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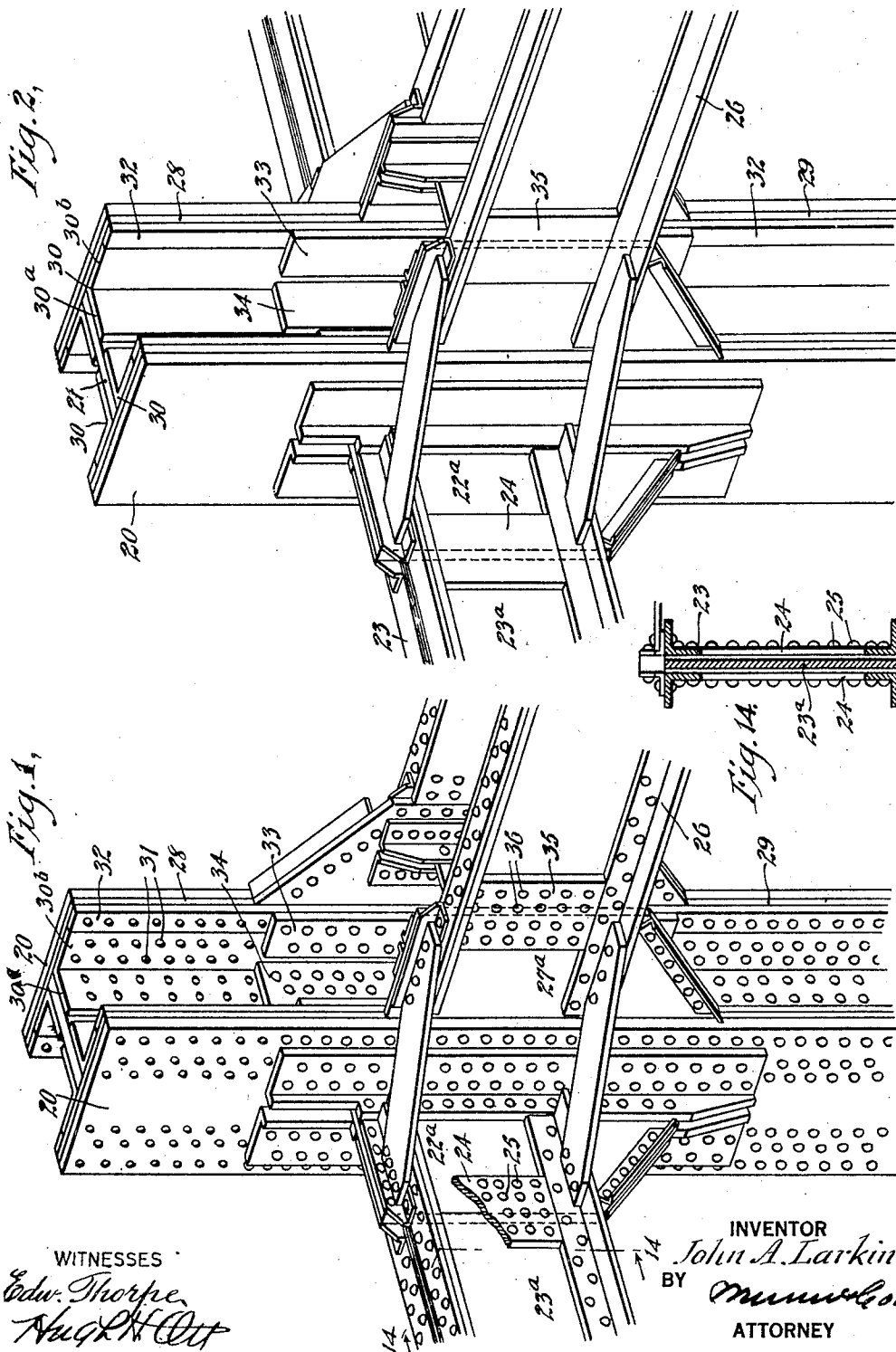
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1,727,293

