Aug. 3, 1926. 1,594,609

H. F. FREASE

TRUSSED SHEET

Filed July 31, 1924 3 Sheets-Sheet 1

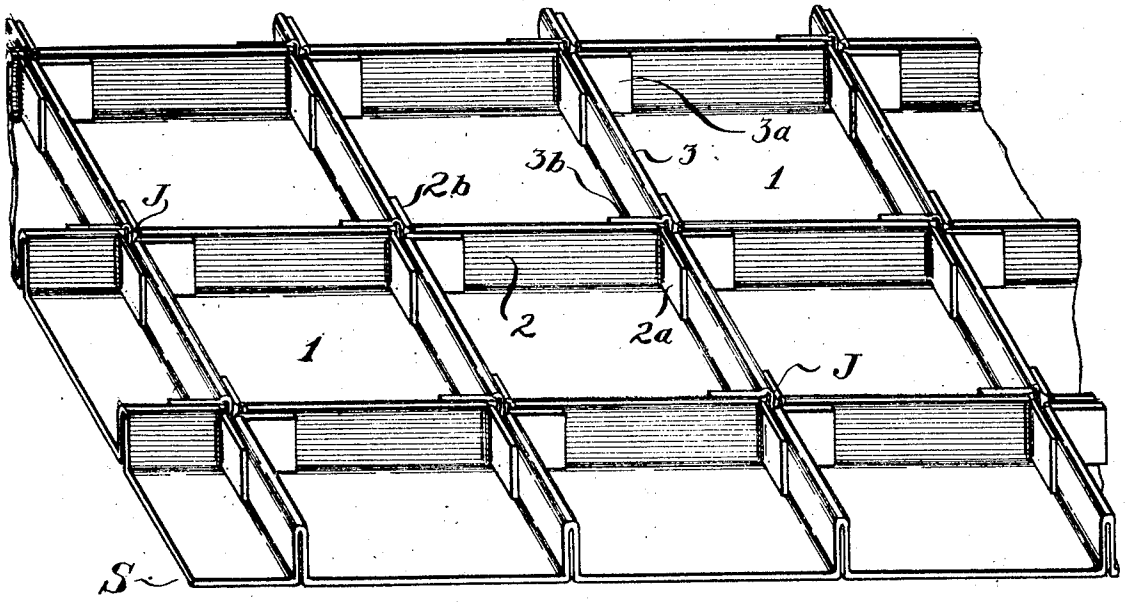



Fig. 1

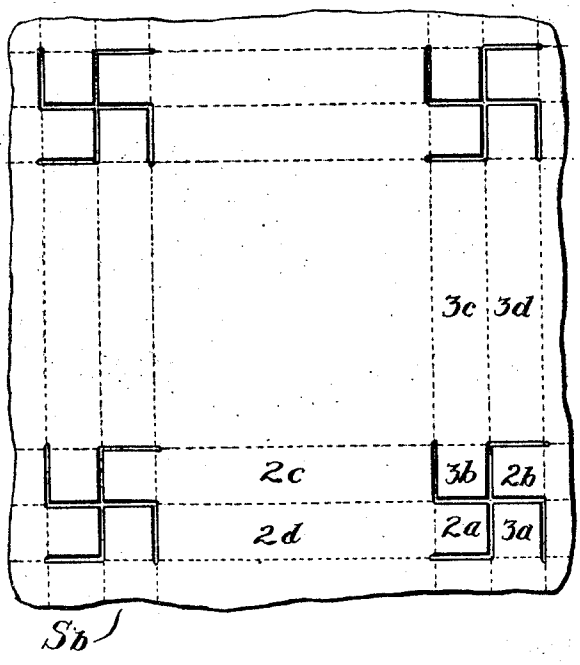



Fig. 2

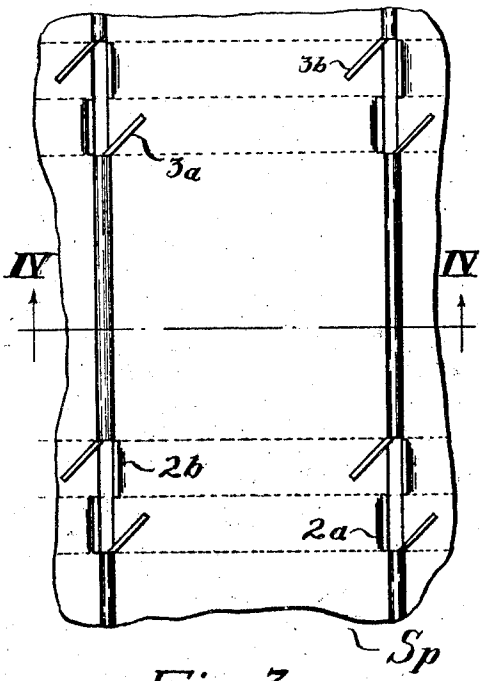



Fig. 3

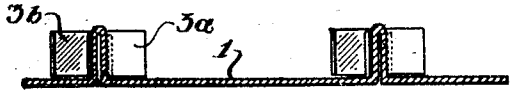



Fig. 4

