

E. McCULLOUGH.
REINFORCED CONCRETE STRUCTURE.
APPLICATION FILED NOV. 25, 1908.

Patented Sept. 14, 1909.
2 SHEETS—SHEET 1.

934,089.

Fig. 1.

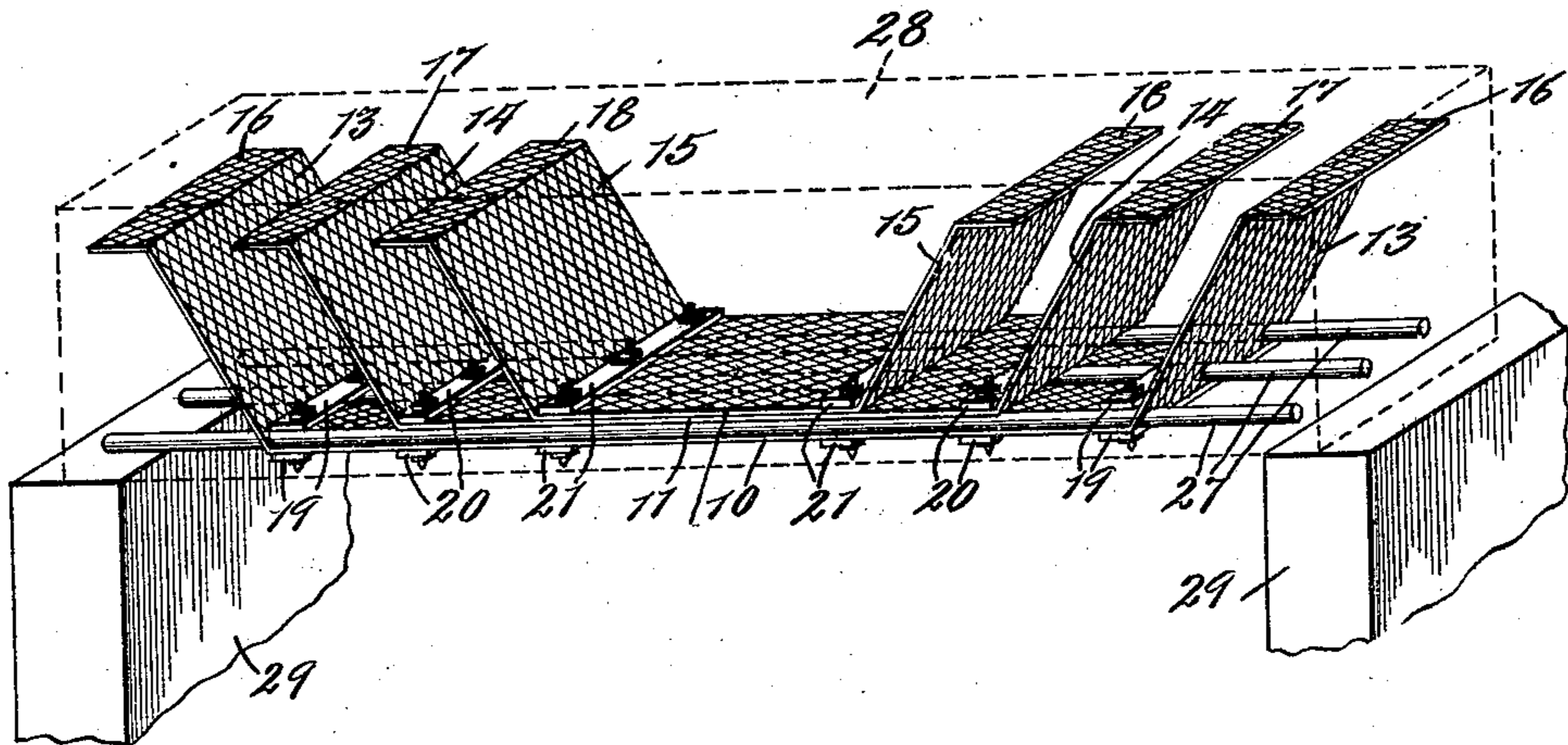


Fig. 2.

