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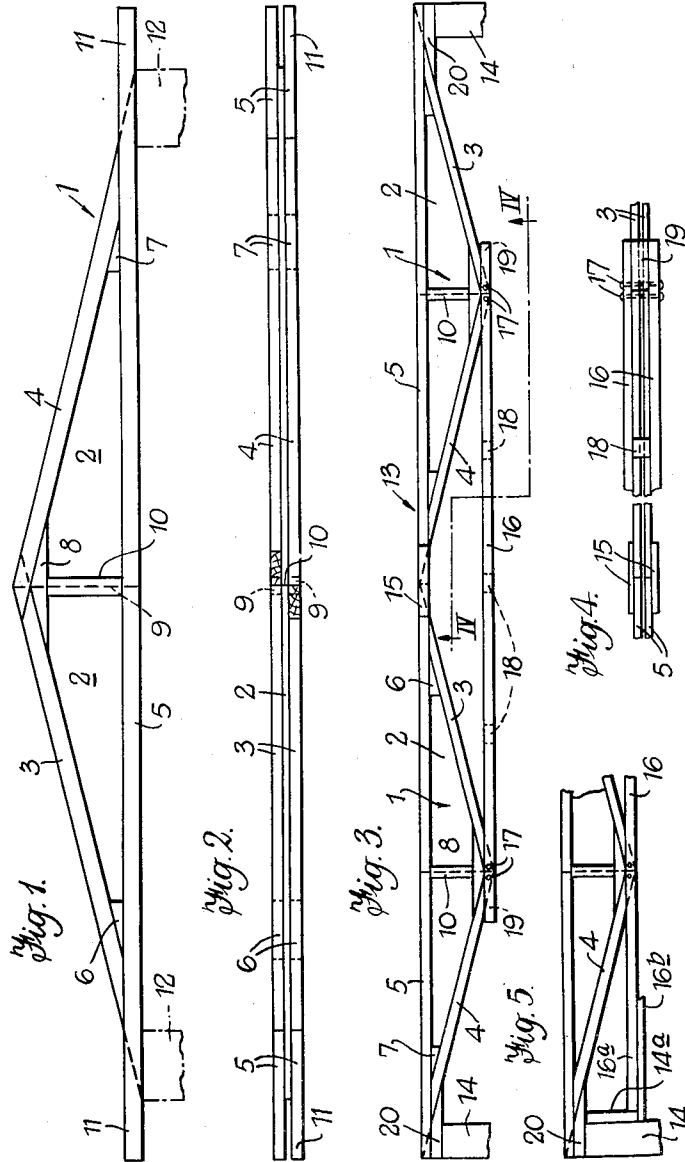
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3,067,544

