No. 840,571. PATENTED JAN. 8, 1907.

J. W. LINZEE, JR.

CONCRETE AND METAL STRUCTURE.

APPLICATION FILED SEPT. 27, 1905.

Fig. 1.

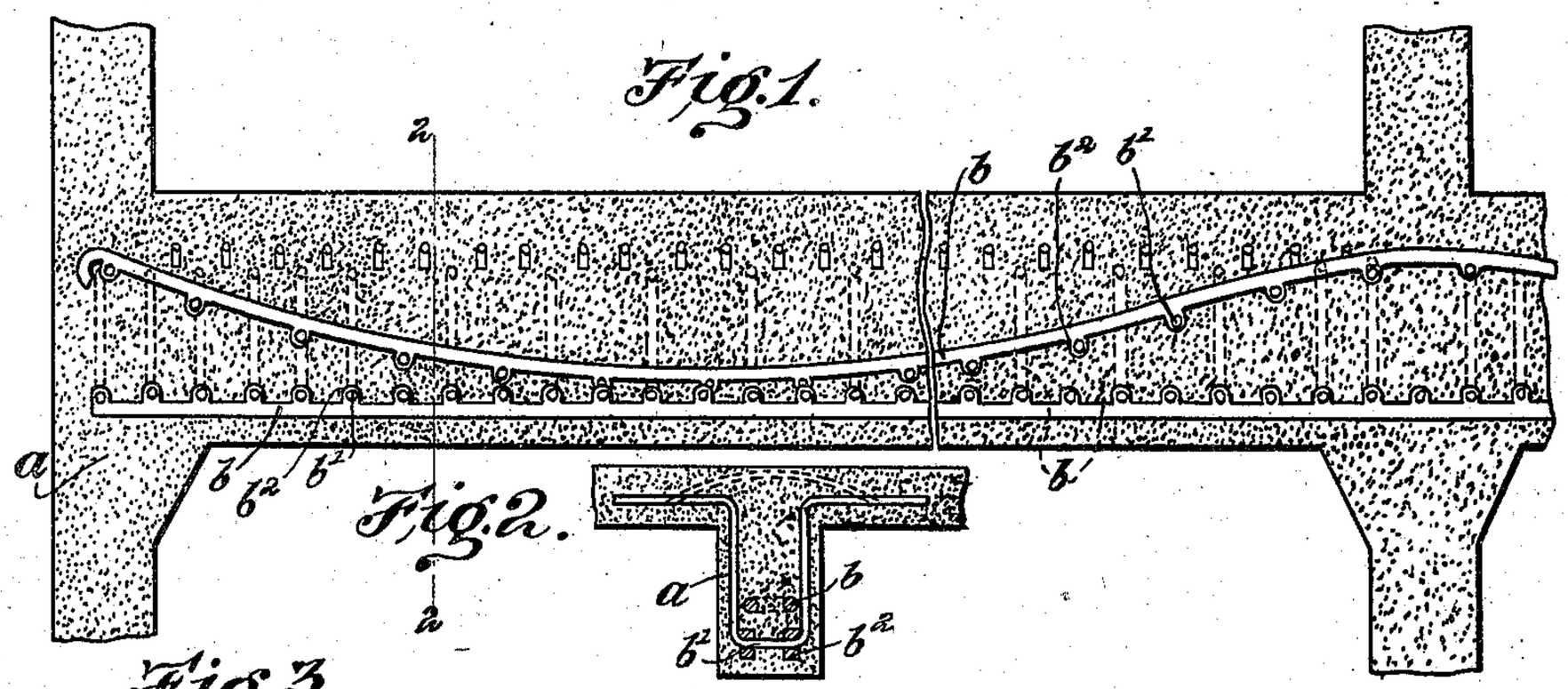


Fig. 2.

Fig. 3.

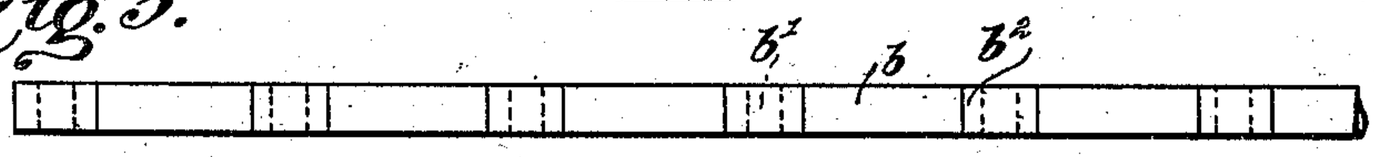


Fig. 4.

