A. J. BATES.

TRUSSED STRUCTURE.

APPLICATION FILED APR. 18, 1910.

1,006,047.

Patented Oct. 17, 1911.

3 SHEETS—SHEET 1.

Fig 1

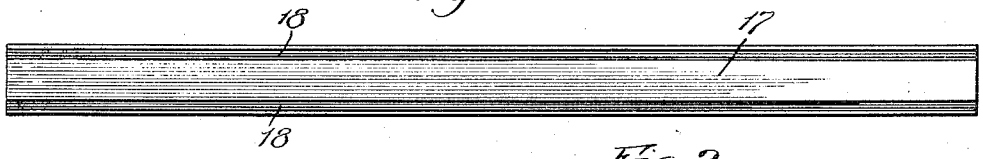


Fig. 2

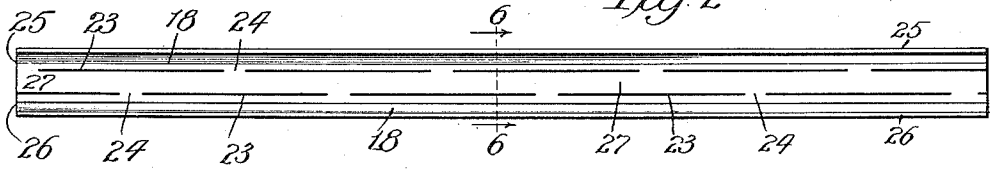


Fig. 3.

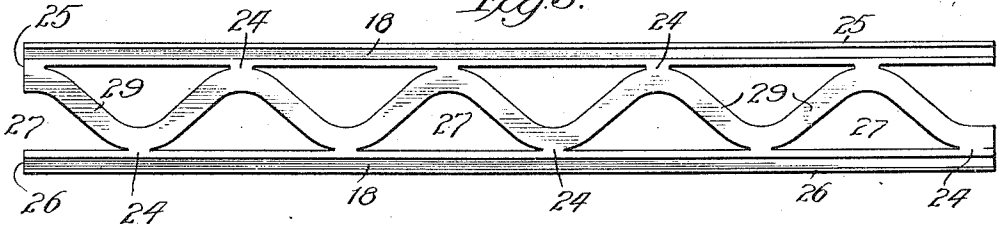


Fig 4

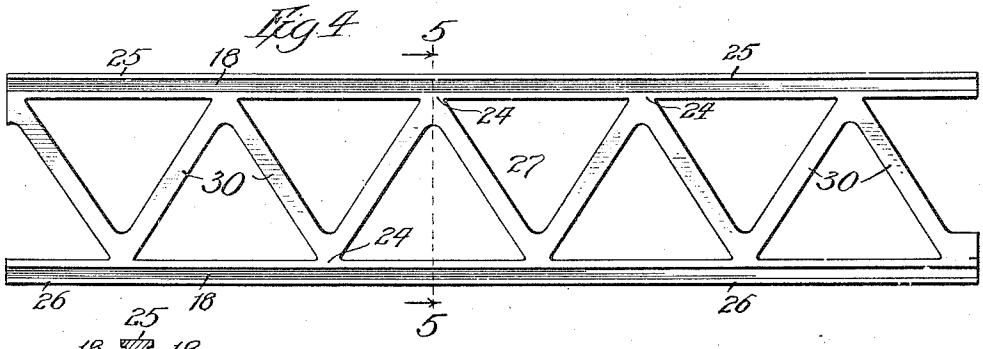


Fig. 5.

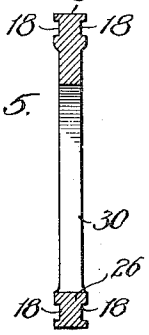


Fig. 6.

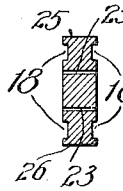
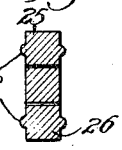


Fig 7

Fig 8

Fig. 9

Fig. 10.



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3 SHEETS—SHEET 2.

