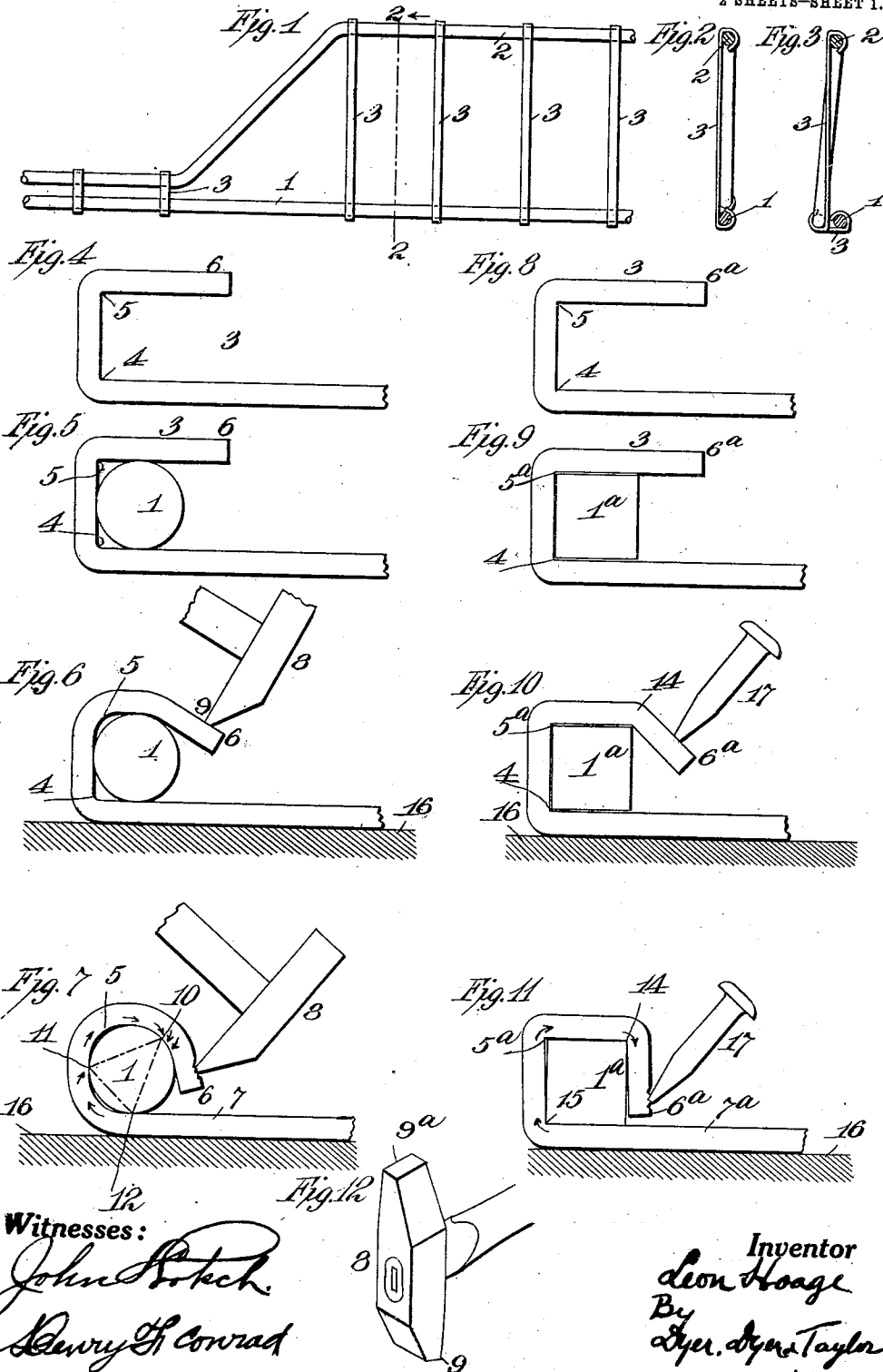


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METAL GIRDER FRAME AND PROCESS OF MAKING THE SAME.
APPLICATION FILED FEB. 15, 1910.

991,779.

Patented May 9, 1911.

