(No Model.) 3 Sheets—Sheet 1.

H. A. WILLIAMS.

ROLLING MILL.

No. 395,024. Patented Dec. 25, 1888.

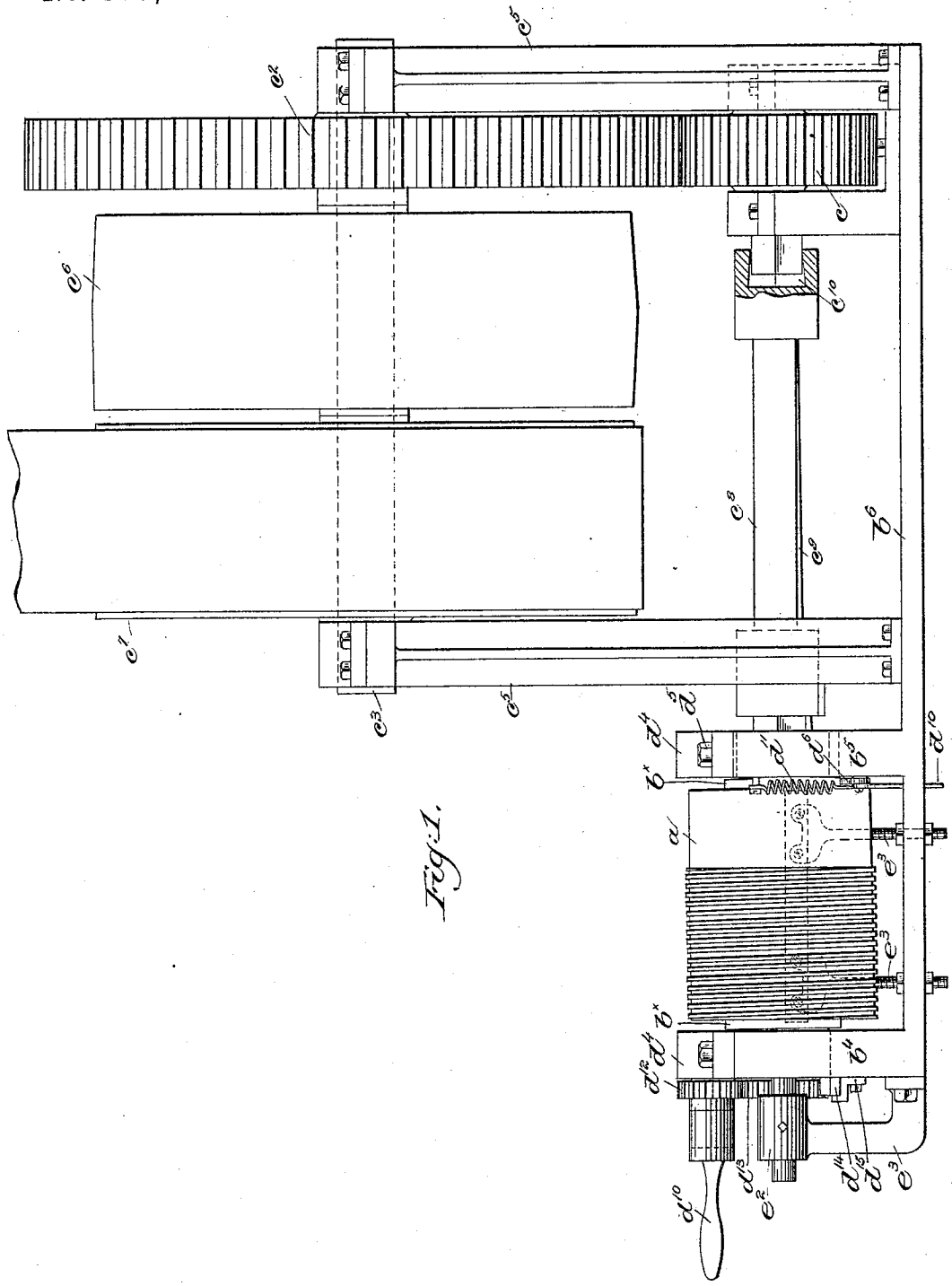


Fig. 1.

Witnesses.
Fred. S. Crumb of
Frederick L. Emery.

