June 29, 1926. 1,591,003

M. S. VINCENT

CAST STEEL CAR WHEEL

Filed July 27, 1925

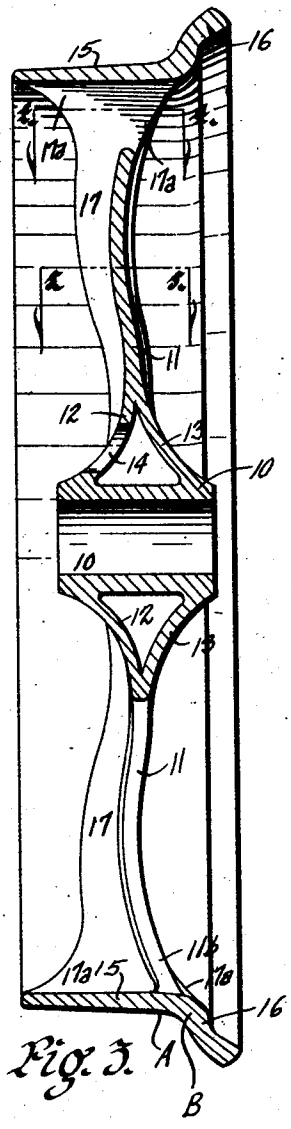


Fig. 3.

Fig. 1.

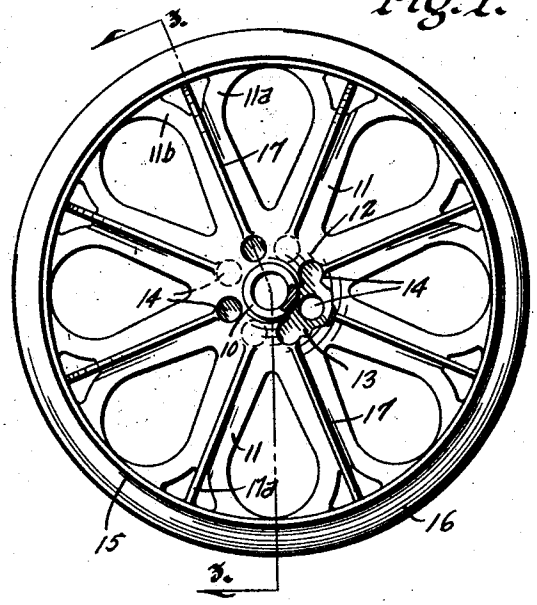
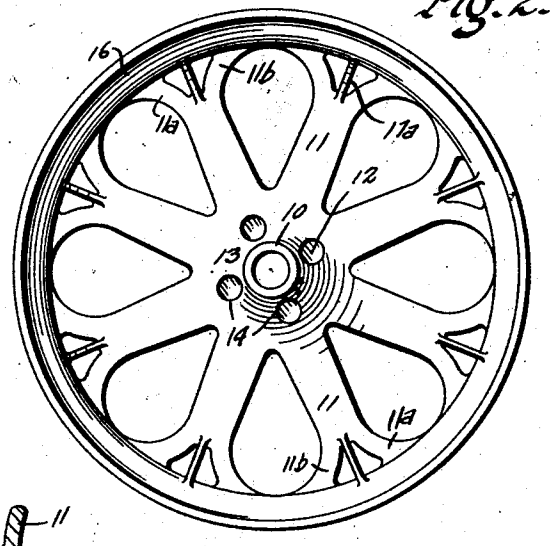


Fig. 2.



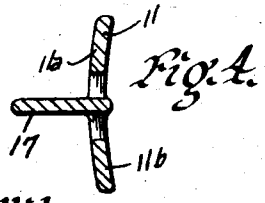


Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

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CAST-STEEL CAR WHEEL.

Application filed July 27, 1925. Serial No. 46,324.

The object of my invention is to provide a cast steel car wheel of simple, durable and inexpensive construction.

More particularly, it is my purpose to provide a cast steel car wheel intended for use on metal rails of such construction as to have the advantages of a cast steel wheel over other materials without having certain disadvantages heretofore experienced with cast steel wheels.

Another important object of my invention is to provide such a cast steel wheel having a maximum of strength with a minimum of weight of material.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my car wheel, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of a cast steel car wheel embodying my invention.

