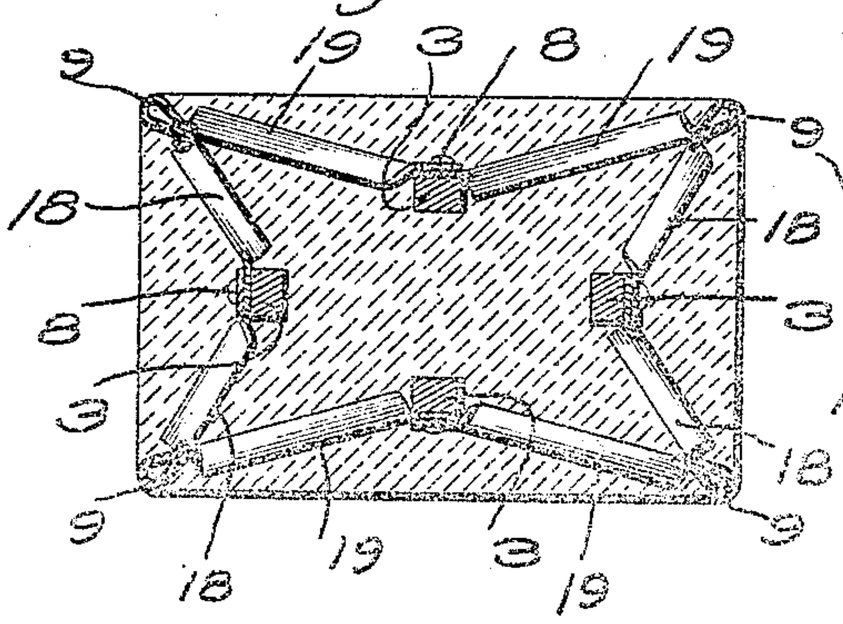
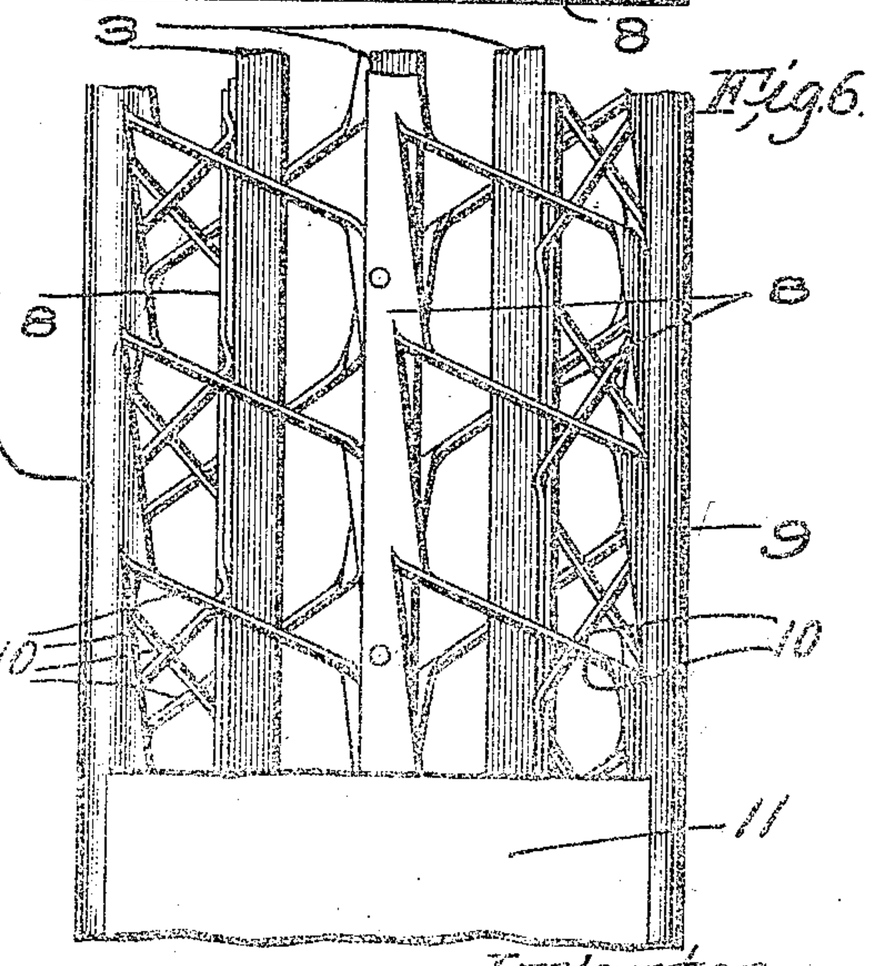


Fig. 6.



Witnesses.
W. C. Lumsford.
Joseph M. Ward.

Inventor.
Edward Nichols.
By Lemuel Gilbert Watts
Attys

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3 SHEETS—SHEET 2.

Fig. 7.

