No. 676,998. Patented June 25, 1901.

F. R. SCHNEIDER.

ROLLS FOR THE MANUFACTURE OF AXLES, &c.

(Application filed Jan. 3, 1901.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

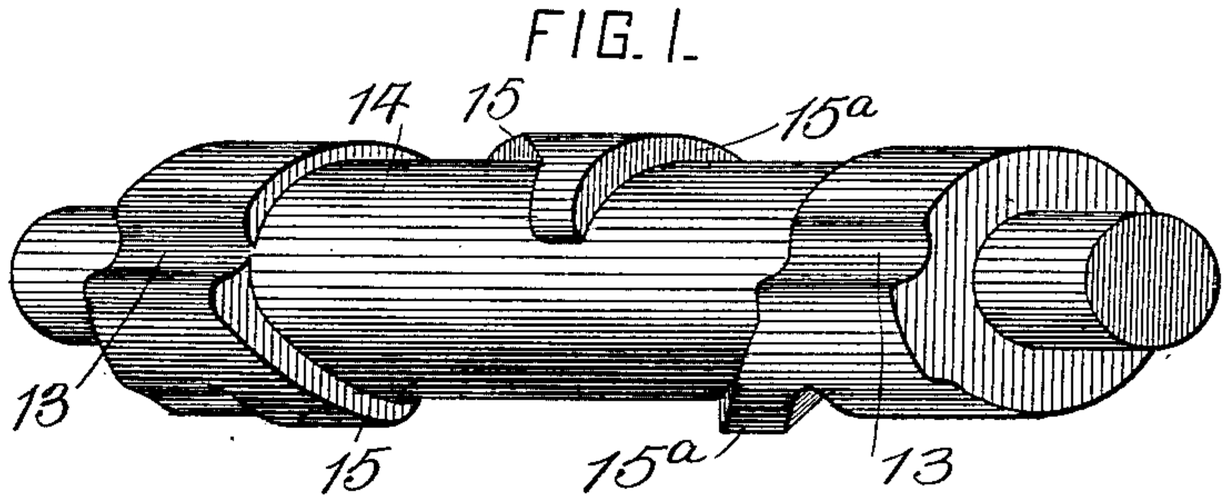

FIG. 2.

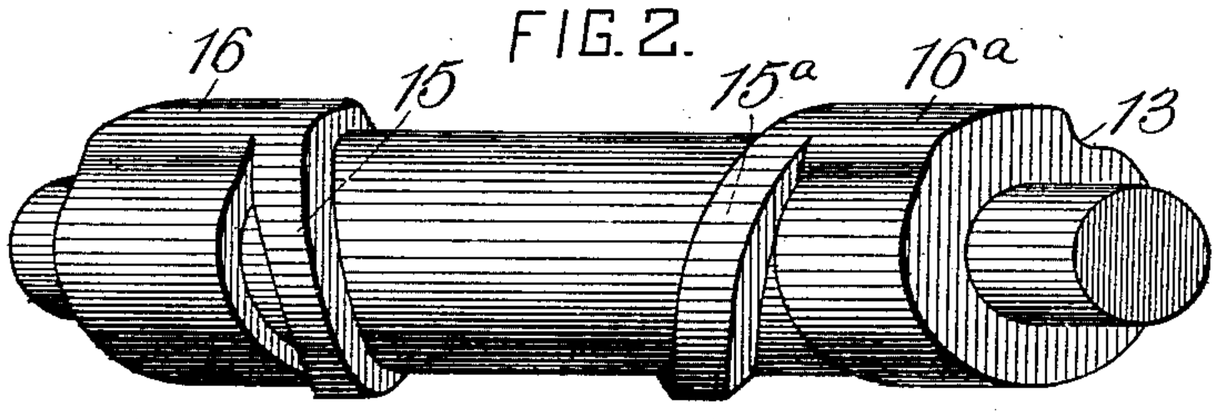

FIG. 3.

FIG. 8.

