(No Model.) 3 Sheets—Sheet 1.

# J. T. ROWLEY.

## MACHINERY FOR SHAPING IRON OR STEEL AXLES.

No. 445,662. Patented Feb. 3, 1891.

*Fig. 1.*

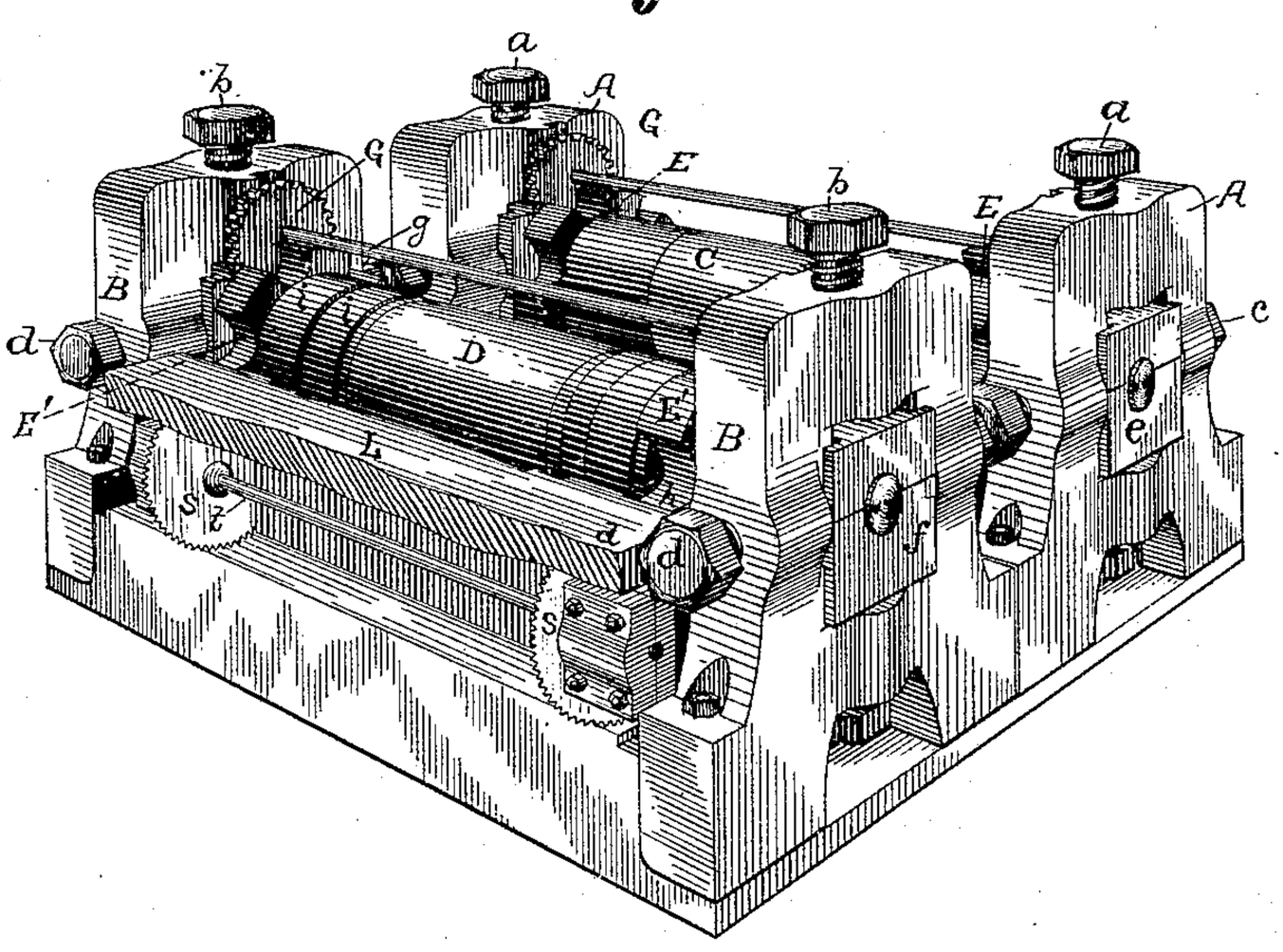
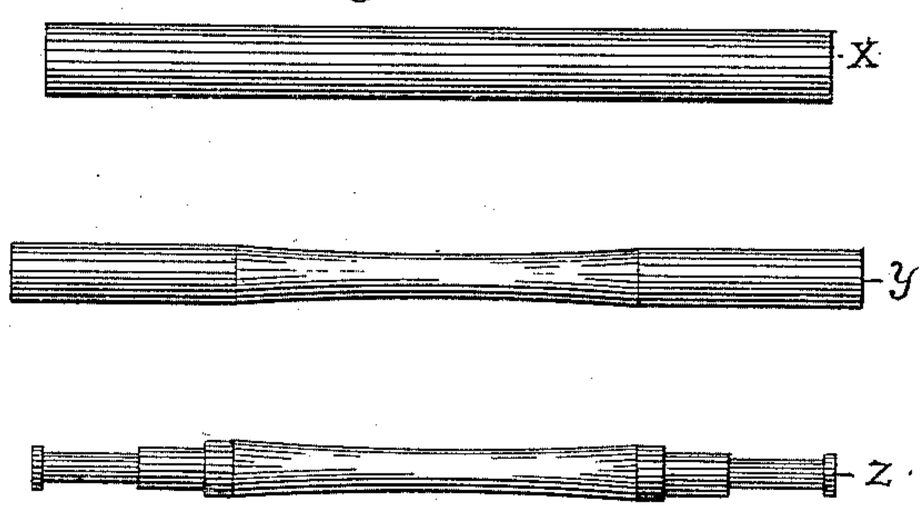



