April 21, 1931. H. F. FREASE 1,802,011

INTEGRAL FRAME STRUCTURE

Filed April 24, 1925 3 Sheets-Sheet 1

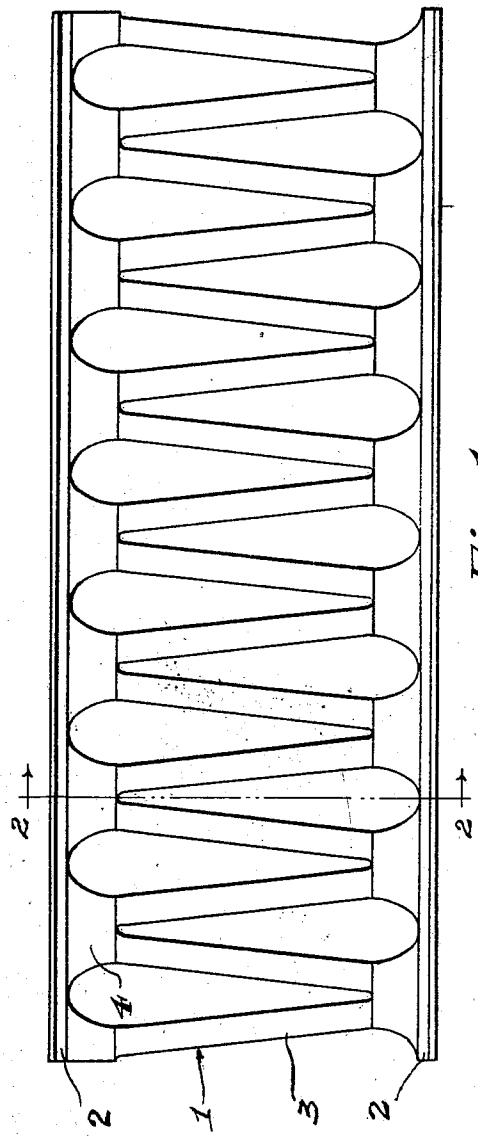


Fig. 1

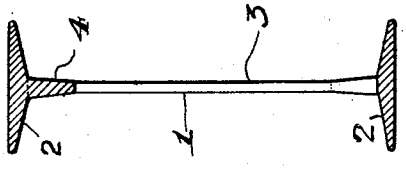


Fig. 2

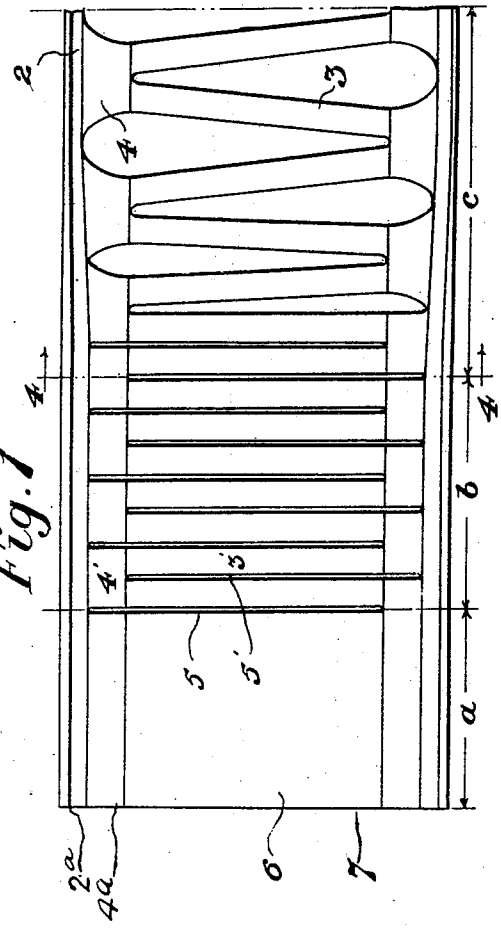


Fig. 3

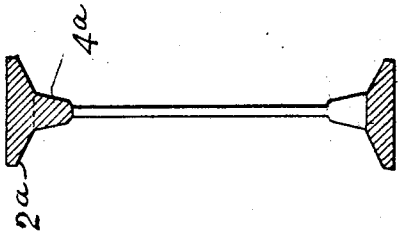


Fig. 4

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INTEGRAL FRAME STRUCTURE

