No. 768,284. PATENTED AUG. 23, 1904.

J. KAHN.

COMBINED STEEL AND CONCRETE BEAM.

APPLICATION FILED JAN. 20, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

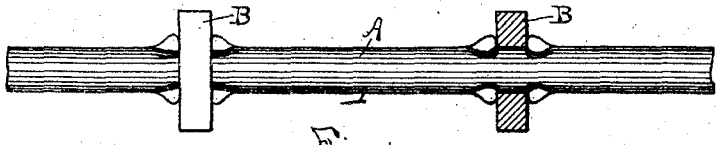


Fig. 1.

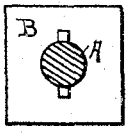


Fig. 8.

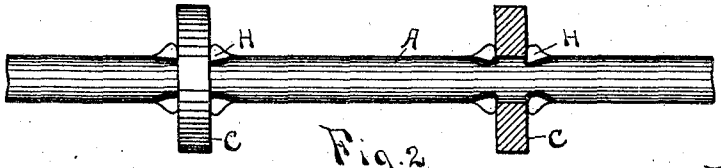


Fig. 2.

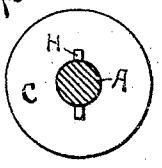


Fig. 9.

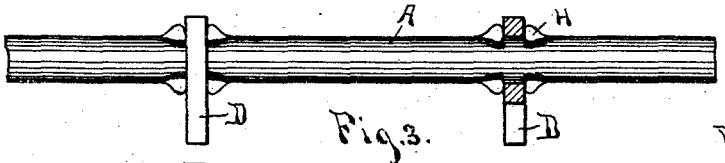


Fig. 3.

Fig. 10.

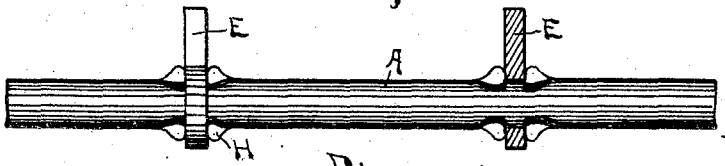


Fig. 4.

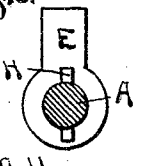


Fig. 11.

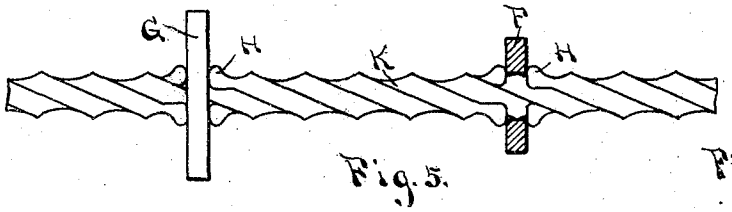


Fig. 5.

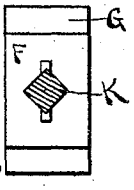


Fig. 12.

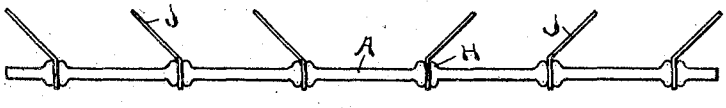


Fig. 6.

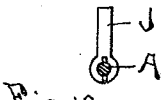


Fig. 13.

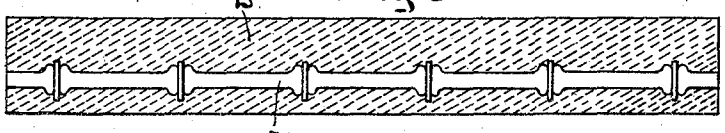


Fig. 7.

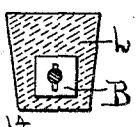


Fig. 14.

Witnesses.
Geo. W. Barnes.
A. F. Wilcox

Inventor.
Julius Kahn.
by Edward N. Pagelsen.
his Attorney.

No. 768,284. PATENTED AUG. 23, 1904.

