I. L. HUGHES.

METHOD OF STRAIGHTENING ROLLED METAL BARS AND THE LIKE.

APPLICATION FILED MAY 21, 1912.

1,252,115. Patented Jan. 1, 1918.

4 SHEETS—SHEET 1.

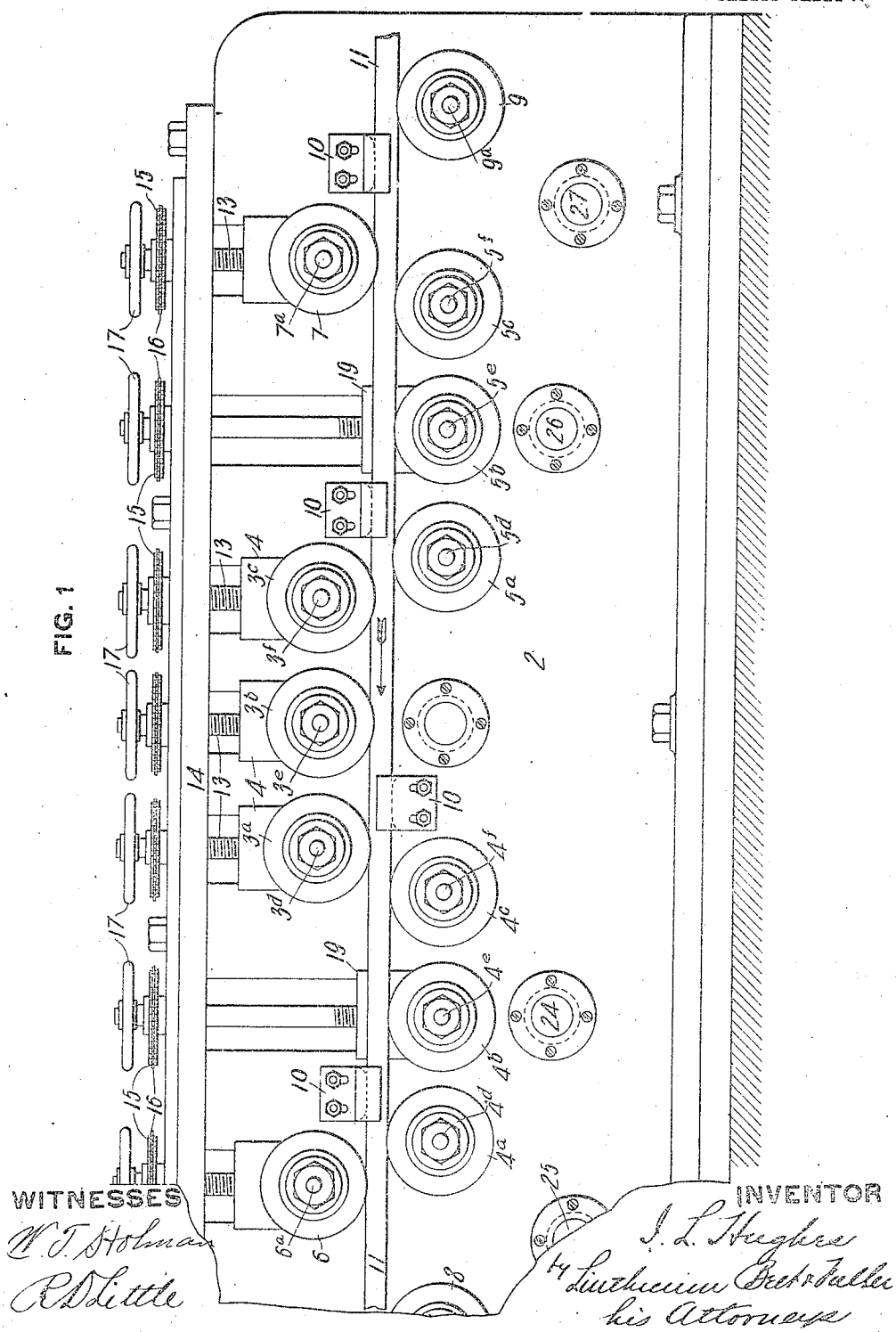


FIG. 1

WITNESSES

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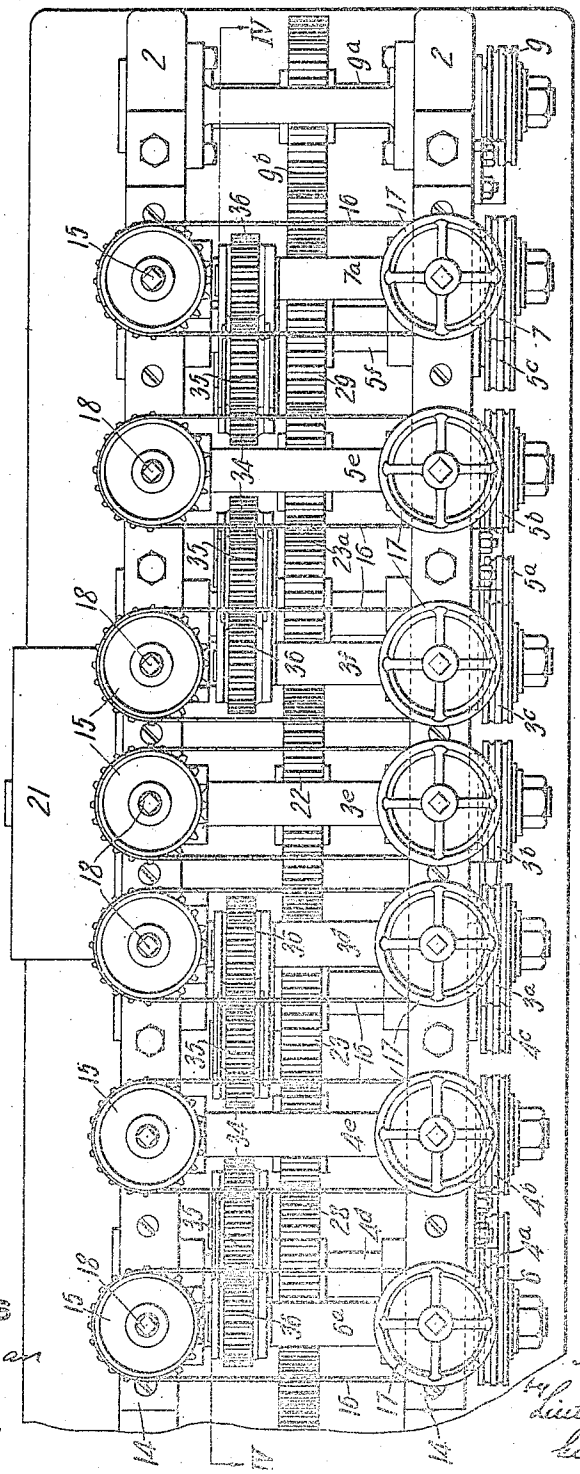
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4 SHEETS—SHEET 2

FIG. 2



WITNESSES

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4 SHEETS—SHEET 3.

