

July 28, 1925.

1,547,607

N. C. RENDLEMAN

METALLIC STRUCTURAL ELEMENT

Filed Feb. 13, 1922

2 Sheets-Sheet 1

Fig. 1.

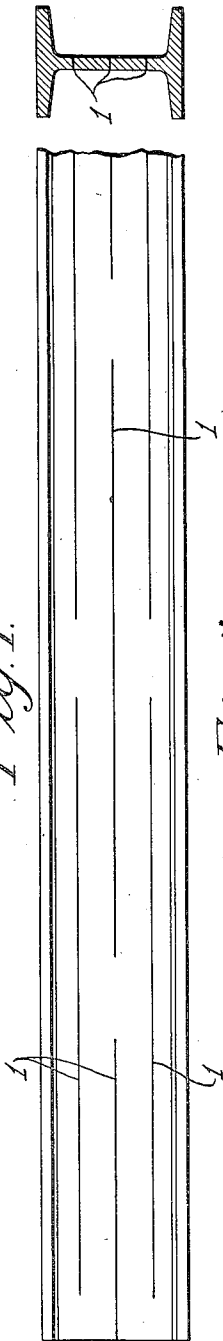


Fig. 2.

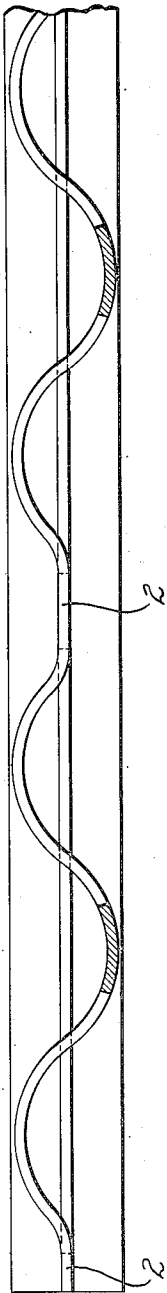
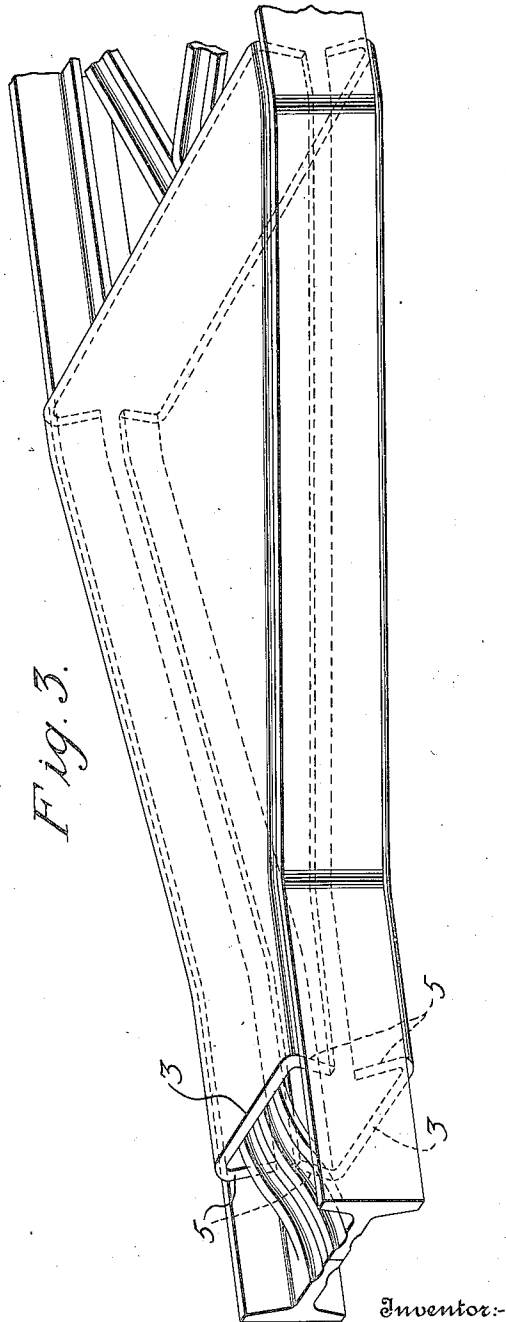


Fig. 3.