BUILDING COMPONENTS AND STRUCTURES

Filed April 21, 1959

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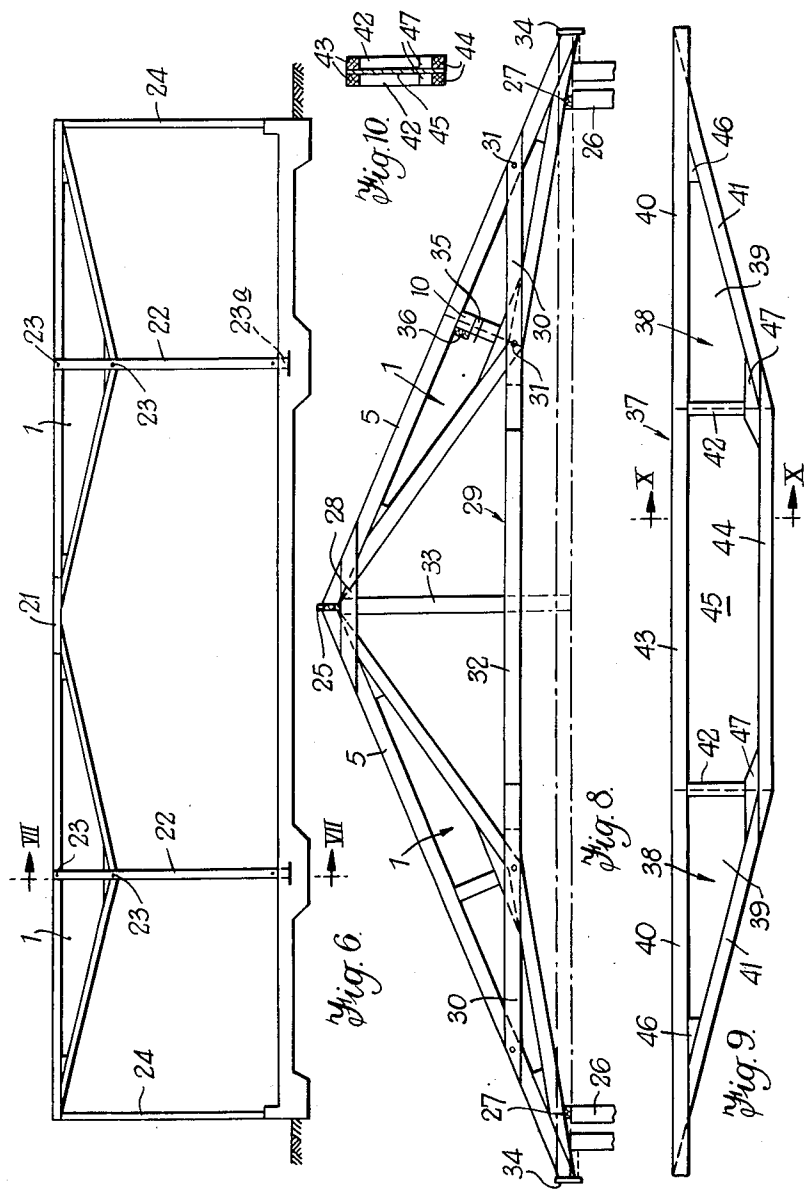
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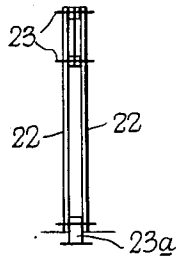


Fig. 7.

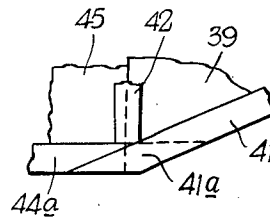


Fig. 11.

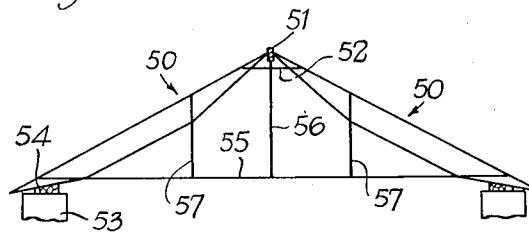


Fig. 12.

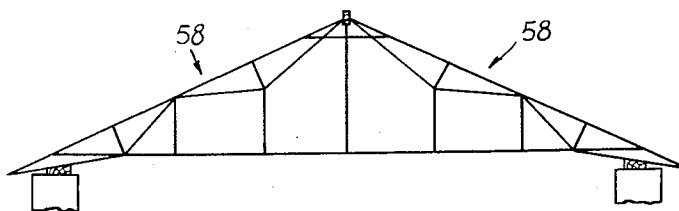


Fig. 13.

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BUILDING COMPONENTS AND STRUCTURES

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2 Claims. (Cl. 50—55)

This invention relates to building components and structures.

In accordance with the invention there is provided a building component or structure comprising a triangularly shaped web element of sheet material having, on at least one of its side faces, strengthening members secured to the web element and extending along the edges thereof, to reinforce the web element so that the component or structure can be employed in a roof or other building construction.