Figure 2 is an elevation of the opposite side of the wheel.

Figure 3 is a detail, sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a detail, sectional view taken on the line 4—4 of Figure 3; and

Figure 5 is a detail, sectional view taken on the line 5—5 of Figure 3.

Considerable difficulty has been experienced in the manufacture of metal wheels of a medium size for mine cars or motor cars of the type used on railroads and the like.

The wheels for cars of this type have been made of pressed steel. The pressed steel wheel has certain disadvantages. In the first place, it does not have the strength and wearing qualities of cast steel.

Another disadvantage arises from the fact that in the practical structures so far made, the hub has been a separate piece riveted in various ways to the spokes, and the riveted hub wheels tend to break down at the point of connection between the hub and the spokes.

It is advantageous to use cast steel as a material for such wheels, because the cast steel wheels are stronger and considerably more durable with the same weight of material.

It is also highly desirable, if possible, to make such a wheel in a single unit.

Heretofore, however, in the making of cast steel wheels, certain serious difficulties have been experienced.

When the wheels were cast in such a way as to be strong enough around the hub and at the points of connections between the spokes and the tread, it was found that there were certain places near the hub and near the tread, where there was such a bulk of metal, that when the wheels were cooled, shrink holes were left on the interior of the metal.

These shrink holes occur because as the metal cools, after the casting process, it cools first on the surface and later on the interior. As the metal cools, it shrinks. The final shrink occurs on the interior of the section where there is a considerable bulk of metal, leaving a hollow place which is not visible in or from the outer surface of the product.

Such shrink holes or shrinks are undesirable and dangerous for several reasons.

It is difficult to ascertain just where they exist. When they do exist, then it frequently occurs in the use of the wheel, for instance in service, the vibration causes crystallization to set up and a breakage or cracking occurs, commencing at the shrink and working toward the outer surface of the wheel. Wherever this occurs, the wheel is liable to ultimately break.

It is obvious therefore that it is highly desirable to avoid these shrinks.

It has heretofore been found in practice, however, that when the casting was made thin enough around the hub where the spokes connect with the hub or where the spokes connect with the tread, that is to say when the bulk of metal is reduced enough to avoid the shrink holes, then the wheel does not have sufficient strength to stand up under service.

Also it has been found that where the bulk of metal at the point of connection be-

tween the spokes and tread is reduced enough to avoid the danger of the shrink holes, there is not sufficient reinforcement for the tread, and when the wheel shrinks after casting it tends to flatten between the successive spokes.

It is therefore obvious that it is a desirable thing to make the wheel of such design that it may be of uniform section as nearly as possible throughout, and this is a problem, difficult of solution, which I believe I have worked out in the present wheel.

I have shown in the accompanying drawings a wheel, which accomplishes this purpose, and has been successfully tried out, and which will in actual experience far outlast a pressed wheel of like weight and outlast also cast steel wheels heretofore made, in which the idea of sections of uniform thickness was not carried out.

My wheel is a complete wheel made in a single steel casting.

It has the hollow hub or journal indicated in the accompanying drawings by the reference numeral 10.

Extending radially from the hub are the spokes 11. The shape of the spokes and the design of the connection between the spokes and the hub and the spokes and the tread are of great importance.

The inner ends of the spokes are connected with the hub by webs 12 and 13. Each web 12 and 13 is substantially continuous around the hub and is connected with each spoke.

The two webs diverge from the spokes toward the opposite ends of the hub 10, as shown in Figure 3.

It will thus be seen that I secure by this arrangement the great strength of a truss structure, by which the hub is properly supported by and connected with the spokes, while at the same time the hub itself, the webs 12 and 13 and bodies of the spokes 11 are all made of sections of substantially uniform thickness.

In order to permit proper casting process, each web 12 or 13 as the case may be is provided with a hole 14 in raidal line with the successive alternating spokes.

The holes in the respective webs 12 and 13 are staggered with relation to each other, as indicated by the full lines and dotted lines respectfully in Figure 1.

The holes provide means for supporting the core in the mold in the casting process and also for removing the core sand after the casting proper has been formed.

I find in actual practice that the provision of these holes 14 do not unduly weaken the wheel structure around the hub.

