June 6, 1939. J. P. CORDOVA 2,161,337

STIFFENING TRUSS

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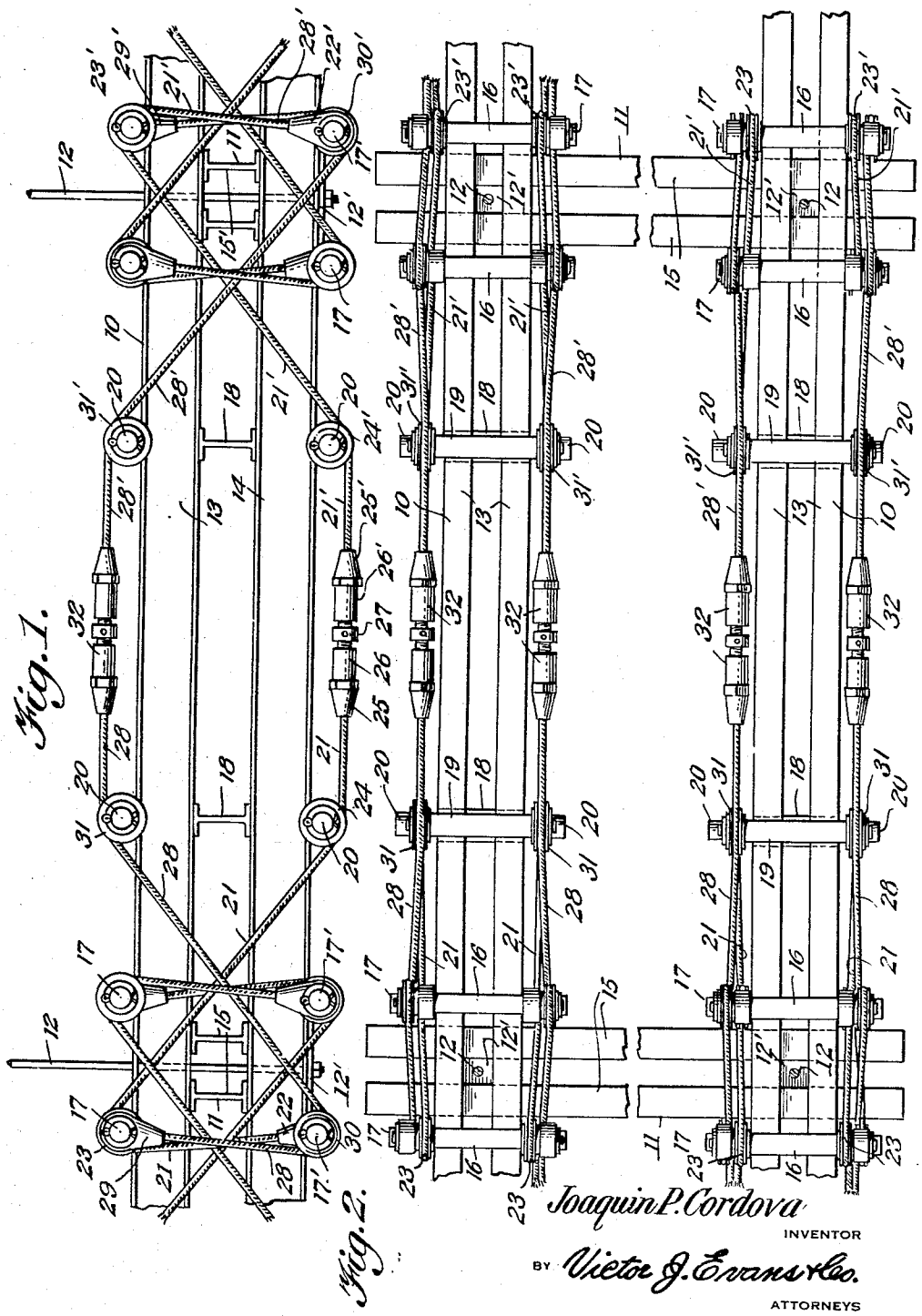


Fig. 1.



Fig. 2.

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Fig. 3.

