

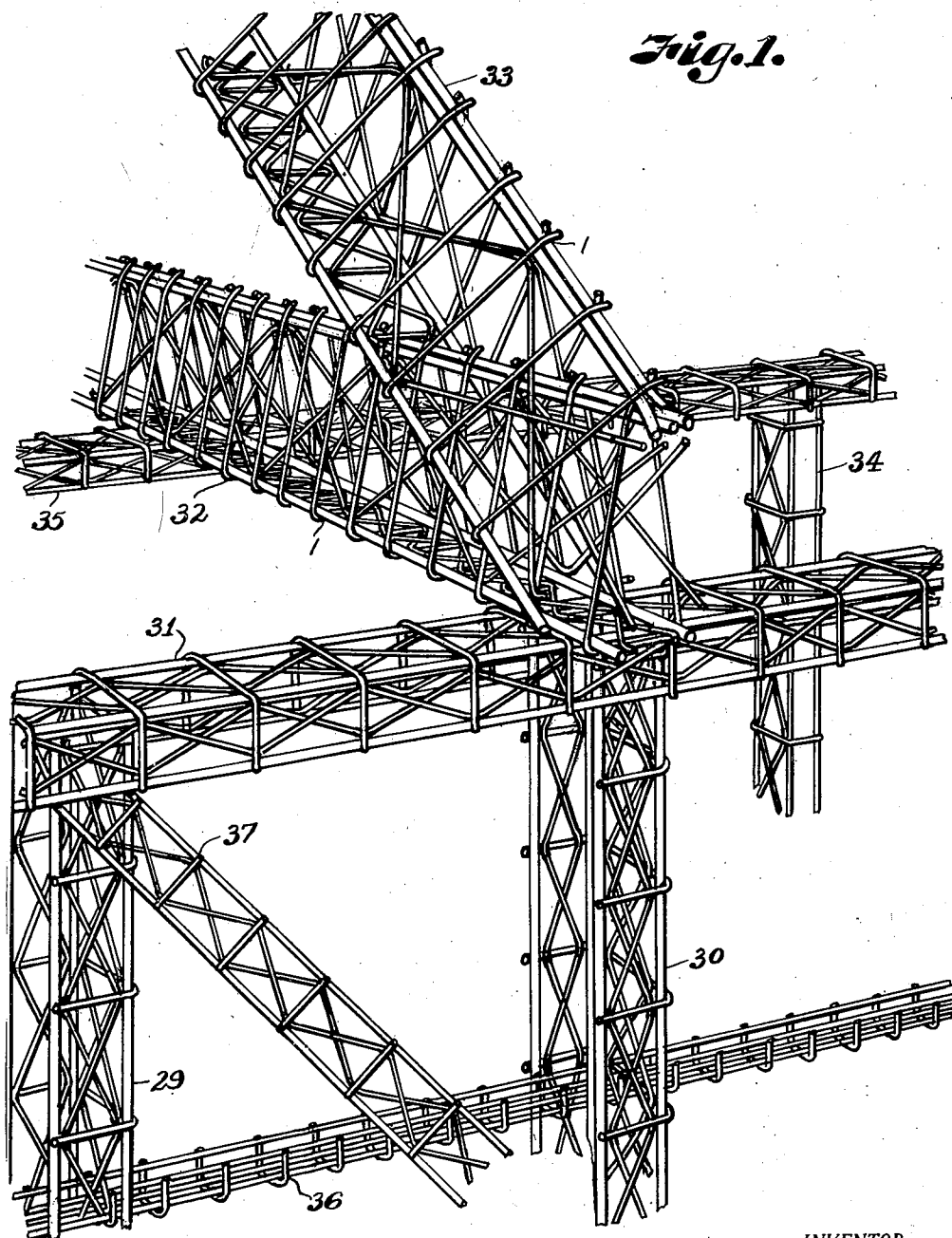
March 22, 1949.

W. S. EDGE
STRUCTURAL MEMBER

2,465,074

Filed Sept. 13, 1944

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2.