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H. F. FREASE

TRUSSED SHEET

Filed July 31, 1924 3 Sheets-Sheet 2

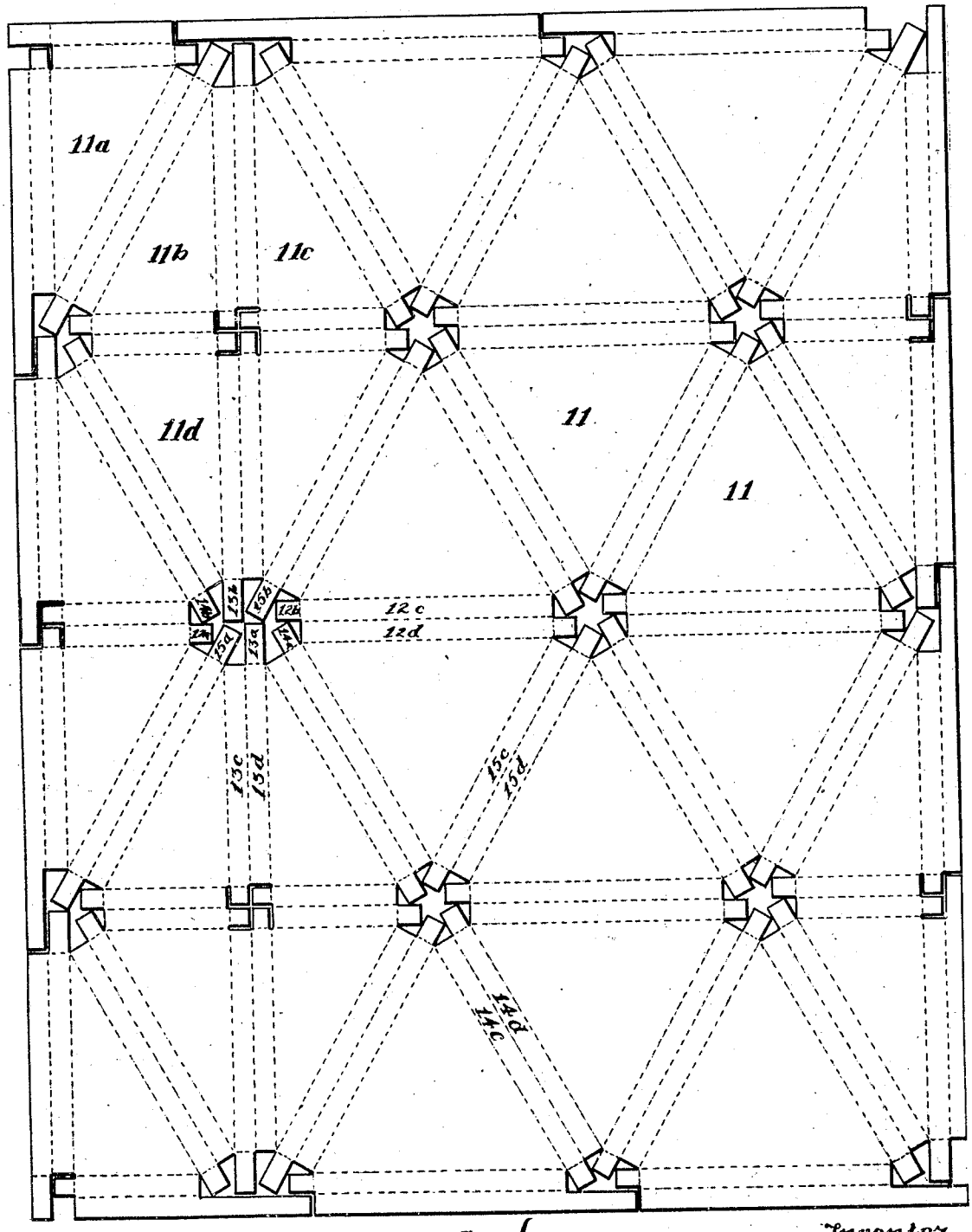



Fig. 5

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H. F. FREASE

TRUSSED SHEET

Filed July 31, 1924 3 Sheets-Sheet 3

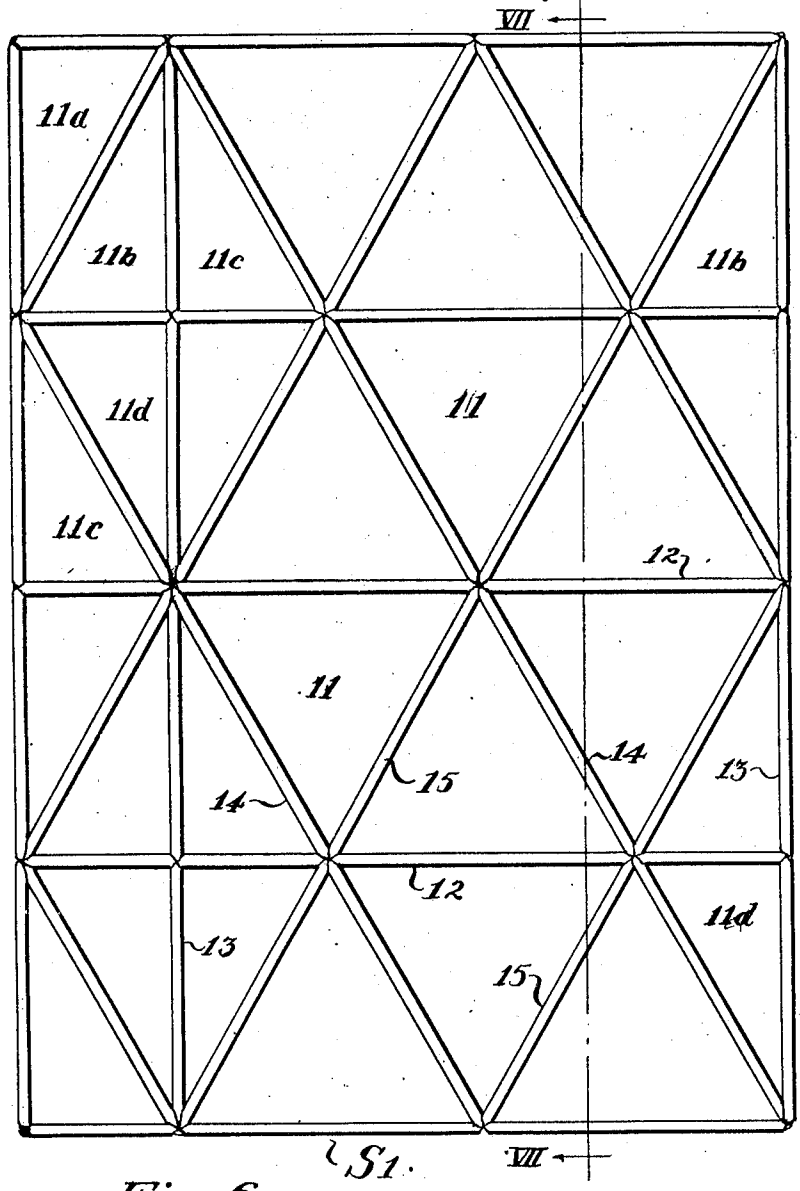



Fig. 6

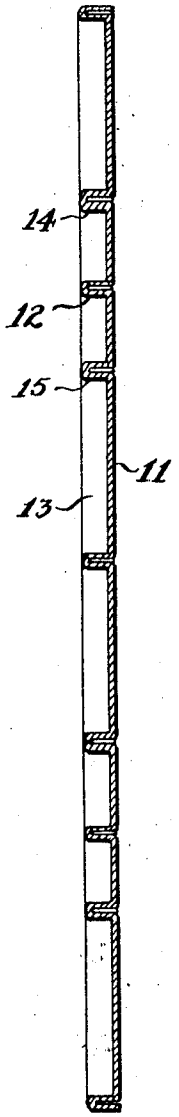



Fig. 7



Fig. 8

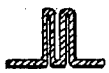


Fig. 9

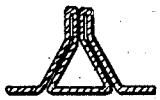


Fig. 10

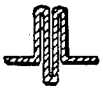


Fig. 11

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Patented Aug. 3, 1926.

