Jan. 2, 1923. 1,440,695.

W. M. PRATT.

ROOF TRUSS.

FILED FEB. 5, 1921.

3 SHEETS—SHEET 1.

Fig. 1.

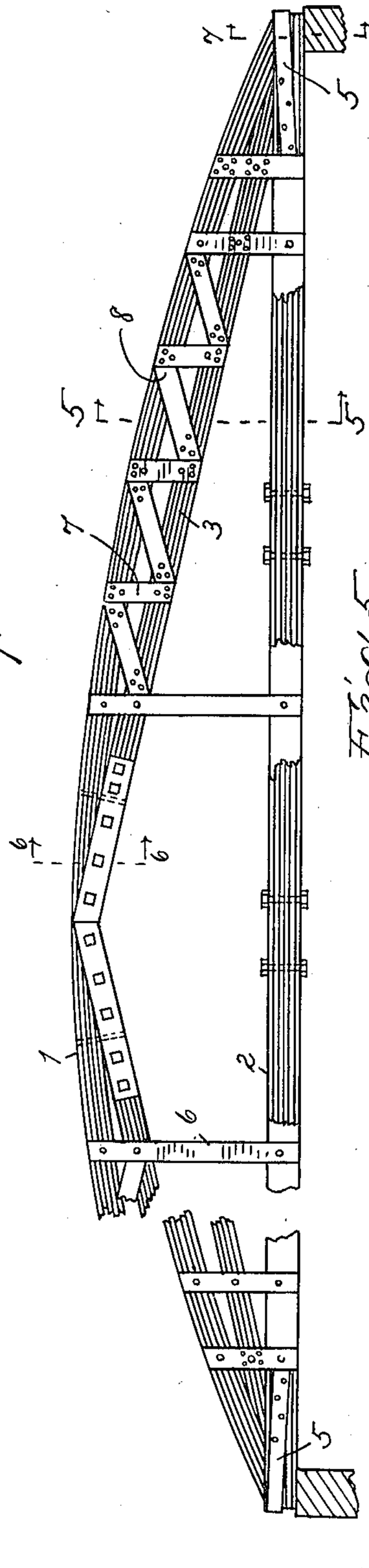


Fig. 7.

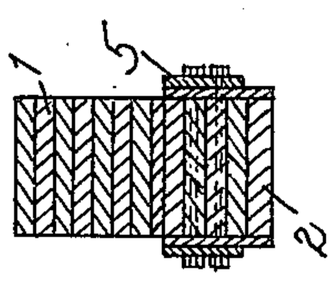


Fig. 5.

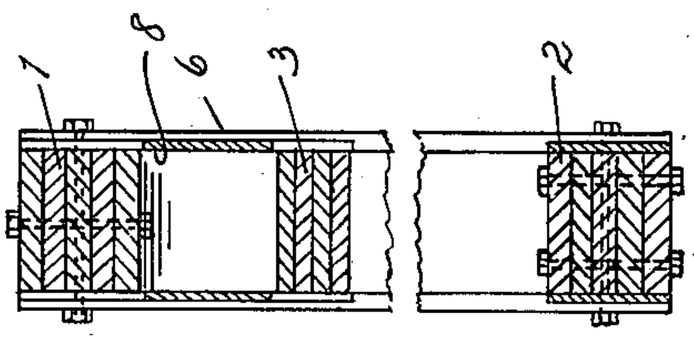
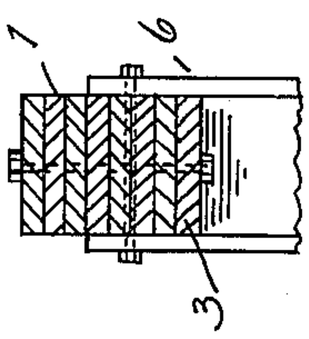


Fig. 6.



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3 SHEETS—SHEET 2.

