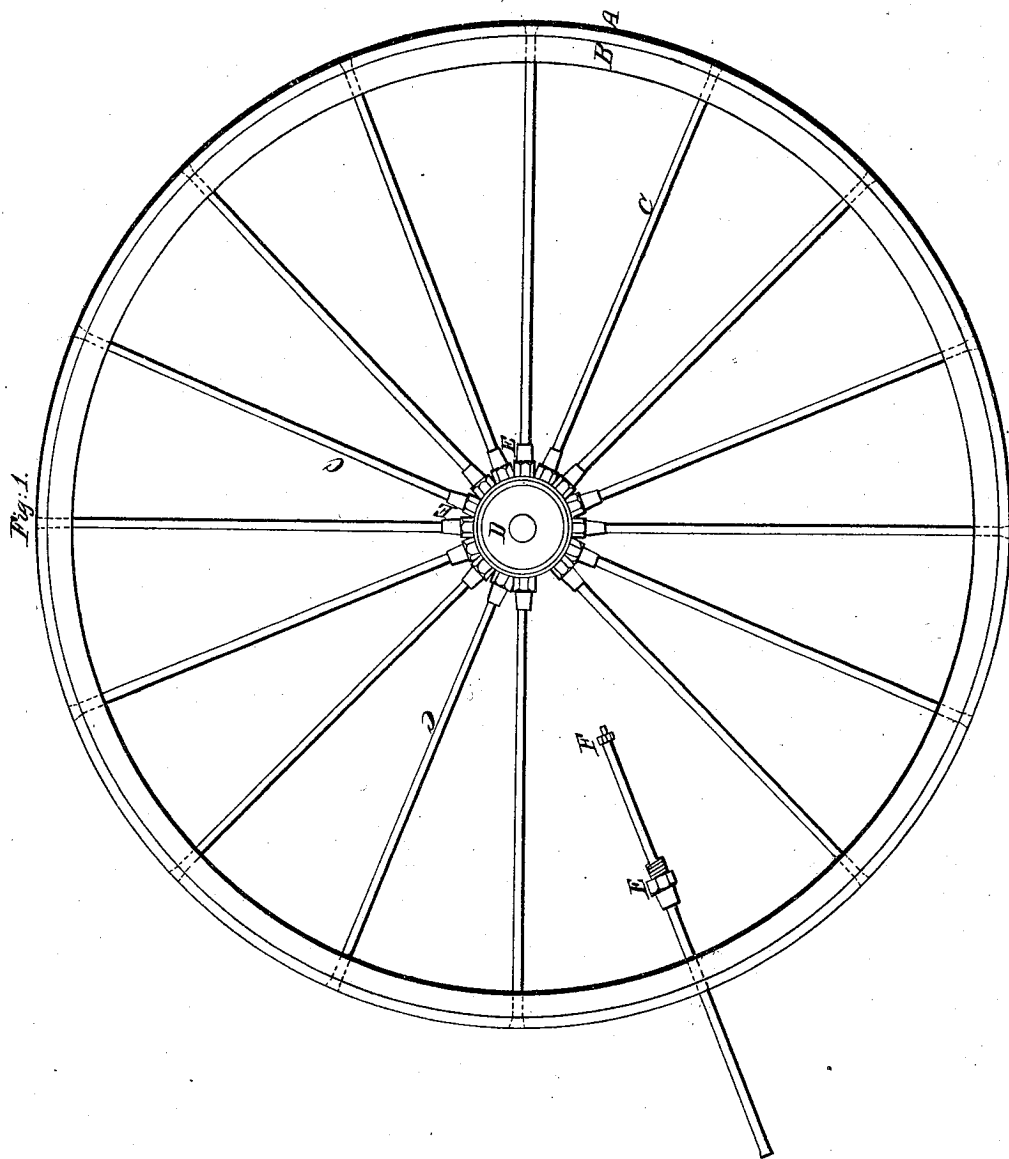


G. B. & A. B. WOODARD.  
CARRIAGE WHEEL.

No. 43,651.

Patented July 26, 1864.



