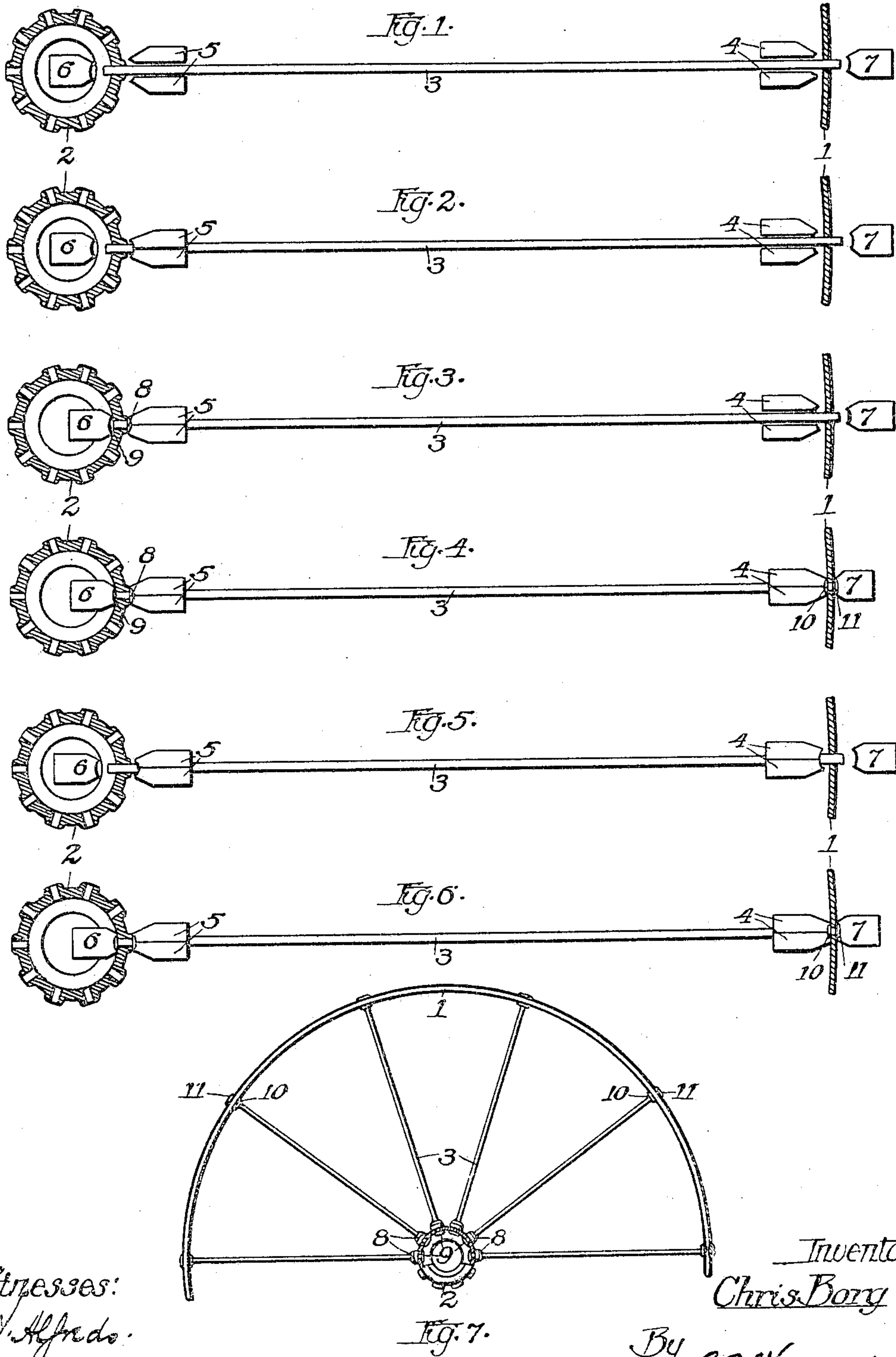


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C. BORG.
METHOD OF MANUFACTURING METAL WHEELS.
APPLICATION FILED NOV. 16, 1904.



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UNITED STATES PATENT OFFICE.

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METHOD OF MANUFACTURING METAL WHEELS.

SPECIFICATION forming part of Letters Patent No. 787,889, dated April 25, 1905.

Application filed November 16, 1904. Serial No. 232,922.

To all whom it may concern:

Be it known that I, CHRIS BORG, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have
5 invented a new and useful Improvement in Methods of Manufacturing Metal Wheels, of which the following is a complete specification.

This invention relates to the manner in
10 which the spokes are secured to the hub and rim of the wheel; and it consists in stretching the spoke-blanks to permit of shoulders being formed thereon against the adjacent wheel member, the object being to provide an im-
15 proved and simple method which will result in a strong and durable wheel.

