No. 815,157. PATENTED MAR. 13, 1906.

J. F. GOLDING.

TENSION BAR FOR USE IN CONCRETE AND THE LIKE.

APPLICATION FILED FEB. 20, 1905.

Fig. 1.

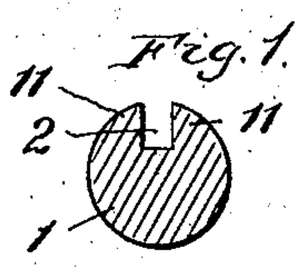


Fig. 2.

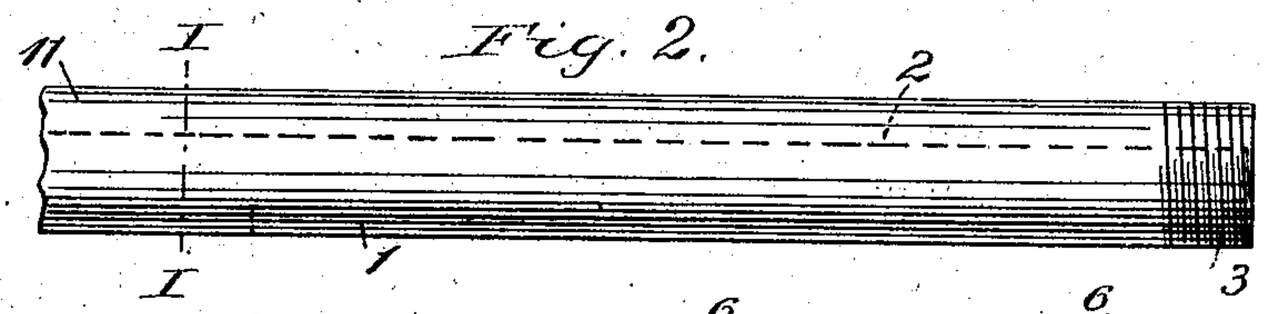


Fig. 3.

