(No Model.) 2 Sheets—Sheet 1.

P. H. JACKSON.

METALLIC TIE TO RESIST PROGRESSIVE STRAINS.

No. 504,924. Patented Sept. 12, 1893.

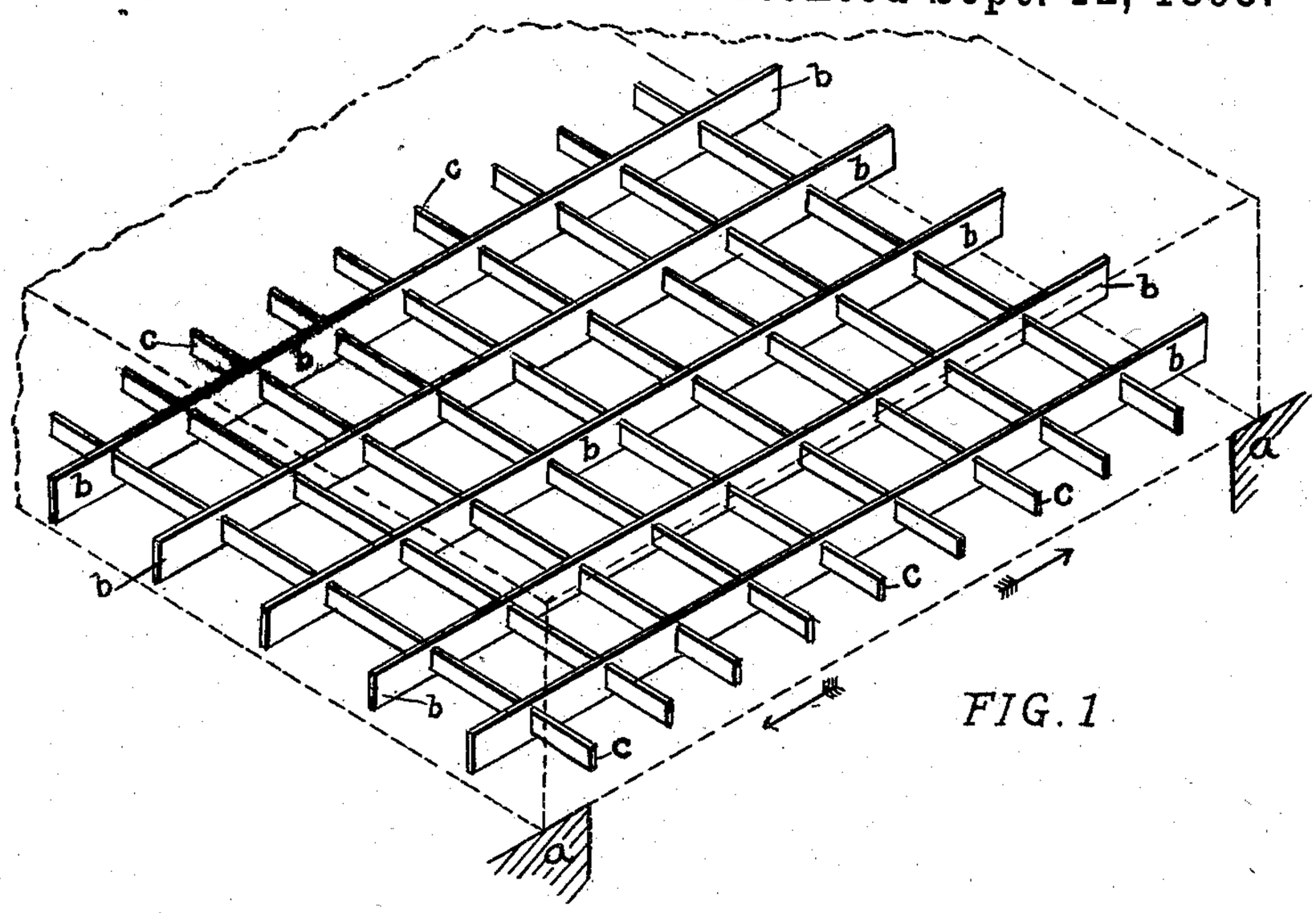

