

No. 649,497.

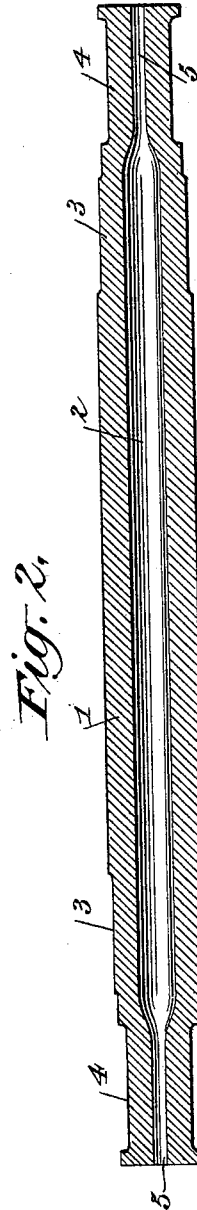
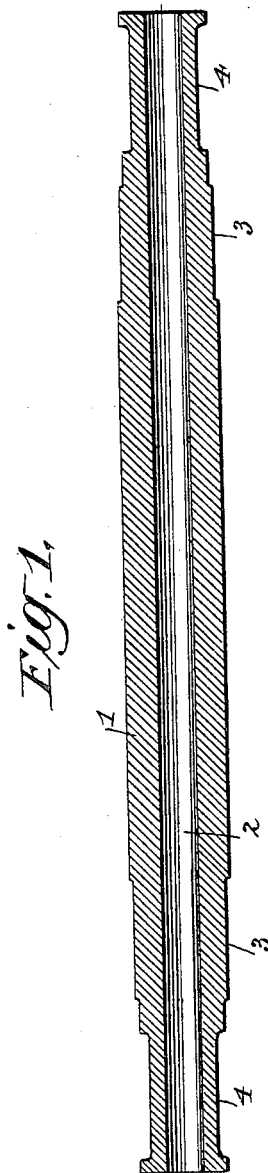
Patented May 15, 1900.

C. M. WALES.
METHOD OF FORGING CAR AXLES.

(Application filed July 14, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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Fig. 3,

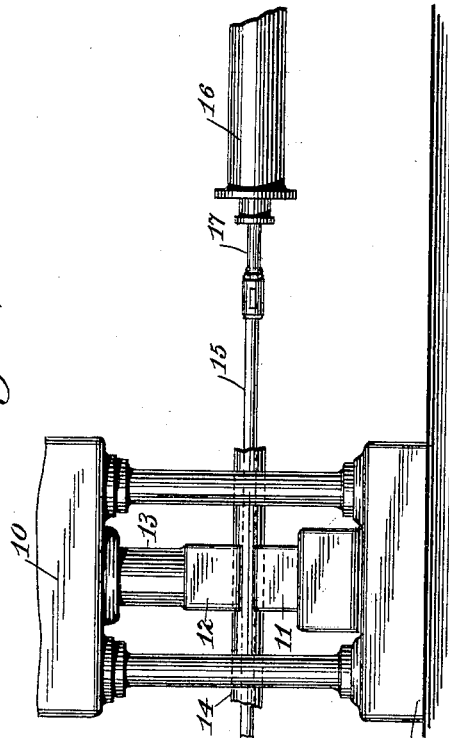
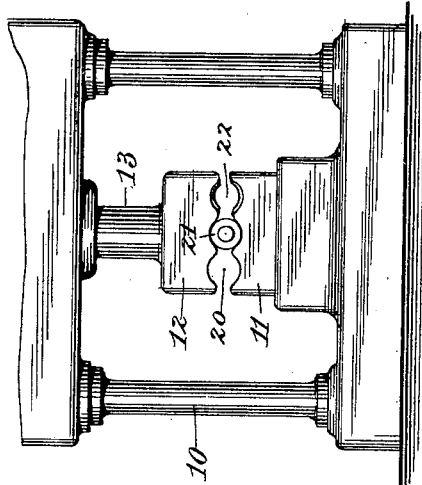


Fig. 4,



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UNITED STATES PATENT OFFICE.

CHARLES MARSHALL WALES, OF NEW YORK, N. Y.

METHOD OF FORGING CAR-AXLES.

SPECIFICATION forming part of Letters Patent No. 649,497, dated May 15, 1900.

Application filed July 14, 1899. Serial No. 723,850 (No specimens.)

