June 24, 1958 E. A. WADSWORTH ET AL 2,840,014

JOINT FOR A WOODEN TRUSS

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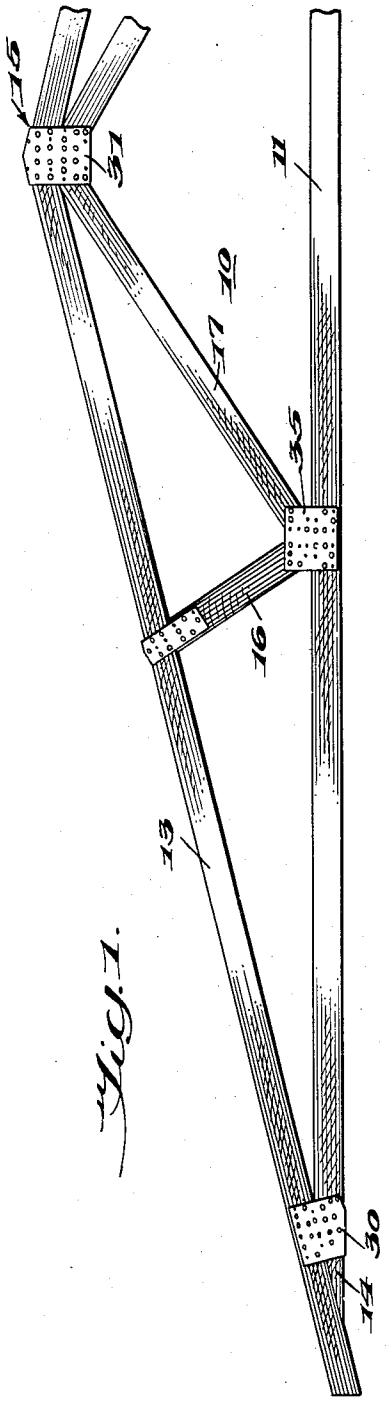


Fig. 1.

