May 17, 1960 E. CVIKL 2,936,862

WELDED LATTICE GIRDERS

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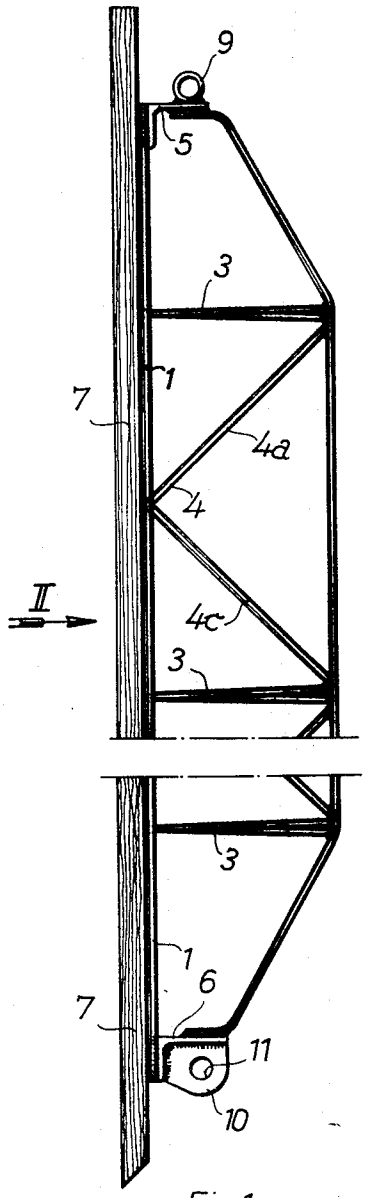

Fig. 1

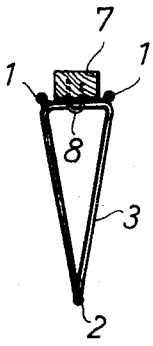

Fig. 3

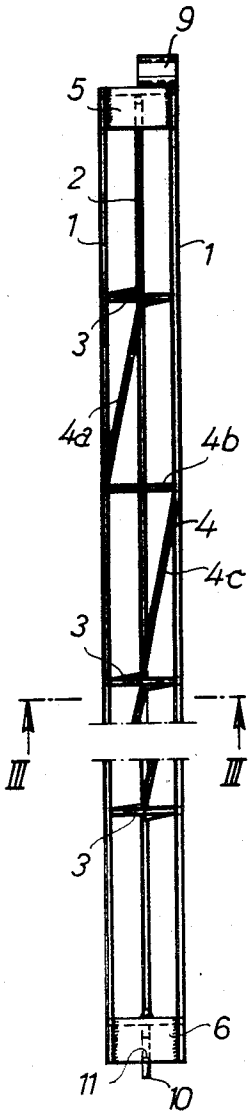

Fig. 2

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WELDED LATTICE GIRDERS

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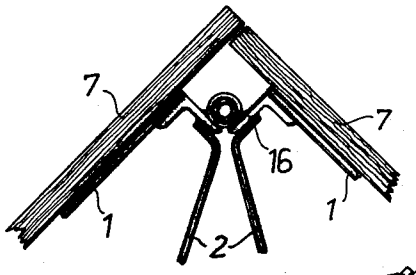

Fig.5

Fig.4

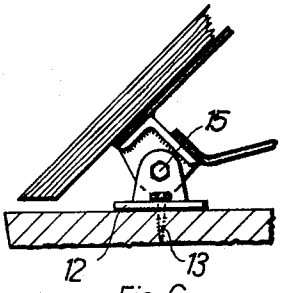

Fig.6

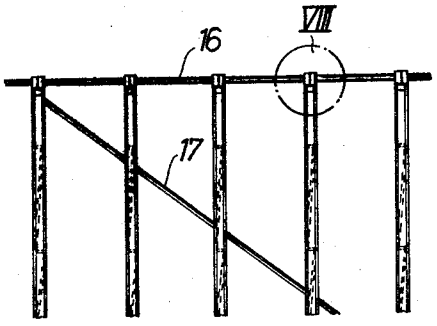

Fig.7

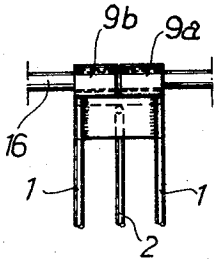

Fig.8

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WELDED LATTICE GIRDERS

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Application April 6, 1955, Serial No. 499,712