Witnesses:

*Chas. E. Howe,*  
*James T. Graham.*

Inventors:

*G. B. Woodward*  
*A. B. Woodward*  
*By Thos. S. Howe,*  
*Atty.*

G. B. & A. B. WOODARD.  
CARRIAGE WHEEL.

No. 43,651.

Patented July 26, 1864.

Fig. 2.

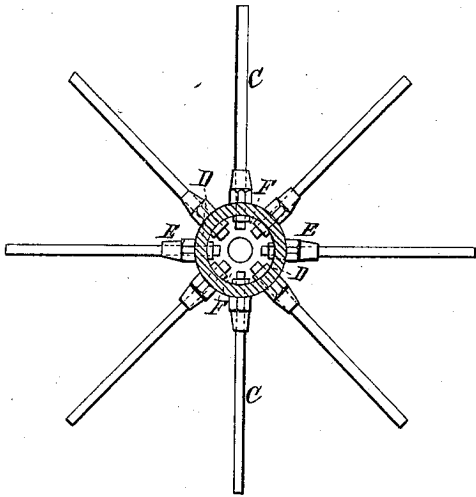
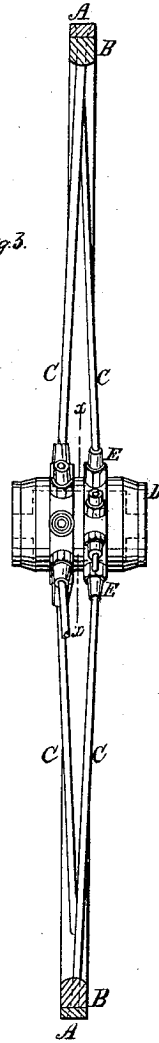


Fig. 3.



Witnesses:

*James T. Graham*  
*James T. Graham*

Inventors:

G. B. Woodard  
A. B. Woodard  
By *Sheldon*  
*Atty*

# UNITED STATES PATENT OFFICE.

GEORGE B. WOODARD, OF BOLIVAR, AND A. B. WOODARD, OF ALFRED CENTRE, NEW YORK.

## IMPROVEMENT IN CARRIAGE-WHEELS.

Specification forming part of Letters Patent No. 43,651, dated July 26, 1864.

*To all whom it may concern:*

Be it known that we, GEORGE B. WOODARD, of Bolivar, in the county of Allegany and State of New York, and A. B. WOODARD, of Alfred Centre, in the county of Allegany and State of New York, have invented certain Improvements in Suspension Carriage-Wheels, of which the following is a specification.

Our invention relates to the manner in which the spokes or tension-rods are inserted and secured in the hub.

In the drawings, Figure 1 is a side view of the wheel. Fig. 2 is a vertical section of the hub through the line *x x*, and Fig. 3 is an edge view of the wheel with part of the tire, fellies, and spokes or tension-rods removed.

A is the tire of the wheel.

B are the fellies.

C are the spokes or tension-rods, which pass through the fellies and also through the tire. The heads of the spokes or tension-rods, or the part of said spokes or tension-rods which passes through the tire, are made cone-shaped, so that however thin the tire may be worn there are still heads on the spokes or tension-rods to keep the tire in its place. Upon the other end of the spokes or tension-rods is cut a screw-thread, upon which is screwed a small nut, F, said nut being sufficiently small to pass through the holes in the hub through which the ends of the spokes or tension-rods pass. The use of this nut is for the ends of the thimble-nuts E to press against and strain or tighten the spokes or tension-rods.

