Nov. 14, 1967 H. W. DICKINSON 3,352,082

STRUCTURAL UNIT FOR BUILDINGS

Filed Dec. 10, 1965 2 Sheets-Sheet 1

FIG. 1

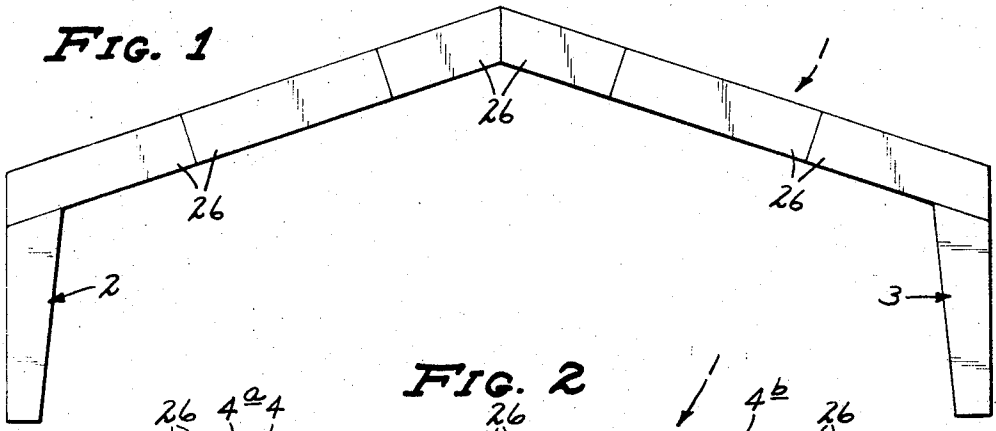


FIG. 2

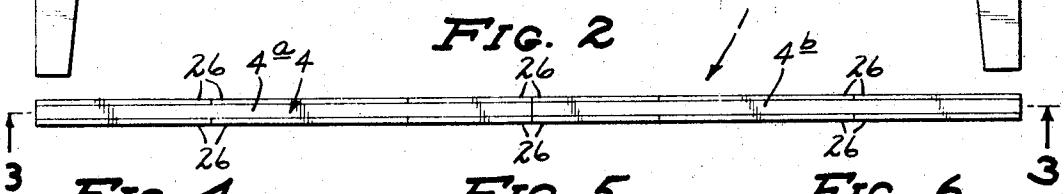


FIG. 4

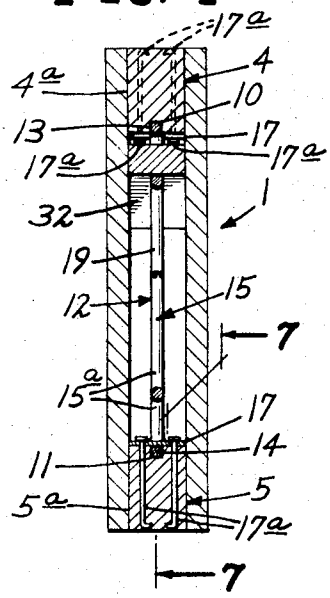


FIG 5

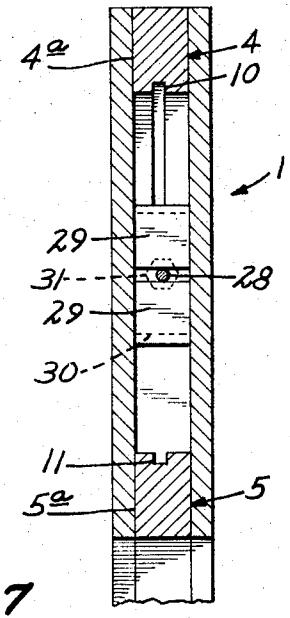


FIG. 6

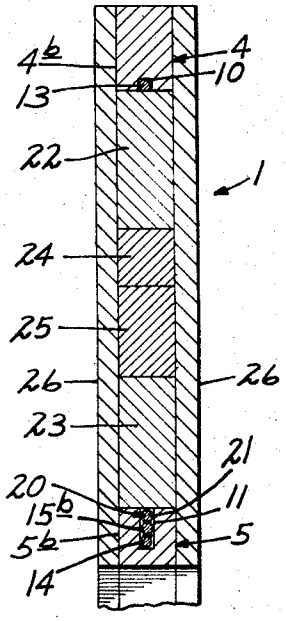
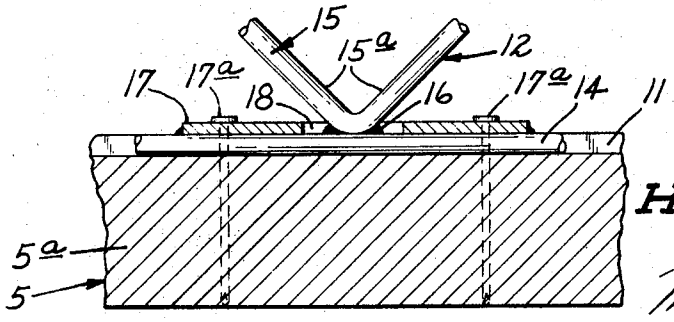