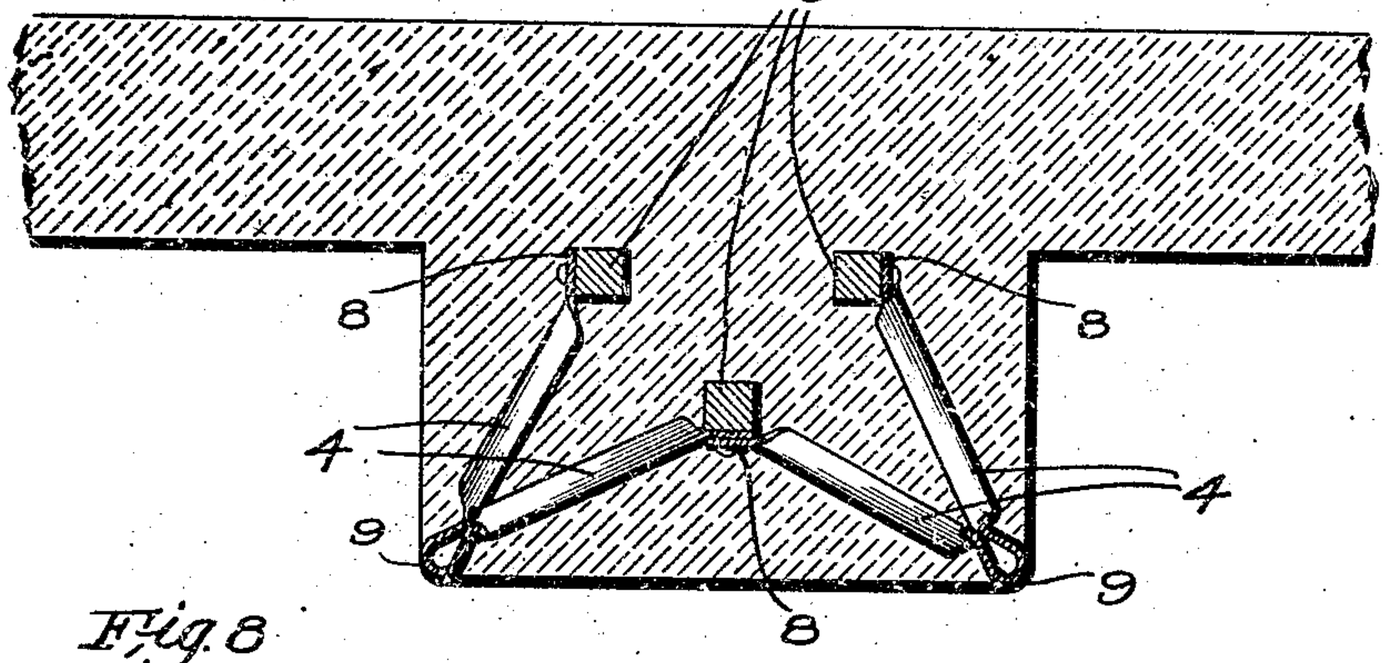


Fig. 8

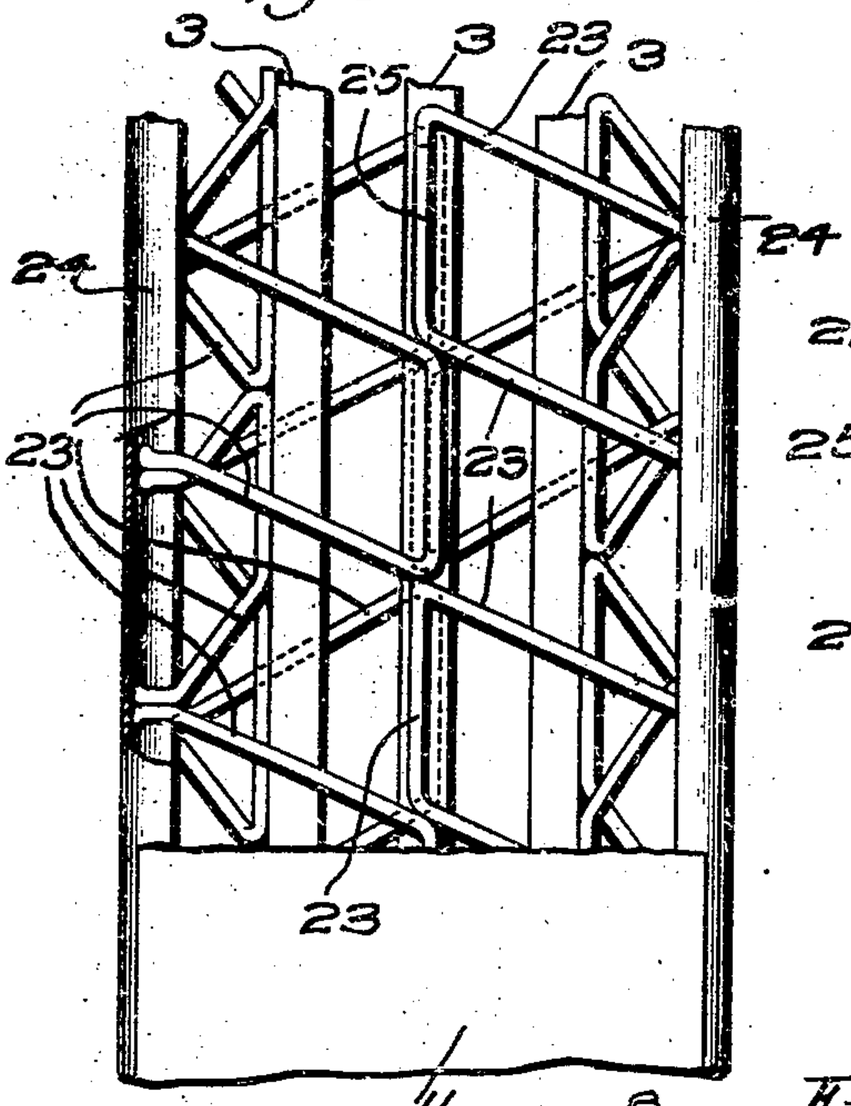