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Fig. 4.

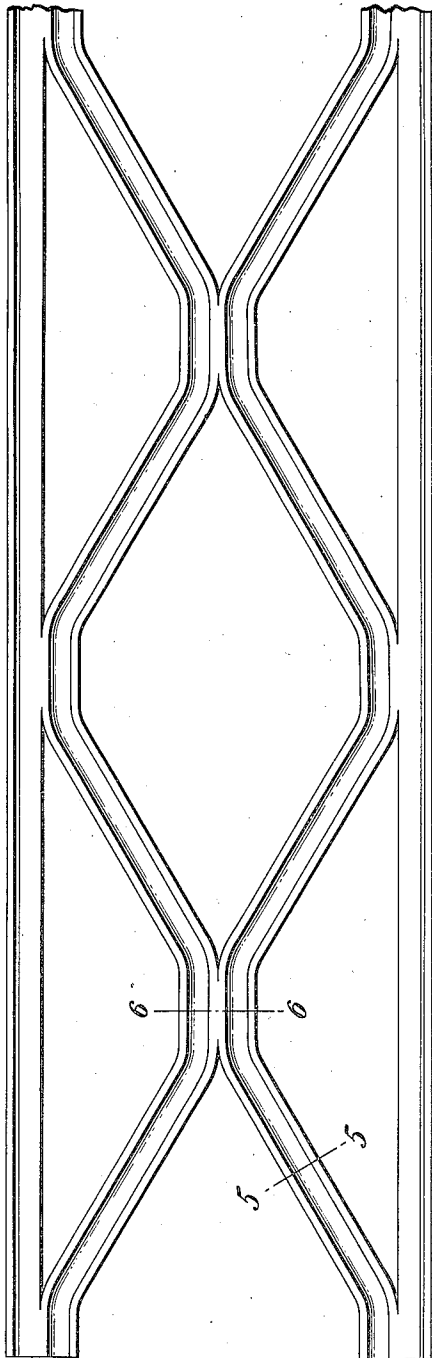


Fig. 6.



Fig. 5.



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UNITED STATES PATENT OFFICE.

NORMAN C. RENDLEMAN, OF DORMONT, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO JONES & LAUGHLIN STEEL CORPORATION, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

METALLIC STRUCTURAL ELEMENT.

Application filed February 13, 1922. Serial No. 536,382.

To all whom it may concern:

Be it known that I, NORMAN C. RENDLEMAN, a citizen of the United States, and a resident of Dormont, county of Allegheny, State of Pennsylvania, have invented an Improvement in Metallic Structural Elements, of which the following is a specification.

My invention aims to provide improved metallic beams, columns and other structural elements intended to carry or resist heavy loads or stresses, they being commonly rolled shapes such I-beams, T-beams, channels, etc., and of the type having latticed, trussed or open webs.

In the accompanying drawings by way of example there is illustrated one practice of the invention in connection with an I-beam. Figure 1 shows in elevation and in cross-section a slitted I-beam; Figure 2 is a longitudinal section of the same after the reduction and elongation of the web by rolling; Figure 3 shows in perspective one manner of separating the opposite flanges and thereby forming the truss-members from the web; Figure 4 is a view in elevation of the finished illustrative beam; Figures 5 and 6 are enlarged cross-sectional views on the lines V—V and VI—VI, respectively of Figure 4.

The entire operation is advantageously performed upon the beam or other shape as it comes from the finishing pass of the rolling-mill, and without reheating. This results in great economy, and gives a better product since the metal is not subjected to possible deterioration by repeated heating. The beam if rolled in usual manner is first subjected to the action of a shear, which forms in the web the slits 1 as shown in Figure 1, the adjacent rows of slits being in staggered relation to one another. In the present case three rows of slits are shown, but there may be a less number of rows, one row adjacent each of the flanges, or in other cases there may be more than three rows.