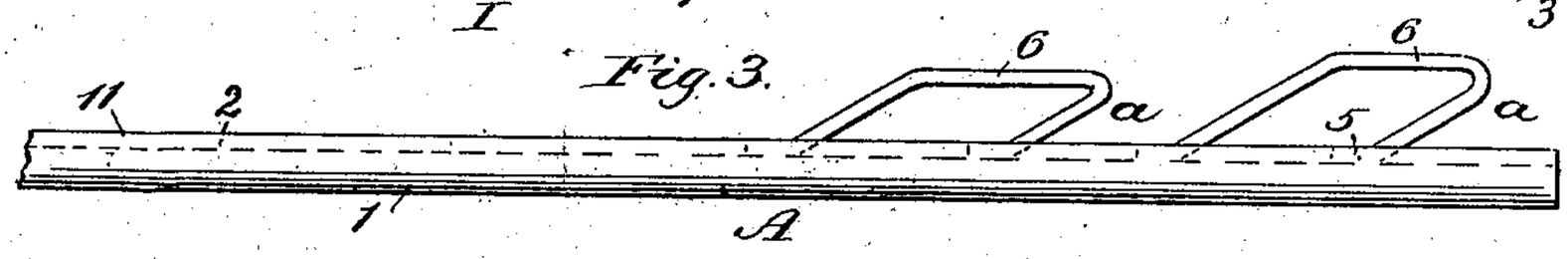


Fig. 4

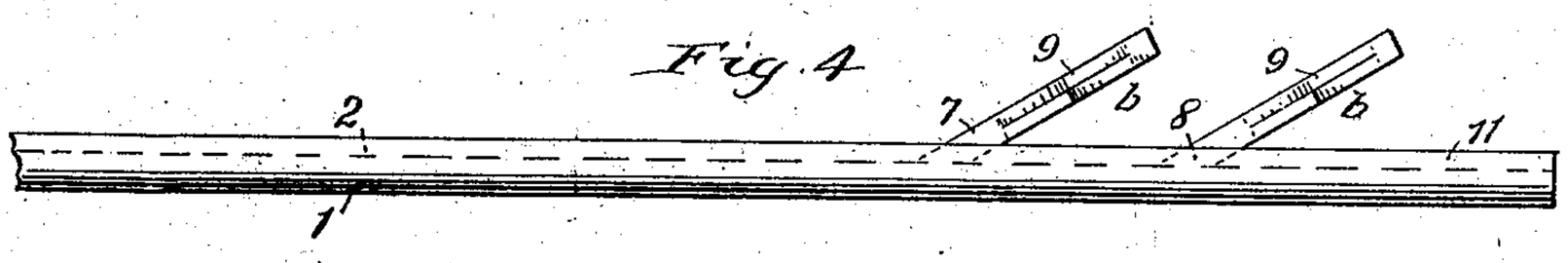


Fig. 5.

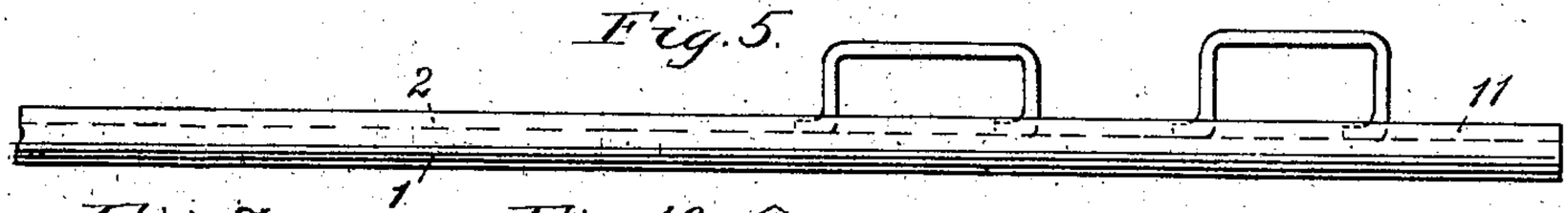


Fig. 7.

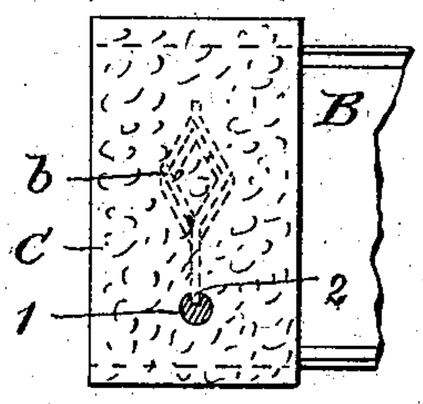


Fig. 10.

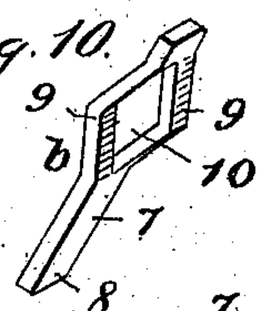


Fig. 6.

Fig. 8.

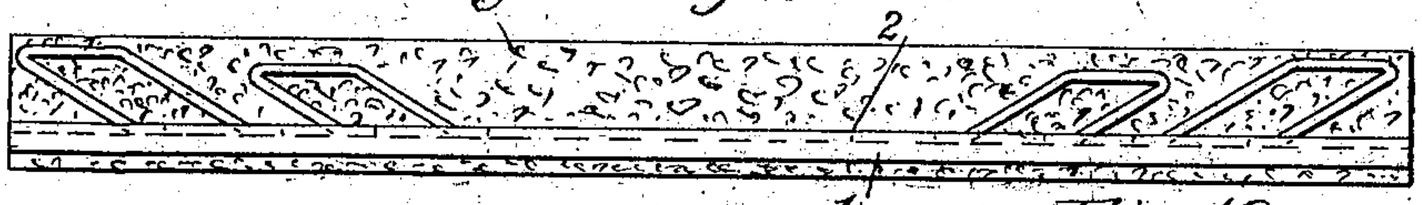


Fig. 9.

