Dec. 31, 1929. M. LACHMAN 1,741,423

GIRDER

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Fig. 1,

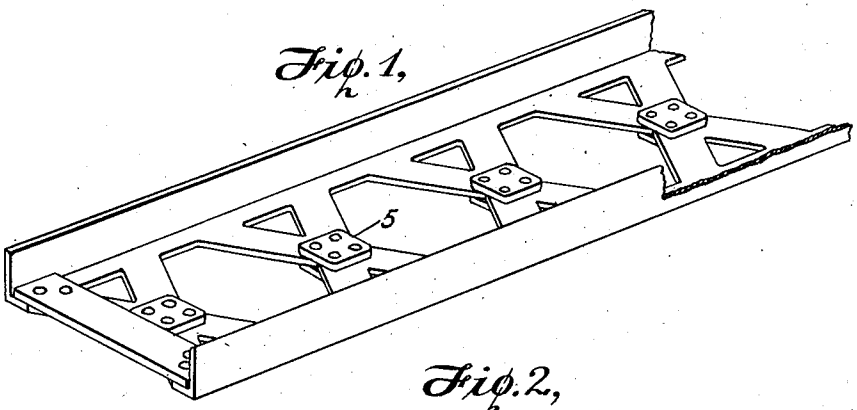


Fig. 2,

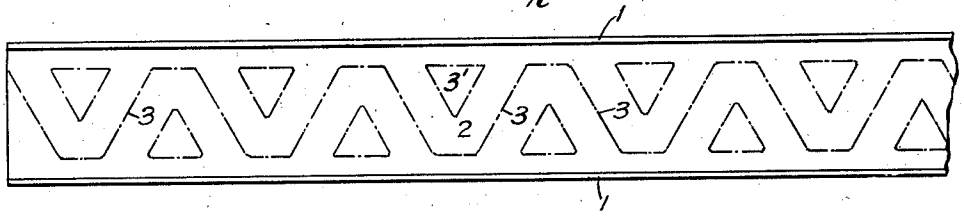


Fig. 3,

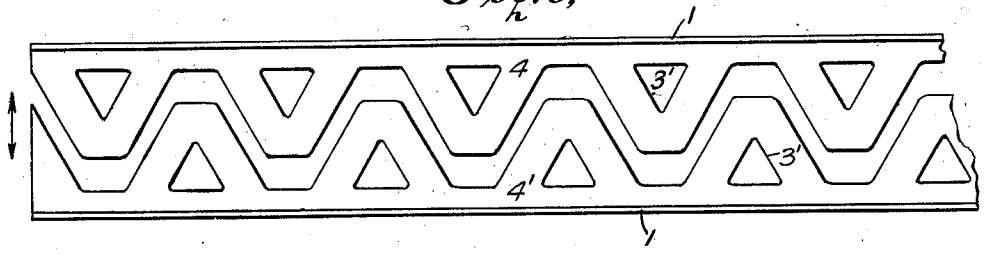
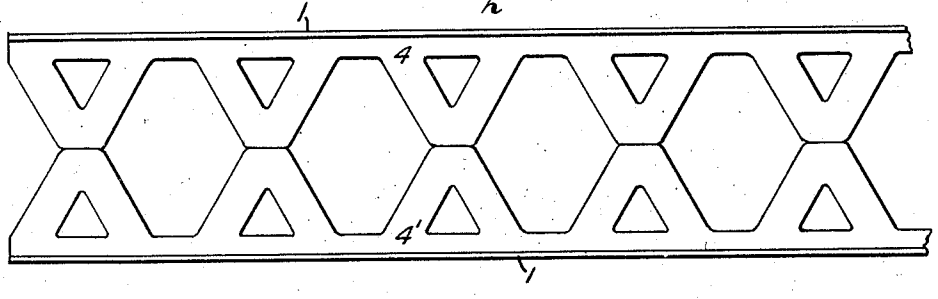