Inventor.
Henry A. Williams.
by Cerosby & Gregory
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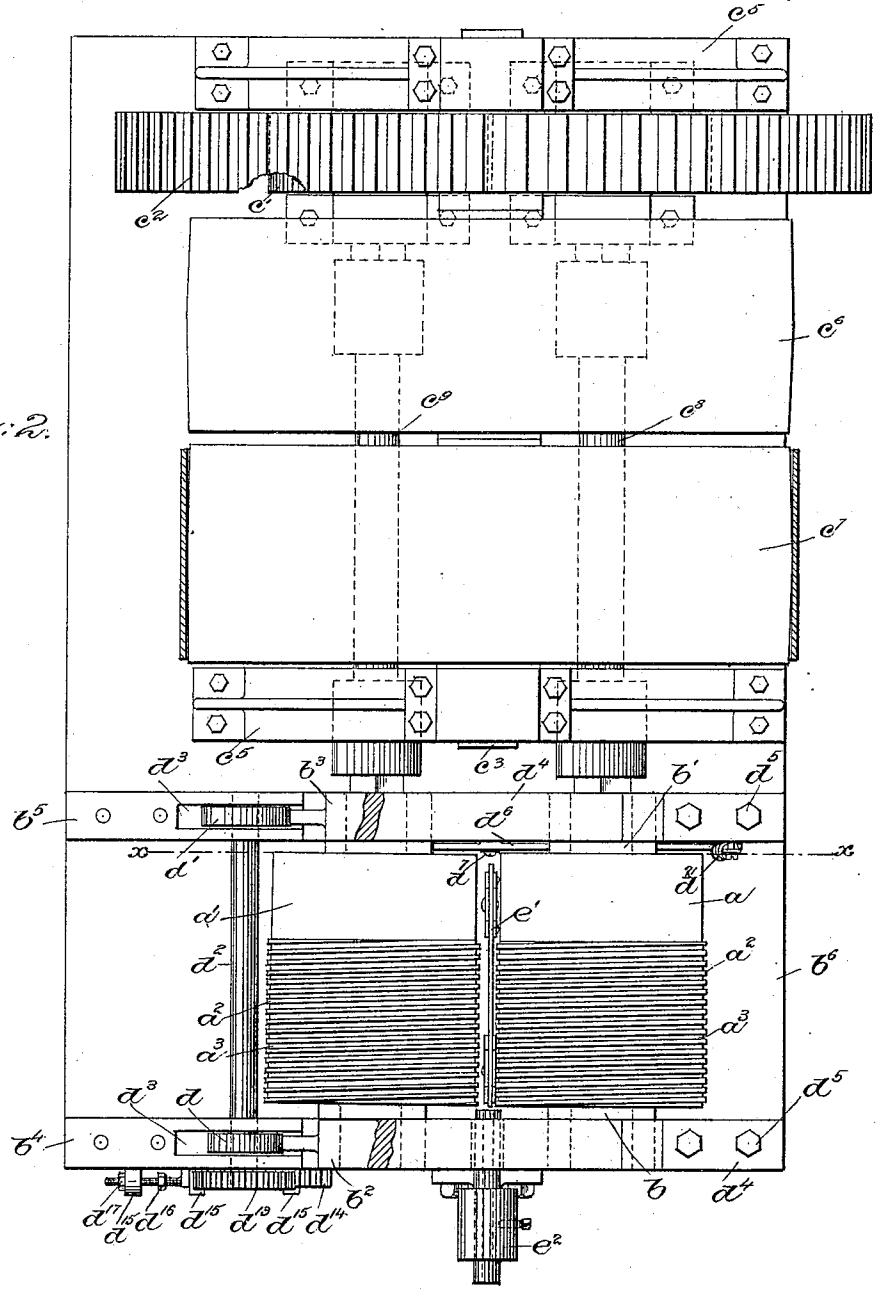
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Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

H. A. WILLIAMS.

ROLLING MILL.

No. 395,024. Patented Dec. 25, 1888.

Fig. 3.

