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O. CARLSEN
STRUCTURAL SECTION AND STRUCTURAL
MEMBERS COMPOSED THEREOF
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Fig. 1.

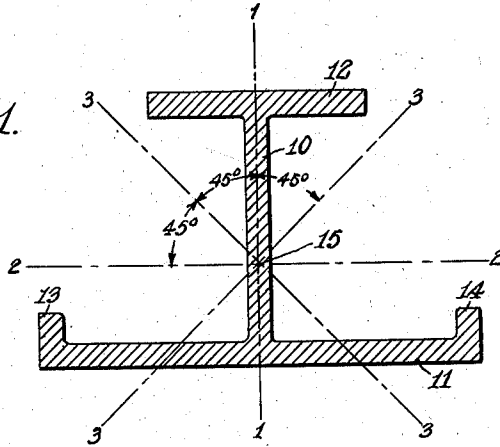


Fig. 2.

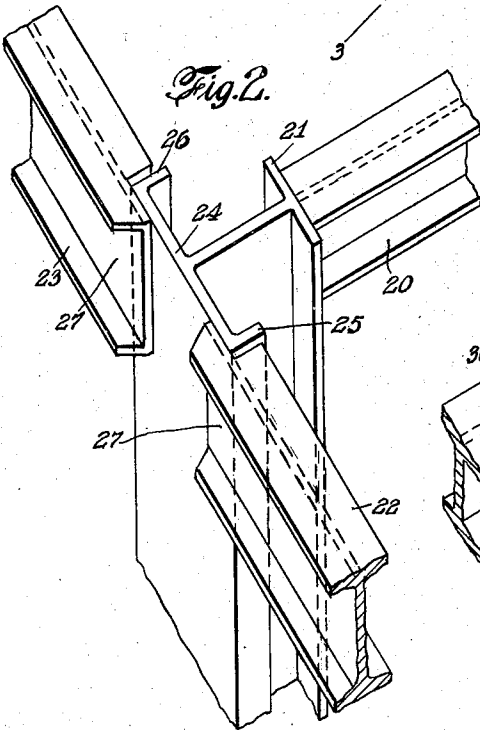


Fig. 3.

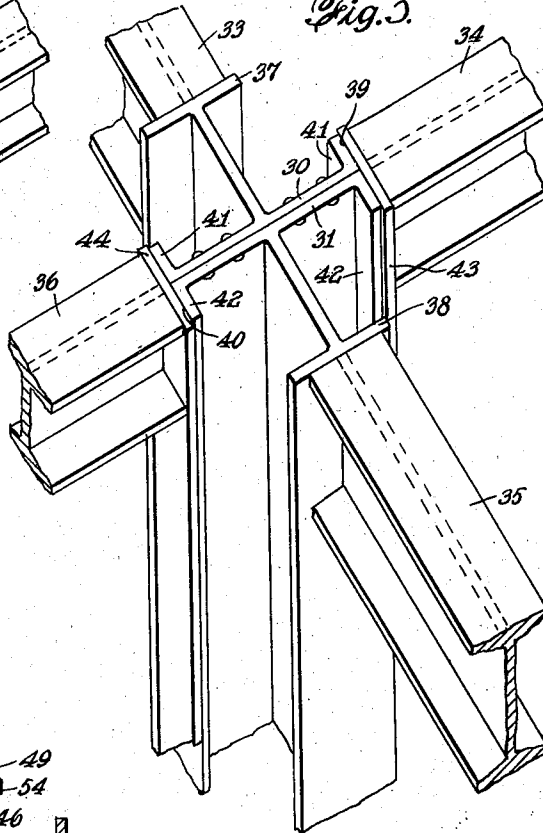
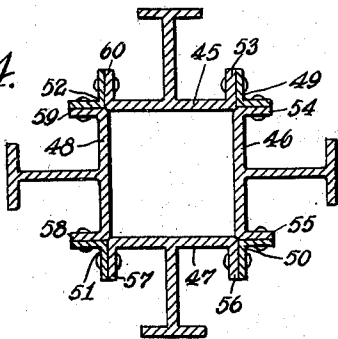


Fig. 4.