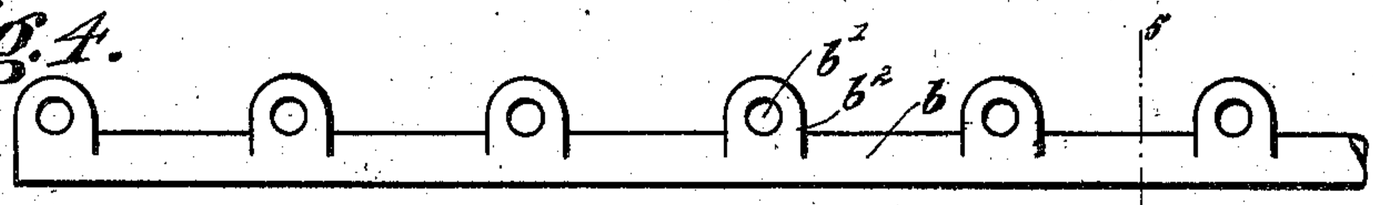


Fig. 5.

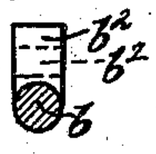


Fig. 6.

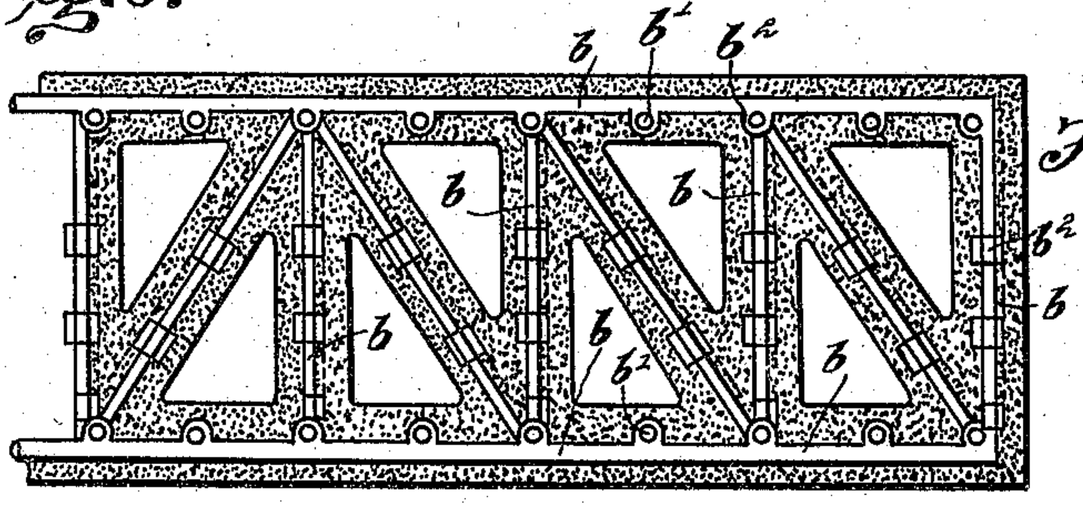


Fig. 7.

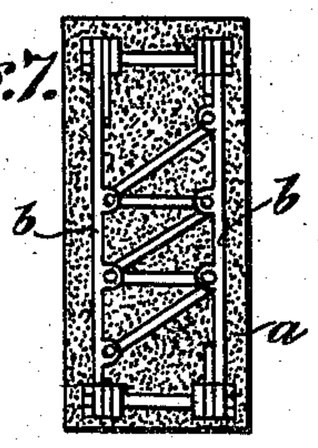


Fig. 8.

