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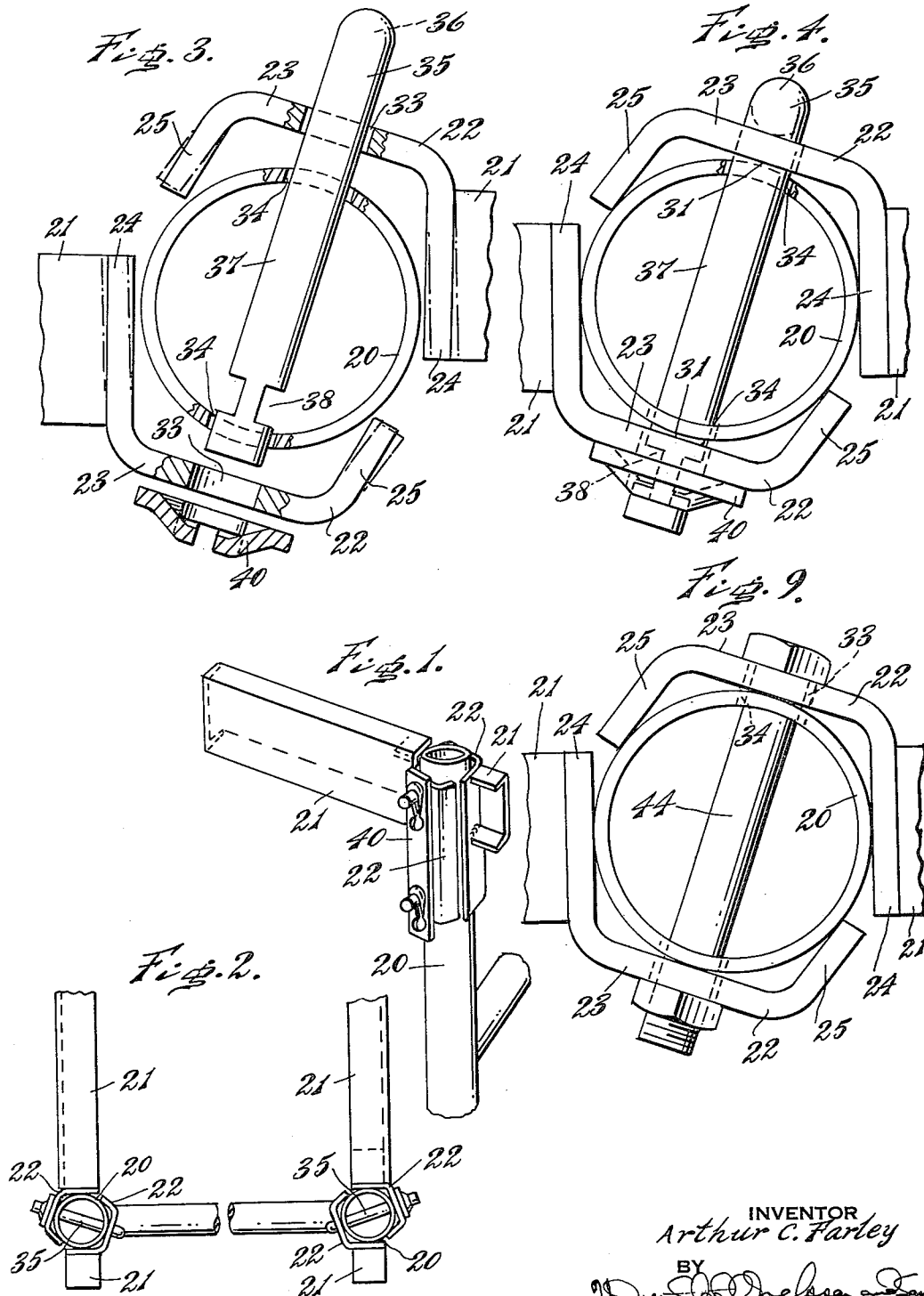
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3,096,107