INVENTOR.
OLAF CARLSEN

BY

Frederick Schuster

ATTORNEY.

UNITED STATES PATENT OFFICE

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STRUCTURAL SECTION AND STRUCTURAL MEMBERS COMPOSED THEREOF

Olaf Carlsen, New York, N. Y.

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6 Claims. (Cl. 189—38)

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The invention relates to structural metal work and more especially to a novel structural section and to structural members such as columns, beams and girders, struts, etc. constructed thereof.

An object of the invention is to provide a metal section of uniform thickness and strength throughout wherein the moments of inertia about all principal axes are substantially equal.

Another object of the invention is to provide a section requiring minimum weight of material.

Still another object of the invention is to provide a section which will possess great strength and wherein the stresses will be uniformly distributed.

The invention has for an object, also, to provide a section which will allow of ready access to its different portions in attaching other members thereto, as by welding or riveting the same in place.

A further object of the invention is to provide a section wherein twisting forces are counteracted.

A still further object of the invention is to obviate the necessity for bracket plates in making use of a section.

Another object of the invention is to provide a section which will lend itself to the construction of novel structural members.

In carrying out the invention, the novel section is constructed to form a T in cross-section, with top and bottom flanges and in which the former flange is wider than the latter flange and has its opposite ends turned inwardly at right angles. The depth of the web connecting the top and bottom flanges of the novel section varies directly with the width of the former flange and by substantially constant increments, which is the case also of the extent of the inturning of the opposite ends of the said top flange.

While the novel section is suitable alone as a structural member, various columns, girders, and other structural members may be constructed thereof by combining a plurality of the said T-section or by combining with such section or combination of sections other structural sections.

The nature of the invention, however, will best be understood when described in connection with the accompanying drawings, in which—

Fig. 1 is a transverse section through the novel structural section.

Fig. 2 is a view in isometric projection illustrating the use of the novel section as a column and the manner of applying thereto beams such as the standard I-beam.

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Fig. 3 is a similar view illustrating the formation of a column out of two of the novel sections, with I-beams attached thereto.

Fig. 4 is a transverse section through a column composed of four of the novel sections.

Referring to the drawings, the novel section is shown in transverse section in Fig. 1 as comprising an inverted T-shaped member having the web 10 connecting the top flange 11 to the base flange 12; and where used in the specification and claims, T, T-section, T-shaped, "capital letter T" are intended to indicate a section comprising a web connecting top and bottom flanges, the former flange having its respective ends inturned. The section is made of uniform thickness throughout and, to preserve or balance the moments of inertia about at least three axes such as the axes 1—1, 2—2, and 3—3 of the section, the wider or top flange 11 has its opposite ends 13 and 14 turned inwardly to an extent sufficient to effect the balance.

In the design of a section of the nature set forth, when the width of the one flange is made double that of the other, the extent of inturn of the wider flange is made to vary directly with the width of the said top flange, for example, and by a substantially constant amount or equal increment. This applies also to the depth of the web 10. As a specific example, assuming a width of the flange 11 of 10 inches and a width, therefore, of the flange 12 of 5 inches, the web connecting these flanges will then be approximately 7 $\frac{7}{8}$ inches in depth, with the inturned ends of the top flange approximately 3 $\frac{3}{8}$ inches. A section having a top flange width of 20 inches and base flange of 10 inches would require a depth of the web of 13 $\frac{5}{8}$ inches; and in the case of a 30 inch top flange, the web would have to be 19 $\frac{3}{8}$ inches, or a substantially constant increment of 5 $\frac{3}{4}$ inches in each instance.

The corresponding dimensions for the inturned ends would be, in the case of the 10 inch top flange, 3 $\frac{3}{8}$ inches; of the 20 inch top flange, 4 inches; and in the case of the 30 inch top flange, 4 $\frac{5}{8}$ inches, thus showing also a substantially constant increment, namely $\frac{5}{8}$ of an inch.

The moments of inertia in all of these examples are figured about three axes 1—1, 2—2, and 3—3 which pass through the center of gravity 15 of the section; and all are substantially equal for the corresponding section—in the first instance amounting to 100 inch⁴; in the second, to 1015 inch⁴; and in the last, to 4300 inch⁴. It will be observed that by increasing the thickness only of

this section, the moments of inertia about the three neutral axes remain identical also.