FIG. 5

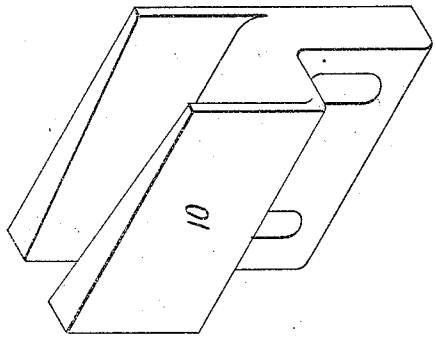


FIG. 6

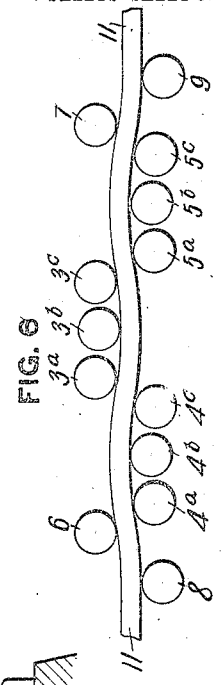
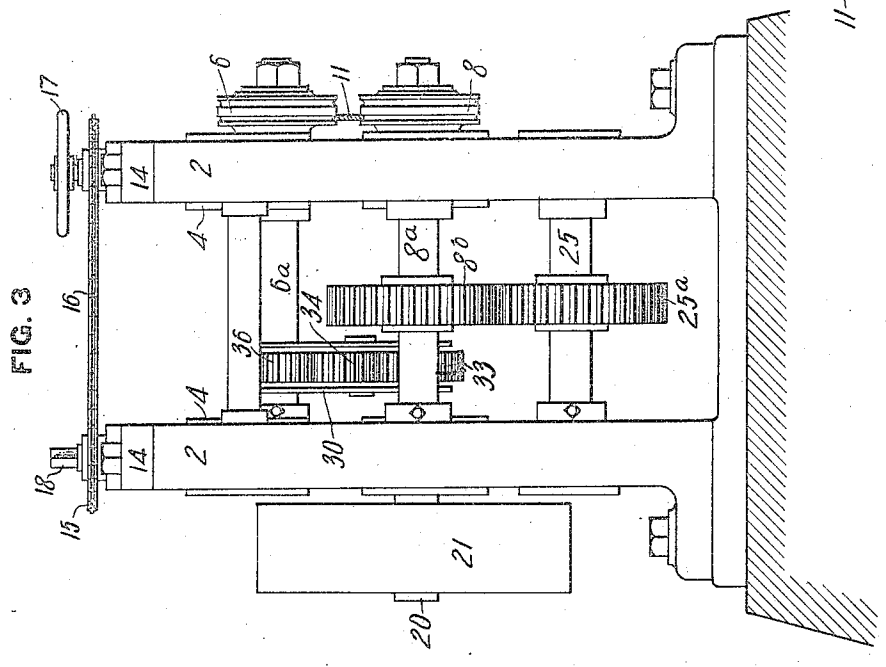


FIG. 3



WITNESSES

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4 SHEETS—SHEET 4.

