No. 647,201.

Patented Apr. 10, 1900.

J. T. ROWLEY.

APPARATUS FOR PRODUCING TAPERED BARS.

(No Model.)

(Application filed Sept. 12, 1899.)

Fig. 2.

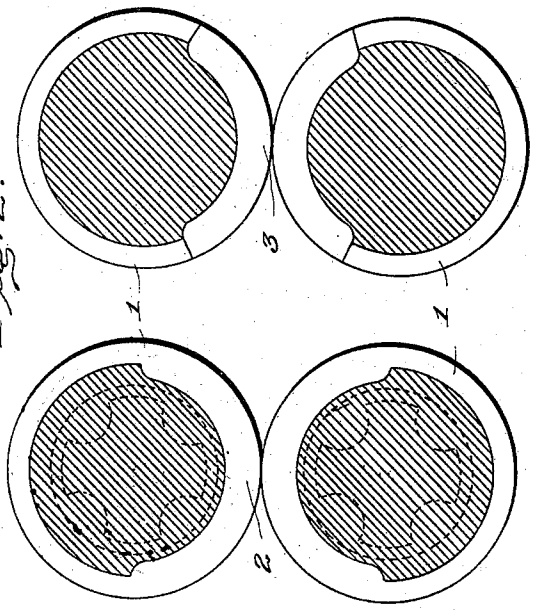


Fig. 1.

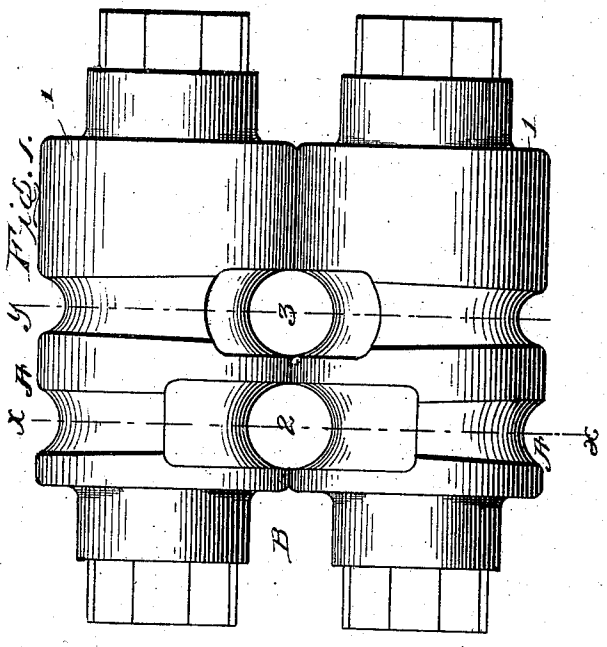


Fig. 3.

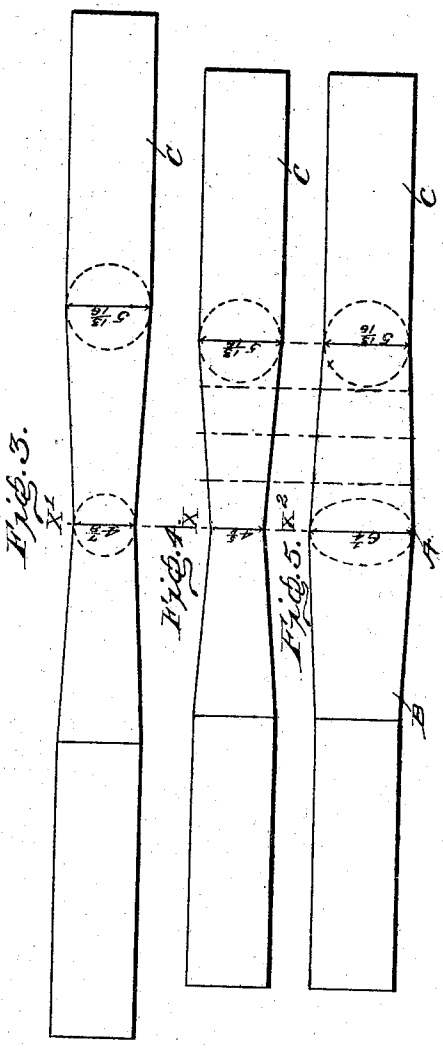


Fig. 4.

Fig. 5.

Witnesses.
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UNITED STATES PATENT OFFICE.

JOHN THOMAS ROWLEY, OF BEAVER FALLS, PENNSYLVANIA.

APPARATUS FOR PRODUCING TAPERED BARS.

SPECIFICATION forming part of Letters Patent No. 647,201, dated April 10, 1900.

Original application filed November 10, 1898, Serial No. 696,025. Divided and this application filed September 12, 1899. Serial No. 730,244. (No model.)

To all whom it may concern:

Be it known that I, JOHN THOMAS ROWLEY, a citizen of the United States, residing at Beaver Falls, in the county of Beaver, State of Pennsylvania, have invented or discovered certain new and useful Improvements in Apparatus for Producing Tapered Bars or Rods Having Different Cross-Section, of which the following is a specification.

My invention relates to apparatus for producing tapered bars or rods.