STRUCTURAL CONNECTION

Filed June 29, 1960

2 Sheets-Sheet 1



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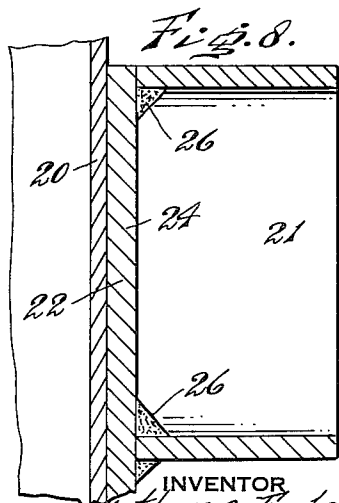
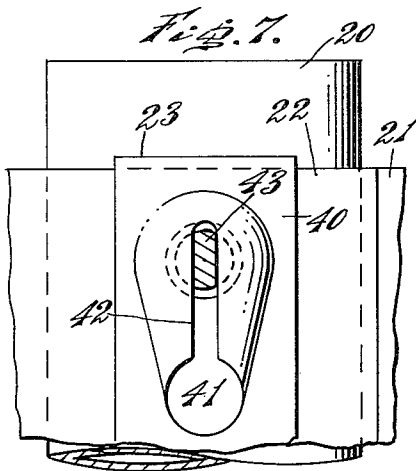
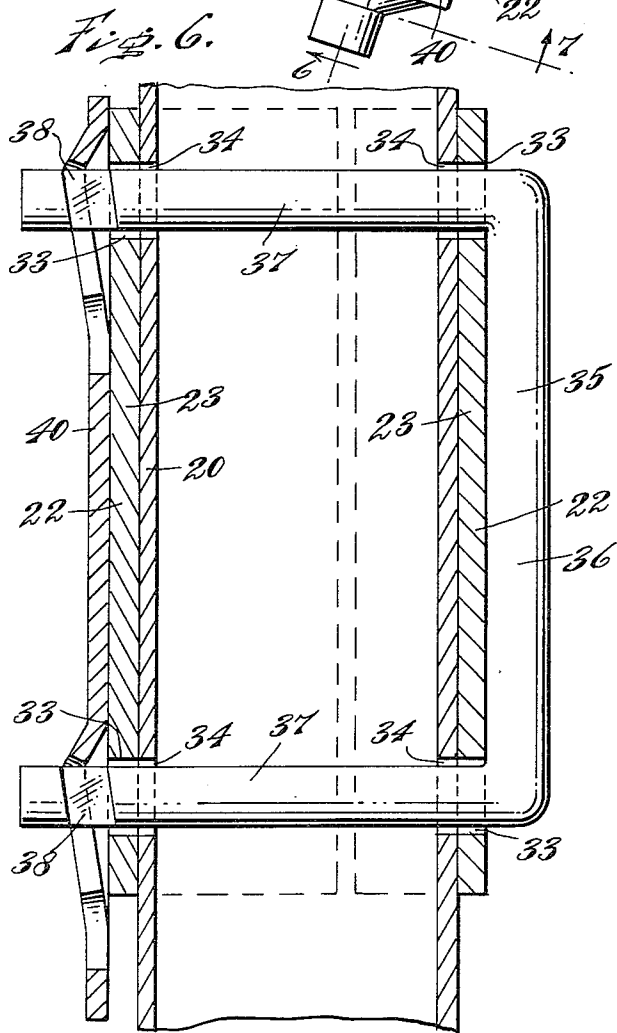
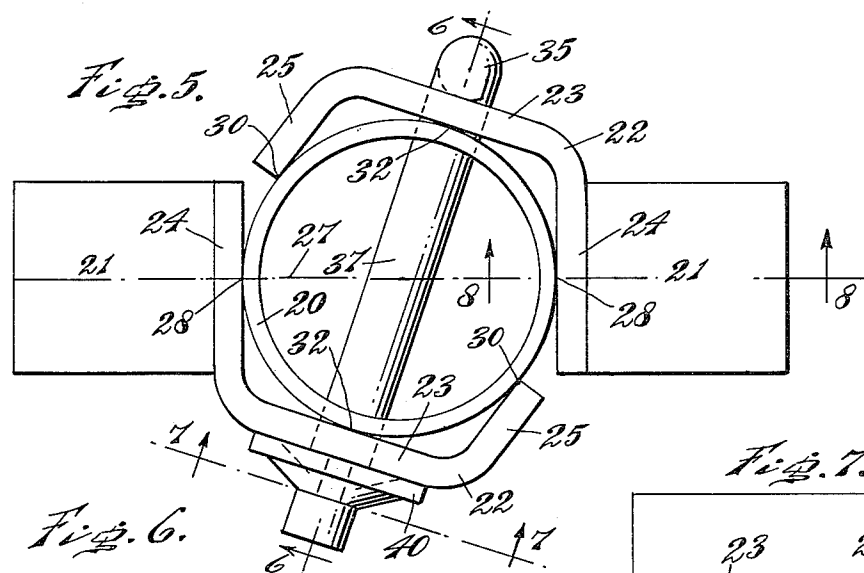
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STRUCTURAL CONNECTION
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3 Claims. (Cl. 287—54)

