C. M. WALES.

METHOD FOR MAKING HOLLOW AXLES.

APPLICATION FILED NOV. 10, 1911.

1,104,088.

Patented July 21, 1914.

Fig. 1,

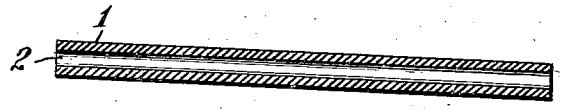


Fig. 2,

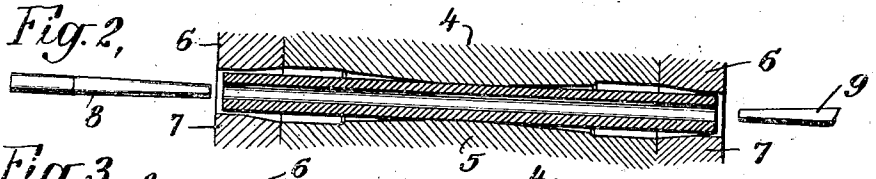


Fig. 3,

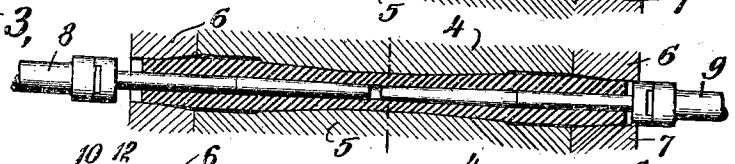


Fig. 4,

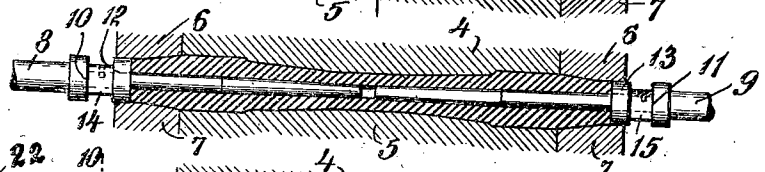


Fig. 5,

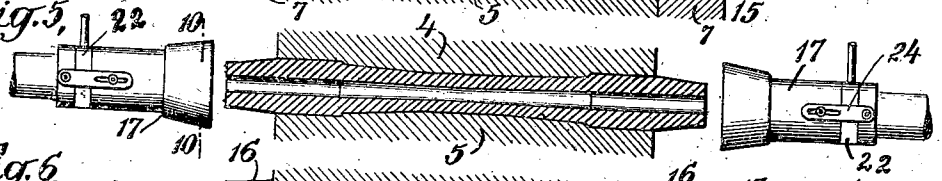


Fig. 6,

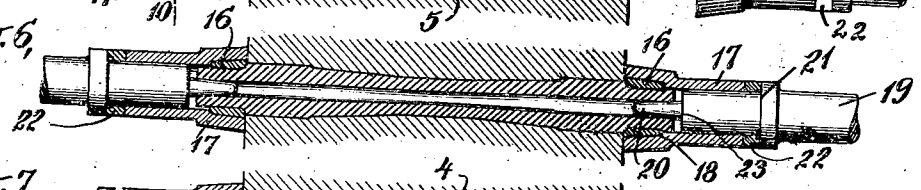


Fig. 7,

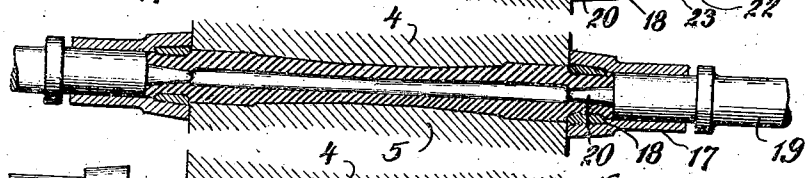


Fig. 8,

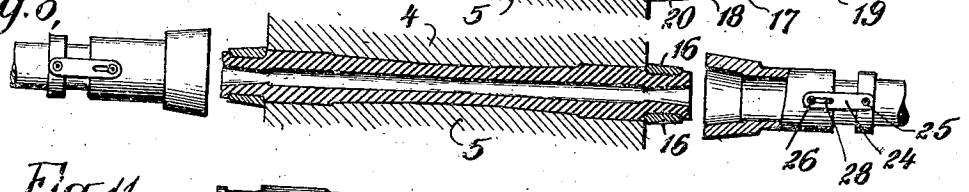


Fig. 11,



Fig. 9,

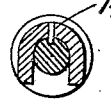
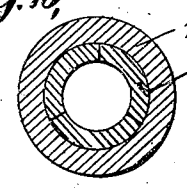


Fig. 10,



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METHOD FOR MAKING HOLLOW AXLES.