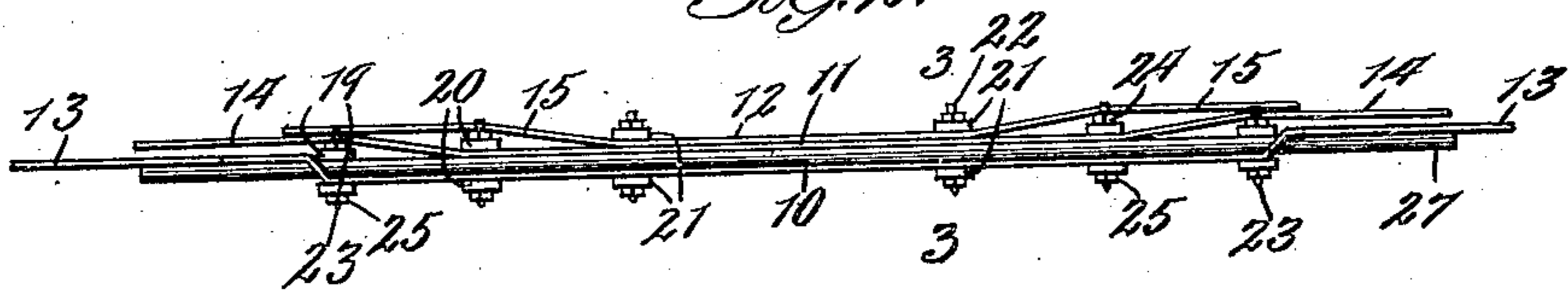


Fig. 3.