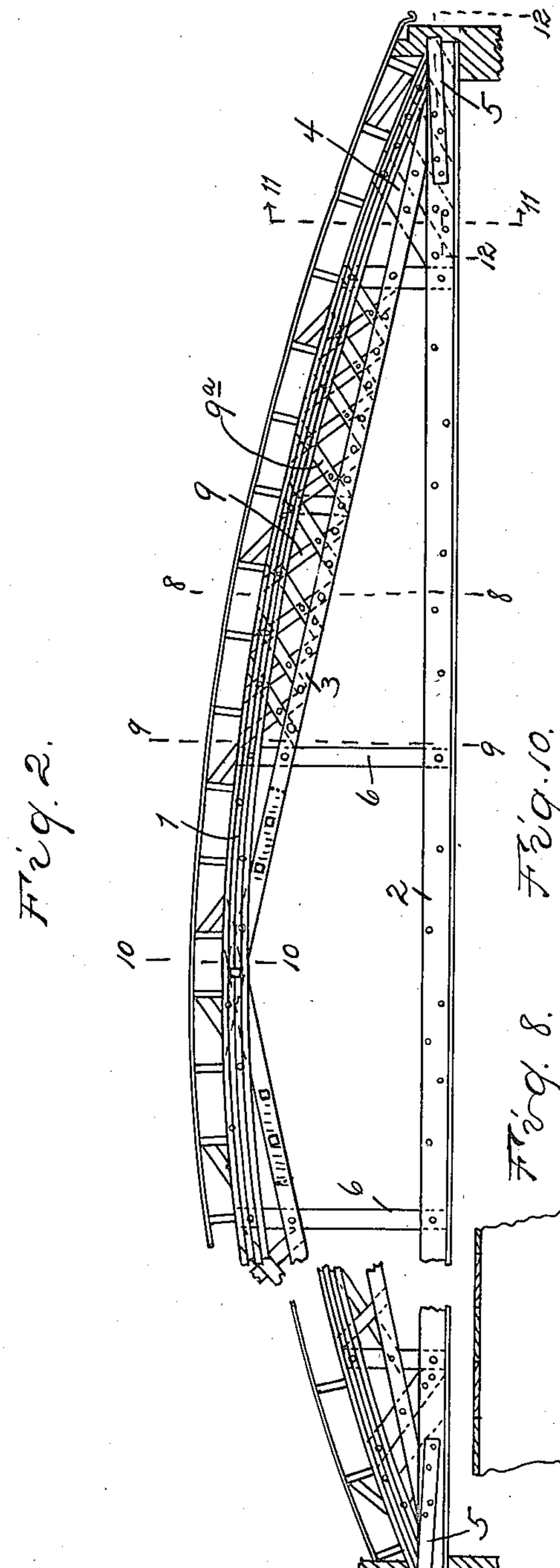

Fig. 2.

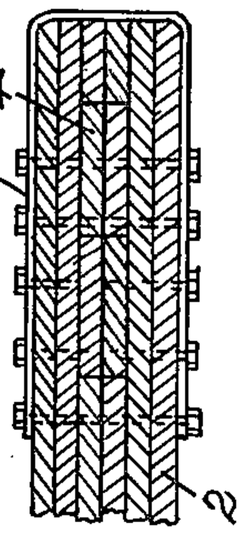

Fig. 12

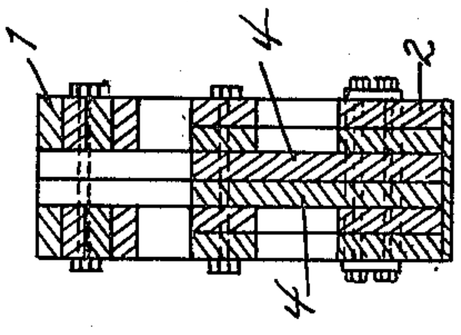

Fig. 11.

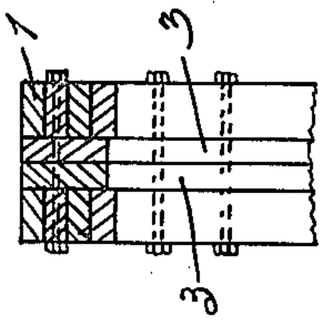

Fig. 10.

