

E. E. SLICK.
METHOD OF AND APPARATUS FOR ROLLING HOLLOW METAL BODIES.
APPLICATION FILED OCT. 15, 1909.

965,038.

Patented July 19, 1910.

4 SHEETS—SHEET 1.

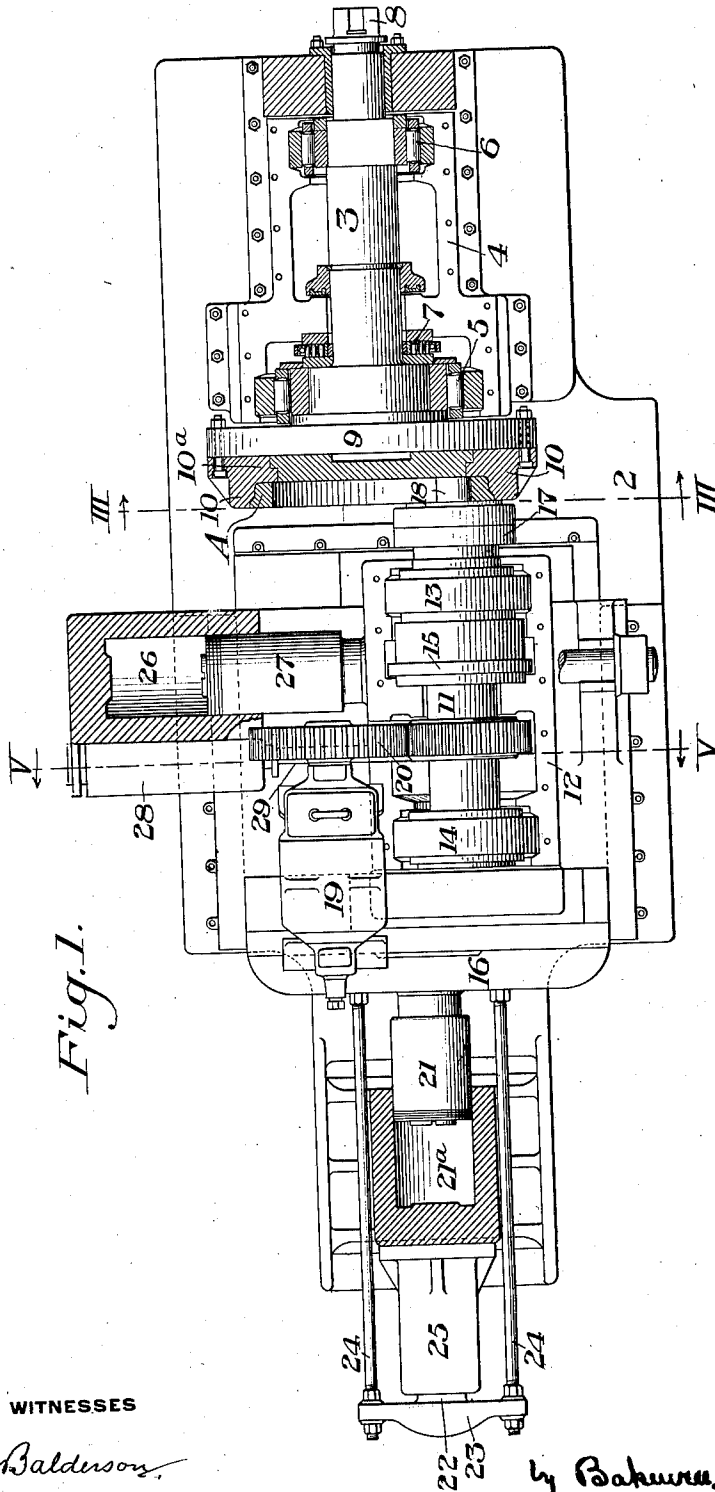


Fig. 1.