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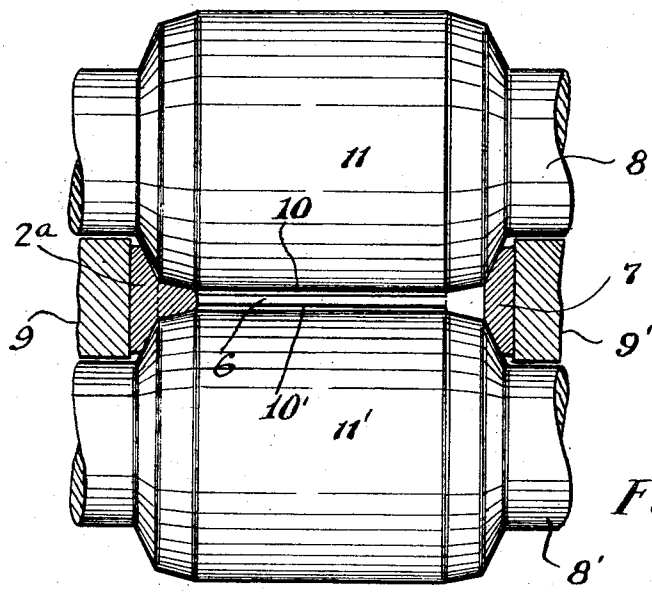


Fig. 5

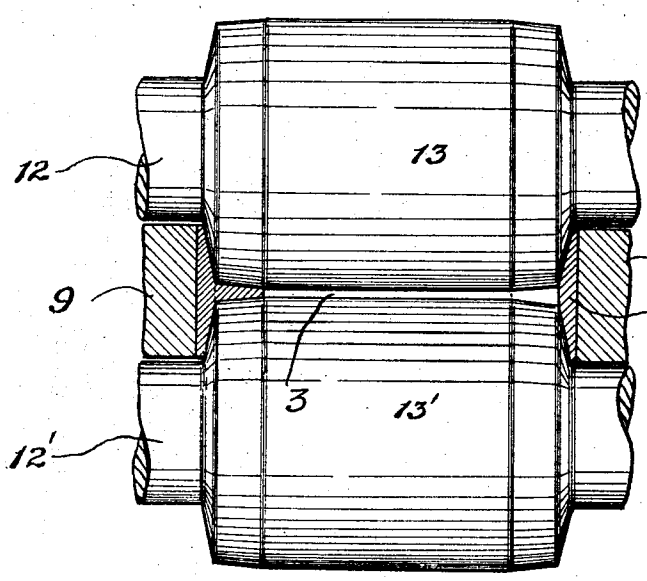


Fig. 6

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INTEGRAL FRAME STRUCTURE

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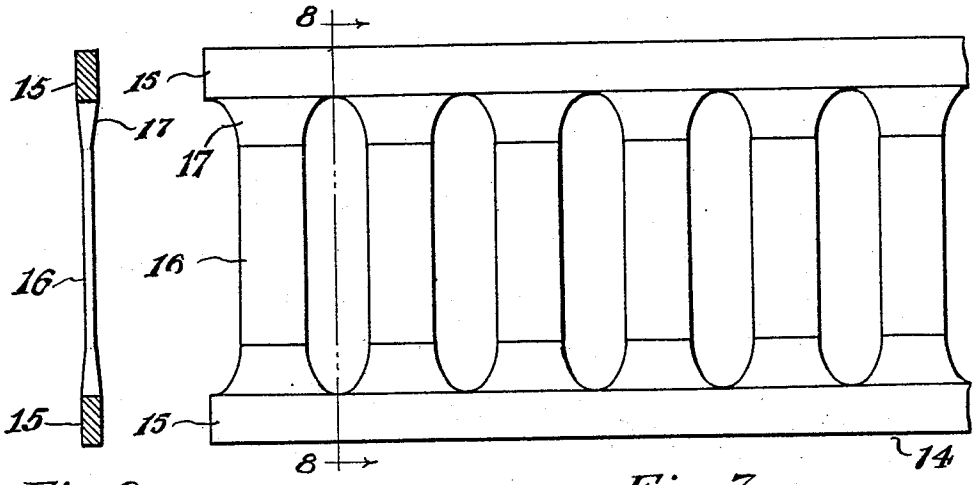


