No. 650,049. Patented May 22, 1900.

E. P. LYNCH.

FORMER FOR BENDING ANGLE BEAMS.

(Application filed Jan. 21, 1898.)

(No Model.)

Fig. 1.

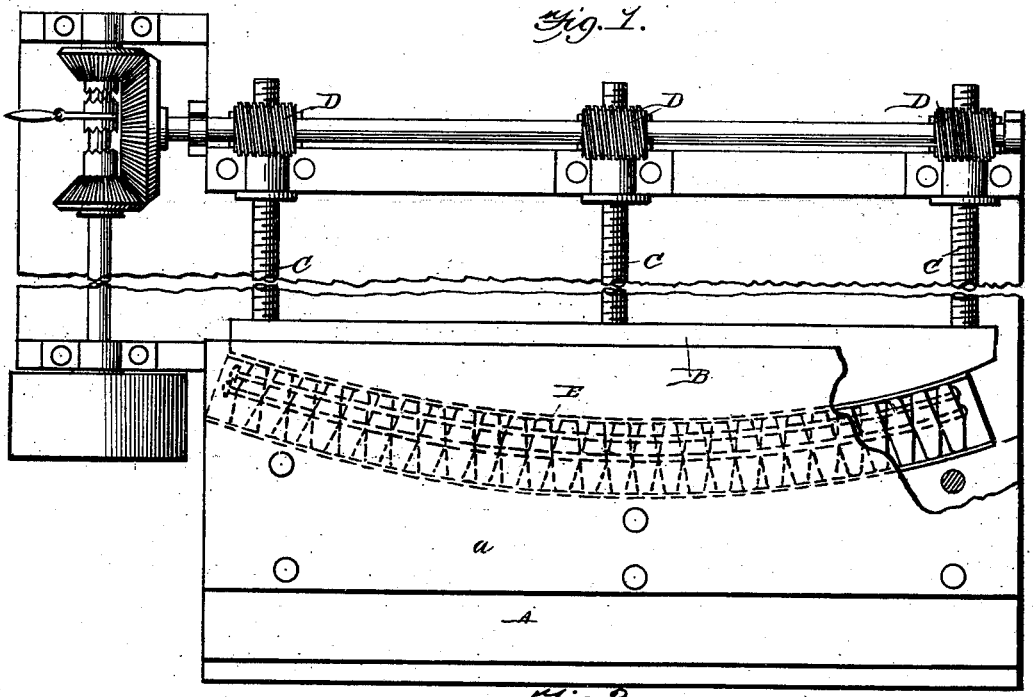


Fig. 2.

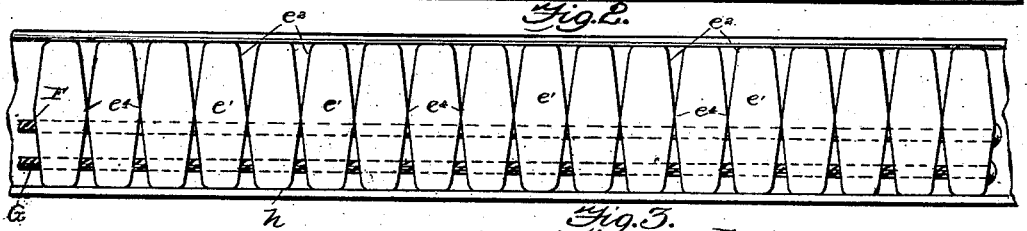


Fig. 3.

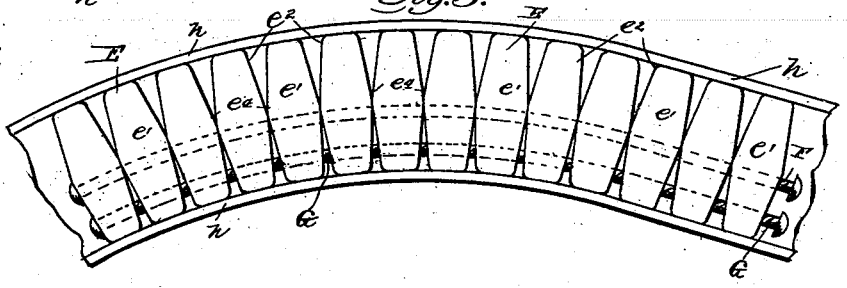


Fig. 4.