WITNESSES

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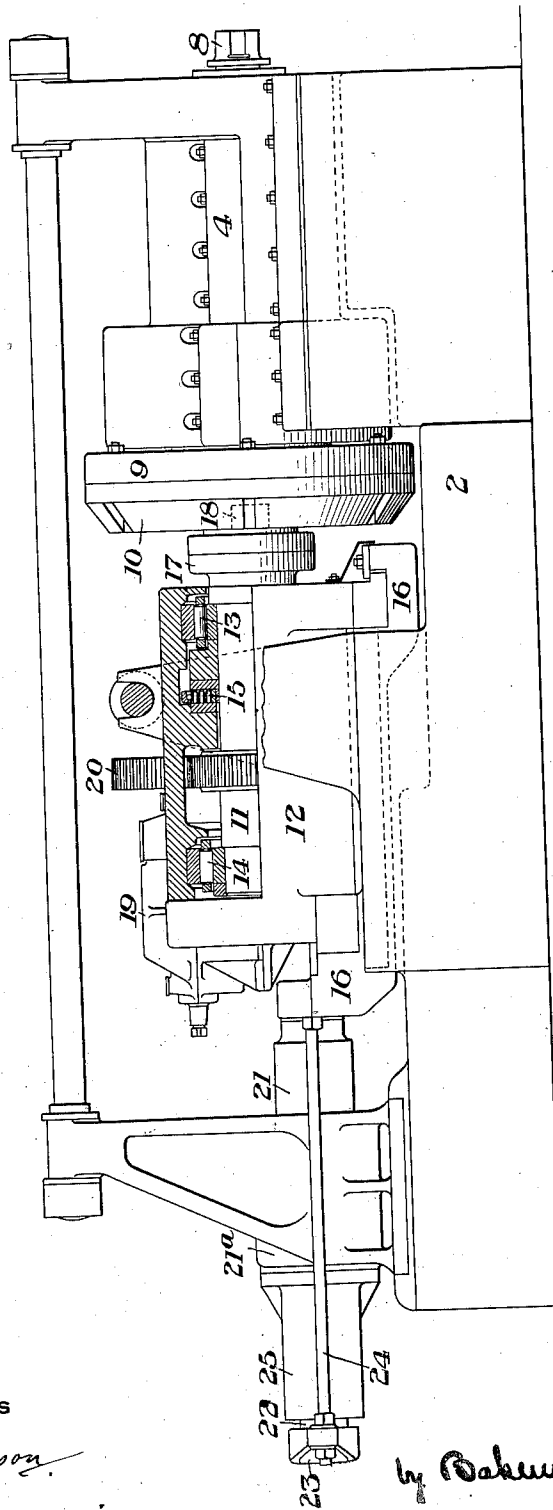
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4 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

