

(No Model.)

3 Sheets—Sheet 1.

P. WEBER.

MANUFACTURE OF RAILWAY CAR AXLES.

No. 559,239.

Patented Apr. 28, 1896.

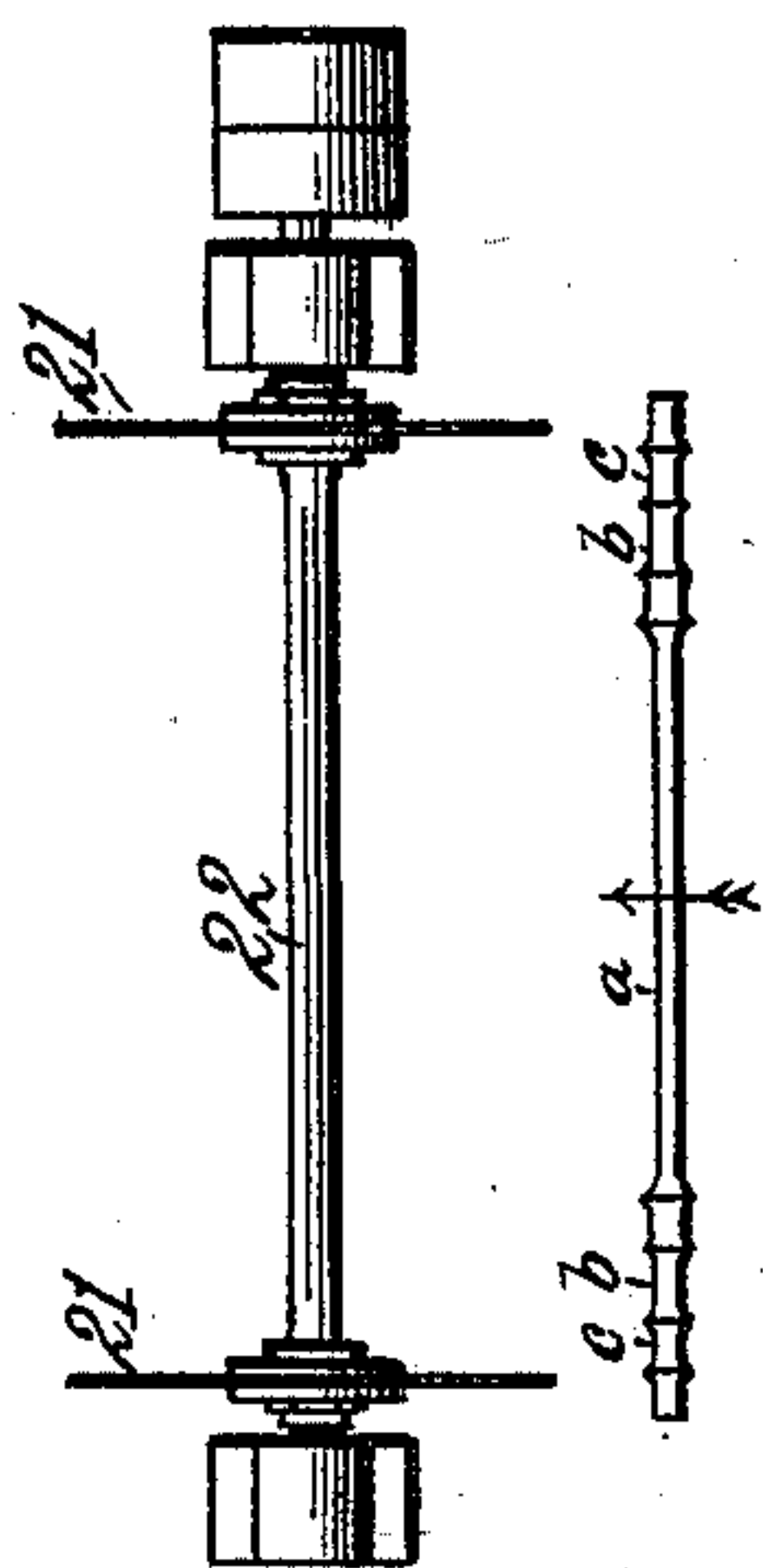
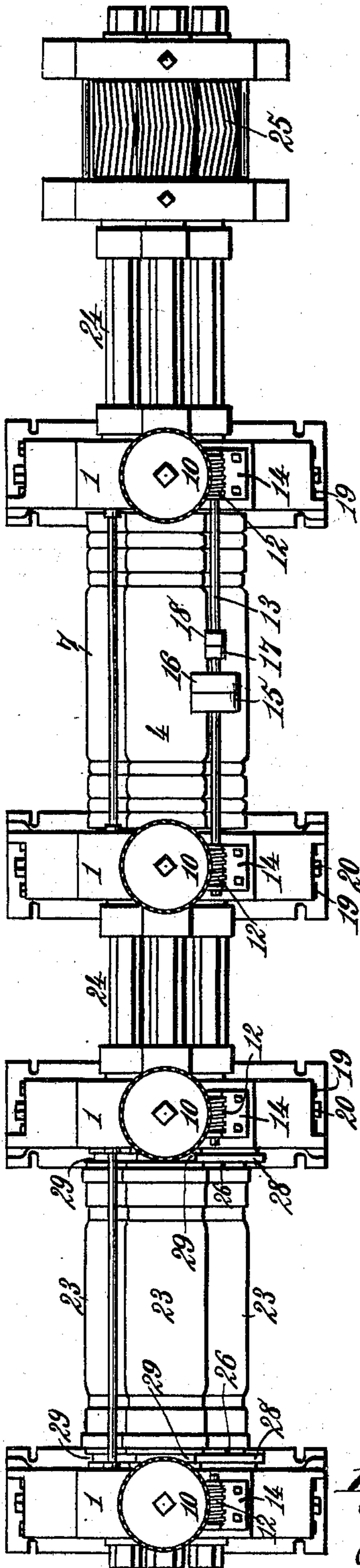


