

(No Model.)

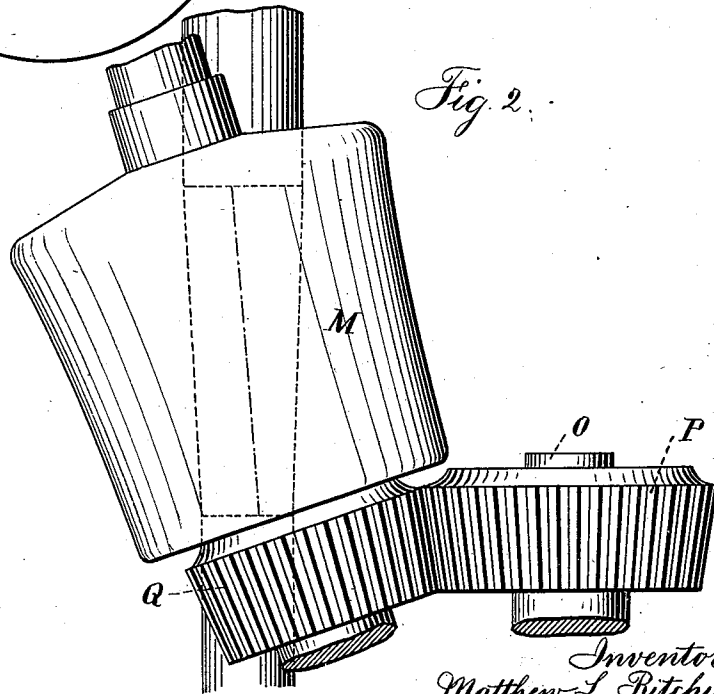
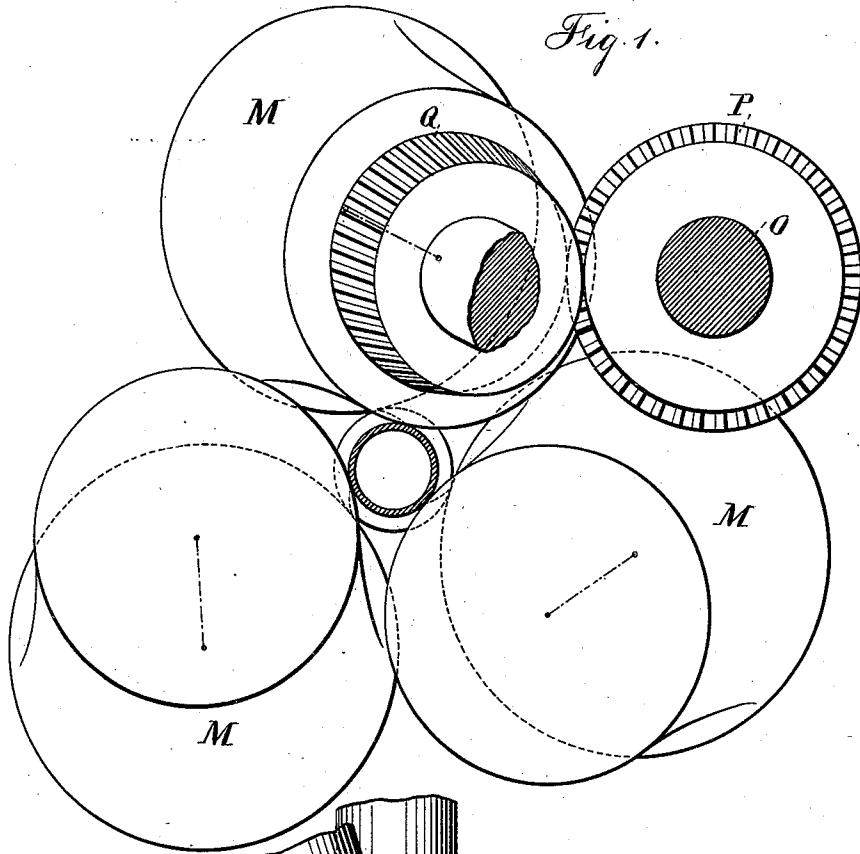
3 Sheets—Sheet 1.