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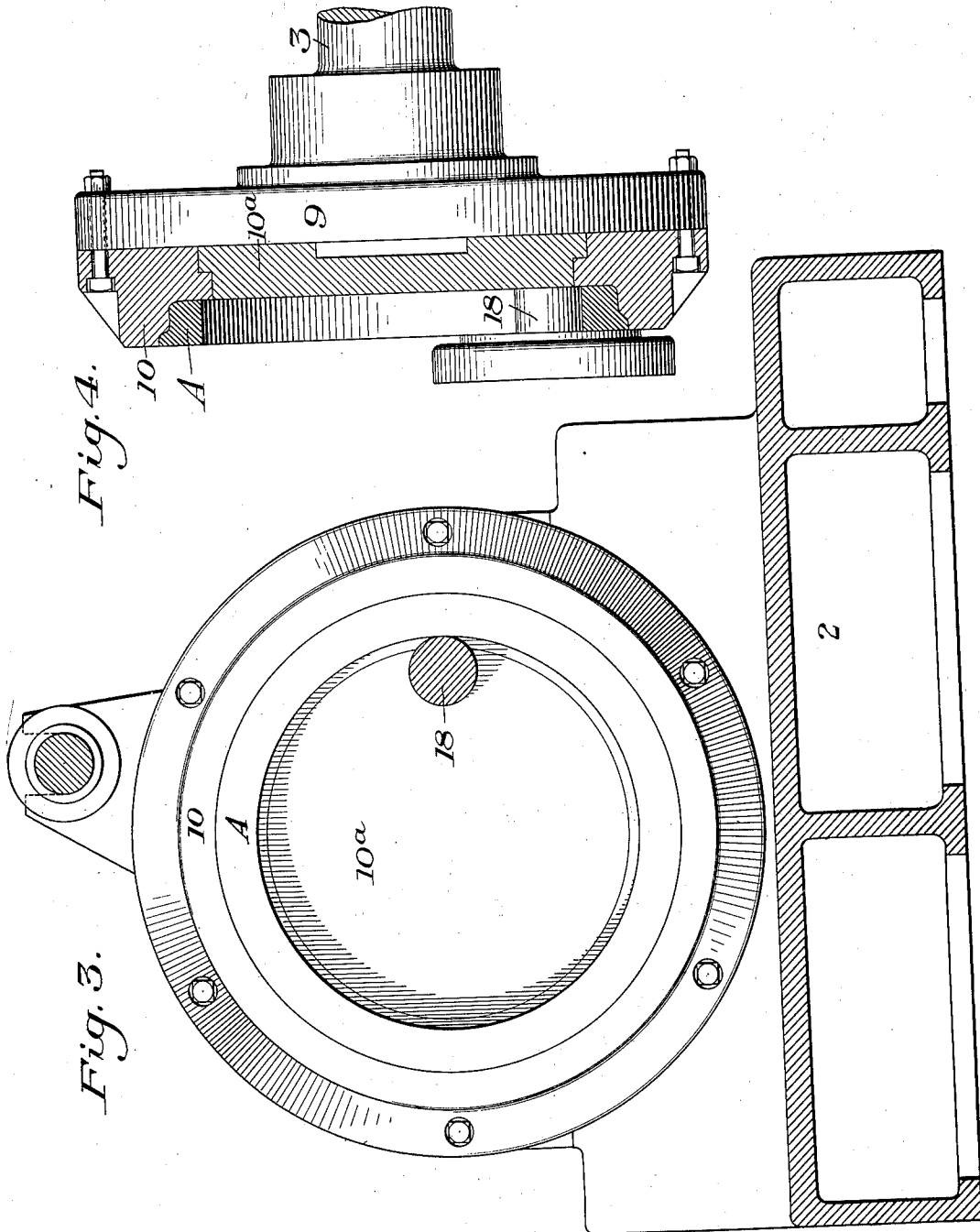
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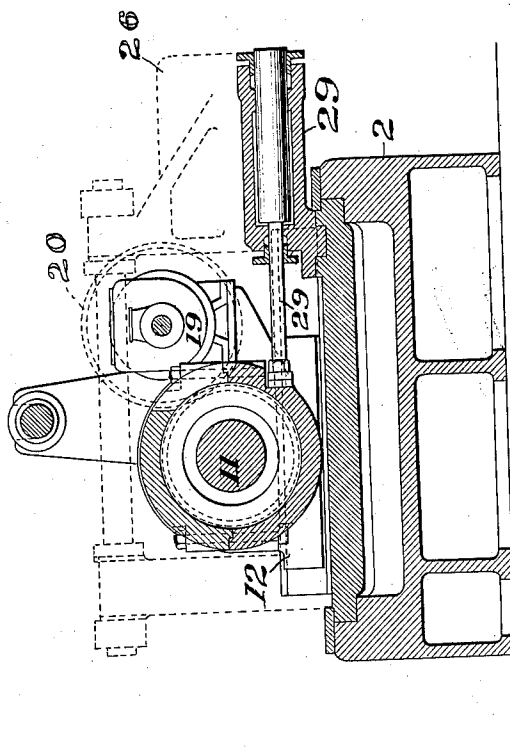


Fig 5

WITNESSES

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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR ROLLING HOLLOW METAL BODIES.

965,038.

Specification of Letters Patent.

Patented July 19, 1910.

Application filed October 15, 1909. Serial No. 522,730.

To all whom it may concern:

Be it known that I, EDWIN E. SLICK, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Method of and Apparatus for Rolling Hollow Metal Bodies, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to the rolling of hollow metal bodies or metal bodies having a cavity or opening therein, and it more particularly relates to the rolling of annular metal tires used on locomotive wheels or "built up" car wheels both flanged and without flanges.

The object of the invention is to provide an improved method of rolling tires and similar hollow bodies and to provide improved apparatus for carrying out the rolling operation in making such articles by my improved method.

Figure 1 is a plan partly in section of metal rolling apparatus constructed in accordance with my invention and arranged for rolling steel or other metal tires. Fig. 2 is a longitudinal side elevation, partly in section, of the same. Fig. 3 is a sectional end elevation on the line III—III of Fig. 1. Fig. 4 is a detail sectional side elevation showing the supporting die and forming roll employed in carrying out my invention and forming part of my improved apparatus, Figs. 3 and 4 being on a larger scale. Fig. 5 is a transverse section on the line V—V of Fig. 1 showing the bearing support and its connections to the pull back cylinder.