Fig. 1.



Witnesses.  
*Robert Emmett*  
*Thos. A. Green*

Inventor.  
*Peter Weber.*  
By *James L. Norris.*  
*Atty.*

(No Model.)

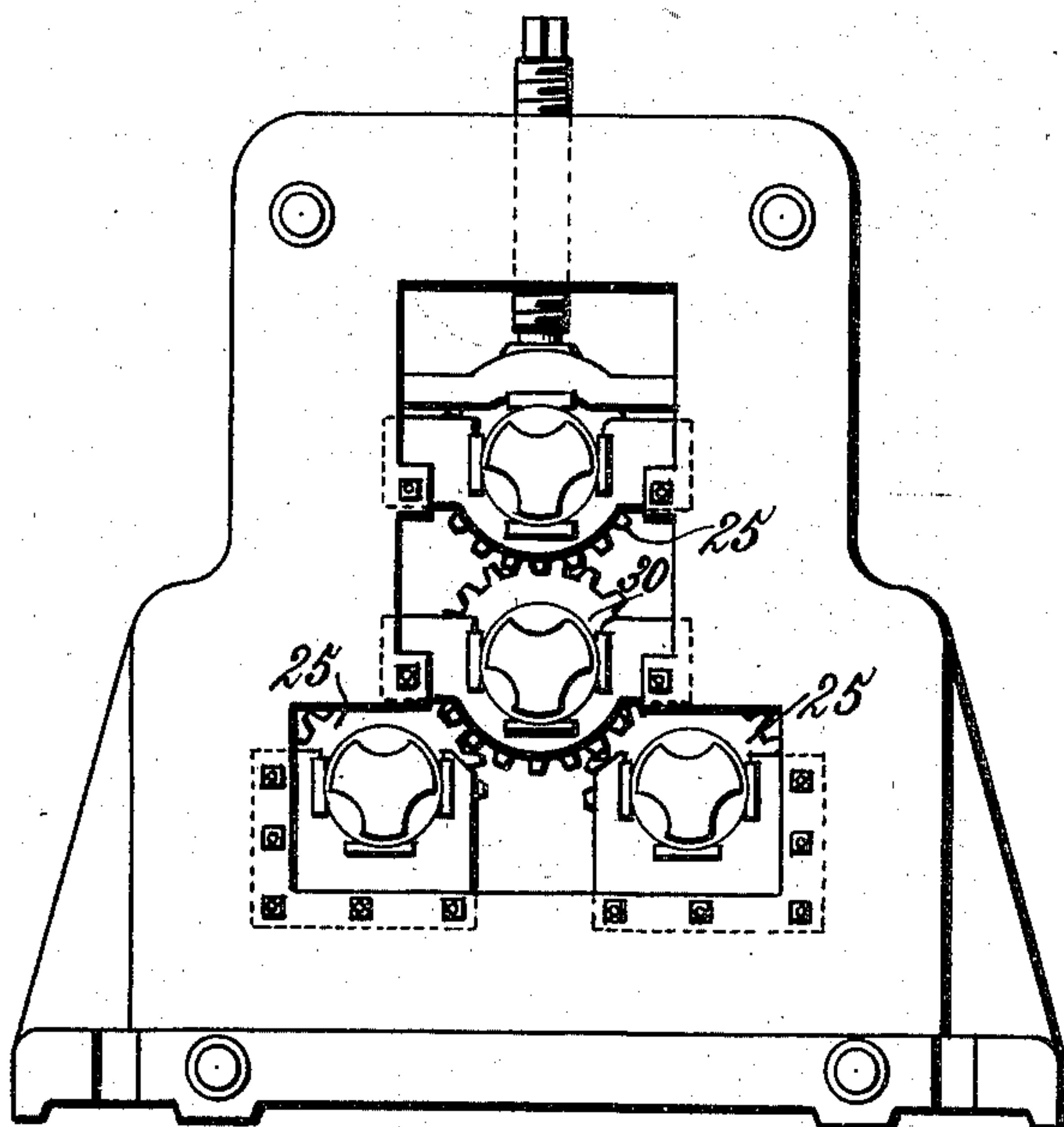