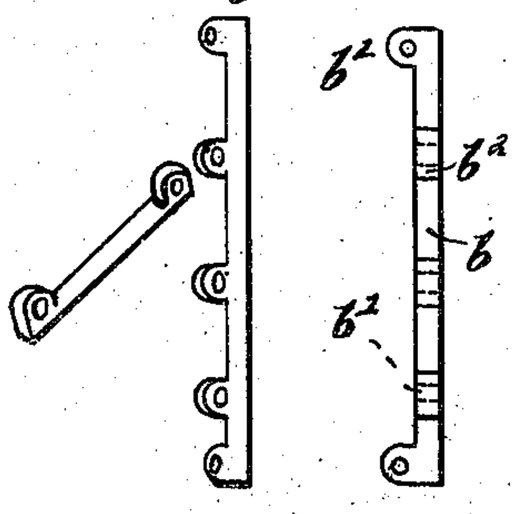
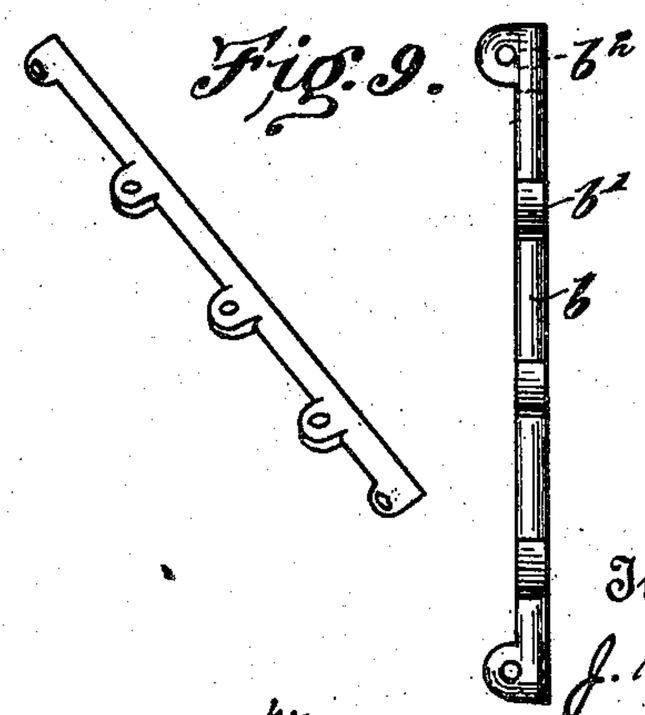


Fig. 9.



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UNITED STATES PATENT OFFICE.

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CONCRETE-AND-METAL STRUCTURE.

No. 840,571. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed September 27, 1905. Serial No. 280,308.

To all whom it may concern:

Be it known that I, JOHN W. LINZEE, Jr., of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Concrete-and-Metal Structures, of which the following is a specification.

This invention relates to building structures consisting of concrete, artificial stone, cement, mortar, terra-cotta, brick, glass, or similar substances having embedded therein rods of steel or similar material possessing great tensile strength relatively to the tensile strength of the concrete or analogous material.

The invention relates particularly to structures of this character having eye-rods so connected to other rods or reinforcing members as to form reinforcing skeleton structures which are entirely surrounded by and embedded in the concrete, cement, &c.

The chief object of the invention is to so construct the said eye-rods that they will have substantially the same cross-sectional area and strength at the eyes or apertures as at other points, so that they will lose nothing in strength by reason of the presence of the eyes, by means of which the rods are connected to other rods or members.

Another object of the invention is to provide an eye-rod of such construction that it will not only possess adequate strength at points where it is united to other rods or members, but will also furnish bearings to anchor the reinforcing structure in the concrete.

In accordance with my invention those members of a reinforcing structure that are provided with eyes for engagement with other members are provided also with enlargements surrounding or adjacent to the eye-orifices, said enlargements compensating for any weakness of the bars due to the presence of the eye-orifices, and providing anchoring portions to take a bearing on the cement or concrete or on other adjacent metal structures or members.

In the accompanying drawings, in which I show some of the embodiments of the invention, although without attempting to illustrate all of the uses or utilities of rods or bars constructed in accordance with my invention, Figure 1 is a longitudinal section of a floor-beam constructed of concrete and metal in accordance with my invention. Fig. 2 represents a section on line 2 2 of Fig. 1. Fig. 3 is an edge view, enlarged, of a rod forming a part of the structure shown in Fig. 1. Fig. 4 represents a side elevation of the same. Fig. 5 represents a section on line 5 5 of Fig. 4. Fig. 6 is a fragmentary view similar to Fig. 1, showing a different structure of trusswork. Fig. 7 is a view looking from one end of Fig. 6. Figs. 8 and 9 are detailed views of different forms of rods which may be employed in carrying out my invention.

Since my invention relates in no way to any particular method of embedding the metal structure in the cement or concrete, I shall not attempt to refer to or describe the many ways by which the eye-rods hereinafter described may be connected and united and embedded. It is sufficient to state that the metal eye rods or bars *b* are of such length and forms as will best meet the requirements which they are intended to meet. They may be long or short and will be provided with eyes *b'* wherever such eyes will be required. Said bars or rods *b* are embedded in concrete or cement *a* after they have been set up and united with other members to form a skeleton reinforcing structure.