FIG. 1

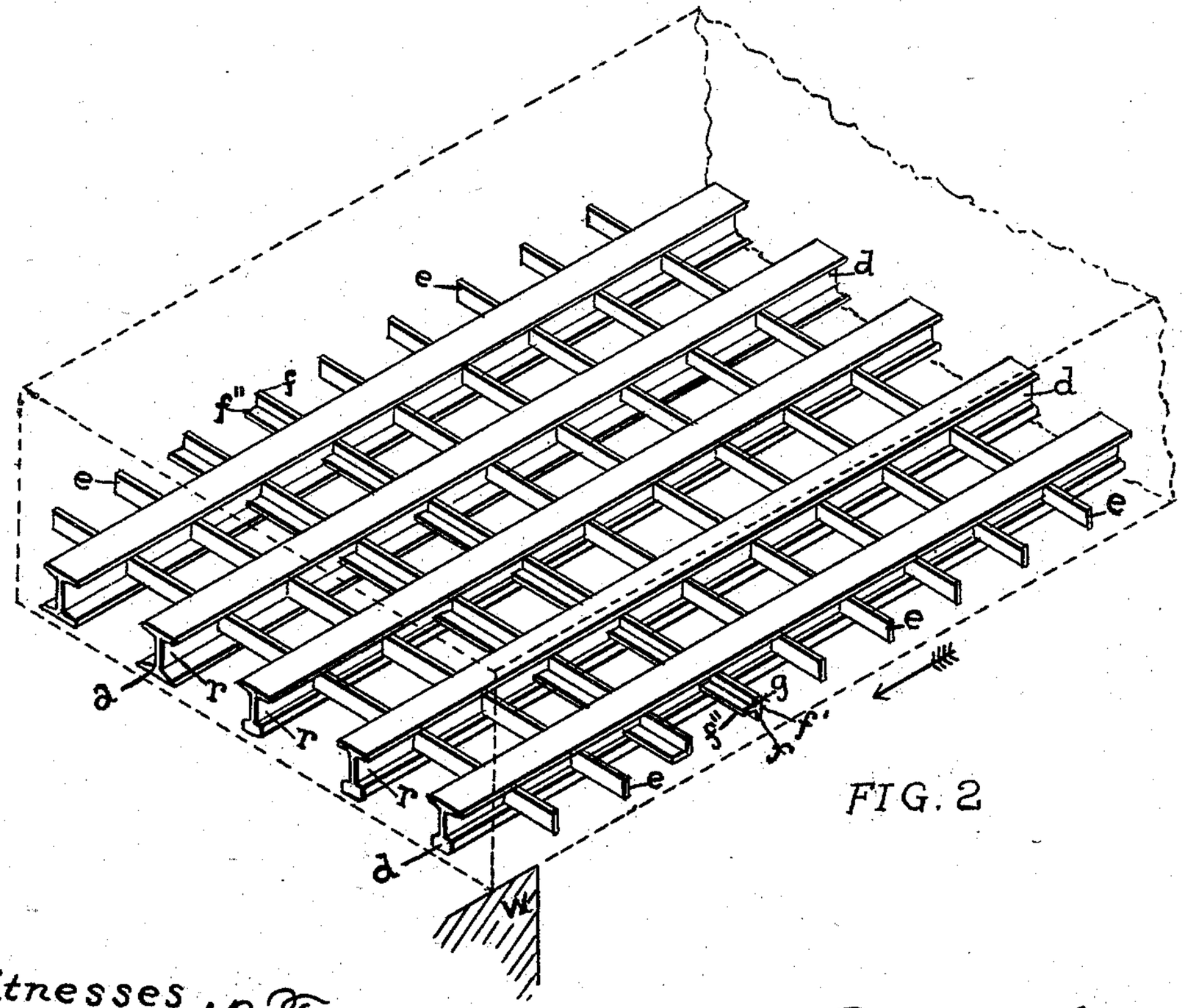

FIG. 2

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Inventor

(No Model.) 2 Sheets—Sheet 2.