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P. WEBER.  
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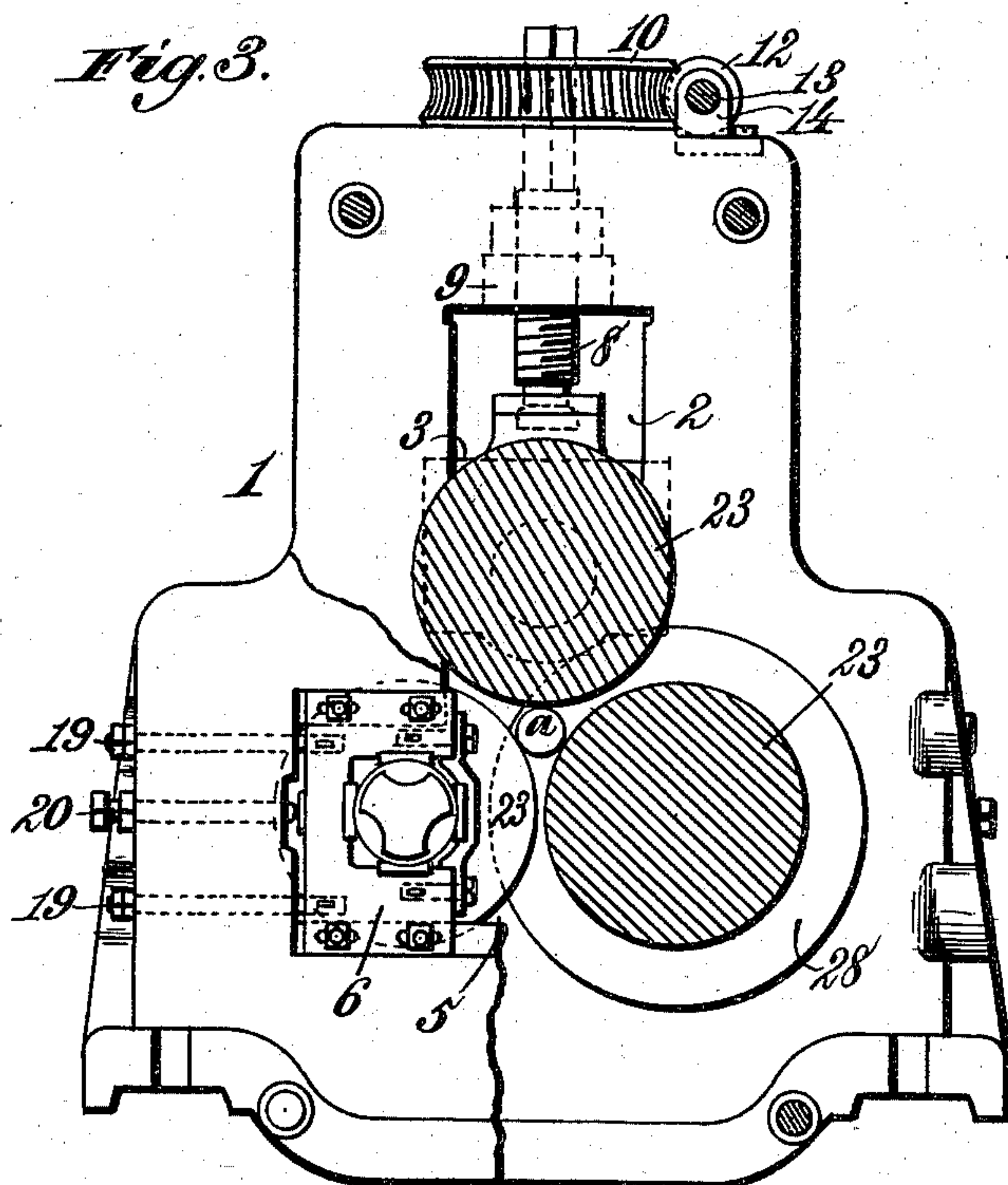
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*Fig. 2.*