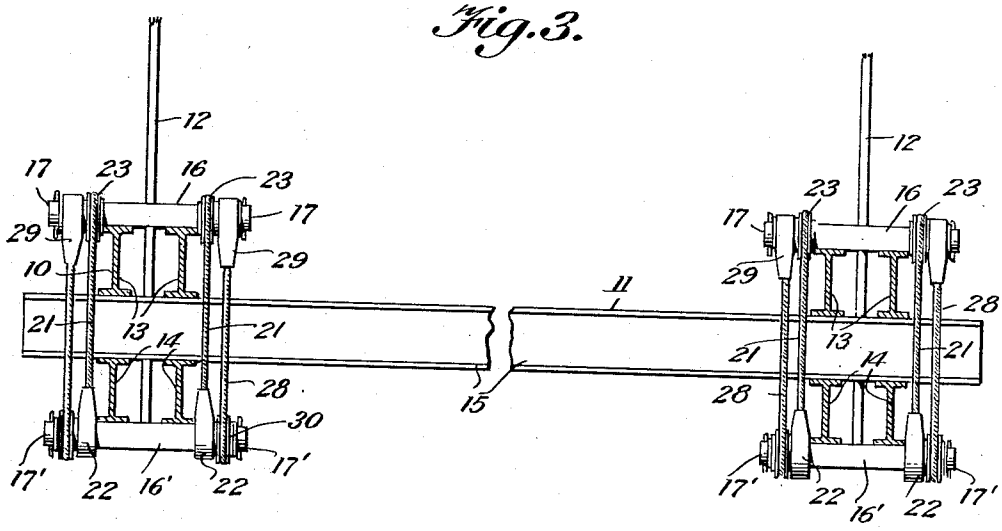



Fig. 4.

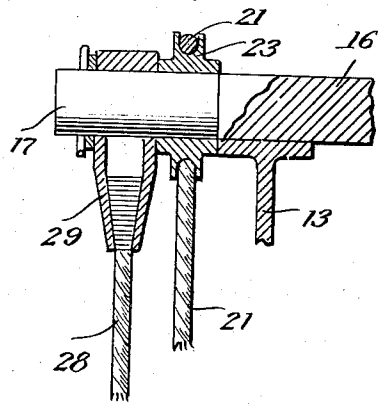
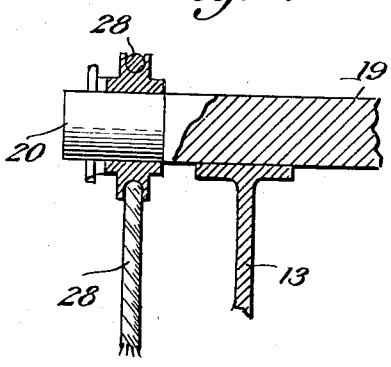



Fig. 5.




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# UNITED STATES PATENT OFFICE

2,161,337

## STIFFENING TRUSS

Joaquin Pedrero Cordova, El Paso, Tex.

Application April 25, 1938, Serial No. 204,202

4 Claims. (Cl. 189—37)

This invention relates to stiffening trusses and more particularly to supporting beam trusses for floor spans and the like.

The invention has for its principal object to improve generally upon beam structures by minimizing the weight and at the same time more effectively providing increased resistance to vertical stresses as well as torsional strains.

A further object is to provide for a practical and highly effective utilization of tension and binding cables in connection with the structural body elements of the beam whereby to not only secure characteristic trussing qualities in the assembled structure but to make it easy to transport the several parts and facilitate assembly thereof.

Another important object of the invention is to provide for a practical utilization of structural steel elements in pairs in the structure so as to more effectively overcome torsional stresses.

With the foregoing and other objects and advantages to be attained, as will hereinafter more fully appear, the invention consists in the general assembly and in the parts and combinations and arrangements of parts thereof, as hereinafter described and pointed out with particularity in the appended claims, reference being had to the accompanying drawings illustrating a practical adaptation of the invention, and in which

Figure 1 is a side elevation illustrating an adaptation of the invention to a floor supporting beam assembly;

Figure 2 is a top plan view;

Figure 3 is a cross sectional and end elevational view;

Figure 4 is a fragmentary sectional view showing details of the cable end attachment and associated cable supporting sheave; and

Figure 5 is a fragmentary sectional view illustrating the mounting for the cable supporting sheave which is associated with the strut element of the beam.