JOINT FOR STRUCTURAL STEEL COLUMNS AND GIRDERS

Filed April 1, 1927

3 Sheets-Sheet 1



WITNESSES

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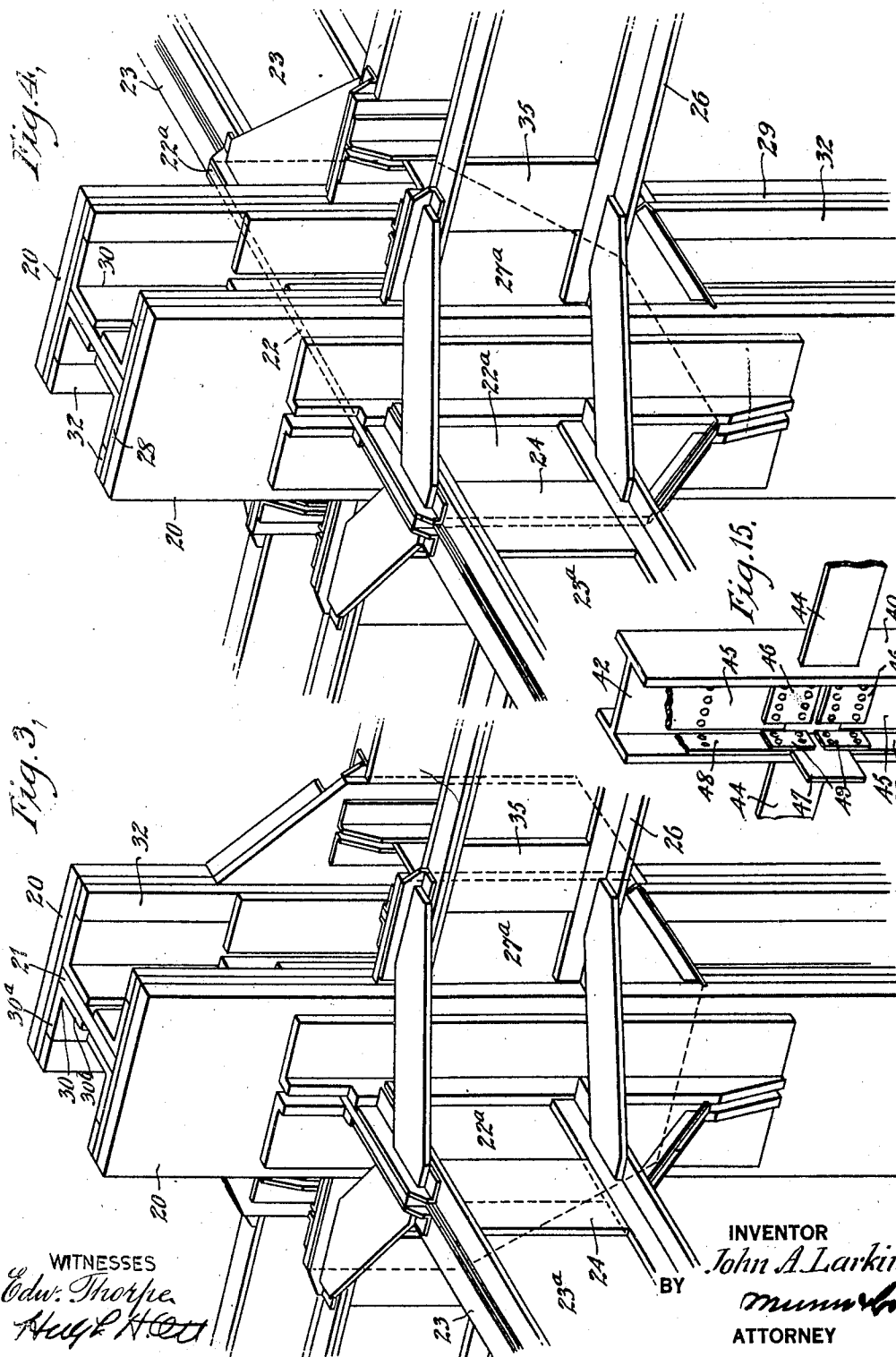
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JOINT FOR STRUCTURAL STEEL COLUMNS AND GIRDERS