Fig. 9.

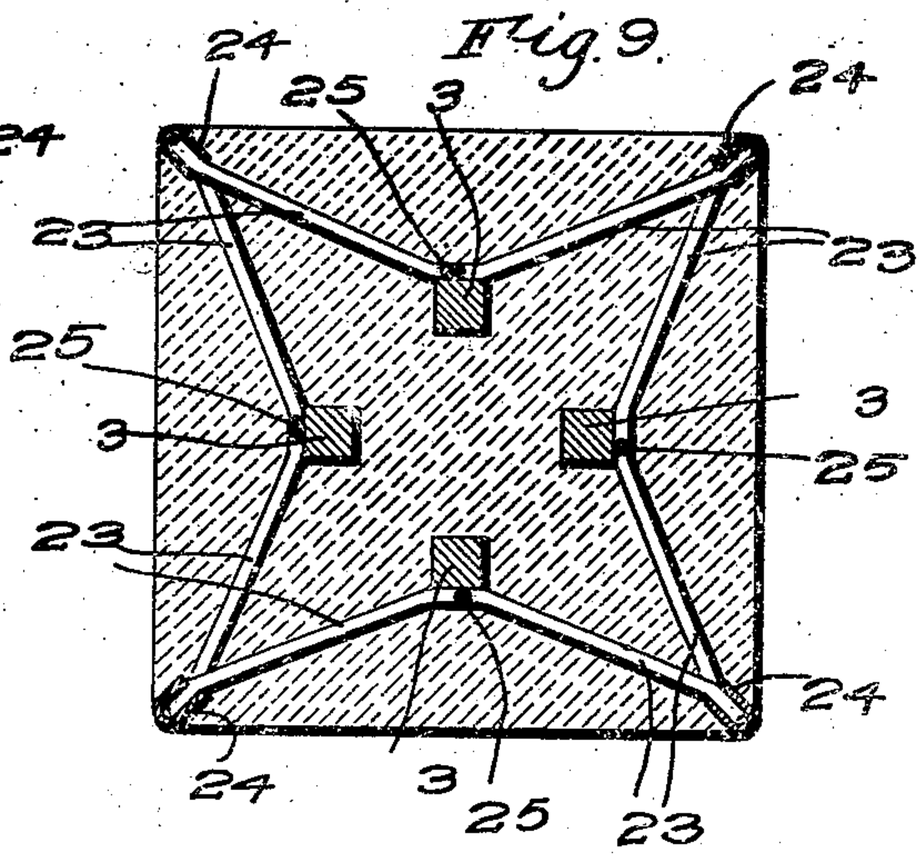
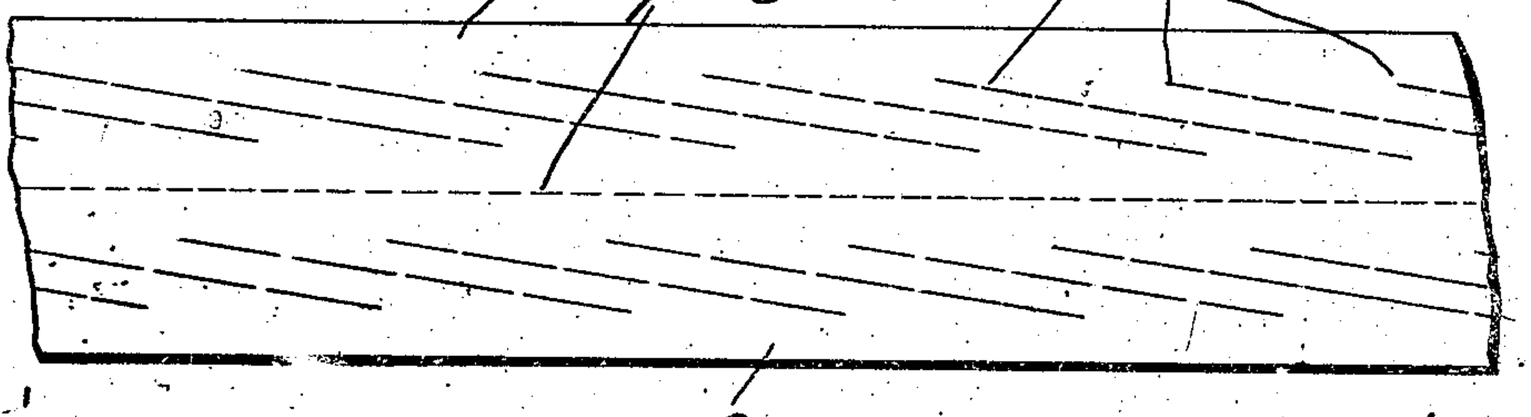