Referring now to the drawings, wherein a supporting beam assembly for a floor span is illustrated, the numeral 10 designates generally the longitudinal supporting beams and the numeral 11 the transverse floor beams, the assembly as illustrated being that of a bridge structure and supported by vertical rods 12.

As shown, each longitudinal supporting beam 10 comprises an upper chord including a pair of I-shaped structural steel members 13 which are spaced some distance apart and a lower chord including a like pair of I-shaped members 14. The transverse floor beams 11 each includes a pair of structural steel members 15 which are spaced apart and have their opposite end portions projected between the upper and lower chord members 13 and 14 of the longitudinal beams and may be fastened thereto in any desirable manner, by a welding process or otherwise.

Extending across the top of the upper longitudinal beam members 13, and secured thereto, preferably by welding, are transverse tie members 16 which, as shown, are of generally square cross section but are formed with cylindrical end portions 17 which project some distance outwardly beyond either side of the beam members 13.

In the illustration in the drawings, which is for an adaptation of the invention to a multiplicity of adjoining floor spans, said cross tie members 16 are arranged in pairs, there being one of the members on each side of the transverse floor beams 11, whereas, in the case of a single floor span there may be only one of said cross members correlated to each transverse floor beams 11 and that the single cross member being located at the outer side of the transverse floor beam. In either case, corresponding cross tie members 16' are located on the under side of the lower chord members 14 of the longitudinal supporting beam.

At two points between the transverse floor beams 11 of each panel, strut members 18 are inserted between the upper and lower chord members 13 and 14 of the longitudinal supporting beam and, directly above each strut member 18, cross tie members 19, similar to the cross tie members 16, are secured on the upper side of the upper longitudinal beam members 13, while similar cross members are provided on the under side of the lower longitudinal beam members 14, said members 19 having cylindrical end portions 20.

The trussing of the structure in accordance with the present invention will now be described. Generally stated, the trussing means includes opposed flexible tension elements which operate to effectively tie the structural beam parts together as well as resist strains thereon.

For trussing the longitudinal beam against downward deflection between the beam supporting rods 12, which latter, as shown, have plates 12' attached to their lower ends and on which the lower chord members 14 of the beam rest, a pair of cable sections 21 having socket members 22 at their outer ends are attached to the cylin-

drical end portions 17' of the cross tie member 16' which is located on the under side of the lower chord members 14 of the longitudinal beam, said cable sections 21 being carried up over sheaves 23 on the ends 17 of the upper cross member 16 directly above the lower cross member 16' to which the ends of the cable sections are attached and thence downwardly under sheaves 24 located on the ends 20 of the lower cross member 19 beneath the next adjacent strut element 18, the inner ends of said cable sections 21 being secured to socket portions 25 having internally screw threaded extensions 26 for the reception of the turnbuckle screw element 27, there being complemental cable elements 21' leading from socket members 22' attached to the lower cross member 16' at the outer side of the opposite floor beam 11 and being carried over sheaves 23' and thence under sheaves 24' corresponding to the sheaves 23 and 24, the ends of the cable sections 21' being provided with turnbuckle elements 25' and 26' corresponding to the elements 25 and 26 of the other cable elements to which they are joined by the screw element 27.

By tightening the turnbuckles between the complemental cable sections 21 and 21' on each side of the longitudinal beam, the joined cable sections are drawn taut and placed under tension, thereby binding the transverse floor beam members 15 between the upper and lower chord members 13 and 14 of said longitudinal supporting beam and exerting a force upwardly upon the chord members 13 and 14 in the region where the strut members 18 are provided and beneath which the lower cross members 19 are located.

To resist upward deflection of the longitudinal supporting beams, an inverse arrangement of cable sections 28, similar to the cable sections 21, is provided in connection with cable sections 28' corresponding to the cable sections 21', said cable sections 28 being carried downwardly from their end socket members 29 which are mounted on the ends 17 of the upper cross member 16, thence under sheaves 30 on the lower cross member 16' and upwardly over sheaves 31 on the upper cross member 19, while the complemental cable sections 28' are carried downwardly from their socket members 29' on the corresponding cross member 16 adjacent the opposite floor beam 11, thence under sheaves 30' and up over sheaves 31' where they are joined to the cable sections 28 by turnbuckles, designated generally by the numeral 32, comprising the same elements as the hereinbefore turnbuckles by which the cable sections 21 and 21' are connected.