*Fig. 3.*



Witnesses.  
*Robert Everett*  
*Thos. A. Green*

Inventor:  
*Peter Weber.*  
By *James L. Norris.*  
*Atty.*

(No Model.)

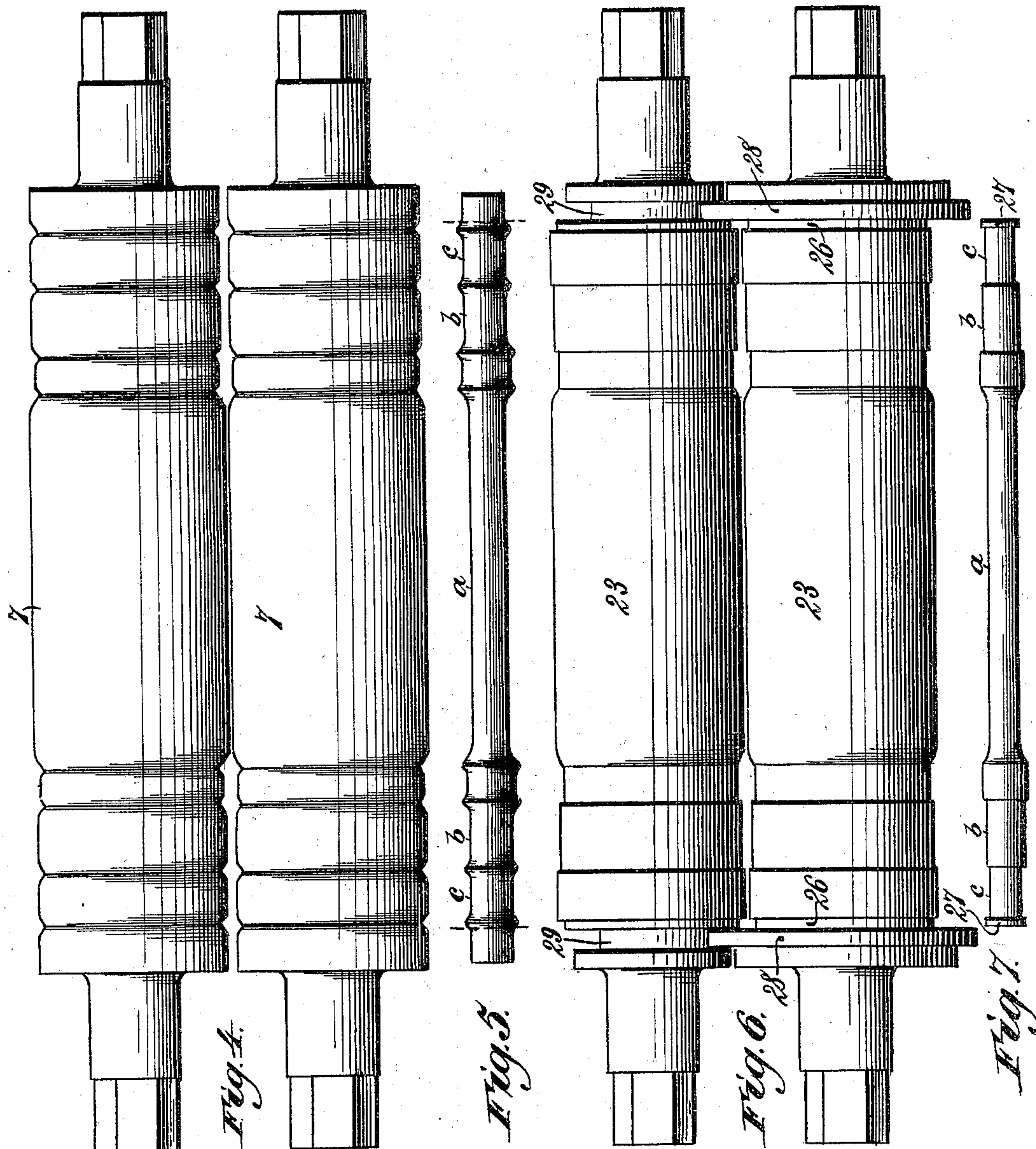
3 Sheets—Sheet 3.

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# MANUFACTURE OF RAILWAY CAR AXLES.

No. 559,239.

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Robert Emmett,  
Thos. A. Green.

Robert Everett.

Thos. A. Green.

*Inventor.*

*Peter Weber:*

By James L. Norrie  
Atty

Atty



# UNITED STATES PATENT OFFICE.

PETER WEBER, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF ONE-FOURTH TO JUSTIN HEID, OF SAME PLACE.

## MANUFACTURE OF RAILWAY-CAR AXLES.

SPECIFICATION forming part of Letters Patent No. 559,239, dated April 28, 1896.

Application filed July 26, 1894. Serial No. 518,660. (No model.)

*To all whom it may concern:*

Be it known that I, PETER WEBER, a subject of the Emperor of Germany, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in the Manufacture of Railway-Car Axles, of which the following is a specification.

My invention consists in certain novel improvements in apparatus for the manufacture of railway-car axles, my purpose being to provide an improvement in the means for producing said axles whereby they may be manufactured with great rapidity at a largely-reduced expenditure and of superior quality to the car-axles heretofore in use.