FIG. 7



INVENTOR.
HAROLD W. DICKINSON
BY
Merchant & Gould
ATTORNEYS

Nov. 14, 1967 H. W. DICKINSON 3,352,082

STRUCTURAL UNIT FOR BUILDINGS

Filed Dec. 10, 1965 2 Sheets-Sheet 2

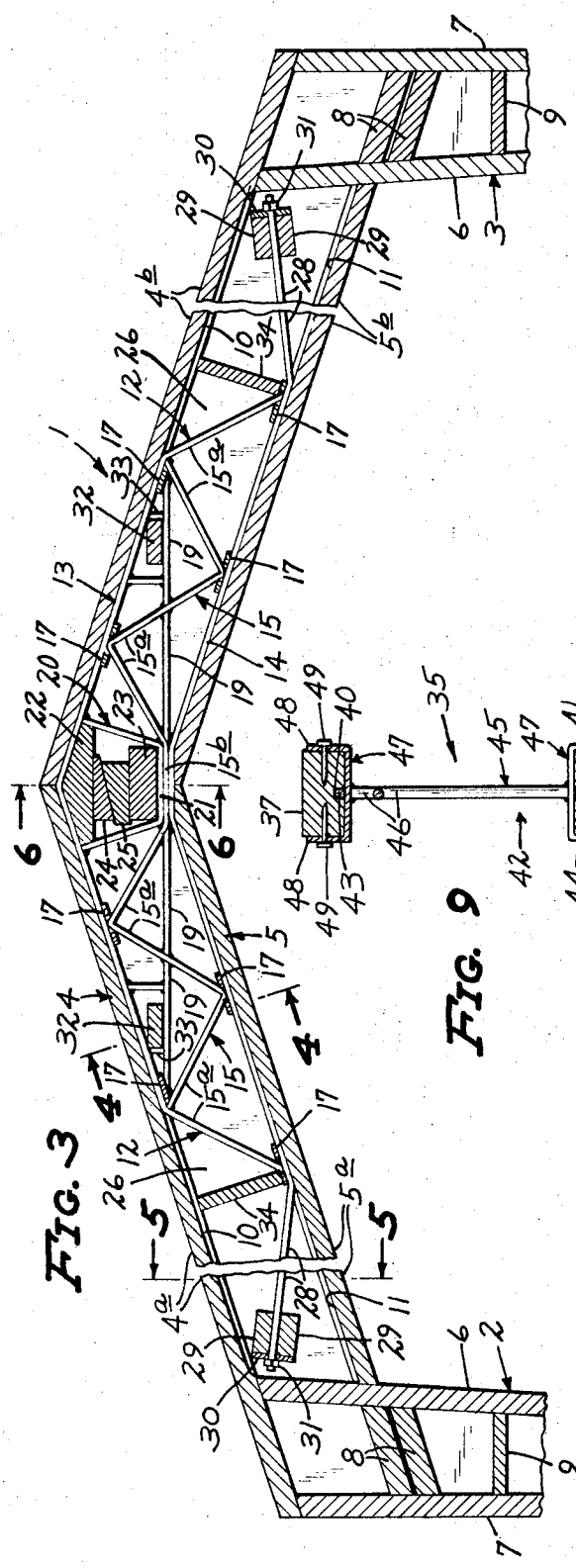


FIG. 3

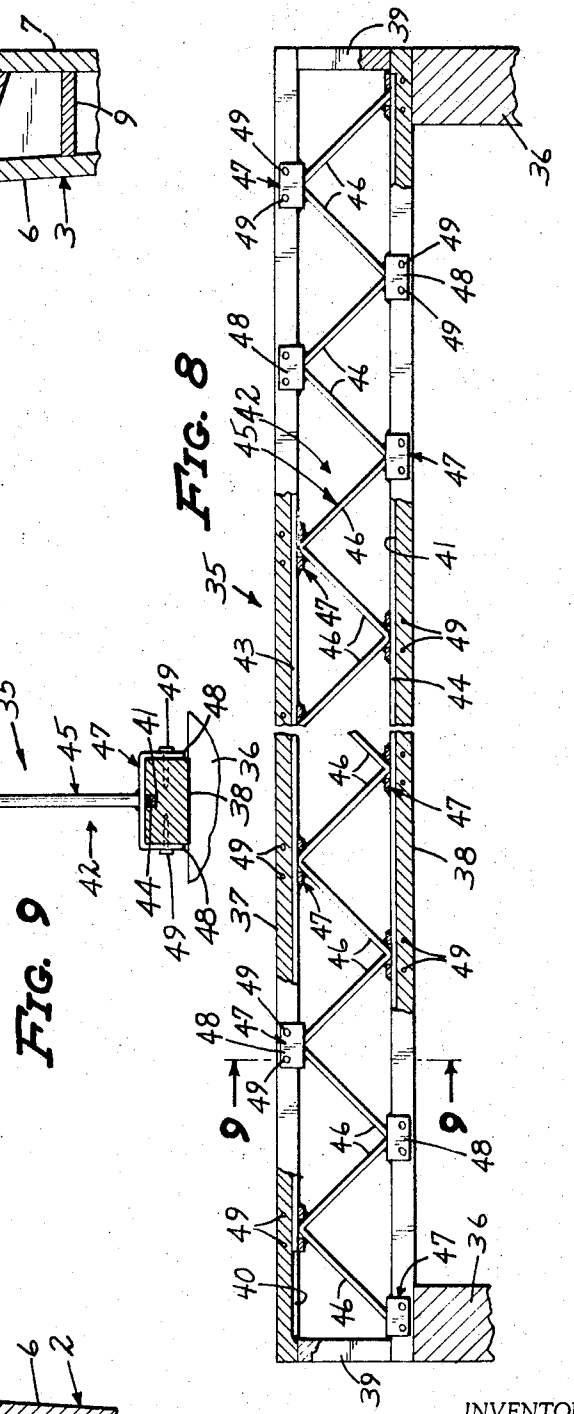


FIG. 8

FIG. 9

INVENTOR.
HAROLD W. DICKINSON
BY
Merchant & Gould
ATTORNEYS

United States Patent Office

3,352,082
Patented Nov. 14, 1967

3,352,082

STRUCTURAL UNIT FOR BUILDINGS

Harold W. Dickinson, % Rafters, Inc.,
Olivia, Minn. 56277

Filed Dec. 10, 1965, Ser. No. 512,864
5 Claims. (Cl. 52—639)

ABSTRACT OF THE DISCLOSURE

A pair of vertically spaced generally parallel wooden stringers having opposed longitudinal channels for reception of elongated longitudinal metallic rod members connected by a zig-zag brace rod welded to longitudinally spaced portions of the longitudinal members. Anchoring plates are welded to the longitudinal members and the brace rod, and are secured to the stringers to maintain the stringers in predetermined spaced apart relationship; cover plates and filler elements further cooperating to maintain the spaced relationship of the stringers.

