(No Model.) 2 Sheets—Sheet 1.

I. S. McGIEHAN.

MACHINE FOR FORMING AND BENDING METAL.

No. 419,156. Patented Jan. 7, 1890.

Fig. 2.

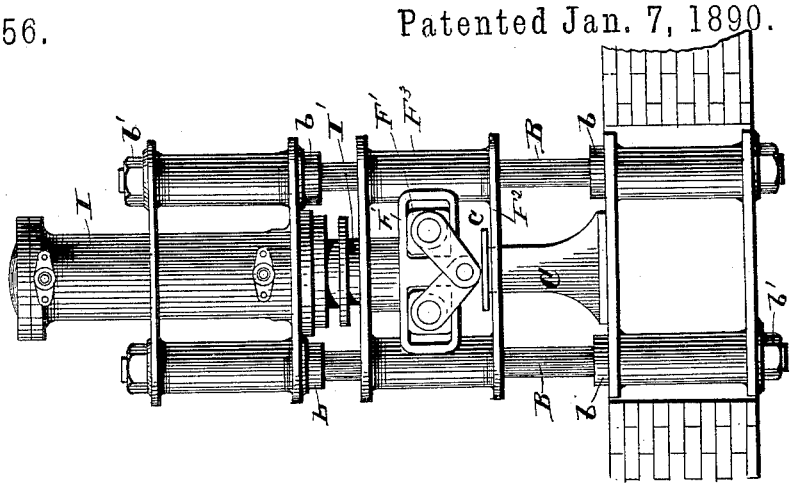
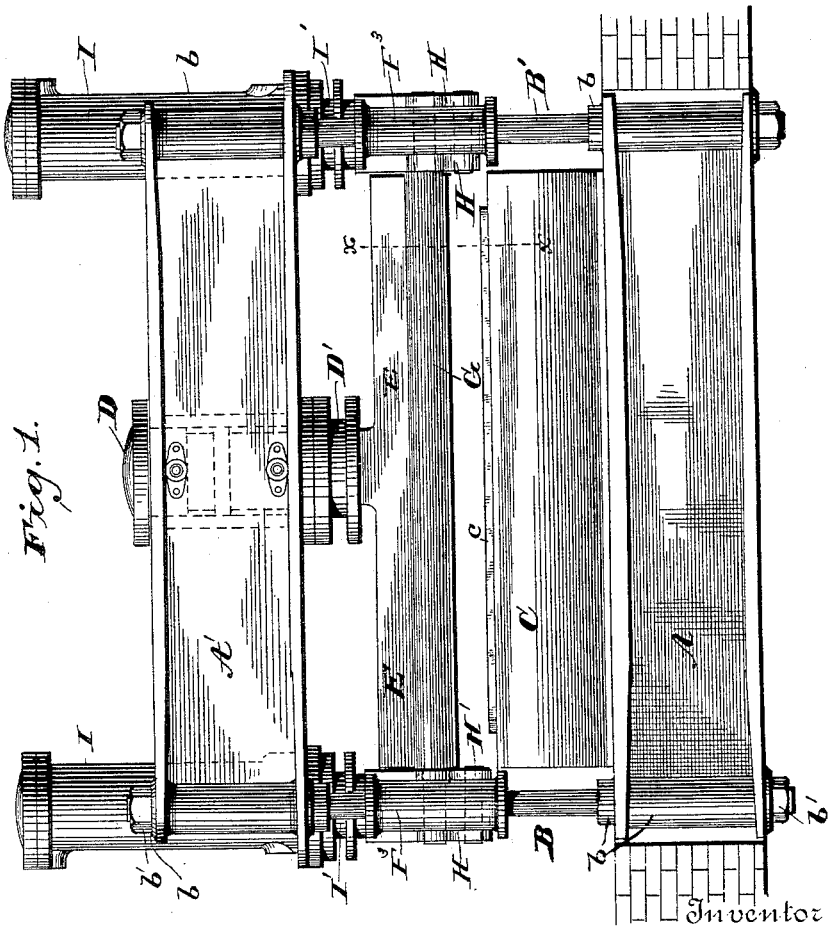


Fig. 1.