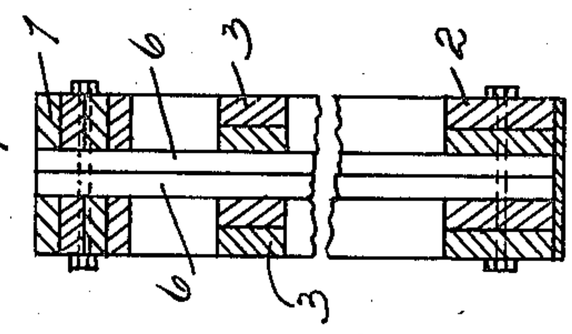

Fig. 9.

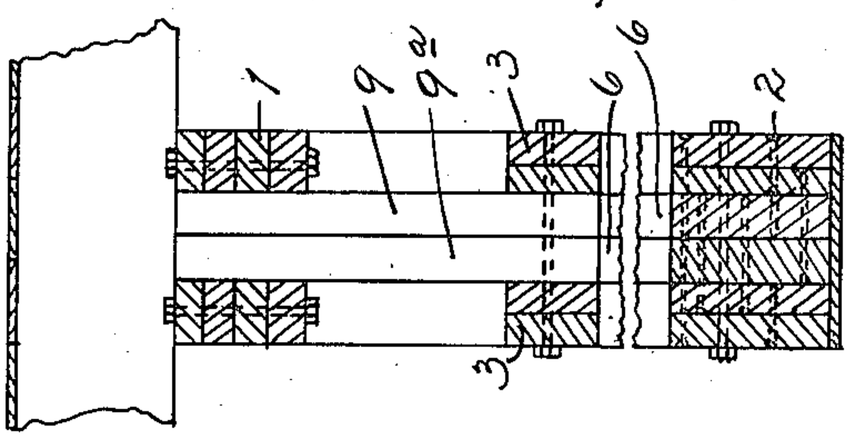

Fig. 8.

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3 SHEETS—SHEET 3.

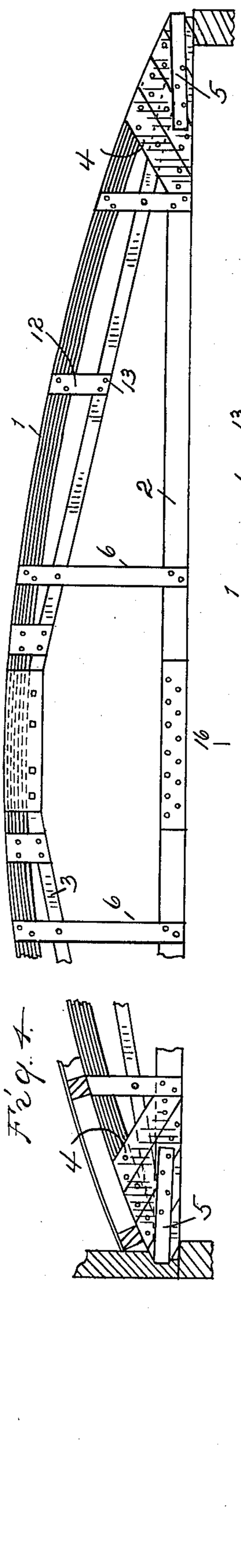

Fig. 4.

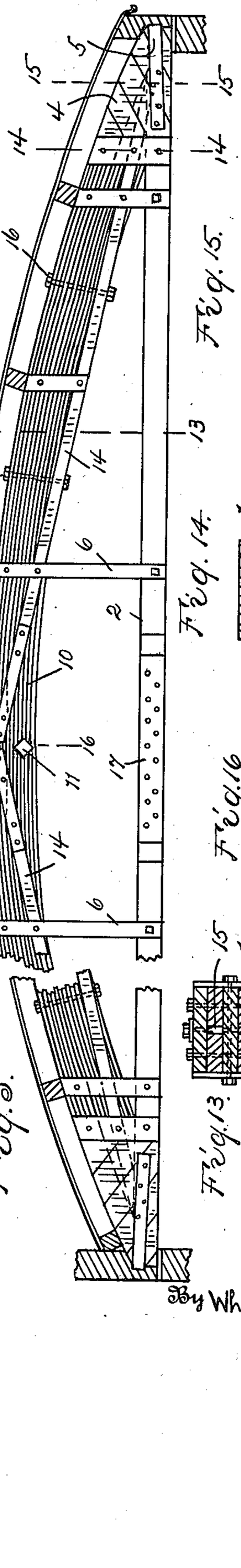

Fig. 3.