1,594,609

# UNITED STATES PATENT OFFICE.

HUBERTHAL FIELD FREASE, OF CANTON, OHIO.

## TRUSSED SHEET.

Application filed July 31, 1924. Serial No. 729,303.

The invention relates to sheet material, preferably metal, which is adapted to resist structural loads; and the object of the improvement is to provide sheet material having formed therein two or more series of truss members angular to the plane of the sheet, the members meeting each other at intersections and being fastened to each other at the intersections to form trussed sheets adapted to resist loads applied from any direction.

Sheet material having parallel corrugations is weak against loads applied transverse the corrugations. Stamping has been employed to rectify this weakness by pressing or stamping a truss formation in the sheet.

In the stamping operation, however, the members of the truss formation are necessarily stretched thinner than the sheet, and the depth of such truss members is therefore limited because of this necessary stretching of the material. Consequently it is impractical to provide by corrugating or stamping, a sheet material adapted to resist loads of a wide range of magnitude and applied from any direction.

These difficulties are overcome by the present invention, in which two or more series of rib truss members having any desired depth are folded or formed in a sheet without stretching the ribs, and are contracted into junction with each other at intersections, and then fastened to each other at the intersection to form trussed sheets.

Several forms of the invention are illustrated by the accompanying drawings forming part hereof, in which—

Figure 1 is a fragmentary oblique perspective view of one form of trussed sheet;

Fig. 2, a fragmentary plan view of the sheet blank for the same, showing the rib tongues cut out, and indicating the lines of fold for the ribs;

Fig. 3, a fragmentary plan view of the blank partially formed to make the trussed sheet;

Fig. 4, a cross section of the same on line IV—IV, Fig. 3;

Fig. 5, a plan view of the sheet blank for another form of trussed sheet;

Fig 6, a plan view of the finished trussed sheet made from the blank of Fig. 5;

Fig. 7, a cross-section of the same on line VII—VII, Fig. 6; and

Figs. 8, 9, 10 and 11, cross-sections of various modified rib truss members.

Similar numerals refer to similar parts throughout the drawings.

Referring to Figs. 1, 2, 3, and 4, $S^b$ in Fig. 2 is the blank. $S^p$ in Figs. 3 and 4 is the partially formed blank, and S of Fig. 1 is a completed fragmentary portion of one form of trussed sheet.

The trussed sheet S includes sheet panels 1, integral with two series of folded ribs 2 and 3, having tongues $2^a$ and $2^b$, and $3^a$ and $3^b$, at the respective ends thereof, the ribs meeting each other at intersections J, and being fastened to each other at the intersections by spot welds, not shown, which join the tongues $2^a$ and $2^b$ to the ribs 3, and the tongues $3^a$ and $3^b$ to the ribs 2. Rivets, eyelets or other fastening means may be used instead of spot welds to join the tongue to the ribs, or the tongues may be entirely dispensed with and the ribs joined to each other at the intersections by means of solder or arc welding, or other means.

The ribs 2 and 3 consist of folds of material having two opposing plies $2^c$ and $2^d$, and $3^c$ and $3^d$, respectively, and thus each rib truss member has a two ply rectangular cross section in which the material in each ply is of the same thickness as the material in the sheet.

The ribs may be folded and formed without reducing the thickness of the material into other cross-sections as illustrated in Figs. 8 to 11 inclusive. Fig. 8 illustrates a folded and formed U-rib; Fig. 9, a four ply rectangular rib; Fig. 10, a triangular rib; and Fig. 11, a rib projecting from both sides of the sheet. Any desired combination of intersecting rib truss members may be used, permitting variations in the depth or cross-section of the intersecting members.

