(No Model.)

H. A. HARVEY.

MANUFACTURE OF FLANGED TIRES FOR CAR WHEELS.

No. 560,160. Patented May 12, 1896.

Fig. 1

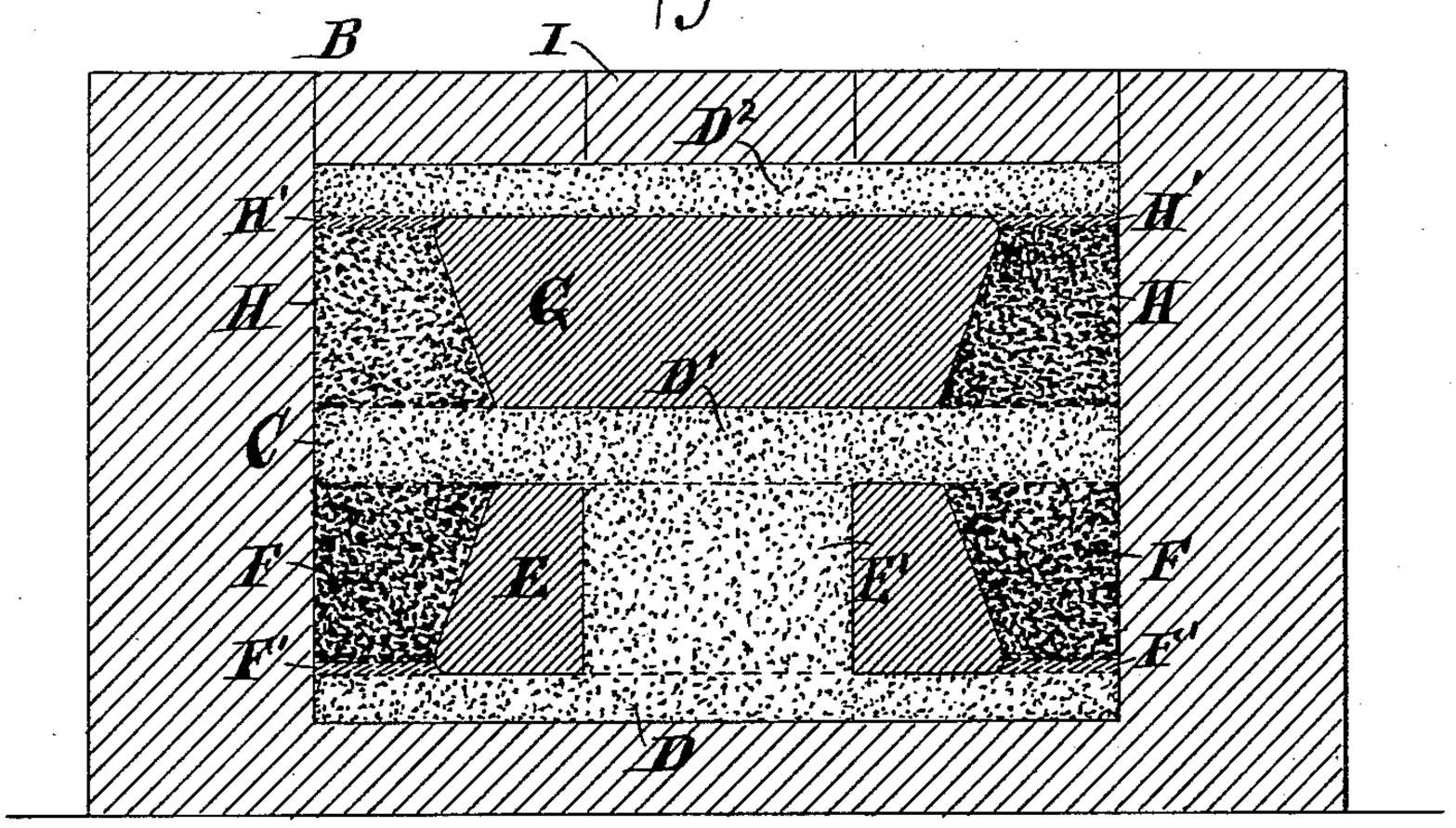
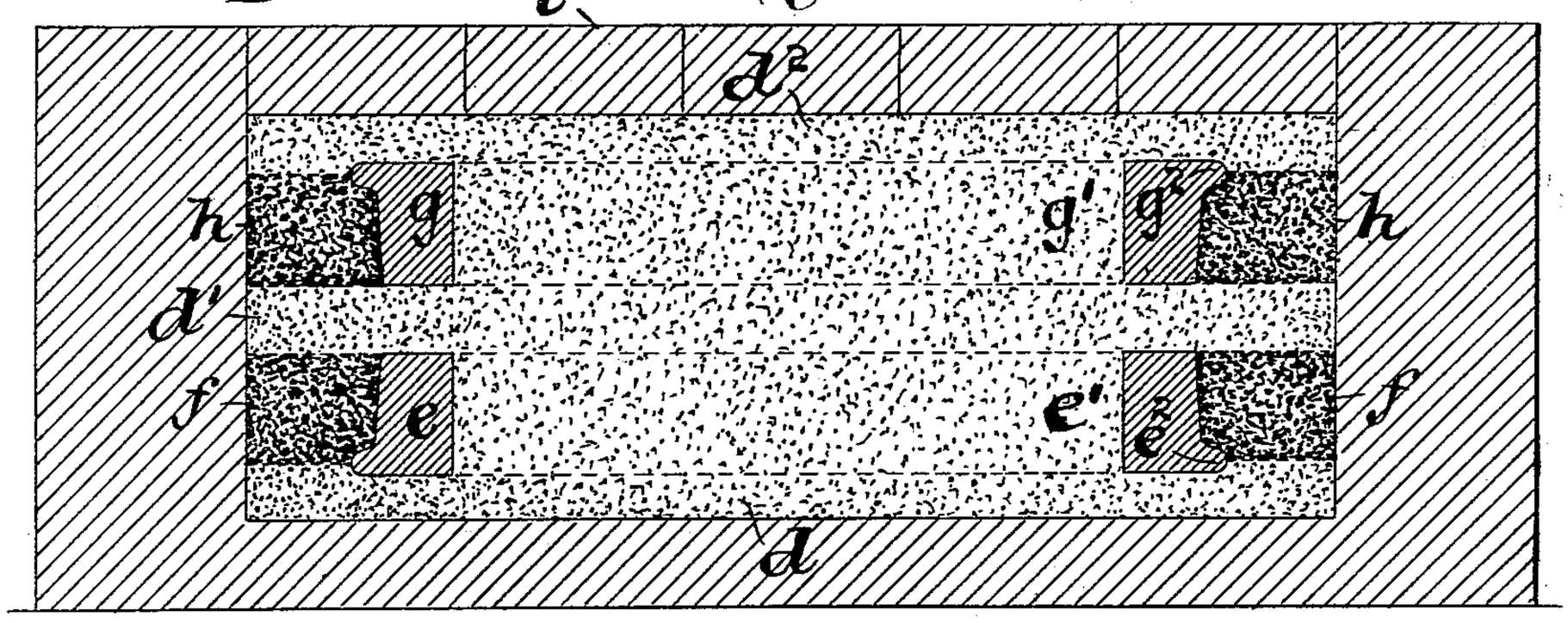