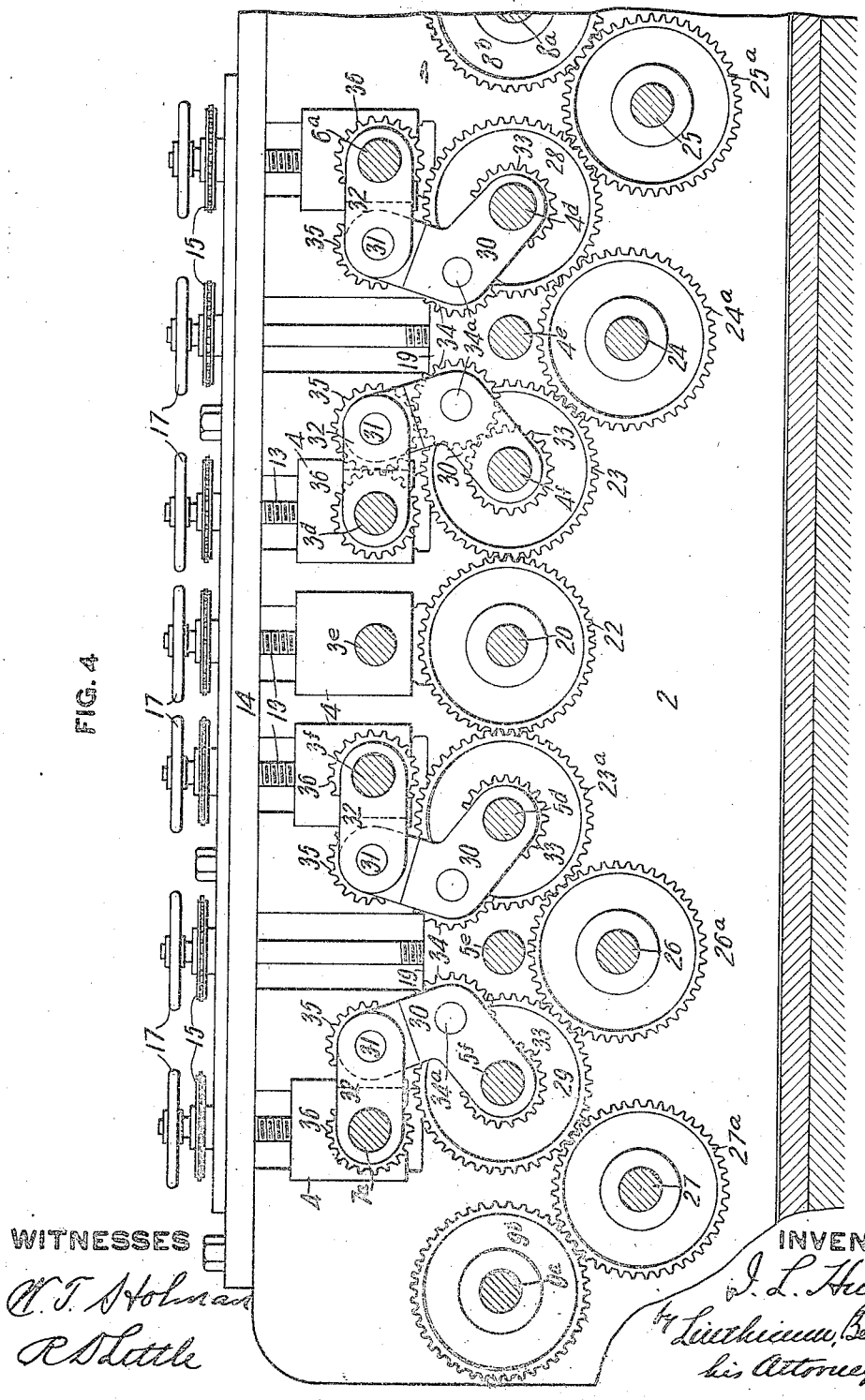


FIG. 4

WITNESSES

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UNITED STATES PATENT OFFICE.

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METHOD OF STRAIGHTENING ROLLED METAL BARS AND THE LIKE.

Specification of Letters Patent. Patented Jan. 1, 1918.

1,252,115.

Original application filed April 26, 1909, Serial No. 492,255. Divided and this application filed May 21, 1912. Serial No. 698,711.

To all whom it may concern:

Be it known that I, ISAAC LAMONT HUGHES, a citizen of the United States, and resident of Youngstown, in the county of Mahoning and State of Ohio, have invented a new and useful Method of Straightening Rolled Metal Bars and the like, of which the following is a specification.

My invention relates to the straightening of metal bars, rods and similar rolled metal sections. The object of my invention is to provide a novel method of straightening the bars by which irregularities caused by the rolling operation are removed without damage to the surfaces of the finished shapes and the shapes are put into the desired straight condition.

Heretofore in straightening such materials, particularly what is known to the trade as tire-iron, which has a very hard, smooth finish, it has been found that the skin formed on the materials during the rolling operation easily becomes cracked and broken when being straightened. When the skin or surface of such materials becomes cracked or broken, the material is defective and must be disposed of at a loss.

Such materials have been straightened in "bumpers" or gag presses in which a gag is placed between the metal and the reciprocating arm of the gag press at the desired points in the length of the bar. In straightening bars in this manner, but one bend or curve is put in the shape at each stroke of the moving ram of the gag press and the shape is supported at but two points on one side and by the gag at a single point on its opposite side. With such methods the cost of straightening the materials is very high and the straightening operation is slow, the output of mills manufacturing such shapes being limited to practically the amount of materials which can be straightened.