In making a trussed sheet the blank is first pierced as in Fig. 2, to permit the intersecting ribs to be folded and contracted into the sheet. It is preferable to pierce the sheets to provide for the rib tongues as

shown. One series of ribs are then folded and formed into the sheet, and the tongues bent back as shown in Figs. 3 and 4; after which the intersecting series is folded, its tongues bent back and the ribs and tongues fastened to each other at the intersections to form the trussed sheet of Fig. 1.

Although a truss may be folded into a sheet without piercing the sheet, if the sheet be sufficiently thin, it is preferable that the ends of the truss member be separated from each other by piercing the blank, as illustrated.

The trussed sheet of Figs. 1 to 4 inclusive consists of two series of ribs intersecting at right angles to each other and being at right angles to the plane of the sheet panels. It is obvious that the ribs may be at any other desired angle with each other and with the sheet panels.

Moreover more than two series of intersecting ribs may be folded into the sheet. Fig. 5 illustrates the sheet blank $S^{1b}$, and Figs. 6 and 7 the trussed sheet $S^1$ made therefrom, wherein four series of intersecting ribs have been folded into the sheet, the tongues tucked in at the intersections, and the ribs fastened to each other to form the truss.

The trussed sheet $S^1$ includes triangular sheet panels 11, $11^a$, $11^b$, $11^c$, and $11^d$, integral with, as shown, the series of intersecting folded ribs 12, 13, 14, and 15, there being rib tongues $12^a$ and $12^b$, $13^a$ and $13^b$, $14^a$ and $14^b$, and $15^a$ and $15^b$ on the respective ends thereof, the tongues being tucked in between the rib plies at the intersections, and the ribs being joined to each other at the intersections by means of spot welds not shown.

The rib truss members of the trussed sheets are obviously strengthened by the sheet panels against lateral deflection.

The invention thus provides a sheet material having formed and fastened therein a true truss angular to the plane of the sheet and adapted to resist loads of any practical magnitude and distribution, and applied from any direction.

The proper shape of the panels, and the proper depth and cross-section of the ribs may be determined by the conditions under which any given trussed sheet is to be used.

The trussed sheets have a wide range of usefulness in many different kinds of structures, particularly where it is desired to utilize the lightness and strength of sheet metal without being subject to the tendency to buckle of large unsupported areas. Such structures include at the one extreme, panel forms for concrete; and, at the other, external surface members for air craft.

The trussed sheets may be considered from another stand-point to be made up of a plurality of box panels, the panel box sides being integral with each other edgewise, and fastened to each other endwise to form a truss.

I claim:

1. A sheet having a plurality of integral box panels, the box sides being folded in the sheet, integral with each other edgewise, and being fastened to each other endwise at intersections to form a truss.

2. A sheet having a plurality of integral square box panels, the box sides being folded in the sheet and integral with each other edgewise, and being fastened to each other endwise at intersections to form a truss.

3. A sheet having a plurality of integral triangular box panels, the box sides being folded in the sheet and integral with each other edgewise, and being fastened to each other endwise at intersections to form a truss.

4. A sheet having a plurality of integral polygonal box panels, the box sides being folded in the sheet and integral with each other edgewise, and being fastened to each other endwise at intersections to form a truss.

5. A trussed sheet including sheet panels integral with truss members having separate ends meeting each other at intersections and being fastened to each other at the intersections to form a truss.

6. A trussed sheet including sheet panels integral with two or more series of truss members having separate ends meeting each other at intersections and being fastened to each other at the intersections to form a truss.

7. A trussed sheet including sheet panels integral with truss members having separate ends meeting each other at intersections and being fastened to each other at the intersections to form a truss, some of the ends being provided with tongues, and the tongues being fastened to the other ends at the intersections.

8. A trussed sheet including sheet panels integral with truss members having separate ends meeting each other at intersections and being fastened to each other at the intersections to form a truss, the members consisting of a plurality of plies of the sheet.

9. A trussed sheet including sheet panels integral with folded truss members having separate ends meeting each other at intersections and being fastened to each other at the intersections to form a truss.

10. A trussed sheet including sheet panels integral with folded and formed truss members having separate ends meeting each other at intersections and being fastened to each other at the intersections to form a truss.

In testimony that I claim the above, I have hereunto subscribed my name.

HURXTHAL FIELD FREASE.