Fig. 10.



Witnesses:
W. C. Linsforq.
Joseph M. Ward.

Inventor:
Edward Nichols.
by Kennedy & Gregory Atty's.

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APPLICATION FILED JULY 8, 1907.

3 SHEETS—SHEET 3.

Fig. 15.

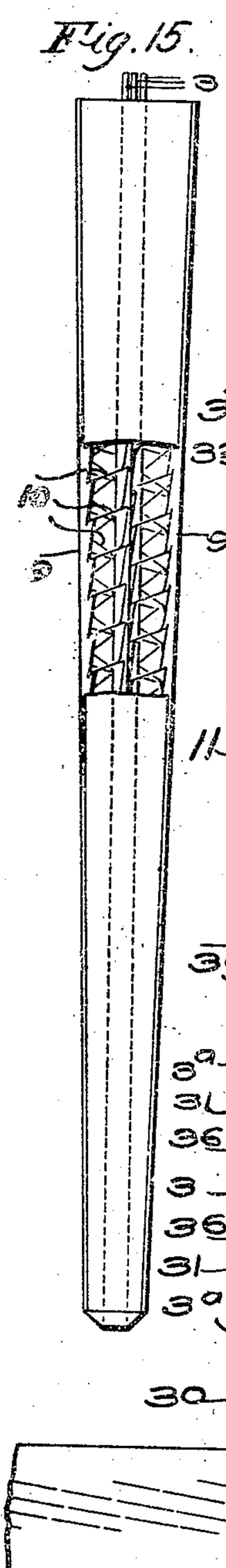


Fig. 13.