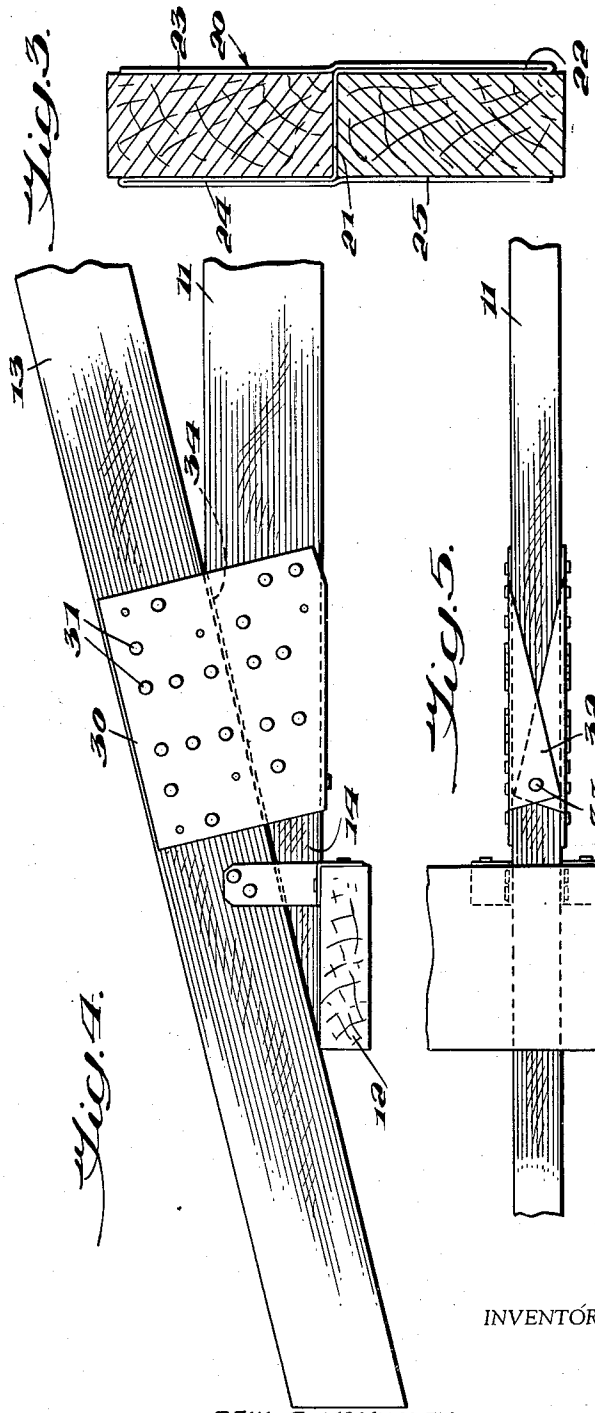


Fig. 4.

Fig. 3.

Fig. 5.

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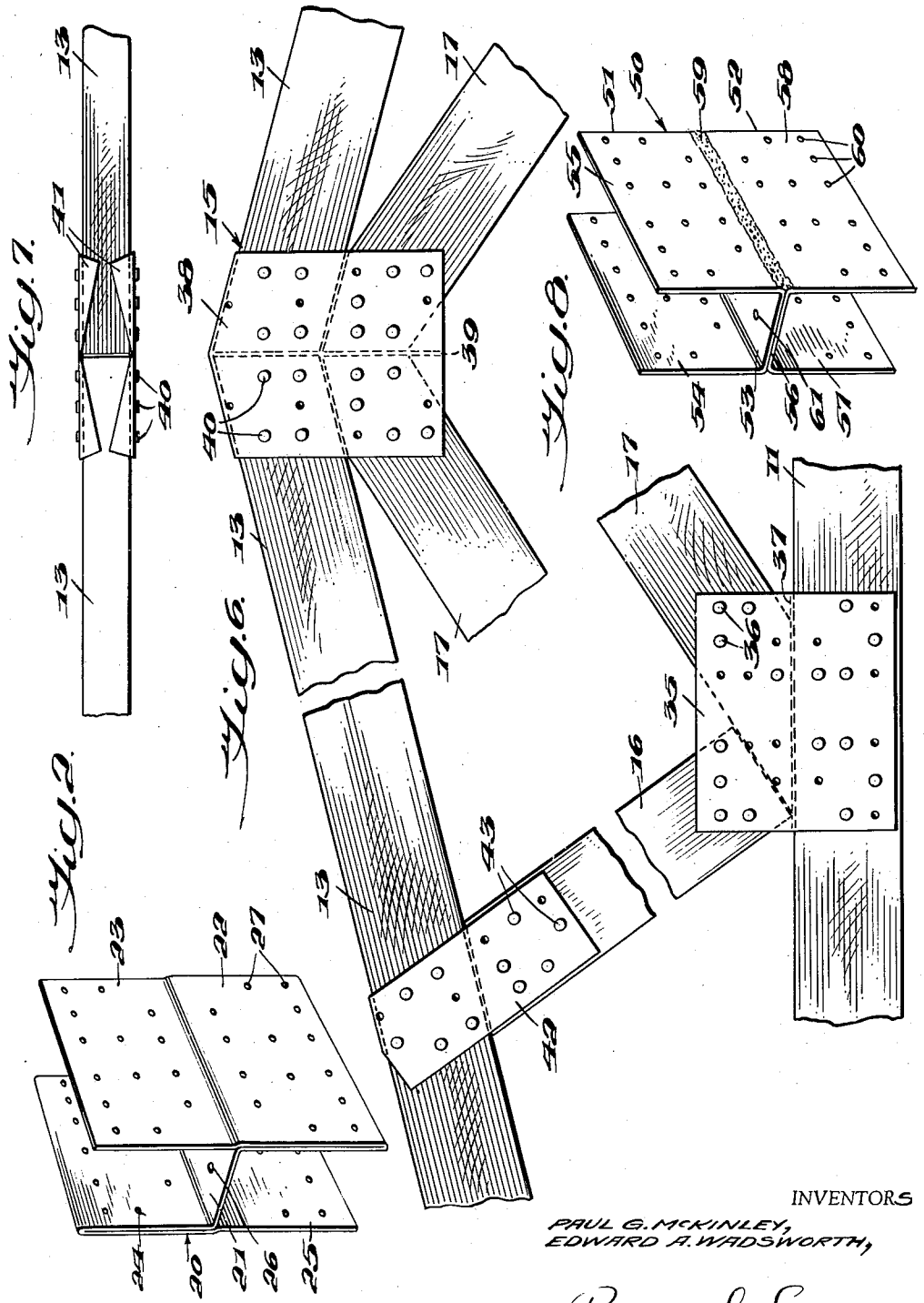
BY Parry and Siese

