(No Model.)

# R. C. TOTTEN.

## CAR WHEEL.

No. 509,409. Patented Nov. 28, 1893.

Fig. 1.

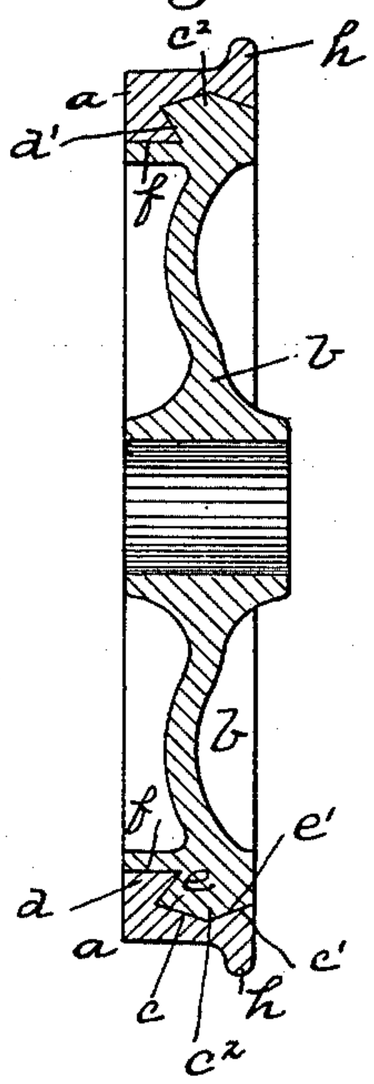



Fig. 2.

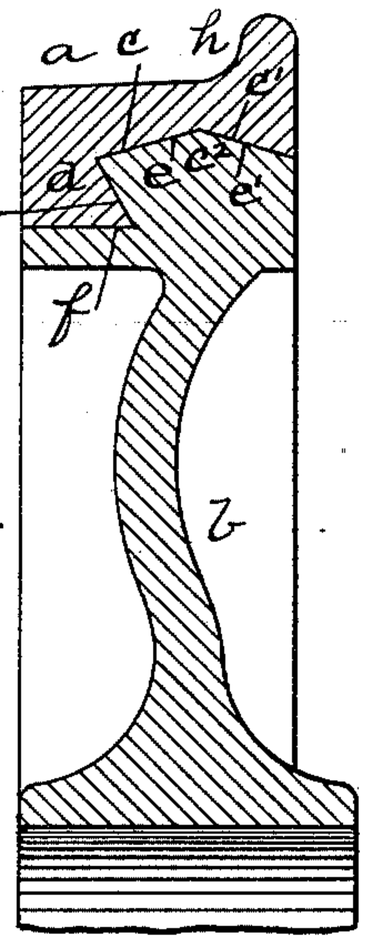



Fig. 5.

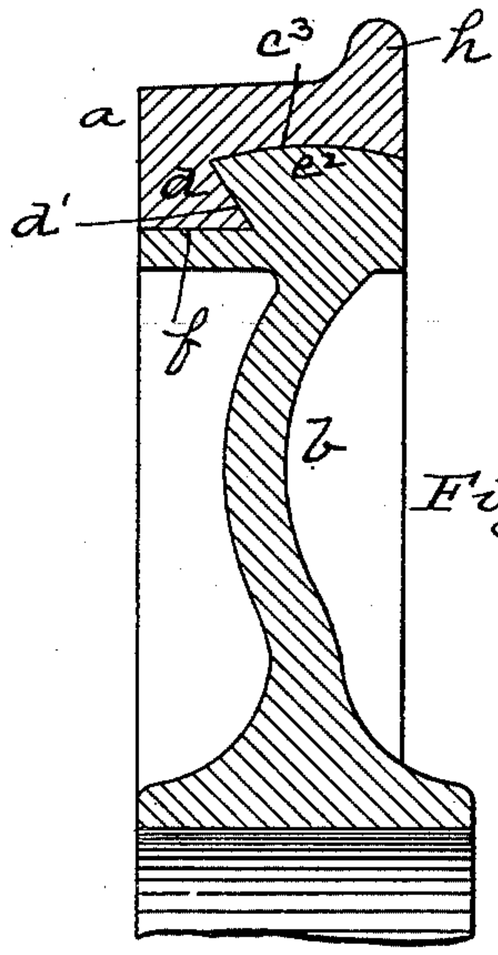



Fig. 3.