The present invention relates to structural connections of metallic members of the type which are suitable for building constructions, warehouse frameworks and the like.

A purpose of the invention is to permit removal of a beam section from a column laterally without interfering in any way with other beam sections or requiring change in the position of the column.

A further purpose is to avoid accumulation of tolerance variations longitudinally of a structure which uses a locking yoke acting against a round column.

A further purpose is to provide inequality in the yoke arms so as to favor connection to a beam.

A further purpose is to grip the yoke by a C-pin and a locking plate, which will insure that the same tension will be applied at two positions longitudinally along the column.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate a few only of the numerous embodiments in which my invention may appear, selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

FIGURE 1 is a fragmentary perspective showing the device of the invention applied to interconnect a column with beams extending horizontally in both directions.

FIGURE 2 is a fragmentary top plan view of the structure in FIGURE 1, showing two columns.

FIGURE 3 is a fragmentary top plan view showing the parts in process of assembly.

FIGURE 4 is a fragmentary top plan view showing the parts partially assembled, prior to the application of tension by the C-pin.

FIGURE 5 is a fragmentary top plan view showing the completed assembly after tension has been applied by the C-pin and locking plate.

FIGURE 6 is a fragmentary section on the line 6—6 of FIGURE 5.

FIGURE 7 is a fragmentary section on the line 7—7 of FIGURE 5.

FIGURE 8 is a fragmentary section on the line 8—8 of FIGURE 5.

FIGURE 9 is a fragmentary top plan view of the completed structural connection of the invention showing a variation.

Describing in illustration but not in limitation and referring to the drawings:

The structural connection of the present invention is of the character shown in my U.S. Patent No. 2,919,149, granted December 29, 1959, for Structural Connection.

One of the problems created by the structural connection of my previous invention is that when a number of columns are provided at intervals and they are connected by yokes and beams, it is not possible to disassemble to remove an individual beam at an intermediate point without either displacing a whole line of columns, or attempting to slide the beam up to the top and remove the yokes and the beam above the columns, if this is possible.

One of the advantages of the device of the present invention is that it is possible to disassemble to remove an individual beam and its yokes laterally without displacing any of the columns or any of the other beams.

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A further problem which has been created by the device of my prior invention is that the base of the yoke is on the line of centers of the columns. In view of the fact that there is a substantial tolerance variation in the yokes, and the yokes are not always tightened to bring the base of the yoke "home" against the column, an accumulation of tolerance variation occurs longitudinally of the structure from column to column, especially in a long structure which may be several hundred feet long or even longer. The result of the accumulation of tolerance variation has in some cases been pantographing of the structure.

In the present invention, the point of contact of one of the arms of the U with the column is along the line of centers of the columns, so that there is less likelihood that difference in tightness or slight difference in bending of the yokes may cause accumulation of tolerance longitudinally of the structure.

In some cases the widths of the beams are such that the lengths of the arms of the U provided in my prior invention have not been adequate for effective manufacture of butt joints to the yoke. One of the features of the present invention is that in the preferred form one arm of the yoke is made longer so as to make an effective butt joint to the beam.

