(No Model.) 3 Sheets—Sheet 1.

J. COFFIN, Dec'd.

E. F. COFFIN, Executrix.

METAL STRAIGHTENING MACHINE.

No. 465,348. Patented Dec. 15, 1891.

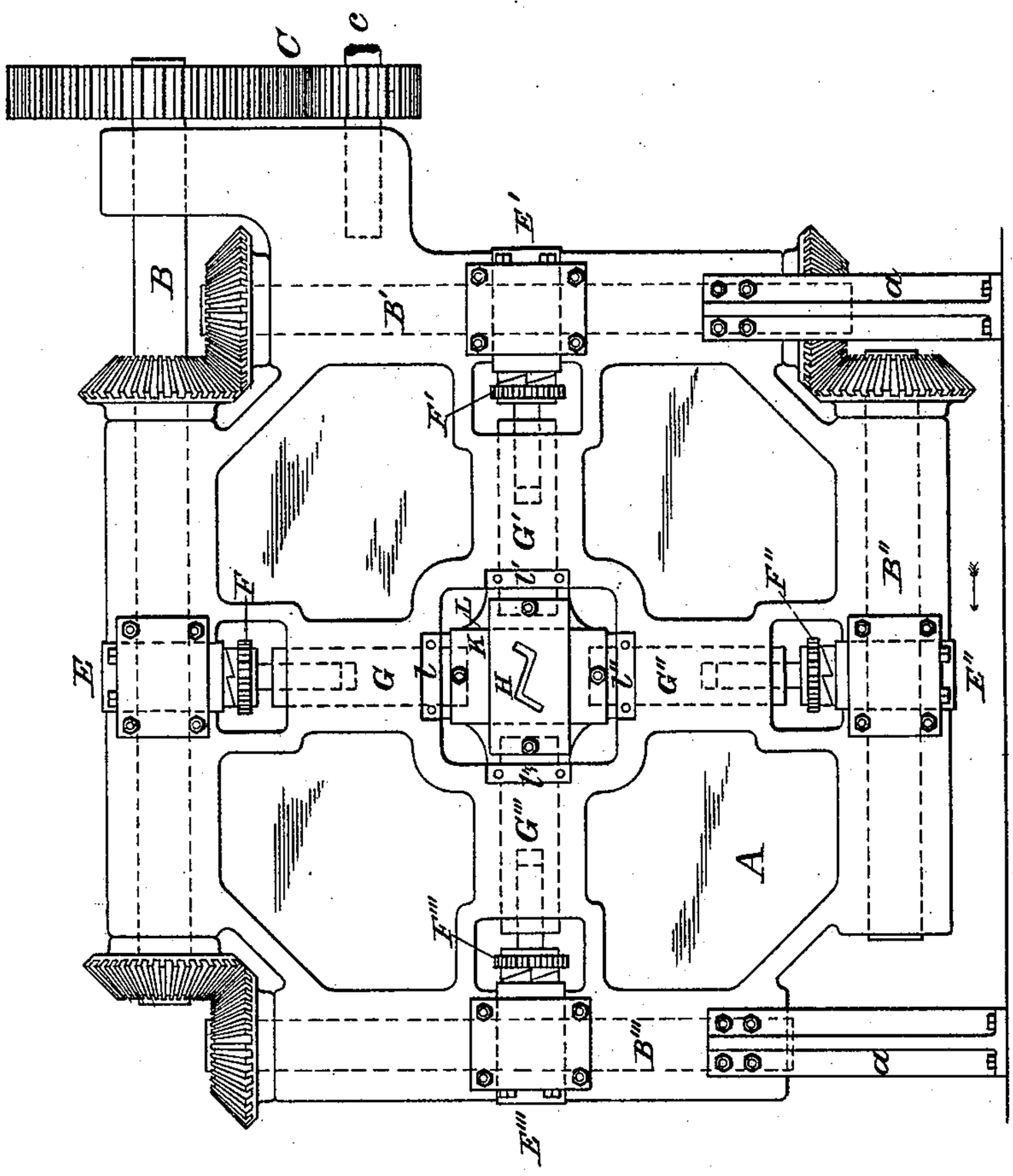

Fig. 1

WITNESSES.

James Cranston

Fred W. Stammler.

John Coffin INVENTOR.

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E. F. COFFIN, Executrix.

