Dec. 6, 1932. H. M. GIVENS 1,890,287

MACHINE FOR STRAIGHTENING METAL BARS

Filed Aug. 25, 1931

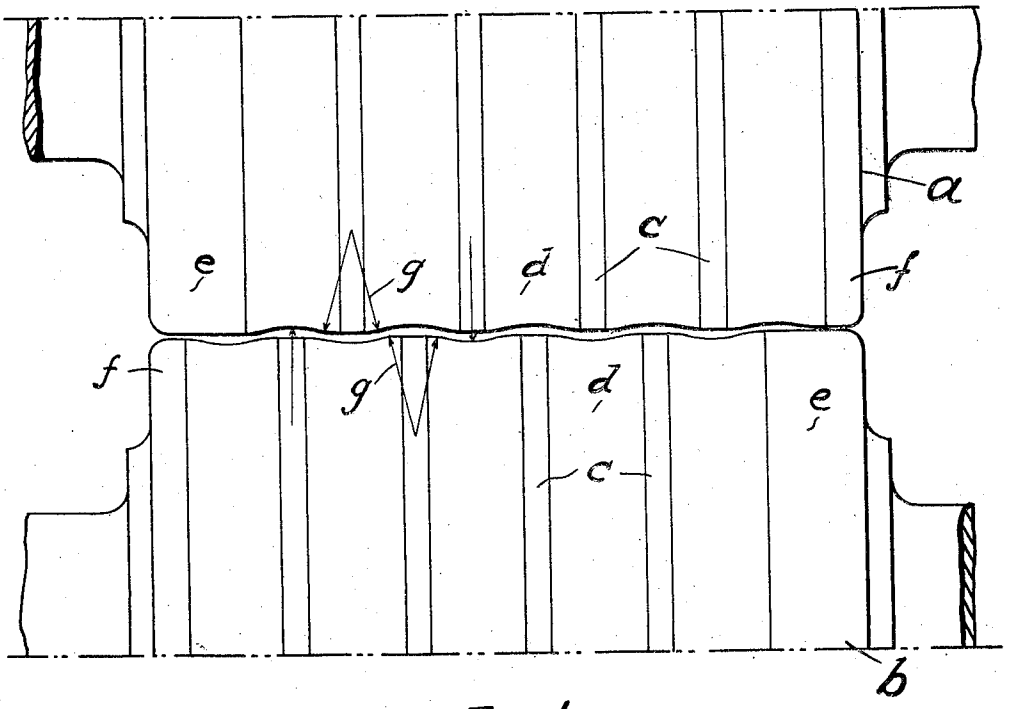


FIG. 1.

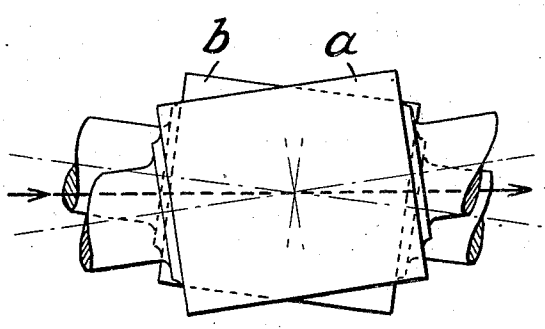


FIG. 2.

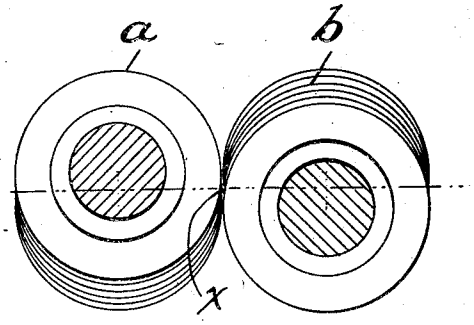


FIG. 3.

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UNITED STATES PATENT OFFICE

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MACHINE FOR STRAIGHTENING METAL BARS

Application filed August 25, 1931. Serial No. 559,216.