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3 Sheets-Sheet 2



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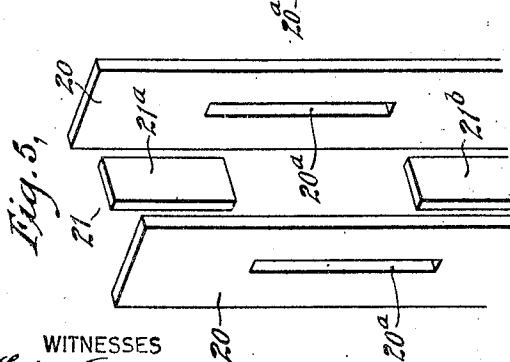
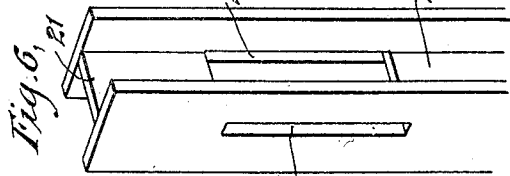
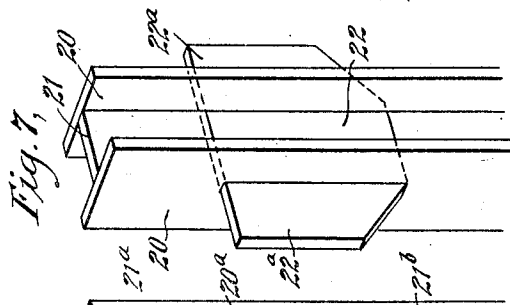
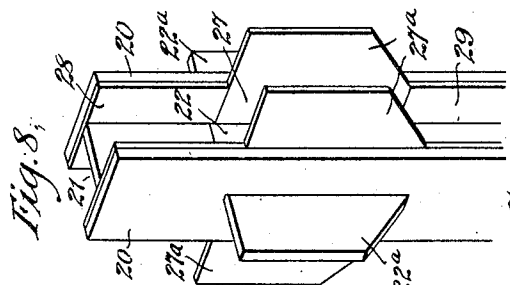
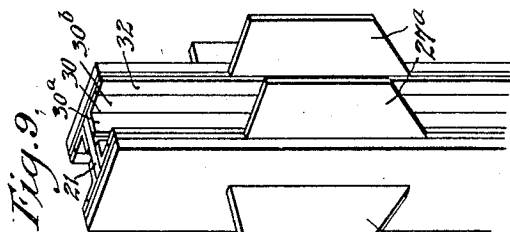
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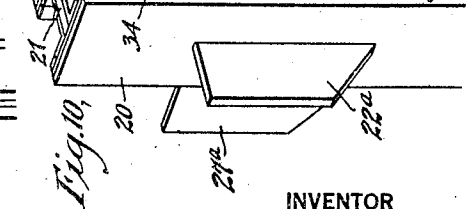
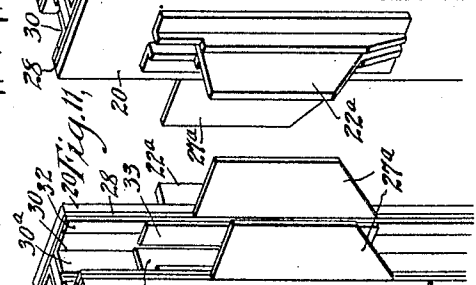
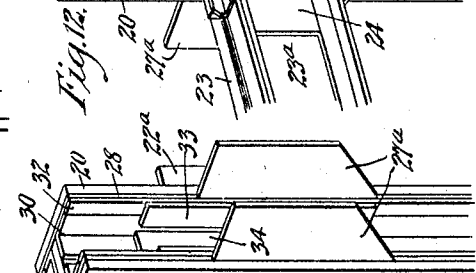
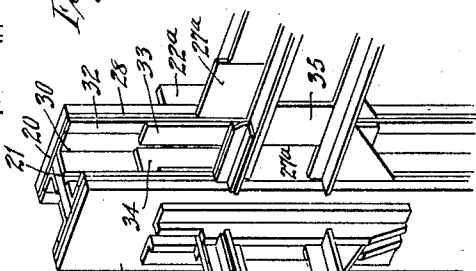
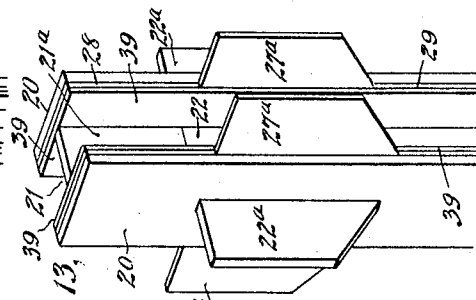
JOINT FOR STRUCTURAL STEEL COLUMNS AND GIRDERS