It will be seen from the forgoing that I have provided a unitary trussed hub and spoke structure of proper strength and thickness of metal without any accumulation of bulk of metal in one place likely to result in shrink holes.

At the outer ends of the spokes is the tread 15 having the wall flange 16.

The spokes 11 are slightly concavo-convex from the hub to the tread for the following reason:

In making a steel casting, the tread cools and shrinks. The shrinking of the tread tends to put a strain on the spokes.

It is found in practice that if the spokes are slightly concavo-convex, as shown, between the tread and hub, the shrinking of the tread can be completed with a minimum of internal strain on the spokes and a minimum likelihood of breaking or cracking of the casting.

It may be mentioned also that the spokes 11 are slightly concavo-convex from edge to edge as illustrated particularly in Figure 5. This is in order to further strengthen the spokes.

The connecting of the spokes with the tread, I have found a matter of extreme difficulty and have solved this difficulty in the following manner:

The spokes are so arranged that at their outer ends, each spoke is spread and divided so as to form portions 11^a and 11^b, which are curved divergingly toward the inner part of the tread, as indicated at 11^a and 11^b in Figure 2.

The portions 11^a and 11^b of each spoke form a truss and it will be noted that the portions 11^a and 11^b of the successive spoke also form a truss.

On the convex side of each spoke, there is provided a rib or flange 17 commencing at the web 12 and increasing in width toward the tread.

Commencing approximately at the point where the portions 11^a and 11^b diverge from the main body of the spoke 11, the width of the rib 17 increases in both directions, as indicated at 17^a in Figure 3, thus furnishing a support cross-wise of the inside of the tread.

The ribs also strengthen the spokes.

The construction of the portions 11^a and 11^b and the rib 17, it will be seen, affords a maximum supporting connection between the spokes and the tread on the underside of the tread, both circumferentially of the tread and cross-wise of the tread, while maintaining in all parts of the spokes connection, the uniform section thickness to which attention has been called.

A finished wheel of this type bears on the rail just a short distance from the flange 16 approximately at the point indicated at A in Figure 3.

It will be noted that in order to secure maximum strength, the portions 11^a and 11^b connect with the tread in a line opposite the

portion A, where the wheel bears on the rail, and where the load is imposed.

It may be mentioned incidentally that the tread itself is built to comply with the Master Car Builders' standard, and the hub and spoke structure is peculiarly adapted for use with treads of that standard.

It will be obvious that by slightly changing the patterns, the hub may be varied as to the bore for fitting axles of any desired size, and also that it may be shifted somewhat with relation to the central radii lines of the wheel, so that the wheel may be mounted upon axles of slightly different lengths or different points in the lengths of of the axles, and still be adapted for use on tracks of the desired gauge.

The tread 15 may be made with any thickness of metal at the throat B, which may be desired. Thinness of the metal here is not of such vital importance in casting, because this part of the casting is near the top of the mold, where the danger of shrinking is not so great.

It will thus be seen that I have provided a steel wheel in a single casting affording ample strength at the hub and ample strength at the tread, where the tread connects with the spokes, without the evils which occur when there is an accumulation of metal at one point in a steel casting.

Changes may be made in the details of the shape and structure of my wheel without departing from the essential spirit of my invention, and it is my intention to cover by my claims, any modified forms of structure, which may be reasonably included within their scope.

I claim as my invention:

1. In a cast steel wheel, a tread, a hub and curved radial connecting spokes, said spokes being connected with the hub by diverging webs of substantially the same thickness as the spokes, said spokes being divided at their outer ends into converging curved parts for forming a truss connection with the tread for each spoke and for forming a truss by means of the adjacent portions of adjacent spokes, and a longitudinal rib on the convex side of each spoke widened centrally between the outward converging portions of the spokes to extend across the inner side of the tread, substantially as shown.

2. In a cast steel wheel, a tread, a hub and curved radial connecting spokes, said spokes being divided at their outer ends into converging curved parts for forming a truss connection with the tread for each spoke and for forming a truss by means of the adjacent portions of adjacent spokes, and a longitudinal rib on the convex side of each spoke widened centrally between the outward converging portions of the spokes to extend across the inner side of the tread, substantially as shown.

MERLIN S. VINCENT.