For a better understanding of the invention and to show how it may be carried into effect, embodiments thereof will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIGURE 1 is a side elevation of a component according to one embodiment,

FIGURE 2 is a plan view corresponding to FIGURE 1,

FIGURE 3 is a side elevation of a structure according to another embodiment and incorporating components similar to the component of FIGURES 1 and 2,

FIGURE 4 is a view from below taken along the line IV—IV of FIGURE 3,

FIGURE 5 is a fragmentary side elevation illustrating a modification of the structure shown in FIGURE 3,

FIGURE 6 is a side view illustrating another structure incorporating components similar to the component of FIGURES 1 and 2,

FIGURE 7 is a cross-section along the line VII—VII of FIGURE 6,

FIGURE 8 is a side elevation of a further construction embodying the components,

FIGURE 9 is a side elevation of a structure according to a further embodiment,

FIGURE 10 is a section along the line X—X of FIGURE 9,

FIGURE 11 is a detail view illustrating a modification of the structure shown in FIGURES 9 and 10, and

FIGURES 12 and 13 illustrate further embodiments of the invention.

The embodiment illustrated in FIGURES 1 and 2 comprises a light-weight timber component illustrated generally at 1, for use as, or in the construction of, a roof truss or beam, the component comprising a web element 2 made of plywood and in the form of an isosceles triangle. In the component as illustrated the perpendicular height of the triangular web is approximately one-eighth of the length of the base of the triangle, but it will be understood that the length and height of the web can be varied according to the dimensions and loading requirements of the component, and the sizes of the plywood sheets from which the web is to be cut. In the present embodiment, the web 2 is formed of two right-angle triangular plywood pieces arranged together in co-planar relation so that the hypotenuse of the two triangular pieces define the two equal side edges of the isosceles triangle. To each side face of the web element 2 there are secured as by nailed and glued joints, strengthening batten members 3 and 4 which extend along the equal side edges of the triangle, and similar strengthening batten members 5 which extend along the base edge of the web. The ends of battens 3 and 4 at the base of the triangle, are mitred so as to abut the edge faces of the associated battens 5. On the side of the component shown in FIGURE 1 batten

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4 is slightly longer than batten 3 so that, at the apex, the end portion of batten 4 extends across or overlaps the adjacent end of batten 3 and is shaped to form the angle of the apex, the adjacent end of batten 3 being shaped to abut the inwardly directed edge of the batten 4 in the region of the apex. On the reverse side of the web element, the batten 3 is longer and is shaped to conform to the angle of the apex, the end portion of this batten 3 being engaged by the adjacent abutting end of the shorter batten 4. Thus, at the apex the shaped end portions of the oppositely inclined longer battens on opposite sides of the web element, are disposed in overlapping relation, thereby to strengthen the component at the apex. Triangular reinforcing blocks 6 and 7 located in the angles between batten 5 and the adjacent side battens 3 and 4, are secured to each side of the web element and a similar reinforcing block 8 is secured on each side of the web element at the apex in the angle between battens 3 and 4. The adjoining edges of the two right-angled triangular plywood pieces constituting the web element 2, are arranged to form a butt joint 9, this joint being reinforced by a perpendicular batten 10 applied to each side of the web element and extending between the batten 5 and the reinforcing block 8.

The strengthening battens 5 are extended at their opposite ends beyond the adjacent corners of the web element 2, to provide projecting portions 11 adapted to serve in the support of the component as by walls or pillars, or in the making of a joint at for example the ridge of a pitched roof structure, as hereinafter described. However, if desired, these projecting portions 11 can be trimmed back as required in accordance with the nature of the structure in which the component is to be employed.

By forming the web 2 of right-angled triangular pieces, the latter may be cut from standard plywood sheet measuring for example, eight feet by four feet, which permits economical production of webs for components approximately sixteen feet in overall length and of between twelve and twenty-four inches in perpendicular height. The reinforcing battens may be cut from standard lengths of timber, approximately three inches by one inch in cross-section. In cutting such lengths of timber for the side battens 3 and 4, the off-cut portions produced in forming the inclined ends of the battens can be utilized to form the reinforcing blocks 6, 7 and 8, thereby to economize in material.