Reliance was placed in the prior invention particularly upon bolts for tightening the yoke at two positions along the length of the column. In order that this tightness might be the same at both positions, it was important to use a torque wrench.

One of the features of the present invention is that the yoke is tightened by a C-pin and a locking plate, and therefore since the tightening at both longitudinal positions along the column is cooperatively related, it is possible to assure the same tightness without the need of a torque wrench.

Considering first the form of FIGURES 1 to 8 inclusive, I there illustrate columns 20 which are shown as metallic tubing or pipe, for example steel or aluminum alloy, but in some cases may be solid metallic bars of circular cross section if desired.

The columns are connected longitudinally by beams 21 which in some cases are broken away to facilitate illustration. While the beams are shown as being channels, it will be understood that they may have other sectional forms, such as I-beams, H-beams, angles and the like, of structural metal, such as steel or aluminum alloy.

Connection of each beam to the column is accomplished by means of a metallic yoke 22 which extends longitudinally of each column and is composed of a flat U-base 23, a first arm 24 of the U which is suitably straight and a second arm 25 of the U which is desirably shorter and also suitably straight. The arms of the U in their initial position before assembly and also in their final position after assembly diverge from one another as shown in the drawings.

The metallic beam 21 abuts against the arm 24 of the U, and is secured thereto as by welding at 26, the center line 27 of each of the beams 21 passing through the point of contact 28 of the arm 24 of the U with the column in assembled position as shown in FIGURE 5.

Thus it will be evident that the yoke when viewed in top plan fully assembled as in FIGURE 5 is disposed diagonally to the direction of the beam 21.

The arms of the yoke are disposed on opposite sides of the generally circular column and extend longitudinally of the column. The arms of the yoke come into engagement with the curved surface of the column at generally opposed positions 28 and 30 (FIGURE 5) on the column which are spaced by a distance less than the diameter of the column.

Now it will be evident from FIGURE 3 which shows the initial assembly of the yoke and the beam to the column, and from FIGURE 4 which shows the yoke and the beam further assembled but before tension is applied, that in relaxed position, when the yoke is in contact with the column, the base of the yoke is spaced from the column a substantial distance at 31. When however the yoke is tightened with respect to the column, the base of the yoke moves closer to the column as shown in FIGURE 5 and may actually contact the column as indicated at 32.

The base of the yoke is provided near the top and near the bottom with openings 33 which are in line one above another, and there are corresponding openings 34 through the column.

The clamping tension is desirably applied to the yokes and the column by a C-clamp 35 of U shape having a base 36 of the U and arms 37 of the U which extend through the openings in the yokes and in the column. At positions beyond the yoke and adjoining the outer ends of the arms of the U, there are notches 38 at the sides of the C-pin, said notches desirably being disposed in a sloping direction as later described.

At the side of the assembly, opposite from the base of the U of the C-pin, a metallic clamping plate 40 is placed which has in line with each of the arms of the U of the C-pin holes 41 which will pass the ends of the C-pin and then slots 42 connecting with the top edges of holes 41, which will pass the portion of the C-pin at 43 between the notches 38. The C-pin along the length of the slots 32 tapers as best seen in FIGURE 6 from a position adjacent the base of the yoke at the bottom to a position remote from the base of the yoke at the top, and the notches 38 in the C-pin slope correspondingly, so that as the locking plate 40 is moved down with respect to the column it will progressively exert locking tension on the C-pin and will equally exert locking tension at both the top and the bottom of the C-pin.

In the assembly of FIGURES 1 to 8 inclusive, I illustrate yokes applied to both sides of the column, for securing beams extending in both directions, but it will be understood that at the end positions there will be only a beam and yokes at one side rather than both sides, and in this case C-pins with shorter arms are used.

In operation of the form of FIGURES 1 to 8, after the elements have been constructed, the assembly is accomplished by bringing the yokes and beams together as shown in FIGURE 3 and then inserting the C-pin and the locking plate as shown in FIGURE 4, and finally driving the locking plate downwardly as with a hammer or hydraulic jack to resiliently spread the arms of the yokes as suggested by the dot-and-dash lines of FIGURE 3 and bring the points of contact 28 of the beams into line with the center line 27 of the beams and the columns, and also diminish the space at 31 between the bases of the yokes and the columns and preferably bring the bases of the yokes into engagement with the columns at 32.