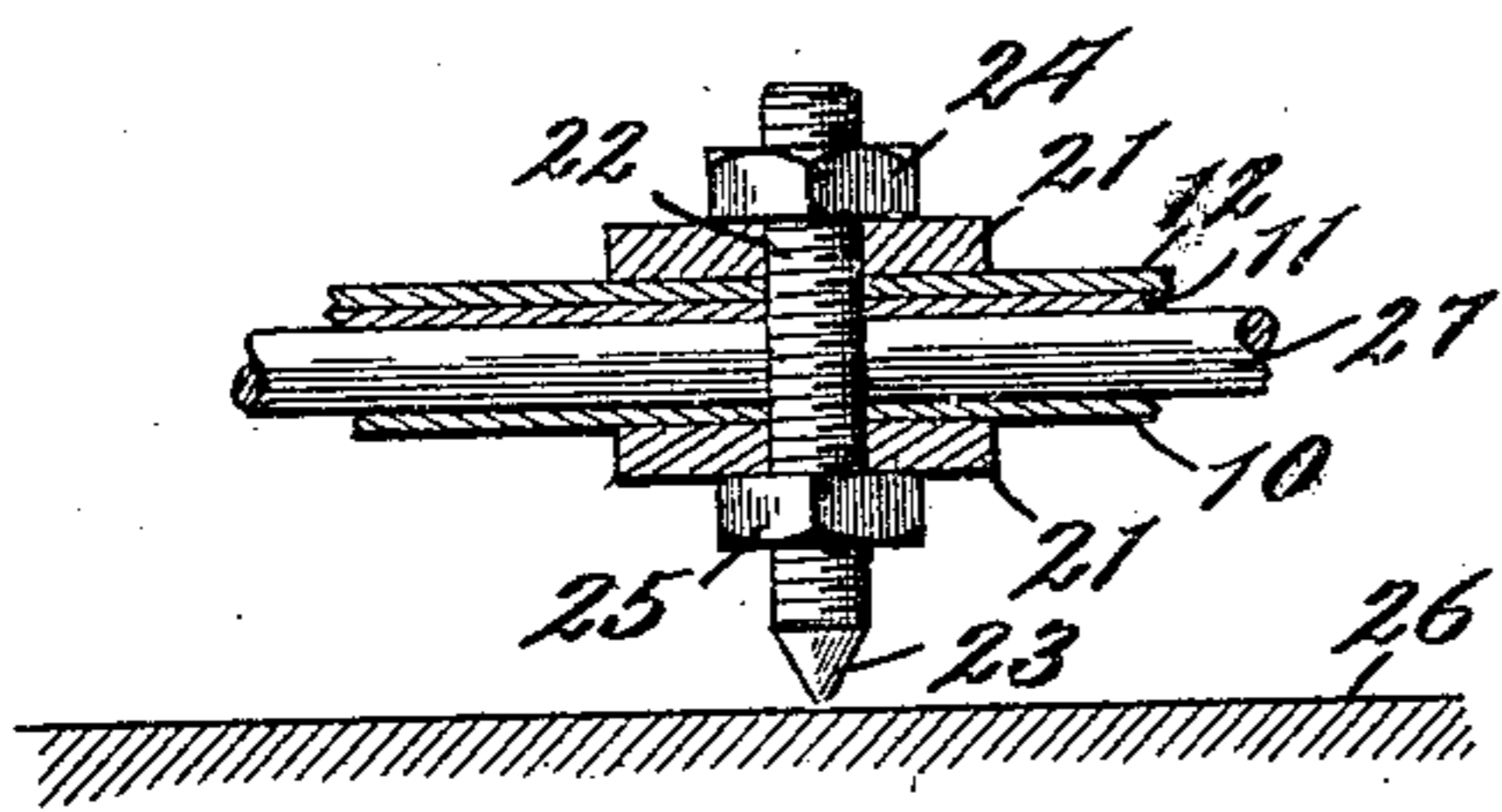
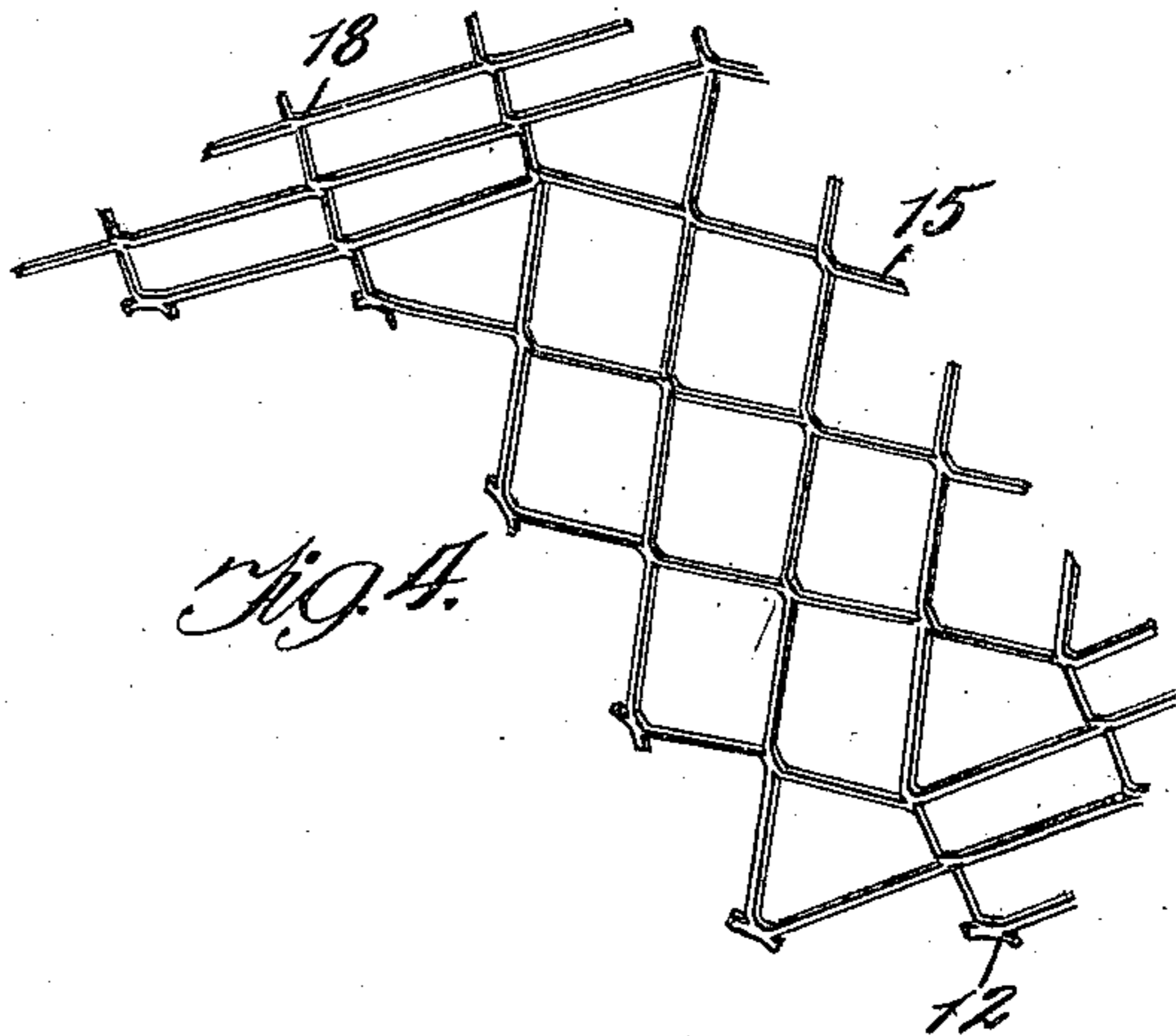