2 SHEETS—SHEET 1.



Witnesses:

John P. Koch
Henry H. Conrad

Inventor

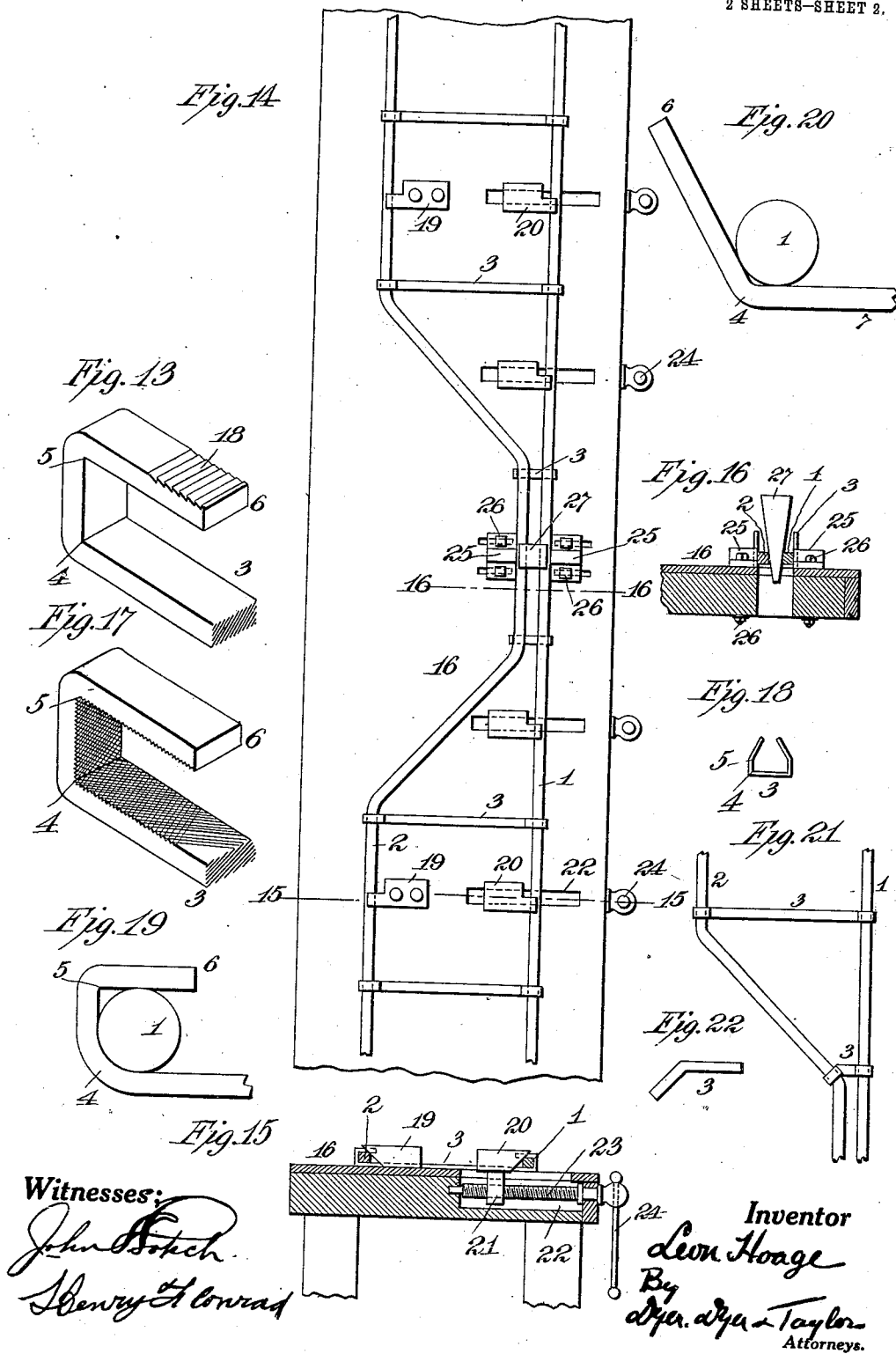
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UNITED STATES PATENT OFFICE.

LEON HOAGE, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO PAUL BERTIN, OF
BROOKLYN, NEW YORK.

METAL GIRDER-FRAME AND PROCESS OF MAKING THE SAME.

991,779.

Specification of Letters Patent.

Patented May 9, 1911.

Application filed February 15, 1910. Serial No. 543,952.

To all whom it may concern:

Be it known that I, LEON HOAGE, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented a certain new and useful Improvement in Metal Girder-Frames and Process of Making the Same, of which the following is a specification.