Fig. 2



Witnesses
Geo. Wadman
A. M. Jones.

Inventor
Hayward A. Harvey,
Per Edw. E. Lumby,
Atty.

UNITED STATES PATENT OFFICE.

HAYWARD A. HARVEY, OF ORANGE, NEW JERSEY, ASSIGNOR TO THE HARVEY STEEL COMPANY, OF NEWARK, NEW JERSEY.

MANUFACTURE OF FLANGED TIRES FOR CAR-WHEELS.

SPECIFICATION forming part of Letters Patent No. 560,160, dated May 12, 1896.

Application filed October 9, 1895. Serial No. 565,160. (No specimens.)

To all whom it may concern:

Be it known that I, HAYWARD A. HARVEY, of Orange, New Jersey, have invented certain Improvements in the Manufacture of Flanged Tires for Car-Wheels, of which the following is a specification.

The object of this invention is the production for use on a car or locomotive wheel of a flanged tire, the main body of which is composed of tough metal and is integral with excessively hard metal upon the face or tread of the tire and with a somewhat less excessively hard metal upon the side of the flange adjacent to the tread. In the common process of manufacturing car-wheel tires the first step is to cast or forge a steel ingot in the form of a truncated cone, which is technically called a "cheese." The present invention requires that this cheese shall be made of low steel containing not to exceed, say, .3 per centum of carbon. In the ordinary process of manufacture the center of the cheese is punched out and the remaining annulus is subjected to the operation of rough-rolling, in the course of which the flange is developed.