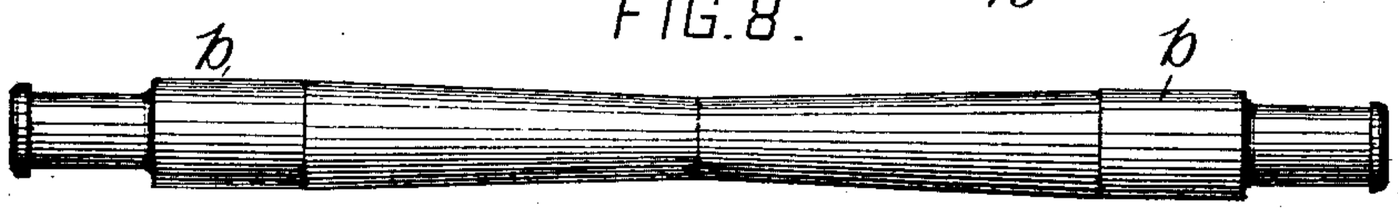

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FIG. 4.

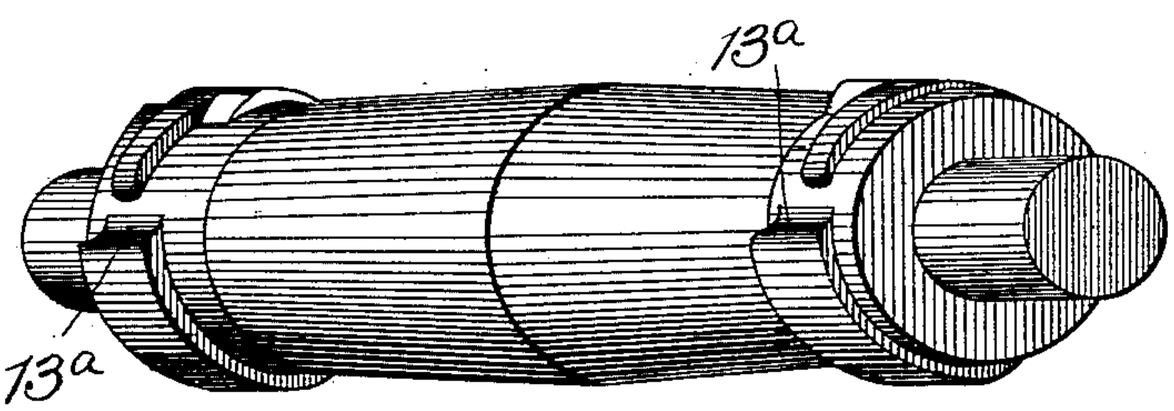

FIG. 5.

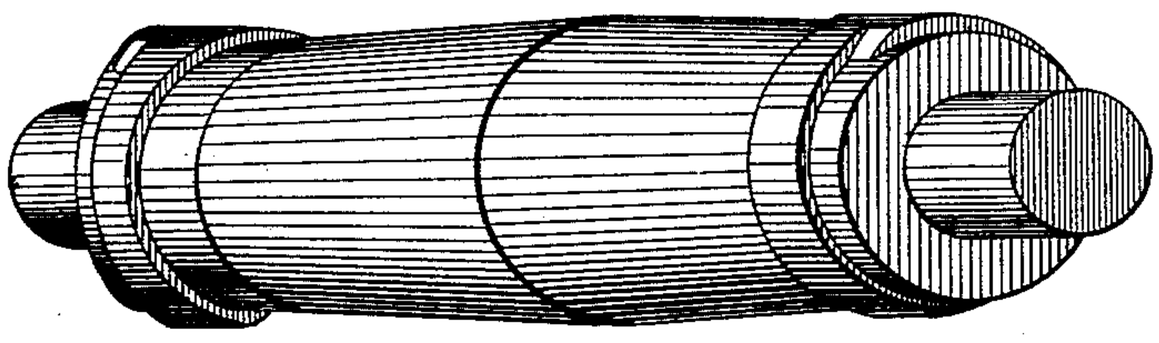

FIG. 6.