10 The object I have in view is the production of a metal girder frame by a cold process, by means of which the longitudinal and lateral members are effectively secured together. According to my invention, this
15 new system is applicable to any form of bar,—round, square, twisted or deformed—and has the advantage over other girder frames which use stirrups inasmuch as any number of laterals can be used and can be
20 placed at any point where strength is desired, and absolute rigidity secured.

It has advantages over the hot process of setting laterals, due to the fact that the girder frame can be made up at the place where
25 used and for the reason that it requires no elaborate plant, and thereby reduces the cost of manufacturing and transportation.

According to my invention, I secure the attachment of the lateral or tie to the longitudinal member by bending the former
30 around the latter in a novel and unique manner, without the use of heat or additional fastening devices.

These and further objects will appear
35 from the following specification and accompanying drawings, considered together or separately.

In the drawings: Figure 1 represents a detail of a truss girder formed of two longitudinal members, and a number of ties or laterals connecting the two; Fig. 2 is a section on the line 2—2 of Fig. 1, looking in the direction of the arrow; Fig. 3 is a section similar to that of Fig. 2, but of a modification in
45 which the top longitudinal is brought down to the same horizontal plane as the bottom one; Figs. 4, 5, 6 and 7 show steps in the process for attaching the tie or lateral to a longitudinal of circular cross-section, Fig. 4
50 representing one extremity of the tie or lateral before attachment, Fig. 5 representing the same as hooked over the longitudinal, Fig. 6 showing the process partly completed

by bending the end of the tie partly, and Fig. 7 showing the process completed and
55 indicating the permanent and rigid attachment of the tie to the longitudinal; Figs. 8, 9, 10 and 11 are similar views, showing the attachment of the tie, or lateral, to a longitudinal of rectangular cross-section, Fig. 8
60 representing the end of the tie or lateral as bent for preliminary attachment to the longitudinal, Fig. 9 showing the lateral in place, Fig. 10 showing the process partly carried out by a partial bending of the lateral, and Fig. 11 illustrates the process completed, the lateral being locked upon the longitudinal; Fig. 12 represents a convenient and satisfactory form of hammer, by means of which the process may be carried
65 out; Fig. 13 is a perspective view of one end of the tie or lateral slightly modified; Fig. 14 represents a plan view of an apparatus for carrying out the process; Fig. 15 is a section thereof on the line 15—15 of Fig. 14; Fig. 16 is a section on the line 16—16 of Fig. 14; Fig. 17 is a perspective view of one end of the lateral or tie slightly modified; Fig. 18 is a detail of a short tie or lateral, showing a modification; Figs. 19 and 20 are
70 details of modifications; Fig. 21 is another modification, and Fig. 22 is a view of the lateral used therewith.

In all of the views like parts are designated by the same reference characters.

85 In Fig. 1, 1 represents the bottom longitudinal and 2 the top longitudinal of a girder frame. 3 represents the ties or laterals which connect the longitudinals together and are rigidly secured to the latter. For
90 simplicity in illustration, I show but two forms of girder,—that shown in Figs. 1 and 2 being of the well known type and in which the top longitudinal member is bent down at a point close to the bottom longitudinal in order to secure a shear member; and in the second form, shown in Fig. 3, the two longitudinal members are at one place brought down to the same horizontal plane. In the
95 latter construction—where the two members are brought down to the same horizontal plane—it is apparent that some of the ties or laterals must be horizontal instead of vertical, as in the other form. The process is carried out substantially the same in connection with the longitudinal member of
105

any cross-section. The resultant effect, however, is somewhat different when the longitudinal member is of circular cross-section than when of rectangular cross-section.

I will describe the process first in connection with a longitudinal member of circular cross-section. The tie or lateral is best made of soft steel of rectangular cross-section, preferably flat, but the material and precise shape is immaterial and may be varied without departing from the spirit of the invention. The tie or lateral is first prepared by bending the portion near the extremity at a right angle, which is indicated at 4. The tie is again bent at 5, producing a hook, as shown in Fig. 4.

Referring to the drawings, it will be observed that the bends 4 and 5 are separated a distance approximately equal to the diameter of the longitudinal, and the free end 6 of the lateral will be approximately the same distance beyond the bend 5; consequently the bend 4 is approximately at a distance from the free end of the tie equal to twice the diameter of the longitudinal. The latter bend 5 can be made before the hook is engaged with the longitudinal member 1 or 2,—the longitudinal member in the figures being assumed to be the member "1;" but it is apparent that there will be no difference in carrying out the process in connection with the longitudinal "2." If desired, the bend 5 need not be made until the parts are engaged together (see Fig. 20), but I illustrate in Figs. 4 to 7 inclusive, the carrying out of the process with this bend made first. The right angle bent hook is then passed around the longitudinal member, as shown in Fig. 5.