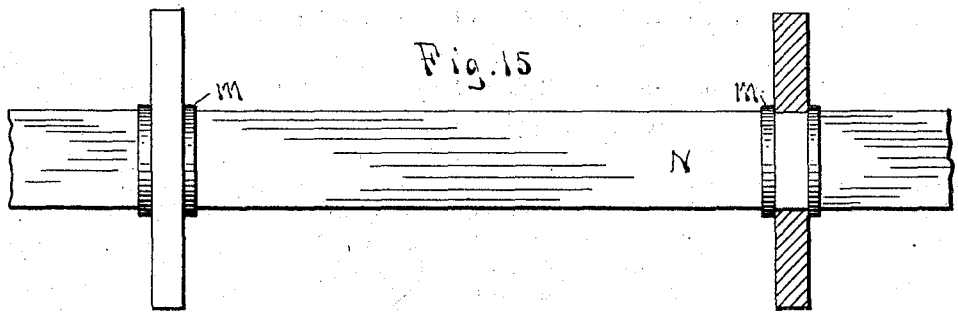
J. KAHN.

COMBINED STEEL AND CONCRETE BEAM.

APPLICATION FILED JAN. 20, 1904.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 15



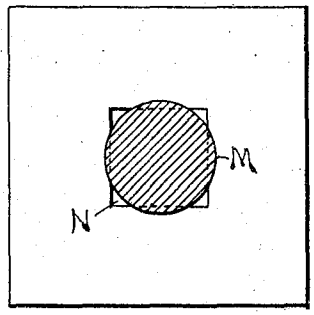


Fig. 16.

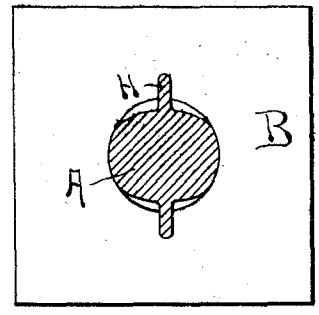


Fig. 18.

Fig. 17.

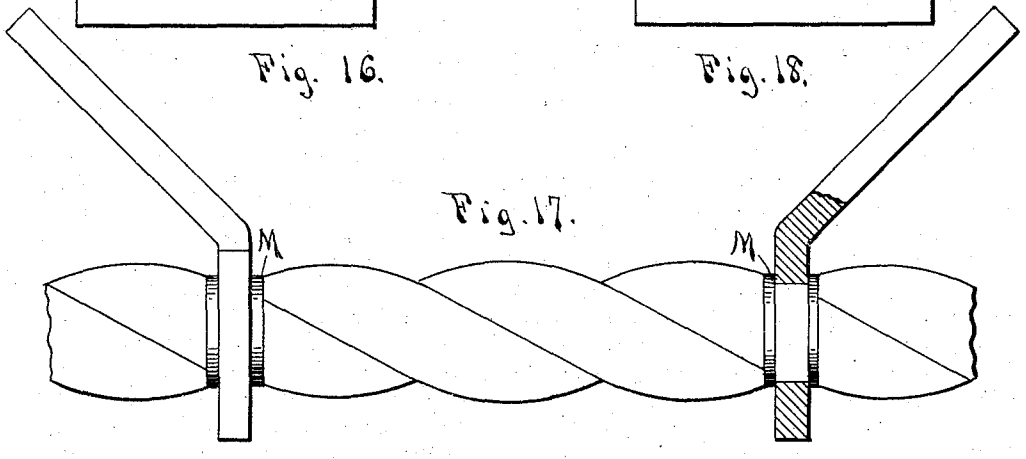
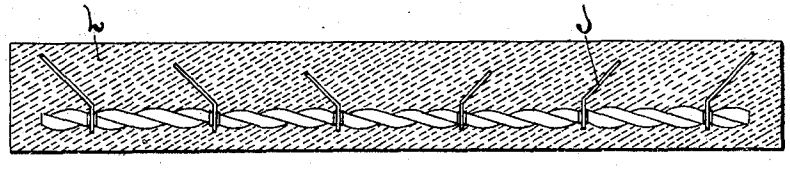


Fig. 19.



Witnesses.
A. D. Wilcox
Louis Ott

Inventor.
Julius Kahn
by Edward N. Pageleen
his Attorney.

No. 768,284. Patented August 23, 1904.

UNITED STATES PATENT OFFICE.

JULIUS KAHN, OF DETROIT, MICHIGAN.

COMBINED STEEL AND CONCRETE BEAM.