Fig. 4,



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Fig. 7,

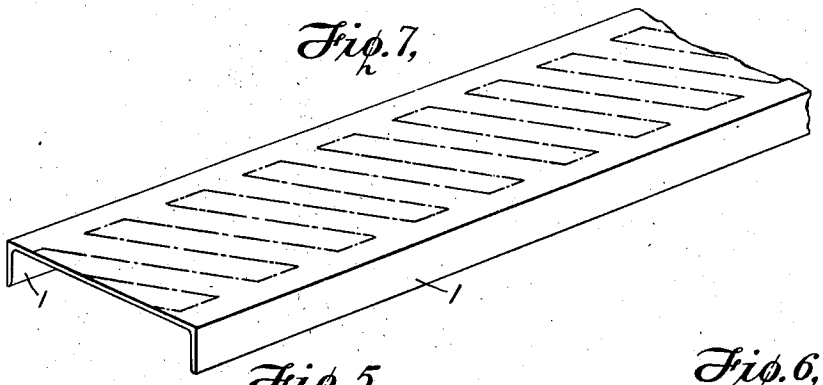


Fig. 5,

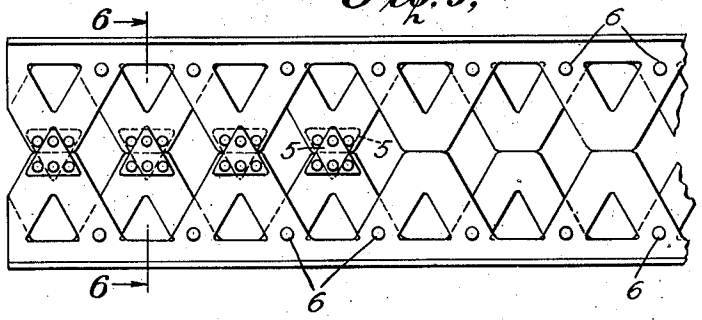


Fig. 6,

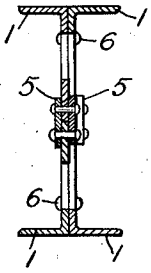


Fig. 8,

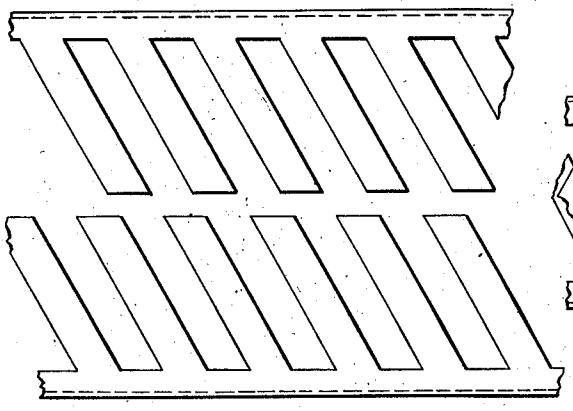


Fig. 9,

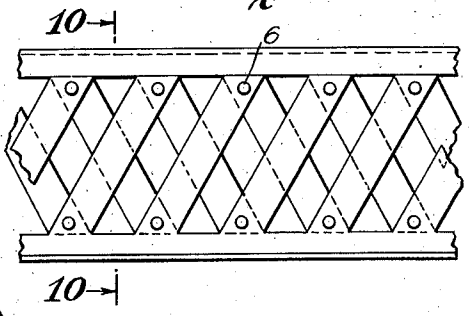


Fig. 10,



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Fig. 11.

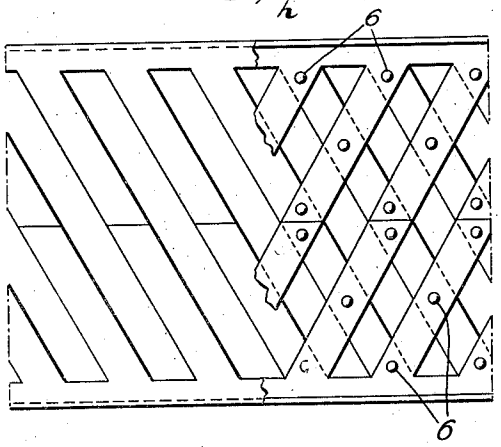


Fig. 12.

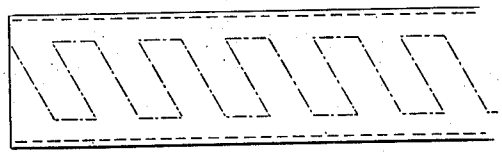


Fig. 13.