If desired, the adjoining edges of the plywood pieces forming the web 2, may be bevelled to enable the two triangular pieces to be connected together in co-planar relation by a scarf joint. In this case, the perpendicular reinforcing battens 10 may be omitted and the battens 3 and 4 on each side of the component, may be identical in length, the ends of these battens being mitred at the apex to form a butt joint.

In the construction of a pitched roof for a building, a number of the preformed components 1 may be arranged as roof trusses spaced apart and parallel to each other, the base members 5 of the components being substantially horizontal and supported at their opposite ends upon walls of the building indicated by broken lines at 12 in FIGURE 1. In such an arrangement, the upwardly directed apices of the several components define the ridge of the roof and the inclined battens 3 and 4 form the roof rafters, the portions 11 of the battens 5 extending from the walls 12 for the construction of gutters and eaves. If desired, the components may be supported upon the walls 12 in inverted positions for the construction of a flat roof, bearer plates of timber being provided along the tops of the walls and appropriately shaped for engagement by the outer end portions of the inclined

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battens 3 and 4 of the inverted components. The inverted components may also be arranged for the construction of a lean-to roof.

In FIGURES 3 and 4 there is illustrated another embodiment of the invention comprising a beam structure indicated generally at 13 and shown supported at its outer extremities upon walls 14 for the construction of a flat roof. The beam structure includes two triangular components each closely similar to the component illustrated in FIGURES 1 and 2 and thus identified by similar references, the two triangular components 1 being connected together end-to-end so that the base battens 5 are disposed in substantial alignment. In the construction of the beam 13, the projecting portions 11 at the opposite ends of the battens 5 of each component 1 are trimmed back to the adjacent corners of the associated webs 2 and the inner adjoining ends of the battens 5 of the two components are connected together by overlapping timber plates 15 secured as by nails, or nails and glue, to the battens 5 at each side of the two components. The beam structure 13 includes also a horizontal tie member comprising two timber batens disposed side-by-side, one of such batens being shown at 16. The tie battens 16 are arranged to form a connection between the downwardly directed apices of the two inverted components 1 and are secured to the components, one on each side, by bolts 17. The battens 16 are thus spaced laterally apart by the thickness of the components, the intermediate portions of the battens being spaced apart by wooden spacer blocks 18. Wedge-shaped spacer blocks 19 are also located between the end portions of the two battens 16, the blocks 19 presenting inclined faces engaging the corresponding inclined edges of the adjacent components 1. At the top of each wall 14 there is provided a bearer plate of timber 20 formed with an inclined edge face for engagement with the outer inclined end portion of the adjacent component.

In a modification of the structure shown in FIGURES 3 and 4, the battens 16 forming the horizontal tie member, are extended at each end, as shown at 16a in FIGURE 5, the extended portions 16a engaging at their extremities the adjacent supporting walls 14 and being fixed to upright timber plates 14a secured to the walls. This arrangement permits the extended tie members of a number of the beam structures incorporated in a roof construction, to be employed for the support of a ceiling structure as shown diagrammatically at 16b.

The components 1 may also be arranged with the base of each component uppermost and the apex thereof resting upon an upright support, such as a column, to form a cantilevered roof construction. In FIGURES 6 and 7, for example, there is illustrated a composite structure comprising two components 1 connected together end-to-end, the inner adjoining ends of the two components being secured by timber plates 21 similar to the plates 15 shown in FIGURE 3. The two components are supported at their apices by columns each comprising two upright timber members 22 disposed at opposite sides of the adjacent component and secured thereto as by bolts 23. The timber members 22 are bolted at their lower ends to locating blocks 23a embedded in and projecting from the floor structure. The arrangement provides a double cantilevered roof truss in which the upright members 22 of the supporting columns serve at their upper ends to stiffen the triangular components at the points of maximum stress. The cantilevered arrangement is such that no external load-bearing walls or other supports are required at the outer extremities of the roof trusses and the spaces at the opposite sides of the building may be infilled by light timber framing having relatively large areas of glass, as indicated diagrammatically at 24 in FIGURE 6. In FIGURE 6, the bases of the two inverted triangular components are arranged in horizontal alignment for a flat roof. The arrangement may be modified by appropriately in-

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clining the components so that the base members slope inwardly toward each other, or outwardly away from each other, or the components may be arranged, for example, for the construction of a roof of saw-tooth like form in cross-section.