To all whom it may concern:

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

My invention relates to hollow forged car-axles and the method of producing same; and it has for its object to produce a car-axle which shall be lighter and stronger than those heretofore in use.

My invention consists in taking an ingot of steel and boring a hole through the center of said ingot and in forging the ingot in a hydraulic press or by means of hydraulic pressure on an arbor into the required shape.

In the drawings accompanying and forming part of this specification, Figure 1 shows my improved car-axle made according to my improved method. Fig. 2 represents a modification of the same. Fig. 3 represents a side view, and Fig. 4 an end view, of an apparatus which will illustrate my method of producing the improved car-axle.

Similar characters of reference designate like parts in all of the figures.

1 represents the main body of the car-axle.
2 represents the hole through which the arbor on which the ingot is forged is inserted.
3 represents the wheel-seat.
4 represents the journals.

5 represents the reduced diameter of the hole in the journals in the modified form.

10 represents a hydraulic press of any suitable construction.

11 represents the lower die, 12 the upper die, and 13 the piston, of the hydraulic press.

14 represents a partially-forged ingot.

15 represents a movable arbor on which the ingot is formed.

16 represents a hydraulic cylinder in which is operated the piston 17 for the purpose of forcing the arbor 15 back and forth through the ingot and also for shifting and turning the ingot in the dies.

The dies 11 and 12 are provided with three forms or recesses 20, 21, and 22, respectively.

20 is a roughing-form or that employed when the forging is begun on the ingot.

21 is a form for finishing the body of the

axle, and 22 is a form for producing the reduced diameter at the end of the axle for the journal.

After a hole has been drilled through the ingot which will permit the arbor to pass through it the ingot is heated in the furnace in the ordinary way. It is then taken out and placed upon the arbor between the dies of the hydraulic press. The press is then operated to lower and raise the die 12 upon the ingot, bringing a succession of impulses or squeezing effects upon the ingot with a very great pressure, while at the same time the ingot is turned about its axis and moved back and forth longitudinally, thereby reducing the external diameter of the ingot and elongating it. From time to time during the forging operation the arbor 15 is shifted back and forth in the ingot by means of the hydraulic cylinder 16 and piston 17 for the purpose of bringing a relatively-cool portion of the arbor in contact with the ingot. This arbor, being of a relatively-small diameter, would soon become very hot and before the forging process was completed might stick to the ingot and become soft; but by means of shifting its position in the ingot at suitable intervals a relatively cool and hard surface is kept constantly in contact with the inner surface of the ingot, thereby rendering the forging process on this inner surface much more perfect and at the same time avoiding all danger of the arbor welding to the ingot. When the ingot has been wrought into the shape of a hollow shaft of the right diameter and length, the ends are forged to a smaller diameter for the journals. This may be done in a separate press or may be done in the same press, if suitable dies are made, as shown. The end portions of the car-axle may be forged down to the proper diameter before the arbor is fully withdrawn, in which case an axle of the form shown in Fig. 1 will be produced, or this operation of reducing the ends of the axle for the journals may be done after the arbor is withdrawn, in which case the holes in the ends of the axle will be reduced, as shown in Fig. 2. The arbor 15 is made considerably longer than the finished axle, and provision may be made to cool that portion which is not within the ingot by a jet of water. The ingot is relatively short and of great diameter

compared with the length and diameter of the finished car-axle, and it is largely due to the great amount of working and forging which the material undergoes that the strength of the material is so greatly increased.

5 Axles made by this method are found to have a far greater strength and the material is far more homogeneous than solid axles made in the usual manner. This is due partly
10 to the fact that the center of the ingot, which is always more or less spongy and porous, has been removed before the forging has taken place and partly to the fact that the forging effect is carried throughout the material both
15 internally and externally.

By means of this method I am able to produce a car-axle far stronger and more dura-

ble and which weighs over a hundred pounds less than any at present in use.

Having thus described my invention, what I claim is— 20

A method of forging hollow car-axles, consisting in forging an ingot previously drilled to receive an arbor upon said arbor, and in moving said arbor longitudinally so as to
25 bring relatively-cool portions of the arbor in contact with the ingot while the forging process is progressing.

Signed by me at New York, county and State of New York, this 13th day of July, 1899.

CHARLES MARSHALL WALES.

Witnesses:

HENRY SCHOENHERR, Jr.,
C. F. CARRINGTON.