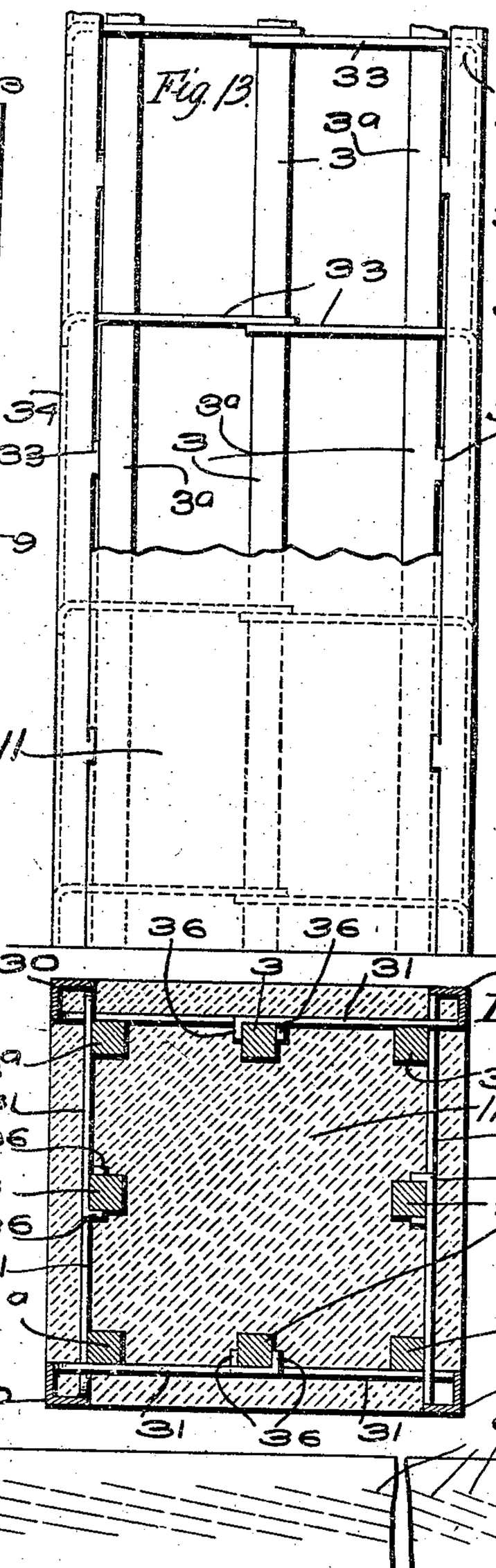


Fig. 14

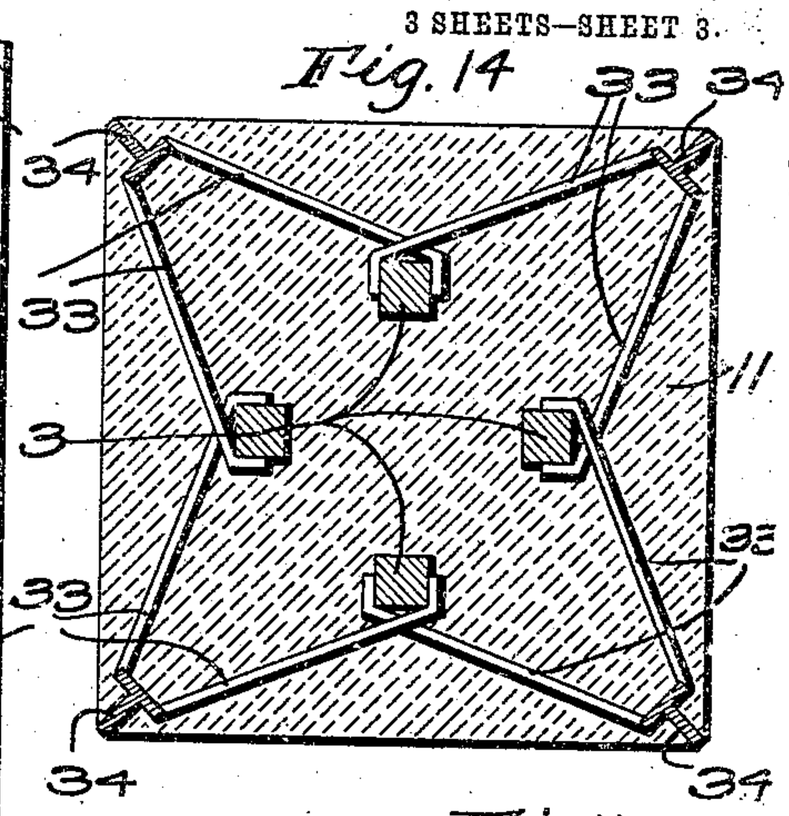


Fig. 11.

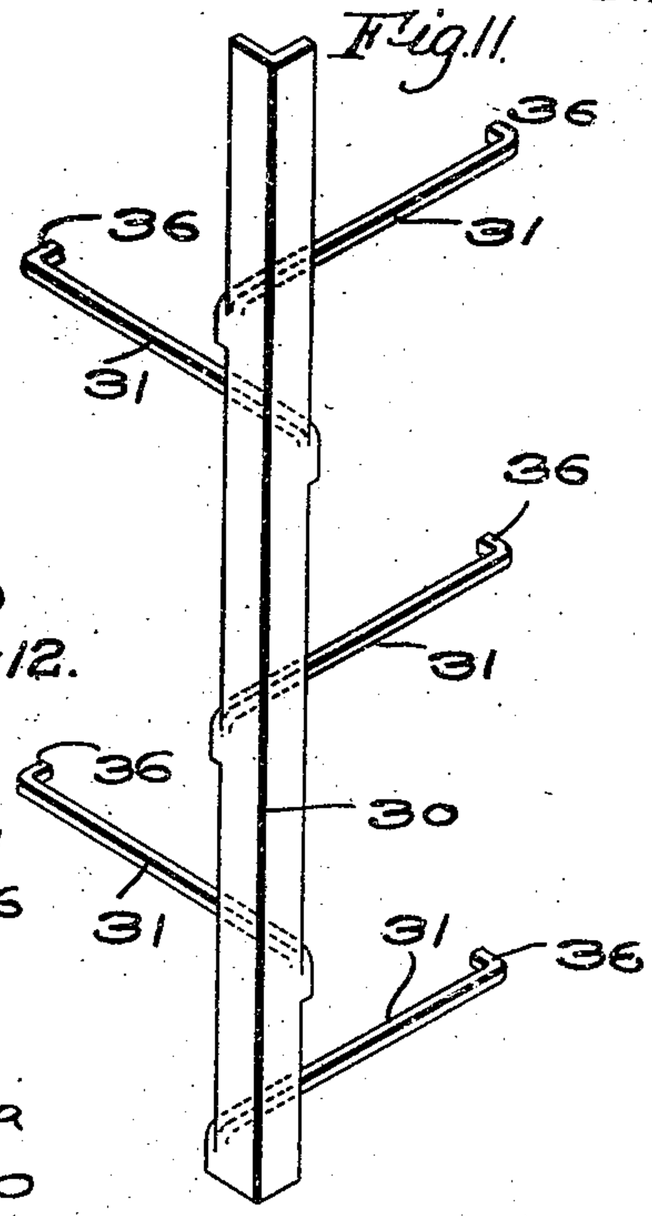
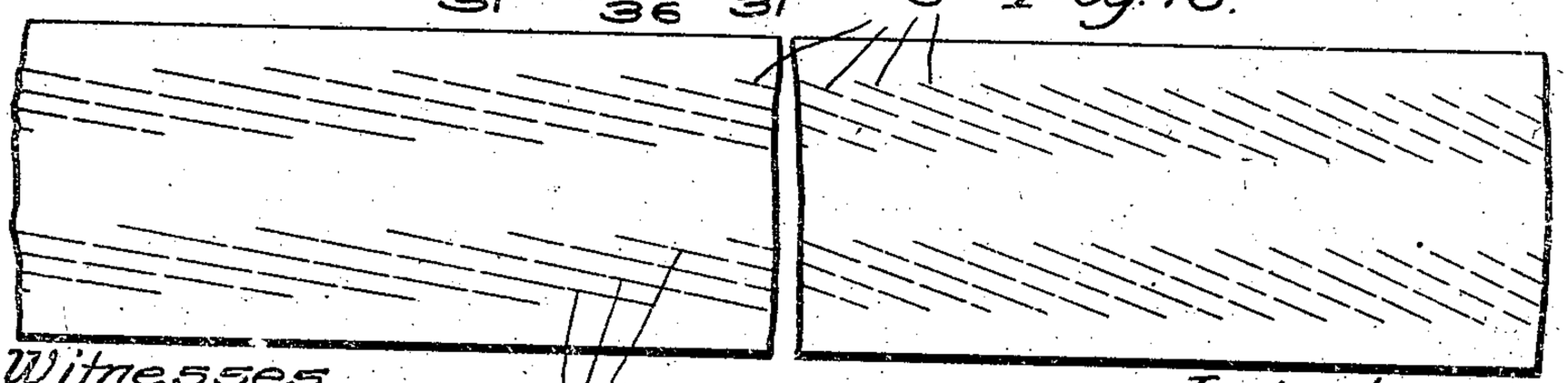