The present invention requires that the part of the said cheese or annulus which is to form the tread, as the case may be, either before or after the rough-rolling operation, shall be impregnated upon its convex surface to the depth of from two to three inches with a prescribed additional quantity of carbon, while the part which is to form the flange is impregnated to a less extent. This is effected by subjecting the cheese or the annulus either before or after it has been rough-rolled to intense heat while its convex face is in contact with a granular material rich in carbon, the side of its flange, or of the metal which is to form the side of the flange adjacent to the tread, is in contact with a material lean in carbon, and the remaining portion of the surface of the cheese or annulus is in contact with sand or other non-carbonaceous material, said granular materials being contained in a suitably-shaped receptacle, the walls of which are made of fire-clay or other refractory substance, and which is arranged within the heating-chamber of a suitable furnace. The period of time required for such impregnation will of course vary with different furnaces and different fuels, and must therefore be determined by previous tests of the particular furnace and the particular fuel employed.

In prior patents granted to Hayward A. Harvey, No. 376,194, dated January 10, 1888, and No. 460,262, dated September 29, 1891, the intense heat above referred to necessary for supercarburization has been indicated in connection with the treatment of ingots or other bodies of steel, and also in connection with armor-plate. In the first-named patent there is specified a temperature above 1,500° Fahrenheit, and excellent results are stated to be produced by raising the raw steel to a temperature upward of 3,000° Fahrenheit. In the last-named patent a temperature above the melting point of cast-iron, (1,930° to 2,300° Fahrenheit,) or approximately such heat, is specified. All these temperatures can only be stated approximately—first, because it is difficult to measure the same exactly, and, secondly, because a prolonged heating at a somewhat lower temperature will produce results which are similar to those obtained by a less prolonged heating at more intense temperatures. The extent of supercarburization effected should be such that the metal upon the surface of the tread will be made to contain at least .9 per centum, and possibly 1.25 per centum of carbon. If the supercarburization has been performed upon a cheese, the central portion of the cheese will subsequently be punched out in the usual manner. The cheese, or the annulus, may be slowly cooled down and thus annealed in the furnace, but preferably after having cooled down is reheated and carefully annealed preparatory to being rerolled and machined to its finished form, and subsequently again reheated in a suitable furnace for the purpose of being hardened. When its convex surface is observed to have the color which indicates the degree of temperature suitable for hardening steel of the particular quality used, it is chilled by being submerged in or copiously sprayed with a cold chilling liquid. Copious spraying is important where the mass of heated metal is large, and the degree of hardening

produced by chilling is to be properly proportioned to the degree of carburization at different depths in the body of the tire. As the main body of the resulting tire is composed of tough metal, any warping which it may acquire during the described treatment can easily be taken out of it by the use of the ordinary appliances for that purpose. If desired, the convex face and flange of the tire can then be finished by grinding.

The accompanying drawings, conventionally representing the heating-chamber of a furnace containing the receptacle in which the supercarburizing operation is performed, are as follows, to wit:

Figure 1 is a vertical section of the annular receptacle filled with the granular materials, in which two cheeses are embedded. Fig. 2 is a vertical section showing the strata of granular materials and affording a view in section of two tires embedded therein.

Fig. 1 represents in central vertical section the cylindrical receptacle B, the interior of which constitutes a cell C of suitable dimensions for conducting the supercarburizing operation upon two cheeses. At the bottom of the cell is a stratum D of sand, upon which is deposited the punched cheese E, the periphery of which is inclosed by an annular mass F of granular carbonaceous material. Preferably a thin stratum F′ of mixed sand and granular carbonaceous material is interposed between the stratum D of sand and the annular mass F of carbonaceous material. The interior E′ of the punched cheese is filled with sand, and a stratum D′ of sand surmounts the cheese E and the annular mass F of carbonaceous material. An unpunched cheese G rests upon the stratum D′ of sand and has nearly all its periphery inclosed by the annular mass H of granular carbonaceous material. A relatively thin stratum H′ of mixed sand and carbonaceous material is arranged above the annular mass H of carbonaceous material, and together with the unpunched cheese G is surmounted by the uppermost stratum D^2 of sand, above which is the cover I, made of fire-clay or other refractory material. It will be seen that the portions of the cheese which are ultimately worked into the flange of the tire are those which are in contact with the strata F′ and H′, which are lean in carbon.