Fig. 4.



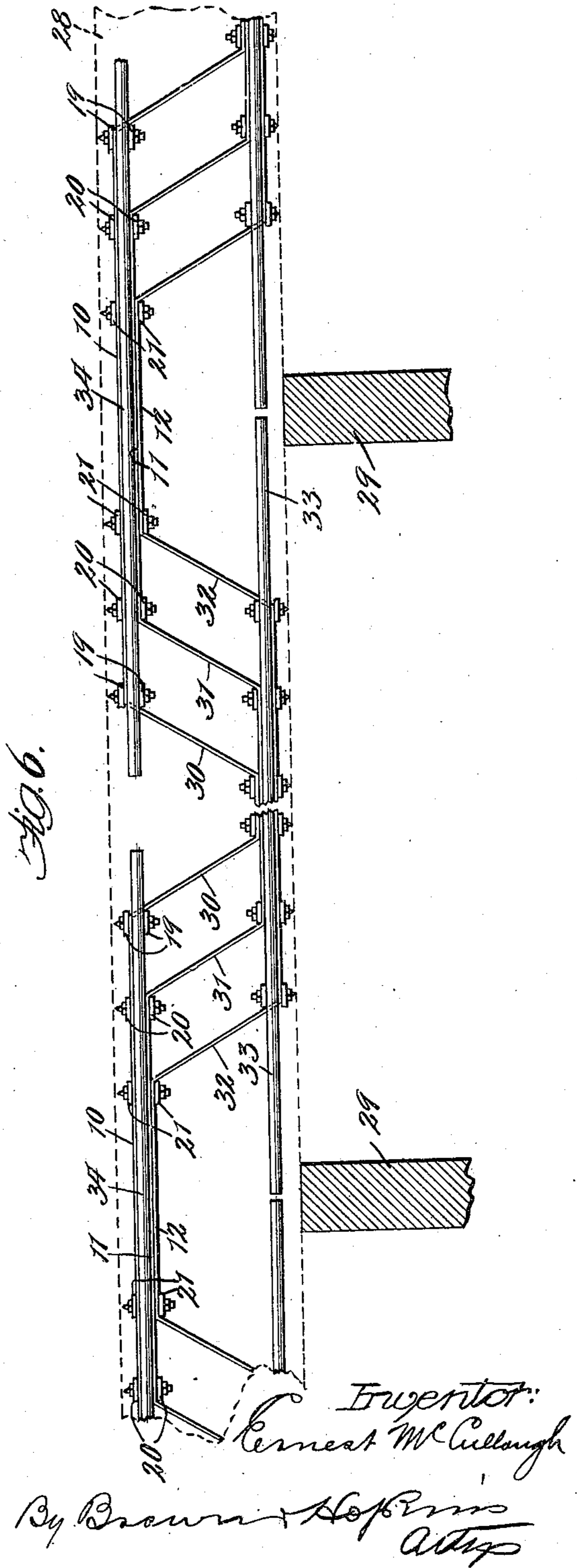
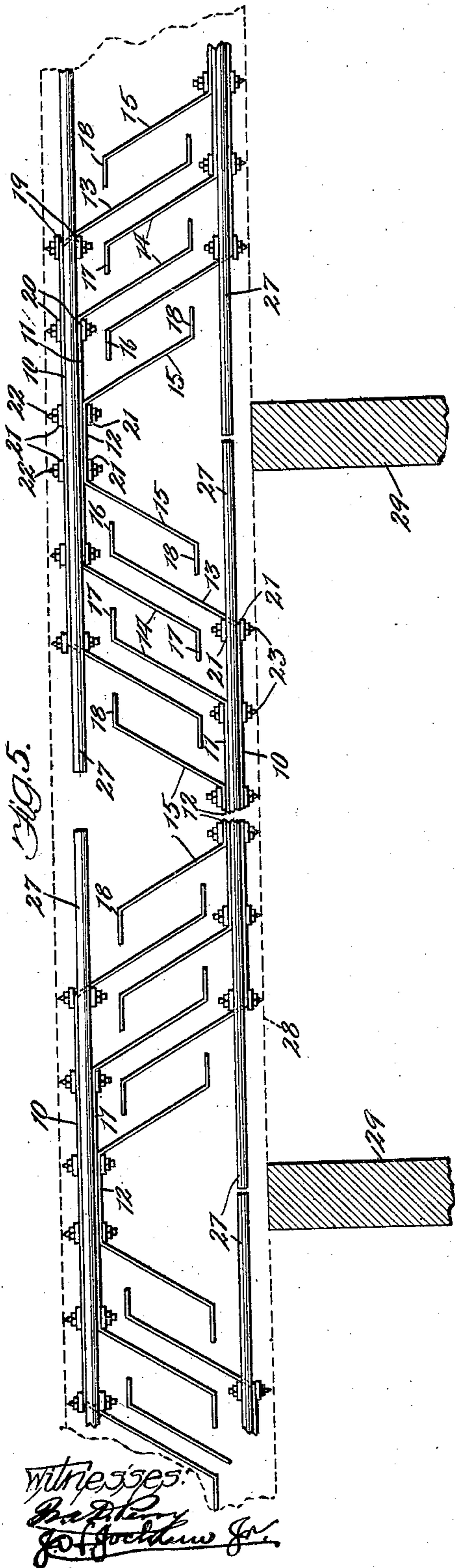
Witnesses:
Ed. D. Perry
J. F. Gochman, Jr.