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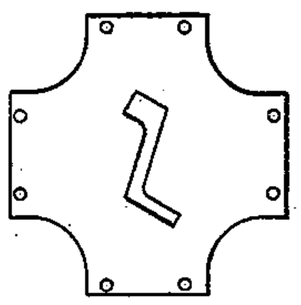

Fig. 3

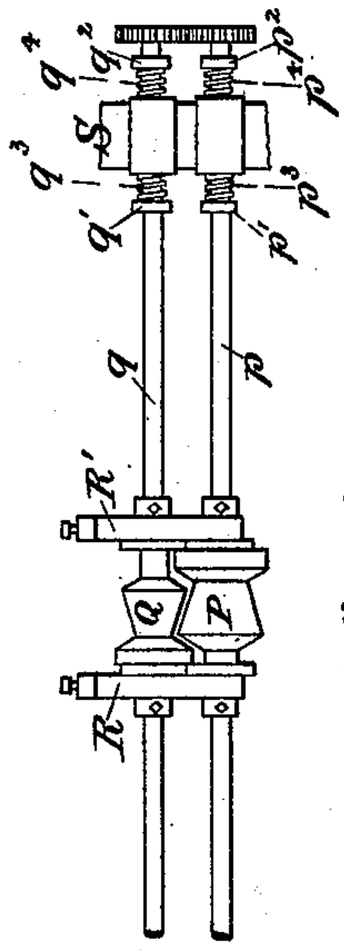

Fig. 4

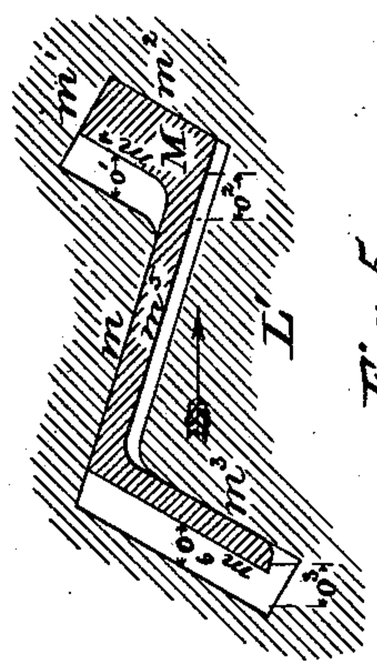

Fig. 5

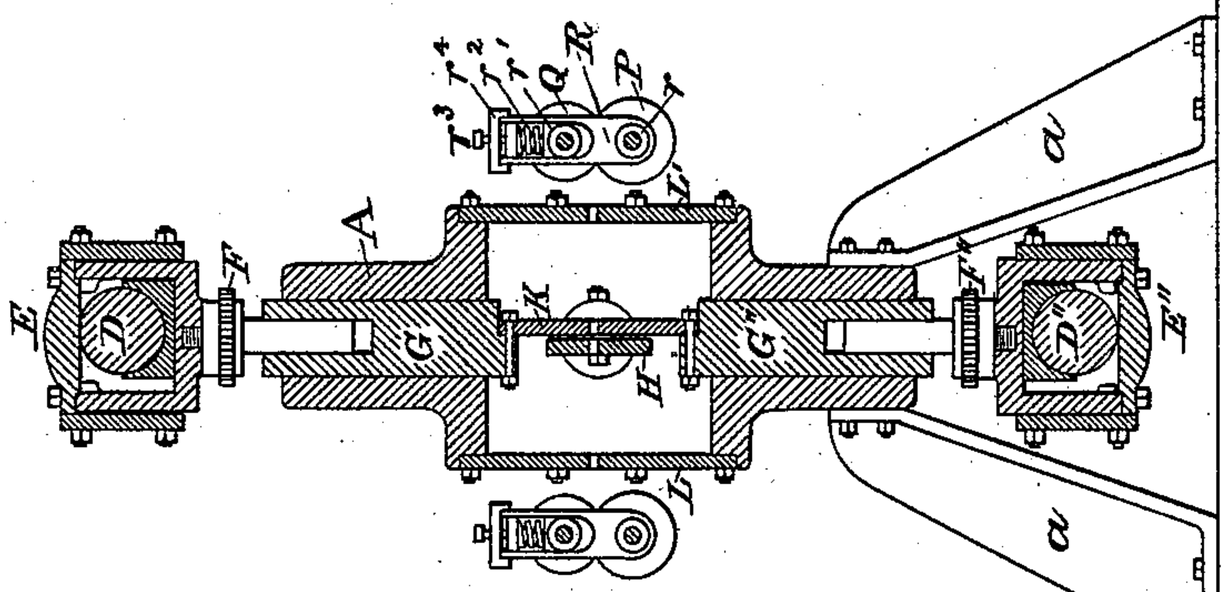

Fig. 2

WITNESSES.