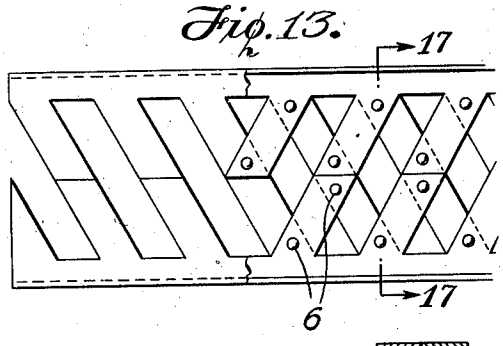


Fig. 14.

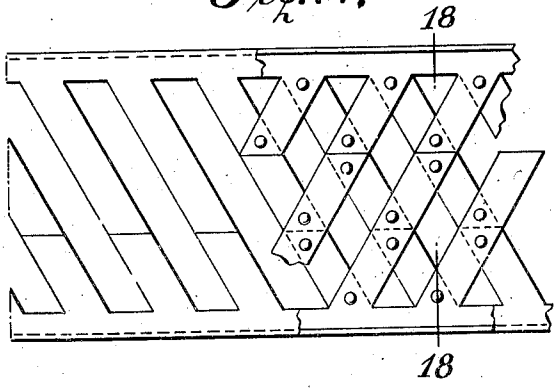


Fig. 15.

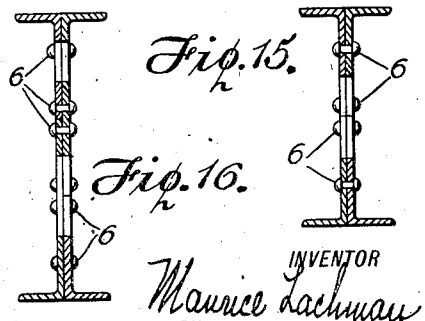


Fig. 16.

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UNITED STATES PATENT OFFICE

MAURICE LACHMAN, OF NEW YORK, N. Y.

GIRDER

Application filed June 28, 1926. Serial No. 118,879.

My invention relates to the construction and method of producing girders, beams, columns or similar structures having continuous edge members united by strut or tie members to form a skeleton girder or beam.

The principal object of my invention is to permit rolled channel or other forms of commercial bar or plate to be utilized for a skeleton form of girder, beam or similar device.

A further object of my invention is to reduce the number of rivets necessarily employed in the building up of the skeleton form of girder according to the usual method and particularly to dispense with the use of rivets or other forms of union at the point of connection of the strut or diagonal with the continuous edge member of the girder.

A further object of my invention is to permit the utilization of rolled bars, plates or beams of standard form in the production of a girder or similar structure, the depth of which between its edges shall be greater than the depth or width of the beam, bar or plate from which it is produced and approximately of double such depth or width.

Another object of my invention is to produce a beam or girder of the I form in cross-section from rolled channel bars or beams and with a depth or width in the completed beam or girder that may be of the same or, if desired, of practically double the width of the web part of the channel bar or beam from which it is produced.

Essentially my invention consists in the method of producing skeleton girders or beams from rolled channel bars or plates by dividing the bar or plate on a zigzag line extending longitudinally of the bar or stock, leaving an edge portion of said bar or plate intact and so as to permit it to be separated in the plane of the bar or plate into two parts each having a continuous edge with a plurality of separate projecting members integral with said edge and adapted to form the struts or tie members of a completed skeleton girder, frame, column or other structure wherein said strut or tie members, being suitably united at their free ends to other members or parts in the various ways hereinafter described, form in conjunction therewith the completed skeleton girder, beam or frame desired.

My invention consists further in the novel construction and manner of producing a skeleton girder, frame or beam wherein sections, parts or divisions of the bar or plate divided as hereinbefore stated have the free ends of the strut members thus produced united in any suitable way to form a girder, bar or beam of approximately twice the depth of the divided portion of the bar or plate from which it is produced.