Inventor:
Ernest McCullough
By Brown & Hoffmann
Attys

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UNITED STATES PATENT OFFICE.

ERNEST McCULLOUGH, OF CHICAGO, ILLINOIS, ASSIGNOR TO NORTHWESTERN EXPANDED METAL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

REINFORCED CONCRETE STRUCTURE.

934,089.

Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed November 25, 1908. Serial No. 464,385.

To all whom it may concern:

Be it known that I, ERNEST McCULLOUGH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Reinforced Concrete Structures, of which the following is a specification.

This invention relates to improvements in reinforcing concrete structures and more particularly to web reinforcement for beams, slabs or the like and the primary object of the invention is to provide an improved strengthening web of this character constructed of reticulated material.

A further object is to provide an improved web reinforcement for concrete structures formed of a plurality of superposed sheets or strips of reticulated material secured together in such a manner that the extremities of the sheets or strips may be bent or deflected at an angle to the body portions so as to extend transversely across the body of the beam or slab to resist internal stresses.

A further object is to provide an improved reinforcing web which may be constructed as a unit and collapsed for shipment purposes, and improved means for guiding the user in bending or shaping the web for use.

A further object is to provide improved means for supporting and properly positioning the web above the bottom of the mold or form in which the beam or slab is cast.

A further object is to provide improved means whereby tension rods may be secured to the web when desired for reinforcing the same.

A further object is to provide an improved device of this character which will be simple, durable, cheap and light in construction, and effective and efficient in operation.

To the attainment of these ends and the accomplishment of other new and useful objects, as will appear, the invention consists in the features of novelty in the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating the embodiment of the invention, and in which—

Figure 1 is a perspective view of an improved structure of this character con-

structed in accordance with the principles of this invention and showing the beam or slab in diagram. Fig. 2 is a detail view of one unit in a collapsed form for shipment. Fig. 3 is an enlarged detail sectional view on line 3—3 of Fig. 2. Fig. 4 is a detail perspective view of the preferred form of reticulated material, from which the reinforcing web is constructed showing a portion of the body of one of the strips, the angularly deflected end thereof and the horizontally deflected extremity of the end. Fig. 5 is a diagrammatic view showing one manner of using this improved reinforcing web. Fig. 6 shows a modified form of the invention.