Filed April 1, 1927

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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JOINT FOR STRUCTURAL-STEEL COLUMNS AND GIRDERS.

Application filed April 1, 1927. Serial No. 180,188.

This invention relates to structural steel framework employed in the erection of buildings or other structures, and refers more particularly to an improved means or method of establishing a joint or connection between the columns and girders.

Heretofore rolled columns have been made with slots in the flanges disposed in a plane parallel to the side faces of the web, and plates have been inserted through said slots and riveted to the web with the ends of the plates projecting beyond the flanges, to constitute gusset wings to which girder webs were spliced in end-to-end relation for placing the rivets in shear, but the said web gusset has not been made an integral part of the column.

Heretofore the webs of girders have been placed alongside of column flanges in line with and riveted to the column flanges, but due to the fact that no means such as filler plates have been disposed above and below the girder webs, the said girder webs cannot be held to constitute an integral part of the column flange.

Heretofore built-up columns have been employed with a gusset plate disposed in the same plane as the web between two vertically separated sections thereof with the end or ends projecting through a slot or slots formed in one or both flanges, the end or ends of the gusset plate projecting beyond the outer face of the flanges, providing a gusset wing or wings to which a girder or girders extending in one direction may be spliced to place the rivets in shear, but the gusset plate was not an integral part of the column web.

Heretofore girders extending in an opposite direction were attached to a column as set forth, by placing the girder web alongside the column flange and connecting said web to said flange, but said girder web was not an integral part of the column flange.

The present invention therefore comprehends a joint or connection between girders and rolled columns, which includes a gusset plate parallel to the column web, with its end projecting beyond the flanges through slots in said flanges, which joint or connection includes the employment of filler plates riveted to the web above and below and in the same plane with the gusset plate and in which the gusset plate is spliced to the plates installed above and below by splice plates and riveted to develop the strength of a continuous

plate, thereby rendering the gusset an integral part of the column web.

A further object of the present invention resides in the provision of a column with a gusset having projecting wings or extremities extending at an angle in all directions necessary to effect a connection of the girder webs therewith so that the rivets are in shear for obtaining the maximum strength possible both for sustaining the loads and thrusts to which the same may be subjected.

As a further object the invention contemplates a column construction having gussets integrally associated with the column and arranged in the same plane with or in a plane parallel to the webs and flanges of the column so that the gusset extremities project therefrom in the directions necessary to the particular condition under which they are used, whereby to allow for a spliced or other connection of the girder webs with the gusset wings or extremities, for placing in shear all rivets which establish a connection between the girders and columns.

The invention furthermore comprehends where gussets are disposed in a plane parallel to and alongside of a rolled column web or flange, means such as filler plates disposed above and below the gussets and in the same plane therewith, for rendering the gussets integral with the column thereby obtaining maximum strength.

As a further object the invention embodies a construction which has the effect of inserting a part of a girder web into a column section and employing that part of the web so inserted as a part of the column section, thereby effecting a saving in the weight of metal by obtaining a double use for that part of the girder web inserted in the column, which produces, in effect, a column web and flange having integral wing gussets.