My invention consists in the novel construction of beam or girder of the I form in cross-section built up from two sections of a rolled channel bar or beam whose web is divided on a longitudinally extending zigzag line to provide strut members integral with an edge of the completed I beam, said sections being assembled back to back to form together a strut part of the beam by the divided web portions of the two sections and to form by the flanges of said sections in the assembled relation a T head or edge of the girder.

My invention also consists in the novel construction of beam or girder of the I form in cross-section built up from sections of rolled channel bar or beams divided on a longitudinally extending zigzag line to provide strut members integral with the edges of the completed I beam, the sections of said channel bar being assembled back to back to form opposite sides of the I bar and being united at the free ends of the strut members to form a beam or girder that in its skeleton portion shall be approximately double the depth or height of the rolled channel bar.

The invention further consists in the method of producing an I form of skeleton girder or frame by dividing a rolled channel bar through its web in a general longitudinal direction to form struts or tie members integral with the flanged edge of the completed girder, placing the two halves or portions of the divided bar together back to back to form a T head or edge for the girder on one side thereof and securing the free ends of the strut parts to the similar free ends of two divided sections of channel bar placed similarly back to back.

The invention consists further in the constructions of girder as will be hereinafter more particularly described and claimed.

Fig. 1 is a perspective view of a portion of a flanged beam or girder constructed in accordance with my invention.

Fig. 2 is a plan of a portion of a rolled channel bar illustrating the manner in which it may be diveded longitudinally so as to provide parts utilizable in constructing the beam or girder Fig. 1.

Fig. 3 shows the two divisions of Fig. 2 slightly separated after cutting on the zigzag diagonal line indicated.

Fig. 4 shows the manner in which the two halves or portions of Fig. 3 are to be arranged with the free ends of the strut portions in apposition for attachment to one another by the means illustrated in Fig. 1 or by any other suitable means to produce a beam or girder of practically twice the depth of the channel bar, Fig. 2, from which it is produced.

Fig. 5 illustrates my invention as carried out by utilizing the longitudinal sections of a channel bar in the production of a girder of the general I form in cross-section shown in Fig. 6.

Fig. 7 illustrates a modifiecation in the direction of the cuts or dividing lines in the web portion of a channel bar wherein the cuts run diagonally all in the same direction instead of in alternately reversed direction as in Fig. 2.

Fig. 8 shows the two halves of the channel bar, Fig. 7, separated to form the sections which may be utilized in the construction of a lattice girder such as illustrated in Fig. 9.

Fig. 10 is a cross-section of said girder on the line 10—10, Fig. 9.

Fig. 11 illustrates the manner of disposing the parts of the channel bars provided after the manner of Figs. 7 and 8 to permit the production of a beam or girder of practically double the depth or width of the channel bar, Fig. 7, by securing the free or unattached ends of the strut members to one another by means of coupling plates such as illustrated in Fig. 5 or by other means.

Fig. 12 illustrates the channel bar divided through its web to produce two portions suitable for use in building up or producing an I bar or beam of the dimensions indicated in Fig. 13.

Fig. 13 shows in side elevation a beam or girder having sections or portions such as are produced from a channel bar of the dimensions illustrated in Fig. 12 when assembled to produce a girder of practically double depth or width.

Fig. 14 illustrates the manner of utilizing sections of two L bars of different width in the production of an I beam without the employment of tie plates for securing the meeting portions of the free ends of the diagonal or strut together.

Fig. 15 is a cross-section on the line 17, Fig. 13, and

Fig. 16 is a cross-section on the line 18 of Fig. 14.

Referring first to Fig. 2, I have shown in general plan or elevation a portion of a rolled channel bar the flanges of which are indicated at 1 and the web portion at 2. In carrying out my invention I divide the web part on a line indicated by the dotted line 3 which in general may be described as a zigzag line the effect of which is to separate the bar into two sections or portions 4, 4′, Fig. 3. If desired the parts of the web may be cut out as indicated at 3′ so that the web portion of each part or division will more nearly approximate in form the shape and dimensions of the strut or tie members of a skeleton or lattice work girder.

As will be seen, each longitudinal section or division of the bar or plate comprises a continuous edge portion thereof and projecting members, projecting from and integral with said edge portion, adapted to form in conjunction with other parts secured to their free ends, the strut or tie members of a girder, beam or similar skeleton structure.

