(No Model.) 2 Sheets—Sheet 1.

U. & F. L. EBERHARDT.

WROUGHT METAL GEAR WHEEL AND MECHANISM FOR MAKING SAME.

No. 578,731. Patented Mar. 16, 1897.

Fig. 1.

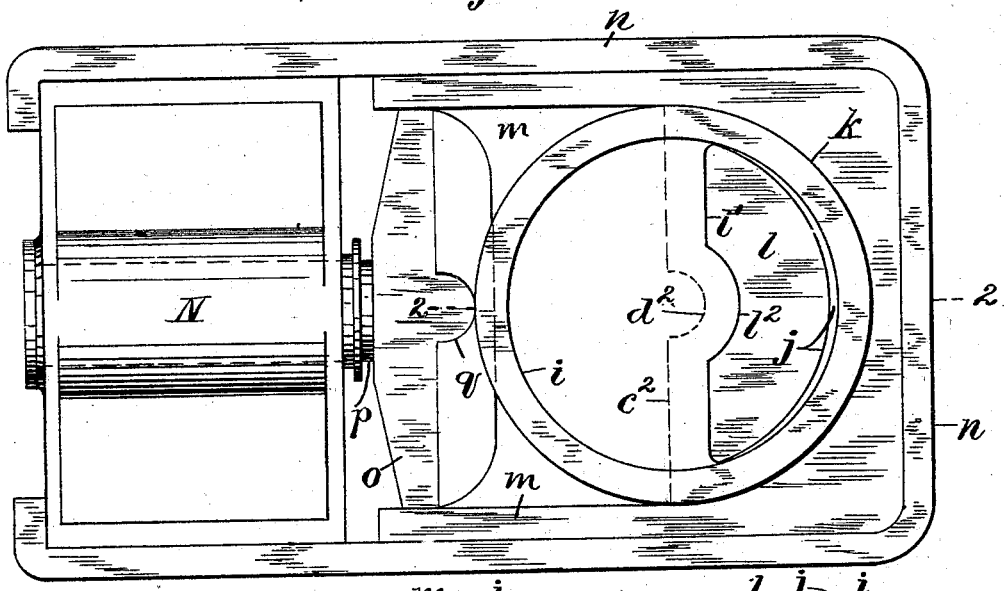


Fig. 2.

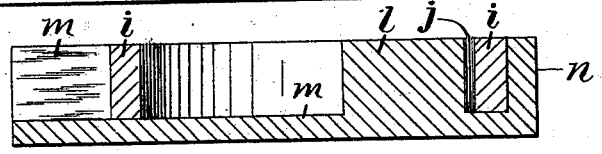


Fig. 4.

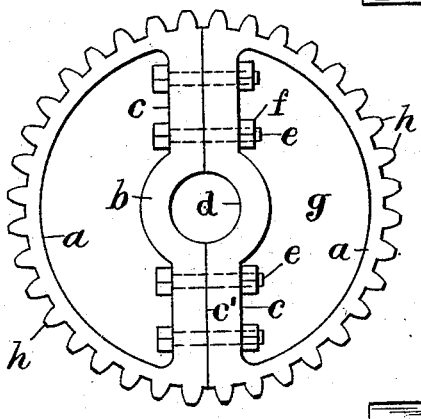


Fig. 3.

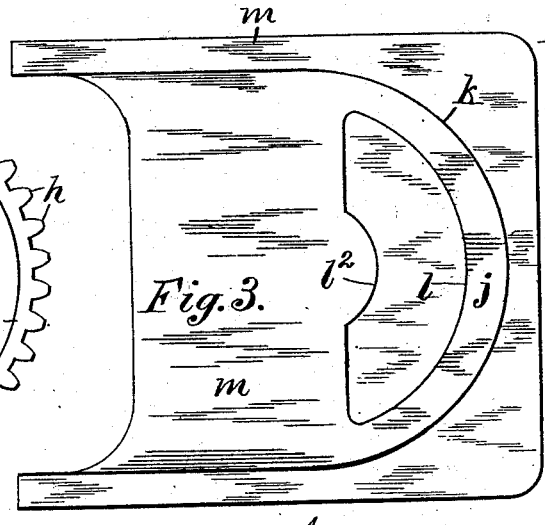
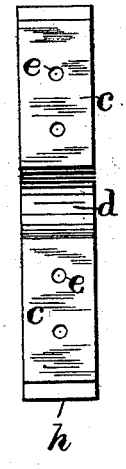


Fig. 5.



Attest:
L. Lee.
Edw. F. Kinsey

Inventors.
Ulrich Eberhardt,
Fred L. Eberhardt, per
Thomas S. Crane, Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2

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Fig. 6.

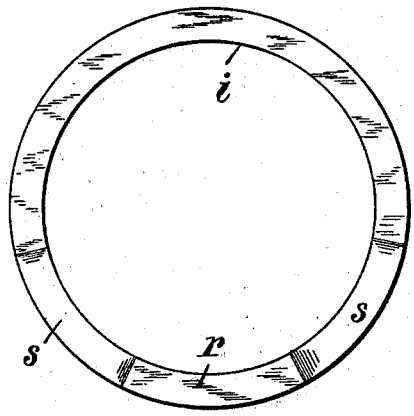


Fig. 7.