P. H. JACKSON.

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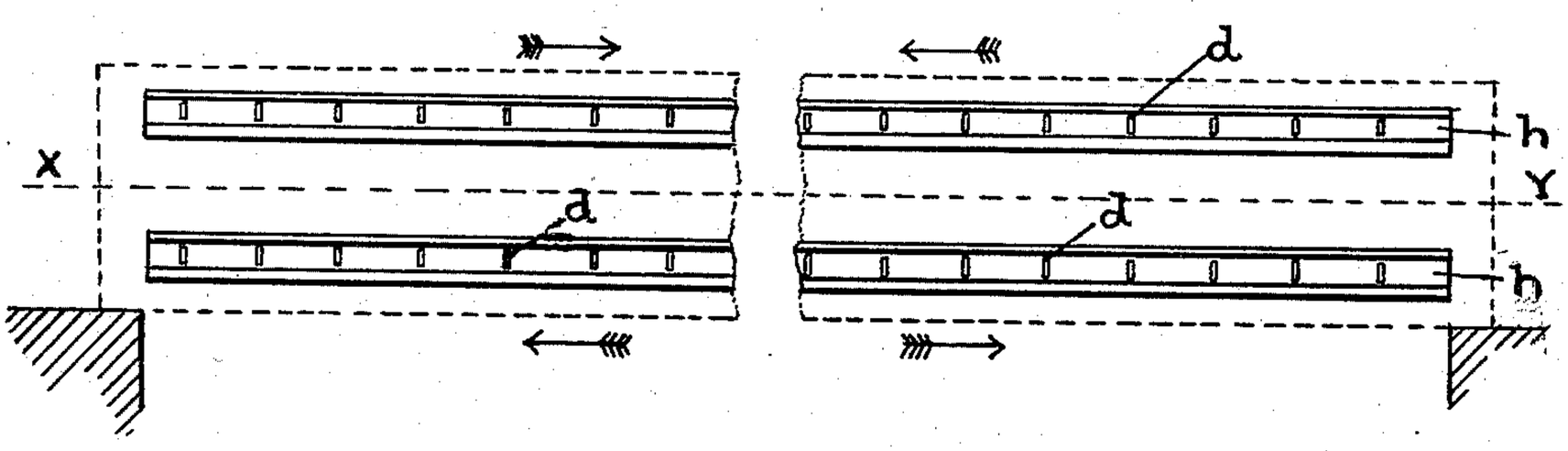
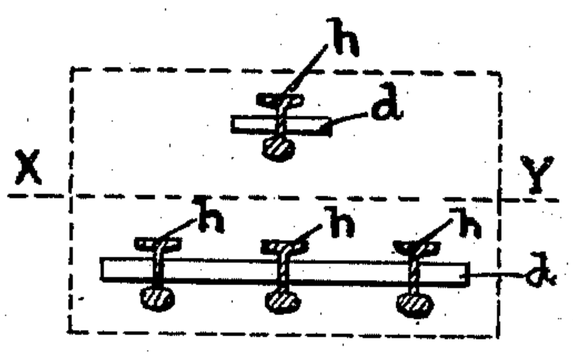
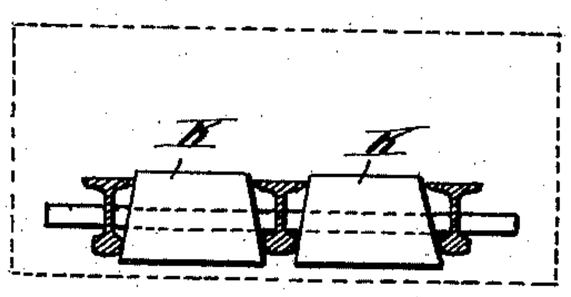


FIG 3.