As is well known, the strain or stress placed on the bars which are included in concrete and metal structures extends longitudinally of the rods. Hence the presence of openings therein which in any way decreases the amount of metal in cross-section at points intermediate the ends of the rod weakens the rod to that extent, regardless of the amount of metal in cross-section at points intermediate the openings, the rod being no stronger than its weakest part. While this weakness can be avoided to some extent by the presence of enlargements around the openings or eyes, which enlargements are so formed as to provide substantially the same quantity of metal in cross-section as is present in the remaining parts of the rod, yet there is a constant tendency where heavy longitudinally-extending stress is present to elongate the openings or eyes and thereby change their shape. Where this stress is provided during the placing of the concrete in position, the elongation of the eyes tends to form air-spaces within the structure when the concrete hardens, and if present after the hardening process is complete there is a tendency to crack and break up the adjacent parts of the concrete, necessarily weakening the structure. To overcome these objections, I provide the rods *b*,

of any suitable shape in cross-section, with enlargements b^2, within which are placed the openings or eyes b', the openings or eyes being located at one side of the longitudinal axis of the rod or member. By this construction the rod is not weakened at any point, and the placing of longitudinally-extending stress or strain on the rod or member does not affect the shape of the opening or eye, and thereby insuring of the formation of a close connection between the rod and the complemental member which passes through the opening or eye, which connection will not be affected by the presence of such stress or strain.

The rods may have any desired shape in cross-section, such as round, oval, square, or polygonal, and they may be either twisted or straight. The eyes and the enlargements formed in any one rod may be in the same plane as indicated in Figs. 3 and 4 or they may be at different angles relatively to each other, as indicated in Figs. 8 and 9. In said Figs. 8 and 9 I have simply illustrated in detail, perspective, and side elevation the forms which may be given to the several eye-rods which are included in the structure illustrated in Figs. 6 and 7. It will now be understood that whatever form may be given to the rods in cross-section the tensile strength of the rods is substantially equal at all points of their length, and the enlargements thereon serve to take a bearing on the concrete or cement in which said bars are embedded without the liability of leaving air-spaces in the cement at any points around said enlargements. The enlargements may be formed by indenting opposite sides of the rod, the metal thus displaced forming protuberances on the intermediate sides or between the depressions. In all cases the eye-orifices constitute a simple means for directly connecting a steel reinforcing member to another reinforcing member or members.

Having thus explained the nature of my invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, what I claim, and desire to secure, is—

1. A concrete-and-metal structure comprising separate reinforcing members embedded in the concrete, some of said members having eyes through which other members pass, the opening of the eye being at one side of the longitudinal axis of its member, the eye members being enlarged adjacent to their eyes, whereby the tensile strength of the members is preserved at the eyes and anchoring portions are formed.

2. A concrete-and-metal structure comprising separate reinforcing members embedded in the concrete, some of said members having circular openings or eyes through which other members pass, the receiving portion of the openings or eyes being at one side of the longitudinal axis of the member, the members having openings or eyes being enlarged adjacent to said openings or eyes whereby the tensile strength of the members is preserved.

3. A concrete-and-metal structure comprising rods having circular eyes and formed with enlargements adjacent to said eyes to prevent breaking of the rods at the eyes, the enlargements and eyes being at one side of the longitudinal axis of the rods, whereby the shape of the eyes will not be affected by stress applied lengthwise of the rods, and supplemental members passing through said eyes.

4. A concrete-and-metal structure, comprising separate reinforcing members embedded in the concrete, said members having eyes, the openings of which are located at one side of the longitudinal axis of the member, said members being enlarged adjacent to their eyes, said eyes being adapted to receive pins or bolts of similar material to the members, for the purpose of connecting said reinforcing members together.

5. A concrete-and-metal structure comprising separate reinforcing members embedded in the concrete, said members having a continuous set of eyes, the openings of which are located at one side of the longitudinal axis of the member, said members being enlarged adjacent to their eyes, whereby said eyes furnish a ready, simple, economical and secure means for connecting said members together, at all points of their lengths where said eyes occur, without additional work in the field.

6. A concrete-and-metal structure, comprising separate reinforcing members embedded in the concrete, said members having eyes, the openings of which extend therethrough and through which other members pass, said openings being at one side of the longitudinal axis of the reinforcing members, said members also being enlarged adjacent to their eyes, said eyes being all in one plane, or some in one plane and the others in planes making an angle with those in other planes.

In testimony whereof I have affixed my signature in presence of two witnesses.

JOHN W. LINZEE, JR.

Witnesses:
C. F. BROWN,
H. L. ROBBINS.