As a further object the present invention provides a column with integral web and flange gussets, the ends of which project from or beyond the confines of the column, whereby that part of the gusset which forms an integral part of the column section will constitute a part of the effective area of the column and can be included in calculations ascertaining the properties of the column, such as the sectional area, radii of gyration, section moduli, and other essential calculations.

The invention further aims to provide in-

tegral wing gusset columns for structural steel framework, to which girders may be directly attached by splice plates or otherwise connected, so that all rivets are in shear which establish such joints or connections, and whereby all joints are free from the use of connecting angles.

With the above recited and other objects in view, reference is had to the following specification and accompanying drawings in which there is exhibited certain examples or embodiments of the invention which are in no way intended as limitations upon the scope of the appended claims as it is to be clearly understood that variations and modifications which properly fall within the scope of said claims may be resorted to when found expedient.

In the drawings—

Figure 1 is a perspective view of a corner column with the girders, illustrating the girders connected thereto by a joint or connection constructed in accordance with the invention;

Fig. 2 is a perspective view of an outside intermediate column in which the column flange is disposed parallel to the side of the building;

Fig. 3 is a similar view in which the webs are disposed parallel to the outside of the building;

Fig. 4 is a perspective view of an intermediate column for supporting four-way girders;

Figs. 5 to 11 are perspective views illustrating the development of the integral wing gusset column;

Fig. 12 is a perspective view with the girders attached;

Fig. 13 is a perspective view similar to Fig. 8 of the development, illustrating the flange gussets between outer and inner flange plates and with the rivets in double shear;

Fig. 14 is a sectional view taken approximately on the line 14—14 of Fig. 1;

Fig. 15 is a perspective view of a modified adaptation of the invention.

Referring to the drawings by characters of reference, Figs. 1 to 14 illustrate the joint or connection as applied to a built-up column, which includes separate flanges 20—20 and a web 21, which are suitably connected together, as distinguished from a rolled column in which the flanges and web are rolled from a single piece of metal. In this type of column a gusset plate 22 is positioned between vertically spaced sections 21^a and 21^b of the web 21, with the lower edge of the upper section 21^a in contact with the upper edge of the gusset plate 22 and with the upper edge of the lower web section 21^b in contact with the lower edge of the gusset plate 22. The flanges 20 are formed with corresponding slots 20^a of a length approximating the depth of the gusset plate so that one or both ends 22^a project beyond the outer face or surface of the flanges 20 to provide gusset wings integral with the

column to which the webs 23^a of girders 23 are positioned in end-to-end relation, for splicing attachment thereto by means of splice plates 24, which are riveted respectively to the gusset plate wings 22^a, by rivets 25, to place said rivets in shear. The girder webs may, if desired, overlap the gusset wings and be riveted thereto for placing the rivets in shear in lieu of using splice plates, without departing from the spirit of the invention.

In order to afford a similar connection for the girder or girders 26 which are disposed in a different directional plane or at right angles to the girder or girders 23, a second gusset or set of gussets 27 are applied to either the inner or outer side face of the flanges 20, with the inner edge of said gusset plate or plates in abutting relation to the first-mentioned gusset 22. In order to render the connection of the gusset 27 integral with the column, upper and lower filler plates 28 and 29 are riveted to the column flange 20 above and below the gusset 27, with the lower edge of the upper filler plate abutting the upper edge of the gusset and the upper edge of the lower plate 29 abutting the lower edge of the gusset. The gusset plate or plates 27 are of a length to provide portions 27^a extending beyond the side edges of the flanges to form gusset wings. Angles 30 for establishing the connection between the built-up column flanges 20 and webs 21, are applied within the re-entrant angles formed by the filler plates 28 and the column web 21 and the gussets 22 and 27, and the angle legs 30^a and 30^b are respectively riveted to said elements by rivets 31. A filler piece or strip 32 of a width to fill in between the free edge of the outer angle leg 30^b and the outer edges of the column flanges and filler plates, is applied against the filler plates and gussets 27. Splice plates 33 are applied over the filler piece or strip 32 and outer angle legs 30^b and riveted thereto, so that the gussets 27 and gusset wings 27^a become an integral part of the column structure. Splice plates 34 are applied over the inner angle legs 30^a and are riveted through to further augment the integral construction of the gussets 22. It will thus be seen that the girders 26 which are disposed in a different directional plane from the girders 23 or at right angles to said girders 23, may have their webs brought into end-to-end relation with the gusset wings 27^a and spliced thereto by splice plates 35 connected by rivets 36, which disposes said rivets in shear.