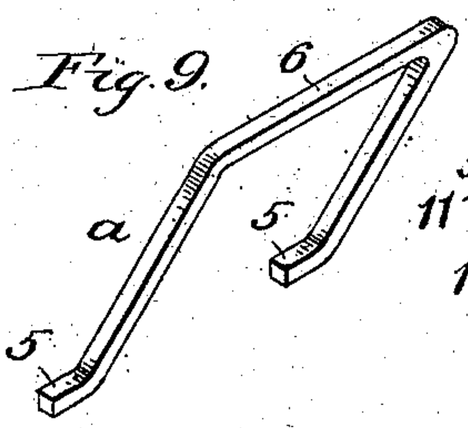


Fig. 11.

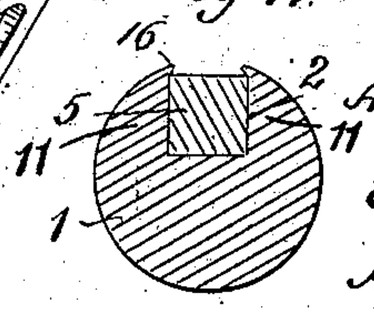


Fig. 12.

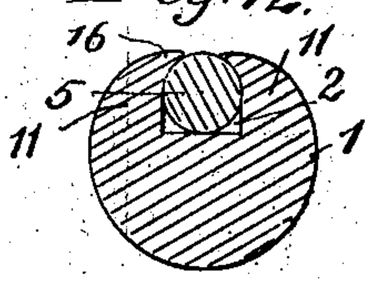
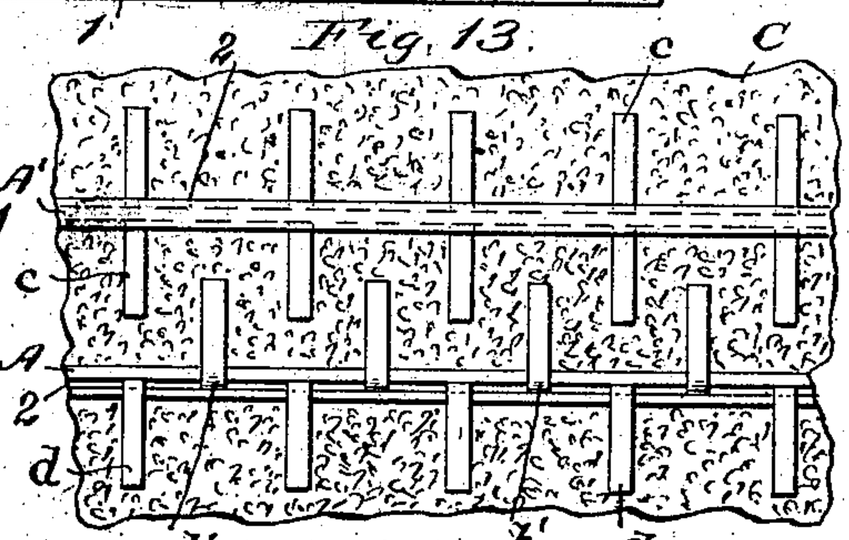


Fig. 13.



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Geo. B. Pitts.

Inventor:
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by H. N. Low
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UNITED STATES PATENT OFFICE.

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TENSION-BAR FOR USE IN CONCRETE AND THE LIKE.

No. 815,157. Specification of Letters Patent. Patented March 13, 1906.

Application filed February 20, 1905. Serial No. 246,609.

To all whom it may concern:

Be it known that I, JOHN FRENCH GOLDING, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Tension-Bars for Use in Concrete and the Like, of which the following is a specification.