*Fig. 2.*

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(No Model.) 3 Sheets—Sheet 2.

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## MACHINERY FOR SHAPING IRON OR STEEL AXLES.

No. 445,662. Patented Feb. 3, 1891.

*Fig. 3.*

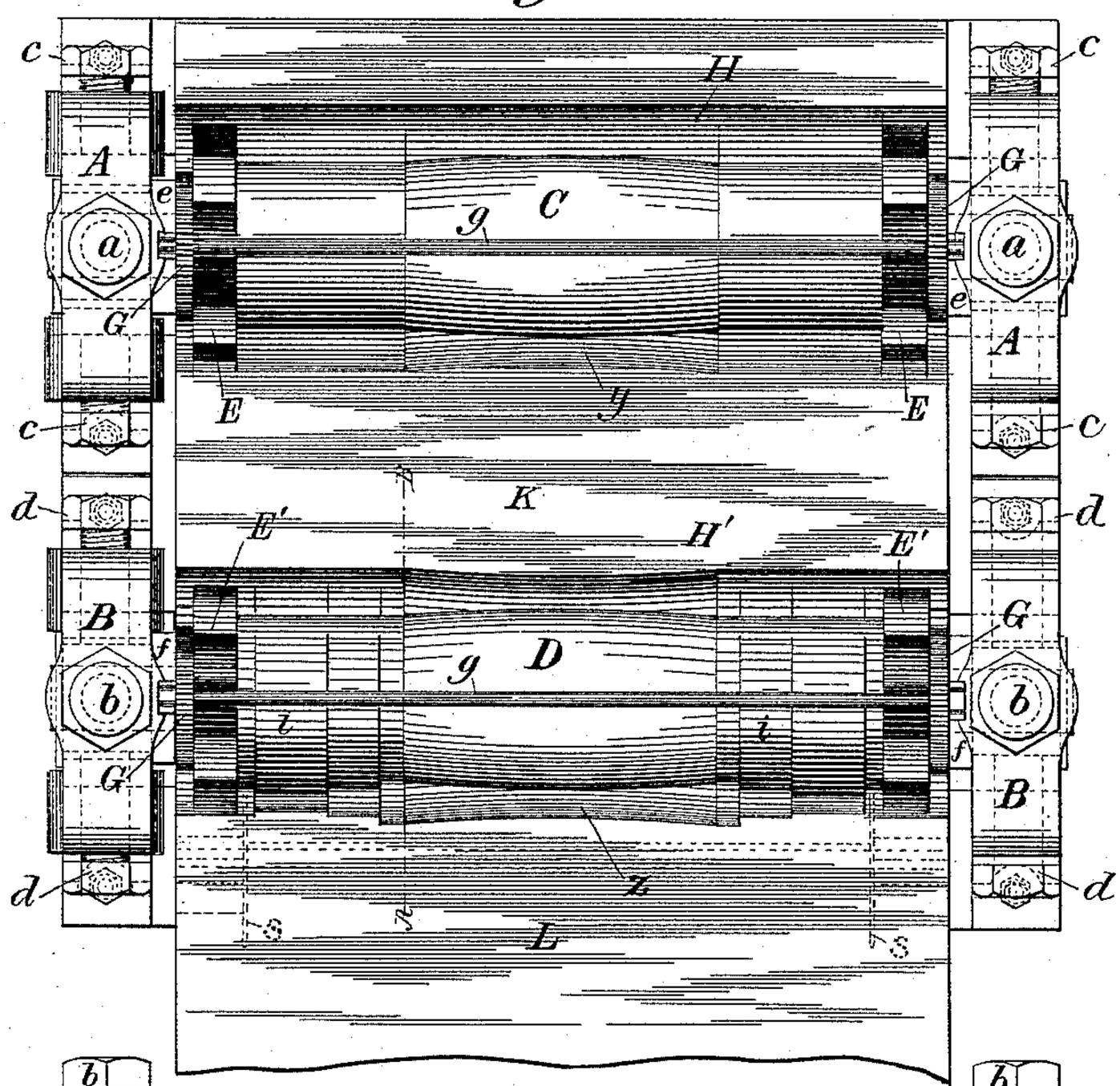
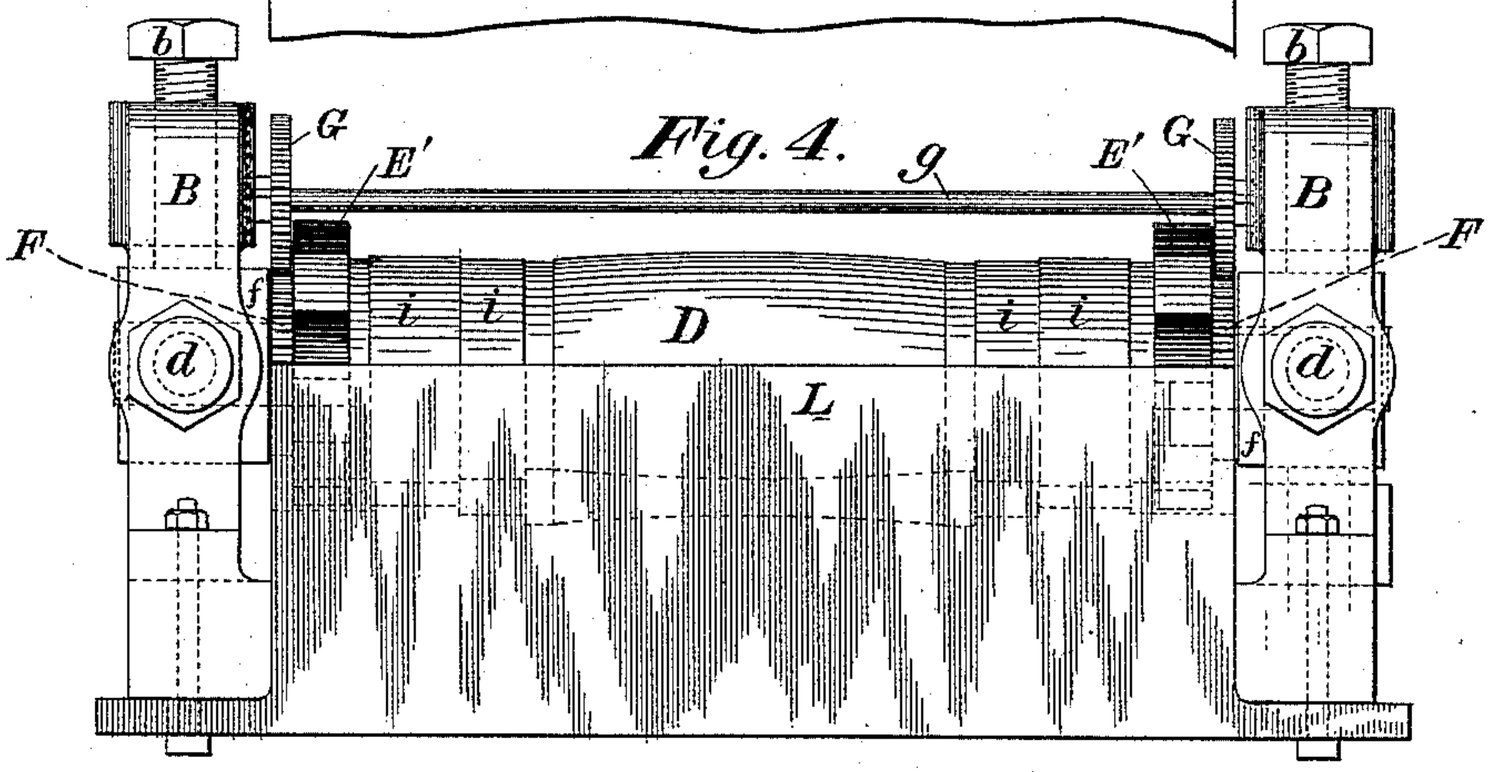