M. L. RITCHIE.

ROLLS FOR REDUCING AND TAPERING TUBES AND RODS.

No. 374,703.

Patented Dec. 13, 1887.



Witnesses:
J. Strait
Chas. H. Smith

Inventor:
Matthew L. Ritchie
per Lemuel W. Farrell, atty.

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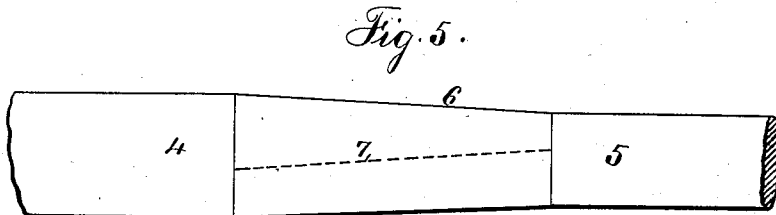
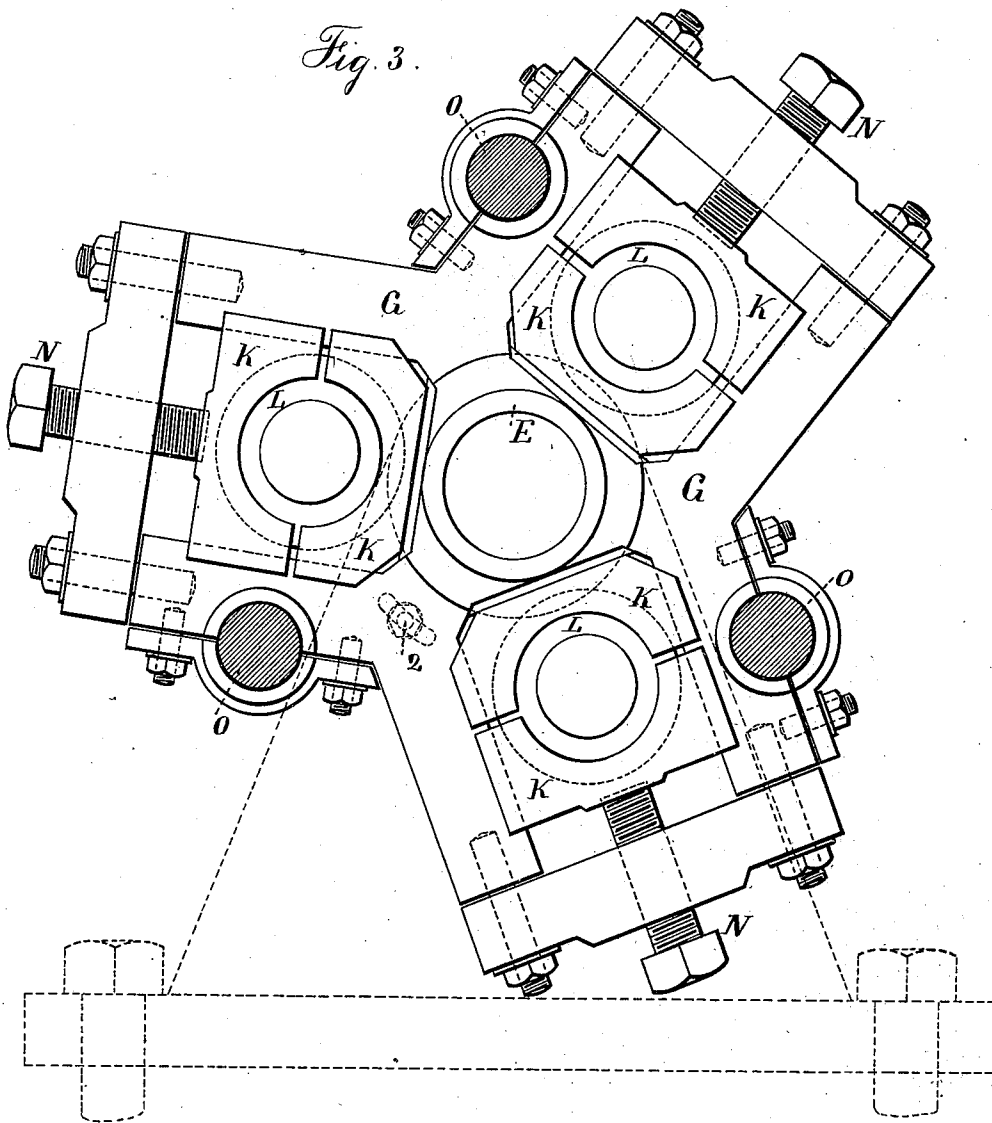
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UNITED STATES PATENT OFFICE.