SPECIFICATION forming part of Letters Patent No. 768,284, dated August 23, 1904.

Application filed January 20, 1904. Serial No. 189,798. (No model.)

To all whom it may concern:

Be it known that I, JULIUS KAHN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and Improved Combined Steel and Concrete Beam, of which the following is a specification.

This invention relates to a combined steel and concrete beam, and has for its object to provide for a longitudinal tension member for said beam supplemented with washers or deformations to insure better contact with the concrete body and to prevent stripping.

A further object of my invention is to construct the main tension-bar of uniform cross-sections in order that there may be no waste of material and to enable the use of a greater or less number of washers, as may be desired.

These objects I attain by the construction and arrangement of the parts, as illustrated in the drawings, and set forth in the description and claims.

In the accompanying drawings, Figures 1, 2, 3, 4, and 6 are views of a bar constructed in accordance with my invention, having washers of different forms. Fig. 5 shows a tension member in the form of a twisted square bar. Fig. 7 is a longitudinal section of the beam with the tension member in position. Figs. 8 to 13, inclusive, are cross-sections of the tension members shown in Figs. 1 to 6, inclusive, respectively. Fig. 14 is a cross-section of the beam shown in Fig. 7. Fig. 15 shows a square bar molded to give a round cross-section on each side of the washers. Fig. 16 is a cross-section through the alteration. Fig. 17 is a similar bar twisted. Fig. 18 is an enlarged cross-section through the alteration of the bar shown in Fig. 1. Fig. 19 shows a beam with the tension member of Fig. 17 in position.

Similar reference characters refer to like parts throughout the several views.

A is the main longitudinal bar, of round steel or similar material capable of resisting tension stresses. This bar is provided at points intermediate its ends with the washers B, which may be used in any desired number and placed at any desired distance apart, either uniformly spaced or preferably closer together at the ends of the bars. These washers B, as shown in Figs. 8 and 18, are square, with a circular opening in the center to fit on the bar A, which will also be circular in cross-section. After the washers have been placed on the bar an upsetting, distortion, or deformation of said bar (indicated by H) is made on either side of the washers for the purpose of holding them securely in position by placing the bar between two pairs of dies, the washer being between the pairs. When the dies are closed, a portion of the bar is squeezed out radially, so as to form a lug or ear H on each side of the washer, thereby rigidly securing the washer in place on the bar without reducing the cross-sectional area. These lugs are preferably formed in pairs, one on either side of the bar. The washers may be of any shape or size, as shown in the various figures, depending upon the shape and load of the beam.

Where square bars are used, either straight or twisted, I prefer to change the cross-section at the point of alteration of the cross-section from square to round, as shown in Figs. 15, 16, and 17, which may be done by using cylindrical dies. The diameter of a circle of unit area is 1.13, so that four strong lugs or shoulders M will be formed on the bar N on either side of the washers. The bar may be twisted either before or after the alteration of the cross-section; but I prefer to twist the bar after the washers are secured in place.

As shown in Fig. 5, the bar K is provided with spiral corrugations, which greatly increase the adhesion of the concrete. The washers in this figure are represented of varying sizes, smaller at the middle of the bar and increasing in size as they approach the ends. For the purpose of serving as binders for the concrete these washers would preferably be made rectangular or oblong and the greater length placed in a vertical line of the beam L. They may extend perpendicularly to the main longitudinal beam or may be inclined obliquely thereto, as represented in Figs. 6 and 17. In this modification the washers best perform the function of binding the concrete against sheering stresses and at the same time prevent the bar from stripping. It is

not necessary that these washers shall be of great weight or strength, but are preferably constructed of a comparatively light material.

The adhesion of concrete to a plain bar is considerable, but not sufficient in all cases to make a beam of symmetrical strength—that is, one in which the adhesion of the concrete necessary to prevent stripping will equal the tensile strength of the longitudinal metal bar. By the use of my invention these factors may be provided for as particular cases demand and the highest efficiency obtained by the reinforcement.

To form the beam, the tension-bar is suspended or otherwise supported in and near the bottom of the mold and concrete rammed around it, which when setting unites with the tension member, forming a beam of great strength, the tension member being below the neutral axis of the beam.