Upon the outside of the part of the thimble-nuts E which enters the hub is cut a screw-thread, which fits into a thread cut on the inside of the holes in the hub through which the ends of the spokes or tension-rods pass. The threads on the thimble-nuts E and in the small nut F must be cut in such a way that when the spokes or tension-rods are strained or tightened the pressure of the

thimble-nuts E upon the nuts F will tend to screw the nut F on and not off the ends of the spokes or tension-rods. A portion of the part of the thimble-nuts E which is outside of the hub is made with plain surfaces, so that a wrench may take hold of them to screw them in or out of the hub, as occasion may require. By this arrangement the spokes or tension-rods are strained and held in their places by the pressure of the lower ends of the thimble nuts E upon the small nuts F, and the spokes or tension-rods are at the same time free to pass inward toward the center of the hub, except as restrained by the general tension and resistance of the wheel, thus removing the effect of a concussion between the wheel and any obstruction in the road from the individual spoke or tension-rod near the end of which the concussion occurs, and distributing said effect through the adjacent parts of the wheel. The rim of the wheel is directly over the center of the hub, as represented in Fig. 3, and the spokes are set alternately inclined in opposite directions, so as to brace the wheel and give it additional strength. The part of the hub D into which the spokes or tension-rods C enter is raised up or has a greater diameter than the rest of the hub, to give more strength to the hub and allow a chamber to be hollowed out beneath said raised part for the reception of the ends of the spokes or tension-rods and the nuts thereon, as represented in Figs. 2 and 3.

We claim—

The combination, in a suspension carriage-wheel, of the thimble-nuts E and the small nuts F with the spokes or tension-rods C and the hub D, substantially as and for the purpose set forth.

G. B. WOODARD.  
A. B. WOODARD.

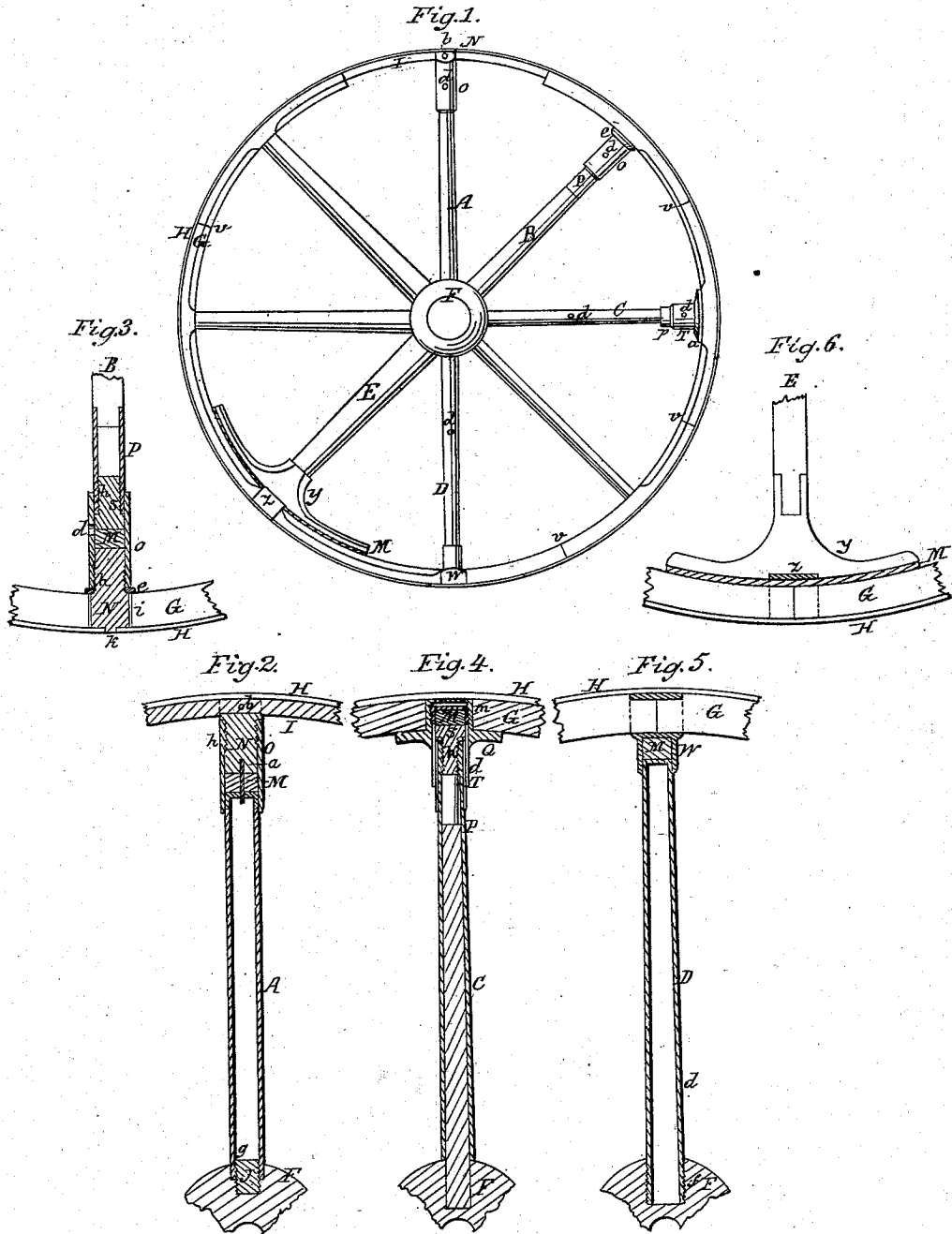
Witnesses:

W. C. BURDICK,  
C. M. ALLEN.

J. RADDIN.  
Carriage-Wheel.

No. 48,207.

Patented June 13, 1865.



Witnesses.  
N. Ames.  
Samuel Green.

Inventor.  
John Raddin.

# UNITED STATES PATENT OFFICE.

JOHN RADDIN, OF LYNN, MASSACHUSETTS.

## IMPROVEMENT IN CARRIAGE-WHEELS.

Specification forming part of Letters Patent No. 48,207, dated June 13, 1865.

*To all whom it may concern:*

Be it known that I, JOHN RADDIN, of Lynn, in the county of Essex and State of Massachusetts, have invented a new and useful Improvement in Carriage-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a side elevation of one of my wheels, different spokes of which show the different modifications of the principle of my invention; and Figs. 2, 3, 4, 5, and 6 are enlarged longitudinal central sections through the different spokes, showing their internal construction and the manner in which they are connected with the other parts of a wheel.

Like parts are indicated by the same letters in all the drawings.

The nature of my invention consists, first, in rendering a wheel elastic, so as to relieve the jar and rattle in striking against or passing over stones and other hard obstructions, by applying to the end of the spokes a spring or packing of rubber or other elastic substance inclosed in a suitable box or socket; second, in so constructing the spokes with a screw at either end and so connecting them with the hub and felly that by simply turning the spokes or screws the wheel, or rather the felly, may be expanded at pleasure whenever it is required to tighten the tire, thereby saving the cost of resetting the same whenever it becomes expanded or the felly contracted; third, in placing a cushion of rubber or other suitable elastic substance between the sections of the felly, so that the diameter of the latter may be contracted without cutting the said sections or expanded without leaving an open space between them; fourth, in constructing the spokes of a carriage-wheel of metallic tubes, whereby I am enabled to obtain the requisite lightness and strength.

To enable others skilled in the art to make and use my invention, I will now proceed to describe the construction and operation of the same.

F is the hub of the wheel, which may be either of wood or metal. G is a wooden felly,

and H is the tire, all constructed like those in general use.

I is one section of a metallic felly, which, if desirable, may be used instead of wood.

The spokes marked A, B, C, and D represent the different modifications of my invention as applied to a common carriage-wheel.

In Fig. 2 the spoke A is made of a hollow metallic cylinder, the hub end of which is provided with an internal screw, *g*, which receives the screw J, previously driven fast into the wooden hub F. The outer end of this cylinder is plugged or covered. N is a square-headed screw, the head of which is slotted so as to clasp the iron felly I, to which it is confined by means of a pin or screw, *b*. O is a metallic cylinder or thimble, the bore of which is just large enough to receive the end of the spoke A and the screw N. One end of this thimble O is provided with an internal screw, *h*, which fits the external screw cut on N, as seen in Fig. 2. *a* is a small pin fast in the end of screw N, and passing freely through a hole in the center of the end of the cylinder A to form a guide for the packing M, which latter is made of rubber or other suitable elastic material, and is inclosed within the thimble O, between the ends of the screw N and cylinder A. This elastic packing is intended to relieve the jar and rattle of the wheel in passing over hard obstructions. In order to tighten the tire it is only necessary to turn the spoke A by any suitable instrument, so as to move it farther from the hub, thus avoiding the necessity and expense of resetting.