In the drawings 2 represents the base of my improved apparatus having a rotary die shaft 3 mounted in the bearing 4. Preferably roller bearings 5 and 6 are provided for this shaft and a roller bearing 7 is also shown employed to transmit end thrust from the die shaft 3 to the bearing 4. The shaft 3 is provided with a wobbler 8 which is connected by a spindle and coupling boxes to any suitable type of driving motor, the motor and spindle not forming part of this invention not being shown. Removably secured on the flange 9 on one end of the shaft 3 is a forming die 10 having a forming or shaping opening or recess therein in which the blank A is forged to shape, the surrounding wall of this opening or recess being formed into the desired contour and

preferably to the size of the periphery of the article to be formed. The blanks may be finished, however, without being expanded to the same size as the opening or recess in the supporting die when desired. The bottom surface 10* of the forming die 10 may be omitted and the die 10 formed of a hollow ring when desired.

Opposite the shaft 3 and die 10 is a second shaft 11 which is mounted in the bearing 12, and which is also provided with roller bearings 13 and 14 and with a thrust roller bearing 15 to take and transmit end thrust from this shaft to the bearing 12. The bearing 12 and shaft 11 are mounted so as to be transversely movable on the support 16 and the support 16 is arranged to be moved longitudinally so as to advance and retract the shaft 11 endwise toward and away from the die 10.

The shaft 11 is provided with a flange 17 on which a stub forming or reducing roll 18 is removably secured, the outer end of the roll 18 when in use being in proximity to the bottom of the forming opening or recess in the supporting die 10 mounted on the end of the shaft 3, when the die is provided with such bottom surface.

As shown a motor 19 is mounted upon the support 16 so as to move with this support and the shaft 11, the motor being connected by slow-down gearing 20 with the shaft 11 so as to rotate this shaft and the stub roll 18 on its end when the motor 19 is actuated.

Engaging by one end with the support or carriage 16 is a piston 21 which reciprocates in the hydraulic cylinder 21* mounted on the base 2 to move the carriage 16 and the roll 18 on the end of the shaft 11 toward and away from the die 10.

A second piston 22 is connected by the cross-head 23 and rods 24 to the carriage and, with the pull back cylinder 25 in which this piston reciprocates, forms means for retracting the carriage 16 on its support and moving the forming roll 18 longitudinally on its axis away from the forming die.

Mounted on the longitudinally movable support 16 is a cylinder 26 having a piston 27 by which the carrier 12 with its shaft 11 and the forming roll 18 is moved transversely on the support 16 in one direction, a pull back cylinder 28 and plunger on the end of the rod 29 being provided to move the carrier in the opposite direction.

In making annular or recessed bodies with

my improved apparatus, a blank A of the required size and weight is first formed by casting or otherwise. The blank is placed in position within the opening in the supporting die 10, and the forming roll 18 is then moved longitudinally so as to pierce the blank and project into the hole or opening so formed in the blank and is moved transversely so as to bring the hollow blank in contact, on its opposite sides, with the roll and with the forming face of the opening in the forming die and hold the blank within the opening. The die 10 and the roll 18 are then caused to rotate or a further rotation of the die and roll is effected and, by means of the cylinder 26 and piston 27 the roll 18 is pressed sidewise away from the axial center of the die 10 on the shaft 3. The hollow blank is increased in diameter in this manner and is forced outwardly with its peripheral face in contact with the forming face of the hollow die. As the blank increases in diameter it gradually comes in contact at successively greater portions of its periphery with the engaging faces of the die and when the rolling operation is continued for a sufficient time is finally expanded to the same diameter as the opening or recess in the die. When this result is reached the blank will have been formed into the desired shape and cross-sectional contour and the forming operation will then be completed. Instead of forming the hole or recess in the blank by means of the forming roll 18 the blank may be punched before being put in position in the hollow die 10 or may be formed by casting when desired, although I prefer to punch the opening in the blank while in the hollow die 10. The above operations are then repeated upon successive blanks in carrying out my improved method.

The advantages of my invention are many and will be appreciated by those skilled in the art.

The apparatus is simple and is easily kept in repair. By its use the metal bodies are easily and quickly formed into the desired size and contour.

Modifications in the construction and arrangement of the parts may be made without departing from my invention.

The forming die may be movable and forming roll stationary, or both the roll and die may be moved in carrying out the forging operation. Either the die or the roll may be positively rotated or both may be positively driven as desired. The roll may be moved in an eccentric path relative to the die or vice-versa in effecting the forging of the blanks, instead of rotating. The construction of the mechanism for causing a relative approach of the die and forming roll may be varied and other changes may be made.

While the drawings show a blank which has been expanded to the same size as the recess in the supporting die, the blanks may be formed without increasing their width or diameter to that of the recess in the supporting die.