Having now explained my improvement, what I claim as my invention, and desire to secure by Letters Patent, is—

1. In a metal reinforcement for concrete, the combination of a tension member, of a plurality of metal blocks or washers placed upon the member at points intermediate its ends, said washers having arms projecting laterally from one side of the member, the cross-section of said member being changed to form shoulders for the support of said blocks.

2. In a beam, the combination of a tension member of uniform cross-section and uniformly twisted, of a plurality of auxiliary pieces placed upon said member at points intermediate its ends and inclined in opposite directions from the center and secured in position by deformations of said member on the opposite sides thereof, and a beam of plastic material surrounding said member.

3. In a beam, the combination of a longitudinally-disposed tension member, of auxiliary pieces placed upon said member at points intermediate its ends and secured in position by deformation of the member without varying its cross-sectional area, and a beam of plastic material surrounding said tension member, the tension member being below the neutral axis of the beam.

4. In a metallic reinforcement for concrete, the combination of a metallic bar longitudinally disposed, of auxiliary perforated members strung upon the bar and secured in place, said auxiliary members being inclined in opposite directions from the middle of said bar.

5. In a metallic reinforcement for concrete, the combination of a bar, rectangular in cross-section, and washers on said bar having rectangular openings, said bar being molded to circular cross-sections to form shoulders to support said washers.

6. In a metallic reinforcement for concrete, the combination of a twisted bar, rectangular in cross-section, and washers on said bar, said bar being molded to circular cross-section to form shoulders to support said washers.

7. In a metallic reinforcement for concrete, the combination of a bar, rectangular in cross-section, and washers on said bar having rectangular openings and being inclined in opposite directions from the middle of said bar, said bar being molded to circular cross-sections to form supporting-shoulders on each side of said washers.

8. In a metal reinforcement for concrete, the combination of a tension member, of a plurality of metal blocks or washers placed upon the member, at points intermediate its ends, and of a deformation of said member without varying its cross-sectional area whereby a shoulder is given for the support of said blocks.

9. In a reinforcement for concrete or similar material, the combination of a longitudinal bar of uniform cross-section, of a plurality of washers placed upon said bar at points intermediate its ends, and secured against longitudinal movement by deformations of the bar to form shoulders on opposite sides of the washers which distortions do not vary the cross-sectional area of the bar.

10. In a metal reinforcement for concrete, the combination of a tension member, of a plurality of auxiliary members placed upon the tension member intermediate its ends, said auxiliary members having arms projecting laterally from one side, the cross-section of said tension member being changed to form shoulders for the support of said auxiliary members.

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

JULIUS KAHN.

Witnesses:
EDWARD N. PAGELSEN,
MAURICE GOLDENBERG.

No. 816,334. PATENTED MAR. 27, 1906.

J. KAHN.

TENSION MEMBER FOR COMPOSITE CONSTRUCTION.

APPLICATION FILED JUNE 21, 1905.

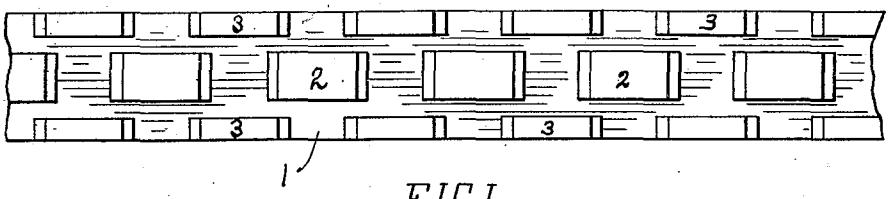


FIG. 1.

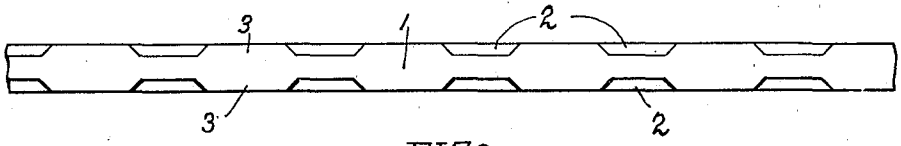


FIG. 2.