James Braunston

Fred W. Stammler.

John Coffin INVENTOR.

(No Model.) 3 Sheets—Sheet 3.

J. COFFIN, Dec'd.

E. F. COFFIN, Executrix.

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Fig. 7.

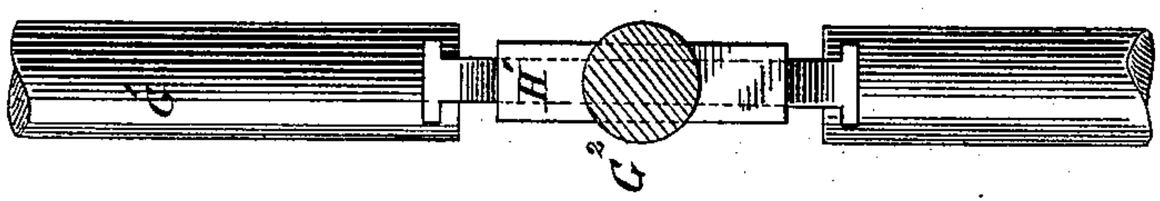
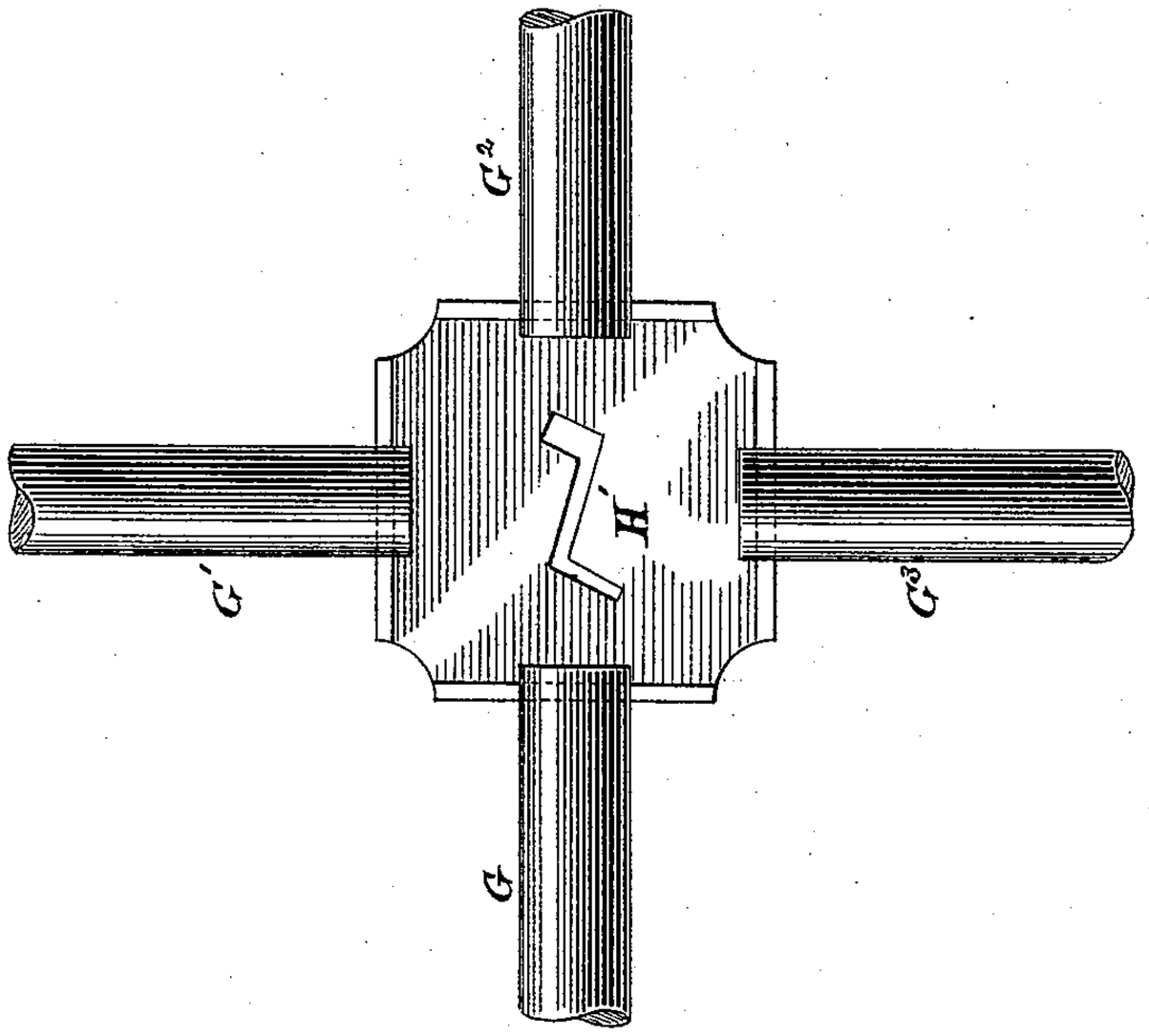