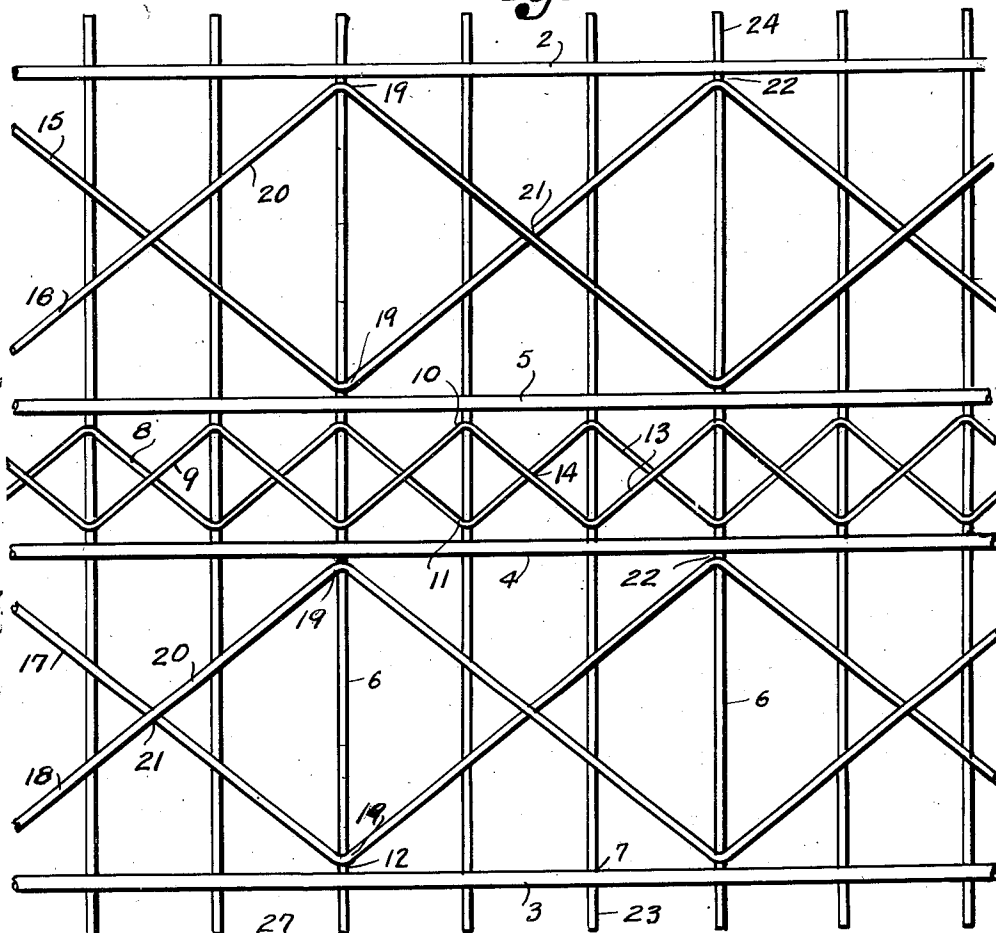


Fig. 3.

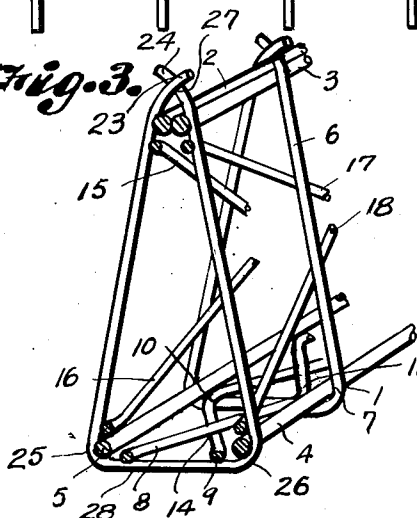
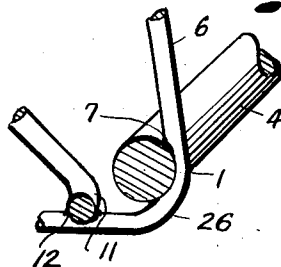


Fig. 4.



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2,465,074

STRUCTURAL MEMBER

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Application September 13, 1944, Serial No. 553,835

7 Claims. (Cl. 189—37)

1

This invention relates to structural members for framing light occupancy buildings and the like where ordinary structural members are not practical, and has as its principal object to provide metal framing members of light weight and high strength ratio and which are comparable in cost to ordinary dimension lumber.