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2,840,014

JOINT FOR A WOODEN TRUSS

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Application October 12, 1956, Serial No. 615,712

12 Claims. (Cl. 108—23)

This invention relates to a joint in a wooden truss. More particularly, this joint incorporates the use of a sheet metal coupling member which embraces the sides of the members joined and secures the members in a fixed position by fastening means impaling said structural elements.

More specifically, this invention relates to a joint for wooden truss members comprising a coupling as disclosed in our application Serial No. 358,239, of which this application is a continuation in part.

In constructing a wood frame roof for any type of building it has been customary to build up the roof of joists laid across the top plates and rafters built up on the joists. Such a construction necessitates the use of skilled labor at each step of the construction and requires that relatively heavy framing lumber be used to give the roof requisite strength. It has been found, however, that by building the roof of preformed trusses, the same or greater strength than that obtained by the aforementioned construction is had, while effecting substantial savings in labor and material. The savings are achieved by virtue of the fact that the preformed truss can be constructed of lighter stock framing lumber, the trusses can be more widely spaced than are the joists and rafters, and the construction of the roof using preformed trusses takes substantially less time than is consumed by building it up of joists and rafters.

In prior preformed trusses, it has been customary to form joints by placing the members to be joined in side-by-side relation, drilling a hole through each of them, aligning the holes, and passing a bolt or dowel through the aligned apertures. This effects a "lap" joint. Instead of bolts, lag screws have been used to secure the structural elements in their side-by-side relation. In either case, a joint is formed which is unsatisfactory for many reasons. First, trusses with such joints are awkward to handle because of the varying thickness of the truss at the points of joining. Such differences in thickness are inevitable when the two joined members do not meet in the same plane but are merely lapped as above described. Secondly, the lapped joints as above described, are deficient in that they are subject to eccentric moments and secondary bending, putting the wooden structural members to unusual and unnecessary stress.

The instant invention presents a joint which makes it possible to expediently assemble structural elements of the trusses to realize advantages which are inherent in the use of a truss construction. In addition, our invention presents a joint which eliminates the disadvantages of prior truss joints. The two above-mentioned disadvantages in the lap joint are overcome by the fact that the joint here presented makes it possible for the joined members to lie in the same plane. The members are butted, rather than lapped. Thus, the trusses are not of varying thickness at the points of joint and the members are not subject to eccentric moments and secondary bending.

Briefly, the novel joint includes two or more structural members of substantially the same thickness, each of the structural members having parallel planar sides. The coupling member includes a sheet metal device which is, in effect, two back-to-back channels. The members to be joined are introduced into opposite recesses in the coupling, with at least one of the structural members on each side. Preliminary positioning means are provided on the web which comprises the center of the coupling, said preliminary positioning means impaling the structural members. A secure joint is formed as fastening means extending perpendicular to the side plates of the coupling member impale the sides of the structural members thereadjacent.

Accordingly, it is an object of the instant invention to provide a joint for wooden structural elements wherein said structural elements may lie in a single plane.

A further object of this invention is to provide a joint which may be effected easily and quickly.

A further object of this invention is to provide a joint which substantially contributes to the strength of the overall assembly.