As is well known, the straightening of metal bars, rods, etc., has been effected in machines of different types all involving the subjection of the bar, while it is moving lengthwise, to the action of opposing pressure surfaces which first overbend and then straighten it. Such machines are usually of two types;—

1st—Those with a long series of upper and lower rolls revolving on axes at right angles to the bar being straightened, and which can be used to straighten bars of any cross section if appropriate grooves be cut in their circumferences.

2nd—Those having two or more long rolls with axes in parallel vertical planes but oppositely inclined to the horizontal, through a small angle, the bar to be straightened being revolved and drawn lengthwise between them while resting upon a supporting guide beneath. This type of machine can straighten only round bars of relatively large diameter. It is usual to have one of these rolls concave in longitudinal outline while the other may be cylindrical or convex. In some machines operating on this principle the rolls, instead of being fixed in position and revolving the bar between them, are carried in a cradle, or cradles, and revolve around the bar.

In both these types of machines the bar is bent back and forth between the rolls,—in a vertical plane only in the first type, but while being revolved in the second type,—which first bend the bar regularly to a greater degree than the initial irregular bends, thus removing them, and finally remove the regular bends produced.

These machines work well with material of low or moderate elastic limit, but I have found it impossible with them to straighten bars of small diameter and high elastic limit, because the centers on which the machines bend the bars are so far apart that the special bars spring enough to conform to the bends given and then spring back again without having been permanently bent. In the case of the first type machine there is no remedy because the rolls, lying in the plane of the bar, cannot be brought sufficiently near together to make short bends, their diameter preventing it, but I have found a novel way of making rolls for the second type of machine which completely accomplishes my object and forms the subject of this patent application.

I have found that by cutting a properly designed series of circumferential grooves in practically cylindrical rolls, with this type of machine one can bend the bars between such close centers that their elastic limit is exceeded, the necessary preliminary removal of existing bends accomplished and the bars delivered straight and true.

Rolls embodying my invention are shown in the annexed drawing, in which—

Fig. 1 is a plan view of the two adjacent halves of each of a pair of straightening rolls.

Fig. 2 is a diagrammatic side view, and Fig. 3 an end view, of the rolls, the desirable deviation of the rolls from parallelism being exaggerated in order more strikingly to illustrate this feature of the invention.

The two rolls *a* and *b* are mounted side by side. In side view the rolls are so positioned that the axis of each is inclined relatively to that of the other. In the actual construction the axis of each roll is inclined to the horizontal about two degrees, but in opposite directions, as clearly shown in Figs. 2 and 3. In Fig. 1, in order that the peripheral contours of the rolls may be better illustrated, the two rolls are arranged with their axes parallel. The degree of deviation from parallelism may be more or less varied; in some machines it is adjustable, in others fixed.

The peripheries of the two rolls are adjustably spaced apart, the average distance between them being least at their longitudinal centers and (due to their relative inclinations) gradually increasing toward their opposite extremities. This feature does not show in Fig. 1, but it is apparent, from Figs. 2 and 3 and the foregoing description, taken in connection with Fig. 1, that such must be the case. The dimensions of the grooves and ribs depend upon the diameter of the bars to be straightened, but one set of rolls will straighten bars having a considerable range in diameter.

Each roll comprises alternating convex and concave circumferential surfaces, the concave circumferential surfaces of each roll being respectively opposite the convex circumferential surfaces of the other roll. The convexities and concavities need not take the form of continuous and regular curves. For example, it is desirable that each roll shall comprise narrow sections *c* of true cylindrical shape, alternating with convexo-concave sections *d*. Where actual curvature exists, it should be on radii much shorter than the radius of the rolls, as indicated by the arrow *g*. The extreme front end of one roll and the extreme rear end of the other roll may each have a comparatively wide truly cylindrical periphery with a preferably rounded extremity, as indicated at *e*. The opposite end of each roll has preferably a substantially narrower cylindrical periphery, as indicated at *f*.