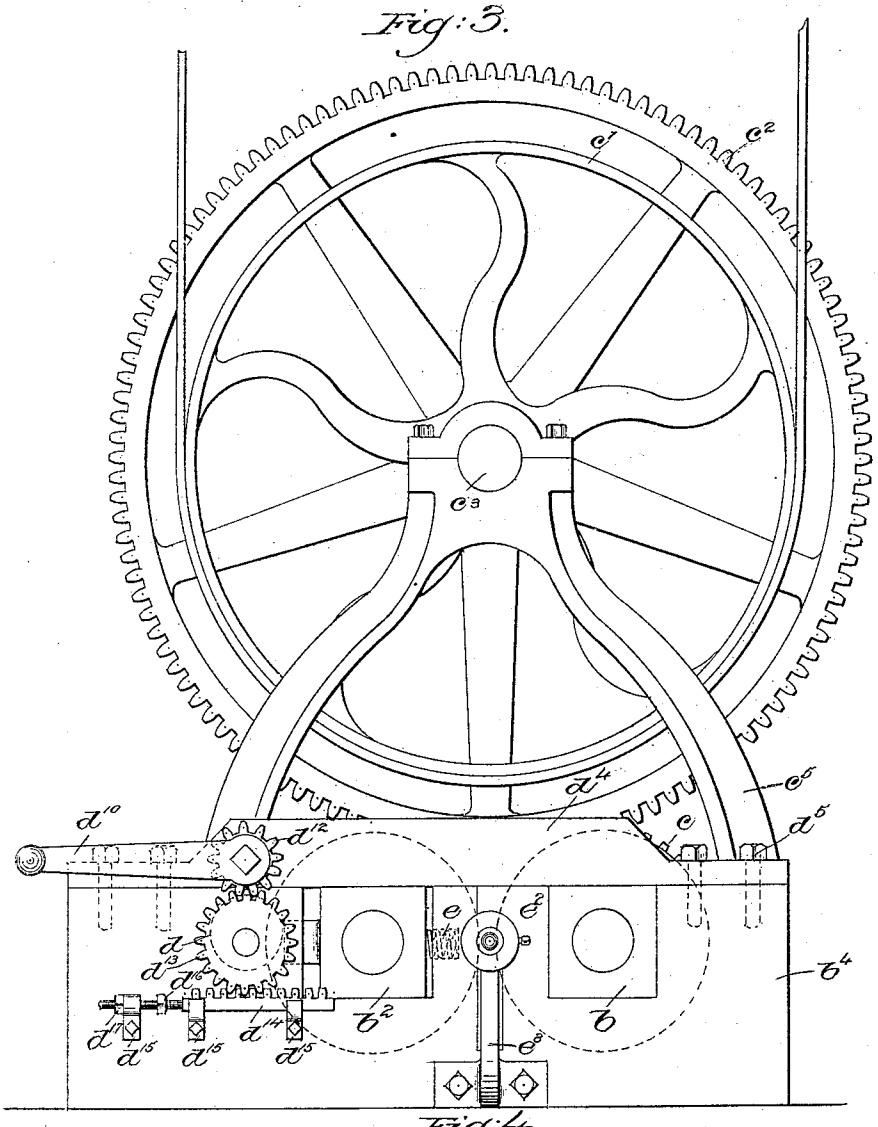
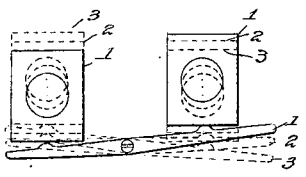
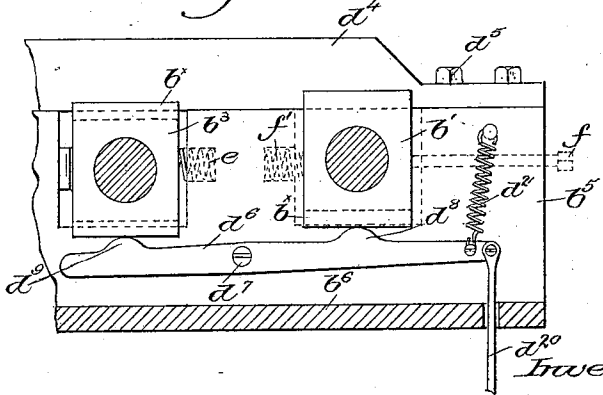


Fig. 4.

Fig. 5.





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UNITED STATES PATENT OFFICE.

HENRY A. WILLIAMS, OF TAUNTON, MASSACHUSETTS.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 395,024, dated December 25, 1888.

Application filed January 24, 1888. Serial No. 261,744. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. WILLIAMS, of Taunton, county of Bristol, and State of Massachusetts, have invented an Improvement in Machines for Reducing and Shaping Metal Rods, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to mechanism for reducing and shaping metal objects substantially cylindrical in cross-section from a larger to a smaller diameter, and is an improvement upon the mechanism shown and described in my United States patent, No. 367,879, dated August 9, 1887.

In accordance with my invention the metal object to be reduced or shaped—such as a rod or bar—is placed between two rolls revolving in the same direction and having their surfaces grooved to form and leave a series of projecting inclined lands, the bar or rod to be reduced in diameter or to be shaped being caught between the said rolls by moving one of them toward the other, the bar or rod so nipped being rotated by the said rolls and drawn to the required shape.