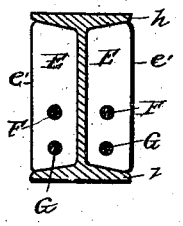
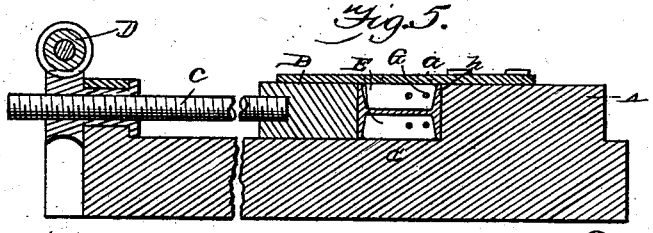


Fig. 5.



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FORMER FOR BENDING ANGLE-BEAMS.

SPECIFICATION forming part of Letters Patent No. 650,049, dated May 22, 1900.

Application filed January 21, 1898. Serial No. 667,515. (No model.)

To all whom it may concern:

Be it known that I, EDWARD P. LYNCH, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Formers for Bending Angle-Beams; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Figure 1 is a plan view of a sufficient portion of a machine to illustrate the manner of applying my improvement. Fig. 2 is a plan view of the shaper in place on a beam, on a larger scale, prior to being placed in the machine. Fig. 3 is a similar view of the beam and shaper when removed from the machine. Fig. 4 is a section through Fig. 2. Fig. 5 is a vertical sectional view of the bending mechanism.

In the drawings I have shown, more or less conventionally, parts which can be used for the bending of such metal as I desire to properly shape.

A indicates the device which may be regarded as the die or male member of the mechanism, and B the matrix or female member, of which the movable part can be advanced toward and from the other by any suitable mechanism—as, for instance, threaded shafts and gearing, as at C D, or by a system of knee-levers, toggle-joints, or the like. There are now well-known numerous forms of mechanism for this purpose—namely, the bending of heavy bars or beams—and the present invention is applicable to each of them. A serious difficulty has been experienced in using any of the mechanisms with which I am acquainted for this bending of bars or beams which are angular in section—that is, which have webs or plates together with integral lateral flanges—and particularly when the bending has been of such character that the flanges are on curves of different radii. For instance, when bending an I-beam in the plane of the web portion the resistance to the condensation of those flanges which are on the inner curve and the resistance to the elongation of those flanges which are on the outer curve are such that it has been practically impossible to obtain a uniform shaping of the web and flanges, and there always results a crimping or distorting of the web or flanges, or both, and often to such an extent as to seriously weaken and fracture the metal. For the overcoming of this I provide an attachment for the bending-machine, or a supplemental device which is adapted to serve as a shaping abutment for practically all of the points of the web and the flange where they are curving and prevent buckling or distorting of any of the parts.

E E indicate peculiarly-formed blocks of steel or other suitable material. Their length is equal to the distance between the flanges of the beam to be bent. The inner and the outer faces e e' are preferably flat and parallel. Their side faces e^2 e^2 taper from the center longitudinally to the ends, the angle of convergence varying in accordance with the radius of the desired curve to be formed in the beam. At their centers e^4 the blocks abut against each other, but are adapted to rock each upon those adjacent. These are arranged in a series as long as is necessary to accommodate the arc of the curve. They are bound loosely together by a flexible connecting device F, which can be of any suitable material, as a wire or metallic strip or a wire cable. At present I prefer the latter because of its flexibility in all directions and of its not being liable to be injured by the application of heat. This connecting device F is supplemented by one at G, which may be similar in character to that at F. It operates to hold the former-blocks in proper relation to each other and to prevent any one being displaced or twisted at the ends under the pressure from the flanges at the time the bending occurs.