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Inventor
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(No Model.) 2 Sheets—Sheet 2.

I. S. McGIEHAN.

MACHINE FOR FORMING AND BENDING METAL.

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Fig. 3

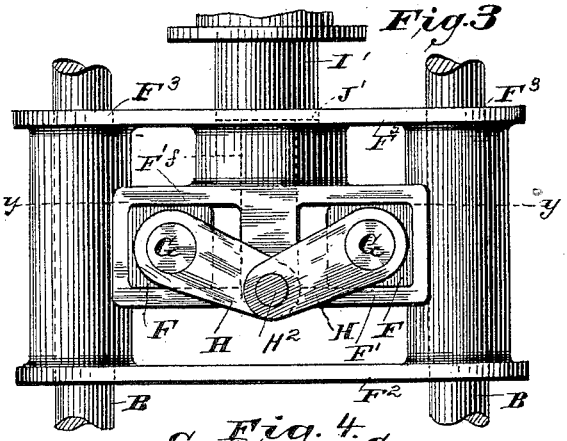


Fig. 5

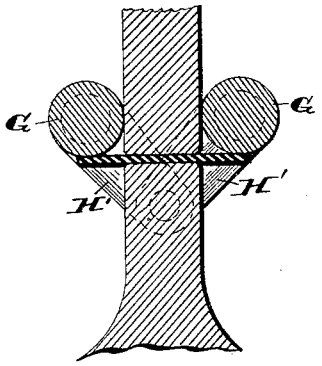


Fig. 4.

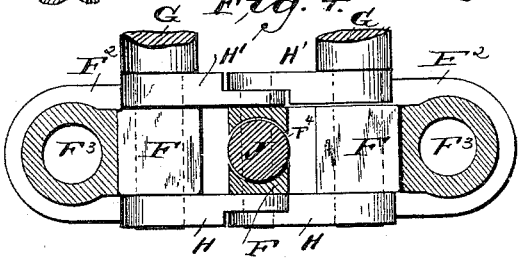


Fig. 6

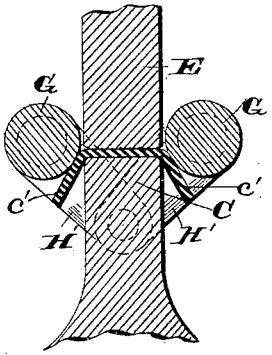
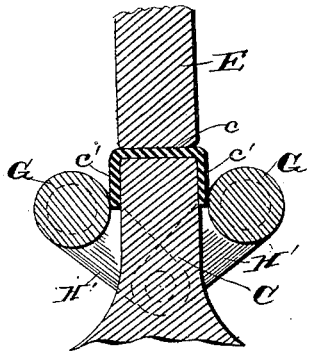


Fig. 7.



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UNITED STATES PATENT OFFICE.

ISAAC S. MCGIEHAN, OF NEW YORK, N. Y.

MACHINE FOR FORMING AND BENDING METAL.

SPECIFICATION forming part of Letters Patent No. 419,156, dated January 7, 1890.

Application filed October 26, 1889. Serial No. 328,307. (No model.)

To all whom it may concern:

Be it known that I, ISAAC S. MCGIEHAN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Machines for Forming and Bending Metal; and I do hereby 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.

This invention relates to the forming of sheet metal into troughs, channels, and other shapes when it becomes necessary to bend the metal after it has been rolled into sheets, its principal object being to convert sheet metal into the form of a channel-beam to be used for railway metal cross-ties, such as those illustrated and described in the patents of Henry Shultzen, dated July 17, 1888, and numbered, respectively, 386,356 and 386,357, both of which were assigned to the Standard Metal Tie and Construction Company, of New York city.