My invention relates to the strengthening of cement, concrete, and the like where these materials are employed in various structures; and it consists in a tension-bar adapted to be embedded in or surrounded by such materials, the bar comprising a main longitudinal member and inclined members provided with concrete engaging or locking portions which are so arranged as to obtain a positive hold upon the material at a distance from the bar as distinguished from a mere skin frictional engagement, whereby the cracking of the material is prevented when the structure is subjected to strain and the separation of the different parts of the body of material from each other or from the said main member is rendered impossible.

It further consists in a tension-bar of peculiar construction; also, in such a bar suitably embedded in concrete or the like; also, in the parts and combinations thereof hereinafter set forth and claimed.

In order to make the invention clearly understood, I have shown in the accompanying drawings means for carrying the same into practical effect without limiting my improvements in their useful applications to the precise constructions and arrangements which, for the sake of example, I have delineated.

In said drawings, Figure 1 is a sectional view of the main longitudinal member of a tension-bar embodying my invention on line I of Fig. 2. Fig. 2 is a side view of a portion of said main member. Fig. 3 is a side view, on a smaller scale, of a portion of my improved tension-bar, showing two of the inclined or supplemental members combined with the main longitudinal member. Fig. 4 is a similar view showing supplemental members of a different form also embodying the invention. Fig. 5 is a side view showing another form of supplemental member. Fig. 6 is a side view, partly in section, of a portion of the tension-bar united with one of the floor-beams. Fig. 7 is a sectional view at right angles to Fig. 6, showing also the body of concrete around the tension-bar. Fig. 8 is a vertical sectional view of a concrete floor or beam containing a tension-bar of the form shown in Fig. 3. Figs. 9 and 10 are perspective views of the supplemental members shown, respectively, in Figs 3 and 4. Figs. 11 and 12 are sectional views across the tension-bar at the point where it is united with a supplemental member, said views showing, respectively, a supplemental member of square cross-section and one of round cross-section. Fig. 13 is a plan view, partly in section, of a portion of a floor having tension-bars embodying my invention, in this instance the supplemental members extending horizontally on each side of the grooved member.

I have herein shown and described the tension-bar as combined in a floor; but it will be understood that the invention is not confined to use in such particular structure. The word "concrete" as used herein is intended to cover all built-up structures of similar or analogous materials.

Referring to the drawings, 1 indicates the main or longitudinal member of the tension-bar A, made of suitable material, such as iron or steel, to have the necessary tensile strength. The member 1 is rolled or otherwise formed with a longitudinal surface-groove 2, extending for a portion of or by preference for the entire length of the member, and leaving a relatively heavy main body from and beyond which extend the opposing lips 11. When the bar A is combined in a floor, as shown in Figs. 7 and 8, the member 1 is laid substantially horizontally with the groove 2 on the upper side. The member 1 is or may be provided at its ends with screw-threads 3 and nuts 4, as indicated in Figs. 2 and 6.

In Fig. 3 the supplemental members are shown at *a* extending in an inclined direction upward and away from the member 1. They are provided with feet 5, securely held in the groove 2 and at a distance from the member 1, with concrete engaging or locking portions 6 arranged crosswise of or at an angle to the general direction of the supplemental member, so as to obtain a positive hold or lock on or in the concrete. Thus the portions 6 may be parallel with the member 1, as shown in Figs. 3, 5, and 8. In this particular construction of supplemental member (shown at *a*) it is formed of a bar of metal the middle of which

forms the engaging or locking part 6, the ends of which are legs extending in an inclined direction to the member 1 and the extremes of which constitute the feet 5. In order to effect the most economical distribution of metal, I usually prefer to make the supplemental members progressively a little longer or higher as the end of the main bar is approached, as indicated in Figs. 3, 5, and 8.

Another form of supplemental member is shown in Figs. 4, 6, 7, and 10 at *b*, the same having a single leg 7 and foot 8. The concrete engaging or locking portions are formed by the limbs 9 of eyes or loops 10. The latter are of diamond or other suitable shape. The members shown at *b* are or may be short sections of the tension-bar which is the subject of my Patent No. 758,061, dated April 26, 1904. The legs of the supplemental members may extend at right angles to the bar 1 instead of being inclined, as seen in Fig. 5.