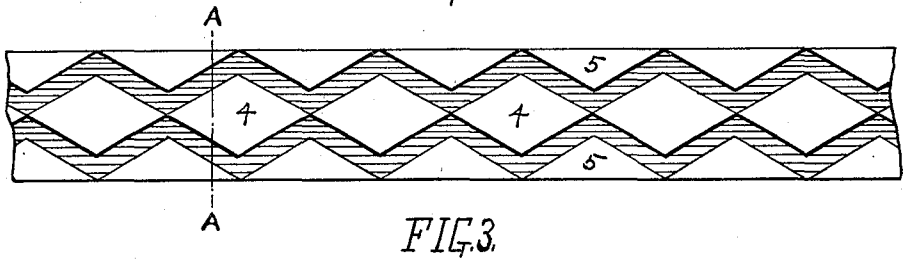


FIG. 3.

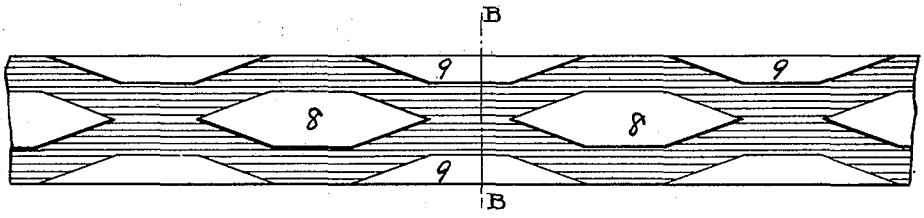


FIG. 4.

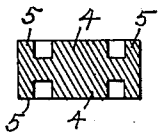


FIG. 5.

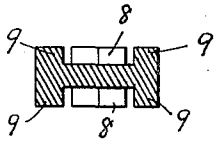


FIG. 6.

Witnesses:
A. G. Wilcox
W. B. Hudson

Inventor
By his Attorney Julius Kahn.
Edward N. Pagelsen.

UNITED STATES PATENT OFFICE.

JULIUS KAHN, OF DETROIT, MICHIGAN, ASSIGNOR TO TRUSSED CONCRETE STEEL COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

TENSION MEMBER FOR COMPOSITE CONSTRUCTION.

No. 816,334. Specification of Letters Patent. Patented March 27, 1906.

Application filed June 21, 1905. Serial No. 266,241.

To all whom it may concern:

Be it known that I, JULIUS KAHN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and Improved Tension Member for Composite Constructions, of which the following is a specification.

This invention relates to tension members for combined steel and concrete beams, trusses, and other structures subject to transverse stresses; and the object of my improvement is to provide a tension member of this kind in the form of a rod or bar which shall have projections formed thereon to insure more perfect engagement between the metal and the plastic material, while at the same time the tensional strength of the tension member shall be uniform throughout its length. I attain this object by the construction illustrated in the accompanying drawings, in which—

Figure 1 is a side view, and Fig. 2 is an edge view, of one form of my improved tension members. Fig. 3 and Fig. 4 are side views of other forms of the same. Fig. 5 is a cross-section on the line A A of Fig. 3. Fig. 6 is a cross-section on the line B B of Fig. 4.

Similar reference characters refer to like parts throughout the several views.

Tension members for concrete steel construction have been formed by twisting angular metal bars, by securing washers and other projections upon the tension-bars intermediate their length at regular intervals, by corrugating the bars, and by forming projections on the bars by rolling. These changes in the form of the metal are to prevent the bars from slipping in the plastic material when the structure is loaded; but each of the various forms requires an excess of metal—a portion that serves merely to prevent the slipping of the bar in the concrete and does not carry its proportion of the tensional stress. In my improved construction I have endeavored to so proportion the various parts that the stress required to rupture the metal will be equally great at every point in the length of the bar.

In Figs. 1 and 2 the bar 1 is provided with a series of projections 2 and 3 on both sides of the bar, those on one side being equal and opposite to those on the other. The projections 3 are of equal length, and their width is one-half that of the projections 2, thus forming a symmetrical bar. The projections are beveled at their ends, and the inclines of the projections 3 lap those of projections 2, which is sufficient to cause the amount of metal which would be broken should the line of breakage extend around between the projections to be equal to that should the break be at right angles to the bar.