Fig. 12.

Fig. 16.



Witnesses.
W. C. Sumsford.
Joseph M. Wood.

Inventor.
Edward Nichols.
By Lemley & Gwynn Atty's.

UNITED STATES PATENT OFFICE.

EDWARD NICHOLS, OF COHASSET, MASSACHUSETTS.

REINFORCED CONCRETE CONSTRUCTION.

No. 869,724. Specification of Letters Patent. Patented Oct. 29, 1907.

Application filed July 8, 1907. Serial No. 382,617.

To all whom it may concern:

Be it known that I, EDWARD NICHOLS, a citizen of the United States, residing at Cohasset, county of Norfolk, and State of Massachusetts, have invented an Improvement in Reinforced Concrete Construction, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention has for its object to provide a novel reinforced concrete construction which is especially adapted for reinforcing concrete columns and beams, although the invention may be used in other reinforced concrete structures.

In accordance with my invention the reinforcement of the concrete comprises longitudinal members in combination with other reinforcing members which have substantially a V-shape or U-shape in cross section with the edges of the legs or sides of said members secured to the longitudinals.

In the drawings I have shown several ways in which my invention may be embodied without attempting, however, to show all forms thereof.

Figures 1, 2, 3 4 and 5 are cross sectional views of reinforced concrete columns showing different forms of my invention; Fig. 6 is a side view of the reinforcement shown in Fig. 2; Fig. 7 is a sectional view of a beam embodying my invention; Fig. 8 is a side view of the form of reinforcement shown in Fig. 9; Fig. 9 is a transverse section through a column having the reinforcement shown in Fig. 8; Fig. 10 shows the blank from which the form of reinforcement shown in Figs. 1 to 5 may be made; Fig. 11 shows still another way in which a reinforcing member embodying my invention may be made.

As stated above a structure embodying my invention comprises longitudinal reinforcing members combined with auxiliary reinforcing members which have a substantially V-shape or U-shape in cross section, and which are arranged with the edges thereof secured to the longitudinals.

In Fig. 2 the longitudinals are shown at 3, and they may be of any suitable shape in cross section and of any suitable construction and are arranged in the column to extend longitudinally thereof. The other reinforcing element is designated by 4 and as shown it is substantially V-shape in cross section with the edges of the sides secured to the longitudinals by any suitable means. This V-shaped reinforcing member may be an expanded metal member, or a built up structure or may be made in any suitable way.