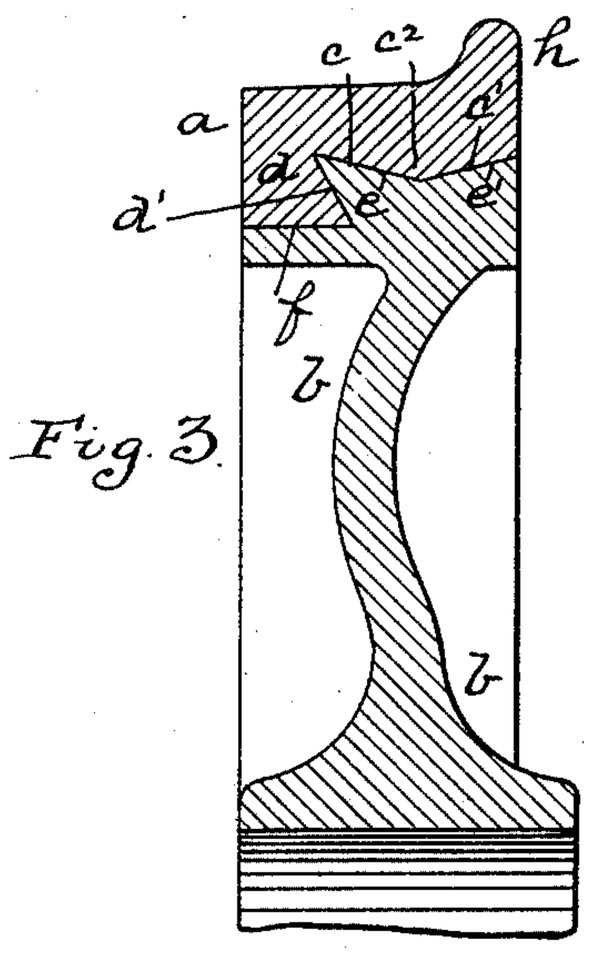



Fig. 7.

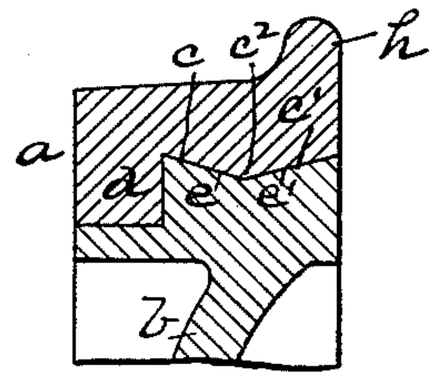



Fig. 6.

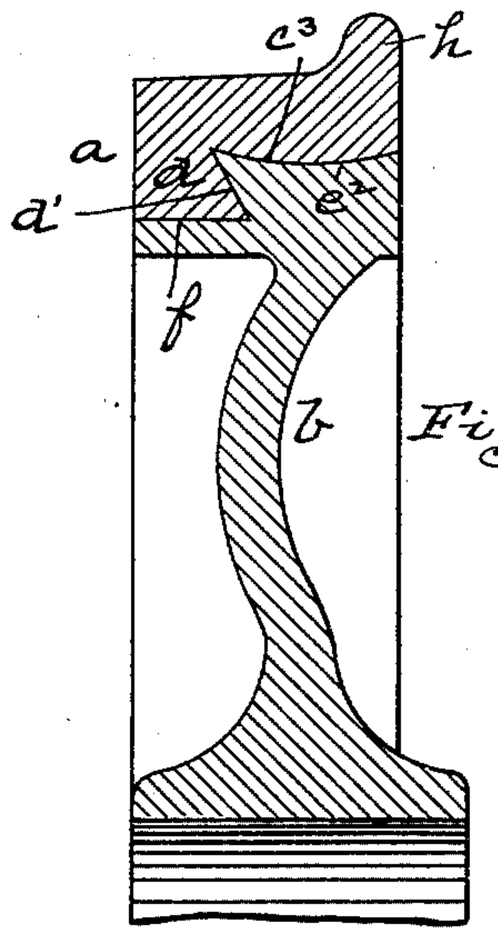



Fig. 4.