CROSS SECTION



Cross Section

FIG 5

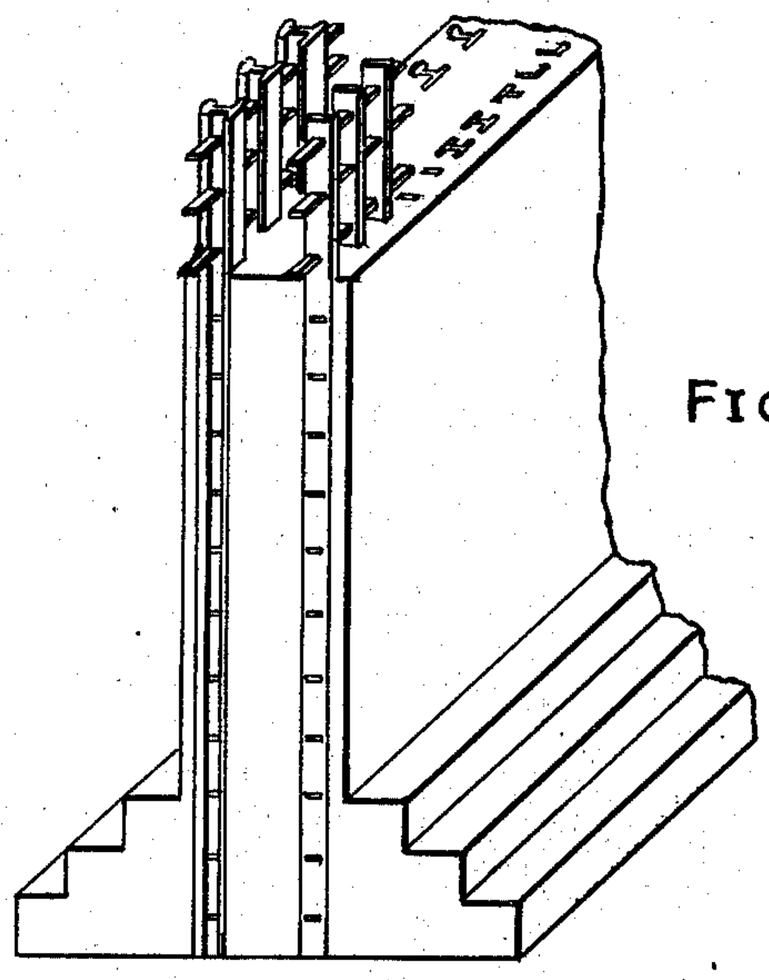
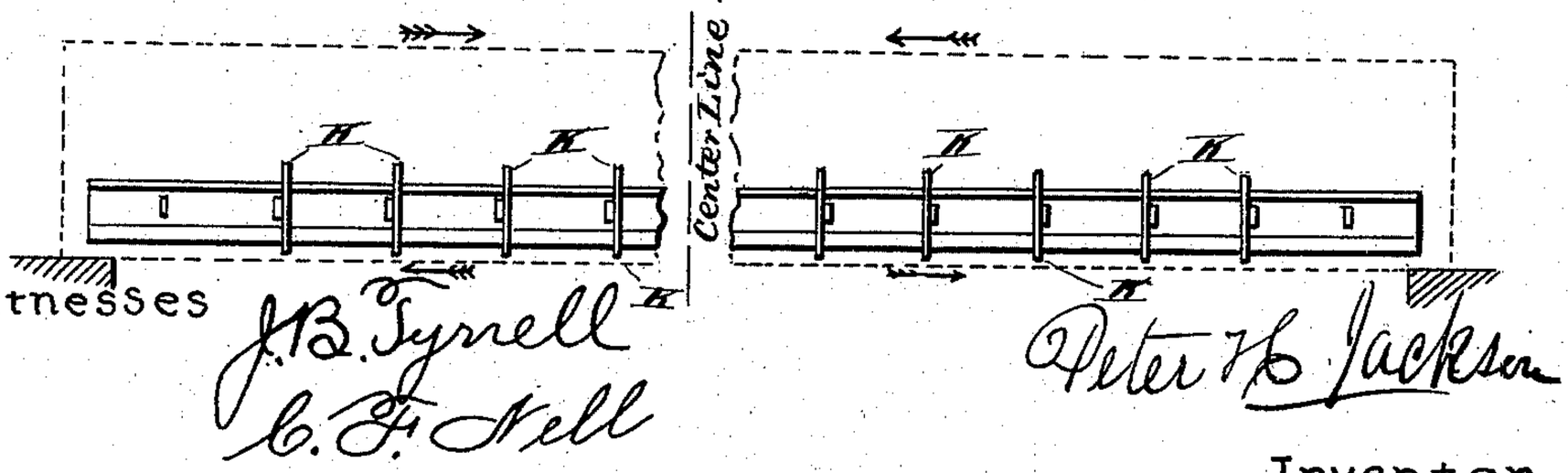


FIG. 4.