Summary of the invention

An important object of this invention is the provision of a structural unit, such as a beam or rafter structure, which is light in weight and which possesses great rigidity and load carrying ability.

Another object of this invention is the provision of a structural unit which can be easily fabricated from readily available materials, such as wood and steel rod and sheet stock, with a minimum of machining.

Still another object of this invention is the provision of a structural unit of the above type which can be readily produced in various shapes and sizes.

To the above ends, I provide a structural unit comprising a pair of stringers of wood or the like disposed in spaced generally parallel relationship and having opposed longitudinally extending channels. Disposed between the stringers is a truss structure of commercial steel rod stock and comprising a pair of longitudinal members and cross brace means welded to the longitudinal members, the longitudinal members each being received in the channel of a different one of said stringers. In one form of the invention, I provide anchoring plates welded to the longitudinal members and fastened to longitudinally spaced portions of adjacent ones of said stringers to retain the longitudinal members in their respective channels and cooperating with the truss structure to hold the stringers against movement relative to each other.

Brief description of the drawings

Referring to the drawings, which illustrate the invention, and in which like reference characters indicate like parts throughout the several views:

FIG. 1 is a view in side elevation of a structural unit produced in accordance with this invention;

FIG. 2 is a view in top plan;

FIG. 3 is an enlarged longitudinal section taken substantially on the line 3—3 of FIG. 2;

FIGS. 4, 5 and 6 are enlarged transverse sections taken substantially on the lines 4—4, 5—5, and 6—6 respectively of FIG. 3;

FIG. 7 is a still further enlarged fragmentary section taken substantially on the line 7—7 of FIG. 4;

FIG. 8 is a view in side elevation of a modified form of

structural unit, some parts being broken away and some parts being shown in section; and

FIG. 9 is an enlarged transverse section taken substantially on the line 9—9 of FIG. 8.

Description of the preferred embodiments

In the embodiment of the invention illustrated in FIGS. 1–7, a structural unit in the nature of an arched beam or the like, indicated in its entirety by the numeral **1**, is shown as being supported at its opposite ends by generally upright legs **2** and **3**. The beam **1** comprises upper and lower stringers **4** and **5** respectively disposed in vertically spaced generally parallel relationship, the stringers **4** and **5** each comprising a pair of cooperating stringer sections **4***a* and **4***b* and **5***a* and **5***b* respectively. With reference to FIG. 3, it will be seen that the stringer sections **4***a* and **4***b*, as well as the sections **5***a* and **5***b* are disposed in angularly displaced end-to-end relationship, the several stringer sections diverging downwardly from their abutting ends. The stringers **4** and **5** are preferably made from wood, as are the legs **2** and **3**, said legs each including laterally spaced generally vertical inner and outer stringers **6** and **7** and cross brace members **8** and **9**. At their upper ends, the stringers **6** and **7** are nailed or otherwise rigidly secured to the adjacent outer ends of the stringers **4** and **5**.

The bottom surface of the stringer **4** is grooved generally centrally between its opposite sides to provide a longitudinally extending channel **10**, the top surface of the lower stringer **5** being similarly grooved to provide an upwardly opening longitudinal channel **11** that is opposed to the channel **10**. A truss structure **12** is mounted between the stringers **4** and **5**, and comprises a pair of longitudinal members **13** and **14** that are received in the channels **10** and **11** respectively, the members **13** and **14** being bent intermediate their ends to conform to the angular relationship of the stringer sections **4***a* and **4***b* and of the stringer sections **5***a* and **5***b* respectively. The truss structure **12** further includes brace means in the nature of an elongated member or steel rod **15** that is bent into zig-zag formation to provide a plurality of angularly displaced brace portions **15***a* that are welded as indicated at **16**, to longitudinally spaced portions of the longitudinal members **13** and **14**. A plurality of anchoring plates **17** are each formed with central apertures **18** which receive the adjacent ends of the brace portions **15***a*, the anchoring plates **17** being welded to the ends of the brace portions **15***a* and to adjacent portions of the longitudinal members **13** and **14**. The anchoring plates **17** are rigidly secured to their adjacent stringers **4** and **5** by suitable means, such as nails or the like **17***a*. The brace means further includes a plurality of aligned tie rods **19** that are welded to the brace portions **15***a* and to the longitudinal members **13** and **14**. A generally U-shaped brace member **20** is welded at its opposite ends to the longitudinal member **13** longitudinally outwardly of the inner abutting ends of the stringer sections **4***a* and **4***b*. At its intermediate portion **21**, the brace member **20** is welded to the adjacent underlying portion **15***b* of the steel rod **15**, adjacent the inner abutting ends of the stringer sections **5***a* and **5***b*.