One feature of this invention consists in providing a stop or regulating device, as will be described, by means of which the metal rods or bars may be reduced to substantially the same diameter to secure uniformity in the work produced.

Another feature of my invention consists in providing a feed-controlling device, to be described, by which the position of the axes of the reducing-rolls may be changed to automatically feed the metal rod or bar in either direction—that is, forward or backward—between the said rolls.

Other features of my invention will be pointed out in the claims at the end of this specification.

Figure 1 is a side elevation of a machine embodying my invention, one of the coupling-bars at one end being broken out; Fig. 2, a top or plan view of the machine shown in Fig. 1, the caps of the journal-boxes being broken out to show the cams employed to change the movable roll; Fig. 3, a front end elevation of the machine; Fig. 4, a section of Fig. 2 on line $x\ x$, and Fig. 5 a detail to be referred to.

In the present embodiment of my invention I have shown but a single set or pair of reducing or shaping rolls, $a\ a'$, the roll a being hereinafter designated by me as the "fixed" or "stationary" roll and the roll a' as the "movable" roll. Each roll $a\ a'$ is provided for at least part of its length, as shown, with strips or lands a^2, which are preferably concentric with the axes of the said rolls and are separated by grooves or depressions a^3, preferably of less width than the said lands. I prefer to have these lands extend continuously around the circumference of these rolls at a pitch of about six threads to the inch, each of said rolls being so placed that it will act on the rod or bar at diametrically-opposite points. The rolls $a\ a'$ have their journals supported in boxes $b\ b'$ and $b^2\ b^3$, respectively, (see Figs. 2, 3, and 4,) loosely fitted in uprights or housings $b^4\ b^5$ of a base, b^6, forming part of the frame of the machine.

Each journal-box is retained in place, as shown, by a flange, $b^\times$, which bears against the inner side of the housings $b^4\ b^5$. (See Figs. 1 and 4.) The rolls $a\ a'$ are rotated in the same direction, as herein shown, by pinions $c\ c'$, in mesh with and driven by a gear, c^3, mounted on a shaft, c^3, supported in uprights c^5, and provided, as shown, with a fast pulley, c^6, and loose pulley c^7, the said rolls being connected, as shown, by coupling-rods $c^8\ c^9$, each enlarged at both of its ends and provided with a square or other shaped socket, c^{10}, to fit the square or other shaped end of the journals of the said rolls and of the shafts of the pinions $c\ c'$. (See Fig. 1.) The roll a is substantially fixed or stationary while in operation, and the roll a' is capable of being moved toward and from the said fixed roll during the operation of the machine, it being moved toward the said roll, as shown, by cams $d\ d'$ on a shaft, d^2, the said cams or equivalents being shown as located in recesses or pockets d^3 in the housings $b^4\ b^5$, they being covered in practice by the caps d^4, secured, as shown, by bolts d^5 to the said housings.

The cam-shaft d^2 may be operated, as shown, by turning a crank or handle, d^{10}, secured to the arbor of a pinion, d^{12}, in mesh with a gear,

d^{13}, on the said cam-shaft, the said gear engaging a rack-bar, d^{14}, movable in guides d^{15}, and herein shown as screw-threaded for a portion of its length, to be engaged, as shown, by nuts d^{16} d^{17}, one on either side of a stop, shown as one of the guides, the said rack-bar, stop, and nuts constituting the pressure-regulating device of the machine.

The machine herein shown is especially adapted to form spindles and like tapering objects, the taper being effected, as shown, by inclining the axis of the roll a' toward the axis of the roll a, which in the present instance is effected by changing the position of the cam d' on the shaft d^2 to vary its eccentricity, so that the said cam will act on the journal-box b^3 to move that end of the roll a' toward the roll a before the cam d operates to move its end of the roll a' toward the roll a, the journal-boxes b^2 b^3 of the roll a' being capable of sliding in their housings. The journal-boxes b^2 b^3 are normally forced toward the cams, as shown, by springs e, seated in sockets in the housings b^4 b^5. (See Figs. 3 and 4.) The metal rod to be reduced and shaped will be sustained, as herein shown, by guides e' e^2, supported by uprights e^3. In the operation of the machine as thus far described the rod to be reduced and shaped is placed between the rolls, it being sustained by the support e^2, and the rolls having been set in motion by shipping the belt from the loose to the fast pulley the roll a', as herein shown, is moved bodily toward the roll a by turning the crank or handle d^{10} until the metal rod is nipped between and rotated by the said rolls.