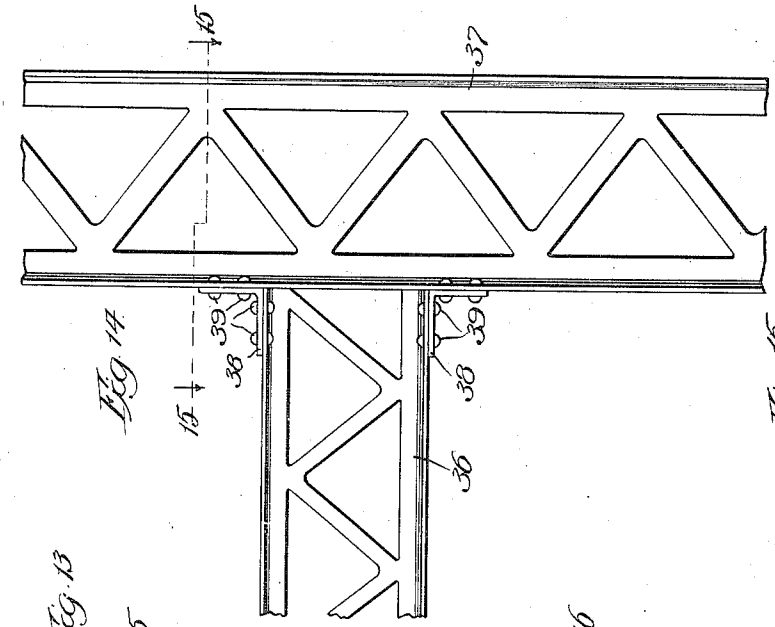

Fig. 14.

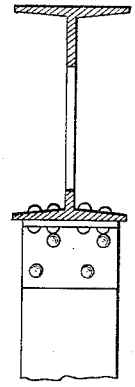

Fig. 15.

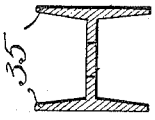

Fig. 16.

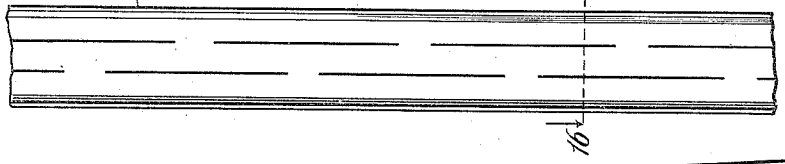

Fig. 13.

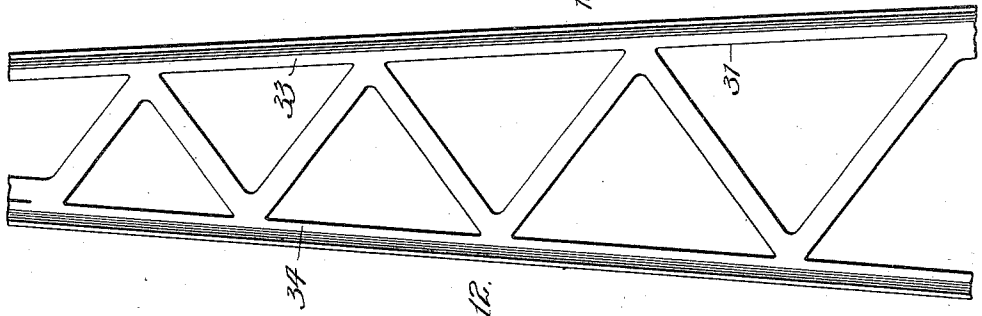

Fig. 12.

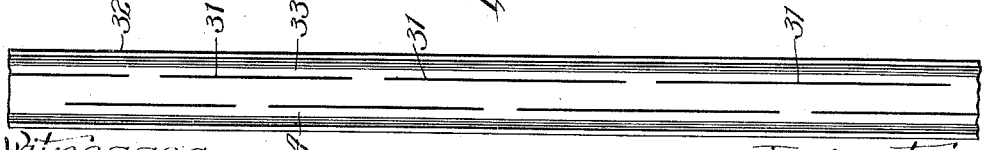

Fig. 11.

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TRUSSED STRUCTURE.

APPLICATION FILED APR. 18, 1910.

1,006,047. Patented Oct. 17, 1911.

3 SHEETS—SHEET 3.

Fig. 17.