Prior to my invention railway-car axles have usually been made either by forging and then finishing the axle in a lathe or by rolling the wheel-seats and journal-bearings and afterward finishing the axle by turning the middle portion, which comprises that part lying between the wheel-seats, in a lathe. Attempts have also been made to form the axle in dies by means of powerful hydraulic pressure; but this method has been found to offer no advantages in either speed or economy of production, and the product thereof does not differ in quality from the forged axle. The large expense entailed in the installation of a plant, therefore, has been an effectual obstacle to the introduction of this method of manufacture.

The principal objection to the method of manufacture first mentioned is that it requires so much time and labor that the first cost of the axles is considerably increased, an expert workman being unable to finish more than five per diem. The process of forging also, even when performed with the utmost care, cannot produce perfectly homogeneous density and strength throughout, and unless continued for a suitable period or performed by mechanism of great power the axle will not receive the maximum compression of which it is capable and the surplus metal must be removed in the lathe. In all cases two entirely distinct processes must be employed in turning out the finished article.

The second process of manufacture men-

tioned, which consists in rolling the wheel-seats and journals and afterward finishing the remaining portion in the lathe, is also objectionable so far as speed of production is regarded. A more serious defect, however, is the fact that it is impossible to form square shoulders at the ends of the wheel-seats and journal-bearings, because no provision is made for limiting the longitudinal extension of the metal under the pressure of the rolls. The most serious objection of all is that it is impossible to form the entire axle at a single heat. When brought to the rolls, both ends must be heated, and being rolled down to proper dimensions while hot it is practically impossible to avoid the development of local tensions in the metal whereby a dangerous liability to breakage is introduced. This process also has no substantial advantage in point of economy either in time or expenditure.

My invention, which is intended to remove the defects and objections above referred to, consists in a novel mechanism for rolling the axle to its finished form at a single heat and by a single operation, the rolls acting upon all parts of the axle at the same time and the longitudinal extension of the metal being limited or arrested during the final stage of the process.

To enable those skilled in the art to which said invention pertains to clearly understand and to make and use said mechanism, I will proceed to describe the same, reference being had for this purpose to the accompanying drawings, in which—

Figure 1 is a plan view showing a system of roller-mills and actuating-gearing organized in accordance with my invention, together with the saws which cut the roughly-shaped axle to its proper length. Fig. 2 is an end elevation of the gearing by which the rolls are driven. Fig. 3 is an end elevation, partly in section, of one stand of rolls. Fig. 4 is a side elevation of two of the three roughing-rolls removed from their supports, showing the outline of said rolls. Fig. 5 is a view of the roughly-rolled axle as it comes from the roughing-rolls. Fig. 6 is an elevation of two of the three finishing-rolls removed from the ma-



chine, showing the form of the axle-forming opening between them. Fig. 7 is a view of the finished axle.

The reference-numeral 1 in said drawings indicates the roller-supporting uprights or frames, which are of familiar form and mounted upon a suitable base. In each upright is formed an opening 2 for the journal-box 3 of an upper-roll 4 and an opening 5 for the journal-boxes 6 of two rolls 7, which lie below and upon opposite sides of the upper roll 4. The opening 5 is horizontal and the vertical opening 4 is at its middle point. The journal-boxes 3 are connected to vertical screw-shafts 8, tapped through nut-blocks 9 in the upper part of the uprights 1, and upon squared portions of said shafts are mounted worm-gears 10, the shafts being compelled to turn with said gears, but being longitudinally movable in the same. Said gears are driven by worms 12, carried by shafts 13, which are journaled in bearings 14 and provided with a tight and a loose pulley 15 and 16 for forcing the upper roll downward and smaller tight and loose pulleys 17 and 18 for raising the roll.

The boxes 6 of the two lower rolls are adjusted horizontally by means of threaded bolts 19, which retract the boxes to separate the rolls, and by similar bolts 20, which give adjustment in the opposite direction and drive the rolls together. The rolls 7 are roughing-rolls—that is to say, they shape the bloom or blank of metal to a form approximating that of the finished axle, but having a greater length and exceeding the final perfected product in diameter by about one-eighth. The form of the roughly-rolled axle is seen in Fig. 5, from which it will be noted that the middle portion *a*, the wheel-seats *b*, with the shoulders between the same and the middle portion, and the journals *c* are all roughly shaped. During the operation of the roughing-rolls the metal is rolled out to a length somewhat in excess of that of the finished axle, as it is desirable during this stage of the process to permit free longitudinal extension.

