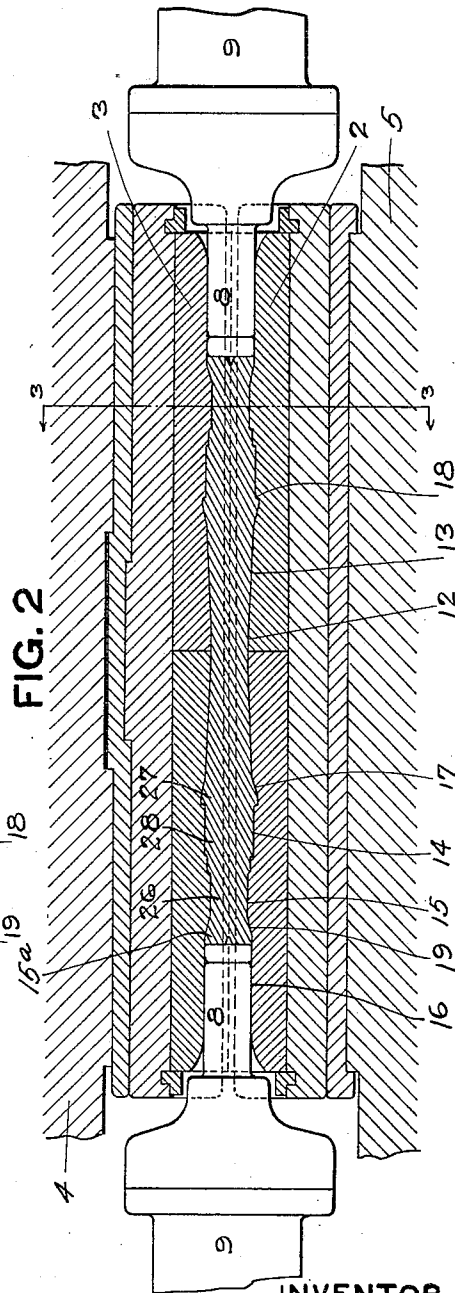
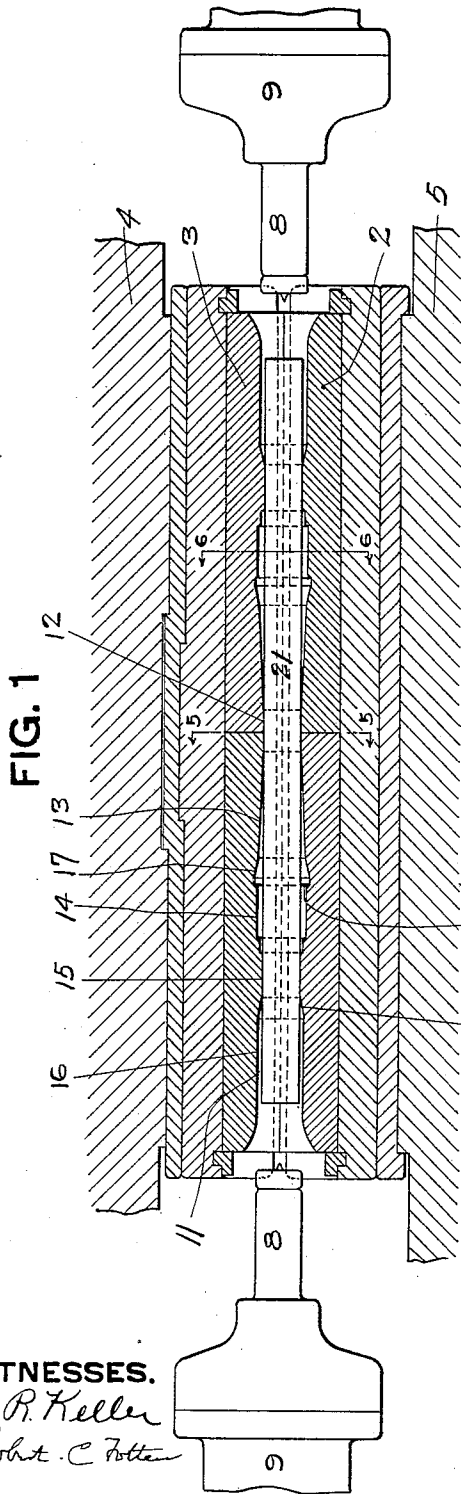


J. M. HANSEN.
MANUFACTURE OF RAILROAD AXLES.
APPLICATION FILED NOV. 25, 1911.

1,041,999.