The object of my invention is to produce a mill or apparatus for rolling tapered bars or rods having different cross-section; and to this purpose my invention consists in heating a bar or rod of the requisite and predetermined cross-section (in the drawings the bar previous to the first pass is five and thirteen-sixteenths inches in diameter) and passing the same between rolls cam-grooved, the first pass or groove tapering the bar or rod oviform in cross-section at the center—*i. e.*, the side surfaces of the piece being carried outwardly from the longitudinal axis of the same and the bottom and top surfaces of said piece being carried inwardly toward its longitudinal axis a distance greater than the outwardly-forced surfaces are carried from the axis, as shown in Figures 4 and 5 of the drawings—the groove widening at its central operative part so as to enable the sidewise flow of the metal at such point and produce at the first pass a bar or rod one diameter of which has been reduced at such point and enlarged on the diameter perpendicular thereto, the inward-forced opposite surfaces being carried toward the longitudinal axis a distance greater than the outward-forced surfaces are carried from the axis, then passing the bar or rod through a groove circular in cross-section in all axial planes, carrying the previously outwardly carried surfaces inwardly toward the longitudinal axis of the piece, and the previously inwardly carried surfaces outwardly from the longitudinal axis of the piece, the diameter of the second or last-mentioned groove being greater than the least diameter of the first groove to enable the metal to spread sidewise or laterally at its central operative part, and the operative part of said second groove being of greater peripheral length than that of the first groove. These two operations produce a bar or rod of a predetermined length circular in cross-section and expanding from the center toward the ends.

By imparting to the bar or rod the peculiar shape described at the first operation the metal is so disposed that by slightly bringing back the outwardly-crowded surfaces, and consequently slightly expanding the inwardly-brought surfaces, the whole forming operation is completed.

I will now describe my improved mill adapted to the application of my improved method of producing tapered bars or rods, reference being had to the accompanying drawings, which form a part of this specification, in which like reference characters indicate like parts wherever they occur throughout the several views thereof.

In the accompanying drawings, Fig. 1 indicates a front elevation of a mill adapted to the application of my improved method of producing tapered bars or rods. Fig. 2 is a sectional view on lines $x\ x$ and $y\ y$ arranged tandem with that shown in Fig. 1. Fig. 3 is a longitudinal elevation of piece after final pass. Figs. 4 and 5 are respectively longitudinal elevation and plan views of piece after first pass.

Referring to said drawings, 1 1 are rolls horizontally arranged and adapted to be mounted in suitable housings and to be driven in the usual manner. The said rolls are provided with passes or grooves 2 and 3. The pass or groove 2 gradually widens toward the point A and narrows toward the point B, so that the bar or rod C is rolled oviform in cross-section. The groove 2 being as to its depth tapered reversely—*i. e.*, from the ends toward the center—produces a tapered oval, as shown in the accompanying drawings, Figs. 4 and 5. The piece is then passed through groove 3, (the oval or greater diameter being in a vertical plane,) which being semicircular in all axial planes and wider at their central operative parts on a line parallel to the axis of the rolls and the least diameter of the groove of the first pass and shallower at the center operative part than the greatest diameter of the first pass. In other words, the diameter of the second groove is greater than the least di-

ameter of the first groove, and its operative part is of greater peripheral length than that of the first groove, as shown in the drawings, whereby a bar or rod passed through said groove is rolled into a finished bar or rod circular in cross-section and expanding from the center toward the end, the ends being of a predetermined length and diameter.

One of the characteristic features of my invention lies in the fact that I at the center of the bar flatten and widen the entire body of the mass, carrying all portions of the sides outward and bringing inward the top and bottom parts to lines near the axis. To provide for this, the grooves for the first pass are materially wider at the center line of their operative parts than they are at the end lines thereof. This construction of grooves provides a free space or chamber, into which the metal is carried without resistance from the side walls, the widening being on lines parallel to the axis of the roll and transverse to the lines of pressure. In the second pass the previously inwardly brought central portion of the piece is permitted to expand or spread horizontally—that is, on lines parallel with the axes of the roll from four and five-eighths inches, as shown at X in Fig. 4, to four and seven-eighths inches, as shown at X′, Fig. 3—while the previously outwardly carried portion is reduced from six and one-quarter inches, as shown at X^2, Fig. 5, to four and seven-eighths inches, as shown at X′ in Fig. 3.

Another characteristic feature of my apparatus is that the points of reduction in the first pass coincide with those of the second pass. In other words, the points where the rolls leave off work coincide in both passes. Simultaneously with this feature of the shaping occurs also the elongating or crowding endwise of the metal of the bar of its central portion. This rapidly increases from the end of the groove to its central line, and with such elongation there is a proportionate reduction at the successive transverse plane of the cross-sectional area of the bar.

I have so far described my improved mill as comprising a pair of rolls having two grooves, but the same may be (and preferably) arranged as shown in the accompanying drawings, Fig. 2, a pair of rolls in which groove 2 is formed, and an independent pair arranged immediately in front of said last-mentioned rolls, having groove 3 formed therein, so that immediately the bar or rod passes out of and through the first pair of rolls it enters and passes through the second pair of rolls without reversing, as would be necessary when the mill shown in Fig. 1 is used.

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

1. In an apparatus for rolling tapered bars or rods of gradually-varying circular cross-section, a pair of rolls having two pairs of grooves, two grooves in each roll, those of each pair being in opposition to each other, each groove of the first pair being at its operative center longitudinally, wider on lines parallel to the axis of the rolls than at the ends of the operative parts, and shallower on lines radial to the rolls at the said central operative line than at the end line, and the grooves of the second pair being each semicircular in all axial planes, and their diameter at their center operative part being greater than the least diameter of the last-preceding pass or groove, each groove of each of said pair of grooves tapering in its dimensions from the central line of its operative part to the end lines thereof, substantially as herein described.

2. In an apparatus for rolling tapered bars or rods of gradually-varying circular cross-section, rolls having two successively-acting pairs of grooves, the grooves of each pair being opposite to each other, the grooves of the first-acting pair having operative parts of a relatively-shorter peripheral length and each of said grooves tapering in its dimensions from the central line of the operative part to the end lines thereof, and the grooves of the second-acting pair having operative parts of a relatively-greater peripheral length and also tapered from the central line of the operative part to the end lines thereof, substantially as set forth.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

JOHN THOMAS ROWLEY.

Witnesses:

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