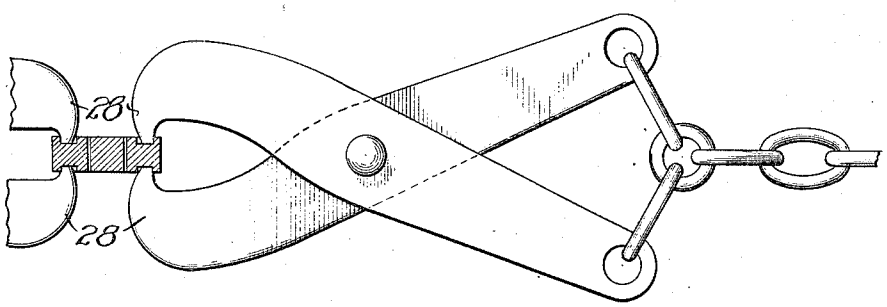
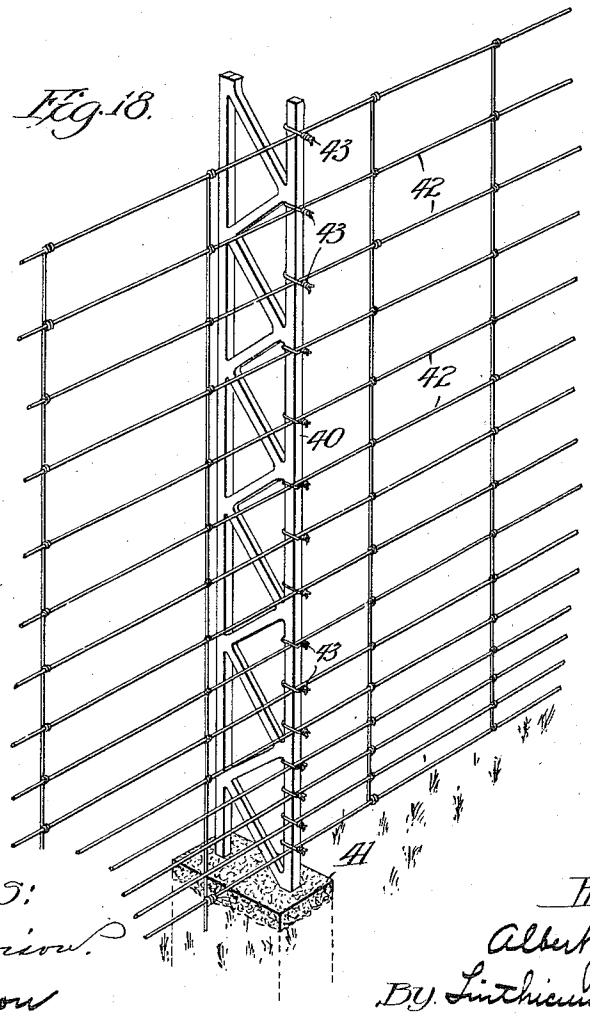


Fig. 18.



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UNITED STATES PATENT OFFICE.

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TRUSSED STRUCTURE.

1,006,047. Specification of Letters Patent. Patented Oct. 17, 1911.

Application filed April 18, 1910. Serial No. 556,221.

To all whom it may concern:

Be it known that I, ALBERT J. BATES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Trussed Structures, of which the following is a specification.

My invention relates to trussed structures and comprises essentially the formation of a structure having longitudinally extending side members spaced apart and integrally connected together at intervals throughout their length by truss members preferably angularly disposed to the side members.

So far as I am aware, trussed structures heretofore employed in the construction of buildings, bridges, elevated railways, and other metal work, have been built up of longitudinal side members connected together by cross-pieces riveted or bolted thereto.

The object of my invention is to provide a strong and substantial integral trussed structure of skeleton form which can be employed as a substitute for the built-up structures heretofore referred to and for a variety of other purposes and which combines greater strength and rigidity than the built-up structures with economy of production.

To this end my invention embodies the conversion of a solid bar or strip of metal into skeleton form and of the same or substantially the same length as the original bar or strip and providing a trussed structure essentially stronger for many purposes than the original bar or strip and having a certain inherent elasticity.