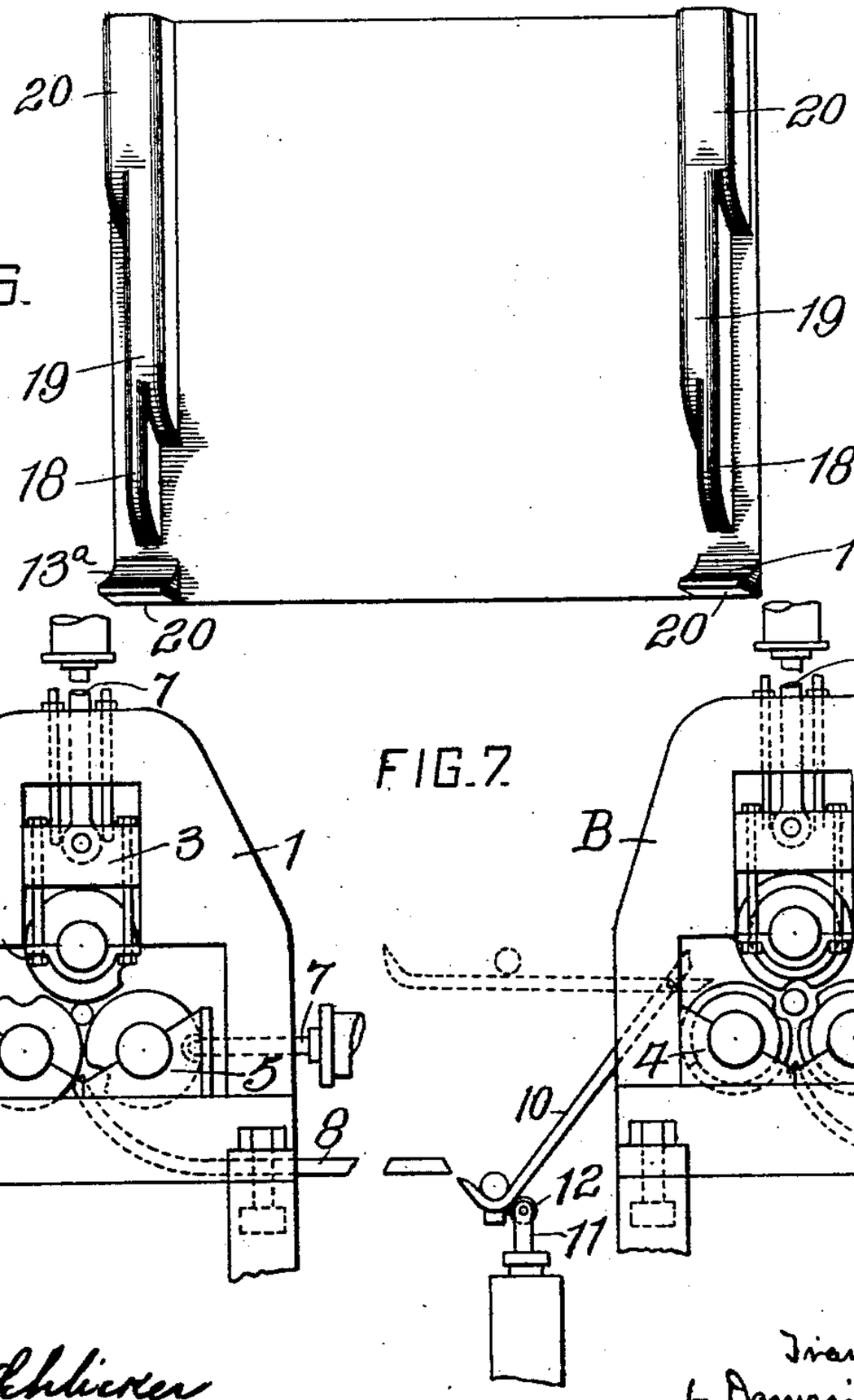

FIG. 7.

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FIG. 9.