For further stiffening the beam **1** at its longitudinally central portion, I provide upper and lower filler elements **22** and **23** respectively, and a pair of wedge-shaped filler elements **24** and **25** disposed in a stack within the U-shaped brace member **20**, the upper and lower filler ele-

ments 22 and 23 operatively engaging the adjacent inner end portions of the stringer sections 4a, 4b, and 5a and 5b respectively. The wedge-shaped elements 24 and 25 are disposed between the filler elements 22 and 23, and are operative to assist in maintaining predetermined spaced relationship between the upper and lower stringers 4 and 5 at their central portions.

The opposite sides of the beam 1 are closed by cover-plates 26 preferably made from laminated stock such as plywood, and nailed or otherwise rigidly secured to opposite sides of the stringers 4 and 5. Not only do the cover-plates 26 add a more finished appearance to the beam 1, but they also aid the truss structure 12 in lending rigidity and strength the beam 1.

Adjacent its opposite ends, the lower longitudinal member 14 is bent to provide angularly disposed opposite end portions 28 that extend between pairs of strain blocks or the like 29 and through suitable apertures in thrust plates 30, the strain blocks 29 being glued or otherwise rigidly secured to adjacent ones of the cover-plates 26, the thrust plates 30 bearing against the outer ends of their respective strain blocks 29. The extreme outer ends of the end portions 28 are screw threaded to receive nuts 31 that are screw threaded against their adjacent thrust plates 30, whereby to exert tensile stress upon the lower longitudinal member 14, further adding to the rigidity of the beam 1. Other strain blocks 32 rigidly secured to adjacent cover-plates 26, bear against adjacent tie rods 19, and metallic struts 33 are welded to a pair of the tie rods 19 and the upper longitudinal member 13, the struts 33 and strain blocks 32 adding to the rigidity of the tie rods 19 and upper longitudinal member 13. Longitudinally outwardly of the outermost brace portions 15, cross brace members 34 are inserted between the upper and lower longitudinal members 13 and 14 and are rigidly secured to adjacent ones of the cover plates 26.

In fabricating the beam 1, the stringers 4 and 5 are assembled to the truss structure 12 after which the cover-plates 26 are nailed or otherwise rigidly secured to one side of the beam 1. The filler blocks 22–25 are then inserted and the wedge-shaped filler elements 24 and 25 are adjusted and locked in place as are the strain blocks 29 and 32, and the cross braces 34. The thrust plates 30 and nuts 31 are applied to the strain blocks 29, after which other cover plates 26 are nailed or otherwise secured to the open side of the beam 1. The nuts 31 are then adjusted to place the lower longitudinal member 14 under desired tension by conventional means such as a wrench, not shown, through suitable apertures in the beam 1, also not shown. The legs 2 and 3 may be affixed to the opposite ends of the beam 1 at the factory or if desired, may be secured to the ends of the beam 1 at the building site.