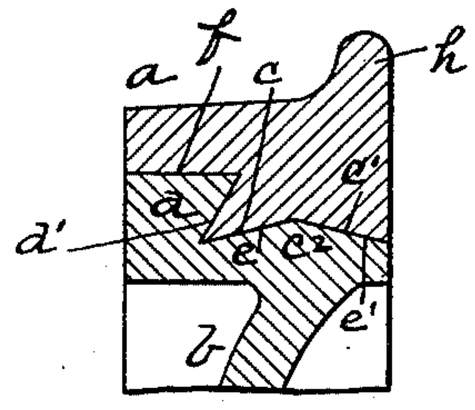
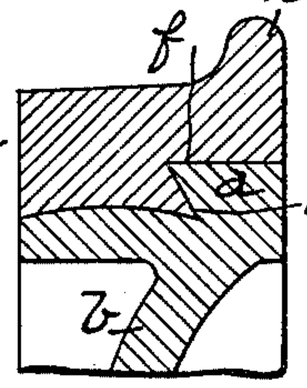



Fig. 8.

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# UNITED STATES PATENT OFFICE.

ROBERT C. TOTTEN, OF NEW YORK, N. Y.

## CAR-WHEEL.

SPECIFICATION forming part of Letters Patent No. 509,409, dated November 28, 1893.

Application filed December 17, 1892. Serial No. 455,480. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT C. TOTTEN, a resident of New York, in the county of New York and State of New York, have invented a new and useful Improvement in Car-Wheels; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to car wheels.

The increasing tendency of steel to supersede iron in the arts, and the fact that the cost of manufacture has been greatly reduced owing to the many improvements in furnaces and appliances for the production and working of steel, have led to the adoption in many cases of the solid steel car wheel. While the chilled iron wheel has always been distinguished for the wearing capacity of its tread, yet this quality has been obtained at the sacrifice of strength in the body of the wheel. The increasing traffic on railroads necessitates increased capacity and greater tonnage of cars, and to meet this demand the strength of the wheels must be accordingly increased. The result has been that many experiments have been made with steel wheels, either by the use of the solid steel wheel or a steel or iron body with a rolled steel tire secured thereto.