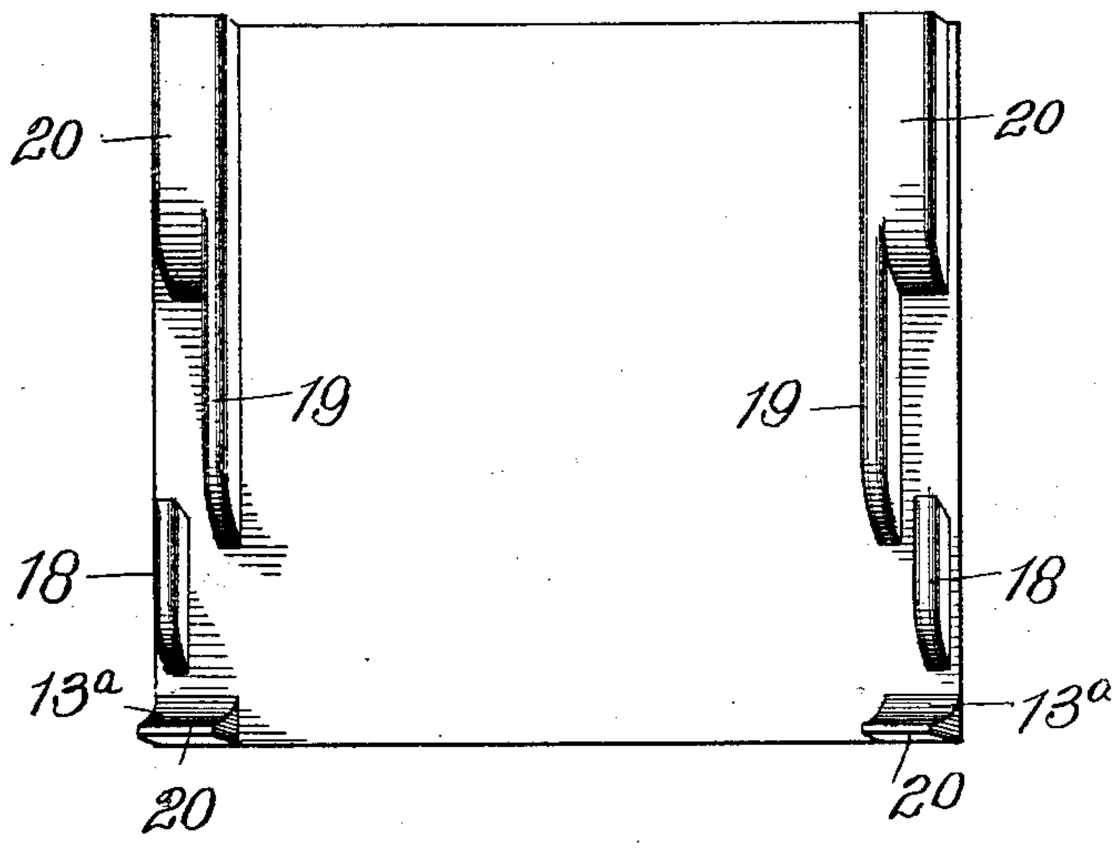
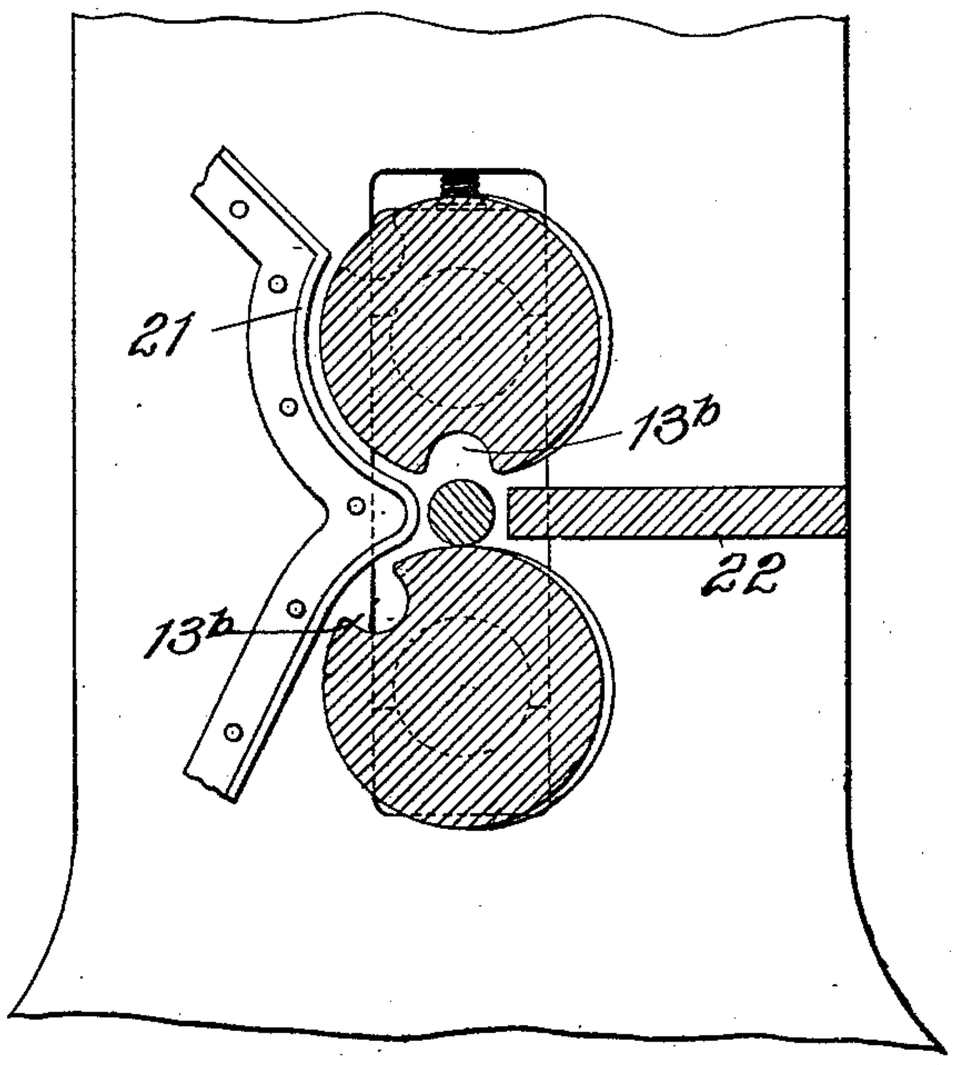