The tension-rod described is or may be delivered in a knockdown condition, the supplemental members separate from the main member 1. The parts are then assembled according to the requirements of the floor or other structure, the supplemental members being spaced apart or arranged as desired in the groove 2 of the member 1, and the feet of the supplemental members are secured by forcing inward the lips or parts 11, which extend outward from and beyond the main body of the member 1, with a suitable press or swage, so as to permanently set the metal of the member 1 against or onto the sides of the supplemental members. The tension-bar A may, however, be completed for use at the factory, in which case the parts may be permanently united by a rolling process, the bar with the supplemental members inserted in its groove being passed between grooved rollers suitably shaped to upset, bend, or compress the metal of the member 1, as desired.

The preferred manner of attaching the tension-bar to the supporting-beams is shown in Fig. 6, where one of such beams is indicated at B. The end of the member 1 is inserted through an aperture in the lower part of the vertical web of the beam, and the nut 4 is set up against the web. The other end of the member is similarly secured to another beam. 13 is a tie-rod having a foot 14 secured in the described manner in the groove 2 and which extends thence in an inclined direction to the top of the beam, where it is provided with a hook 15, which engages the top flange or other convenient part of the beam. The tie strengthens and supports the member 1, strengthens the concrete at one of its points most subject to heavy strain, and keeps the tension-bar A upright during building.

The supplemental members may be of square, round, or other cross-section. The thickness of the supplemental member or of its foot may be a little less than the depth of the groove 2, Figs. 11 and 12, in which case the edges of the groove are or may be bent partly over or around the foot of the supplemental member, as indicated at 16 in said figures.

C is a body of concrete representing a floor, beam, or other structural element. It incloses the bar A and enters the spaces between or within the supplemental members.

In Fig. 13 I have shown supplemental members consisting of plain straight bars secured in the grooved bars, as already described. In this construction the supplemental members are arranged horizontally. The bar shown at A′ has two of the described grooves opposite to each other, one on each side of the bar, and the supplemental members *c* are secured some in one groove and some in the other, extending in opposite directions from the grooved bar. The bar shown at A is similar to that shown in the other figures and has the groove on its upper side. The supplemental members *d* have downwardly-bent feet *b*′, seated in the groove 2, and thence extend horizontally to each side of the bar A.

Where tension-bars are constructed with the supplemental or concrete-locking members integral with the part or parts that act as tension members, the latter cannot well be of the highest tensile strength on account of the concomitant hardness and the difficulty of cutting and forming the supplemental members from it. My present improvement allows the member 1 to be made of the highest tensile strength without encountering said difficulty, and I can get the same structural strength with less metal and weight. Also I am enabled to closely adapt the tension-bar at the place of building to the requirements of the structure, doing away with the necessity of having made to order at the factory in complete form the various tension-bars for the different parts of the building. It will be further noticed that the described means for securing the supplemental members to the member 1 leaves to the latter the full tensile strength of the metal which is contained in it. In other words, there is no metal which is wasted for tensile purposes, as would be the case if the member 1 were perforated or cut away on transverse lines.

The feet of the supplemental members are extended longitudinally in the groove of the main bar sufficiently to enable the bar to have a firm and secure hold on the supplemental member. This may be effected in different ways—for instance, by making the supplemental member wide in the direction of the groove, as shown at 8, Figs. 6 and 10, or by bending such feet in a direction parallel with the groove, as shown at 5, Figs. 3 and 9. It is to be understood that the word "ten-