The two rolls have, preferably, approximately the same contour, but I have found it expedient to make one roll with its ribs of uniform diameter while, in the case of the other roll, the end ribs are of relatively small diameter, the ribs adjacent thereto of relatively large diameter, and the two central ribs of intermediate diameter. The maximum difference in diameter will not usually exceed about an eighth of an inch and no attempt is made in the drawing to illustrate this slight difference, which difference is not an essential feature, and may not, in all cases, be a desirable feature, of the invention. In any construction, the longitudinal contour of one roll from front to rear closely resembles the longitudinal contour of the other roll from rear to front.

The bar to be straightened is, by action of the rolls, carried in the direction of their lengthwise extension by driving them in opposite directions. The means for supporting the bar during straightening are not shown as they are those in common use and form no part of the invention. The action of the rolls upon the bars is perfectly to straighten them.

The distance between the rolls is adjusted in accordance with the diameter of the bars to be straightened.

The rolls, instead of rotating around fixed axes, may be held in a frame and rotate about the bar. Mechanism for so actuating the rolls, being known in the art, is not shown.

What I claim is:—

1. A bar straightening machine comprising two rotatable rolls arranged side by side and slightly spaced apart, each roll having a succession of alternating approximately convex and concave circumferential faces, the concave circumferential surfaces of each roll being substantially opposite the convex circumferential faces of the other roll, the axes of the two rolls, when the same are viewed in side elevation, being inclined relatively to each other.

2. A bar straightening machine comprising two rotatable rolls arranged side by side and slightly spaced apart, each roll having a succession of alternating approximately convex and concave circumferential faces, the concave circumferential surfaces of each roll being substantially opposite the convex circumferential faces of the other roll, the rolls being so positioned that both axes lie in vertical planes, while such axes are oppositely inclined with respect to a horizontal plane.

3. A bar straightening machine comprising two rotatable rolls arranged side by side and slightly apart, each roll having a succession of alternating convex and concave circumferential faces, each of a number of said convex circumferential surfaces comprising a central cylindrical surface, which is opposite the central portion of a concave circumferential surface of the other roll, the rolls being adapted to be driven in opposite directions so as to revolve between them the bar to be straightened.

4. A bar straightening machine comprising two rolls positioned side by side and spaced somewhat apart, the periphery of each roll, along any radial plane including its axis, presenting a wave-like contour, the contour of each roll from front to rear being substantially the same as the contour of the other roll from rear to front, both rolls being inclined to the horizontal but in opposite directions.

5. A machine for straightening bars comprising two rolls positioned side by side and spaced somewhat apart and adaptable to be rotated in opposite directions, each roll comprising a series of cylindrical sections alternating with a series of convexo-concave sections, the middle part of the concavities of each roll being respectively opposite cylindrical parts of the other roll, the rolls being oppositely inclined.

6. A machine for straightening bars comprising two rolls positioned side by side and spaced somewhat apart and adaptable to be rotated in opposite directions, each roll comprising a series of cylindrical sections alternating with a series of convexo-concave sections, the middle part of the concavities of each roll being respectively opposite cylindrical parts of the other roll, opposite extremities of each roll comprising relatively wide and narrow cylindrical sections, the contour of each roll from front to rear being approximately the same as the contour of the other roll from rear to front, both rolls being inclined to the horizontal but in opposite directions.

7. Rolls for a machine for straightening metal bars, each roll having a series of circumferential convexities and concavities so positioned longitudinally as to be opposite a

corresponding series of concavities and convexities in the other roll, the axes of the two rolls, when the same are viewed in side elevation, being inclined relatively to each other whereby a bar rotated between such rolls while passing between them longitudinally is bent back and forth to remove short kinks and is delivered straight.

8. A bar straightening machine comprising two rotatable rolls arranged side by side and slightly spaced apart, each roll having a succession of alternating approximately convex and concave circumferential faces, the concave circumferential surfaces of each roll being substantially opposite the convex circumferential faces of the other roll, the rolls being so relatively positioned that when their axes are included in two parallel planes, the projection of the axis of one roll on the plane of the other roll forms a slight angle with the axis of such other roll.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, Pennsylvania, on this 19th day of August, 1931.

HOWARD M. GIVENS.