The end 6 of the tie will lie in a definite position,—namely, slightly beyond the point of contact between the tie and the longitudinal. The tie and member 1 are then supported upon a firm foundation 16; or, in lieu of this foundation, the longitudinal is firmly supported, and the lateral is held in close and firm contact with it. When in this position, the foundation avoiding vibration, or the support for the longitudinal avoiding vibration, the free end 6 of the tie is bent down to the position shown in Fig. 6, and the pressure is continued until it assumes the position shown in Fig. 7. The bending may be done by any suitable tool, by continuous pressure or by a series of blows. I show in Figs. 6 and 7 that the tool used for bending is a hammer. This hammer 8, shown in Fig. 12, is provided with sharp edges 9 and 9^a. For convenience, I prefer to make the edges 9 and 9^a at right angles to each other, so that the hammer may be driven from the end or side at the convenience of the operator. The hammer is first held in position, as shown in Fig. 6, with

the handle at a slight incline, causing the edge 9 to come in contact with the tie. The blows are applied close to the end 6 and the tie is forced around the longitudinal 1,—first assuming the position shown in Fig. 6, and later the position shown in Fig. 7. As the bending continues the right angle bends 4 and 5 will become changed and finally obliterated. Meanwhile, the angle of the hammer handle is changed so that the edge 9 will always come fairly into contact with the tie. I find in practice that the bend 5 (see Fig. 6) first becomes partly obliterated; the blows continuing, the right angle bend 4 will then become partly obliterated, as shown in Fig. 7. When the parts are in the position shown in Fig. 7, the tie will be tightly clamped around the longitudinal, contact being at the points marked 10, 11 and 12. The dotted triangle illustrates the three points of contact. The arrows illustrate the distortion of the material of the tie as it is distorted from the position shown in Fig. 5 to that shown in Fig. 7.

It will be noted that the inner face of the tie, behind the bends 4 and 5, does not come in contact with the longitudinal; and also that the end 6 does not come in contact with the body of the tie at 7. These features are important. If the fit were caused to be made close all around the longitudinal, the tie would not be firmly held in position, because it would be impossible to press the tie into close enough contact with the longitudinal to hold it firmly in position; but by first forming it in the angular shape shown in Figs. 4 and 5 and then applying pressure to the free end 6, it may be distorted around the longitudinal member until the three points 10, 11 and 12 (occupying the apices of a triangle) are in close contact with the longitudinal. When in this position, an absolutely rigid connection is produced between the two elements. If desired, the inner face of the end of the tie, where it comes into contact with the longitudinal, may be suitably roughened as by cross hatching, as shown in Fig. 17.

From the preceding description, it is apparent that the grasp of the lateral with the longitudinal is, instead of a continuous contact of surface, a spaced or separated contact making contact at a plurality of points. The bend 4 need not be right angled, it can be curved as in Fig. 19, or less than a right angle, as shown in Fig. 20. In either form when the joint is complete, the lateral will engage at a plurality of points with the longitudinal.

In carrying out the process, in connection with a longitudinal of rectangular cross-section, the tie is first bent as described in connection with Fig. 4 and as illustrated in Fig. 8; but it is to be noted that the end 6^a is at a greater distance from the bend 5 than

before. This is owing to the fact that less distortion of the tie is necessary than in connection with a longitudinal of circular cross-section. The longitudinal 1^a is introduced in the position before described, and the free end of the tie 6^a is bent down first to the position shown in Fig. 10, turning at 14. Further bending occurs, as illustrated in Fig. 11. This will distort the tie so that the longitudinal is tightly clamped between the points 14 and 15. It is to be noted that the free end 6^a is not brought into contact with the longitudinal and it is of insufficient length to come in contact with the body 7^a of the tie. It will be noted that the bend 5^a is out of contact with the edge of the longitudinal. This permits a tight and intimate grasp between the points 14 and 15 with the opposite edges of the longitudinal.

As I have stated, any tool may be used for bending the tie around to the ultimate shape, a chisel being illustrated in Figs. 10 and 11. If desired, the free end of the tie may be serrated, as shown in Fig. 13, the serration being indicated at 18. It is desirable for the purpose of adequately bending the tie into position to not only support it on a firm foundation 16, but also to tightly engage the longitudinal with the hooked end of the tie.