Fig.8

Fig.7

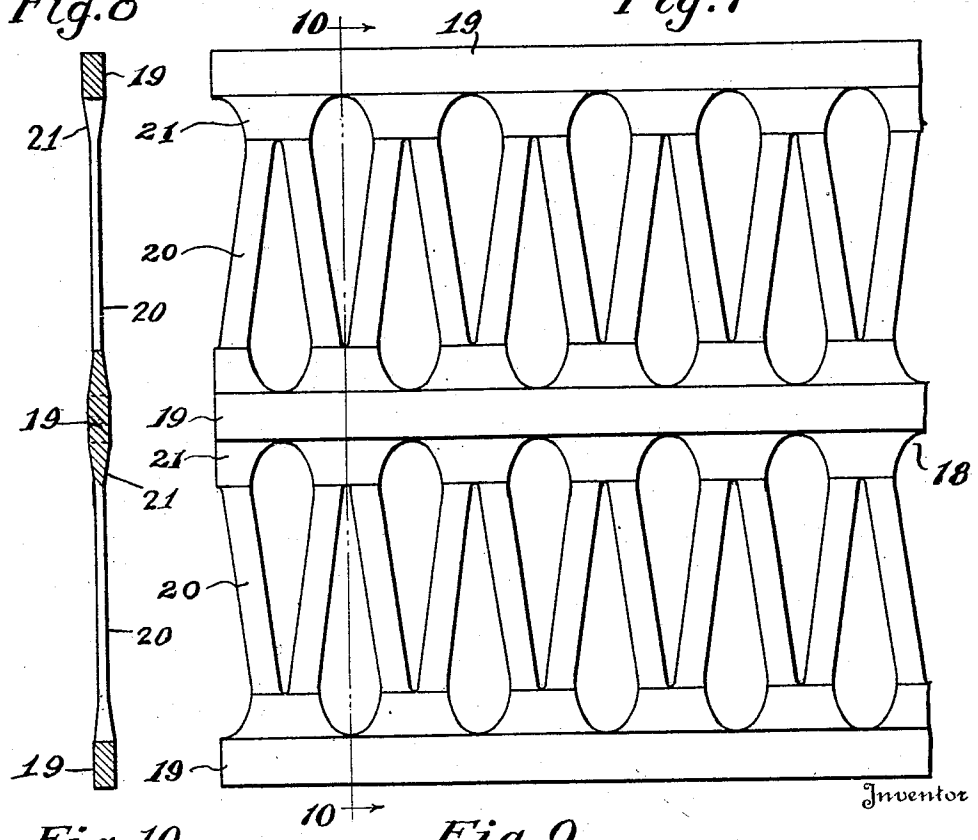


Fig.10

Fig.9

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Patented Apr. 21, 1931 1,802,011

UNITED STATES PATENT OFFICE

HURXTHAL FIELD FREASE, OF CANTON, OHIO

INTEGRAL FRAME STRUCTURE

Application filed April 24, 1925. Serial No. 25,663.

The invention relates to frame structures having chord and web members, and more particularly to elongated integral frame structures in which the chord and web members are integral with each other; and the objects of the improvement are to provide integral frame structures including longitudinal chord members integral with transverse web members of varying cross-section and being longitudinally separated from each other and having integral pyramidal gussets between the chord and web members, each pyramidal gusset having its base in one chord member and extending towards another chord member, and each gusset having its apex connected with one or more web members, the structure being made from a solid longitudinal strip of material, thereby providing a frame structure more efficient, and consequently more economical, than the solid strip, when used as a load resisting member.