sion" is herein used in connection with the bar 1 to indicate its general function in receiving the strains imposed by the concrete and its load and not in such a narrow sense as to exclude the use of my improvement from columns or other situations in which it would receive other than simple tension strains. Important advantages result from making the main bar 1 with a continuous groove or grooves. When of such shape, it can be very economically produced by a rolling process. The groove-producing flange of the roll enters and rolls and finishes the interior of the bar to a material degree, thereby giving to the bar an extra amount of rolled tough skin or surface and increased tensile strength. The bar is or may be of uniform cross-section, having no waste metal which is not utilized for strengthening purposes. The supplemental members can be arranged at any desired points along the bar, according to the requirements of the structure or building, and there secured with the greatest firmness. The grooves at their portions which are not occupied by the supplemental members are open to receive the concrete or cement and unite the bar with the same against lateral strains, giving the bar also a strong frictional hold on the concrete to prevent longitudinal displacement. In assembling the supplemental members with the bar the former will readily become seated in the groove without its being necessary to exercise great particularity as to their exact location longitudinally of the bar. The parts can be united by a simple rolling process, the bar having the supplemental members inserted in its groove or grooves being passed between rolls, which act on it from end to end and bring the walls of the groove or grooves to bear securely against the sides of the supplemental members. If the bar is not of too great cross-section, such assembling-rolls may compress the bar as a whole to bring the walls of the grooves nearer together; but my improvements are not to be limited to such precise mode of securing the parts together. If the bar be of such size that it cannot be readily compressed as a whole, I may cause the rolls to act along those parts of the bar between which the groove is situated or I may use a swaging process, as already explained.

What I claim is—

1. The combination, with a body of concrete, of a metal bar supporting such concrete and formed with a continuous longitudinal groove, and one or more supplemental members arranged in said groove at the desired points in the length of the bar and secured in the groove, substantially as and for the purposes described.

2. A metal strengthening-bar for use in concrete and the like, said bar being formed with a continuous longitudinal groove, in combination with one or more supplemental members adjustable along the groove of the bar to the desired points, the bar being adapted to be upset to secure the supplemental members, substantially as and for the purposes described.

3. The combination, with a body of concrete, of a metal bar surrounded by such concrete and formed with a continuous longitudinal groove, and one or more supplemental members secured in such groove, the open portion of the groove being adapted to receive therein, and obtain a hold on, the concrete, substantially as and for the purposes described.

4. A tension-bar for use in concrete and other purposes, consisting of a main, longitudinal, continuously-grooved member, and supplemental members arranged at desired points along the groove of said main member and having their feet or ends extending longitudinally in the groove, the metal of the main member being permanently upset to cause the walls of the groove to rigidly secure said supplemental members, substantially as set forth.

5. A tension-bar consisting of a main, longitudinally and continuously grooved member 1, and a supplemental member *a* formed with a longitudinal portion 6 arranged at a distance from the main member and with legs extending to said main member, the ends of said legs being arranged within the groove of the main member and the metal of the main member being permanently upset to cause the walls of the groove to rigidly secure such ends, substantially as set forth.

6. A tension-bar adapted to be supplied in an unassembled or knockdown condition, consisting of a main longitudinal member formed with a continuous groove 2, and supplemental members having parts fitting said groove and adapted to be arranged along such groove and spaced apart as desired, the main member being of malleable material for the securing of the supplemental members by the permanent upsetting of the material of the main member as described.

7. The combination of the tension-bar, consisting of a longitudinal and continuously-grooved member, beams supporting the ends of said longitudinal member and a tie engaging the upper part of the beam, extending in an inclined direction to said longitudinal member and having its end or foot secured by compression in the groove of the longitudinal member, substantially as set forth.

8. In combination with a body of concrete or the like, a tension-bar consisting of a main longitudinal member having a relatively heavy main body and formed with opposing lips extending outward from and beyond the main body, such lips producing a continuous groove wherein the concrete can enter, and

supplemental members arranged at desired points along the said main member and having their feet or ends between such lips, such main member having its metal permanently upset to cause the lips to rigidly secure such supplemental members, and said body of concrete being arranged to surround and engage the bar and the supplemental members and to enter between said lips of the bar, substantially as set forth.

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

JOHN F. GOLDING.

Witnesses:

H. N. Low,

Wm. H. De Lacy.