The said structure consists essentially of longitudinal side members and diagonal strut members disposed with relation to the side members so as to form a plurality of adjacent triangular shaped openings in the structure. In the formation of the structure the side members remain substantially unchanged in length and cross-section but the truss members are stretched lengthwise and more or less reduced in cross-section. This is accomplished, briefly, by slitting the bar or strip at intervals, the slits being parallel to the side members and in staggered relation to each other and then separating the outer members of the bar or strip and stretching lengthwise the sections comprising the intermediate member until the desired structure is obtained. By this method I am enabled to produce a structure more rigid and much stronger than the built-up structures heretofore employed and the integrated structures produced by welding and free from the weaknesses at the joints of the parts in the old structures, and furthermore my intergral structure is more economical to produce than a built-up structure or an integrated structure and is more durable.

Another object of my invention is the production of a structure in which the strains and stresses are distributed evenly throughout its length, which desideratum is practically impossible in built-up structures because of the inevitable inaccuracies which creep into an attempt to make a large number of pieces of exactly the same length, and to drill or punch a large number of holes which shall be spaced exactly the same distance apart.

My invention also aims to produce a structure which shall be lighter than the constructions heretofore employed, and which can be manufactured at much less cost.

Furthermore, my invention has for its object the provision of a structure which is capable of a variety of uses to which a built-up structure could not be successfully adapted.

Additional aims and objects of my invention will be apparent to those skilled in the art as it becomes better understood by reference to the following description when taken in connection with the accompanying drawings illustrating a preferred embodiment thereof.

Referring to the drawings Figure 1 is a plan of a bar or strip of metal from which my improved structure is made. Fig. 2 is a plan of this bar after grooving and slitting operations. Fig. 3 is a plan showing the side members of the bar partially separated. Fig. 4 shows the side sections separated to produce a trussed structure of maximum strength. Fig. 5 is a section on the line 5—5 of Fig. 4. Fig. 6 is a section on the line 6—6 of Fig. 2. Figs. 7 to 10 are views similar to Fig. 6 and showing other forms of bar. Fig. 11 is a view similar to Fig. 2 but having slits therein of graduated lengths to produce a tapering structure. Fig. 12 shows the resulting structure after

the side members of Fig. 11 have been separated. Fig. 13 is a side view of an I-beam slitted according to my invention. Fig. 14 shows a method of connecting two of my improved trussed structures. Fig. 15 is a section on the line 15—15 of Fig. 14. Fig. 16 is a section on the line 16—16 of Fig. 13. Fig. 17 shows a tool constructed to engage with the side members of a slitted bar for the purpose of separating them. Fig. 18 shows my invention employed as a fence post.

On the drawings, 17 designates one form of bar or beam which may be advantageously employed in the manufacture of my improved trussed structure. The bar as shown in Fig. 6 is provided with grooves or longitudinal depressions 18 near its edges which form grip surfaces so that the bar can be firmly grasped by a tool or machine for the purpose of separating the side members, as will be later described. The grip surfaces may be otherwise produced, as by the flanges 19, (Fig. 7), the grooves 20, (Fig. 8), the beads 21, (Fig. 9), the ribs 22, (Fig. 10) or the side members may be roughened. Instead of forming these gripping surfaces on the bar the drawing or stretching means may be provided with suitable gripping surfaces to make locking engagement with the bar. The bar, with or without the gripping surfaces, is provided with a plurality of slits 23 extending longitudinally throughout its length in staggered relation to each other and in two series. These slits, as shown in Fig. 2, are of substantially equal length, the ends of the slits being separated by an integral tie portion 24 affording sufficient strength to prevent fracture during the separating or drawing operation. The uncut tie portions 24 between the slits in each series are preferably disposed substantially opposite the center of the slits in the other series, and each series of slits is located substantially equidistant from the edges of the bar and from each other, thus dividing the bar into two longitudinal side members 25, 26, and an intermediate member 27. The slits may be produced by any suitable cutting implement with the bar in either heated or cold condition, as may be found desirable. After the slitting operation, the side members of the bar are grasped throughout their length or at such points as may be found sufficient, by a suitable stretching tool or implement. Any preferred type of stretching or drawing device may be employed, one type being shown in Fig. 17 for the purposes of illustration merely. The device shown comprises jaws 28 adapted to engage the side members. Suitable means are employed for pulling the jaws to separate the side members and to stretch or elongate the sections 29 of the intermediate member of the bar into a sinuous form, as shown in Fig. 3 without increasing or decreasing the length of the side members. The pulling or stretching operation is materially facilitated by heating the bar, and in heavy work the heating of the bar is practically necessary.