Fig. 2 represents a cylindrical receptacle B, proportioned with reference to effecting the supercarburization of two such rough-rolled tires as would be made from cheeses of the proportions indicated in Fig. 1. In this case the lower tire *e* is deposited upon the lower stratum *d* of sand, and its interior *e′* is filled with sand. Instead of arranging a stratum of granular material lean in carbon immediately around the flange of the tire *e*, the tire *e* is placed flange downward and is embedded into the stratum *d* of sand to a depth equal to rather more than one-half of the thickness of its flange e^2. The remainder of the periphery of the tire is inclosed by the annular mass *f* of granular carbonaceous material, which, together with the tire, is surmounted by the stratum *d′* of sand or other non-carbonaceous material. The tire *g*, arranged with its flanged side upward, is deposited upon the stratum *d′* of sand, and the interior *g′* of the tire *g* is also filled with sand. The periphery of the tire *g*, with the exception of rather more than one-half of its flange g^2, is inclosed by the annular mass *h* of granular carbonaceous material, which, together with the tire *g*, is surmounted by the stratum d^2 of sand, above which is the cover *i*. The expedient of exposing only portions of the flanges of the tires *e* and *g* to contact with the carbonaceous material is to be regarded merely as the alternative of the expedient illustrated in Fig. 1 of surrounding the corresponding parts of the cheeses with mixtures of sand and carbonaceous material. In both cases the object is the same—to wit, to prevent the supercarburization of the flange of the wheel to the extent to which the remainder of the tire is supercarburized, so that the flange will not be impregnated with sufficient carbon to be in danger of being made brittle in a subsequent process of hardening the tire. It is preferred to so conduct the operation of supercarburization that the finished tire will be impregnated upon its face or tread with the added carbon ordinarily to the depth of one and one-half inches. In such case it will be necessary to impregnate the face or tread of the rough-rolled tire to a greater depth—that is, to such greater depth as is inversely proportional to the difference between the diameter of the rough-rolled tire and the diameter of the finished tire. Similarly, if the supercarburizing operation is performed upon the cheese, the depth of impregnation must be still greater. For example, if the rough-rolled tire is one-quarter less in diameter than the finished tire, then it should be impregnated to a depth of, say, two and one-eighth inches, in order that the finished tire produced from it shall have upon its tread or face a depth of impregnation of one and one-half inches; or, for example, if the supercarburizing operation is performed upon a cheese the mean diameter of which is one-half that of the finished tire, then the depth of impregnation of the cheese should be twice that required for the finished tire. It is also to be understood that the supercarburizing operation may, if preferred, be performed upon the finished tire after it has been subjected to the final rolling operation by which it is brought to its ultimate diameter, and in such case the process of supercarburization will be so regulated as to secure in the finished tire the depth of impregnation of added carbon which may be desired. In conducting the supercarburizing operation upon the finished tire the operation is similar to that described with reference to the treatment

of the rough-rolled tire, especially in respect of the fact that the flange is prevented from absorbing too much carbon by protecting the greater portion of it with sand or by inclosing it in a mass of material lean in carbon.

What is claimed as the invention is—

1. The herein-described improvement in the manufacture of flanged tires for car-wheels, which consists in constructing such tires from steel low in carbon by the usual methods, and in the course of manufacture impregnating the metal ultimately composing the tread with a prescribed excess of carbon, and in impregnating with a relatively smaller excess of carbon the metal ultimately composing the side of the flange adjacent to the tread, and in finally hardening the tire while it is at a suitable temperature by immersing it in, or spraying it with, a cold chilling liquid.

2. The improvement in the manufacture of flanged tires for car-wheels, which consists in subjecting a low steel tire to heat while its face or tread is in contact with a body of powdered charcoal, or other carbonaceous material, and while the side of its flange adjacent to its face or tread is in contact with a body of material comparatively lean in carbon and in subsequently hardening the tire while it is at a suitable temperature by immersing it in, or spraying it with, a cold chilling liquid.

HAYWARD A. HARVEY.

Witnesses:

A. M. JONES,

E. GATTERER.