In FIGURE 8 there is illustrated another composite structure comprising two triangular components 1 arranged in co-planar relation with the base batens 5 uppermost and inclined downwardly and outwardly from each other to form an inverted V truss for a pitched roof. The inner end portions of the base members 5 of the two components are trimmed back for engagement with and connection to a ridge plate 25. The outer end portions of the two components are supported upon walls 26 of the building, appropriately shaped bearing plates 27 extending along the tops of the walls for engagement with the adjacent inclined parts of the components. The connection of the two components at the ridge is strengthened by a transverse collar 28. The structure includes also a horizontal transverse tie member 29 comprising at each end, two side-by-side battens 30 arranged one at each side of the adjacent component 1 and extending through the apex thereof, the battens 30 being secured to the components as by bolts 31. The tie member 29 comprises also an intermediate batten 32 the opposite end portions of which are disposed between and connected to portions of the adjacent battens 30 which project inwardly from the apices of the components 1. The structure is further strengthened by an upright hanger 33 connected at its upper end to the collar 28 and at its lower end to the tie member 29. The outer ends of the two components 1 are trimmed back for the reception of fascia boards 34. The perpendicular reinforcing battens 10 of the two components 1, have secured thereto blocks 35 for the fixing in position of roof purlins 36.

In FIGURE 8, the transverse tie member 29 may be arranged at a lower level, as shown for example by dash-and-dot lines, and the upright hanger 33 appropriately extended.

The arrangement shown in FIGURE 8 may also be modified for the construction of a low pitched roof, the components 1 being so arranged that their apices are disposed substantially in the plane of the tops of the walls 26. In such an arrangement, the horizontal tie member 29 may consist of two side-by-side battens extending between and connected to the apices of the two components.

The arrangement of FIGURE 8 may also be modified to form a truss for the construction of a roof of greater slope than that shown in FIGURE 8, so that the base members 5 of the two components 1 will define a smaller angle at the ridge, and the transverse tie members 29 connected between the apices of the components will be located at a greater height above the points of support at the outer ends of the two components. In this modified arrangement, a second or lower tie member adapted to form a ceiling tie, may extend horizontally between the outer extremities of the two components substantially in the plane of the points of support provided by the walls 26. Moreover, the hanger 33 depending from the ridge may be extended for connection to the lower tie member and additional hangers may be provided between the lower tie member and superjacent parts of the triangular components.

In FIGURES 9 and 10 there is illustrated another embodiment comprising a beam or rafter indicated generally at 37 for a roof or floor construction, the beam comprising two triangular components 38 each including a web 39 in the form of a right-angled triangle provided on each side with strengthening battens 40, 41 and 42 extending along the edges of the web. The triangular components 38 are located at opposite ends of the beam and are connected by upper and lower pairs of battens 43 and 44 so that in elevation the beam is of trapezoidal shape. The

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two upper connecting battens 43 are formed integrally with the strengthening battens 40 and the perpendicular strengthening battens 42 are so arranged that they overlap and serve to reinforce a rectangular web element 45 of ply-wood which is co-planar with the webs 39 and which fills the intermediate rectangular part of the beam. Triangular reinforcing blocks 46 are provided in the angles between the battens 40 and 41 and the joints between the battens 41 of the two components 38 and the lower connecting battens 44 are reinforced by blocks 47. These joints are also strengthened by extending the lower connecting battens 44 to overlap, at each end, the web 39 of the adjacent component 38.