A spreading action of the arms of the yoke occurs which applies residual stress to the columns transverse to the tension of the C-pin.

It will be evident that in order to remove a single beam it is merely necessary to loosen the C-pins at both ends and the beam can be lifted out laterally without change in the position of the columns.

It will also be evident that since the arm of the U where it engages the column at 28 is in the line of centers of the columns and beams, there will be no tendency for slight variations in tightening of the yoke to appreciably affect accumulation of tolerance in a long structure which might cause pantographing.

It will also be evident that using the C-pins there is no need for employing the torque wrench to equalize tension at the top and bottom.

It will further be evident that the inequality of the

arms of the yoke allows enough room for the long arms of the yoke to abut against the beams, while the arms 25 do not interfere with the long arms of the other yoke at the column.

In some cases it will be preferred to use a bolt 44 at the top and at the bottom in place of the C-pin and locking plate. In this case the bolts should be tightened under the control of a torque wrench for best results.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

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

1. In a structural connection, a first metallic member of generally round cross section, a second metallic member extending generally transversely to the first member, a metallic connector yoke having a generally flat base and arms of the yoke which diverge from the base, said second metallic member being secured in abutting relation to one of the arms of the yoke, the arms of the yoke being disposed on opposite sides of said first member and extending longitudinally of said first member and the arms coming into engagement with the curved surface of said first member at generally opposed positions on the first member spaced by a distance less than the diameter of the first member, the yoke in relaxed position when in contact with said first member having the arms of the yoke engaging the first member and the base of the yoke spaced from the first member, the arms of the yoke in assembled position being resiliently outwardly deflected and maintaining residual stress on the first member and the base of the yoke in assembled position being relatively closer to the side of the first member than in the relaxed position of the yoke, and tension fastening means extending through the base of the yoke and through the first member at a plurality of points distributed longitudinally of the first member and pulling said yoke toward the first member and maintaining the arms of said yoke prestressed against the first member, the compression stress imposed on the first member by the tension of said fastening means being generally at right angles to the compression imposed on said first member by the arms of the yoke.

2. In a structural connection, a first metallic member of generally round cross section, a second metallic member extending generally transverse to the first member, a metallic connector yoke having a generally flat base and arms of the yoke which diverge from the base, one arm of said yoke being secured to said second metallic member in abutting relationship at one end thereof, the arms of the yoke being disposed on opposite sides of the first member and extending longitudinally of the first member and the arms of the yoke coming into engagement with the curved surface of the first member at generally opposed positions on the first member spaced by a distance less than the diameter of the first member, the yoke in relaxed position when in contact with the first member having the arms of the yoke engaging the first member and the base of the yoke spaced from the first member, the arms of the yoke in assembled position being resiliently outwardly deflected and maintaining residual stress on the first member, and the base of the yoke in assembled position being relatively closer to the side of the first member than in the relaxed position of the yoke, a C-pin extending through the base of the yoke and through the first member at a plurality of points distributed longitudinally of the first member and pulling the yoke toward the first member and maintaining the arms of the yoke prestressed against the first member, the compression impressed on the first member by the tension of said C-pin being generally at right

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angles to the compression impressed on the first member by the arms of the yoke, said C-pin having near its ends notches which are adapted to be engaged, and a locking plate extending longitudinally of said first member having openings which pass the ends of the C-pin and having slots which engage in the notches of the C-pin and tension the C-pin.

3. A structural connection of claim 2, in which said locking plate slopes at each of its slots from a position adjacent to said first member to a position remote from

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said first member, and said notches in the C-pin slope in correspondence to the slope of said locking plate.

References Cited in the file of this patent

UNITED STATES PATENTS

1,165,403	Hackney	Dec. 28, 1915
1,349,677	Kleckler	Aug. 17, 1920
1,627,177	Henningesen	May 3, 1927
2,839,809	Warner et al.	June 24, 1958
2,919,149	Farley	Dec. 29, 1959