This invention embodies other novel features and details of construction and arrangement of parts which are hereinafter set forth in the specification and claims, and illustrated in the accompanying drawings, wherein:

Fig. 1 is an elevational view of a portion of a truss incorporating the instant invention;

Fig. 2 is a perspective view of the coupling member which is part of the instant invention;

Fig. 3 is an end elevational view of the coupling member shown in Fig. 2, said coupling member being shown in use with wooden structural members comprising the joint of the invention;

Fig. 4 is an enlarged view of the heel of the truss in Fig. 1;

Fig. 5 is a bottom plan view of the heel of the truss in Fig. 4;

Fig. 6 is an enlarged view of portions of the truss shown in Fig. 1;

Fig. 7 is a top plan view of the ridge of the truss figures shown in Fig. 6; and

Fig. 8 is the perspective view of a modified form of the novel coupling member.

A typical truss **10** for use in constructing a wood roof of any type structure, utilizing the instant invention, comprises a lower chord **11** for spanning the top plates **12** of the building wall (see Fig. 4). The upper chords **13** are joined to the lower chord **11** at the heel **14** and run upwardly toward each other to form the ridge **15**, defining the inclined roof profile. The diagonals **16** and **17** are disposed intermediate the lower chord **11** and the upper chord **13** to brace the truss.

The strength of the truss depends upon effectively joining the structural elements to each other in a rigid assembly. This is accomplished by means of the joint of the instant invention. The joint includes a coupling member **20**.

Member **20** includes a web **21** (see Fig. 2) and the side plates **22**, **23**, **24**, and **25**. The side plates are formed on opposing edges of the web and extend laterally thereof to opposite sides of the web. In the embodiment of the coupling member shown in Figs. 2 and 3, the side plates are integral with the web. On one side of the web **21** the downwardly directed side plate **22** has a double thickness of material while the oppositely directed side plate **23** is of a single thickness of material. On the opposite side of the web **21**, the upwardly directed side plate **24** has a double thickness of material and the oppositely directed side plate **25** has a single thickness of material. The coupling member **20** is formed from a flat strip of material. The web **21** is delineated on the strip of material and then reverse right angle bends are formed at each

side of the web. This sets up a side plate on each side of the web. At the extremity of each side of the plate thus set up the material is bent through 180° to provide a second thickness of material on the side plates **22** and **24**, the extensions of which form the side plates **23** and **25** respectively. The coupling member thus formed assumes an H shaped cross section as illustrated in Fig. 3, where the coupling member is shown in assembly with a pair of structural elements. The coupling member is made of sheet metal, the thickness of which is determined by the size of the coupling member and the necessity for making the coupling member substantially rigid.

In most cases, the coupling member is used in a joint with structural members of the same thickness. Therefore, it is desirable that the inside surfaces of the side plates on either side of the web **21** be coplanar. This is accomplished as shown in Fig. 3 by bending the extensions **23** and **25** inwardly of the web **21**. Only a slight deflection is necessary to compensate for the thickness of the sheet metal.

In forming the joint, the coupling member **30** is laid on a structural element with the web **21** abutting a face of the element. A nail hole **26** is provided adjacent each end of the web **21** for preliminarily locating and securing the coupling member with two nails on the one structural element. The side plates **22** and **25** embrace the structural element. The structural elements which are to be joined to the first structural element are located between the side plates **23** and **24** in abutting relation to the web **21**. The side plates are each provided with the apertures **27** located at frequent intervals. It is desirable that the apertures on opposite side plates do not coincide. This obviates the possibility of fastener interference; that is, of a nail associated with one side plate hitting a nail from the other side plate. With this aperture arrangement the coupling member can be secured to the structural elements with a sufficient number of nails to assure the requisite rigidity.