*Fig. 4.*

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(No Model.) 3 Sheets—Sheet 3.

# J. T. ROWLEY.

## MACHINERY FOR SHAPING IRON OR STEEL AXLES.

No. 445,662. Patented Feb. 3, 1891.

*Fig. 5.*

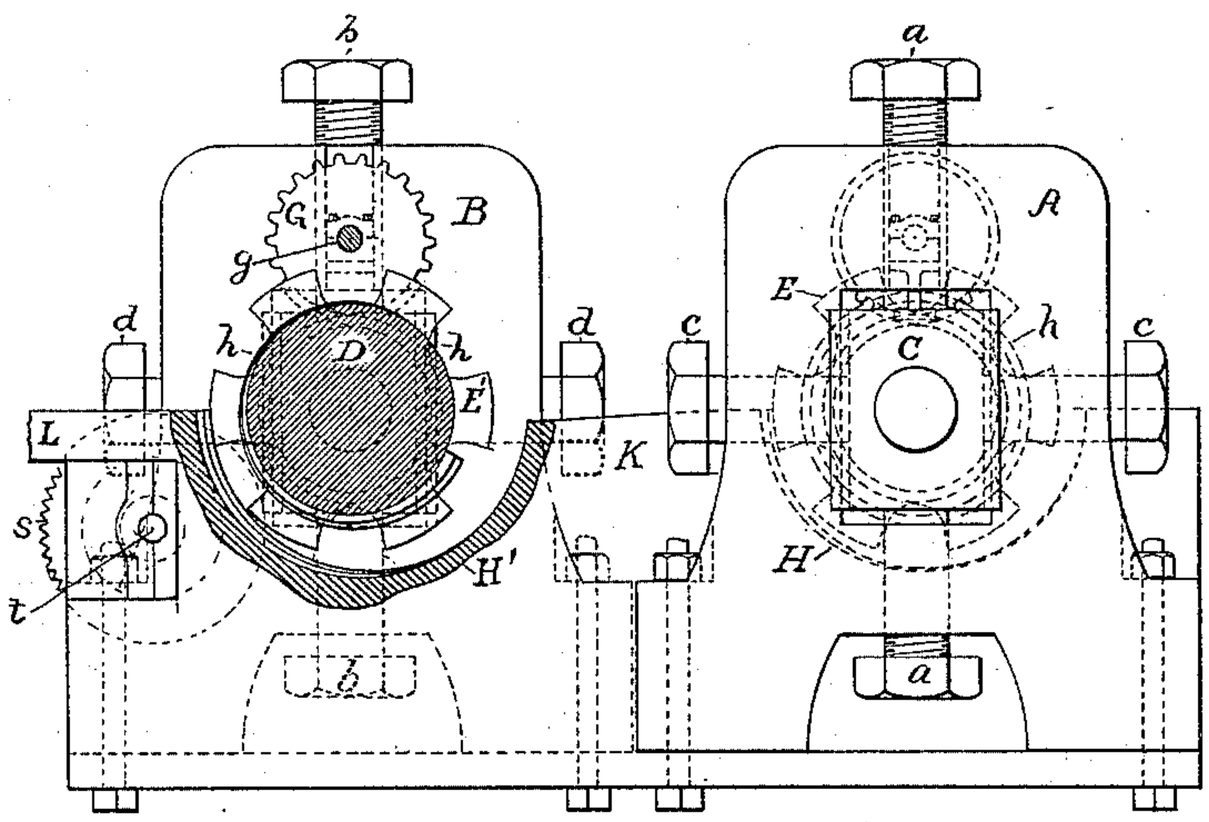
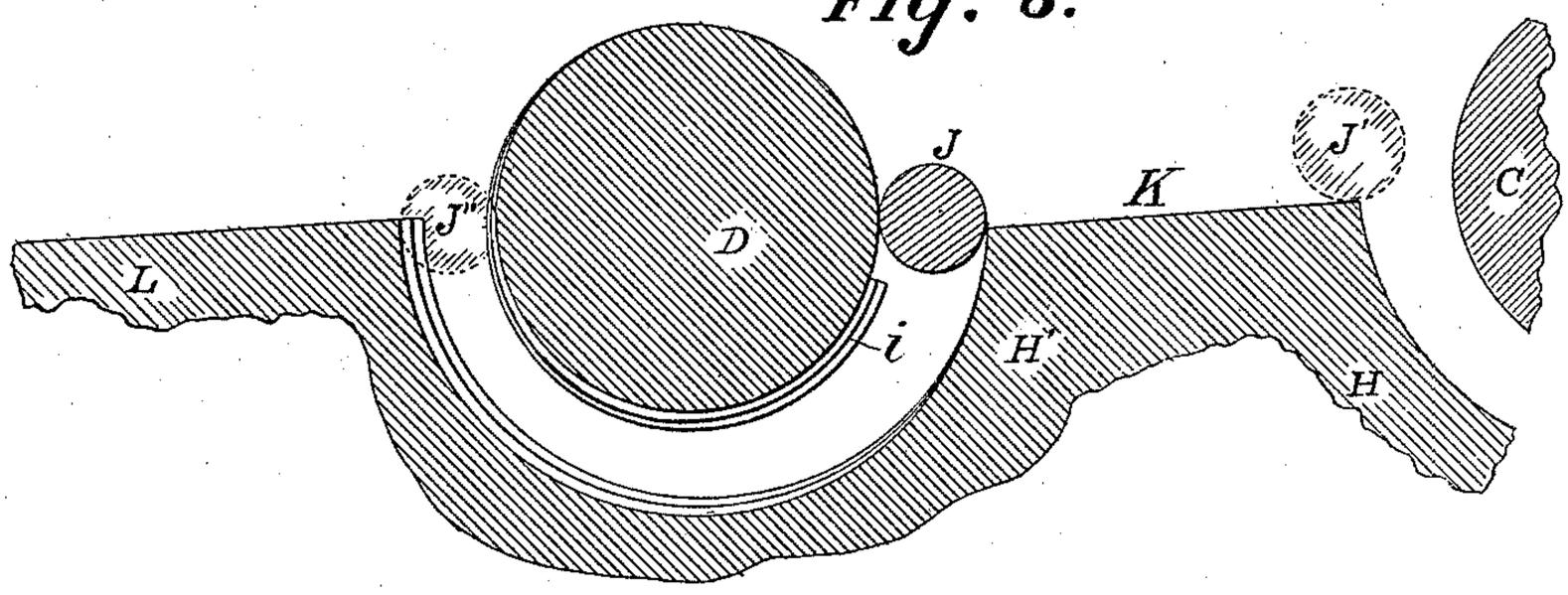



*Fig. 6.*

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# UNITED STATES PATENT OFFICE.

JOHN THOMAS ROWLEY, OF JOHNSTOWN, PENNSYLVANIA.

## MACHINERY FOR SHAPING IRON OR STEEL AXLES.

SPECIFICATION forming part of Letters Patent No. 445,662, dated February 3, 1891.

Application filed October 23, 1890. Serial No. 369,011. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN THOMAS ROWLEY, of Johnstown, in the county of Cambria and State of Pennsylvania, have invented a new and useful Improvement in Machinery for Shaping Iron or Steel Axles or other Articles, of which the following is a full, clear, and exact description.

I shall in this specification describe my improved machinery as applied to the manufacture of metallic axles from cylindrical bars of iron, the production of other articles of irregular shape in cylindrical section involving obvious modifications of shape of those parts of the machinery which are operative in shaping the metal.