Referring more particularly to the drawings and in the present exemplification of the invention, the reinforcing web is constructed of a plurality of superposed strips or sheets of reticulated material 10, 11, 12, which may be of any desired width but of varying lengths, so that the extremities of each sheet or strip will terminate short of the extremities of the next adjacent strips or sheets when the web is collapsed. The respective ends 13, 14, 15 of these sheets of fabric may be bent or deflected at any predetermined points and at angles to the body portions of the respective sheets. These bent or deflected ends are preferably disposed in planes inclined to the vertical and the respective extremities 16, 17, 18, of the inclined ends 13, 14, 15 are deflected horizontally and in a direction preferably away from the longitudinal center of the respective sheets. The extremities 13, 14, 15 of the sheets are of such a length as to extend across the body of the beam to assist in tying together the top and bottom of the beam, and to resist internal stresses of the beam, and are of such lengths that the horizontally deflected extremities 16, 17, 18, may stand at any predetermined distance from one surface of the beam or slab according to the thickness of bonding necessary. Any number of these strips or sheets of reticulated material 10, 11 and 12 may be employed and in the present exemplification of the invention three of such sheets are shown and these strips or sheets may be connected or secured together to form a reinforcing unit in any desired or suitable manner, preferably by means of cooperating strips of material 19, 20, 21, one of which strips is arranged adjacent the bend formed

by the respective ends 13, 14, 15 of the sheets and the cooperating strip being arranged below the respective strips and adjacent the face of the outermost strip 10. These strips
5 may be secured together in any desired or suitable manner so as to form independent clamps, preferably by means of a fastening device 22 in the form of a threaded bolt or screw which is provided with a tapered or
10 pointed extremity 23. Any number of these fastening devices 22 may be employed for each of the pairs of strips and are adapted to pass through the cooperating strips and the adjacent portions of the superposed
15 sheets of fabric 10, 11, 12. Suitable nuts 24, 25, may be provided which surround the bolts 22, one adjacent each of the respective strips and are adapted to be adjusted on the bolt so as to cause the strips 21 to clamp the
20 superposed sheets of reticulated fabric. The bolts are of such a length as to extend for some distance beyond each of the clamping or fastening strips and may be adjusted with respect to the superposed sheets of fabric 10, 11, 12, by loosening the nuts 24, 25
25 so that the reduced or pointed extremity 23 of the bolts may be projected any desired distance beyond the lowermost sheet of the fabric 10. By adjusting the bolts 22 below,
30 the lowermost clamping member, it is possible to project all of the pointed or conical extremities 23 the same distance beyond the body portion of the reinforcing web so that when the sheets of reticulated material are
35 assembled and placed in the mold or form, these extremities 23 will engage and rest upon the bottom 26 of the mold to support the structure at a definite or predetermined distance above the bottom of the mold or
40 form, thereby permitting the plastic material which forms the bottom or slab to entirely surround the reinforcing web as the material is poured into the mold.

With this improved construction it will
45 be apparent that the clamping members 19, 20 and 21 may be located at predetermined points so that when the unit is assembled, it may be shipped in a collapsed or folded condition to the user. When it is desired to use
50 the structure all that is necessary is for the user to bend or deflect the extremities of the respective sheets of reticulated material to the position shown in Fig. 1, the clamping strips 19, 20 and 21 being securely held in
55 position and being located at the points adjacent which the bends of the material are to be made, thereby insuring the proper bending or shaping of the reinforced web in the hand of an inexperienced person.

60 If desired, and in order to reinforce the beam or slab tension members, preferably in the form of metal bars or rods, may be employed, and these tension members 27 may be interposed between the layers of fabric so
65 that the extremities thereof will project

through the deflected portions 13 of the outermost layer. Any number of these tension members 27 may be employed according to the width of the material from which the beam or slab is constructed and may also be
70 of any desired length but are preferably of such a length that when the extremities of the beam 28, shown in dotted lines in Fig. 1, rest upon the supports 29, the extremities of the tension members will project over the
75 supports. When the reinforcing web is collapsed or folded for shipment, the deflected portions 13 of the outermost member will be bent to rest upon the extremities of the tension members 27, as shown more clearly in
80 Fig. 2 of the drawings.