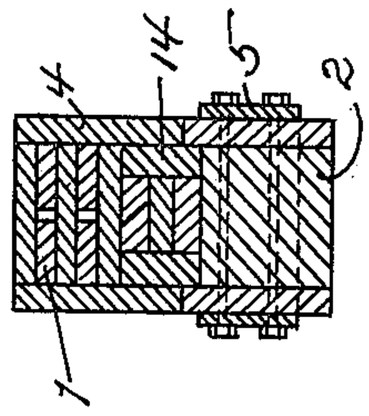

Fig. 15.

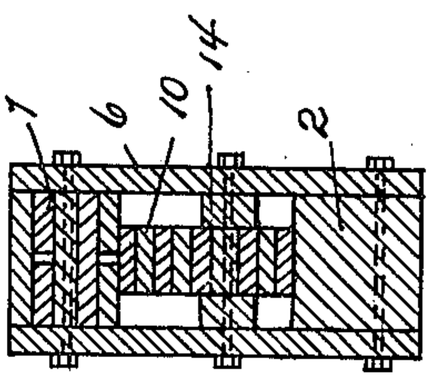

Fig. 14.

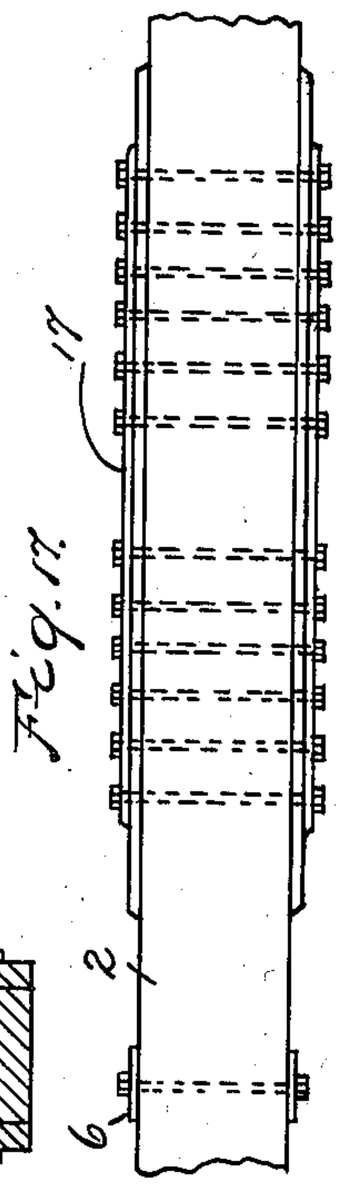

Fig. 17.

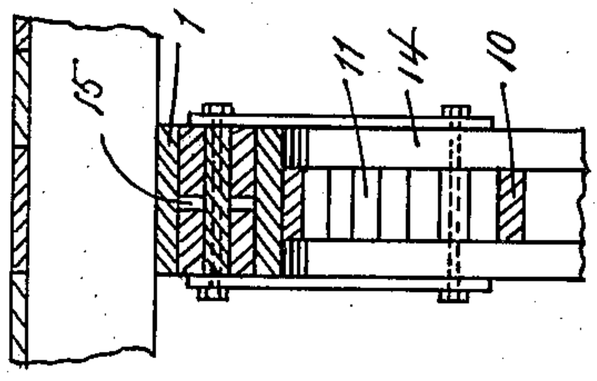

Fig. 16.