Fig. 5.a



Witnesses

J. B. Tyrell

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UNITED STATES PATENT OFFICE.

PETER H. JACKSON, OF SAN FRANCISCO, CALIFORNIA.

METALLIC TIE TO RESIST PROGRESSIVE STRAINS.

SPECIFICATION forming part of Letters Patent No. 504,924, dated September 12, 1893.

Application filed April 4, 1893. Serial No. 469,043. (No model.)

To all whom it may concern:

Be it known that I, PETER H. JACKSON, of the city and county of San Francisco, State of California, have invented an improvement in metallic ties to resist progressive strains, to be used, in combination with artificial stone, concrete, brick and mortar, stone, and similar materials, in structures such as floors, roofs, sidewalks, platforms, bridges, walls, partitions, and the like for a better holding to the cementitious material in which they are incased when subjected to great force and strain, thereby increasing the strength of the structure; and I declare the following to be a full, clear, and exact description thereof, sufficient to enable anyone skilled in the art to which this invention applies to make and use the same, reference being had to the accompanying drawings, which form part of this specification.

My improvement consists of a metal tie or ties, the main body of the tie to be either flat iron or steel, T, angle, or other shapes, combined and arranged as hereinafter described and claimed. It may be of small I beams or railroad T rails, (worn out rails preferred for economy.) Through any of these shapes, holes are punched at certain distances apart adequate for the purpose. Through these holes pass cross bars nicely fitting and having large flat surfaces on the side which the inclosing abutting material will press against during employment of the structure. Each cross bar forms a flat absolute resistant to the corresponding flat abutment formed of the inclosing cementitious material and at right angles to the force, in the manner that a skew back at the end of the masonry segmental arch resists squarely across the line of thrust.

Figure 1 represents a floor or similar structure to be employed on the beam principle, of artificial stone, concrete, or other material, resting on end bearings *a. a.* with the improved ties built in the bottom part, the portion subjected to tensile strain when the floor is employed in sustaining a load. The body of the tie *b. b.* is shown of flat iron. Through these pass flat bars *c. c.* forming a series of flat cross-resistants which prevent the inclosing cementitious abutting material from sliding over the tie when the bottom part of the structure is subjected to intense tensile strain.

Fig. 2 also represents a floor construction like Fig. 1 resting on end bearings, but with ties of small I beams or rail road T rails *d. d.* Through these pass flat bars *e. e.* Also in others are shown the cross bars of T iron *f. f.* or they may be of angle iron. The flat part *f'* is the face of resistant to the abutment *g*. *f''* is the web, making *f'* and *f''* of beam strength to resist bending between the main body of the ties; the ties tieing the floor direct and across. I prefer I shape to flat iron for the body of the tie, as with the latter the vertical hole for a wide cross bar cuts away considerable of cross section, and injures its strength to resist both tensile and transverse strains, but where there is a cross flange at top and bottom of the web, these remain for tensile strength, and being of beam form are strong in resistance to bending. Also the inclosing material extending in between the flanges to the web at *r*. stiffens the whole in resisting deflection.

Fig. 3. shows a beam or girder of concrete with three rail road T rails *h*. with flat resisting cross bars *d*. built in the bottom of the beam; when employed these resist the tensile strain in the direction indicated by the arrows, that is, from the center each way toward the ends. As there would not be sufficient concrete material above the neutral line X. *y*. to resist the compressive force required to balance the lower part subjected to tensile strain; to meet the deficiency one of the same kind of ties *h*. is shown in the top part of the beam.