Patented Oct. 22, 1912.

2 SHEETS—SHEET 1.



WITNESSES.

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Robert C. Fother

INVENTOR.

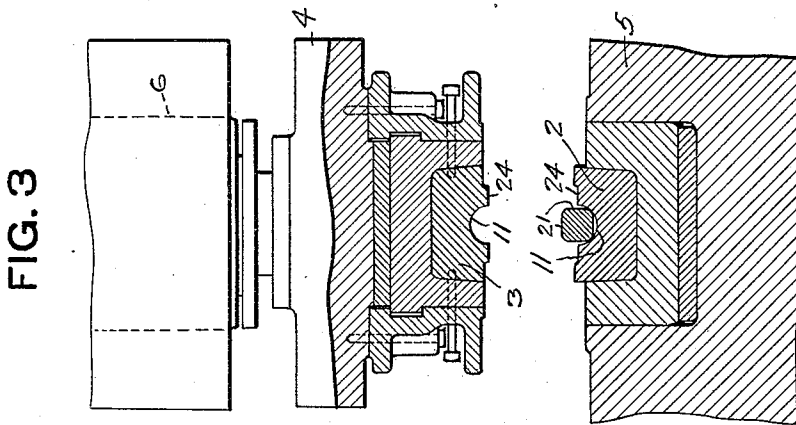
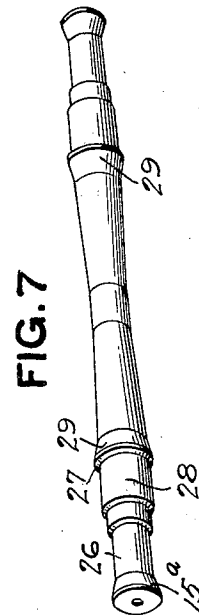
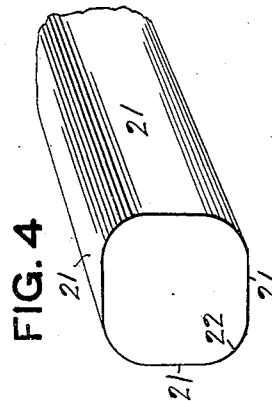
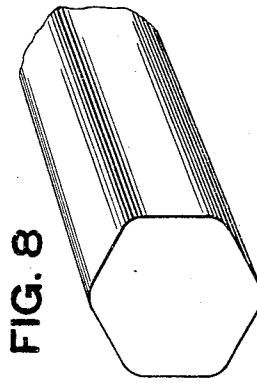
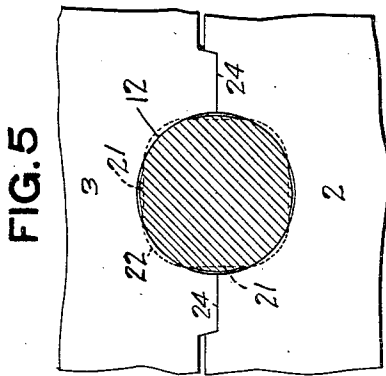
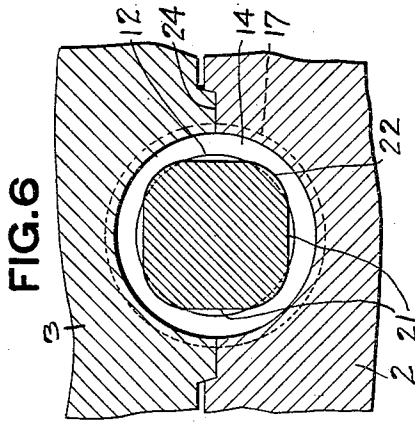
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2 SHEETS—SHEET 2.