The present invention consists, broadly, in the employment of forming-rollers for bending the metal, in connection with a die of any desired shape or size; also, in means for holding the metal to the die while it is being operated on; also, in minor details of construction and combinations of parts, which will be hereinafter more fully set forth in the specification and claims.

In order that the present invention may be more clearly understood, I have illustrated it as applied to two forms of dies, and in which—

Figure 1 represents a side elevation of a machine which I have designed to illustrate the principle of the rollers. Fig. 2 represents an end view of the same, showing the toggles which automatically adjust the rollers to the width of the channel or trough to be formed, and as they will appear when the power is applied to the piston which connects with the toggles in the operation of bending the plate. Fig. 3 represents an elevation of the cross-head detached, showing the position of the rollers and toggles when the rollers are being raised after the plate has been formed. Fig. 4 represents a horizontal section in the line *y y* of Fig. 3. Figs. 5, 6, and 7 represent transverse sections through the line *x x* of Fig. 1, showing the position of the rolls before, during, and after the operation of bending.

The same letters of reference indicate identical parts in all the figures.

The frame of the machine which I have shown to illustrate the application of my invention is composed of a hollow girder A, embedded in any suitable foundation, in each of the four corners of which girder is formed a sleeved opening *a* for the reception of guides or supporting-posts B B B′ B′, provided each with a collar or shoulder *b*, which bears against the upper side of said girder and supports the post therein, and with a nut *b′* at the lower end, for holding the posts securely in place. At the top of the posts B B B′ B′ is another girder A′, similar to the girder A, secured to the guides or supporting-posts in the same manner.

Located on the base of the machine longitudinally thereof, and in a plane centrally between the end guide-posts B B, is an anvil C, on which the metal to be operated upon is placed. In order to clamp the metal plate *c* to the anvil C while being operated on, I secure to the center of the girder A a vertical hydraulic cylinder D, provided with a piston or plunger D′, which carries at its lower end a clamping-bar E, the under face of which corresponds in size and shape to the upper face of the anvil; but in cases where the plate to be bent is of unusual thickness I prefer to use a clamping-bar E a trifle wider than the face of the anvil in order to compensate for such increased thickness of the metal plate. While I have shown and described only one cylinder and plunger for operating the clamping-bar, I may employ two cylinders and plungers, one at either end of the clamping-bar, in cases where the plate to be bent is of unusual length.

Located at opposite sides of the clamping-bar E are vertically and horizontally movable rollers G, journaled in movable bearings F, mounted in guideways F′, formed in a frame or cross-head F^2 at either end of the machine. These frames or cross-heads F^2 are mounted on the guide-posts B B and B′ B′, and are capable of vertical movement thereon by means of sleeved openings F^3 at their ends,

through which the guide-posts B B and B′ B′ pass to guide and steady the cross-heads in their movement, and at a point midway between the two guide-posts B B and B′ B′ the cross-heads are each provided with a vertical opening F^4, the upper end of which is of larger diameter for a short distance from the top to form a shoulder or countersink *f*, by which construction I am enabled to use shorter plungers I′ I′ than if the countersinks *f* were omitted.

The journals of the rollers G G are coupled together on either side of the sliding bearing F by means of toggle-joint connections H H′, as shown in Fig. 4, the pivotal points or joint ends of which are journaled on pivotal pins H^2 below the guideways F′. Between the posts B B and B′ B′, at either end of the girder A′, is mounted a vertical hydraulic cylinder I, having a piston-plunger I′, the lower end J of which, or that portion outside the cylinder, is turned down to a smaller diameter than the remainder, in order to pass through the circular opening F^4 in the cross-head, and at its lower end the piston J is connected with the pivotal pin H^2 of the toggles.

