No. 637,654. Patented Nov. 21, 1899.

N. E. PARISH.

SPROCKET WHEEL.

(Application filed Oct. 13, 1898.)

(No Model.)

FIG. I.

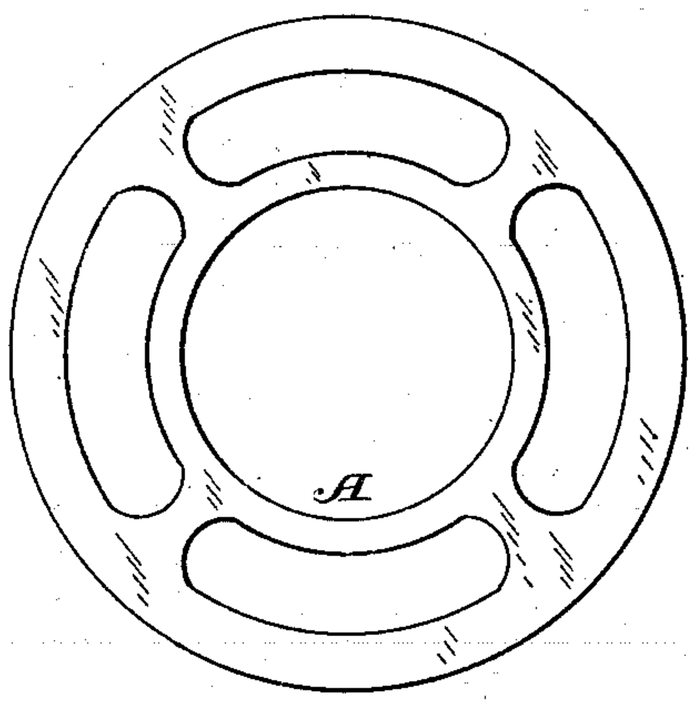

FIG. II.

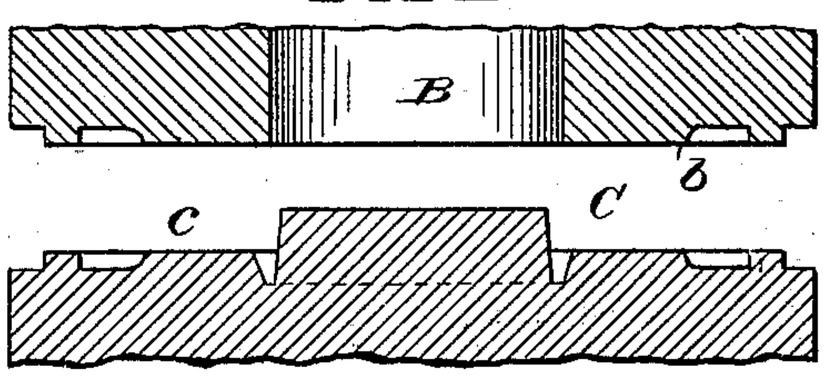

FIG. III.

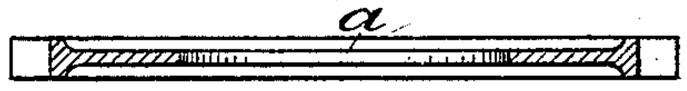

FIG. IV.

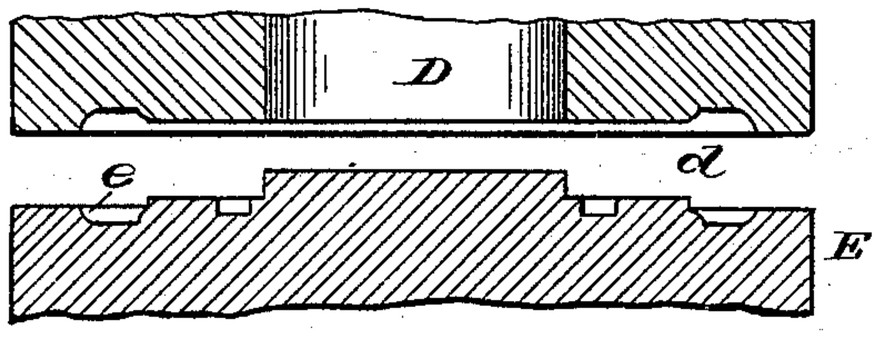

FIG. V.

WITNESSES:

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NEFF E. PARISH, OF CLEVELAND, OHIO, ASSIGNOR TO THE PARISH & BINGHAM COMPANY, OF SAME PLACE.

SPROCKET-WHEEL.

SPECIFICATION forming part of Letters Patent No. 637,654, dated November 21, 1899.

Application filed October 13, 1898. Serial No. 693,395. (No model.)