1,104,088. Specification of Letters Patent. Patented July 21, 1914.

Application filed November 10, 1911. Serial No. 659,510.

To all whom it may concern:

Be it known that I, CHARLES M. WALES, a citizen of the United States of America, and resident of the city, county, and State of New York, have invented certain new and useful Improvements in Methods for Making Hollow Axles, of which the following is a specification.

My invention relates to a novel method for making hollow axles for railroad cars and the like.

The object of my invention is to provide an economical and effective method for making hollow car axles, by means of which both on account of the distribution of the metal and the treatment which it undergoes, superior strength, uniformity, and economy of material are attained.

My invention consists in the various steps, severally and combined which are hereinafter described and pointed out in the claims.

In the drawings accompanying and forming part of this specification, Figure 1 represents in section the billet of which the axle is to be formed; Fig. 2 a section through the dies in which the billet is placed preparatory to performing the first step; Fig. 3 a similar section at the end of the first step; Fig. 4 the same at the end of the second step; Fig. 5 represents the apparatus in position for the third step; Fig. 6 the same at the end of the third step; Fig. 7 shows in section the apparatus at the completion of the fourth step; Fig. 8 shows the same with the journal forming dies withdrawn; Fig. 9 a transverse section through the center of the distance piece 14, Fig. 4; Fig. 10 an enlarged section on line 10, 10, of Fig. 5; and Fig. 11 the completed axle forging.

The reference characters are used in the same sense throughout the drawings and the specification.

Numeral 1 represents the billet of which the axle is to be made by my improved method. It is preferably cylindrical in form and of a length somewhat greater than the finished axle, and a diameter substantially equal to the diameter of the finished axle at its center. It has a straight centrally disposed cylindrical hole 2 formed through it. This hole is preferably produced by drilling, because in this way small imperfections of the metal which are generally to be found at the center are removed, and large imperfections which might impair the strength of the axle may be more readily discovered. My invention is not, however, limited to any particular method of forming the hole in the billet, and any other method, such as piercing the billet while hot by forcing a plunger through it, may be employed.

The preferred manner of carrying out my invention is as follows:—After the billet 1 has had the hole 2 drilled through it, it is heated and placed in the dies and expanded progressively from its ends to points near the inner extremities of the wheel seats, by means of pressure exerted upon the interior of the billet. These dies consist of central upper and lower sections 4 and 5 respectively, and upper and lower end sections 6 and 7 respectively, the end portions being movable independently of the central portions, for a purpose which will be hereinafter explained. When the dies are closed they form a chamber having the shape of a surface of revolution with the diameter at the center substantially equal to the diameter of the center of the finished axle forging, and tapering gradually in both directions to the wheel seat forming enlargements, which are preferably straight cylindrical portions, and then tapering to about the diameter desired for the journals. Tapered mandrels 8 and 9 respectively, whose ends have a diameter about equal to the diameter of the hole 2, are then forced into the ends of the billets simultaneously until they about meet at the center. Then one of these mandrels is withdrawn slightly while the other is caused to advance past the center of the billet. This operation is then reversed and the latter is withdrawn while the former is advanced beyond the center, then both mandrels are withdrawn a short distance. The mandrels are provided with shoulders 10 and 11 respectively, and with loose collars 12 and 13 respectively, the collars being of the same diameter as the openings in the ends of the chamber formed by the end sections 6 and 7 of the dies. Removable distance pieces 14 and 15 respectively are then inserted between the collars and the shoulders, and the mandrels are forced inwardly bringing the collars against the ends of the billet causing the metal to expand and fill the wheel seat forming enlargements in the dies, the width of the distance pieces 14 and 15 being such as to prevent the ends of the mandrels coming together during this operation. When

this operation has been completed the mandrels are withdrawn and the end sections 6 and 7 are removed leaving the partially formed forging in the central die sections 4 and 5 with the journal ends projecting therefrom as shown in Fig. 5.