In the truss member **10**, the upper chord **13** is secured to the lower chord **11** by the coupling member **30**, in the manner above described. The coupling member **30** is secured to each side of the lower chord **11** and the upper chord **13** by a plurality of nails **31**. The corners **32** of the coupling are folded under the lower chord **11** to be substantially flush therewith, and a nail **33** secures the corners in place on the lower chord. The web **34** of the coupling member **30** lies intermediate the structural elements and is parallel to the upper chord **13** at an angle to the lower chord **11**. Diagonals **16** and **17** are similarly joined to the lower chord **11** by a coupling member **35** with a plurality of nails **36** securing the structural elements to the coupling member **35**. The base **37** of the coupling member **35** lies parallel to the lower chord **11** and at an angle to the diagonals **16** and **17** intermediate these elements.

At the ridge **15** of the truss **10** the opposing upper chords **13** and the opposing diagonals **17** are joined by a coupling member **38**. The web **39** of the coupling member **38** is disposed vertically between the opposing upper chord **13** and the opposing diagonal **17**. As before, the coupling member is secured to the respective structural elements by nails **40**, a sufficient number of nails being used to assure the requisite rigidity of the assembly. The corners **41** of the coupling member are folded over the top of the upper chords **13** to lie substantially flush therewith. The diagonal **16** may also be joined to the upper chord **13** by the joint of this invention, but for purposes of economy, a plate **42** is used, one on each side of the truss. The plate **42** is secured to each of the structural elements by a plurality of nails **43**, and in the presence of the coupling members at each of the other joints is of adequate strength for connecting the diagonal **16** to the upper chord **13**.

In Fig. 8, there is shown a modification of the coupling as described above. The coupling member **50** is made up of a pair of channel members **51** and **52**. The channel member **51** has a web **53** and laterally directed side plates **54** and **55** extending upwardly from opposing edges of the web **53**. The channel member **52** is similarly formed with a web **56** and laterally directed side plates **57** and **58**. The channel members **51** and **52** are joined with the webs **53** and **56** arranged in opposing relationship and the channel member is spot-welded as at **59** along the seam on each side thereof. The side plates are provided with a plurality of apertures **60** for nails or other securing means, and the webs are provided with an aperture **61** at each end thereof for locating the coupling member and preliminarily nailing it to a structural element.

The invention has been described in a plurality of preferred embodiments. However, it is susceptible of modification within the scope of the invention and is well suited to many other uses than the one described, which is merely exemplary. It finds utility in the prefabrication of all types of prefabricated wooden structural assemblies. The joint of the instant invention not only makes the prefabrication of such assemblies feasible, but contributes well to the strength thereof and at the same time making possible a substantial reduction in time and labor costs of traditional structural assemblies. Accordingly, it is not intended that the invention be limited except as set out in the claims which follow:

We claim:

1. A wooden truss for supporting a peaked roof, said truss including a horizontal lower chord having attached to its opposite ends inwardly and upwardly directed upper chord members, said upper chord members meeting in a peak, said upper and said lower chord members being of rectangular cross-section and of substantially the same thickness, each of said chord members having upper and lower surfaces and opposite side surfaces, the lower chord having opposite end surfaces, said opposite end surfaces being beveled in a plane parallel to the direction of said adjacent upper chord member, said upper chord members at their meeting at said peak having adjacent end surfaces, the plane of said adjacent end surfaces substantially vertical, said chord members all lying in the same plane, said upper chords being joined at the peak and said upper chords each being joined to said lower chord at the opposite ends thereof by couplings, said couplings having a central web portion and parallel side plates disposed on and connected to opposite edges of said central web portion, said side plates extending perpendicular to said web portion in either direction; in the joint at the peak, the vertical end surfaces of said upper chords abutting opposite faces of said central web portion and said side plates extending along and contacting the opposite side surfaces of said upper chords; and in the joint between the opposite end surfaces of said lower chord and said upper chords, the opposite faces of said web portion of each of said couplings being abutted by the lower surface of one of said upper chords upon one side and the end surface of said lower chord on the other side with said side plate portions extending along and contacting opposite side surfaces of said lower chords and upper chords.

2. A wooden truss member as described in claim 1 wherein the side plate portions of said coupling members are apertured and fasteners extending through said apertures impale said chord members.