A further object of the invention is to provide a method of making integral frame structures having longitudinal chord members integral with longitudinally separated transverse web members, from a longitudinal strip of material by direct elongation, as by rolling, of the strip of material without varying the distance between the chord members, thereby adapting the method for use in connection with existing rolling mill equipment for the production of rolled structural shapes.

These and other objects are attained by transversely severing portions of a longitudinal strip of material having a solid web between longitudinal chord flanges to form transverse web members integral with the flanges, and by elongating the flanges, as by rolling, to longitudinally separate the web members.

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

Figure 1 is a side elevation of an elongated integral truss frame structure including flanged and elongated longitudinal truss chord members integral with transverse truss web members longitudinally separated from each other and having integral gussets between the chord and web members;

Fig. 2, a transverse cross-section of the same, as on line 2—2, Fig. 1;

Fig. 3, a side elevation of the same in a partially fabricated condition, and illustrating the method of manufacture;

Fig. 4, a transverse cross-section of the same, as on line 4—4, Fig. 3;

Fig. 5, a fragmentary elevation and cross-section illustrating a first flange elongating operation, as by rolling, in making the integral frame structures;

Fig. 6, a fragmentary elevation and cross-section illustrating a final flange elongating operation, as by rolling, in making the integral frame structures;

Fig. 7, a fragmentary side elevation of an elongated integral frame structure having parallel arrangements of chord and web members;

Fig. 8, a transverse cross-section of the same, as on line 8—8, Fig. 7;

Fig. 9, a fragmentary side elevation of a truss frame structure having three rows of elongated integral truss chord members integral with transverse truss web members longitudinally separated from each other; and

Fig. 10, a transverse cross-section of the same, as on line 10—10, Fig. 9.

Similar numerals refer to similar parts throughout the drawings.

While the frame structures of the invention may be made of any desired material capable of being worked according to the methods about to be described, for most practical purposes metallic material will be found most satisfactory.

Moreover the material may be subject to the operations about to be set forth in varying conditions of temperature, depending upon several factors, and subject to the judgment of the fabricator. For example, heavy steel shapes of substantial depth may be made into elongated integral frame structures according to the present invention in the heated condition usual in rolling mill practice. On the other hand, light steel or other metallic shapes, may be made into

elongated integral frame structures by cold drawing or rolling operations in conjunction with the other steps of the methods of the present invention.

Referring to Figs. 1 and 2, a truss frame structure 1 includes elongated longitudinal truss chord members 2 integral with transverse truss web members 3 longitudinally separated from each other, and integral gussets 4 between the chord and web members.

Each integral gusset 4 is preferably pyramidal, and has its base located in one of the chord members 2 and extends therefrom towards the other chord member, and the apex of each gusset is connected with the intersecting ends of two of the transverse web members 3.

Figs. 3 and 4 illustrate a portion of the truss frame structure of Figs. 1 and 2, in a partially fabricated condition, and make clear the method of manufacture. This method includes transversely stagger severing, as by punching, piercing, slitting, shearing, and the like, and indicated at 5 and 5′, Fig. 3, portions of the solid web 6 and the gusset extensions 4*a* of chord flanges 2*a* of a longitudinal strip of material indicated at 7, to form transverse web members 3′ and gussets 4′ integral with the longitudinal chord flanges 2*a*, and then elongating the chord flanges and gussets to longitudinally separate the transverse web members, and at the same time transversely elongate them in a slight degree.

In Fig. 3, length *a* represents a portion of the longitudinal strip 7 before any of the operations of the invention have been performed upon it. Length *b* represents a continuing portion of the same strip after the solid web 6 has been transversely severed as at 5 and 5′ to form transverse web members 3′ and gussets 4′ integral with the longitudinal chord flanges 2*a*. Length *c* represents a further continuing portion of the same strip during and after the elongation of the flanges 2*a* and gussets 4′ to form the completed frame structure 1 having elongated chord members 2 integral with transverse web members 3 longitudinally separated from each other and having integral gussets 4 between the chord and web members.