The object of my invention is to form metallic axles, &c., from cylindrical bars or blanks of iron or steel by causing the cylindrical bar to traverse the gradually-contracting pass of one or more sets of formers, each set consisting of a cylindroidal roll and a concave die, the blank being so guided and held as to preserve a position of parallelism to the axis of the roll. Where more than one set of formers are used the pass between the roll and concave die in each set approaches the final shape of the article to be formed gradually, the first set making a slight change from the cylindrical shape of the blank, while the last set produces exactly the required form.

In the manufacture of axles two sets of formers will usually suffice to produce the finished article, and therefore in the accompanying drawings I have shown two sets only.

In the drawings accompanying and forming part of this specification, Figure 1 is a perspective representation of my machine composed of two sets of formers. Fig. 2 represents the cylindrical bar and finished axle and the blank in an intermediate condition. Fig. 3 is plan view of the machine shown in Fig. 1. Fig. 4 is a front view of the same. Fig. 5 is an end view thereof, and Fig. 6 is a cross-section through one of the sets of formers and dies on the line A B of Fig. 3.

In the several figures like symbols of reference indicate the same parts of the mechanism.

Fig. 1 shows two sets of formers, which are placed side by side parallel to each other, and may be connected to the same foundation.

A A are the housing of the roll of one set, and B B of the other set. Each pair of housing carries one roll, that in housing A being marked C and that in housing B being marked D, *a a b b* being the ordinary housing-screws for the vertical adjustment of the rolls C D, and *c c d d* being additional housing-screws placed at the sides of the housing and bearing upon the journal boxes or bearings *e e f f* of the rolls. Each bearing of each of the rolls C D has, in addition to the ordinary housing-screw, two additional housing-screws, one on each side, so that the position of the rolls C and D may be adjusted horizontally as well as vertically. The purpose of this adjustment will be explained presently.

At each end of each of the rolls C and D is placed a notched circular plate or carrier E, which is journaled loosely on the neck of the roll, so as to revolve on its axis independently of the revolution of the roll. Each of these carriers has attached to it a gear-wheel F, (shown in Fig. 4,) which gears into a cog-wheel G on the shaft *g*, the gear-wheels F and G being of the same diameter as the corresponding gear-wheels F and G at the other end of the rolls, so that the two carriers E connected with each roll rotate exactly in unison. The notches *h* in the carriers are substantially semicircular and of diameter corresponding to the diameter of the cylindrical blank which is to be operated upon, as they are designed to receive the two extremities of the cylindrical blank and guide it round through the pass between the roll C or D and its counterpart or concave die H. (See Fig. 6.) There are several notches *h* in the circumference of each carrier, so that, if desired, two or more bars may be operated upon at the same time, or the notches may be of slightly-different diameters, so as to receive bars of slightly-different size.

Immediately underneath each of the rolls C and D is placed a concave die H, having a cavity somewhat less than a semicircle in diameter and corresponding to the contour of the cylindroidal former, the space between the surfaces of the roll C or D and die H

forming the pass, through which the axle-blank J is guided in a position parallel to the axis of the roll by the carriers E and carried by the rotation of the roll C or D on its axis. If the axis of the roll C or D and its center of rotation were placed so as to be coincident with the center of the semicircular cavity of the die H, the blank J would pass through without being reduced in diameter after it had once entered, and would not be well shaped; but in operation the center of the revolving roll C or D is set by means of the side screws *c c* or *d d* slightly to one side of the center of the concave die H, as shown in Fig. 6, so that the blank J is somewhat reduced in diameter, as well as shaped or tapered in passing through between the roll C or D and die H. When the blank J has been shaped by passing between the roll and die of the first set of formers, it reaches the position shown at *y* in Fig. 3, and is then ejected from the pass by the rotation of the roll, and being only loosely held by the carrier E it rolls down the inclined bed-plate K, which connects the upper edges of the concave dies H H′ and enters the pass between the second set of formers—that is, between the roll D and die H′, as shown in Fig. 6, in which J represents the blank after being operated upon by the first set of formers entering the pass of the second set, the dotted circle J′ representing the blank as it leaves the first set, and the dotted circle J″ the fully-shaped axle as it leaves the second set, the position of the axle at this time being shown at *z* in Fig. 3.