A suitable apparatus is illustrated in Figs. 14, 15 and 16, to carry out my process. In this apparatus 16 represents the foundation, which is in the form of a bench or table. The ties and longitudinals are adapted to lie upon this,—hence the foundation must be of sufficient size to permit this to be done. Upon the foundation are fixed blocks 19 and adjustable blocks 20. The lower surfaces of these blocks are inclined, as shown, and the inclined faces are adapted to engage with the longitudinals. By moving the adjustable blocks 20 away from the fixed blocks, the longitudinals will be separated and will be tightly engaged with the hooked ends of the ties. A convenient way of moving the adjustable blocks is shown in Fig. 15, in which a block is provided with a nut 21, working in a slot 22 in the foundation, and engaged by a screw 23 turning in bearings in the foundation and rotated by a handle 24, in the same manner as the ordinary bench vise. The number of blocks, fixed and adjustable, is proportioned in accordance with the character of the work—enough of these being used to place all of the ties under tension. Where the longitudinal members come close together, as in the middle of the girder, a different arrangement may be used, as shown in the middle of Fig. 14, and in section in Fig. 16. In this arrangement blocks 25 are used, such blocks being secured in position by bolts 26, which pass through slots in the foundation, the slots permitting the necessary adjustment for different sizes of structure. The two longitudinals, 1 and

2, are separated by means of a wedge 27, and forced into close engagement with the hooked ends of the ties.

In Fig. 16, the tie is shown as bent to U-shape,—that is to say (reference being had to Fig. 4) only the right angle bend 4 is made,—the right angle bend 5 being made after the parts are in position. In Fig. 18 a preferred construction is adopted, the bends or corners 5, 5 being outlined or suggested, which more completely insures the proper bending of the tie around the longitudinal in the manner I have described.

In attaching the tie to the longitudinal, it is of course understood that each end of the tie is bent around one of the longitudinals in the manner heretofore described.

The complete girder is adaptable to any use but is particularly applicable to reinforced concrete construction, and can be used for all reinforcing of any nature, such as beams, columns, floors, etc.

In the modification illustrated in Fig. 21, one extremity of the lateral engages with the inclined portion of the longitudinal at or adjacent to the bend. This produces a very firm joint which will entirely avoid longitudinal slip, the end of the lateral curving around the longitudinal at an angle.

It is to be understood that the terms “lateral” and “longitudinal” may be transposed where the structure utilizing my invention requires it.

In accordance with the provisions of the patent statutes, I have described the principle of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is merely illustrative and that the invention can be carried out in other ways.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. The process of attaching laterals to longitudinals which consists in first forming the end of the lateral with two right angle bends, laying the longitudinal within the bends, and then forcing the free end of the lateral around the longitudinal.

2. The process of attaching laterals to longitudinals which consists in first forming the end of the lateral with two right angle bends, separated approximately the distance equal to the diameter of the longitudinal, and one of them removed from the free end about the same distance, then inserting the longitudinal within the bend, then applying pressure to the free end of the lateral until the lateral closely engages with the longitudinal at a plurality of places.

3. As an article of manufacture, a girder frame having a longitudinal and a lateral joined together, the end of the lateral partly encircling the longitudinal, and in contact

therewith at a plurality of separate places, and with the free end of the lateral out of contact with the main body of the lateral.

4. As an article of manufacture, a girder
5 frame having a longitudinal and a lateral joined together, the end of the lateral partly encircling the longitudinal and in contact therewith at a plurality of separate places, on opposite sides of the longitudinal, and
10 with the free end of the lateral out of contact with the main body of the lateral, and also of the longitudinal.

5. The process of attaching laterals to longitudinal which consists in first forming the
15 end of the lateral with a bend, laying the longitudinal in the bend, firmly supporting the longitudinal to prevent vibration, then successively exerting pressures at different

angles adjacent to the free end of the lateral to bend it around the longitudinal, causing
20 contact at a plurality of points.

6. The process of attaching laterals to longitudinal, which consists in first forming the end of the lateral with a bend, then laying the longitudinal in the bend, then exerting
25 pressure of the longitudinal into the bend, and bending at another point the free end of the lateral to cause contact at a plurality of points.

This specification signed and witnessed
30 this eleventh day of February, 1910.

LEON HOAGE.

Witnesses:

JOHN L. LOTSCH,
HENRY F. CONRAD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