Claims priority, application Germany April 7, 1954

5 Claims. (Cl. 189—37)

This invention relates to welded lattice girders of triangular cross-section, and an object of the invention is to provide an improved girder formed largely of round steel rods and particularly suitable for use as a roof support or rafter.

According to the invention there is provided a welded lattice girder of triangular cross-section with two round steel rods as upper chord members and a round steel rod as a lower chord member, characterised in that the upper and lower chord members are interconnected by V-shaped closed strut members and double diagonal stay members bent somewhat like the letter Z. The chord members and the strut members and stay members are preferably all formed of round steel rods. Such a girder constitutes a static load bearing constructional element of the simplest construction and requires a small amount of material only.

In comparison with known constructions of steel lattice-work supports for roof rafters, in which the roof battens or purlins must be secured by means of additional ridged sections or fastening means or the like, the invention makes it possible to secure a wooden batten to the upper side of the lattice girder in a simple manner, so that the purlins can be fastened to the batten by simple nailing as in a roof frame of wood.

From the point of view of technical production, the construction of the lattice girder according to the invention is very simple, as all the welding zones are readily accessible and can be effected as groove seams and thus also from the point of view of welding technique can be produced easily both with the use of the simpler apparatus and with the smallest labour requirements. The girder consequently is also very suitable for mass production. Further features of the invention appear from the following description and are set forth in the claims.

The invention is illustrated by way of example in the accompanying drawings in which:

Figure 1 is a side view of a girder according to the invention,

Figure 2 is a plan in the direction of the arrow II in Figure 1,

Figure 3 is a section on the line III—III of Figure 2,

Figure 4 is a part sectional view of a roof construction employing girders according to the invention,

Figures 5 and 6 show details to a larger scale of parts within the circles IV and V of Figure 4,

Figure 7 is a side view of the roof construction, and

Figure 8 is a detail view to a larger scale of the part within the circle VIII of Figure 7.

The illustrated girder consists largely of round steel rods and comprises two upper chord members **1**, a lower chord member **2**, and lattice-work-like strut or vertical members **3** and stay members **4**; in consequence of the particular formation of the latter the girder has a triangular or V-shaped cross-section. The lower chord member **2** is bent towards the upper chord members **1**

at the ends of the girder and the chord members are connected together at each end by means of an angle piece **5** to which they are welded, the angle pieces **5** also serving for mounting means for securing the girder for example to a building structure and also at the ridge when the girders serve as roof spars or rafters. The chord members **1** and **2** and also the strut members **3** and stay members **4** all consisting of round steel rods are all also connected together by means of welding.

As can be seen from Figure 3 in particular, the upper chord members **1** abut the outer edges of an elongated isosceles triangle standing upon its point. The shape of the thus formed geometrical figure being determined by the strut member **3**. As will be seen from Figures 1 and 2, the lower ends of the vertical or strut member **3** are, at their points of contact with the lower chord member **2**, arranged one in front of the other, which fact is of particular advantage from the point of welding because in this way throat seam or fillet welds can easily and satisfactorily be employed.

Moreover, in view of the use of the double diagonal stay members **4** the number of welding positions is reduced in comparison with single stays; they can be bent in one working stage and simultaneously cut off at an angle with the tapering off at their ends, whereby there is afforded the possibility of joining them by fillet welds considered highly favorable in the welding art.