According to the present invention the shape is fed endwise and subjected to alternate bendings, the pressure for each bending being applied to the shape simultaneously along a plurality of lines only, such lines being spaced or separated longitudinally of the shape and extending transversely thereof. Between the lines of pressure, the shape is free and unconfined, and it is believed that the superiority of the present method over prior methods is due in part at least to the fact that the shape is free and unconfined between the lines of pressure. It is preferred to diminish the degree of bending toward the termination of the operation.

Referring to the accompanying drawings forming part of this specification Figure 1 is a side elevation showing one form of apparatus constructed and arranged and adapted for use in carrying out my improved method; Fig. 2 is a top plan of the same; Fig. 3 is an end elevation of the apparatus shown in Figs. 1 and 2; Fig. 4 is a sectional side elevation on the line IV—IV of Fig. 2 showing the arrangement of the spur driving gears and the idler gears; Fig. 5 is a perspective view showing a detail of the adjustable guides forming part of the apparatus; Fig. 6 is a diagrammatic side elevation showing the sets of rollers as adjusted with relation to each other in carrying out the steps of my invention, a flat bar being shown in its position between the rollers while being straightened.

In the drawings the numeral 2 designates the housings of the straightening machine in which the rollers 3^a, 3^b and 3^c forming one multiple set are adjustably secured, the shafts of these rollers being carried in suitable bearings 4 which are movably mounted in the windows of the housings 2, and preferably the rollers are overhung as shown in the drawings. 4^a, 4^b and 4^c represent the rollers forming one of the lower series or sets of multiple rollers and 5^a, 5^b and 5^c represent the multiple rollers forming another set of the lower series of rollers.

By reference to Fig. 1 it will be seen that two single rollers 6 and 7 of the upper series of rollers are mounted in their windows in the housings in the same manner as the rollers 3^a, 3^b and 3^c and that single rollers 8 and 9 of the lower series of rollers are provided to support the outer end portions of the bars while being operated upon.