FIG. 10.



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UNITED STATES PATENT OFFICE.

FRANCIS R. SCHNEIDER, OF CRAFTON, PENNSYLVANIA.

ROLLS FOR THE MANUFACTURE OF AXLES, &c.

SPECIFICATION forming part of Letters Patent No. 676,998, dated June 25, 1901.

Application filed January 3, 1901. Serial No. 41,937. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS R. SCHNEIDER, a citizen of the United States, residing at Crafton, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Rolls for the Manufacture of Axles, &c., of which improvement the following is a specification.

The invention described herein relates to certain improvements in the manufacture of axles for cars and other articles. As is well-known, the body portion of the axle—*i. e.*, the portion between the wheel-seats—is made tapering from the seats to the middle of the axle. The wheel-seats are generally made of a diameter slightly less than the largest diameter of the body portion, and the journals are made smaller than the wheel-seats. Attempts have been made to form these axles by means of rolls constructed to have a reducing action simultaneously along the entire length of the axle or a great portion thereof; but by reason of the differences in diameter the axle during such reduction is subjected to such torsional strains as to render it unfit for use.

The object of this invention is to provide for the gradual reduction of the bar to finished size, the reducing action being limited or confined at all times to such parts as have equal or approximately equal diameters, thereby avoiding injurious torsional strains.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figures 1 and 2 are perspective views of different portions of one of the rolls employed for shaping the middle and wheel-seat portions of the axle. Fig. 3 is a plane projection of the roll-surface. Figs. 4 and 5 are perspective views showing different portions of one of the rolls employed for shaping the journal portions of the axle. Fig. 6 is a plane projection of the roll-surface. Fig. 7 is a view in end elevation of a mill for rolling axles. Fig. 8 is a side elevation of a completed axle. Fig. 9 is a plane projection of the roll-surface, illustrating a modification in the arranging of reducing-surfaces; and Fig. 10 is a sectional elevation of a two-high mill for rolling axles.