Fig. 6.



Witnesses

H. C. Newman.

C. P. Scoby.

Inventor

John Coffin.

By his Attorney

Lyon & Eder

UNITED STATES PATENT OFFICE.

JOHN COFFIN, OF JOHNSTOWN, PENNSYLVANIA; ELIZABETH F. COFFIN, EXECUTRIX OF SAID JOHN COFFIN, DECEASED, ASSIGNOR TO THE CAMBRIA IRON COMPANY.

METAL-STRAIGHTENING MACHINE.

SPECIFICATION forming part of Letters Patent No. 465,348, dated December 15, 1891.

Application filed September 10, 1888. Serial No. 284,997. (No model.)

To all whom it may concern:

Be it known that I, JOHN COFFIN, a citizen of the United States, residing at Johnstown, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Straightening-Machines; 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.

My invention relates to means for straightening bars of metal of irregular section; and it consists in an improvement in the invention of rail-straightening machines made by A. J. Gustin and set forth in United States Patents Nos. 343,270, 358,116, and 358,810.

The object of my invention is to make it possible to straighten very irregular sections, such as slot-rails for cable-roads and other unsymmetrical bars.

The invention of A. J. Gustin consists in the main of four separate plungers acting on four sides of the rail, and also of four sets of anvil-blocks arranged to offer suitable resistance to the rail at proper distances from the points of impact of the plungers, so that the rail may be bent in all directions to straighten it without turning it over.

In order to straighten a rail or bar of irregular or unsymmetrical cross-section, I embrace the rail with a die which fits the contour of the section. The anvils I use are also dies which fit the cross-section of the rail, so that in bending a rail or bar to straighten it the impact is distributed over its whole cross-section.

The machine consists in two horizontal and two vertical plungers, the several pairs opposing each other. The plungers of the horizontal pairs are isochronous in their movements—that is, one advances while the other recedes, and vice versa. The plungers of the vertical pair are likewise. I connect the inner ends of the horizontal plungers with a single plate, through which an opening is cut, which properly embraces the rail. This plate is slightly out of the center line in a horizontal direction, for a reason which will appear. I also connect the two inner ends of the vertical plungers with a similar plate similarly cut out to receive and embrace the rail. The vertical plate is similarly slightly removed from the line of centers of the plungers in a horizontal direction, the object of the slight offset of these two die-plates being so that they will properly pass each other.

In my invention I use anvil-blocks consisting in plates with proper shaped openings through them, and use feed-rollers located outside of the anvil-plates, these feed-rollers acting in no wise as anvils, but being made free to move in all directions with slight restraint.

To make this description more clear, I will now refer to the annexed three sheets of drawings, which form part of this specification, and in which—

Figure 1 represents a vertical side elevation of my invention; Fig. 2, a vertical sectional elevation on center line of Fig. 1; Fig. 3, one of the anvil-plates; Fig. 4, the feed-rollers; and Fig. 5, the opening in the anvil-plates, on a larger scale, with the outside broken away, showing the contained rail in section. Fig. 6 represents a side elevation of an alternative arrangement of plungers and plunger-plate, while Fig. 7 is an end elevation of the same.