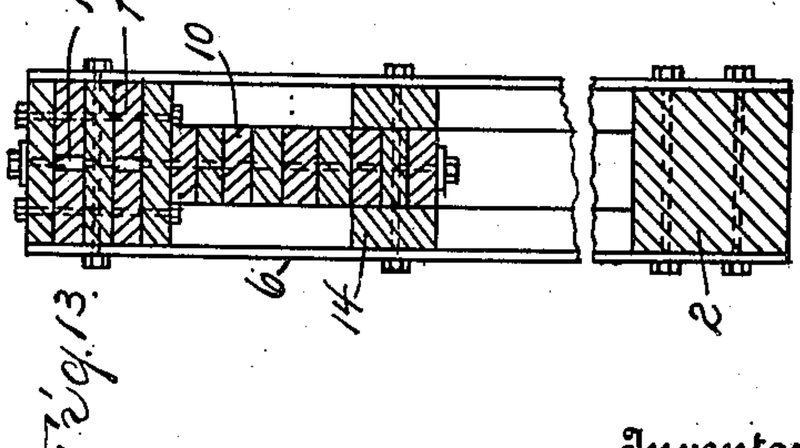

Fig. 13.

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Patented Jan. 2, 1923. 1,440,695

UNITED STATES PATENT OFFICE.

WALTER M. PRATT, OF DETROIT, MICHIGAN.

ROOF TRUSS.

Application filed February 5, 1921. Serial No. 442,631.

To all whom it may concern:

Be it known that WALTER M. PRATT, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, has invented certain new and useful Improvements in Roof Trusses, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to roof trusses and more particularly to wooden roof trusses.

An object of the invention is to provide a roof truss of light and inexpensive design, and one that may be quickly built up at the place of installation without the use of special machinery or equipment.

A further object is to provide a roof truss employing a minimum number of brace or tie members and affording a maximum open space for pipes or the like, or for a passage-way.

A still further object is to minimize the fire risk to which a wooden truss is exposed by affording ready accessibility to all the parts thereof.

Various structural embodiments of the invention are hereinafter described, and are illustrated in the accompanying drawings, wherein:

Figures 1, 2, 3 and 4 are respectively views in side elevation of different embodiments of the invention;

Figures 5, 6 and 7 are respectively vertical cross-section views on lines 5—5, 6—6, and 7—7 of Figure 1;

Figures 8, 9, 10 and 11 are respectively vertical cross sections on lines 8—8, 9—9, 10—10 and 11—11 of Figure 2;

Figure 12 is a sectional view of an end portion of the truss shown in Figure 2, the section being taken on line 12—12 of Figure 2;

Figures 13, 14, 15, and 16 are vertical cross section views taken respectively on lines 13—13, 14—14, 15—15, and 16—16 of Figure 3.

Figure 17 is a plan view of the central portion of the lower chord of the truss shown in Figure 3.

Each of the several truss constructions illustrated in the drawings employs certain main framing members the general relation of which is not changed, namely an arch or top chord member 1 preferably having a parabolic curvature, a bottom chord member 2 establishing a tie between the extremities of the arch 1, and a pair of main brace members 3, extending from substantially the center of said arch to the joints between its ends and the members 2.

The necessary tie between the ends of the upper and lower chord members is established by a plurality of boards 4 nailed, at an inclination to the horizontal of approximately 30 degrees, across the front and rear faces of said members, and by U-shaped metal bars 5, having their connecting portions engaging the end faces of the upper chord member and their parallel arms embracing and secured to the end portions of the lower chord member. Each of the disclosed constructions furthermore employs a number of vertical tie members 6, connecting the upper and lower chord members at suitable space intervals.

The structure so far described is adequate for a load uniformly distributed over the whole truss or from the center to one end thereof. To take care of non-uniform loading, however, it is desirable to provide compression members intermediate the top chord 1 and the main brace members 3, and such a provision is variously made in the four illustrated forms of the invention. As shown in Figure 1, vertical ties 7 are alternated with struts 8, inclined at approximately thirty degrees to the horizontal, said ties and struts having the nature of metal bars nailed or bolted at their respective extremities to the members 1 and 3. In Figure 2 said provision consists of inclined struts 9 and ties 9^a arranged in pairs crossing each other at right angles and forming an angle of 45 degrees with a tangent to the secondary parabola which may be considered to pass through their crossing points. As shown in Figure 3 a solid webbing is formed co-extensive with the upper chord, therebeneath, which webbing may be considered to comprise, in part, the main brace members. Said webbing is formed by heavy boards 10 superposed one upon another and nailed together to form a rigid structure.