Obviously, instead of interposing the tension members 27 between the sheets of the reticulated material, they may be disposed against the outer face of the outermost
85 sheet, in which event they may be secured in position in a similar manner with the exception that the respective adjacent clamping strips will directly engage the tension members.
90

A plurality of the reinforcing web units thus formed may be employed for constructing a beam of a length somewhat greater than the length of the unit to form a single
95 span girder and in this event the units may be arranged opposed to each other so that the bottom or base of one unit will stand adjacent one face of the girder or beam and the bottom or base of another unit may stand
100 adjacent the opposite face of the girder or beam, so that the angularly deflected extremities 13, 14, 15 will be disposed between the adjacent angularly deflected portions of the next adjacent unit and these deflected portions are spaced from each other a sufficient
105 distance to cause a space to intervene between two of the adjacent deflected portions to permit the plastic material to fill the spaces therebetween.

When the beam or girder is constructed in
110 the manner shown in Fig. 5 and the tension rods or members 27 are employed, the latter are of such a length as to project over the supports or uprights 29. One of the units is also arranged to stand astride of each of the
115 uprights or supports so as to resist all reversed stresses of the beam or girder. In this form of the invention and when a plurality of units are employed, they may be supported in the mold or form in any desired
120 manner so that the extremities 23 of the fastening bolts 22 will engage the bottom of the mold for spacing the unit from the bottom to permit the plastic material to completely surround the units, and when
125 thus completed, portions of the units will be disposed adjacent to and will extend parallel with the top and bottom of the beam or girder to furnish a bond.

If desired, the reinforcing web may be
130

constructed as a continuous unit, that is, so that the web will extend from one end of the girder or beam to the other, as shown more clearly in the modification shown in Fig. 6 of the drawings. When the reinforcing web is thus constructed, the sheets of reticulated material may be continuous and may be fastened together at intervals by the cooperating clamping members 19, 20 and 21 in the same manner as the single unit, the cooperating clamping members being spaced longitudinally from each other to permit the superposed sheets of reticulated material to be angularly deflected, as at 30, 31, 32, at predetermined intervals to connect portions of the web which are disposed parallel to each other and spaced from each other any desired distance according to the depth of the girder, beam or slab. These parallel portions are also spaced longitudinally from each other whereby the angularly disposed portions 30, 31, 32 will connect the said parallel portions. In this exemplification of the invention, as well as in the form shown in Fig. 5, the tension rods 33 may be arranged adjacent the portions of the reinforcing web which extend adjacent the lower face of the girder, beam or slab, the extremities of which extend over the supports or standards 29 and similar tension rods 34 may be employed which are secured to the portions of the web which stand adjacent the opposite face of the beam or girder and these tension rods 34 may be of a length to terminate short of the next adjacent tension rods but are arranged to extend across the uprights or standards 29 so that their respective extremities will terminate at points between the uprights or standards. In this form of the invention the reinforcing web will be constructed as a unit and will be shipped in shape ready for use but in the other forms of the invention the reinforcing web may be shipped in a collapsed or folded form. Obviously the tension rods 33, 34, may be omitted when desired.

Although in the present exemplification of the invention the web is shown as being constructed of sheets of sheared or expanded material, it is to be understood that any suitable reticulated material, such as sheared, woven or welded fabric may be employed and the sheets secured together so that the body portions thereof will be disposed in different horizontal planes.

In order that the invention might be fully understood the details of the foregoing embodiment thereof have been thus specifically described, but

What I claim as new, is:

1. A reinforcing web for concrete structures comprising a plurality of superimposed members, and means for securing the bodies of said members together, the ex-

trémities of the members being spaced from each other, the said securing means including a member adjustable with respect to the first said members whereby the extremity of the adjustable fastening member may be projected a predetermined distance beyond the first said members for supporting the web in a mold and for adjustment with relation to the mold.

2. A reinforcing web for concrete structures comprising a plurality of superimposed members, means for securing the bodies of said members together, the extremities of the members being spaced from each other, the said securing means including a member adjustable with respect to the first said members whereby the extremity of the adjustable fastening member may be projected a predetermined distance beyond the first said members for supporting the web in a mold and for adjustment with relation to the mold, and means for securing the said adjustable member in its adjusted position.

3. A reinforcing web for concrete structures comprising a plurality of superimposed members and means for securing the bodies of said members together at points remote from their ends, the portions of the members beyond the securing means being separated from each other, the said securing means including a member adjustable with respect to the first said members whereby the extremity of the adjustable member may be projected a predetermined distance beyond the first said members for supporting the web in a mold and for adjustment with respect to the mold.