In the practice of my invention I employ two stands A and B, having two or three rolls, the stands being preferably arranged in tandem, so as to facilitate the feed of the article from one stand to the other. The housing 1 of the stand having three rolls is constructed for the reception of the bearing-blocks 3, 4, and 5 for the journals of the three rolls in each stand. Supporting-blocks 6 are arranged under the journals of the upper rolls and are connected by bolts or other means to the bearing-blocks 3 in order that the upper roll may be raised to permit of the feed of an axle-blank to position between the three rolls. The bearings 4 and 5 for the lower rolls are preferably made triangular, as shown, as such form is better adapted to receive the thrust of said rolls when in operation. The bearing-blocks 3 and 5 are connected to any suitable shifting mechanism, as the piston-rods 7 of fluid-pressure cylinders. By the outward movements of the bearing-blocks 5 the article will be permitted to drop onto rails 8 and 9. The rails 8 conduct the article to a lifting mechanism in front of the stand of rolls B, if both stands are arranged on or approximately on the same level. If the stand B is on a lower level than the stand A, the guide-rails can be arranged to direct the article direct to the second stand of rolls. The lifting mechanism may be constructed in any suitable manner—such, for example, as that shown, consisting of pivotally-mounted arms 10, having their outer ends curved, so as to receive the article from the rails 8. These arms are raised from receiving to delivery position by any suitable means, such as a fluid-pressure cylinder. The rod 11, connected to the piston of the cylinder, is provided with rollers 12, on which the arms 10 rest.

The construction of the rolls in the stand A is clearly shown in Figs. 1, 2, and 3. Each of these rolls is provided with a groove 13, extending longitudinally along the body of the rolls. These grooves in the rolls are so proportioned that when the rolls are brought into operative relation to each other they will hold the blank, but without any material compression thereof. A land or raised portion 14, which is so formed on each of the rolls as to operate on the middle portion of the blank, extends from the groove 13 a distance at least equal to one-third of the circumference of the

blank, so that by the conjoint action of all three rolls the entire circumference of the blank at that point will be reduced. From this central reducing land or rib two lands 15 15ª diverge and connect with or merge into lands or raised portions 16 16ª, which extend from the points of junction with the lands or ribs 15 15ª to the longitudinal gróove 13. The three rolls are so geared together that the several portions of the rolls above described will operate simultaneously—*e. g.*, the lands or ribs 14 of each roll will operate at the same time, followed in due sequence by the action of the lands 15 15ª and 16 16ª of each roll.

When it is desired to form an axle, the rolls are brought to such position that the several grooves 13 in the rolls will form a receptacle for the blank. The upper roll is then raised so as to permit a heated blank to roll down the rails 17 into the pocket formed by the grooves 13 in the lower rails. The upper roll is then lowered and the rolls rotated. On the rotation of the rolls the lands or raised portions 14 of each of the rolls operate on the middle portion of the blank, reducing it to the desired dimensions. If desired, the operative faces of the land or raised portions 14 may be inclined oppositely from a medium line to correspond with the taper of the body of the axle. As the rolls continue to rotate the diverging lands or raised portions 15 15ª come into operation on the blank and reduce the portions outside of that operated in by the lands 14 progressively toward the ends of the axles. On account of the angle of the lands to the axes of the rolls their reducing is spiral around the rolls. As the height or projection of the lands or raised portions 15 15ª is lessened gradually from the land or raised portion 14 to their points of junction with lands or raised portions 16 16ª the portions of the blank operated on by the lands 15 15ª will be given the desired taper. The lands or raised portions 16 16ª, which come into operation after the lands 15 15ª, have their operative faces in arcs of circles of the same radii. Hence the end portions of the blank will be cylindrical.

It will be understood by those skilled in the art that the area of reduction effected at any one time is limited to the widths of the operative faces of the lands or ribs measured in a direction parallel with the axes of the rolls—as, for example, when the lands or ribs 14 are operative on the article the length of the reducing area is equal to the length of the line *a b*, and when the ribs or lands 15 are operating the lengths of the reducing areas are equal to the lengths of the lines *c d*.

As the several lands 14 15 15ª are made comparatively narrow, the portions of the article operated on at any one time will vary little in circumference, thereby avoiding any material torsional strain.

It will be understood by those skilled in the art that the widths of the lands or raised portions will vary with the taper desired in the article to be produced—*i. e.*, the greater the taper the narrower the lands or raised portions.

While the invention is described in connection with the manufacture of railway-axles, it will be understood that it can be employed in the manufacture of other articles of varying diameters. The number of lands or raised portions can be increased or diminished in accordance with the shape or contour of the article to be produced.