3. A wooden truss as described in claim 2 wherein the central web portion of said coupling members are provided with positioning means impaling said chord members.

4. A wooden truss member as described in claim 3 wherein at least one of said side plate portions has a corner portion which is bent over said chord portion which said side plate portion contacts.

5. A wooden truss member as described in claim 1 wherein a pair of diagonal chords are incorporated into

said truss, each of said diagonal chords being of the same thickness as said upper and lower chord members, said diagonal chords extending from a point under said peak to junction points on the lower chord intermediate the midpoint of said lower chord and said opposite ends of said lower chords, said junction points being on opposite sides of the midpoint of said lower chords respectively, each of said diagonal chords being of rectangular cross-section and having an upper and a lower end, said lower end on each of said diagonal chords having a horizontal end surface and said upper end on each of said diagonal chords having a vertical end surface, said upper ends of said diagonal chord members extending into the coupling member at said peak and having their upper end surfaces abutting the opposite faces respectively of said central web portion of said coupling member at said peak, the side plate portions of said coupling at said peak extending along and contacting opposite side surfaces of said diagonal chord, fastening means extending through said side plate portions of said coupling at said peak impaling the diagonal chord members, an additional coupling at the lower end of each diagonal chord member, the lower end surface of each of said diagonal chord members abutting one face of one of said additional coupling members and the opposite face of said web portion abutting the upper side of said lower chord, said additional couplings having side plates which extend along and contact opposite sides of said diagonal chord members and said lower chord member respectively.

6. A wooden roof truss as described in claim 5 wherein said additional coupling members have fastening means associated with their side plates, said fastening means on said additional coupling members extending into said lower chord and said diagonal chord members with which said additional coupling members are associated respectively.

7. A wooden truss as described in claim 5 having a second pair of diagonal chords the chords in said second pair extending one on either side of said truss, each of said chords in said second pair having an upper end and a lower end, each lower end being associated with one of said coupling members on said lower chord associated with one of said first pair of diagonal chords, the upper end of each of said diagonals in said second pair being connected to the upper chord member adjacent.

8. A wooden truss for supporting a peaked roof, said truss including a horizontal lower chord having attached to its opposite ends inwardly and upwardly directed upper chord members, said upper chord members meeting in a peak, said upper and said lower chord members being of rectangular cross section and of substantially the same thickness, each of said upper chord members having upper and lower surfaces and opposite side surfaces, the lower chord having opposite end surfaces, said opposite end surfaces being beveled in a plane parallel to the direction of said adjacent upper chord members, said upper chord members at their meeting at said peak having adjacent end surfaces, the plane of said adjacent end surfaces substantially vertical, said chord members all lying in the same plane, the upper chords being joined at the peak and said upper chords each being joined to said lower chord at the opposite ends thereof by couplings, said couplings each comprising a sheet metal body having a rectangular central web portion in the interior of said body, and side plate portions integral with said web, the first of said side plate portions being bent in a first direction at right angles with respect to said web along one side thereof and then bent double in a second direction opposite said first direction to provide a double thickness on a first side of the web and a single thickness on the second side of the web, and the second of the side plate portions being bent in said second direction along the opposite edge of said web and then bent double in said first direction to provide a double thickness on said second side of said web and a single thickness on said first side, whereby the composite body has one side wall of double thickness and one of single thickness on either side of said web; in the joint at the peak, the vertical end surfaces of said upper chords abutting opposite faces of said central web portion and said side plates extending along and contacting the opposite side surfaces of said upper chords; and in each joint between the end surfaces of said lower chord and said upper chords, the opposite faces of said web portion of each of said couplings being abutted by the lower surface of one of said upper chords upon one side and the end surface of said lower chord on the other side with said side plate portions extending along and contacting opposite side surfaces of said lower chord and upper chords.