In a corner column as illustrated particularly in Fig. 1, the gusset 22 extends through one flange 20 only, while a single pair of gussets 27 will be employed projecting from one side edge of the column flanges 20. In an intermediate outside column as illustrated in Fig. 2, in which the column web is in the same directional plane as the side of the building on which it is arranged, the gusset 22 will ex-

tend through slots in both flanges 20, while a single pair of gussets 27 will project from one side edge of the column flanges 20. In the condition illustrated in Fig. 2, namely, an intermediate outside column where the flanges 20 are in the same directional plane as the side of the building upon which it occurs, the gusset 22 will extend through a slot in the inner flange only, while two pairs of gussets 27 will be employed for connecting the girders, disposed on opposite sides of the column. In the condition illustrated particularly in Fig. 4, for the intermediate columns, the gusset 22 will extend through both flanges 20, while two pairs of gussets 27 will be employed on opposite sides of the column. Under this construction and arrangement it is obvious that an integral gusset wing column has been devised for establishing a connection between all girders and columns, to place the rivets in shear both as to thrusts caused by wind or other stresses and for the sustaining of the load of the framework, building and contents.

In the adaptation of the invention illustrated in Fig. 13, the flange gussets 27 and upper and lower filler plates 28 and 29 have been installed thereover an inside flange plate 39, prior to the application of the angles and filler pieces or strips 32, so that the rivets between the flanges 20 and the inner flange plates 39 are in double shear.

In the form of the invention illustrated in Fig. 15, which is particularly, although not necessarily, adapted to rolled columns, the column flanges 40 are provided with slots disposed in a plane parallel to the side faces of the web 42 to receive therethrough a gusset plate 44. In this instance in order to render the gusset integral, web or filler plates 45 are installed above and below the gusset with their confronting edges abutting respectively the upper and lower edges of the gusset plate and riveted to the web. Splice plates 46 are applied over the gusset plates 44 and web or filler plates 45 at their juncture, and rivets extend through the web or filler plates, the gusset plates and the flange. A gusset plate or plates 47 are riveted to the column flange and filler plates are inserted above and below the gusset plate and spliced thereto by splice plates 49 arranged at the top and bottom over the juncture of the gusset and filler plates. This produces a column web and flange having integral wing gussets projecting from the confines thereof in different directional planes.

From the foregoing it will thus be seen that a connection for structural steel girders and columns has been devised, which permits of a direct attachment of the girders to the column by splice plates, thereby eliminating connections by angles and hence placing all rivets in shear which establish such connection.

What is claimed is:

1. In a joint for connecting structural steel columns and girders, an H column including integral wing gussets constituting an essential part of the sectional area of the column within the column structure and extending therefrom approximately at right angles, permitting the connection of approximately right-angularly disposed girders thereto for placing in shear all rivets establishing connections between the girders and columns.

2. In a structural steel column having a web and flanges and an integral gusset plate projecting therefrom coincident with the plane of the web, a second gusset plate in face to face contact with a flange of said column, filler plates parallel to and alongside of said flange above and below the second gusset plate and in the same plane therewith, and splice plates in face to face contact with the gusset and filler plates at their juncture and riveted respectively to said plates and to the flange of the column, to render said gusset plate integral therewith.