The connecting device F may be arranged along the central transverse line of the blocks or abutments; but for some reasons I prefer to have it slightly eccentric, as shown in the drawings, it being passed through an aperture in the abutment-block a little below the

center. Consequently the block is allowed to have the wider part of its side face at the center all available for receiving lateral thrust or pressure, and, again, the connecting device is relieved of all longitudinal strain, which might be experienced if any part of it should lie above the central axial line.

The method of using this device will be readily understood. Prior to subjecting the beam to the action of the bending-machine one of the formers or shapers (a series of the anvil-blocks of suitable length joined together) is placed between the flanges to be bent, as shown in the drawings. In the case of an I-beam two formers are employed, one on each side of the web. Then when the movable part of the machine, as the die A, exerts its force the flanges *h h* are supported, spaced, and held apart at their normal distance. After the bending commences the inner ends of the blocks E of the former move toward each other slightly, while the outer ones slightly separate, the connecting devices holding them as a series together at the centers.

The machine has guides *a a'* above and below the beam, which serve to prevent vertical displacement of the formers under the powerful pressure that is exerted by the die or plunger. In the embodiment of the invention herein illustrated the guide *a'* is a part of the base or bed, which is shown as formed integral with the die A.

By devices of this sort I have succeeded in obviating entirely the buckling, crimping, and distorting that have been incident to the bending of large and heavy angle-beams and so distribute the strain that the finished article is found to be practically uniform at all points along its length, and the crowding inward or displacing of any of the metal is overcome.

By having the inner faces and the outer faces of each block flat it can be held properly against the web and against the retaining or holding plate *a* and be prevented from being forced upward and the distortion of the beam-web can be obviated. In the case of an I-beam when two formers are used, each consisting of a series of the blocks or abutments, they operate to hold the web in its plane while bending, as well as to apply the bending strain properly to the flanges. Of course it is not necessary to have the inner and outer faces continuously flat from end to end, I meaning above by "flat" that there should be two or more contact or bearing points against the web and two or more against the retaining or holding plate, so that the blocks or abutments of the former shall be held true. The tapering or inclined end faces of the block cannot be wedged outward, because of being held in place by the retaining or holding guides *a a'*.

What I claim is—

1. A former consisting of a series of blocks constructed to have the two opposing operative faces of each pair of contiguous blocks converging from the inner curve of flexion to a fixed fulcrum-line of bearing of one of said blocks on the other, and a flexible connecting device for said series located between the said curve of flexion and the line of the series of fulcra or bearings, substantially as set forth.

2. A former for bending metal angle-bars, consisting of a series of counterpart blocks each having a fixed line of fulcrum bearing upon the next and formed at the end toward the inner curve of flexion with two side faces which diverge from said inner curve continuously to the fulcrum-lines of said block, and a connecting device for joining all the blocks of the series, substantially as set forth.

3. A former for bending metal angle-bars, consisting of a series of counterpart blocks each having a fixed line of fulcrum bearing upon the next and formed at the end toward the inner curve of flexion with two side faces which diverge from said inner curve continuously to the fulcrum-lines of said block, and having at the end extending toward the outer curve of flexion two side faces which converge from the lines of said fulcra toward the outer curve, and a connecting device for joining all of the blocks of the series, substantially as set forth.

4. A flexible former consisting of a series of counterpart blocks each formed with a fulcrum or bearing angle on a straight line across the face of the block, and a plurality of flexible connections for said blocks passing through the latter on different lines, whereby said bearings are held in line with each other to form a continuous series of opposing fulcra, substantially as set forth.

5. An apparatus for the bending of metal angle bars or beams having shapers for the convex and concave sides of the beam, guiding and retaining means respectively above and below the beam, and a former between the flanges of the beam consisting of a series of blocks or abutments adapted to bear longitudinally against the flanges of the beam and laterally against one of the retaining or holding devices, and a flexible connecting device joining together the blocks or abutments of the series, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD P. LYNCH.

Witnesses:
THOS. G. PEACHEY,
C. H. MCCLERY.