The beam shown in FIGURE 9 may be increased in length by extending the connecting battens 43 and 44 so as to double, for example, the length of the intermediate rectangular part of the beam. In such a structure, there would be two co-planar rectangular webs, each similar to the web 45, between the triangular components 38 and the join between the two rectangular webs reinforced at each side by a perpendicular batten similar to the battens 42.

In the structure described with reference to FIGURE 9, the lower connecting batten 44 on each side of the rectangular web element 45, is extended at each end to overlap the web 39 of the adjacent triangular component 38. If desired, however, the batten 44 on one side only of the structure may be so extended, in which case the inclined battens 41 on the other side of the structure may each be extended and shaped, as shown at 41a in FIGURE 11, to overlap the adjacent lower corner portion of the web element 45, the lower connecting batten 44a on said other side being appropriately mitred at its extremities for abutment with the adjacent inclined extended edge portions of the battens 41a. The overlapping of the battens on opposite sides of the structure in this manner, serves to reinforce the joints at the lower corners of the web element 45 and permits the shaped blocks 47 to be omitted, as indicated in FIGURE 11.

FIGURE 12 illustrates a further example of a truss for a pitched roof, the truss incorporating two mutually inclined beam structures 50 each similar in formation to the beam shown in FIGURES 9 and 10. The beams 50 are trimmed back at their upper adjacent ends for connection to a ridge plate 51 and the ridge joint is strengthened by a transverse collar 52. The lower outer ends of the beams are supported by walls 53, there being timber bearing plates 54 along the walls for engagement by the adjacent inclined battens of the beams. The beams are interconnected by a transverse tie member 55 and between this tie member and the collar 52 there is provided a central hanger 56. Intermediate hangers 57 are also provided between the beams and the tie member. As shown, the tie member and the intermediate hangers 57 are connected to the beams in the region of the joints at the lower corners of the central rectangular parts of the beams.

The pitched roof truss illustrated in FIGURE 13, comprises two mutually inclined beams 58 each similar to the structure shown in FIGURES 3 and 4. Here again the beams are supported in position between the walls and a ridge plate and appropriate transverse tie and hanger members are incorporated in the truss.

It will be understood that the components and struc-

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tures hereinbefore described can be modified according to the form and loading requirements thereof. In the afore-described embodiments, the triangular components are constructed of ply-wood and timber battens but other materials may be used or incorporated according to the required strength and dimensions of the components.

I claim:

1. A roof truss adapted for being constructed from mass produced prefabricated elements, the truss being constructable to adapt to one of a plurality of spans and one of a plurality of slopes the truss, comprising a pair of prefabricated elements, each element adapted for being constructed in part from one of a number of rectangular sheets having sizes corresponding to standard sizes of standard sheets, each element comprising a pair of congruent right triangular shaped webs arranged in a common plane in abutting relation to form an isosceles triangle, said webs having hypotenuses and defining a rectangle with said hypotenuses in concurring relation, said rectangle being adapted for being formed from a sheet of standard size, said isosceles triangle defining a base, a batten, constituting a reinforcement for said webs, on said webs on either side thereof and extending along the base of the isosceles triangle, battens on said webs extending along the hypotenuses thereof and coupled together to define an apex for said element, the latter said battens defining an angle with the first said battens, joint reinforcing blocks in said angles formed by said battens, a further batten extending from the apex of the element to the first said battens along a line defined by the abutting webs, said further batten being connected to both said webs to connect the same together in reinforced fashion, said battens and blocks projecting equal distances from said web whereby they define a common plane adapted for supporting said element, said pair of elements being connected together in end to end relation, and with their apices facing downwardly to include an angle corresponding to the slope and span desired, each said element being adapted for being supported at an end opposite the first said end at a location defining said span, and a transverse tie member extending between the first said battens of said elements and through the apices of said elements.

2. A roof truss as claimed in claim 1 comprising a hanger extending between the connected ends of the elements and the transverse tie member.

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