Fig. 4 represents a wall with the ties built in near each surface to resist tensile strain or compressive force due to pressure from either side or from unequal settlement of foundation causing the wall to be out of plumb. These ties may be employed in any floor, sidewalk or bridge construction of concrete or like material. In such cases it is usual to make the structure in segmental arches. The ties would be incorporated along the footings of the arches in the parts subjected to tensile strain. These constructions may be of any of the materials described. The cementitious material (which is preferred to be of Portland cement either neat or mixed) cements the ties in its embrace and at the same time cements the surrounding brick,

stone or other material of which that part of the structure is composed.

This improvement is the result of many experiments made by me with segmental and flat arched floors and sidewalks, also slabs and beams, full size and with models, mainly of artificial stone and concrete combined with Hyatt metallic ties patented July 16, 1878, No. 206,112. When the projections are formed integral on bars of large size to resist great strains as shown in Figs. 3 and 4 of that patent, the rolling mills are unable to make the projections sufficiently extended to hold the inclosing material which breaks away before the tie ruptures. Besides the projections have to be of tapering form to leave the rolls during manufacture. When the cross rods are round extending through the tie as shown in Figs. 5, 6, 8, and 9 of that patent, I find by experiment from their rounded or tapering shape fitting into the half round surface or socket abutments on the pressing sides, the wedging metal crushes into the softer material before the tie ruptures. These ties bear the same relation in their tensile employment in a structure employed on the beam principle, that the bottom flange of a made up wrought iron beam or girder bears to the other parts. The bottom flange of a beam or girder is held and secured by rivets to its web at very short distancee apart over its length, and meet the progressive strains from the bearings to the center of span. The bottom flange during employment in every instance should tear asunder from tensile strain, and is so computed, before the rivets give way which hold it to its web. Also the tie or ties in the concrete or like combination beam or other structure employed on the beam principle, should in every instance rupture before it would slip or break away from the embrace of the cementitious material in which it is inclosed. To meet this requirement is the object of this improvement. A twisted rod for a tie in these constructions, instead of the projecting surfaces being at right angles to the direction of tensile resistance, offers only limited projecting edges, which operate at more or less oblique angles to it. These slanting edges are terminations of a series of inclined planes, generally verging more toward the length than in a cross direction to the tie.

Fig. 5 represents three ties consisting of rail road T rails or small I beams with flat cross bars extending through the webs. Between the rails and resting against the flat cross bars on the thrust side, or side which the inclosing material will press against in the structure during employment, are loose metal plates *k*, which present increased flat resisting areas for the softer inclosing material to press against. Fig. 5ª shows the construction in side view. These plates may be made to any required size, and are intended for the larger structures and to be placed to resist the greatest strains, which would be other than near the bearings.

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

1. The means for strengthening structures of artificial stone, concrete, brick and mortar, stone or similar materials, comprising a peculiarly formed metallic tie or ties embedded near either surface so as to resist compressive force or tensile strain, performing the functions similar to either the top or bottom flanges of an iron or steel supporting beam; said ties consisting of flat, T, angle, or other shaped bars of iron or steel, with cross bars extending through them presenting flat resisting surfaces to the abutting material in which they are inclosed, substantially as herein described.

2. The means for strengthening structures of artificial stone, concrete, brick and mortar, stone or similar materials comprising metallic ties embedded near either surface so as to resist compressive force or tensile strain, performing the functions similar to either top or bottom flanges of iron or steel supporting beams, said ties consisting of a web and top and bottom flanges of iron or steel, with cross bars extending through the web between the flanges, and presenting flat resisting surfaces to the abutting material in which they are inclosed, substantially as herein described.

3. The means for strengthening structures of artificial stone, concrete, brick and mortar, stone or similar materials comprising metallic ties emdedded near either surface so as to resist compressive force or tensile strain, performing the functions similar to the top and bottom flanges of iron or steel supporting beams, said ties consisting of flat, T, angle, or other shaped bars of iron or steel, or small I beams,—or railroad T rails, with cross bars extending through them, and plates resting against the cross bars presenting extended flat surfaces to the abutting material in which they are inclosed, substantially as herein described.

PETER H. JACKSON.

Witnesses:
J. B. TYRRELL,
C. F. NELL.