3. In a structural steel column having a web and flanges and an integral gusset plate projecting therefrom coincident with the plane of the web, a second gusset plate in face to face contact with a flange of said column, filler plates in face to face contact with said flange above and below the second gusset plate and in the same plane therewith and splice plates in face to face contact with the gusset and filler plates at their juncture and riveted respectively to said plates and to the flange of the column, to render said gusset plate integral therewith, and affording means for connecting approximately right angularly disposed girders to the column with the rivets in shear.

4. A structural steel column having a web and flanges and including an integral gusset plate extending through and beyond the outer face of one flange in a plane coincident with the web, and a second integral gusset plate extending beyond the side edge of one flange and in a plane coincident with the flange to afford means for splicing thereto girders extending in different directional planes.

5. A structural steel column having a web and flanges and including an integral gusset plate extending through and beyond the outer face of one flange in a plane coincident with the web, and a second integral gusset plate extending beyond the side edge of one flange and in a plane coincident with the flange to afford means for connecting thereto girders extending in different directional planes, whereby all rivets are in shear which establish the girder and column connections.

6. A structural steel column having a web and flanges and including an integral gusset plate extending through and beyond the outer face of one flange in a plane coincident with the web, and a second integral gusset

plate extending beyond the side edge of one flange and in a plane coincident with the flange to afford means for riveting thereto girders extending in different directional planes whereby the rivets are in shear.

7. A structural steel column having a web and flanges and including an integral gusset plate extending through and beyond the outer face of one flange in a plane coincident with the web, and a second integral gusset plate extending beyond the side edge of one flange and in a plane coincident with the flange to afford means for connecting thereto in prolongation therewith, girders extending in different directional planes from the columns.

8. In a structural steel H-column, elements constituting an integral part of the column constituting an essential part of the sectional area of the column within the column structure and extending therefrom in angularly disposed relation to afford means for riveting girder webs thereto whereby the rivets are in shear.

9. In a structural steel H-column, separate elements connected with the column to constitute an integral part thereof and an essential part of the sectional area of the column within the column structure and extending therefrom in relatively angularly disposed relation to afford means for riveting girder webs thereto, whereby the rivets are in shear.

10. In a structural steel H-column, separate elements connected with the column within its confines to constitute an integral part and an essential part of the sectional area of the column within the column structure thereof, said elements having portions extending beyond the confines thereof in different directional planes to afford means for riveting girder webs thereto, whereby the rivets are in shear.

11. In a structural steel column, web plate sections vertically spaced apart, a slotted flange plate having a slot of a size equal to and alined with the space of the web plate sections, and a gusset plate positioned between the web plate sections and in the same plane therewith, having an end extending

through the flange plate slot to provide a wing for attachment of the girder web thereto; in combination with a gusset plate in face to face contact with a column flange plate, filler plates in face to face contact with said flange plate above and below the gusset plate and in the same plane therewith, and splice plates alongside of and over the juncture of the filler and gusset plates.

12. In a structural steel column, web plate sections vertically spaced apart, a slotted flange plate having a slot of a size equal to and alined with the space of the web plate sections, and a gusset plate positioned between the web plate sections and in the same plane therewith defining an end extending through the flange plate slot to provide a wing for attachment of a girder web thereto.

13. In a structural steel H-column, web plate sections spaced vertically apart, a slotted flange plate having a slot of a size equal to and alined with the space between the web plate sections, a gusset plate positioned between the web plate sections in the same plane therewith, having an end extending through the flange plate slot to provide a wing for the attachment of a girder web thereto, and means for connecting the gusset plate to the column so as to render the same integral therewith.

14. In a structural steel H-column, web plate sections spaced vertically apart, a slotted flange plate having a slot of a size equal to and alined with the space between the web plate sections, a gusset plate positioned between the web plate sections in the same plane therewith, having an end extending through the flange plate slot to provide a wing for the attachment of a girder web thereto, and means for connecting the gusset plate to the column so as to render the same integral therewith, said means consisting of splice plates in face to face contact with the opposite faces of the column web sections and the gusset plates and rivets extending there-through.

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