9. A wooden truss for supporting a peaked roof, said truss including a horizontal lower chord having attached to its opposite ends inwardly and upwardly directed upper chord members, said upper chord members meeting in a peak, said upper and said lower chord members being of rectangular cross section and of substantially the same thickness, each of said upper chord members having lower faces and opposite side surfaces, said lower chord member having opposite end faces, said opposite end faces being beveled in a plane parallel to the lower face of said adjacent upper chord members respectively, said upper chord members at their meeting at said peak having adjacent end faces, the planes of said adjacent end faces being parallel, said chord members all lying in the same plane, the upper chords being joined at a joint at the peak and said upper chords each being joined at joints to said lower chord at the opposite ends thereof by couplings, the coupling at one of said joints having a rectangular central web portion and parallel side plate portions attached to the opposite edges of said web and perpendicular to said web; at said one joint the parallel faces of the joined cords abutting respectively opposite faces of said central web portion of said side plates extending along and contacting the opposite side surfaces of said joined chords.

10. A wooden truss for supporting a peaked roof, said truss including a horizontal lower chord having attached to its opposite ends inwardly and upwardly directed upper chord members, said upper chord members meeting in a peak, said upper and said lower chord members being of rectangular cross section and of substantially the same thickness, each of said upper chord members having lower faces and opposite side surfaces, said lower chord member having opposite end faces, said opposite end faces being beveled in a plane parallel to the lower face of said adjacent upper chord members respectively, said upper chord members at their meeting at said peak having adjacent end faces, the planes of said adjacent end faces being parallel, said chord members all lying in the same plane, the upper chords being joined at a joint at the peak and said upper chords each being joined at joints to said lower chord at the opposite ends thereof by couplings, the coupling at one of said joints comprising a sheet metal body having a rectangular central web portion in the interior of said body, and side plate portions integral with said web, the first of said side plate portions being bent in a first direction at right angles with respect to said web along one side thereof and then bent double in a second direction opposite said first direction to provide a double thickness on a first side of the web and a single thickness on the second side of the web, and the second of the side plate portions being bent in said second direction along the opposite edge of said web and then bent double in said first direction to provide a double thickness on said second side of said web and a single thickness on said first side, whereby the composite body has one side wall of double thickness and one of single thickness on either side of said web; at said one joint the parallel faces of the joined chords

abutting respectively opposite faces of said central web portion and said side plates extending along and contacting the opposite side surfaces of said joined chords.

11. A wooden truss for supporting a roof, said truss comprising a lower chord member and a plurality of upper chord members, said chord members being attached together adjacent their ends to outline a polygon, each of said chord members forming a side of said outlined polygon, each of said chord members being of rectangular cross section and of substantially the same thickness, and having upper and lower surfaces and opposite side surfaces, said lower chord having its opposite end surfaces beveled to parallel the lower surfaces of the respective adjacent upper chord members, said upper chord members where they are attached to each other having respective parallel end surfaces, the attachment together of all of said chords being effected by couplings, each of said couplings having a central web portion and parallel side plates disposed on and connected to opposite edges of said central web portions, said side plates extending perpendicular to said web portion in either direction; in the attachment of said upper chord members to each other, the parallel end surfaces of said attached upper chords abutting respectively opposite faces of said central web portion and said side plates extending along and contacting the opposite side surfaces of said attached upper chords; and in the attachment of the lower chord to the adjacent upper chords, the opposite faces of said web portion being abutted respectively by the lower surface of said adjacent upper chord and the end surface of said lower chord with said side plate portions extending

along and contacting opposite side surfaces of said lower and upper chords.

12. A wooden truss as described in claim 11 wherein each of said couplings comprise a sheet metal body having said rectangular web portion in the interior of said body and side plate portions integral with said web the first of said side plate portions being bent in a first direction at right angles with respect to said web along one side thereof and then bent double in a second direction opposite said first direction to provide a double thickness on a first side of the web and a single thickness on the second side of the web, and the second of the side plate portions being bent in said second direction along the opposite edge of said web and then bent double in said first direction to provide a double thickness on said second side of said web and a single thickness on said first side, whereby the composite body has one sidewall of double thickness and one of single thickness on either side of said web.

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