The novel section is adaptable to the construction of various structural members, for example, such as are indicated in Figs. 2 to 4 inclusive. In the showing, Fig. 2, the manner of using the section with I-beams is illustrated, the one beam 20 being attached, as by welding or riveting, directly to the base flange 21 of the section, while two additional beams 22 and 23 are attached similarly to a portion of the top flange 24 and about the respective intumed ends 25 and 26 of said top flange. The attachment is effected at the web 27 of a beam, the flanges of which are recessed at the attachment end of the beam to allow of overlapping the web 27 on the portion of the top flange 24 of the novel section.

In Fig. 3, the top flanges 30 and 31 of two like sections of the novel design are riveted to each other; and a plurality of I-beams 33, 34, 35, and 36 are attached to the corresponding bottom flanges 37 and 38 of the two sections and to the faces 39 and 40 formed by the juxtaposed intumed ends 41 and 42 of the respective top flanges 30 and 31, said beams projecting outwardly therefrom. Due to the increased moment of inertia resulting from the joining of the top flanges 30 and 31, the balance of the moments of inertia will be disturbed in the column thus provided. This is conveniently compensated for or equalized by attaching plates 43 and 44 respectively to and along the length of the oppositely disposed faces 39 and 40 formed by the coacting intumed ends 41 and 42, the size of which plates is to be calculated.

Still another form of structural member is illustrated in Fig. 4 in which four like sections 45, 46, 47, and 48 of the novel design are formed into a box like column by juxtaposing their top flanges to form a square in cross-section, the respective top flanges being attached to one another, for example, by angles 49, 50, 51, and 52 abutting corresponding intumed ends 53-54, 55-56, 57-58 and 59-60 of the top flanges. This affords an exceptionally strong symmetrical column in which every portion of the material is utilized to full advantage.

I claim:

1. A structural member having substantially the section of the capital letter T and with substantially equal moments of inertia about more than two axes all lying in a common plane and passing through the center of gravity of the section.

2. A structural member having substantially the section of the capital letter T, of uniform thickness throughout, and with substantially equal moments of inertia about more than two axes all lying in a common plane and passing through the center of gravity of the section.

3. A structural integral member having substantially the section of the capital letter T and of uniform thickness throughout, the top flange being twice the width of the base flange and its opposite ends intumed at right angles to said top flange and with substantially equal moments of inertia about more than two axes all lying in a common plane and passing through the center of gravity of the section.

4. A column for structural metal work, com-

prising four like integral members each having substantially the section of the capital letter T and having substantially equal moments of inertia about more than two of their respective axes which lie in a common plane and pass through the center of gravity of a said section, and each member having a top flange intumed at opposite ends and the said top flanges of the respective members being juxtaposed to form a square in cross-section and secured to each other directly along their respective contiguous intumed ends.

5. A column for structural metal work, comprising two like integral members each having substantially the section of the capital letter T and having substantially equal moments of inertia about more than two of their respective axes which lie in a common plane and pass through the center of gravity of a said section and each member having a top flange intumed at opposite ends, the respective top flanges of the two members abutting and being secured to each other, and the juxtaposed intumed ends providing a pair of oppositely disposed faces, I-beams secured to said faces to project at right angles to the respective integral members, and I-beams secured to the outer faces of the respective base flanges of said integral members to project at right angles thereto.

6. A column for structural metal work, comprising two like integral members each having substantially the section of the capital letter T and having substantially equal moments of inertia about more than two of their respective axes which lie in a common plane and pass through the center of gravity of a said section, and each member having a top flange intumed at opposite ends and abutting and being secured to each other, and the juxtaposed intumed ends providing a pair of oppositely disposed faces, respective plates secured to and along said oppositely disposed faces provided by the juxtaposed intumed ends, I-beams secured to said plates to project at right angles to the respective integral members, and I-beams secured to the outer faces of the respective base flanges of said integral members to project at right angles thereto.

OLAF CARLSEN.

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