To all whom it may concern:

Be it known that I, NEFF E. PARISH, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Sprocket-Wheels, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My improved bicycle sprocket-wheel, formed by cold-pressing the metal, possesses many advantages over sprocket-wheels made by the old forging process—by giving a much denser product, the difference being especially increased at the surface, where hardness is most desired, and by giving a clean uniform surface free from scale and imperfections. This is of considerable importance in the subsequent treatment of the sprocket before nickeling and causes a considerable saving in the cost of such treatment. Before the steel can be electroplated all of this scale must be removed and a chemically-clean bright surface prepared. Where the sprocket-wheels have been made by the cold-pressing process, this surface is clean, dense, and with few or no imperfections, and hence the cost of preparation for electroplating is much less than with those made by the usual process of hot-forging. The process of cold-pressing effects an important and advantageous difference in the chemical nature of the product made in this way over that made by hot-forging. When steel is heated for hot-forging, the surface always burns to a greater or less degree, depending upon the length of time of heating, upon the temperature used, and upon the number of times it must be heated for each step in the process of shaping. This burning at the surface consists in a chemical union of the iron and carbon of the steel with the oxygen of the air, whereby the carbon passes off as gaseous oxids and the iron oxid remains on the surface as scale, which must be removed completely by grinding or pickling before the article can be electroplated. This burning during hot-forging often takes place to such an extent as to render the product brittle and to remove a large portion of the carbon of the steel, replacing it by oxid of iron, or what the practical forger calls "taking the life out of the metal." In consequence of this chemical action many defective sprocket-wheels are always produced by the method of hot-forging, and often the defect cannot be located until the wheel is used, thus causing serious loss to the makers of bicycles when such wheels must be replaced. In my cold-pressed sprockets, the surface of the metal is not oxidized in the least and thus is not injured in any way. No scale is formed, and no part of the carbon is removed. In the cold-pressing of sprocket-wheels there is not only no removal of carbon from the surface of the metal, but an advantageous chemical change takes place, whereby the surface is made harder. Carbon exists in steel in several different methods of chemical union. One such combination of carbon, causing the hardness of the steel to increase, is known as "hardening-carbon" and gives to steel the well-known effect of quenching or hardening. The cold-pressing of sprocket-wheels causes the carbon near the surface of the metal to change to this hardening condition, producing the effect of surface hardening and at the same time leaving the interior metal tough. Cold-pressing also increases the rigidity and stiffness of the metal and raises its elastic limit. All of these advantageous effects produced in cold-pressing over hot-forging sprocket-wheels are intensified in the thinner part or web, because this part being small and thin is more liable to burn through and to become fatally weak by the reheating necessary for hot-forging, while in cold-pressing this part has the most of the hardening-carbon and is hence strongest at these weaker points.

The annexed drawings and the following description set forth in detail one mode of carrying out the invention, such disclosed mode constituting but one of various ways in which the principle of the invention may be used.

Referring to the drawings, Figure I is a plan view of a steel sprocket-blank before compression. Fig. II is a central sectional view of the web-compression dies. Fig. III is a central sectional view of the sprocket-blank after being operated upon by said dies. Fig. IV is a central sectional view of the rim-com-

pressing dies. Fig. V is a central sectional view through the sprocket-blank after it has been operated upon by the rim-compressing dies.

In producing my improved steel sprocket, a blank A of any suitable design is placed without heating between two compressing-dies, as B C, and the web portion *a* of the sprocket is compressed to a greatly-reduced thickness between the projecting portions *b c*, respectively, of said dies, thereby greatly increasing the hardening-carbon in said web portion. The teeth of the sprocket-blank are then punched out in any suitable manner, and the blank is then placed between the two dies D E, having the curved rim-compressing surfaces *d e*, whereby the teeth are rounded off and the hardening-carbon in the rim, and particularly in the wearing-surface of the teeth, is increased, but not to so great an extent as in the web portion of the sprocket-blank. The finished blank F is now in its complete form, as shown in the drawings. It will thus be seen that a steel sprocket-wheel is formed which has the opposite side faces of its teeth surface-hardened and the metal of the peripheral faces or edges of the teeth less hard than the metal forming said side faces.

Other modes of applying the principle of my invention may be employed instead of the one explained.

I therefore particularly point out and distinctly claim as my invention—

1. A steel sprocket-wheel, having its teeth surface-hardened, the interior of said teeth being of tough metal and having the carbon in the web portion mainly in the hardening condition, substantially as set forth.

2. A steel sprocket-wheel having the opposite side faces of its teeth surface-hardened and having the metal of the peripheral faces of the teeth less hard than said side faces, substantially as set forth.

Signed by me this 23d day of September, 1898.

NEFF E. PARISH.

Attest:
D. T. DAVIES,
J. C. TURNER.