The parts of the bar or plate retained in each divided half are integral with the flanged edge 1 and the cuts extend from near the edge as nearly as possible through the bar to the opposite edge without weakening the base connection of said strut parts at their integral connection with the flanged edge of the bar. When the two halves or portions are fully separated and displaced longitudinally to bring them into the relation indicated in Fig. 4, in which relation or position they may be suitably secured or tied together by the riveted coupling plates indicated in Fig. 1 at 5, there results from the tying or union of the free ends of said projecting strut or tie members a skeleton channel beam or girder of the form illustrated in Fig. 1. Plainly, in this manner of carrying out my invention I obtain from a channel bar having a width of web illustrated in Fig. 2, a skeleton channel bar or girder of approximately twice the width or depth, less however the undivided portion of the web near each flanged edge. The result is, however, a girder that is extremely light and that, by reason of the increased width or depth, has increased load resistance over that which could be secured from a plate beam or girder utilizing a channel bar or beam of the form, Fig. 2, without sub-division.

Furthermore, by the practice of my invention in the form so far described and in other forms to be later described, I avoid the practical difficulties encountered in rolling a bar or beam of desired width to secure the load resisting factor necessary in some situations of use.

The channel bar or beam divided as de-

scribed may be also utilized in the production of a skeleton bar, beam or girder of the general I form in section as illustrated in Figs. 5 and 6. In this instance the two sides or portions of a divided channel bar are taken and placed back to back and suitably united to one another by rivets or other means as indicated at 6, to provide one edge of the completed skeleton beam or girder. Two other sections or portions of a channel bar are employed in a similar way to form a T head or edge on the other side of the girder. In thus assembling the parts of the divided channel bar they are arranged in staggered relation so that, when the free ends of the projecting members are in apposition to the free ends of the projecting members on the other half of the completed girder, the form of lattice girder indicated in Figs. 5 and 6 will result. The two halves of the skeleton girder may be fastened together by the tie plates or clamping means indicated at 5 securely riveted or otherwise secured to the strut parts of the divided webs. These clamping or tie plates may be of triangular form, as indicated, or otherwise shaped as desired.

In the figures so far described the dividing line follows a diagonal which is alternately reversed as it progresses longitudinally along the web but, as indicated in Fig. 7 and as will be obvious, the cuts or divisions may be all inclined in the same direction with the result that when the two halves or divisions of the channel bar are separated fully they will present the form shown in Fig. 8. Said halves or divisions may be employed in producing the skeleton beam or girder by reversing the one-half end for end with relation to the other and securing the strut or tie members at their free ends to the base of the similar strut or tie member of the opposite half of the skeleton beam or girder, as indicated at 6, Fig. 9. The result of reversing the two halves or portions end for end is as will be obvious in the production of a flanged skeleton beam or girder of the Z form as indicated in Fig. 10.

In Fig. 11 I show one of the ways in which the divisions of a rolled bar divided along lines such as indicated in Figs. 7 and 8 may be utilized in the production of a skeleton beam or girder according to my invention. In this figure each half or side of the beam comprises the two divisions such as indicated in Fig. 8, reversed with relation to one another and placed back to back to cause the strut or tie members to cross one another while the free ends of each half portion of the completed girder are arranged in apposition and may be there secured together by the tie plates already described or by any other means as desired. The crossings of the struts in each half of the completed beam or girder may be fastened together as indicated by the rivets 6 if desired. Obviously there results from this construction a skeleton girder of the general I form in construction.

The less width of channel bar shown in Fig. 12 may be similarly divided and have its part similarly disposed as indicated in Fig. 13 to produce the I form of skeleton girder illustrated in section in Fig. 15. Such lesser width of bar is also useful in connection with the greater width of bar illustrated in Fig. 8 in a manner to avoid the necessity of using the ties such as shown at 5. In this form (Fig. 14) the strut members, when secured together as shown, securely tie the two halves or sides of the skeleton girder together. To produce this effect one-half of the skeleton girder is composed of a section or half of a narrower channel bar such as shown in Fig. 12, reversed and placed back to back against one-half of a sectional channel bar of the greater width. The other portion or side of the completed skeleton girder is similarly formed and when the parts are arranged in the relation indicated in Fig. 14 the longer struts of one side or half will lap over upon the longer strut members of the other half at their free ends and may there be directly tied or riveted to them as shown. Additional rivets may be employed to fasten the two halves of each side or edge of the bar together but the riveting of the longer sections of the two sides respectively to one another secures said sides together without the employment of the tie plates 5.