The solid cast steel wheel has not met with general approval owing to the difficulties encountered in the casting of such a wheel, as well as the expense incurred in rolling the treads of such wheels after they have been cast. It is a well-known fact that steel castings shrink from one-fourth ($\frac{1}{4}$) to three-eighths ($\frac{3}{8}$) of an inch to the foot, according to the grade of steel, and, consequently, the pattern for a thirty-six (36) inch solid steel car wheel must be made from three-fourths ($\frac{3}{4}$) of an inch to one and one-eighth ($1\frac{1}{8}$) inches larger in diameter than the diameter of the required wheel. In a cast iron car wheel the shrinkage would be about one-eighth ($\frac{1}{8}$) of an inch to the foot, or, say, thirty-six and three-eighths ($36\frac{3}{8}$) inches for the diameter of the pattern for a thirty-six inch wheel. Owing chiefly to the irregular form of the tread of a car wheel when cast in connection with the center, the contraction is so irregular and unequal in cooling that, although much time and ingenuity have been expended in endeavoring to modify the shape of the center, the tread or tire of the wheel being unalterable owing to the necessity of a flange to hold it on the rail, and a certain contour to adapt it to curves, yet no such modification has been sufficient to make even a cast iron car wheel, with only a shrinkage of three-eighths of an inch to the foot, so free from strain that it can be safely used as cast, but all such wheels are annealed by inserting them into a heated cooling pit or oven, or burying them in hot sand in order that they may be free from strain in casting. It is apparent at once that if this is a fact concerning a car wheel made of metal that shrinks but one-eighth ($\frac{1}{8}$) of an inch to the foot, it would be much more necessary to anneal a car wheel made of steel which shrinks two or three times as much. Accordingly, it has been found necessary to anneal all solid steel car wheels before they are put into use. But while the tread of a chilled iron car wheel is not materially modified by the annealing process, the solid wheel is very much modified by such process, as all annealing of steel castings results in their becoming very much softer than as originally cast. To soften the tread of a solid steel car wheel, therefore, means to diminish its wearing capacity and its ability to resist wear when the wheels are prevented from turning by the brakes and slide along the rails, which results in flat places being worn on the face of the tread. Then, again, where the shrinkage is so great, there is always the uncertainty as to whether all the strain of contraction has been removed by the process of annealing, and whether the wheel may not give out when subjected to any great pressure of the brakes or a sudden shock. I propose to obviate these difficulties attending the casting of a solid steel car wheel by casting the tire and body of the wheel separately. By this operation I obtain a steel tire cast to shape which is practically free from all strain in cooling, as all its sections are in harmony with each other. Such a tire can be made of any grade of steel, and will not need to be annealed. The center or body of the wheel, which is of necessity more or less irregular in shape and connected with a central hub whereby the strain in cooling is

increased, can be made of any grade of steel and annealed, the annealing in this case being of advantage as it renders said center or body softer, stronger, and more readily bored or machined.

The object of my invention, therefore, is to provide a wheel with great wearing powers and strength of body, and one in which the tire is secured to the center in such a manner as to form a very tight connection without the employment of separate locking keys or rings.

To these ends my invention comprises, generally stated, a steel tire cast to shape in combination with a central body portion formed of steel or iron on which the tire is secured by shrinking.

It also consists in such steel casting tire unannealed, and a central body portion cast to shape of steel or iron and annealed.

It also consists in a car wheel having the engaging portions of the tire and central body provided with two oppositely inclined faces, and an annular flange and corresponding recess, the oppositely inclined faces serving to lock the tire and central body together, while the flange and recess assist in holding the tire and body against transverse strain.

It also consists in forming the engaging faces of such annular flange and recess dove-tailed or inwardly inclined to further assist in holding the tire to the central body.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a sectional view of a car wheel composed of a cast steel tire and a steel or like metal body. Fig. 2 is an enlarged vertical cross section showing the manner in which the tire is secured to the body. Figs. 3, 4, 5, 6, 7 and 8 are modified forms of securing the tire to the body of the wheel.

Like letters of reference indicate like parts in each of the views.

My invention is applicable to any style of car wheel, whether the center be of single or double plate or spoke pattern, although I have illustrated it in connection with a center or body of a single plate. The tire *a* is cast to shape in any suitable mold, and any grade or mixture of metals which will give the requisite strength and hardness in the finished tire may be employed. In this manner I obtain a steel tire cast to shape which is practically free from strain and, as it does not require to be annealed, possesses a very hard wearing face or tread. It is cast to the exact shape, and with, perhaps, the exception of a little milling, is ready to be applied at once to the central body portion *b*. The body or center *b* may be formed of cast steel, cast iron, or other suitable metal having the requisite strength. The center *b*, when formed of cast steel, although subjected to great strain in cooling, when annealed is relieved of practically all strain, and, consequently, possesses the qualities of softness, strength, and durability. An ordinary cast iron center or body may be employed, if desired.