From the shear the beam is passed through a rolling-mill, the rolls of which operate only upon the web, leaving the opposite flanges free, and the effect of this rolling is uniformly to reduce and elongate the web of the beam without changing the length of the opposite flanges. This opera-

tion will cause longitudinal bows or undulations between the points 2 where the web remains tied to the flanges, and in order to control these undulations, top and bottom guides 3 may be placed above and below the web portion of the beam at the discharge side of the roll pass, thus giving the web portion of the beam the general form shown in Figure 2.

The spreading of the opposite flanges may be accomplished as preferred, or as determined by the particular shape of the beam or other section being operated upon. In the case of the I-beams it is preferred to accomplish this spreading by passing the rolled section longitudinally over gradually diverging side guides 5 as shown in Figure 3, which bends without injuriously stretching the slit formed member, bringing the article to the finished width. Then if found necessary or desirable it may be subjected to another rolling operation, though that may not always be necessary.

The pass between the rolls may of course be a plain pass, which will result in the truss-members having a general rectangular form in cross-section. But to make the truss-members of such cross-sectional form as to give them maximum strength, it is preferred to form the roll pass so as to impart to the metal of the web between each row of slits a flanged or ribbed form, such for example as shown in Figure 5 of the drawings, which is essentially the form of an I-beam, and when the flanges are pulled apart the truss-members will consequently have this cross-sectional form. Their form at the points of their junction with each other is shown in Figure 6.

The extent of elongation of the portion of the web subjected to rolling may be controlled to suit the desired length of the truss-members, so that when the side margins of the beam are separated to expand the beam to its latticed shape the longitudinal bows or undulations of the slitted portion of the web produced by the rolling operation will be straightened out but not stretched appreciably. By varying the length of the slits and the amount of elongation of the slitted portions of the web any desired depth of beam may be produced, and the angle made by the truss-members with each other and with the marginal flanges may be varied

to provide the most suitable shape of lattice work for the purpose for which it is to be used.

It will be apparent that the method above described is not the sole means of producing articles embodying the present invention, which may be incorporated in beams and articles of a variety of shapes having a latticed, trussed or open web between the opposite margins or plates. Flat reticulated plates may be used to great advantage in the construction of roadways, and they have other valuable uses as well. For that reason in the appended claims the term latticed element is used generally to designate inclusively beams, plates or other metallic shapes made in accordance with the invention herein illustrated.

Heretofore it has been proposed to elongate the slit-formed areas or portions of the plate or web by stretching the same, as by seizing and separating the marginal portions or beads or by sinking or deflecting such portions under lateral pressure or action; but all stretching of such slit-formed portions results in an impairment or injurious deformation of the stretched portions. This deformation may be evidenced in various aspects such as inequalities in cross-sectional areas or configurations due to structural differences at various points in the slit-formed portions or it may be evidenced by deformations in the metallic structure itself, such for example as an impaired homogeneity.

By rolling or otherwise elongating the slit-formed portions of the web under pressure or by compression, and preferably preliminary to lateral spreading and bending, a definite and predetermined cross-section may be assured and a resultant controlled structural condition of equal or greater density or homogeneity may be had in the bent and spread product, thus greatly adding to the

strength and efficiency of the completed beam or plate.

I claim as my invention:

1. A rolled metal trussed structural element having continuous flange members and web connecting members integral therewith and of uniform physical properties throughout all parts, each of said connecting members having an elongated structure of uniform cross-sectional area from end to end.

2. As a new article of manufacture, an integral rolled and bent latticed element the diagonal members of which are of substantially uniform cross-section and free from stretch deformations.

3. A latticed element having opposite marginal portions connected by integral oblique truss-members, said truss-members having a flanged or ribbed cross-sectional form.

4. A latticed element having opposite marginal portions connected by integral intersecting truss-members, thus forming an intermediate latticed structure, said truss-members having a flanged or ribbed cross-sectional form.

5. As a new article of manufacture, a rolled metal latticed element comprising marginal portions continuous from end to end and connecting members integral therewith and having uniform physical properties and homogeneous structure throughout the element.

6. A latticed element having opposite marginal portions connected by integral oblique truss-members, said truss-members having a flanged or ribbed cross-sectional form of uniform physical properties with the remainder of the element.

In testimony whereof, I have signed my name to this specification this eleventh day of February A. D. 1922.

NORMAN C. RENDLEMAN.