In Figs. 3 and 5 a bar is shown with projections 4 and 5 and grooves between the same so proportioned that the cross-sectional area is constant for all planes at right angles to the bar. The tensional strength of the bar will therefore be uniform throughout its length.

In Figs. 4 and 6 a bar 6 is shown having a continuous projection 7 on each side in the form of a sinuous ridge, which ridges may be symmetrical on the bar, as indicated by the solid and dotted lines of Fig. 4, or they may be opposite each other.

Many other modifications embodying my invention may be produced by those skilled in the art, either with continuous or disconnected projections, the point to be attained being that the metal be so proportioned that the bar be of uniform tensile strength, thus avoiding all waste of material, and that the projections be sufficient to insure good union between the metal and concrete.

Having now explained my improvements, what I claim as my invention, and desire to secure by Letters Patent, is—

1. A metal bar having a plurality of rows of disconnected projections extending from a side thereof, the projections of one row overlapping the gaps in each adjacent row, the projections being so proportioned that the bar shall be uniform in tensile strength throughout the portion of its length having such projections.

2. A metal bar having a plurality of rows of disconnected projections extending from

each side thereof, the projections of each row having parallel sides, the projections of one row overlapping the gaps in each adjacent row, and the projections being so proportioned that the bar shall be of uniform tensile strength throughout the portion of its length having such projections.

In testimony whereof I have signed this application in the presence of two subscribing witnesses.

JULIUS KAHN.

Witnesses:

ANNA M. GREGORY,

EDWARD N. PAGELSEN

No. 835,758. PATENTED NOV. 13, 1906.

J. KAHN.

TENSION MEMBER FOR REINFORCED CONCRETE.

APPLICATION FILED JULY 5, 1906.

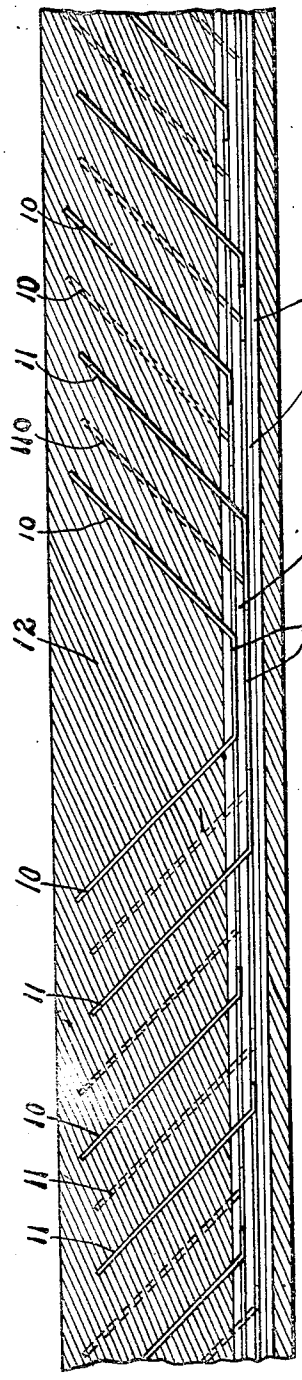


FIG. 1.

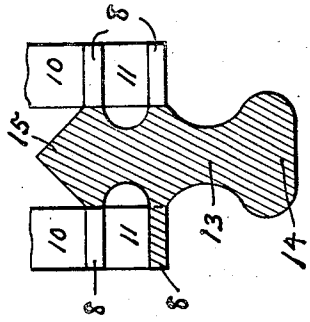


FIG. 5.

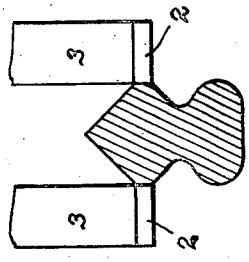


FIG. 4.

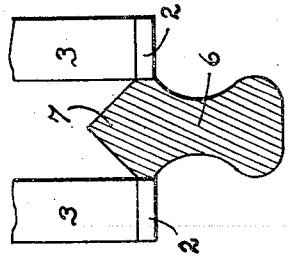


FIG. 3.

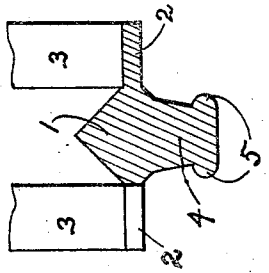


FIG. 2.