The force with which the metal rod is nipped between the said rolls determines the rapidity of the flow of the metal and consequent reduction of the rod, and the said force may be regulated, as herein shown, by controlling the amount of power applied to the crank or handle in moving the roll a' toward the fixed roll a. The nut d^{16} on the threaded portion of the rack-bar acts as a stop to limit the forward movement of the roll a', so that the successive metal rods or bars will be reduced to substantially the same diameter or shape in cross-section, thus insuring uniformity of work.

The amount or degree of taper imparted to the metal rod or bar may be changed by varying the inclination of the axes of the rolls toward each other, which may be accomplished by changing the eccentricity of the adjustable cam or equivalent on its shaft. If this does not give the exact taper required, the journal-box b', which is maintained normally pressed against a set-screw, f, (shown by dotted lines in Fig. 4,) by a spring recessed in a socket in the housing b^5, may be accurately adjusted by this set-screw; but when the exact taper required has been thus obtained then the roll a in the operating of the machine is fixed, the roll a' being moved toward the roll a by means of the cams, as described.

In practice the axes of the rolls a a' may be made to occupy three different positions with relation to each other, as indicated by the dotted and full lines, Fig. 5, and marked, respectively, 1, 2, and 3. The relative positions of the said axes is changed, as herein shown, by means of a lever, d^6, pivoted, as at d^7, to the housing b^5 and having lugs or ears d^8 d^9, upon which rest the journal-boxes b' b^3, respectively, the said lever being connected by link d^{20} preferably to a foot-treadle. (Not shown.) The axes of the rolls normally occupy the position marked 1, they being held in the said position, as shown, by a spring, d^{21}, secured to the housing b^5, the rolls when in this position producing an outward feed of the metal rod.

To feed the metal rod into the machine, the operator depresses the treadle, so as to bring the rolls into the position marked 3—that is, opposite to that marked 1. To effect the flow and consequent reduction of the metal rod or bar without feeding it in either direction, the rolls are brought into the position marked 2—that is, with their axes in the same horizontal plane. It will thus be readily seen that the metal rod may be kept moving in and out between the rolls by alternately changing the position of the axes of the said rolls from 1 to 3, and vice versa.

I prefer to have the lands and grooves on the rolls extend completely round the circumference thereof; but I do not desire to limit myself to the use of such rolls, as rolls having the grooves extended nearly but not quite around their circumference may be used with good results, as the said rolls would find their true center by means of the yielding or movable boxes supporting them.

Instead of the particular shaped rolls of uniform diameter herein shown, I may employ rolls of varying diameter having an irregular contour of a shape to conform to the article to be produced, such as projectiles, &c.

I claim—

1. In a machine for drawing, reducing, and shaping metal rods or bars, the combination, with rolls by which to reduce or shape a metal rod or bar or other object and a cam to move one roll bodily toward the other, of a stop or pressure-regulating device to limit the movement of the said movable roll, to thereby obtain uniformity in work, substantially as described.

2. In a machine for drawing, reducing, and shaping metal rods, the combination, with rolls by which to reduce and shape a metal rod or other object, of movable boxes to support said rolls and a feed-regulating device to act on said boxes to regulate the relative position of the said rolls, whereby the said metal rod may be fed in either direction, substantially as described.

3. In a machine for drawing, reducing, and shaping metal rods, the combination, with rolls by which to reduce and shape a metal rod or other object, of movable boxes to support said rolls, a cam to move one roll

bodily toward the other, a stop or pressure-regulating device to limit the movement of the said movable roll, and a feed-regulating device to act on the said boxes, whereby the metal rod may be fed in either direction, substantially as described.

4. In a machine for drawing, reducing, and shaping metal rods, reducing and shaping rolls having lands and grooves and a cam to move one roll toward the other, combined with a stop or pressure-regulating device to limit the movement of the said roll, substantially as described.

5. In a machine for reducing and shaping metal rods, the combination, with reducing and shaping rolls provided with lands and grooves and having their journals supported in boxes loosely mounted in the frame of the machine, combined with springs *e*, to act against said journal-boxes and maintain the same substantially rigid until positively moved, substantially as and for the purpose specified.

6. In a machine for reducing and shaping metal rods, the combination, with reducing and shaping rolls provided with lands and grooves and having their journals supported in boxes loosely mounted in the frame of the machine, combined with springs *e*, to act against said journal-boxes and maintain the same substantially rigid until positively moved, and with an adjusting-screw, as *f*, to move one of the said journal-boxes to incline its roll toward the other roll, to thereby effect a taper, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY A. WILLIAMS.

Witnesses:
ELISHA T. JACKSON,
NELLIE B. LEONARD.