Other objects of the invention are to provide structural members which are adapted to fabrication from high-tensile, cold-drawn wire in combination with wires having substantial ductility; to provide structural members capable of production in long lengths at no increase in unit cost; to provide structural members that are mechanically straight and which will not warp, expand, or contract under changes in atmospheric conditions; to provide structural members designed to be nested one within another to facilitate shipping, storing, and handling thereof; to provide structural members that may be jobbed and dispensed in a manner analogous to ordinary lumber; to provide structural members which may be cut to length and accurately assembled in a building structure at the job site; to provide structural members adapted for use in prefabricated units; and to provide structural members which may be utilized for framing purposes in association with lumber or as reinforcing members in concrete construction.

In accomplishing these and other objects of the invention, I have provided improved details of structure, the preferred form of which is shown in the accompanying drawings wherein:

Fig. 1 is a perspective view of a portion of framing utilizing structural members embodying the features of the present invention.

Fig. 2 is a plan view of a portion of a fabricated structural member prior to bending thereof to shape.

Fig. 3 is a fragmentary perspective view of a structural member formed from the fabricated member shown in Fig. 2 and adapted to be used as a joist, rafter, or the like in a building structure.

Fig. 4 is an enlarged fragmentary perspective view of a portion of the structural member particularly illustrating welding of the wires of which the structural member is composed.

Referring more in detail to the drawings:

1 designates a portion of a joist, rafter, or the like constructed in accordance with the present invention and which may be utilized in a building structure in place of the ordinary 2x6, 2x8, 2x10, and similar framing members. The structural member 1 includes a pair of outer longi-

2

tudinal wires 2 and 3 spaced apart and arranged in parallel relation. Cooperating with the longitudinal members 2 and 3 are a pair of immediately disposed longitudinal members 4 and 5 spaced apart to constitute the base of a beam and from the outer members a distance corresponding to the width of the beam.

The members 2—3 and 4—5 are formed from high tensile, hard-drawn wire of a suitable cross section, for example, round, and which has a high degree of tensile strength so as to constitute the main longitudinal members of the beam and take the loads acting thereon analogous to the upper and lower cords of a truss. This material is lacking somewhat in ductility but has a proportionately high elastic limit. Where the elastic limit of structural grade steel may be two-thirds of its ultimate strength, that of the material I employ may be 80 or 90 per cent of its ultimate strength. The longitudinal wires are interconnected by a longitudinal series of spaced transverse wires 6, which wires are preferably formed of a softer more ductile material so that they are capable of being bent to shape the beam without danger of fracture. The transverse wires are juxtaposed preferably against the common sides of the longitudinal wires and are welded thereto at the crossing points thereof by a suitable resistance weld as indicated at 7 in the manner of the welds produced in manufacture of welding wire, fencing, mats, and the like.

Positioned upon the transverse wires intermediate the spacing between the longitudinal wires 4 and 5 are diagonal braces preferably formed by a pair of symmetrical zigzagged wires 8 and 9, one disposed upon the other and having the apexes 10 of one arranged in opposed relation with the apexes 11 of the other and registering with the respective transverse wires at points spaced slightly from the longitudinal wires 4 and 5 to accommodate bending thereof as later described. The crossing points of the apexes are welded to the transverse wires as indicated at 12 and the intermediate portions 13 of the respective zigzagged wires cross each other and extend in the manner of an X brace between the respective transverse wires, the crossing points 14 being suitably welded in a manner similar to the other welds.

Similar brace wires preferably of zigzagged formation are positioned in the spaces between the longitudinal wires 2—5 and 3—4 respectively, which zigzagged wires are designated 15—16 and 17—18 for the respective spaces. The apexes 19 of the zigzagged wires are also positioned in op-

posed relation with one wire disposed upon the other and with the intermediate portions 20 between the apexes of one wire crossing the apexes of another as at 21 in the manner of the zigzagged wires previously described; however, the apexes of the zigzagged wires 15—16 and 17—18 are spaced a greater distance apart so that they cross every fourth transverse wire 6 in slightly spaced relation with the longitudinal wires as indicated at 22. The crossing points 21 of the portions of zigzagged wires intermediate the apexes are connected by welds and are in the space midway between the transverse wires as shown in Fig. 2. The symmetrically bent wires thus cooperate with the transverse wires to form a certain pattern wherein the spaces between the transverse wires constitute unit spaces and the diagonals of the zigzagged wires cross the unit spaces and the transverse wires that are included between those to which the apexes are connected. The diagonal portions are, therefore, similarly welded at these crossing points to the transverse wires.