In the modified form of the invention illustrated in FIGS. 8 and 9, a relatively straight beam 35 is shown as being supported at its opposite ends on the upper ends of legs or wall sections, indicated at 36. The beam 35 comprises a pair of upper and lower wood stringers 37 and 38 respectively connected at their opposite ends by cross members 39. Like the stringers 4 and 5, the stringers 37 and 38 are grooved to provide opposed longitudinal channels 40 and 41 respectively that extend substantially the full length of the stringers 37 and 38. A truss structure 42 comprises upper and lower longitudinal members 43 and 44 respectively that are seated in respective ones of the channels 40 and 41. The truss structure 42 further includes an elongated member or rod 45 bent into zig-zag form to provide angularly disposed brace portions 46 that are welded at their opposite ends to adjacent ones of the longitudinal members 43 and 44, the longitudinal members 43 and 44, as well as the elongated member 45 being made from commercially available steel rod stock. Cross sectionally U-shaped mounting plates 47 similar to the mounting plates 17, but having laterally spaced side flanges 48, are welded to the integrally formed ends of the brace portions 46 and to adjacent portions of their respective longitudinal members 43 and 44, the side flanges 48 engaging adjacent sides of their respective stringers 37 and 38. The side flanges 48 are provided with suitable apertures for reception of nails or similar fastening devices 49 by means of which the anchoring flanges are rigidly secured to their respective stringers 37 and 38. For supporting relatively lighter loads, the beam 35 may be left open as shown in FIGS. 8 and 9. However, if greater strength is required, or if a more finished appearance is desirable, sheets of plywood, not shown, but similar to the cover-plates 26, may be nailed or otherwise rigidly secured to the opposite sides of the beam 35.

It will be appreciated that beams may be constructed as above described without the use of anchoring plates 17 or 47. In such a construction, by securing the stringers in desired spaced relationship by the cover-plates 26, the truss structures will be secured in place with their longitudinal members seated in the longitudinal channels of their respective stringers. Normally, beams of this last-mentioned type are contemplated for lighter load requirements. From the above, it will be seen that I have provided a structural unit that is completely satisfactory for the accomplishment of the objectives set forth; and, while I have shown and described several forms in which the structural unit may be produced, it will be understood that the same is capable of further modification without departure from the spirit and scope of the invention, as defined in the claims.

What is claimed is:

1. A structural unit comprising:
   (a) a pair of elongated generally parallel wooden stringers disposed in predetermined spaced apart relationship and having laterally spaced flat sides and opposed longitudinally extending channels generally centrally between said sides,
   (b) a truss structure including a pair of longitudinal metallic rod members and cross brace means including an elongated brace rod bent into zig-zag formation to provide a plurality of angularly displaced brace portions having opposite ends welded to longitudinally spaced portions of adjacent ones of said longitudinal rod members,
   (c) said longitudinal members each being received in a different one of said channels,
   (d) and means secured to said stringers for retaining said longitudinal members in said channels and cooperating with said truss structure to hold said stringers in said predetermined spaced apart relationship.

2. The structural unit of claim 1 in which each of said stringers includes a pair of stringer sections joined together in end-to-end angularly displaced downwardly diverging relationship, said longitudinal rod members being bent intermediate their ends to conform to the angular displacement of said stringer sections.

3. The structural unit of claim 2 characterized by plate-like cover elements disposed at opposite sides of said stringers and rigidly anchored to each thereof to enclose said truss structure, and adjustable anchoring means at the opposite ends of at least one of said longitudinal rod members rigidly securing the same against movement relative to said stringers and cover elements.

4. The structural unit of claim 3 characterized by a plurality of stacked filler elements disposed between said stringers at the joined-together ends of said stringer sections, at least one of said filler elements being wedge-shaped, whereby the thickness of the stack of said filler elements may be adjusted in accordance with the distance between said stringers.

5. The structural unit of claim 1 in which said last-mentioned means comprises a plurality of anchoring plates welded to longitudinally spaced portions of said longitudinal members, and fastening elements rigidly se-

curing said anchoring plates to adjacent ones of said stringers.

References Cited

UNITED STATES PATENTS

2,365,175	12/1944	Crawford	52—693
2,459,037	1/1949	McIntosh	52—694
2,822,068	2/1958	Hendrix	52—694

FOREIGN PATENTS

699,069	10/1953	Great Britain.
807,548	7/1951	Germany.

BOBBY R. GAY, *Primary Examiner.*

DAVID J. WILLIAMOWSKY, *Examiner.*

R. D. KRAUS, *Assistant Examiner.*