While the elongation of the chord members may be performed by any well known method, Figs. 5 and 6 illustrate a preferred method of elongation by rolling the chord flanges 2*a*, thereby reducing their cross-sectional area, and consequently increasing their length.

In Fig. 5, the stagger severed strip 7 is shown about to be subject to a first rolling operation by rolls 8 and 8′, which are connected with suitable driving gear, not shown, in any well known manner. Stationary or roller guides 9 and 9′, maintain the longitudinal direction of the strip as it passes through the rolls. Ample clearance indicated at 10 and 10′, is preferably provided between the faces 11 and 11′ of the rolls, and the web 6, so that the flanges 2*a* may be reduced in cross-section by the rolling operation, thereby increasing their length and longitudinally separating the web members without binding the same on the rolls.

A final pair of rolls 12 and 12′, having faces 13 and 13′ in direct contact with the web members 3, may be used in connection with stationary or roller guides 9 and 9′ to provide a final finishing and straightening operation in the rolling fabrication of the truss frame structure 1.

Figs. 7 and 8, illustrate a modified arrangement of web members, in which the frame structure 14 includes longitudinal chord members 15 integral with parallel transverse web members 16 longitudinally separated from each other, and integral gussets 17 between the chord and web members. The method of making structure 14 is obviously similar to that already described for structure 1.

Each gusset 17 is preferably pyramidal and has its base located in one of the chord members 15 and extends therefrom towards the other chord member, and the apex of each gusset is connected with one end of one of the web members 16.

Figs. 9 and 10, illustrate a truss frame structure 18, including a plurality of rows 19 of integral longitudinal chord members, integral with a plurality of transverse web members 20 longitudinally separated from each other, and integral gussets 21 between the chord and web members.

Structure 1 is adapted among other things for use as a beam or girder, while structures 14 and 18 are adapted among other things for use instead of solid plates in plate girder construction.

By the use of the integral frame structures of the present invention as structural members, instead of solid rolled shapes, substantial savings may be attained in the weight of material required to fabricate any given structure, as may be easily demonstrated by well known methods of strength of materials.

As compared with types of expanded rolled shapes, having web bars formed by longitudinally slitting the solid web, and then transversely separating the flanges; the transverse web members of the integral truss frames of the present invention are disposed at angles to the chord flanges much more favorable to the efficient resistance to the imposed loads than the longitudinally slit web bars of the other types. Longitudinally slit web bars are necessarily inclined to the chord flanges at angles which are

much less on one side and much greater on the other side, than the inclinations of the transverse web members of the present invention, which vary but slightly from the normal or right angle even for a very large elongation of the chord members.

Moreover, types of expanded shapes requiring a lateral or transverse displacement of the flanges are more difficult and costly to fabricate in connection with existing rolling equipment than the integral frame structures of the present invention, which, as has been shown are adapted for fabrication without any transverse displacement of the longitudinal flanges.

I claim:—

1. An integral truss frame structure including a plurality of flanged and elongated longitudinal truss chord members integral with a plurality of transverse truss web members longitudinally separated from each other, there being integral pyramidal gussets between the chord and web members, each pyramidal gusset having its base in one chord member and extending towards another chord member, and each gusset having its apex connected with an end of one or more web members.

2. The method of making an integral frame structure from a longitudinal strip of material which includes severing portions of the strip to form longitudinal chord members integral with transverse web members, and elongating the chord members to longitudinally separate the web members and formed tapered integral pyramidal gussets between the chord and web members.

3. The method of making an integral frame structure from a longitudinal strip of material which includes transversely severing portions of the strip to form longitudinal chord members integral with transverse web members, and elongating the chord members to longitudinally separate the web members and form tapered integral pyramidal gussets between the chord and web members.

4. An integral frame structure including a plurality of flanged and elongated longitudinal chord members integral with a plurality of transverse web members longitudinally separated from each other, there being integral gussets between the chord and web members, and the gussets and the web members having different transverse cross-sections.

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

HURXTHAL FIELD FREASE.