Just below the crown of the arch the webbing 10 is formed with an opening 11 therethrough for the purpose of very materially reducing the resistance to bending moment offered by the top chord at the crown thereof.

Considering now the reactions of the truss members under various loading conditions, it will be understood that for uniform load-

ing conditions the top chord 1, being a parabola, is in perfect equilibrium. The stress in the top chord is compressive throughout and is productive of tension in the bottom chord 2 and of substantially no stress in the brace members 3.

If the conditions of uniform loading are confined to only one half the truss, the stresses in the top and bottom chords will still be respectively compressive and tensile, but the brace member 3 beneath the loaded half of the truss will be tensioned, the other main brace member being under compression.

In the regions between the top chord 1 and main braces 3, no stresses are set up except for partial loads, and since such stresses in roof trusses are usually very small, such light triangular bracing as is disclosed in Figures 1 and 2 will ordinarily be sufficient, or it may under some conditions suffice merely to supplement the connections established by the ties 6 by intermediate vertical ties 12 connecting only the top chord 1 and braces 3. In such a construction, however, it is essential that a sufficiency of nails 13 or other fastenings be employed to insure rigidity at the joints between the vertical ties 6 and 12 and the members 1 and 3.

The described truss in its various forms secures a number of important advantages among which may be mentioned the following: The construction is one which locates the intersection of the top and bottom chords 1 and 2 and the main brace members 3 at a point in the vertical reaction line of the truss supports so as to transmit the stresses from said parts in the most direct manner to the supports.

The main brace members 3 being tied into both the top and bottom chords are adapted to resist both tension and compression stresses. From the preceding discussion of the stresses, it will be evident that under certain loading conditions one or other of said members will be tensioned, so that the provision heretofore made adapting such members to resist compression only is not adequate.

The construction furthermore is one providing a large amount of open space between the top and bottom chord members, which space may be utilized as a passageway or for the installation of pipes or the like.

The construction shown in Figure 3 is particularly desirable because of the high degree of stiffness imparted to the top chord member by forming the same and also the underlying webbing 10 of parabolically curved boards or planks solidly connected. The webbing in this form of the invention is practically a part of top chord, being coextensive with said chord and conforming to the shape thereof.

The vertical tie pieces 6 are of value as a reinforcement to the top chord, additional to their function of tying the top and bottom chords together, this being particularly true of the construction shown in Figure 3. In said construction, if the webbing 10 be regarded as a portion of the top chord, then said chord may be imagined as dissected into an upper top chord portion and lower main brace portions with panel or loading points at the vertical ties. The portions of the webbing functioning as the main braces may substantially correspond in location to the main braces 3 of Figures 1 and 2. It is preferred to strengthen said portions by members 14 secured oppositely to the webbing 10 and extended from substantially the center of the top chord to the intersections thereof with the bottom chord. By building the top chord and its underlying bracing as a substantially solid body as disclosed in Figure 3, a high resistance to fire is secured.

It will be noted that the main framing members (1, 2, 3 and 6) are variously formed and arranged in the several disclosed forms of the invention. Thus in Figures 1, 5, 6 and 7 the members 1, 2 and 3 are each built up of planks having a width equal to the full width of said members and the members 6 are metal bars arranged in pairs embracing the members 1, 2 and 3. As shown in Figures 2 and 8 to 12 the members 1 and 3 are each formed in two sections, spaced longitudinally of the truss, and the ties 6 are formed of wood and are engaged between said sections, the members 9 and 9ª being likewise engaged between said sections. The bottom chord in this construction is built up of planks abutting vertically, their stiffness being thus utilized to the best advantage in resisting vertical deflection.

As shown in Figures 3 and 13 to 16, a solid piece of timber is used for the bottom chord, while the top chord is formed of alternating planks having the full width of said chord and horizontally spaced planks between which are formed air spaces 15 extending the full length of said chord. Said air spaces insure dryness and make provision for expansion responsive to temperature changes. The planks forming the upper chord member may be bolted together at intervals as indicated at 16 in Figure 3. Splice plates 17 are employed in Figure 3 at substantially the center of the bottom chord embracing and rigidly connecting abutting timbers jointly forming said chord.