Adjustably secured to one of the housings 2 are the guides 10 which serve to hold and guide the bar or other shape 11 during its passage between the sets of rollers of the straightening apparatus. The rollers 6, 7, 8 and 9 are secured respectively on the ends of the shafts 6^a, 7^a, 8^a and 9^a. The rollers 3^a, 3^b and 3^c forming one multiple set are secured respectively on the shafts 3^d, 3^e and 3^f. The multiple set of rollers 4^a, 4^b and 4^c are secured respectively to the shafts 4^d, 4^e

and 4^f while the rollers 5^a, 5^b and 5^c forming one of the lower sets of multiple rollers are secured on their respective shafts 5^d, 5^e and 5^f. Each shaft of the rollers in the upper series is journaled in bearing blocks or boxes 4 which are vertically adjustable in the windows of the housings 2.

Projecting vertically into the screw threaded openings in the top of each of these blocks is the threaded end of a screw shaft 13. The upper ends of the screws 13 are journaled in a continuous housing cap or cap bar 14, which extends longitudinally over the top of each of the housings so as to close the top of the windows in the housing. Instead of having the continuous cap bar as shown, a separate cap for each window may be used when so desired. Mounted on the upper end of each of these screw shafts 13 is a sprocket wheel 15, the wheels on the opposite housings being connected by sprocket chains 16 so as to cause the screw shaft 13 in the journal box 4 on one end of each shaft to rotate with the screw shaft in the journal box 4 on the opposite end of the same shaft. The upper end of each of the screw shafts 13 on one housing of the apparatus is provided with a hand wheel 17 by which the rollers are adjusted vertically by the operation. Each shaft 13 not provided with a hand wheel, is provided with a squared portion 18 by which it can be adjusted independently, the sprocket chains 16 being disconnected at such time.

The shafts of the central rollers 4^b, 5^b in the lower series of sets of rollers are also provided with journal boxes 19 supported so as to be adjustable in the windows of the housing in which they are mounted in the same manner as those for the upper series of rollers. Preferably the rollers 8 and 9 and the rollers 4^a, 4^c, 5^a and 5^c are journaled in the same horizontal plane. The horizontal axis of the central roller 4^b and 5^b in each of the two lower sets of multiple rollers is slightly above the plane of the axes of the other rollers in these sets (see Fig. 6). The rollers 6 and 7, 3^a and 3^c of the upper series of rollers are in approximately the same horizontal plane, while the axis of the central roller 3^b of the upper set or sets of multiple rollers is adjusted slightly below the horizontal plane of the axes of the other rollers in this set or sets.

By slightly advancing the central roller of each of the sets of rollers toward the opposing sets of rollers, the bar is caused to be curved in a long sweep while passing through the rollers and in reversely opposite directions. As shown in the drawings, the material is passed through these rollers from right to left while being straightened and is first curved upwardly and then downwardly and then again upwardly in long sweeping reverse curves. Preferably the sweep of the curves gradually diminishes toward the exit end of the machine and the bar is run out straight from the last set of rollers. Each roller in each series contacts with the metal being straightened and the metal or bar is supported at a plurality of points on the curved surface of the bar contacting with each series of multiple rollers (see Fig. 6). By subjecting the metal to bending in alternately opposite directions, kinks and other irregularities present in the metal after the completion of the rolling operation are removed and the material will be delivered in a straightened condition while the surface of the metal shapes will not be cracked or otherwise damaged.

Secured on the shaft 20 which is mounted in suitable bearings on the housings 2 is a driving pulley 21 which is connected by a belt with any suitable prime mover. The shaft 20 is provided with a spur gear 22 which meshes with spur gears 23 and 23^a located on the shafts 4^f and 5^d. Also mounted in suitable bearings in the housings 2 are the shafts 24, 25, 26, and 27, each having an idler gear 24^a, 25^a, 26^a and 27^a. The shafts 8^a and 9^a are also provided with driving gears 8^b and 9^b while the shafts 4^d and 5^f have spur gears 28 and 29.

Pivotally mounted between the housings 2 by one end on shafts 4^d, 4^f, 5^d and 5^f are the pair of knees or bent arms 30 one of these arms being on each side of the idler pinions employed to transmit motion from the bottom rollers to the top series of rollers.

The upper ends of the bent arms 30 are pivotally connected by the pins or shafts 31 to one end of the links 32, the opposite ends of the links 32 being pivoted to the shafts 3^d, 3^f, 6^a or 7^a for the upper series of rollers.