WITNESSES.

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UNITED STATES PATENT OFFICE.

JOHN M. HANSEN, OF PITTSBURGH, PENNSYLVANIA.

MANUFACTURE OF RAILROAD-AXLES.

1,041,999.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Application filed November 25, 1911. Serial No. 662,309.

To all whom it may concern:

Be it known that I, JOHN M. HANSEN, a citizen of the United States, and resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Manufacture of Railroad-Axles; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the manufacture of railroad axles. Its main object is to provide for the formation of cylindrical railroad axles from the ordinary rectangular or like flat-sided bars of commerce and so cheapen the cost of production of the same while forging the axle under heavy compression. The ordinary rectangular or like flat-sided bar of commerce can be produced at much less cost than a cylindrical bar, as it is one of the easiest and cheapest forms to be produced by rolling. My invention provides for the making of these axles from such bars angular in cross section and of uniform section throughout by a single operation within suitable dies.

It consists generally stated, in heating a bar of angular cross section and of uniform section throughout its length, clamping the same within the holding dies, and upsetting the angular bar within the cylindrical matrix die cavity to bring it to circular form throughout and form the enlargements thereon. It also comprises other improvements as hereinafter set forth and claimed.

In the accompanying drawings Figure 1 is a longitudinal section of forging apparatus suitable for practising the invention, showing the bar in position for upsetting; Fig. 2 is a like view showing the completed forging of the bar to produce the axle; Fig. 3 is a cross section showing the rectangular bar resting in the lower die and before it is clamped between the dies; Fig. 4 is a perspective view of the end of the rectangular bar employed; Fig. 5 is an enlarged cross section on the line 5—5 Fig. 1, showing the action of the dies in clamping the angular bar in the mid portion of the dies; Fig. 6 is a like view on the line 6—6 showing the position of the bar within the dies and before the upsetting operation; Fig. 7 is a view of the finished axle produced; and Fig. 8 is a view of a hexagonal bar suitable for use with the invention.

The clamping or holding dies 2, 3, are mounted in any suitable press 4 and clamped together by any suitable power. For ex-

ample, the bottom die 2 rests on the bed 5 of the press, which has the hydraulic cylinder 6 which operates the top die 3. The upsetting plungers 8 are also operated by any suitable power, for example, by the hydraulic power the rams 9 of which carry the plunger 8, the plungers entering within the end portions of the clamping dies 2, 3. The matrix cavity 11 of the clamping dies is cylindrical throughout but formed of different diameters according to the desired shape of the axle or other article to be formed, having the mid portion 12, and beyond the same the dies being slightly outwardly flaring as at 13, leading up to the wheel seat enlargements 14 and beyond the same the portion 15 for forming the journal box bearings, while beyond this portion is the enlarged cylindrical portion 17 for forming the collar, which is of the same diameter throughout and corresponds to the diameter of the plunger 8. The construction is the same at both ends of the dies. I prefer, however, to form the die faces of the matrix somewhat different from the ordinary upsetting dies in that all of the inner die faces extending from any enlargement in the matrix cavity are made inclined toward the mid portion of the die. For example, the inclined face 17 on the inner side of the shoulder-forming seat 18 at the inner side of the cavity 14 for the wheel seat and the inclined portion 13 between it and the mid portion of the die. Also the inclined face 19 on the inner side of the collar-forming seat 16 at the outer edge of the cavity 15 for the journal bearing. However, this construction is not a necessary one.

In practising the invention with the above described dies I employ an angular bar, preferably one of the same section throughout of substantially rectangular section, such bar being shown in Fig. 4.