The tire *a* is formed with the oppositely inclined faces *c c'* on the inner surface thereof, and said tire is further provided with the annular flange or rim *d*. The body or center *b* is formed with the inclined faces *e e'* upon the rim thereof, and the annular recess *f*. In order to secure the tire *a* to the center or body *b*, the tire is heated until it expands sufficiently to allow the inner surface of said tire, composed of the inclined faces *c c'*, to pass over the projection $c^2$ formed by the inclined faces *e e'* on the center *b*. For instance, a thirty-three (33) inch steel tire at a red heat would be thirty-three and three-quarters ($33\frac{3}{4}$) inches, leaving three-eighths ($\frac{3}{8}$) of an inch for incline, so that when the tire is cooled the two engaging surfaces, that is, the inner surface of the tire and the outer surface of the center turned to match said tire, will be shrunk together so that the inclined faces thereof prevent the tire from being moved either way by any thrust upon the flange *h* of the wheel, either inside or outside, thus doing away with the necessity of any retaining ring or other device. The annular flange *d* serves the double purpose of preventing the tire from being driven off the center by blows against the inside of the flange *h* of the wheel, and by its dove-tailed face *d'* engaging with a like face on the annular recess *f* will prevent the tire from dropping off in case it is broken at one or more places across the tread.

In Fig. 3 I have shown a modified form of the above device, in which the inclined faces *c c'* and *e e'* are reversed, which gives a greater body to the tire at the center thereof, thereby increasing its strength, and allows for more wear on the tread thereof before it is necessary to remove said tire to apply a new one to the same body.

In Fig. 4 I have shown a modified form of the above in which the annular flange *d* is formed on the body or center *b* instead of upon the tire.

In Fig. 5 I have shown another modified form of my invention in which the inner surface of the tire *a*, instead of having the angular faces *c c'* formed thereon, is provided with the curved face $c^3$, adapted when expanded to be shrunk over the correspondingly curved surface $e^2$ on the outer surface of the body or center *b*. This last form may also be modified as shown in Fig. 6, in which these curved surfaces are reversed in the manner shown.

Fig. 7 shows an annular flange *d* of different form. Fig. 8 shows an annular flange *d* on opposite side from Fig. 4.

The present methods of securing a loose tire to the center or body involve a great deal of expense in time and labor in taking off the tire when it is worn down to a thickness which makes its use unsafe. The retaining rings usually employed are hammered or pressed

into place, when the tire itself is forced down upon the ring in such a way as to render it difficult to remove it when necessary to retire the wheel. By my invention all that is necessary is to put the wheel on the lathe, or, without taking it off the axle, put both wheels on the lathe on their axles, and then cut a groove on the middle of the tread, or, say, at the point $e^2$ in the drawings around the tire, when the tire can be driven off by a hammer or press in two pieces. If it is considered desirable the new tires can be heated and put on the old centers without taking the centers off the axles, which is an impossibility under the present methods.

It is to be understood that the particular construction, that is, the improvements relating to the means for securing the tire upon the wheel body, herein shown, are not limited to use with steel tires cast to shape, but are applicable to all loose tires in connecting them to centers, whether the tires be cast or rolled.

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

1. A car, locomotive, or like wheel, consisting of a central body portion with which the hub is formed composed of iron or steel, and a steel tire cast to shape and secured upon the body portion by shrinking.

2. A car, locomotive, or like wheel, consisting of an unannealed steel tire cast to shape, in combination with an annealed central body portion of steel or iron cast to shape, substantially as and for the purposes set forth.

3. A car, locomotive, or like wheel, having the engaging portions of the tire and central body provided with two oppositely inclined faces said faces meeting at approximately the center of said engaging portions, substantially as and for the purposes set forth.

4. A car, locomotive, or like wheel, having the engaging portions of the tire and central body provided with two oppositely inclined faces, and an annular flange and corresponding recess, substantially as and for the purposes set forth.

5. A car, locomotive, or like wheel, having the engaging portions of the tire and central body provided with two oppositely inclined faces, and an annular dovetailed flange and corresponding recess, substantially as and for the purposes set forth.

In testimony whereof I, the said ROBERT C. TOTTEN, have hereunto set my hand.

ROBERT C. TOTTEN.

Witnesses:

THOMAS MORAN,

EDWARD MACKINLY.