In the methods heretofore employed in the manufacture of metal wheels the spokes have not been stretched, but have been either
20 "scraped up" or the ends of the rims have been united after the securing of the spokes thereto has been effected, or the rims have been sprung or the shoulders formed inside the rim or outside of the hub by the applica-
25 tion of external pressure on the outer end of the spoke. I have found that to stretch the spoke when securing it in position adds to its strength and results in a durable wheel. It is a well-understood property of steel that to
30 subject it to stretching or wire-pulling will favorably affect both its tenacity and its range of elastic action, so that a stretched spoke will therefore be better able to resist either tensional stress or the shocks to which it will
35 be subjected incident to its use.

The employment of this improved method will result in the production of a tension-wheel of uniform stress throughout all its parts, and it will enable plain spoke-blanks to be
40 used, the spoke-blanks having had no other previous operation performed upon them than that of simply being cut to proper length. In addition to this, since the spoke is operated upon hot and since its securing is
45 effected in practically a single operation, a cheaper grade of steel, such as Bessemer instead of open-hearth, or a harder and more rigid high-carbon steel can be used, which would not be possible were a rivet-head formed
50 cold.

This improved method is applicable to the manufacture of all styles of metal wheels. When adapted to the manufacture of metal wheels having two-part hubs or hubs divided transversely with staggered spokes set at a
55 slight angle relative to the axis of the hub, the fact that the hubs are made in two parts will permit them to approach each other on the contraction due to the cooling of the spoke, and thus compensate for such short-
60 ening. In wheels of considerable size, such as rake-wheels having single hubs, the contraction due to the cooling of the spoke is found to ordinarily create an excessive tension therein; but this difficulty can be met
65 by springing the rim outwardly before securing the wheel member thereto in the manner set forth in Patent No. 773,465, issued to me October 25, 1904.

Any suitable machine may be used for ap-
70 plying this method, and hence only diagrammatic views of gripping-jaws and heading-tools are shown in their different relations with respect to the wheel members.

A machine of the preferred construction for
75 the application of this improved method will form the subject-matter of another application.

Referring to the drawings, Figure 1 represents a section of a hub and a fragment of a
80 rim of a wheel with a spoke-blank in place, while the gripping-jaws are in position to grip but have not yet closed on the spoke. Fig. 2 shows a similar view with the gripping-jaws closed on the hub end of the spoke. Fig. 3
85 shows the gripping-jaws and heading-tool on the hub end of the spoke in the position they occupy after the shoulder has been formed outside the hub and a head inside the hub. Fig. 4 represents the spoke-gripping jaws on
90 the rim end of the spoke after they have gripped that end of the spoke and formed a shoulder thereon beneath the rim, the heading-tool outside the rim having simultaneously formed a head on the outer end of the spoke,
95 while the gripping-jaws on the hub end of the spoke are shown as still retaining their grip on that end of the spoke. Fig. 5 represents a similar view with the two pairs of jaws in their gripping position and the heading-tools
100

in the position they occupy before the head has been formed; and Fig. 6 represents a corresponding view in which both pairs of gripping-jaws are shown to have simultaneously moved toward the adjacent member, thereby upsetting a shoulder outside the hub and within the rim, while the heading-tools have also simultaneously moved toward each other and formed heads on both ends of the spoke. Figs. 5 and 6 show modifications of the steps shown in Figs. 1 to 4, inclusive, the modifications consisting in having both pairs of gripping-jaws operate simultaneously in these figures, while in the preceding figures their movements are shown to be successive. Fig. 7 represents a portion of a finished wheel in the manufacture of which this improved method was employed.

In carrying out my invention in the preferred manner a rim 1, either closed or open, is provided, in which are formed at suitable intervals spoke-receiving apertures, and also a hub 2, in which are formed corresponding spoke-receiving apertures. The spoke-blank 3 is shown as being formed of a rod the cross-section of which is circular; but the form of cross-section of the spoke employed is immaterial.

4 4 designate the two opposing spoke-gripping jaws operating on the rim end of the spoke, and 5 5 the jaws operating on the hub end of the spoke. The heading-tool 6 is arranged to form a head on the hub end of the spoke within the hub, while the heading-tool 7 similarly operates to form a head on the rim end of the spoke outside the rim.