In Fig. 3 is represented a wooden spoke provided with a metallic thimble, P, into the outer end of which is screwed the round-headed plug S. N is a screw fast in a hole through the felly, the outer end of which screw is provided with a small square head, *k*, which passes through a corresponding hole in the tire and keeps the screw from turning. *i* is a packing of gutta-percha, which may be used, if desirable, around the said screw to hold it firmly in the hole in the felly. *e* is a washer around the screw N, next to the felly. O is a thimble, similar to O in Fig. 2, and attached to the screw N in a similar manner. M is the elastic packing, like that described in Fig. 2, and for

a similar purpose.  $d$  is a hole in the side of the thimble O, by means of which and a proper instrument inserted therein it may be turned toward or from the felly. By turning the screw-plug S the spoke B may be elongated and the tightening of the tire accomplished, as in Fig. 2.

In Fig. 4 is represented another modification of my invention, in which C is a common wooden spoke, having its felly end provided with a fixed metallic thimble, P, in the outer end of which is cut an internal screw,  $h$ , to receive the screw S, which latter is furnished with a square head, so as to be readily turned by a suitable wrench against the elastic packing M. Q is a flanged socket, the outer cylindrical portion of which passes through the felly G, while the flanged portion rests against the inner edge of the same, as clearly shown in the drawings, Fig. 4. In the cylindrical part of this socket Q are screw-threads  $m$  to receive the threads cut on the end of the thimble T, the latter being provided with a side hole,  $d$ , similar to the hole  $d$  in Fig. 3, and for a similar purpose.

Fig. 5 represents a hollow cylindrical or slightly conical metallic spoke, D, provided with an external screw,  $f$ , which enters an internal screw in a metallic hub, F. The felly end of this spoke D is closed and enters the cylindrical part of the socket W, the outer portion of which is provided with a thimble so shaped as to receive the contiguous ends of two sections of the felly G. M is the elastic packing, similar to that applied to the ends of the other spokes, already described, and for a similar purpose.  $d$  is a hole in the side of the spoke, by means of which and a suitable instrument the spoke may be screwed outward from the hub for the purpose of tightening the tire.

In Fig. 6 is represented a modification of the application of the elastic packing, adapted more particularly for very heavy wagons, carriages, or cars, in which the outer end of the spoke E is provided with an expanded head, Y, of wood or metal, between which and the

felly a long strip of elastic packing, M, is placed, Z being a metallic clamp, the bottom of which is fast to the said head, and the sides of which extend each side of the felly, as shown in Fig. 1, whereby the latter is held in place.

Between the sections of the felly G, I also propose to interpose the cushions V, of india-rubber, for the purpose specified above in setting forth the nature of my invention, the contiguous ends of said sections being made concave to keep the cushions from working out of place.

Having thus described the nature of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The thimble O, in combination with the screw N and elastic packing M, applied to the spokes and felly of a carriage-wheel, substantially as and for the purpose described.

2. The metallic thimble P, applied to the felly end of a wooden spoke, in combination with the screw S, packing M, thimble O, and fixed screw N, substantially as shown in Fig. 3, and for the purpose described.

3. The fixed screw J, in a wooden hub, operating in combination with an internal screw cut in the end of a spoke, substantially as and for the purpose described.

4. The socket W, provided with a clasp entirely surrounding the felly, when used in combination with a spoke rendered adjustable by means of a screw, and the elastic packing M, substantially as and for the purpose specified.

5. The flanged socket Q, in combination with the adjustable screw-thimble T, and packing M, applied to the spokes and felly of a wheel, substantially as and for the purpose described.

6. The combination of a hollow metallic spoke with a thimble, O, screw N, and elastic packing M, substantially as and for the purpose described.