As will be seen, by my invention I am enabled to increase the height or depth of girder attainable by the old method of rolling a plate girder to the dimension or height desired and at the same time to avoid the difficulties met with in constructing plate girders of the desired depth or height, inasmuch as I avoid the difficulty of rolling wider beams due to the tendency of the rolled product to twist or distort and also avoid or reduce the great expense of plant necessary when wide rolls are employed. I am also able to avoid the use of rivets for connecting the struts or diagonals to the extreme or outer parallel members of the girder which have heretofore been necessary in the case of the lattice or skeleton girder built up from L bars and separate strut members. I also am enabled in some forms of my invention to construct a girder or I form consisting essentially of rolled bar or plate while at the same time avoiding the practical difficulty attendant upon the rolling of plates or bars of wide shape which, as is well known, is much more difficult than the rolling of ordinary channel bars.

A very important advance in the art is secured by my invention inasmuch as the difficulty experienced in rolling light girders of plate form and of sufficient width has made it necessary heretofore to employ more weight of metal than is necessary in many situations

to carry the required load. In my invention I can employ a bar having all of the weight of metal desired by employing a rolled bar of less width and can secure the necessary stiffness by employing sections of the divided bar in a manner to give the necessary width or depth. Furthermore, the important advantage of my invention is that a channel bar can be rolled lighter than an I bar and by utilizing it in the manner described I am enabled to produce an I form of girder of less weight and hence with greater saving of material than has heretofore been possible.

What I claim as my invention is:

1. An I beam or girder of skeleton form each edge or side of which comprises two longitudinal sections of a channel bar divided through its web in a general longitudinal direction to provide struts or tie members integral with the edge, said sections being placed back to back and means for uniting the two sections forming one side or edge of the girder by the free ends of said projecting parts or members to the similar projecting free ends of the opposite side or edge.

2. A beam or girder of the I form in cross-section built up from sections of rolled channel bar or beams divided on a longitudinally extending zigzag line to provide strut members integral with the edges of the completed I beam, the sections of said channel bar being assembled back to back to form opposite sides of the I bar and being united at the free ends of the strut members to form a beam or girder that in its skeleton portion shall be approximately the depth or height of the rolled channel bar.

3. A beam or girder of the I form in cross section built up from sections of rolled channel bars or beams divided on a longitudinally extending zigzag line to provide strut members integral with the edges of the completed I beam, the sections of said channel bar being assembled back to back to form opposite sides of the I bar and being united at the free ends of the strut members.

4. An I beam or girder of skeleton form an edge or side of which comprises two sections of a channel bar divided through its web to provide struts or tie members integral with the edge, said sections being placed back to back with the free ends of the struts or tie members joined together.

5. An I beam or girder of skeleton form each edge or side of which comprises two sections of a channel bar divided longitudinally in a zigzag line to provide strut members integral with the edges of the completed I beam, the sections of said channel bar being assembled back to back to form opposite sides of the I bar and the strut members being fastened together in staggered relation to each other.

6. An I beam or girder of skeleton form each edge or side of which comprises two sections of a channel bar divided through its web to provide struts or tie members integral with the edge, said sections being placed back to back with the struts or tie members arranged in staggered relation to each other and fastened together.

7. In a beam or girder, two sections of a rolled channel bar or beam whose web is divided on a longitudinally extending zigzag line to provide strut members integral with an edge of the completed beam, said sections being assembled back to back to form together a strut part of the beam by the divided web portions of the two sections and to form by the flanges of said sections in the assembled relation a T head or edge of the girder.

8. A lattice work girder comprising sections of channel bar divided in its web portion on inclined parallel lines united at their ends to form zigzags, said sections being in reversed relation to one another and secured back to back to form lattice work truss members of a girder having a T edge.

Signed at New York in the county of New York and State of New York this 25th day of June A. D. 1926.

MAURICE LACHMAN.