The roll C of the first set of formers is preferably merely swelled in the middle, and is without collars, so as to reduce the blank from the cylindrical shape of *x* in Fig. 2 and give it the shape shown at *y* in the same figure, and the roll D of the second set is furnished with collars *i i*, &c., by means of which the axle is reduced in diameter at each end and receives its finished shape, as shown at *z* in Fig. 2.

At the delivery end of the machine, under the bed-plate L, are placed two saws *s s* on a driven shaft *t*, the saws entering the die H′ and projecting far enough into its cavity to sever from it that portion at each end of the blank which was within the notches of the carriers E E, the waste pieces thus severed falling away from the carriers and passing out of the machine.

The operation of the machine is as follows: The cylindrical blank of suitable length and diameter, as at *x* of Fig. 2, is placed on the fore-plate of the machine in front of and parallel to the first former-roll C, the fore-plate being preferably slightly inclined toward the roll. The blank is of such length that it cannot enter the pass between the roll C and die H until one of the notches in each of the carriers E at the opposite ends of the roll C comes in line with the blank which then enters the notches and is carried round by the rotation of the roll, guided by the carriers through the pass or space between the roll C and die H. At the same time the revolution of the roll causes the blank to be rotated on its axis. As the pass between the roll C and die H gradually diminishes in diameter or bite, the blank is reduced and shaped. The blank is carried round until it rises out of the pass of the first set of formers, when it drops onto the bed-plate or table K between the two dies H and H′. This table being slightly inclined causes the blank to roll to the entrance of the pass between the former-roll D and the die H′, when it enters the notches in the carriers E′ and is carried round through the pass between the roll D and die H′, as before described, and before leaving the pass the saws *s s* cut off the unformed ends of the axles and it is then automatically delivered onto the bed-plate at the delivery end of the machine.

In case of merely tapering a bar of iron or steel, or where there is not much change to be made in the contour of the blank, it may suffice to use only a single set of formers, (roll and die,) or, where it is desired, three sets or more may be used, connected together as above described, so as to deliver the blank or bar which is being operated upon automatically from one set of formers to the next one in succession. If desired, instead of setting the axis of the revolving former to one side of the axis of the die the former or die, may be made with an eccentric contour; but the arrangement I have described I deem the preferable one.

For some purposes my machine may be used with a cylindrical roll and die, the diameter of the pass between them being equal at all points in their length, though increasing gradually in diameter circumferentially.

As I believe myself to be the first inventor of a practical mode of rolling or shaping bars of metal between a revolving cylindrical or cylindroidal roll or former and a concave die where the axis of the blank is parallel or substantially parallel to the axis of the revolving former, I desire to cover that process whether the blank is tapered or altered in shape or remains when finished of cylindrical shape.

Having thus described my improvement, what I claim as my invention is—

1. The process hereinbefore described of rolling or shaping bars of iron or steel or other metal by passing the same between a revolving roll and a concave die, the blank being retained during its passage in a position substantially parallel to the axis of the roll, substantially as described.

2. The combination of a revolving roll and a concave die having its axis parallel to that of the roll, and mechanism, substantially as described, for holding the blank to be operated upon parallel to the axis of the former while it is rotated on its axis and carried through the pass between the roll and die and rotated by the revolution of the roll.

3. The combination, with a roll, of a carrier placed concentrically with the roll and notched or otherwise adapted to receive and hold a blank or bar of metal to be carried around or revolve with the roll while permitting the blank to revolve on its axis, substantially as and for the purposes described.

4. In combination with a revolving roll or former, a concave die, within the cavity of which the roll revolves on its axis, and carriers for holding the blank to be operated upon parallel to the axis of the roll and permitting it to rotate on its axis while traversing the pass between the roll and die, substantially as described.

5. In combination with a roll or former, a concave die to receive the roll and having its axis parallel thereto, carriers for holding the blank and carrying it through the pass between the roll and die, and saws adjacent to the carriers to sever from the finished blank that part of the blank which was within the carriers and out of contact with the surface of the roll, substantially as described.

6. The combination of two or more sets of formers, each consisting of a roll and die, with carriers substantially such as described for rolling or shaping bars of metal placed parallel to the axis of the formers, and an inclined table or fore-plate between such sets for the purpose of automatically delivering the blank from one to the other, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 16th day of October, A. D. 1890.

JOHN THOMAS ROWLEY.

Witnesses:
JNO. S. TITTLE,
W. MILT. BROWN.