The spoke 3 being first heated, the ends thereof are inserted within the corresponding apertures of the rim and hub 1 and 2, respectively, as shown in Fig. 1. One end of the spoke is then secured to its adjacent member—for instance, to the hub 2—by means of the jaws 5 5 gripping the spoke, as shown in Fig. 2, after which the shoulder 8 is formed outside the hub and the head 9 inside the hub by the said jaws and heading-tool approaching each other and upsetting the material of the spoke. The completion of this step is shown in Fig. 3. This step is confessedly not new, and no claim is made thereto except in combination with the other steps. A shoulder 10 is then upset immediately beneath the rim, and to provide the necessary material for such shoulder the spoke is stretched simultaneously with the upsetting thereof.

The stretching of the spoke for the purpose of providing stock for the formation of a shoulder or shoulders outside of the hub or inside of the rim constitutes the essence of this invention. This step is shown as being accomplished by means of the gripping-jaws 4 4, which are formed on their outer ends to give the desired shape to the shoulder. The said jaws grip the spoke a short distance from the rim, the gripping being sufficient to prevent

longitudinal slippage of the spoke through the jaws. The gripping-jaws are then caused to move toward the rim, in doing which the spoke will be stretched and the shoulder 10 formed adjacent to the rim. The heading-tool 7 is preferably made to move coincidently with the movement of the gripping-jaws, and thereby form the head 11 outside the rim 1. It is also preferable that the gripping-jaws 5 5 retain their grip on the hub end of the spoke until after the stretching thereof, since in so doing the strain on the recently-secured spoke-fastening with the hub will be relieved and taken up by said jaws. In this manner material for the shoulder on the spoke adjacent to the wheel member to which it is last secured is provided, and only enough is required to form one shoulder. If, however, it is desired to effect the securement of both ends of the spoke to the adjacent wheel members simultaneously, then a double stretching sufficient to provide material for both shoulders would result. This modified step is shown in Figs. 5 and 6, where both jaws move outwardly from each other simultaneously. It is preferred, however, to stretch the spoke only sufficiently to provide material for one shoulder, as in the first-described manner.

A slight stretching of the spoke has been found to favorably affect its strength, and while the spoke is shown to be stretched an amount only sufficient to form a shoulder on the end of the spoke adjacent to the wheel member I do not limit myself to stretching the spoke precisely this given amount, for it is apparent that the relative movement of the gripping-jaws and heading-tool longitudinal with respect to the spoke could be so proportioned that the metal would be caused to flow to some extent through the spoke-receiving aperture in the wheel member in a direction inwardly or outwardly, depending upon the relative rapidity of movement of the heading-tool and the gripping-jaws. If the heading-tool moved faster than the gripping-jaws, then some of the metal of the spoke would be forced through the spoke-receiving aperture and assist in forming the shoulder adjacent to that wheel member, so that the spoke would not need to be stretched sufficient to form the entire shoulder. On the other hand, if the gripping-jaws moved faster than the heading-tool then some of the material of the spoke lying within the spoke-receiving aperture would be pressed out and aid in forming the head of the spoke.

As before stated, it is immaterial whether the connection of the ends of the spoke with the wheel members be made at its hub or rim end first or, in fact, whether the operations on the two ends are made simultaneously or successively.

In upsetting the shoulders on the spoke, as above described, it is obvious that the same portion of the spoke cannot at once be both

upset and stretched; furthermore, that the extent of the stretching movement corresponds with that of the upsetting movement, the stretching of the spoke providing material 5 for the upsetting of the shoulder, or, to express the idea more specifically, the stretching of the spoke enables or permits a shoulder or shoulders to be upset thereon.

What I claim as my invention, and desire to 10 secure by Letters Patent, is—

1. The method of securing the spokes in metal wheels, which consists in assembling the spokes in the wheels, forming shoulders on the spokes by stretching them and thereby 15 providing the necessary metal for the shoulders, and upsetting the metal so provided to form the shoulders.

2. The method of manufacturing metal wheels, consisting in stretching the spoke to 20 provide metal for a shoulder, and simultaneously therewith upsetting the material thereof to form said shoulder against one side of the adjacent wheel member, and forming an opposing head on the spoke on the other side 25 of said wheel member.

3. The method of manufacturing metal

wheels, consisting in stretching the spoke to provide metal for a shoulder, upsetting the material thereof to form said shoulder against one side of the adjacent wheel member, and 30 forming an opposing head on the spoke on the opposite side of said wheel member, the several steps being performed simultaneously.

4. The method of manufacturing metal wheels, consisting in uniting one end of the 35 spoke to the adjacent wheel member, securing said spoke end against endwise movement by means independent of its connection with said member, stretching the spoke an amount sufficient to provide material for a shoulder on 40 the other end of the spoke, and simultaneously upsetting the metal to form said shoulder.

5. The method of forming a shoulder on a spoke, which consists in holding the spoke near one end against longitudinal movement, 45 grasping the other end, and forming the shoulder on such end by stretching the spoke and thus upsetting the metal.

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