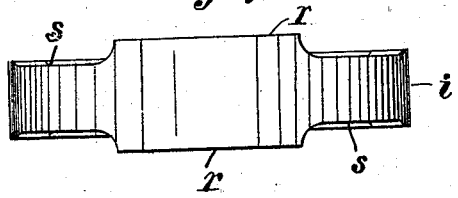
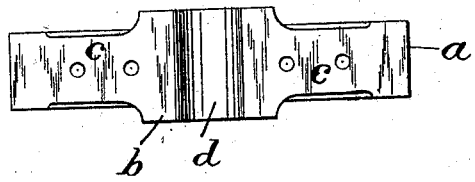


Fig. 8.



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UNITED STATES PATENT OFFICE.

ULRICH EBERHARDT AND FRED L. EBERHARDT, OF NEWARK, NEW JERSEY.

WROUGHT-METAL GEAR-WHEEL AND MECHANISM FOR MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 578,731, dated March 16, 1897.

Application filed October 1, 1895. Serial No. 564,295. (No model.)

To all whom it may concern:

Be it known that we, ULRICH EBERHARDT and FRED L. EBERHARDT, citizens of the United States, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Wrought-Metal Gear-Wheels and Mechanism for Making the Same, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The objects of this invention are, first, to furnish a metallic wheel of greater strength than the castings commonly employed, and, second, to produce such a wheel of less weight than the solid wrought-metal wheels sometimes used where great strength is required. These two requirements are in a measure contradictory, but we are enabled to meet them both by forming the wheel in two semicircular sections, made each in one piece by a special process.

Our process consists in first rolling a weldless ring of suitable diameter and substantially the same width as the intended wheel-section; second, holding one side of said ring, heated suitably for forging, in semicircular shape, and, third, upsetting the metal in the opposite side of the ring and simultaneously shaping the same into a diametrical clamp-bar with semihub in the middle. In this process one side of the original blank or ring is completely transformed in shape and is converted into a straight bar with a projection upon the middle adapted to form a semihub upon the section, and such semihub may in the same process be provided with a semibore to admit a shaft or axle when two of the semiwheel-sections are secured together. By this method of manufacture a nearly semicircular opening is extended through each section between the semirim and the diametral portion, and a construction possessing great strength is secured and a degree of lightness which has never heretofore been attained in the manufacture of a wrought-metal cog-wheel. When two of such sections are suitably faced and secured together, the hub may be bored out, the periphery of the wheel may be turned true, and teeth may be cut in the same, if desired. In practice we use a weldless band of forged steel, which is thoroughly worked in rolling the metal to shape, and which by its process of manufacture has a certain fibrous structure with the fibers running parallel to the surface of the bar. When such weldless ring is compressed into a semicircular wheel-section, as described above, the fibers in the clamp-bar and semihub remain substantially parallel with the surface, and thus positively identify the product as having been made by our process.

The apparatus for performing this process consists, broadly, of means for retaining one half of the circular ring in semicircular form and means for simultaneously upsetting the metal in the opposite semicircular side of the ring and shaping the same into a diametral clamp-bar.

The ring constitutes an entire "blank" for making a semiwheel-section, and such semiwheel-section constitutes a complete article, which when worn may be replaced independently of the corresponding semiwheel-section to which it is attached in use.

In the drawings, Figure 1 is a plan of such an apparatus. Fig. 2 is a plan of the mold on line 2 2 in Fig. 1. Fig. 3 is a plan of the mold removed from the apparatus. Fig. 4 is a side view of a finished gear-wheel embodying our invention, and Fig. 5 is an edge view of the same. Figs. 6, 7, and 8 show modifications.

In Fig. 4, *a* denotes the semirim of each section comprising the wheel; *b*, the semihub; *c*, the clamp-bar extended from the hub to the ends of the semi-rim, and *d* the semibore. The two sections are shown faced upon the diametrical line *c'* and united by through-bolts *e*, having nuts *f*, the wheel being thus what is termed a "split gear-wheel," and thus adapted for application to a shaft where the ends are inaccessible. Teeth *h* are shown formed upon the periphery of the wheel, which would be formed by suitable gear-cutting machinery after the wheel was properly trued up or turned upon its periphery. Such split gear-wheels are largely used upon street-railway cars for connecting an electric motor with the car-axle, and our improved construction for the wheel enables us to furnish a wheel of very great durability and strength at a minimum of cost, as the sections are made with great rapidity and with the smallest amount of metal consistent with strength.