MATTHEW L. RITCHIE, OF NEW YORK, N. Y.

ROLLS FOR REDUCING AND TAPERING TUBES AND RODS.

SPECIFICATION forming part of Letters Patent No. 374,703, dated December 13, 1887.

Application filed August 22, 1887. Serial No. 247,531. (No model.)

To all whom it may concern:

Be it known that I, MATTHEW L. RITCHIE, of the city and State of New York, have invented an Improvement in Rolls for Tubes, Shafts, and Rods, of which the following is a specification.

In the manufacture of wrought-iron tubes three equidistant rolls have been made use of to compress the metal and elongate the tube or the tubular ingot, and in some instances the axes of the rolls have been inclined to the axis of the tube, so that the tube is rotated and fed along endwise by the revolution of the rolls, and rolls of this same character have been employed upon rods and shafts to reduce and consolidate the same. In machines of this character the rolls have been sometimes made with elliptical surfaces—that is to say, the center of each roll has been of the smallest diameter, and the surfaces have been elliptical in their longitudinal section. In practice these rollers with elliptical surfaces are liable to injure the metal, especially when rolling thin iron tubes in a highly-heated condition, because the speeds of motion at the points of contact between the heated tube and the rolls do not correspond, the portions of the rolls of larger diameter moving faster than the surface of the tube with which they are in contact, and the smallest diameter of the rollers moving slower than the surface of the tube with which they are in contact; hence the one surface necessarily slips upon or against the other surface, and there is a tendency to disturb and injure the molecular structure of the iron.

My improvements are made for preventing the aforesaid difficulties in the manner hereinafter set forth.

In the drawings, Figure 1 is a section of the tube and an end view of the surrounding rolls. Fig. 2 is a plan view of one of the rolls and the driving-gear. Fig. 3 is an elevation of the frame and journal-boxes at one end of the rolls. Fig. 4 is a side elevation of the machine, and Fig. 5 is a diagram illustrating the manner of ascertaining the shape of the surface of each roll.

I make use of suitable standards, A B C, upon a bed-plate, and these standards are provided with circular openings in line with each other for receiving the tubular bosses D E of the adjustable frames F G. These tubular

bosses D E are sufficiently large for the largest tube, rod, or shaft that the machine can operate upon to pass freely endwise through them, and the frames F and G receive their support principally from these tubular bosses, and the frames with the tubular bosses can be turned around into any desired position and clamped either by clamping the bosses or by bolts at 2 passing through the slotted portions of the frames and standards, respectively.

It is preferable to make use of three rolls; but the numbers may be varied. I have shown each frame F and G as triangular and adapted to receive three journal-boxes, K, that can be adjusted radially nearer to or farther from the tubular bosses to adapt the rolls to different sizes of tubes or rods, and it is preferable to make the recesses in these boxes K segments of globes to receive the globular bearings L around each journal of each roll M. After the parts have been adjusted the journal boxes and bearings are clamped by the screws N, and it is preferable to introduce filling-plates between the inner half of each journal-box K and the frame F or G, according to the distances that the journals of the rolls M are to be held from the axis of the pipe or shaft that is being rolled.

The principal feature of my invention relates to the shape and character of the rolls M, the object being to construct the rolls M in such a manner that the speed of the surface in rolling and reducing a shaft or tube will correspond to the speed of the surface of the shaft or tube that is being operated upon, in order that the reduction may be regular or uniform without any disturbance of the molecular structure of the metal in consequence of differences in the surface speeds or of irregular action in the progressive reduction.