The treatment of the billet above described leaves it in the form shown in Fig. 5 in which the wheel seats and the intermediate portions of the forging are completed and the end portions of which the journals are to be formed have a diameter at their ends substantially equal to the required diameter for the journal and taper to the diameter of the wheel seats. It is now necessary to make the entire journal of uniform diameter except at the outer ends, which must be enlarged to form the usual collar at the outer ends of the journals, and at the same time it is desirable to produce a thickening of the walls of the journals where they join the wheel seat portions. To accomplish this I provide the rings 16, preferably made of three segments which are held together in the sleeve 17. The internal diameter of the ring formed by these three segments is the diameter desired for the journal. The exterior of the ring and the recess in the sleeve 17 into which it is received are tapered slightly to facilitate their removal. The segments of the ring 16 back up against a shoulder 18 in the sleeve 17, and the internal diameter of the sleeve 17 back of the shoulder 18 is the diameter desired for the collar to be formed at the end of the journal. The sleeve 17 is slidably mounted on the arbor 19, which has a tapering mandrel portion 20 formed at its end, a shoulder 21, and a distance piece 22 removably mounted thereon.

As soon as the mandrels 8 and 9 are withdrawn and removed and the die sections 6 and 7 are removed, the plunger 19 having the distance piece 22 between the shoulder 21 and the sleeve 17, is forced toward the axle until the end of the sleeve 17 abuts the dies 4 and 5. This reduces the external diameter of the journal to a uniform diameter. The pressure against the plunger 19 is then relieved, the distance piece 22 is removed and the plunger is again forced forward, causing the tapered mandrel 20 to enter farther into the opening in the end of the journal and at the same time causing the shoulder 23 at the base of the mandrel end 20 to come up against the end of the journal and form the collar at the end thereof as shown in Fig. 7.

I provide links 24 secured by a stud 25 to the plunger 19, and stud 26 to the sleeve 17, one end of the link being provided with an elongated hole 28. Then as the plunger 19 is withdrawn the sleeve 17 is pulled away from the journal leaving the segmental ring 16 on the journal. The segments are then removed, the dies 4 and 5 are opened, and the completed axle forging is removed.

Having thus described my invention, what I claim is:

1. The herein described method of forming the journal end of a tubular car axle which consists in first forming a central axial hole in the axle, and a journal portion having an external taper from a smaller diameter at the end to a larger diameter at the wheel seat and then forcing a ring formed of segments and having an internal diameter substantially equal to the diameter of the end of said taper journal portion longitudinally over said journal portion while the segments of said ring are rigidly held together.

2. The herein described method of forming the journal end of a tubular car axle which consists in first forming a central axial hole in the axle, and a journal portion having an external taper from a smaller diameter at the end to a larger diameter at the wheel seat and then forcing a ring formed of segments and having an internal diameter substantially equal to the diameter of the end of said taper journal portion longitudinally over said journal portion and then forming a collar at the end of said journal by forcing a shouldered mandrel against said end while said segments are rigidly held together.

3. The herein described method of forming the journal end of a tubular car axle which consists in first forming a central axial hole in the axle, and a journal portion having an external taper from a smaller diameter at the end to a larger diameter at the wheel seat and then forcing a ring formed of segments and having an internal diameter substantially equal to the diameter of the end of said taper journal portion longitudinally over said journal portion and then forcing a tapered and shouldered mandrel into and against the end of said axle while said segments are rigidly held together.

4. The herein described method of forming the journal ends on tubular car axles which consists in forming a tubular forging and reducing the diameter of the ends by forcing longitudinally thereon a ring shaped forming die of smaller diameter and made up of segments while said segments are rigidly held together.

5. The herein described method of forming the journal end of tubular axles which consists in forming a tubular forging of the approximate length of the finished axle forging, reducing the diameter of the end by forcing a ring formed of segments, longitudinally thereon of less diameter, and forming a collar by forcing a shoulder against the end while said ring is held in place.

6. The herein described method of forming the journal end of a tubular axle which consists in first forming a central axial hole

in the axle and a journal portion having an external taper from a smaller diameter at the end to a larger diameter at the wheel seat, then forcing a ring having an internal diameter corresponding to the desired diameter of the journal over said journal portion and then forcing a tapered mandrel into and a shoulder against the end of said axle.

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

CHARLES M. WALES.

Witnesses:
FLORENCE J. WALSH,
W. C. JORDAN.