The blank ring *i*, from which one of the sections would be made, is shown in Fig. 1 with one-half fitted to a groove *j*, between a semicircular recess *k* and segmental boss *l* upon a mold *m*. The front side of the boss is suitably shaped with straight portions *l'* and a curved recess l^2 in the middle to form the inner side of the semihub *b* and clamp-bar *c*, and the mold is shown sustained in a frame *n*, having a hydraulic cylinder N secured therein with a cross-head *o* attached to its piston *p*.

The cross-head forms a die to shape the diametral portion of the wheel-section, and is formed for this purpose with a semicylindrical projection *q*, adapted to press the material of the ring *i* inward upon the middle line to produce the semibore *d*. The ring in its initial position is shown in full lines in Fig. 1, with dotted lines c^2 and d^2 illustrating the shape into which the outer half of the ring is forced by the movement of the die or cross-head *o*.

The metal in the outer half of the ring *i* is forced together or upset by the pressure of the die and the middle portion reversed in its curvatures to form the semihub *b*, the material in such portion of the ring thus making the clamp-bars *c* somewhat thicker than the periphery *a* of the wheel. If such thickening of the clamp-bars be undesirable, the ring may, by suitable previous treatment, be made thinner upon one side than upon the other and the thicker side be arranged within the mold to form the semirim *a*, while the thinner side is pressed by the die to form the clamp-bars and semihub. The thinner portion of the ring *i* could be so proportioned as to make the clamp-bars of the desired thickness. A modification may also be made in the ring to produce semisections in which the semihub projects outside the edge of the wheel, so that the bore is of greater length than the rim of the wheel. Such a semisection is shown in edge view in Fig. 8, the clamp-bars being also modified to make them a little narrower than the rim, by which construction the clamp-bars do not project beyond the edges of the rim when the latter is trued off or turned in a lathe, as would otherwise be the case. Such a projecting hub may be formed by using a suitable mold and pressing the clamp-bar *c* so strongly (when upsetting the outer half of the ring) as to force a portion of the metal into the hub and spread it laterally.

Another means for effecting the same object consists in forming the ring at one or both sides with projecting lugs of suitable length to extend around the ends of the semihub and form the projecting extensions of the same. Such construction is shown in Figs. 6 and 7, in which projecting lugs *r* are shown upon the opposite edges of the ring. Such lugs may be made by drop-forging the ring or other suitable means. In using such a ring it would be placed in a suitable mold, and the projection *q* upon the die would press between the ends of the lugs, and thus form the hub from such portion of the ring.

Recesses *s* are shown in Figs. 6 and 7 formed upon the edges of the ring adjacent to the opposite ends of the lugs *r*, and of suitable length to form, when it is pressed in the mold, the clamp-bars *c* of less width than the rim, as shown in Fig. 8. Such construction for the wheel adapts it for many purposes to which a flat gear-wheel like that shown in Figs. 4 and 5 is not wholly adapted.

From the above description it will be seen that the complete ring which constitutes the blank is entirely changed in shape by the treatment described, and is transformed to a semicircular shape, which requires a very considerable upsetting of the metal in one side of the original ring to make the straight clamp-bar which forms one side of the semisection. One side of the circular ring is thus converted into the diametral portion of a semiwheel-section.

It is evident that the apparatus may be materially modified and still hold one side of the ring in the semicircular form, while the opposite side is upset and bent to produce a diametral portion, and we do not therefore limit ourselves to the precise construction shown herein. The blank which we have claimed herein consists of a cylindrical ring having lug or lugs *r* upon the edge of suitable portions to form a projecting semihub upon the side or sides of the semiwheel-section.

Having thus set forth the nature of the invention, what is claimed herein is—

1. The mechanism for making, from a circular ring, a wrought-metal semiwheel-section with diametral clamp-bar, which consists of means for retaining one half of such circular ring in semicircular form, and means for simultaneously upsetting the metal in the opposite semicircular side of the ring and shaping the same into a diametral clamp-bar, substantially as herein set forth.

2. The mechanism for making a wrought-metal semiwheel-section, which consists of a mold provided with a semicircular recess *k*, and segmental boss *l* having a segmental recess l^2 in the middle, and a cross-head *o* movable toward the segment *l*, and provided with convex projection *q*, the whole adapted to retain one half of a circular blank in a semicylindrical form to shape the remaining hole of the ring into a diametral bar with semihub and semibore, substantially as herein set forth.

3. A blank for a wrought-metal semiwheel-section with projecting semihub upon the side of such section, consisting of a wrought-metal ring of uniform width and provided with lugs *r* upon both edges of the ring, such lugs being of uniform projection from the edge of the ring, as herein set forth.

4. A blank for a wrought-metal semiwheel-section with projecting semihubs upon oppo-

site sides and clamp-bars of less width than the rim, consisting of a wrought-metal ring of uniform width upon one half of its periphery, and provided upon the remaining half with opposite lugs *r* and recesses *s* at the ends of the lugs, in the edges of the ring, the lugs being of uniform projection from the edge of the ring, substantially as herein set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

ULRICH EBERHARDT.
FRED L. EBERHARDT.

Witnesses:
E. N. EBERHARDT,
THOMAS S. CRANE.