The operation of my improved machine is as follows: The plungers D′ and I′ being at their highest points, the piece of metal to be operated on is placed on the anvil C, as shown at *c* in Figs. 1 and 2. The clamping-bar E is forced down on the metal *c* by the hydraulic plunger D′, which holds the metal plate firmly on the anvil, the rollers G G being in the meanwhile in their separated position, or that shown in Fig. 3. The plungers I′ are then forced downward, the effect of which is to first bring the rollers G G toward each other until they come in contact with the clamping-bar E. The continued motion of the plungers carries down the cross-heads F, and with them the rollers G G, which, coming in contact with the plate *c*, as shown in Fig. 5, bend its projecting edges *c c* downward against the sides of the anvil C, as shown in Figs. 6 and 7. The plungers I′ I′ are then returned to their elevated position in the usual manner, the effect of which is to first separate the rollers G G, as shown in Fig. 4, until the movable journal-blocks F reach the limit of their outward movement, when the continued motion of the plungers I′ carries the cross-heads and rollers G G to their normal position above the anvil C. On reversing the plunger D′ the clamping-bar E is moved out of contact with the plate *c*, in order that the finished article can be taken from the anvil.

From the above description it will be readily understood that the inward movement of the rollers G G is only limited by the width of the clamp E, and that by reason of the resistance opposed to their downward movement by the plate to be bent they will move inward until they come in contact with the clamp E, and then downward.

While I have shown and described my invention as applied to the manufacture of a particular form of channel-iron, it is obvious that other shapes and sizes of channels, troughs, &c., may be formed thereon by simply changing the anvil and clamping-bar to suit the size or shape of channel desired, as the rollers, being automatically adjustable, will bear against the clamping-bar and anvil during their downward movement, and by my arrangement of rollers I am enabled to form channel-irons of plates of greater thickness than heretofore, as a greater leverage is obtained on the edges of the plate, and the friction is reduced to a minimum.

I have described the frame shown as my preferred construction; but it will be obvious that the form of frame may be greatly varied without departing from the principle of my invention.

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

1. In a machine for bending metal, the combination, with the stationary die and plunger, of two vertically and horizontally reciprocating forming-rollers located on opposite sides of said plunger and adapted to move in one direction in contact therewith, substantially as and for the purposes described.

2. In a machine for bending metal, the combination, with the anvil and plunger, of rollers located on opposite sides thereof, toggle-levers connecting the journals of said rollers, and plungers operating on said toggles to cause the rollers to approach or recede from each other, substantially as and for the purposes described.

3. In a machine for bending metal, the combination, with a stationary die and movable clamping-bar, of cross-heads mounted in vertical guides on the frame of the machine, rollers journaled in movable bearings in said cross-heads, toggle-levers connecting the journals of the opposite rolls, and a single cylinder and plunger at either end of the machine, for operating said cross-heads and rollers, substantially as and for the purposes described.

4. In a machine for bending metal, the combination, with the stationary die and movable clamping-bar, of cross-heads mounted in vertical guides on the frame of the machine, rollers journaled in guideways in said cross-heads, toggle-levers connecting the journals of said rollers, and a cylinder and plunger at either end of the machine for operating said rollers both horizontally and vertically through said levers, substantially as and for the purposes described.

5. In a machine for bending metal, the combination, with the stationary die or anvil, of a movable bar for clamping the metal to the anvil, a cylinder and plunger for controlling said clamping-bar, two vertically and horizontally movable rollers located on opposite sides of said clamping-bar, and a single

cylinder and plunger at either end of the machine for controlling said rollers, substantially as and for the purposes described.

6. The combination, with the stationary anvil and plunger, of vertically-reciprocating cross-heads, rollers journaled in horizontal guideways in said cross-heads, toggle-levers connecting the journals of said rollers, and a plunger connected with said toggle-levers, whereby on the movement of said piston the rollers are first moved horizontally and then vertically, substantially as and for the purposes described.

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

ISAAC S. McGIEHAN.

Witnesses:
W. H. SPENCER,
ALEXR. MELHADO.