It is to be noted that the construction shown in Figure 3 abuts the ends of the parabolic webbing timbers 10 upon the top of the bottom chord, and provides a rigid connection between the end portions of said webbing members and bottom chord, so that the resulting plane of horizontal shear in the bottom chord is comparatively long, afford-

ing ample area for connecting said top and bottom chords.

What I claim as my invention is:

1. A roof truss, comprising an arched top chord, a bottom chord providing a tie between the extremities of said top chord, a brace member extending from the center portion of said top chord to an end portion thereof, said top chord being built up of flat timbers rigidly connected, and said brace member being rigid and resistant to either compression or tensile stresses, and a series of vertical tie members extending alternately from the top chord to said brace member and from the top chord to the bottom chord, said tie members being proportionately wide and stiff at their points of connection to said chords and being proportioned to resist all secondary stresses in the truss.

2. A roof truss, comprising an arched top chord and a bottom chord, forming a tie between the extremities of said top chord and brace member extending from the center portion of the top chord to an end portion thereof and a solid filling arranged between the top chord and said brace member formed of flat pieces of timber bent in parallel parabolic curves and reinforcing means consisting of timbers extending parallel to said brace member and rigidly secured to the top chord and closely adjacent to the said timber filling and vertical reinforcing members connecting the top chord, said solid filling and said brace member.

3. A roof truss, comprising an arched top chord member, a bottom chord forming a tie between the extremities of the top chord, a brace member extending from the center portion of the top chord to an end portion thereof, a webbing between the top chord and said brace member built up of flat pieces of timber bent in parallel curves abutting upon the top of the bottom chord and rigidly secured thereto whereby a comparatively long plane of horizontal shear is produced in said bottom chord.

4. A roof truss, comprising an arched top chord, a bottom chord forming a tie between the extremities of the top chord, and brace members extended from the center portion of the top chord to the respective end portions thereof, said top chord having a downward central extension with an opening formed therein at the crown of the arch virtually producing a hinged joint at said point.

5. A roof truss, having an arched top chord and a bottom chord forming a tie between the extremities of the top chord, and a brace member extending from the center portion of said top chord to an end portion thereof, each of said members being built up of flat timbers all of substantially the same width, and tie members arranged in pairs on the opposed vertical faces of said top chord, bottom chord and brace members.

6. A roof truss, having an elongated element built up of timbers formed with a series of longitudinal interior air spaces providing for ventilation and air drying.

7. A roof truss having an arched top chord provided with a downward central extension formed at the crown of the arch with an opening virtually producing a hinged joint.

8. A roof truss comprising an arched top chord, a bottom chord forming a tie between the extremities of the top chord, brace members extended from the central portion of the top chord to the respective end portions thereof, a series of vertical tie members connecting said top and bottom chords, and an intermediate series of vertical connections between the top chord and brace members.

9. A roof truss comprising an arched top chord and a bottom chord forming a tie connection between the extremities of said top chord, a solid webbing arranged beneath said top chord and secured thereto, said webbing having a lesser width than said top chord, brace members oppositely secured to said webbing flush with the sides of the top chord, and tie members connecting said top chord and brace members.

10. A roof truss having an arched top chord having a depending portion forming with said chord a T-shaped cross section, and a pair of opposed brace members reinforcing said depending portion and projecting therefrom substantially flush with the sides of the top chord.

11. A roof truss comprising an arched top chord, a bottom chord forming a tie member between the extremities of the top chord, said top chord having a depending portion forming with said top chord a T-shaped cross section, and a brace member laterally carried by said depending portion extending parallel to a line from the center of the top chord to an intersection thereof with the bottom chord.

12. A roof truss comprising an arched chord and a bottom chord forming a tie connection between the extremities of said top chord, a solid webbing arranged beneath and secured to said top chord and having a lesser width than said top chord, brace members oppositely secured to said webbing and tie members connecting said top chord and bracing members.

In testimony whereof I affix my signature.

WALTER M. PRATT.