When the operation of the roughing-rolls 7 is completed, the upper roll is raised and the roughly-formed axle is removed by any suitable means and is cut to the exact length of the finished axle, the two lines of cut being indicated in Fig. 5 by transverse dotted lines just beyond the ends of the journals. This step is effected by means of two saws 21, Fig. 1, mounted on a shaft 22 and arranged at a convenient point with reference to the rolling mechanism. The roughly-rolled axle is then transferred to the finishing-rolls 23, which are arranged in line with the roughing-rolls and connected to them by the ordinary universal couplings 24, so that both stands of rolls are driven by the same stand of gears 25. The finishing-rolls 23 are three in number and of the same form or outline, differing from the roughing-rolls in that the angles are square and sharply defined and that cir-

cumferential channels 26 are formed at their ends to roll collars 27 upon the ends of the journals. The outer walls of these channels 26 are formed by collars 28 upon one of the finishing-rolls, said collars entering channels 29 in the two coöperating rolls. The axle, trimmed by the saws 21, abuts at its ends against these collars and cannot therefore extend its length under the action of said finishing-rolls. As it is reduced one-eighth in diameter under the action of these rolls the metal is not only forced to assume the exact form and dimensions of the perfected axle, having every shoulder and angle formed squarely and sharply defined, but the metal is compacted or increased in density, thereby producing increased fibrous strength and toughness and giving a perfectly smooth surface of increased hardness. Moreover, as the operation of both sets of rolls is exerted throughout the entire length of the axle at each moment, the latter will be of uniform strength in every part and will be wholly free from tension, which latter cannot always be avoided when the different parts of the axle are formed at different times and by successive heats.

By my invention the axle is completed at a single heat and is removed from the finishing-rolls a perfected product, ready to receive the wheels within two minutes from the time when it enters the roughing-rolls as a bloom or blank. If produced by the processes mentioned in a former portion of this specification, not more than five completely-finished axles can be produced in a single day by an expert workman aided by all the mechanical improvements known to the art.

The finishing-rolls are mounted and adjusted in substantially the same way as the roughing-rolls, and the stands and other parts are indicated by the same reference numerals and letters.

The gearing 25 is of known form, the upper and the two lower gears being all driven by a single power-gear 30, whereby all three gears revolve in the same direction.

The simplicity of the mechanism, the great economy in time of labor, and the marked improvement in quality of the manufactured product are all the direct results of my invention or improvement in the art, which consists in rolling the axle in all its parts simultaneously to complete perfected form and checking the longitudinal extension of the same during the latter part of the operation.

What I claim is—

1. In the manufacture of railway-car axles, the apparatus hereinbefore described, the same consisting of roughing-rolls by which an axle-blank is produced of greater diameter than the finished axle, independent means for cutting the axle-blank to the full length of the finished axle, and finishing-rolls arranged in a stand of three, one of said finishing-rolls having a collar or flange at each end which wholly spans the space separating the three



rolls and enters grooves in the ends of both the remaining rolls in said stand, said collars admitting the axle-blank, but wholly preventing all elongation of the same, or any  
5 part thereof during the action of the finishing-rolls, substantially as described.

2. In the manufacture of railway-car axles, the combination with the finishing-rolls having peripheral grooves in their end portions,  
10 of the finishing-roll having collars or flanges at its end portions which enter the said

grooves and span the space separating the rolls to wholly prevent any elongation of the axle-blank during the rolling action of the finishing-rolls, substantially as described. 15

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

PETER WEBER. [L. S.]

Witnesses:

THOS. A. GREEN,  
JAMES L. NORRIS.