4. A collapsible reinforcing web for concrete structures comprising a plurality of superposed reticulated sheets, means for securing said sheets together, said securing means being disposed remote from the respective extremities of said sheets, the portion of the sheets beyond the securing means being deflected to form portions disposed in planes inclined to the respective bodies of the sheets, said fastening means also serving as guides for deflecting the ends of the respective sheets, said fastening means including means projecting beyond and adjustable with respect to the adjacent portions of the sheets for supporting the web in a mold and adjusting the same with relation to the mold.

5. A reinforcing web for concrete structures comprising a plurality of superposed reticulated sheets, cooperating clamping members engaging the outermost sheets at intervals, fastening means engaging said clamping members and adjustable with respect thereto, whereby the extremity of said fastening means may be projected a predetermined distance beyond the reticulated sheets for supporting the web in a mold,

portions of the sheets beyond the clamping members being bent into planes inclined to the respective body portions.

6. A reinforcing web for concrete structures comprising a plurality of superposed reticulated sheets, cooperating clamping members engaging the outermost sheets at intervals, fastening means engaging said clamping members and adjustable with respect thereto, whereby the extremity of said fastening means may be projected a predetermined distance beyond the reticulated sheets for supporting the web in a mold, portions of the sheets beyond the clamping members being bent into planes inclined to the respective body portions, said deflected portions being spaced longitudinally from each other.

7. A reinforcing web for concrete structures comprising a plurality of superposed reticulated sheets, cooperating clamping members engaging the outermost sheets at intervals, fastening means engaging said clamping members and adjustable with respect thereto, whereby the extremity of said fastening means may be projected a predetermined distance beyond the reticulated sheets for supporting the web in a mold, portions of the sheets beyond the clamping members being bent into planes inclined to the respective body portions, and means for securing said fastening means in their adjusted positions.

8. A reinforcing web for concrete structures comprising a plurality of superposed sheets of material, portions of said sheets being deflected to form a body having angularly deflected portions, said angularly deflected portions being spaced longitudinally from each other, rods engaging the body portion and extending longitudinally thereof, the extremities of the rods projecting beyond the outermost deflected portion, and means for securing said body portions and rods together.

9. A reinforcing web for concrete structures comprising a plurality of superposed sheets of reticulated material, portions of said sheets being deflected to form a body having angularly deflected portions, said angularly deflected portions being spaced longitudinally from each other, tension rods engaging the body portion and extending longitudinally thereof, the extremities of the rods projecting beyond the outermost

deflected portion, and common means for securing the tension rods and body portions together to form a single unit.

10. A reinforcing web for concrete structures comprising a plurality of superposed sheets of reticulated material, each of said sheets being bent to form spaced parallel portions, the parallel portions of each sheet being respectively spaced longitudinally from each other, and the respective adjacent parallel portions being connected by portions of the sheets disposed in planes inclined to the planes of the said parallel portions, and independent clamping means engaging the sheets beyond the said inclined portions for securing the sheets together, said inclined portions being spaced longitudinally from each other.

11. A reinforcing web for concrete structures comprising a plurality of superposed sheets of reticulated material, each of said sheets being bent to form spaced parallel portions, the parallel portions of each sheet being respectively spaced longitudinally from each other, and the respective adjacent parallel portions being connected by portions of the sheets disposed in planes inclined to the planes of the said parallel portions, means for engaging the sheets beyond the said inclined portions for securing the sheets together, and tension rods secured to the sheets and projecting beyond the said inclined portions.

12. A reinforcing web for concrete structures comprising a plurality of superposed sheets of reticulated material, each of said sheets being bent to form spaced parallel portions, the parallel portions of each sheet being respectively spaced longitudinally from each other, and the respective adjacent parallel portions being connected by portions of the sheets disposed in planes inclined to the planes of the said parallel portions, tension rods engaging the sheets and projecting beyond the said inclined portions, and common means for securing the sheets and rods together into a single unit.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 21st day of November A. D. 1908.

ERNEST McCULLOUGH.

Witnesses:

J. H. JOCHUM, Jr.,
M. W. CANTWELL.