In order to determine the shape of each roll M and its angular position to the shaft or tube, a blank or mandrel may be turned up, having its largest diameter corresponding to the tube that is to be reduced, as indicated at 4, and its smallest diameter corresponding to the tube after it has been reduced, as seen at 5, and between these two portions the mandrel is a straight or nearly straight taper, as at 6, the length of the taper being slightly less than the length of the roll M. If, now, this mandrel is intersected by a plane, as illustrated by the

line 7 upon the diagram, Fig. 5, the section will denote the curved taper that is to be given to the surface of each roll M, and each roll M, being a little longer than the line 7, allows for the end portions of the rolls being rounded sufficiently to prevent there being any angle that could accidentally be brought into contact with the surface of the tube during the rolling operation.

It will be seen that the smallest diameter of each roll M is at one end and the largest diameter is at the other end; hence as the rolling operation progresses the smallest diameter of the rolls will always rest upon the smallest or reduced diameter of the tube, and the largest diameter of the rolls will rest upon the largest or unreduced portions of the tube, and the angular positions of the rolls and the measurements of such rolls are to be so proportioned that the surface speed of the rolls corresponds, or nearly so, to the surface speed of the tube or shaft that is being rolled; hence the reduction will be by a direct compression of the metal without any twisting action due to differences in the surface speeds, or any wrinkling or irregularity due to sudden or rapid reduction.

It is to be understood that each machine is to be adapted to certain sizes of tubes or rods, and that the rollers can be changed from time to time for different sizes of tubes or rods; but each set of rolls is to be made upon the principles before described, and in adjusting the machine to the different sizes to which one set of rolls may be adapted it is advantageous to employ a mandrel such as is illustrated by the diagram, Fig. 5, and to place it between the rolls and to adjust the journal boxes or bearings toward or from the center, and to partially rotate one or both frames F G and their tubular bosses until the respective rolls bear uniformly, or nearly so, upon the taper portion of the mandrel throughout the entire length of the taper, and when this is done the mandrel to be removed and the operations of the rolls in reducing a tube or shaft will be accurate and rapid and the surface of the metal will be left in the most perfect condition.

This improvement is available in rolling tubes with and without a stationary mandrel inside of the tube.

The rolls M are to be driven in any suitable

manner; but I prefer to use shafts O and pinions P, gearing into wheels or pinions Q upon the shafts of the respective rolls M, and these wheels P are represented at the smaller ends of the rolls; but they may be applied at the larger ends, if desired, and by placing the shaft O at the sides of the radial slides in the frame F or G the journal-boxes can be adjusted without separating the teeth of the gears to any injurious extent.

I am aware that three conical rolls have been used for reducing tubes and rods, and that in some instances the axes of the conical rolls have coincided with planes passing through the axis of the tube or rod being rolled. In these cases, however, the tube or rod had to be forced in between the revolving rolls. In other instances the axes of the conical rolls have been slightly diagonal to planes passing through the axis of the tube or rod being rolled, in order that the said tube or rod may be moved along endwise by the action of the rolls. In machines heretofore made of this character the rolls are conical, but straight-sided, and hence the tube or rod has a concave or hollowed taper at the place of reduction and the reduction cannot be gradual and regular for the entire length of the rolls; and in practice I find that metal tubes are liable to be wrinkled and rendered irregular in consequence of the rolls producing a curved and abrupt taper between the largest and smallest diameters of the rod or tube operated upon. In my improvements the tapering or conical rolls are concave longitudinally, so as to produce a regular and gradual taper upon the rod or tube being reduced, and thereby prevent injury to the metal and insuring greater accuracy in the operation.

I claim as my invention—

The combination, in a machine for rolling tubes or shafts, of three or more conical rolls and their journal-boxes and supporting-frames, each conical roll having concave sides and tapering to the smallest end, substantially as set forth.

Signed by me this 17th day of August, A. D. 1887.

MATTHEW L. RITCHIE.

Witnesses:

GEO. T. PINCKNEY,
WILLIAM G. MOTT.