In Fig. 2 I have shown the V-shaped reinforcing member made of expanded metal, it being made from a blank such as shown in Fig. 10 by slitting the blank on the dotted lines 6 and subsequently folding the blank over on substantially the central line 7 and then drawing the edges 8 apart thereby to make the expanded metal reinforcing member shown in cross section in Fig. 2 and in side elevation in Fig. 6. This manner of making the reinforcing member results in a member which has a continuous apex or edge 9 and also continuous side edges 8, said apex and side edges being connected by the bars 10 which are formed by the material between the slits 6, as shown in Fig. 10. By making the slits on both sides of the central line 7 extend in the same direction and expanding the metal as described the bars 10 on one side of said member incline in an opposite direction from those on the other side, and thus the expanded metal member is in the form of a truss which because of its peculiar shape is comparatively stiff.

As shown in Fig. 2 a plurality of these V-shaped reinforcing members are employed, and they are situated to be directed outwardly with the apex 9 thereof situated at the corner of the column 11.

Where the apex 9 of the V-shaped reinforcing members are exposed at the corners of the column, as shown in Fig. 2, said apex acts to protect the corners of the column and prevent them from being chipped or broken. Furthermore since these apices are exposed in the completed column, it is possible to use them for supporting the false work or form within which the concrete column is made and thus it is not necessary to use so elaborate a construction for supporting the form as is necessary where such form cannot be supported on the reinforcing elements of the column itself. This construction has the further advantage that a column or beam thus formed can be transported without any danger of the corners of the column becoming chipped or broken. This construction, therefore, enables me to build portable columns or beams. This construction may also be advantageously used in concrete piles.

In Fig. 1 I have shown a construction similar to that shown in Fig. 2 except that a central longitudinal reinforcing member or core 13 is shown which may have any suitable structure. Where the form such as shown in Fig. 1 is used in a building, the angle-iron longitudinal members may have sufficient strength so that they may be used to support the false work necessary to mold the concrete structure, thus doing away with much of the timbering which is now necessary in erecting such structures. This method of use obviously involves a great saving of time and labor and lessens very much the risk of accident which is always incidental to structures which are used temporarily as is the false work in a concrete building.

In Fig. 3 I have shown still another form of the invention in which the longitudinal member 15 is tubular,

the edges 8 of the V-shaped reinforcing members being riveted or secured to the tubular member 15 in some suitable way.

In Fig. 4 I have shown a way of embodying my reinforcing members in a column according to which the V-shaped members are arranged with their apices directed inwardly instead of outwardly. In this embodiment of the invention 16 designates the longitudinal members of the column, and 17 the V-shaped members with their edges 8 secured to the longitudinals 16 and with the apices 9 directed inwardly. In this form of the invention no metal is exposed at the corner of the column for protecting the latter, but the benefit of the truss-like V-shaped reinforcing members is secured and also the benefit of the longitudinal reinforcing members.

In Fig. 5 I have shown an embodiment of the invention similar to that shown in Fig. 2 except that the column is oblong in shape instead of square. This may be secured by making the two sides 18 and 19 of the V-shaped reinforcing element of different lengths. In other respects the embodiment is like that shown in Fig. 2 with the edges 8 of the V-shaped reinforcing member secured to the longitudinals 3.

In Fig. 7 I have shown how my invention may be embodied in a beam. It is usually the under side of a beam which is subjected to tension and which needs the strength derived from the reinforcement, and in embodying my invention in a beam, therefore, I propose to use only two of the V-shaped reinforcing elements or the elements which would be used in one side of a square column and to place these two elements so that they will properly reinforce the lower side of the beam, and if placed so that the edges 9 are exposed they will also protect the corners of the beam. As seen in Fig. 7, 3 designates the reinforcing members which extend longitudinally of the beam, and 4 is the V-shaped reinforcing member. Said V-shaped reinforcing member has its edges 8 secured to the longitudinals 3 in any suitable way, and the apices 9 thereof at the corners of the beam.

In Figs. 8 and 9 I have shown the V-shaped reinforcing members formed in a different way from that heretofore described. In this embodiment the sides of the V-shaped member are made of wire bent to form the cross bars 23 which extend from the apex 24, the latter being continuous. In this form of the invention the edges 25 of the V-shaped members are not continuous but they are secured in any suitable way to the longitudinal reinforcing members 3. I wil preferably shape the wire forming the sides of the member so that the cross bars 23 on one side of each V-shaped member will incline oppositely to those on the other side whereby each V-shaped element will be in the nature of a truss.

In Fig. 11 I have shown still another way in which the V-shaped reinforcing member may be made. In this embodiment said member is made from a piece of angle iron 30 in which slits are made at its edges to form short lengths 31 which may be bent into the shape shown in Fig. 11. This forms a V-shaped reinforcing member having the continuous apex with the bars extending at an angle therefrom, but the ends of the bars are not connected as in the form shown in Figs. 1, 2, 3, etc. This form of reinforcing member may be used, as shown in Fig. 12, in connection with the longitudinal reinforcing members 3. The preferred way of using this form of my invention is to place one longitudinal reinforcing member 3^a in the corner where the arms 31 cross, and another longitudinal reinforcing member 3 to which the ends of the arms 31 are secured. The ends of the arms 31 may be bent, as at 36, so that they will hook around the longitudinal members 3, as plainly seen in Fig. 12.