Like letters of reference refer to like parts throughout.

A is the main frame of the machine, which is supported on the legs *a*.

B B′ B″ B‴ are the main shafts of the machine, which are best shown in Fig. 1. They are coupled together by means of the miter-gearing, clearly shown in this figure. Power is communicated from an outside source through the spur-gearing C and the countershaft *c*. Near the center of each of the four main shafts and integral with it is an eccentric-cam, two of which are represented in Fig. 2 by D and D″. These cams actuate the yokes E E′ E″ E‴, which in turn reciprocate the plungers G G′ G″ G‴ through means of the automatic helical gags F F′ F″ F‴. When the yoke E is in its advanced position toward the rail, the yoke E″ is in its most re-

mote position and the yokes E′ E‴ are in their mid-position, or what is usually termed "quarter-stroke."

H represents a plate connecting the two horizontal plungers, and K represents a plate connecting the two vertical plungers. These plates, as shown in Fig. 2, are placed enough out of center to pass each other. Through each of the plates H and K is cut an opening of a shape similar to the rail, but somewhat larger.

L and L′ are the anvil-plates, through which openings are also cut to receive the rail. In Fig. 1 the plate L′ is removed in order to show the plunger-plates beyond; but part of the plate L can be seen. Fig. 3 represents one of the anvil-plates. The corners are rounded out to admit light to the plunger-plates and to enable the operator to see them. The recesses $l\ l'\ l''\ l'''$ in Fig. 1 show the point of attachment of the anvil-plate L′.

I will now describe more fully the shape of openings in the anvil-plates and plunger-plates.

Referring to Fig. 5, L′ represents the central portion of one of the anvil-plates on an enlarged scale. M represents a section of the rail within the anvil-plate. Its position in the opening is that resulting from its being pushed by the plunger-plate in the direction of the arrow. It has bearing on its surfaces marked m, m', m^2, and m^3. The distances o, o', o^2, and o^3 in the reverse direction of the arrow to the walls of the opening in the plate L′ are equal. Therefore if the rail be forced in a reversed direction to the arrow the surfaces m^4, m^5, and m^6 will come in contact simultaneously with the anvil-plate. A similar result takes place if the rail be forced in a direction at right angles with the arrow. The openings in the plunger-plates H K are of the same character. It will readily be seen from this description that in bending a rail to straighten it the pressure of the plungers and the resistance of the anvils is distributed over the entire available profile of the cross-section, and the result is accomplished of preventing the cross-section of the rail from being deformed.

I will now describe the feed mechanism, so far as it relates to my present invention. Two sets of feed mechanisms are used, one in each side of the machine. This is necessary, to provide for both entering and expelling the rail. As these mechanisms are alike in all their parts, I will only describe one. Q and P are the rollers, which are of shape to properly embrace the rail. These rollers are mounted on shafts p and q. Yokes R R′ embrace the shafts $q\ p$ near the rollers Q and P, one of which I will describe. Referring to Fig. 2, the lower end of the yoke R is solid, and receives the shaft p at r. The upper end is slotted, and receives the sliding box r', which surrounds the shaft q. Above the sliding box r' is the spring r^2, which is compressed by means of the screw r^3, which passes through the cap r^4. The shafts q and p are supported at their ends by suitable brackets, one of which is shown at S, Fig. 4. Located on shafts p and q a few inches from the bracket S are collars $q'\ q^2\ p'\ p^2$. Between these collars and the bracket S are springs q^3, q^4, p^3, and p^4. The shafts q and p are free to slide endwise in the brackets S, restrained by the elasticity of the springs q^3, q^4, p^3, and p^4. It will thus be seen that if the rail be crowded in a horizontal direction the flexibility of the before-mentioned springs will allow the rollers to move bodily with it until it comes in proper bearing with the anvil-plates. The shafts q p are of such length between the bearings S that the elasticity of the shafts themselves is great enough to permit enough vertical movement of the rail to bring it into proper contact with the anvil-plates when the impact is received from the vertical plungers. The feed-rollers are shown in proper position in Fig. 2, but are not shown in Fig. 1, as it was thought they would somewhat obscure the drawing. Shafts q and p are driven in any convenient manner.