By the term "substantially rectangular section" it is intended to include any such section which can easily be produced by rolling and which has flat side and top and bottom faces 21 connected by corner portions 22, as indicated in the cross section Fig. 4, the purpose being to employ an ordinary angular bar of commerce which can be rolled in the ordinary blooming mill without the necessity of bringing it to actual circular form. These bars can be produced at very low cost in the ordinary rolling mill, and one object of my invention is to employ a bar in its cheapest form without going to

the expense of rolling it into round or actual cylindrical form. This blank is heated in any suitable furnace and is placed within the clamping dies, it being preferred that it shall be placed therein so that its flat side faces are substantially transverse to the parting line 24 of the two clamping dies, as shown in Fig. 5. Thus when the clamping dies are brought together it will be seen that the first operation will be to press upon the corner portions of the bar, spreading the metal somewhat at the corners where the bar is clamped, but as there is a space between the side faces 21 of the bar and the circular wall of the matrix cavity at this point along the meeting line of the dies, it is evident that the clamping dies can be brought together without liability of the metal entering between them so that the dies take a grip upon the metal of the blank midway of its length and in so doing all liability of the metal of the bar being forced between the meeting edges of the dies and so finning and preventing the dies from actually meeting and forming an absolutely cylindrical matrix or cavity for the upsetting operation is overcome. As soon as the blank is thus gripped and held within the dies the plungers are forced forward and they operate directly upon the end portions of the bar with an upsetting pressure acting throughout the length of the bar, and upset the blank throughout its length and cause it to swell out to properly contact with the walls of the matrix, thus by a single forging operation forming the completed axle from the substantially rectangular bar.

In the practice of the method there are some points which are desirable. First, it is preferred that the greatest thickness of the bar, such as that taken diagonally from corner to corner thereof, shall be greater than the smallest diameter of the circular matrix or die cavity, for instance in the mid-portion 12 thereof, so that when the bar is placed within the dies they will grip and hold the mid portion thereof. This insures the gripping of the blank by the holding die before it is operated on by the plunger. Second, it is desirable that the side or flat faces of the blank shall be opposite and transverse to the parting of the dies so that when the dies grip a rectangular bar though obtaining a hold thereon, an absolutely cylindrical matrix cavity is provided, as above explained. Third, in the forging operation there shall be no angular obstructions toward the forging or upsetting of the metal from its ends toward the mid-portion of the bar. This is accomplished as above stated by providing all the inner die faces of all enlargements inclined toward the center. The metal will thus be caused in the upsetting

operation to flow easily and without the exertion of great power toward the center of the dies and will in the further forging pressure be spread or upset outwardly so as to fill properly all the die cavities. In case it is desired to provide abrupt angular shoulders in any portion of the axle where such inclined faces have been forged thereon, for example back of the end collar 15 (see Fig. 7) to give the proper shape to the journal bearing 26, or back of the inner collar 27 of the wheel seat 28 as at 29, these portions can be turned down in the finishing of the axle.

While I have described and prefer to employ the invention in the forging of bars substantially rectangular in cross section, it is evident that it is applicable to other angular bars, for instance, a hexagonal bar as shown in Fig. 8.

What I claim is:

1. The herein described method of forming axles, consisting in heating a bar angular in cross section and of uniform section throughout, and upsetting the same within circular holding dies to bring it to circular form and form enlargements thereon.

2. The herein described method of forming axles, consisting in heating a bar of substantially rectangular section and of uniform section throughout and upsetting the same within circular holding dies to bring it to circular form and form enlargements thereon.

3. The herein described method of forming axles, consisting in heating a bar having flat side faces and of uniform section throughout, gripping the bar in the mid-portion of cylindrical holding dies and upsetting the same therein to bring it to circular form and form enlargements thereon.

4. The herein described method of forming axles, consisting in heating a bar having flat side faces whose greatest thickness is greater than the smallest diameter of the cylindrical cavity of the holding dies, gripping the same in said dies, and upsetting it within said cylindrical dies to bring it to circular form and form enlargements thereon.

5. The herein described method of forming axles, consisting in heating a bar having flat side faces and of uniform section throughout, setting said bar in circular clamping dies with its flat side faces transverse to the parting of the dies, clamping the same therein and upsetting it to bring it to circular form and form enlargements thereon.

In testimony whereof, I the said JOHN M. HANSEN have hereunto set my hand.

JOHN M. HANSEN.

Witnesses:

ROBERT C. TOTTEN,
J. R. KELLER.