In Figs. 13 and 14 I have shown still another embodiment of my invention. In this embodiment the V shaped reinforcing members are made of T-iron, the edges of which may be slitted to form arms 33 which arms may be bent outwardly at an angle to each other, as shown in the drawings. The T-iron is designated 34, and the web thereof is placed at the corner of the column 11 thereby to protect the corner. The inner ends of the arms 33 are secured to the longitudinal reinforcing members 3.

Figs. 15 and 16 illustrate how it is possible to make a tapering column embodying my invention. The taper may be given to the column by forming the V-shaped reinforcing members with a taper, they being wider at one end than at the other.

Where the reinforcing member is made of expanded metal, as shown in Figs. 1, 2 and 3, this can be accomplished by slitting the blank, as shown in Fig. 16, with the slits 6^a radially arranged or arranged at different angles of inclination. As shown in Fig. 16 the slits at the right hand end have a less inclination than at the left hand end. Where the blank is thus slitted and then folded centrally and expanded, as described with reference to Fig. 10, the V-shaped expanded metal member will be wider at one end than at the other. When a reinforcing member of this construction is used the result will be a tapering column, such as shown in Fig. 15. This feature of the invention is especially applicable where reinforced concrete piles are being made, because by means of it the proper taper can be readily given to the pile without the bother incident to making a form of proper taper.

It will be seen that all the described forms of my invention comprise the V-shaped reinforcing element combined with the longitudinal element or elements. In the preferred embodiments of my invention the V-shaped reinforcing elements are in the form of a truss so that they add their strength as a truss to the strength of the beam or column. Further where the apices 9 are exposed, as shown in Figs. 1 2, 9, 12 and 14, they serve to protect the corner of the finished structure whether it be a column, pile or beam.

One advantage of the expanded metal construction shown in Figs. 1 to 7 is that the distance of the apex 9 from the longitudinal reinforcing elements may be varied by expanding the metal more or less, because the more the metal is expanded the greater will be this distance or the further the apex will project.

The expanding of the metal into the form shown in Figs. 1 to 7 is done by drawing the opposite edges 8 in opposite directions either before or after the metal has been bent into V-shape, and even after the metal has been bent one of the edges 8 may be moved upwardly or downwardly relative to the other edge thereby to expand the metal more or less thereby securing the V-shaped member to the longitudinals. With this form of the invention, therefore, it is possible to adjust

the V-shaped members to correspond to the size of the column or beam to be made after the metal has been expanded and while the reinforcing elements are being arranged preparatory to the application of the concrete.

My invention is not confined to the illustrated embodiments thereof.

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

1. A reinforcement for concrete structures comprising longitudinally-extending reinforcing members and auxiliary reinforcing members each having substantially a V-shape in cross section, the edges of said auxiliary members being secured to the longitudinal members.

2. A reinforced concrete construction comprising longitudinally-extending reinforcing members and auxiliary reinforcing members each having substantially a V-shape in cross section and having also a truss construction, the edges of said auxiliary members overlying and being secured to the longitudinal members.

3. A reinforced concrete column or beam comprising reinforcing members extending longitudinally thereof and other reinforcing members having substantially a V-shape in cross section with the edges secured to the longitudinal members and the apices exposed at the corners of the column or beam.

4. A reinforced concrete column or beam comprising longitudinal reinforcing members and other reinforcing members presenting two edges or strips secured to the longitudinal reinforcing members, a continuous edge or bead exposed at the corner of the column, and bars connecting said bead with the edge strips.

5. A reinforced concrete column or beam comprising reinforcing members extending longitudinally of the column or beam, and other reinforcing members secured to the longitudinal members, said other members each being substantially V-shape in cross section and comprising a continuous edge extending longitudinally of the column at the corner thereof and bars connecting said edge with the longitudinal reinforcing members.

6. A reinforcement for concrete structures comprising a longitudinal reinforcing member of sufficient strength to support the false work necessary to mold the structure, and auxiliary reinforcing members each substantially V-shape in cross section and having their edges secured to the longitudinal member.

7. A reinforcement for concrete structures comprising a longitudinally-extending reinforcing member of sufficient strength to support the false work necessary to mold the structure, and auxiliary trussed reinforced members secured thereto.

8. A reinforcement for concrete structures comprising a longitudinally-extending reinforcing member of sufficient strength to support the false work necessary to mold the structure and an auxiliary trussed form-giving reinforcing member secured thereto.

9. A reinforcement for concrete structures comprising a reinforcing member V-shape in cross section and wider at one end than at the other.

10. A reinforcement for concrete structures comprising longitudinally extending reinforcing members, and auxiliary reinforcing members each having a substantially V-shape in cross section, and each having a progressively increasing width from one end to the other.

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

EDWARD NICHOLS.

Witnesses:
LOUIS C. SMITH,
MARGARET A. DUNN.