Mounted on the shafts 5^d, 4^f, 5^d and 5^f are the spur driving pinions 33 which mesh with and drive the idler pinions 34 on the pins 34^a. The pinions 34 also mesh with and drive the idler pinions 35 on the shafts 31, the pinions 35 also meshing with the driving spur pinions 36 on the shafts 3^d, 3^f, 6^a and 7^a for the top series of rollers.

By reference to Fig. 4 it will be seen that the pulley shaft 20 is provided with a spur gear 22 which is in mesh with similar spur gears 23 and 23^a on the shafts 4^f and 5^d. The spur gears 23 and 23^a in turn mesh with idler gears 24^a and 26^a, which are also in mesh with spur gears 28 and 29 on the shafts 4^d and 5^f. The gears 28 and 29 also mesh with idler gears 25^a and 27^a, which in turn mesh with and drive the spur gears 8^b and 9^b which are mounted on the shafts 8^a and 9^a for the rollers 8 and 9. Also mounted on the shafts 4^d, 4^f, 5^d and 5^f are the spur gears 33, each of which meshes with an idler gear 34 on the bent arms 30. The idler gears 34 also mesh with idler gears 35 which are also mounted on the bent arms

30 and the gears 35 also mesh with driving spur gears 36 which are mounted on the shafts 3^d, 3^f, 6^a and 7^a for the rollers 3^a, 3^c, 6 and 7. This arrangement of gearing permits of the upper rollers 6, 3^a, 3^c and 7 being positively driven in the opposite direction to the lower rollers 8, 4^a, 4^c, 5^a, 5^c and 9.

By means of the idler gearing on their respective arms the rollers on the driving shafts of the upper series are arranged so as to be adjustable vertically toward and away from the lower series of sets of rollers without disengaging the gears, the gearing always being in mesh in all positions of these rollers.

It will be readily understood from the foregoing description that at least part of the rollers in each series are positively driven in the right direction to feed the shapes being straightened through the passes formed by the grooves in the opposing rollers.

The advantages of my invention result from the provision of staggered multiple sets of rollers in which one set of multiple rollers is adjustable with relation to the others and in which at least one roller of each set is adjustable toward and away from the shape being straightened independently of the other rollers in the same multiple set, so that the shape may pass through the rollers in a long sweeping curve and by which the rollers are arranged to contact at a plurality of points on the opposite sides of the reverse curves formed on the shape during the straightening operation.

Obviously, should it be necessary to straighten a shape in two directions, the material can be straightened in one direction and then passed through the straightening machine and be straightened on the opposite sides of the shape to those straightened by the first operation.

Modifications in the construction and arrangement of the apparatus may be made without departing from my invention. Instead of the grooved rollers shown, the contour of the grooves may be changed to suit the cross-section of the shape to be straightened. Instead of having the sets of bars adjustable with relation to each other the middle roller may vary in size from the others in the same set, in this way making the desired bend in the bar. The method is applicable to other uses than straightening the bar of rectangular cross-section shown in the drawings, as for instance to flanged shapes including T-head rails, angles, I-beams and channels, and other changes may be made within the scope of the appended claims.

The apparatus herein described forms the subject-matter of my Patent No. 1,045,031 for apparatus for straightening metal bars, dated November 19, 1912, of which this application is a division.

I claim:—

1. The method of straightening rolled metal shapes which consists in passing the shape lengthwise between sets of positively rotated straightening rollers in a sinuous path and supporting the lengthwise moving shape simultaneously at a plurality of longitudinally separated points on the inside of each curve in the sinuously bent shape during the passage thereof between the straightening rollers.

2. The method of straightening rolled metal shapes which consists in causing lengthwise movement of the shape in a sinuous path to thereby bend the shape into a series of simultaneously formed reverse curves, and supporting the sinuously formed reverse curves, and supporting the sinuously bent shape at intervals on the inside of said reverse curves during the travel of the shape in said sinuous path.

3. The method of straightening rolled metal shapes which consists in causing lengthwise movement of the shape in a sinuous path to thereby bend the shape into a series of simultaneously formed reverse curves, and supporting the sinuously bent shape at intervals on the inside of at least part of said reverse curves during the travel of the shape in said sinuous path.

In testimony whereof, I have hereunto set my hand.

ISAAC LAMONT HUGHES.

Witnesses:
RAY MCLAUGHLIN,
TOD A. CRUM.