The struts **4** have in plan view (Figure 2) a Z-shaped form, without however lying in a single plane, but as can be seen from Figures 1 and 4, the limbs forming the diagonal stays are bent downwardly at equal angles in direction to the lower chord member **2** and lie one in each side plane of the girder. Their connecting points lie on the inner sides of the lower chord member **2** one behind another and in line with the connecting points of the strut members **3**.

As Figure 3 in particular illustrates, a wooden batten **7** is secured by means of staples **8** to those parts of the members **3** and **4** which interconnect the two upper chord members, and this batten **7** permits an easy fastening of the roof purlins. In Figure 2 the batten **7** is not shown in order not to impair the clarity of the plan view of the girder.

For securing the girder at the ridge of a roof connection, a piece of tube or sleeve **9** (Fig. 2), equal in length to half the width of the girder is welded to the angle piece **5**. Secured, for e.g. by welding, to the angle piece **6** in the central plane of the girder, is a securing lug **10** with an aperture **11**.

The formation of a roof assembly by means of girders according to the invention is illustrated in particular in Figure 4 in cross-section and in Figure 7 in side view. The manner of securing the girder to the building structure is illustrated by the detail in the circle VI of Figure 4 and is shown on a larger scale in Figure 6. A bearing block **12** is secured by means of anchor bolts **13** to the building structure **14**. The block **12** serves for the reception of the fastening lug **10**, a bolt **15** being inserted and screwed through the aperture **11** of the lug and likewise through an aperture in the bearing block **12**. At the ridge (see in particular Figure 5) the girders are simultaneously connected in pairs to form three joint structures and at the same time all connected to the rafters or roof supports by means of a ridge tube **16** which is inserted through the sleeves **9**. Through the one-sided or asymmetrical arrangement in each case of the sleeve **9** it is possible to employ a mass produced girder for alternative arrangement either on the right-hand or left-hand side of a roof. This is apparent in particular from Figure 8; the sleeve or hinge portion **9a** is secured to that

one of a pair of girders which is nearer to the viewer, whereas the sleeve or hinge portion *9b* belongs to the opposite girder which is completely covered from the view by the first-mentioned girder. The battens **7** arranged on the girders make possible the easy fastening of the roof battens or purlins **18** for the reception of the roof tiles or the like (see in particular Figure 4). A wind brace **17** stiffens the thus produced roof structure against wind forces.

In addition to roof structures, in particular for small roofs with wooden battens or sheathing, the girders according to the invention are suitable for every purpose in which it is desired to combine small weight with high loading and large width of span; moreover the simplicity of the construction of the girders makes them particularly suitable for mass production.

I claim:

1. A welded lattice girder of triangular cross section which comprises in combination: an upper chord having two longitudinally extending rods of substantially circular cross section; a lower chord comprising a single longitudinally extending rod of substantially circular cross section; a plurality of strut members spaced longitudinally along said girder, each of said strut members being formed of an integral rod and having the shape of a closed triangle with the tip of the triangle welded to the lower chord and with the base of the triangle extending transverse to the longitudinal direction of the upper chord and welded thereto, said triangular strut members being located in planes respectively arranged perpendicular to both said upper chord and said lower chord; and a plurality of stay members alternating with said strut members, each stay member being formed of an integral rod comprising a cross piece transverse to the longitudinal direction of the girder and welded to the two rods of the upper chord intermediate two of said struts and also comprising two diagonal portions respectively extending from the ends of said cross piece in opposite directions with regard to the longitudinal direction of the girder, the free ends of said diagonal portions being welded to said lower chord at the tips of said two struts.

2. A girder according to claim 1, in which the two longitudinally extending rods forming the upper chord have their bottom sides welded to the top sides of the base of the triangle-shaped strut members and to the top sides of the cross pieces of said stay members.