I claim:—

1. The method of forging hollow metal bodies, consisting in holding a hollow blank within a recessed supporting die, applying forging pressure to one side of the opening in said blank while causing a relative rotary movement of said die and roll and thereby expanding the blank within said die; substantially as described.

2. The method of forging hollow metal bodies, consisting in holding a hollow blank within a recessed supporting die, applying forging pressure to one side of the opening in said blank while rotating the supporting die and thereby expanding the blank within the cavity in said die and causing the periphery of the blank to assume the contour of the marginal surface of the cavity in said die; substantially as described.

3. The method of forging metal, consisting in holding a pierced blank within a recessed supporting die, inserting a forming roll within the opening in said blank and causing a relative movement of said roll and the marginal surface of the recess or opening in said die while rotating the die and thereby expanding the blank; substantially as described.

4. The method of forging metal consisting in holding a blank within a die recess, forming an opening within the blank by forcing a forming roll into said blank when within the die recess and then causing a relative movement of the roll and the wall of the recess, the relative movement being transverse to the roll axis while subjecting the blank to a rolling action between the die and roll; substantially as described.

5. The method of forging hollow metal bodies, consisting in holding a hollow blank within a recessed supporting die, applying forging pressure to one side of the opening in said blank while rotating the supporting die and forming roll, and thereby expanding the blank within the recess in said die; substantially as described.

6. The method of forging hollow metal bodies, consisting in holding a hollow blank within a recessed supporting die, applying forging pressure to one side of the opening in said blank while rotating the supporting die and forming roll, and thereby expanding the blank within the recess in said die and causing the periphery of the blank to assume the contour of the marginal surface of the recess or opening in said die; substantially as described.

7. Apparatus for forging metal, comprising a recessed supporting die, means for ro-

tating the die, a forming roll, means for causing endwise approach of said die and roll, and means for causing a relative transverse movement of the die and roll during the forging operation; substantially as described.

8. Apparatus for forging metal, comprising a recessed supporting die, means for rotating the die, a forming roll, means for causing endwise approach of said die and roll, and means for rotating the die and roll; substantially as described.

9. Apparatus for forging metal having opposing rotary shafts, a recessed forming die on one of said shafts, a forming roll on the opposing shaft co-acting with said die in the forging operation, means for causing a relative endwise and sidewise approach of the shafts, and means for rotating at least one of said shafts; substantially as described.

10. Apparatus for forging having opposing shafts, a recessed supporting die on one of said shafts, a forming roll on the opposing shaft co-acting with said recessed die in the forging operation, means for causing a relative endwise and sidewise approach of the shafts, and means for causing a relative rotary movement of said die and roll; substantially as described.

11. Apparatus for forging, comprising opposing rotary shafts, a recessed forming die on one of said shafts, a stub forming roll on the opposite shaft co-acting with said recessed die in the forging operation, means for causing relative endwise approach of said shafts, means for rotating at least one of said shafts, and means for causing a relative transverse movement of the shafts during the forging operation; substantially as described.

12. Apparatus for forging, comprising opposing shafts, carriers for the shafts, a forming roll detachably mounted on one of the shafts, a detachable die for supporting the blank on the opposite shaft, said die having a recess co-acting with the forming

roll in the forging operation, means for causing endwise approach of said shafts, means for causing a relative sidewise movement of the shafts, and means for rotating at least one of the shafts during the rolling operation; substantially as described.

13. Apparatus for forging, comprising opposing shafts, carriers for the shafts, a forming roll detachably mounted on one of the shafts, a detachable die for supporting the blank on the opposite shaft co-acting with said forming roll in the forging operation, means for relatively moving said carriers to cause endwise approach of the shafts, means for moving the carriers to cause a relative sidewise movement of the shafts, and means for rotating at least one of said shafts; substantially as described.

14. In apparatus for forging, opposing rotary shafts having flanged ends, a forming roll detachably secured on the flanged end of one shaft, a recessed supporting die detachably secured on the end of the opposing shaft arranged to co-act with the roll in the forging operation, mechanism for rotating said shafts, and means for causing a relative endwise and sidewise movement of said die and roll in forging the blank; substantially as described.

15. The method of forging metal consisting in holding a blank within a recessed supporting die, piercing the blank by forcing the forming roll thereinto while supported in said recess and then causing a relative movement of said roll and the marginal surface of the recess in a direction transversely of the axes thereof while rotating the forming roll and thereby expanding the blank into the desired shape; substantially as described.

In testimony whereof, I have hereunto set my hand.

EDWIN E. SLICK.

Witnesses:

R. D. LITTLE,
H. M. CORWIN.