This is an important feature of the invention as I have determined by actual tests that I am able to provide a structural member which is better for the present purpose than other types of patterns such as the standard counter braced truss. The stress measurements which have been made on my improved structural member wherein the diagonals of the zigzagged wires extend across and are welded to transverse wires intermediate the transverse wires at the apexes of the diagonals, that is with two extra verticals, show the efficiency of the structure was increased from 25 to 50 per cent over the standard truss design and the measured stress, either tension in the lower cord and compression in the upper cord is 25 per cent below the computed value of a standard truss pattern and does not increase the measured stress in the diagonals above the computed values. The terminals 23 and 24 of the transverse wires preferably extend beyond the outer longitudinal wires 2 and 3. The wires when thus formed provide a continuous foraminated body of sheet-like form and may be stored in rolls or the like prior to bending thereof for forming the beam shown in Fig. 3. The beam shown in Fig. 3 is produced from the foraminated form shown in Fig. 2 by bending the transverse wires as indicated at 25 and 26 adjacent the longitudinal wires 4 and 5 to bring the longitudinal wires 2 and 3 into parallel juxtaposition as shown in Fig. 3 and with the terminals 23 and 24 in crossed relation as indicated at 27 and which are welded together at the points of crossing to maintain the shape of the structure.

It is thus obvious that the structural member when thus formed produces an open work beam wherein portions of the transverse wires between longitudinal wires 4 and 5 cooperate with the zigzagged wires 8 and 9 to form the base 28 of the beam and the portions of the transverse wires intermediate the longitudinal wires 2—5 and 4—3 cooperate with the pairs of zigzagged wires 15—16 and 17—18 to constitute the sides of the beam. When the beam is used in the position shown in Fig. 3, the longitudinal wires 4—5 constitute the lower cords and the wires 2—3 the upper cords of a truss-like structure with the transverse wires 6 serving as the struts and the zigzagged wires 15—16 and 17—18 as the braces. The beam thus provides a truss-like formation which is light in weight and has a high strength ratio so that it is adapted to support loads corre-

sponding to or in excess of those capable of being supported by a corresponding wooden framing member such as a 2 x 6, 2 x 8, 2 x 10, or the like.

The closed triangular section greatly increases the rigidity, stiffness, and tensile strength of the member. By the combination of high tensile, high elastic limit wires used in the longitudinal members with the regular spaced bracing system of more ductile wires and the symmetrical system of diagonal brace members arranged in the pattern described, I have produced structural members of very high efficiency as compared to standard structural beams.

The members thus described are of light weight construction and have a high strength ratio so that when assembled in a building structure provide a strong, light-weight construction corresponding in cost to an ordinary wooden frame structure, having many advantages over wood framing.

Use of the members described coupled with a special combination of materials provides a fireproof construction at a cost considerably below the cost of the customary fireproof constructions and in fact, is comparable with the cost of standard wooden construction.

In using the members, as a typical example, they may be substituted for wooden beams having equal strength but of substantially less weight. For example, in the structure shown in Fig. 1, studs 29 and 30 carry caps 31 that are inverted over the upper ends of the studs as shown so that crossing points of the caps and studs may be suitably connected as by welding at the site. The ceiling joist 32 may comprise the structural members shown in Fig. 3 and correspond in size and strength to wooden joists of standard dimensions. The joist may be used with the base thereof supported on the caps 31 directly over the ends of the studs 29—30 as shown, or they may be turned with the crossed ends of the transverse wires downwardly so that the base portions thereof provide a flat surface to facilitate laying of a floor, attachment of nailing strips, or the like. The triangular-shaped members may also be utilized as a rafter 33 which are positioned as shown in Fig. 1 with the longitudinal wires straddling the ends of a joist as shown, it, of course, being understood that portions of the transverse wires and zigzagged wires are cut away to permit assembly. The crossing points of the longitudinal wires are suitably welded together on the job to complete the connection.

In non-load bearing partitions, studs 34 may be used in connection with caps 35. Connecting members 36 may be used as shown in Fig. 1 to connect the studs 29 and 30 in combination with the brace members 37. The tie members 36 are projected through openings between the wires of the studs and suitably tied at the crossing points preferably by welding. The brace members 37 are placed flat against the sides of the studs and the longitudinal wires thereof are welded together at crossing points with the longitudinal wires of the studs.

From the foregoing it is obvious that I have provided structural members particularly designed for framing of light occupancy buildings and which may be assembled in a building structure analogous to the customary framing with ordinary dimension lumber.

The structural members are readily cut to length at the job site and are assembled in a frame structure and erected very similar to wood

framing, the studs and joists being spaced on standard spacing.