Witnesses:
A. G. Wilcox
John Miner

Inventor
J. Kahn.

By his Attorney
Edward N. Pagelsen

UNITED STATES PATENT OFFICE.

JULIUS KAHN, OF DETROIT, MICHIGAN, ASSIGNOR TO TRUSSED CONCRETE STEEL COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

TENSION MEMBER FOR REINFORCED CONCRETE.

No. 835,758. Specification of Letters Patent. Patented Nov. 13, 1906.

Application filed July 5, 1906. Serial No. 324,723.

To all whom it may concern:

Be it known that I, JULIUS KAHN, a citizen of the United States, and a resident of Detroit, in the county of Wayne and State of Michigan, have invented new and Improved Tension Members for Reinforced Concrete, of which the following is a specification.

In using the reinforcing members for combined concrete and steel construction, particularly members with a cross-section similar to that shown in Figure 10 of my patent, No. 751,921, dated February 9, 1904, it sometimes happens that the concrete on the lower sides of these beams breaks away and falls, exposing the reinforcement.

My present invention is adapted to avoid this; and it consists in a longitudinal rib below the flanged portion of the reinforcing member, which rib is grooved to admit of the concrete forming a stronger bond with the metal of the lower side of the reinforcing member.

In the accompanying drawings, Fig. 1 is a longitudinal section of a beam reinforced by a metallic tension member whose cross-section is shown in Fig. 5. Figs. 2, 3, and 4 are cross-sections of other tension members provided with grooved ribs for said purpose.

Similar reference characters refer to like parts throughout the several views.

Fig. 2 shows a cross-section of a tension member which consists of a main body portion 1, having longitudinal flanges which are cut to provide portions struck up to form inclined tension members 3 similar to those indicated in Fig. 1. A rib 4 projects downward from the lower side and tapers until near the lower edge, where it expands to form ridges 5. Where molded in the concrete of a beam or slab, the plastic material will lock around the rib, and the ridges 5, being so far from the natural plane of fracture at the lower side of the flanges 2, will prevent the strip or sheet of concrete from falling, and thus exposing the lower side of the metallic tension member.

In Fig. 3 the rib 6 is shown to extend down from the body 7 farther below the flanges 2 than in Fig. 2, and the comparative depths of the grooves are greater. In Fig. 4 the rib is shown of still different form, but the object of the grooved rib is the same.

In Fig. 5 is shown a cross-section of a reinforcing member provided with two flanges 8 on each side of the main body portion 9. The inclined arms 10 and 11 extend laterally, as shown in Fig. 1, the arms 11 from the lower flanges extending up through the spaces made by cutting the upper flanges to form the arms 10. By locating the arms in the manner indicated in Fig. 1 a very reliable union is formed between the metal and the concrete, and the compression stresses set up in the plastic body 12 are transmitted along to the tension member 15 by the arms 10 and 11. These arms, spaced as shown, are adapted to overcome great shearing stresses. The longitudinal rib 13 has an enlarged outer portion 14 to prevent the concrete from breaking from the lower side of the tension member, as above stated.

Having now explained my improvements, what I claim as my invention, and desire to secure by Letters Patent, is—

1. A tension member for reinforced concrete consisting of a main longitudinal portion having webs along the opposite sides of the same, and a downwardly-extending rib having a reduced portion adjacent to the main portion of the tension member.

2. A tension member for reinforced concrete consisting of a main longitudinal portion having webs along the opposite sides of the same adapted to be struck up to form the inclined tension members of a truss, said main longitudinal portion being triangular in cross-section above said webs, and having a downwardly-extending tapering portion below the webs to form a rib, said rib being enlarged at its outer edge.

3. A reinforced concrete construction comprising a body of plastic material, a metallic reinforcement for the same comprising a main portion having longitudinal webs projecting from opposite sides of the same, said webs being struck up to form diagonal tension members of a truss for the purpose of transmitting stresses from the plastic material to the main portion of the reinforcement, said main portion having a downwardly-extending rib grooved to insure a permanent connection between the plastic material and the reinforcement.

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

JULIUS KAHN.

Witnesses:

EDWARD N. PAGELSEN,

E. MUTH.