The structure shown in Fig. 3 may be employed for numerous purposes but the form which gives the maximum strength and efficiency is disclosed in Fig. 4, wherein the side members 25 and 26 have been separated until the sections 30 of the intermediate member 27 connecting the tie portions 24, are straight and disposed at practically an angle of 60° with the side members. In thus forming the structure the side members are neither changed in length nor in thickness, at least to any material extent, and they are trussed and strengthened by the angularly disposed sections of the intermediate member. The members and sections form a structure having a plurality of adjacent triangular openings, the sides of these triangles being formed by the sections and the bases thereof by the side members. The triangles are arranged with their bases alternating between the side members.

In the structure shown in Figs. 1 to 8, inclusive, the slits in the bar have been made of uniform length and the side members have been drawn apart and maintained in substantial parallelism. If it is desired to produce a tapering trussed structure, such as is disclosed in Fig. 12, the slits 31 are graduated in length from one end of the bar 32 to the other (Fig. 11). When the stretching operation is performed the longer slits at one end of the bar will permit the side members 33 and 34 to be separated farther than will the shorter slits near the other end of the bar. This structure, shown in Fig. 12, is particularly adapted for use in aerial structures, such as towers, etc., and as telegraph, telephone or power poles.

In Figs. 13 and 16 I have shown an I-beam 35 slitted for stretching to form trussed structure adapted for use in building construction, as shown in Figs. 14 and 15. In the latter figures there is shown a girder 36 and upright 37, the connection being made by means of suitable angle-bars 38 and rivets 39 such as are ordinarily employed in constructions of this kind. It will be obvious that a building frame constructed as shown in Fig. 14 may be made much lighter and stronger than a frame constructed of the same material in the form of ordinary shapes. A frame of this kind is also particularly adapted for use in concrete constructions; the concrete uniting with the open work of the structure to form a firm mechanical bond.

My invention may also be employed as a fence post, as shown in Fig. 18, wherein the lower end of the post 40 is embedded in

concrete 41 or other suitable material. The wires 42 of an ordinary wire fence may be attached to the post by clips 43 or other preferred means. A post thus constructed is strong and durable, and offers the greatest resistance along a line transverse to the direction of the wires of a fence. This is the most useful and efficient type of post, since the strain upon the fence is usually exerted against the side thereof which will be resisted by the post set as shown in Fig. 18.

It will be obvious from the foregoing description that my invention is capable of a variety of uses both in structural work and in reinforced concrete work. Furthermore, it may be employed in lighter constructions such as telephone poles or fence posts, hitching posts, etc., and in fact is a very cheap and efficient substitute for either the built-up or solid constructions heretofore employed.

While I have shown and described several forms of structures embodying my invention, it will be apparent that these forms are selected for the purposes of illustration merely and that it is capable of being embodied in a variety of other forms without departing from the spirit of the invention or sacrificing any of the material advantages thereof.

I make no claim in this application for the method of making trussed structures herein disclosed for the same forms the subject-matter of my divisional application Serial No. 583,394, filed September 23, 1910.

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

1. A trussed structure of skeleton form made from a single piece of ductile metal and having side members and a zig-zag intermediate member, together constituting a series of integral truss elements of triangular form.

2. A trussed structure of skeleton form made from one piece of ductile metal and having side members and an intermediate member, the latter comprising a plurality of oppositely disposed sections integral at their ends with the side members and forming therewith a series of truss elements of triangular form.

3. A one piece trussed structure of ductile metal and of skeleton form having side members and an intermediate member, the latter comprising a plurality of oppositely disposed struts integral at their ends with the side members and with each other and forming with the side members a series of integral truss elements of triangular form.

4. A trussed structure made of one piece of ductile metal and consisting of two side members and a zig-zag intermediate member forming with the side members a series of integral truss elements of triangular form, the center line of all of said members lying in the same plane.

5. A one piece triangulated article composed of ductile material having substantially parallel outer longitudinal members integral with oppositely disposed diagonal members and creating a series of triangles in alinement.

6. A one piece girder of ductile metal having a series of integral truss elements arranged in triangular form, the outer members being flanged and the center line of all the members being in the same plane.

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