Referring now to Figs. 6 and 7, G and G² represent a pair of horizontal plungers, and G′ and G³ represent a pair of vertical plungers, all having slots, as shown, in their ends to receive and hold by its T-shaped edge the plunger-plate H′. The edges of the plates and ends of the plungers are so formed and connected as to allow either pair of plungers to act independently of the other pair, as the plates can move, if necessary, in a direction at right angles to the axis of either pair of plungers.

The mode of operation of my invention is as follows: A rail to be straightened is introduced endwise between the feed-rollers, when they pass it through the first anvil-plate, then through the plunger-plates, then through the second anvil-plate until its end is gripped by the second set of feed-rollers. As long as the rail remains straight the feed-rollers operate to pass it through the machine; but as soon as a bend is reached the departure from a straight line causes an electrical circuit to be closed, thereby stopping the feed-motion and bringing the proper plunger into action. We will suppose, for illustration, that this is the plunger G‴. The plunger G‴, communicating motion to the plunger-plate H, will move the plunger-plate H to the right, (see Fig. 1,) at the same time forcing the plunger G′ back. The movement of the plunger-plate H in the direction mentioned will cause it to bear on the surface of the rail marked $m^4\ m^5\ m^6$, Fig. 5. This will push the rail until its surfaces $m\ m'\ m^2\ m^3$ come into contact with the anvil-plate, whence a further movement of the plunger will properly bend the rail without deforming its section. After it is properly straightened the feed-motion starts, and the rail is carried on to the next bend. Having explained

this mode of operation, it will now be proper to turn again to the openings in the anvil-plates and plunger-plates to explain further their relative size and action.

Referring to Fig. 5, which represents an anvil-plate, the opening is made rather larger than it would be in practice, for convenience of illustration. The opening in the anvil-plates is really made as small as is consistent with the free passage of the rail, whereas the openings in the plunger-plates are made as large as is consistent with the proper bearing on the profile of the section of the rail, the object of this being that when the rail is being bent by the pressure of one plate there will be sufficient room in the opening of the other plate for it to receive a proper amount of bending without coming in contact with the walls of the opening of the plate not in operation.

I do not claim plates with openings to approximately fit the rail to be used in straightening it so as not to deform its section, for, to the best of my knowledge and belief, this is not my invention; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. In a machine to straighten rails or other metallic bars, the combination of two stationary anvil-plates placed one on each side of a movable plunger-plate, said plates being provided with openings to admit the rail or other bar approximately fitting its cross-section, said openings being of the same general form as the cross-section of the rail or other bar, but larger, substantially as and for the purposes set forth.

2. In a machine for straightening rails or other metallic bars, the combination of a set of feed-rollers with two anvil-plates and a movable plunger-plate, said plates having openings of approximately the same contour as the rails, said plunger-plate connected to reciprocating mechanism, whereby it may be moved in either of two directions relatively rectangular, substantially as and for the purpose set forth.

3. In a machine for straightening rails or other metallic bars, the combination of a pair of horizontally-movable plungers, a plunger-plate provided with an opening through it to admit the rail or other bar and approximately fit its cross-section, said plate connecting the inner ends of these plungers, a pair of vertically-movable plungers, a plunger-plate provided with an opening through it to admit the rail or other bar and approximately fit its cross-section, said plate connecting the inner ends of these last-mentioned plungers, and two stationary anvil-plates provided with openings through them to admit the rail or other bar and approximately fit its cross-section, substantially as and for the purpose set forth.

4. In a machine for straightening rails or other metallic bars, the combination of a plunger free to reciprocate, a plunger-plate having an opening through it to admit the rail or other bar and approximately fit its cross-section, said plate being free to reciprocate with said plunger, a reciprocating yoke, an interposable gag between said yoke and said plunger, and anvils or rail-supports, substantially as and for the purpose set forth.

5. In a machine for straightening rails or other metallic bars, the combination of anvils or rail-supports, a movable plunger-plate provided with an opening through it to admit the rail or other bar and approximately fit its cross-section, said plate being connected with movable plungers, whereby it may be moved in different directions and the rail or other bar straightened from different sides without revolving or turning it or without deforming its cross-section, substantially as and for the purpose set forth.

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

JOHN COFFIN.

Witnesses:
JAMES CRANSTON,
FRED W. STAMMLER.