By reason of the light weight and ease of handling, the members may be assembled in prefabricated units and delivered to the job where the units are readily placed.

What I claim and desire to secure by Letters Patent is:

1. A structural member of the character described including a pair of longitudinal wires disposed in spaced parallel relation, a second pair of longitudinal wires disposed in spaced parallel relation with the first-named pair of longitudinal wires, a longitudinal series of spaced transverse wires crossing the longitudinal wires and having terminals projecting beyond the first-named longitudinal wires, pairs of zigzagged wires longitudinally traversing the spaces between the adjacent longitudinal wires with one zigzagged wire of one pair being disposed upon its complementary zigzagged wire and having the apexes of one arranged oppositely to the apexes of the other and crossing certain of the transverse wires in spaced relation with the longitudinal wires, welds at the crossing points of the zigzagged wires with the transverse wires, said transverse wires having bends adjacent the intermediate longitudinal wires to bring the terminals of the transverse wires in crossing relation, and welds connecting said terminals.

2. A structural member of the character described including a pair of longitudinal wires disposed in spaced parallel relation, a second pair of longitudinal wires disposed in spaced parallel relation with the first-named pair of longitudinal wires, a longitudinal series of spaced transverse wires crossing the longitudinal wires and having terminals projecting beyond the first-named longitudinal wires, brace wires extending diagonally in the spaces between the adjacent longitudinal wires and crossing the transverse wires, welds at the crossing points of the wires, said transverse wires having bends adjacent the intermediate longitudinal wires to bring the terminals of the transverse wires in crossing relation, and welds connecting said terminals.

3. A structural member of the character described including a pair of hard-drawn wires disposed longitudinally in spaced parallel relation, a second pair of hard-drawn longitudinal wires disposed in parallel relation with the first-named pair of wires, a longitudinal series of spaced wires having substantial ductility extending transversely of the longitudinal wires and having terminals projecting from the first-named longitudinal wires, welds at the crossing points of said wires, brace wires having similar ductility traversing the series of transverse wires and having substantial ductility, said brace wires being disposed between the longitudinal wires, welds at the crossing points of the wires, bends in the ductile transverse wires to bring the terminals of the respective transverse wires together, and welds connecting said terminals.

4. A structural member of the character described including pairs of longitudinal wires disposed in spaced parallel relation, a longitudinal series of spaced transverse parallel wires connecting the longitudinal wires, pairs of diagonal brace wires traversing the series of transverse

wires intermediate the pairs of longitudinal wires, said transverse wires being bent to bring ends of the transverse wires in contact, welds connecting said ends to form a substantially triangular cross section, the spacing between said transverse wires forming substantially equal unit spaces and the length of said diagonals of the brace wires being at least two of said unit spaces, and welds at the crossing points of the brace wires with the transverse wires.

5. A structural member of the character described including, a pair of longitudinal wires disposed in laterally spaced parallel relation, a second pair of longitudinal wires spaced from the first pair, a longitudinal series of spaced transverse parallel wires connecting the longitudinal wires, pairs of diagonal brace wires intermediate the longitudinal wires with the brace wires between the first named pair of longitudinal wires spaced from said longitudinal wires, said transverse wires having bends between the first named pair of longitudinal wires and said brace wires to bring the ends of the transverse wires in contact, welds at the crossing points of the brace wires and the transverse wires, and welds connecting said ends of the transverse wires to form a substantially triangular cross section.

6. A structural member of the character described including a pair of longitudinal wires disposed in laterally spaced relation, a second pair of longitudinal wires disposed in adjacent relation and spaced from the first pair of longitudinal wires, a longitudinal series of spaced transverse wires connecting the longitudinal wires, said transverse wires having bends adjacent the first named pair of longitudinal wires and having terminals projecting from said second pair of longitudinal wires, and welds connecting terminals of the transverse wires at one side of said structural member with terminals of transverse members at the other side of said structural member.

7. A structural member of the character described including a pair of longitudinal wires disposed in laterally spaced relation, a second pair of longitudinal wires disposed in adjacent relation and spaced from the first pair of longitudinal wires, a longitudinal series of spaced transverse wires connecting the longitudinal wires, said transverse wires having bends adjacent the first named pair of longitudinal wires and having terminals projecting from said second pair of longitudinal wires, said terminals on one side of said structural member being engaged with terminals at the other side of said structural member to maintain the triangular cross section of said member.

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