If the reduction required is greater than can be effected by one revolution of the rolls, the rolls can be rotated any desired number of times, the rolls being gradually moved in toward each other. As soon as the desired reduction has been effected by the rolls in stand A the bearing-blocks 5, with their roll, are moved out, thereby permitting the article to drop onto the rails. The upper roll of stand B having been raised and the several rolls adjusted to receiving position, the partially-formed article will be shifted by the transfer mechanism described to the receiving-grooves 13ª of the lower rolls of stand B.

The rolls of stand B are provided at or near their ends with grooves 13ª, which form when the rolls are adjusted to operative positions receptacles for the portions of the blank to be operated on in these rolls. These grooves are formed in raised portions of the rolls, which increase in the width of their operative faces from one edge of the grooves around to the opposite edge thereof. It is preferred these raised portions should be formed by a series of lands or ribs 18 19 20, &c., of varying widths, the rear land or rib being of a width equal or approximately equal to the desired length of journal, as shown in Figs. 6 and 8. In order to provide an even surface at the bottom of the grooves formed by the lands or ribs 18 19 20, the latter should be made progressively higher, so that each succeeding land should have a slight reducing action on the parts of the article operated on by the preceding lands or ribs. The body of the roll between the raised end portions is constructed to be nearly in contact with the portion or portions of the article reduced in the stand of rolls A, so as to prevent any bending or spring of the axle.

As shown in Fig. 10, the reduction of the blank can be effected by two rolls having reducing lands or surfaces, as described, except that such reducing lands or surfaces should have a length around the roll at least equal to half the perimeter of the portions of the articles operated on by such lands or reducing-surfaces. The rolls are provided with longitudinal grooves 13ᵇ, having a depth and width approximately equal to the diameter of the blank and arranged in advance of the points at which the reducing lands or surfaces start. Guides 21 are arranged on the inner faces of the housings of the rolls to direct and retain a blank in the groove of the upper roll. These guides may extend suffi-

ciently around the lower roll to prevent the axle from dropping out of the groove in the lower roll until such groove has reached its point, or nearly so.

In rolling axles a heated blank is dropped into the groove 13[b] of the upper roll and is carried by said groove, being held therein by the guides 21 until in or approximately in a plane passing through the axes of the rolls. The blank is then free to drop into the lower rolls. The blank will then be caught between the reducing lands or surfaces of the rolls, which are driven in opposite directions. As the rolls complete a revolution, or nearly, the reduced article will drop into the groove in the lower roll and be carried around and dropped onto guides or rails, and by which it will be directed to another stand of rolls if further reduction is desired. While not considered necessary, a retaining-bar 22 may be arranged in the rear of the rolls to prevent the blank from slipping from reducing position.

It is preferred that part of the shaping of the blank should be effected by one stand of rolls and the finishing by a second stand of rolls; but such distribution of reduction will depend upon the relative sizes of the rolls and article to be produced.

As only such portions as are reduced in the stand of rolls A are in contact with the rolls there will not be any material chilling of the portions to be reduced by the rolls in stand B. Hence the entire reduction of the article can be effected at one heat.

It will be understood by those skilled in the art that only two oppositely-rotating rolls, having suitable reducing-surfaces, can be used, provided suitable guides for holding the blank in position be employed.

I claim herein as my invention—

1. A rolling-mill having in combination rolls provided with reducing-surfaces of substantially uniform width throughout their length, arranged to be successively operative on different portions of the article and progressively from point to point along the same, substantially as set forth.

2. A rolling-mill having in combination rolls each provided with diverging reducing-surfaces of substantially uniform width arranged to be successively operative over limited areas on the article, and progressively from point to point along the same, substantially as set forth.

3. A rolling-mill having in combination rolls each provided with a longitudinal receiving-groove, and with raised reducing-surfaces extending in diverging lines from said groove, and having substantially uniform reducing areas, substantially as set forth.

4. A rolling-mill having in combination rolls each provided with raised diverging reducing-surfaces of substantially uniform width throughout their lengths and operative over limited areas, and with parallel reducing-surfaces outside of the diverging surfaces, substantially as set forth.

In testimony whereof I have hereunto set my hand.

FRANCIS R. SCHNEIDER.

Witnesses:

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F. E. GAITHER.