By tightening the opposed upper and lower cable sections a substantial stiffening truss is provided for the longitudinal supporting beam which is readily adjusted by manipulation of the respective turnbuckles so that, by the relative arrangement and location of the transverse floor beams 11 and the strut members 18 and the particular correlation of the respective cross tie members 16, 16' and 19, not only is a substantial trussing effect obtained, but there is produced a binding effect of the longitudinal beam members 13 and 14 upon the interposed floor beam members 15 and strut members 18 whereby the stability of the structure is materially increased and the fastening means between said parts is relieved of considerable strain thereon and thereby making it possible to materially simplify the means of fastening at those particular points. So, too, in accordance with the trussing system of the present invention by the utilization of cables as the tension elements in connection with the laterally spaced pairs of upper and lower chord members for the beam, the weight of the structure is materially reduced and at the same time torsional strains are more effectively resisted. Furthermore, the structure is not only economically produced but the several parts are easily transported for assembly at the place of use, as well as fabricated at the factory and transported in the assembled condition.

Obviously, the structure admits of considerable modification within the spirit of the invention as defined by the appended claims. The invention, therefore, is not limited to the specific construction and arrangements shown in the accompanying drawings.

What is claimed is:

1. In a trussed beam, an upper longitudinal beam member and a spaced lower longitudinal beam member, strut-like means interposed between the opposite end portions of said spaced beam members, an opposed spaced pair of strut elements between said beam members intermediate said end strut-like means, flexible tension means comprising complemental cable sections, each cable section being attached at its outer end to the end portion of one of said beam members adjacent the end strut-like means, said cable sections being carried from their attached end portions over opposed supports on the opposite beam member and thence over supports on the first mentioned beam member adjacent the respective intermediate strut elements between said end strut-like means, turnbuckle means connecting the inner ends of said cable sections, and inversely arranged flexible tension means including an opposed like set and mounting of the cable elements.

2. In a trussed beam, a laterally spaced pair of upper longitudinal beam chord members and a spaced lower pair of correspondingly laterally spaced chord members, opposed transverse floor beam members having their end portions supported between adjacent portions of the upper and lower longitudinal beam chord members, an opposed pair of strut elements extending transversely between said upper and lower pairs of the beam chord members and intermediate said floor beams, cross tie members attached to the upper sides of the upper beam chord members and respectively adjacent said floor beams and said strut elements, opposed correspondingly correlated cross tie members on the under side of the lower beam chord, a flexible tension element including complemental pairs of cable sections on opposite sides of the longitudinal beam, each cable section of a pair being attached at one end to a cross tie member on one of the longitudinal beam chord members and carried over a sheave on the cross tie member of the opposite beam chord member and thence over a sheave on the cross member on the first mentioned beam chord in opposed relation to a companion strut member between the beam chords, the inner end portions of said complemental cable sections being connected by a turnbuckle, said pairs of complemental cable sections being inversely arranged in opposed sets whereby to stiffen the beam structure and resist vertical stresses both upwardly and downwardly between the transverse floor beams.

3. In a trussed beam, an upper longitudinal beam member and a spaced lower longitudinal beam member, strut-like elements interposed between the end portions of said longitudinal beam

members, strut means located between said longitudinal beam members intermediate said strut-like end elements, and a flexible tension element attached at its opposite ends to one of said longitudinal beam members adjacent said strut-like end elements, said flexible tension element being carried over a support on the opposite longitudinal beam member and having its intermediate portion looped reentrantly over a support on the first mentioned longitudinal beam member in correlation to the intermediate strut means between said longitudinal members.

4. In a trussed beam, an upper longitudinal beam member and a spaced lower longitudinal beam member, strut-like elements interposed between the end portions of said longitudinal beam members, an opposed spaced pair of strut elements between said longitudinal beam members intermediate said end strut-like elements, flexible tension means comprising complemental cable sections, each cable section being attached at its outer end to the end portion of one of said longitudinal beam members adjacent an end strut-like element, said cable sections being carried from their attached end portions over opposed supports on the opposite longitudinal beam member and thence reentrantly over supports on the first mentioned longitudinal beam member adjacent the respective intermediate strut elements between said end strut-like elements, and turnbuckle means connecting the inner ends of said cable sections.

JOAQUIN PEDRERO CORDOVA.