3. A welded lattice girder of triangular cross section which comprises in combination: an upper chord having two longitudinally extending rods of substantially circular cross section; a lower chord comprising a single longitudinally extending rod of substantially circular cross section; a plurality of strut members spaced longitudinally along said girder, each of said strut members being formed of an integral rod and having the shape of a closed triangle with the tip of the triangle welded to the lower chord and with the base of the triangle extending transverse to the longitudinal direction of the upper chord and welded thereto, said triangular strut members being located in planes respectively arranged perpendicular to both said upper chord and said lower chord; a plurality of stay members alternating with said strut members, each stay member being formed of an integral rod comprising a cross piece transverse to the longitudinal direction of the girder and welded to the two rods of the upper chord intermediate two of said struts and also comprising two diagonal portions respectively extending from the ends of said cross piece in opposite directions with regard to the longitudinal direction of the girder, the free ends of said diagonal portions being welded to said lower chord at the tips of said two struts, and two connecting members respectively arranged at the ends of said girder and each respectively connecting the ends of said upper chord with the ends of said lower chord, one of said connecting members being provided with a hinge-like outwardly directed extension located in substantially the central longitudinal plane of said girder and having a transverse bore therethrough and the other connecting member having connected thereto one tubular hinge portion only extending from one side of said girder to substantially said central longitudinal plane thereof.

4. A welded lattice girder of triangular cross section which comprises in combination: an upper chord having two longitudinally extending rods of substantially circular cross section; a lower chord comprising a single longitudinally extending rod of substantially circular cross section; a plurality of strut members spaced longitudinally along said girder, each of said strut members being formed of an integral rod and having the shape of a closed triangle with the tip of the triangle welded to the lower chord and with the base of the triangle extending transverse to the longitudinal direction of the upper chord and welded to the lower side thereof so that the upper surface of said base is located in a plane lower than the top surface of the respective adjacent portions of the longitudinally extending rods of said upper chord whereby the longitudinally extending rods of said upper chord form side rails for said base, said triangular strut members being located in planes respectively arranged perpendicular to both said upper chord and said lower chord; a plurality of stay members alternating with said strut members, each stay member being formed of an integral rod comprising a cross piece transverse to the longitudinal direction of the girder and arranged below and welded to the longitudinally extending rods of said upper chord, each stay member also comprising two diagonal portions respectively extending from the ends of said cross piece in opposite directions with regard to the longitudinal direction of the girder, the free ends of said diagonal portions being welded to said lower chord at the tips of adjacent struts, and a wooden batten positioned between said rods of said upper chord and secured to those portions of the triangle-shaped strut members which extend between the longitudinal rods of the upper chord, said batten also being secured to those portions of the cross pieces of said stay members which are located between the longitudinal rods of said upper chord.

5. A welded lattice girder of triangular cross section which comprises in combination: an upper chord having two longitudinally extending rods of substantially circular cross section; a lower chord comprising a single longitudinally extending rod of substantially circular cross section; a plurality of strut members spaced longitudinally along said girder, each of said strut members being formed of an integral rod and having the shape of a closed triangle with the tip of the triangle welded to the lower chord and with the base of the triangle extending transverse to the longitudinal direction of the upper chord and below the latter while being welded thereto, said triangular strut members being located in planes respectively arranged perpendicular to both said upper chord and said lower chord; a plurality of stay members alternating with said strut members, each stay member being formed of an integral rod and comprising a cross piece transverse to the longitudinal direction of the girder and extending below the upper chord while being welded thereto, each stay member also comprising two diagonal portions respectively extending from the ends of said cross piece in opposite directions with regard to the longitudinal direction of the girder, the free ends of said diagonal portions being welded to the lower chord at the tips of said two struts, and two connecting members respectively arranged at each end of said girder and respectively connecting the ends of said upper chord with the ends of said lower chord, at least one end of said girder being provided with a hinge-like sleeve extending from one side of said girder to substantially the central longitudinal plane thereof.

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