JOHN RADDIN.

Witnesses:

N. AMES,  
SAMUEL GREEN.

C. C. AYER.

Wheel.

No. 70,681,

Patented Nov. 12, 1867.

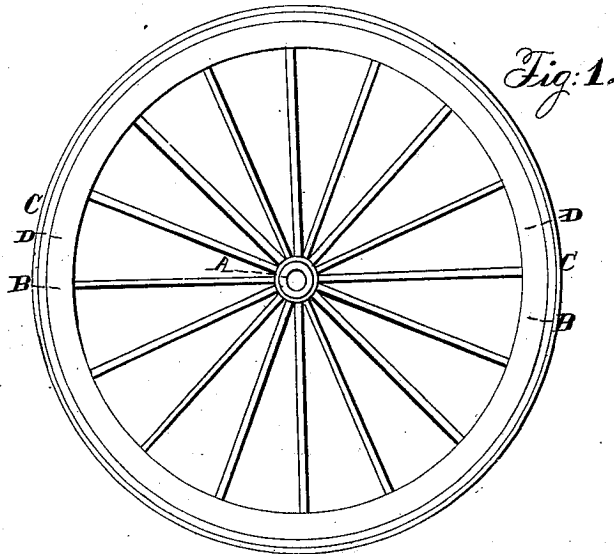


Fig. 1.

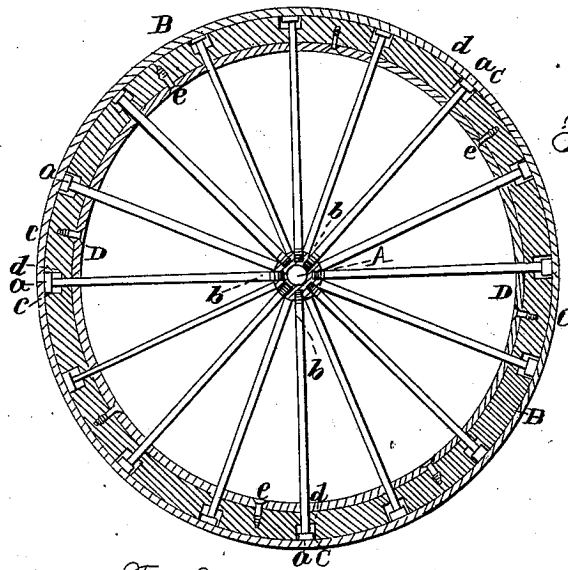


Fig. 2.

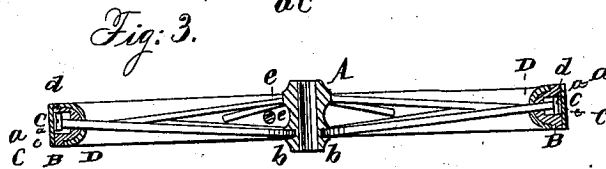


Fig. 3.

Witnesses.  
F. P. Hale Jr  
Geo. H. Andrews

Inventor  
Chas. C. Ayer.  
by his Attorney  
R. W. Eddy

# United States Patent Office.

CHARLES C. AYER, OF CHELSEA, ASSIGNOR TO HIMSELF AND HENRY A. BREED, OF LYNN, MASSACHUSETTS.

Letters Patent No. 70,681, dated November 12, 1867.

## IMPROVEMENT IN CARRIAGE-WHEEL.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL PERSONS TO WHOM THESE PRESENTS SHALL COME:

Be it known that I, CHARLES C. AYER, of Chelsea, in the county of Suffolk, and State of Massachusetts, have invented a new and useful Improvement in Carriage-Wheels; and I do hereby declare the same to be fully described in the following specification, and represented in the accompanying drawings, of which—

Figure 1 is a side elevation,

Figure 2 a longitudinal section, and

Figure 3 a transverse section of a carriage-wheel made in accordance with my invention.

In the said wheel, the hub is suspended from the upper semicircle of the rim or felloe by the spokes, whereby the weight of the carriage body and its load are supported by a tension strain on the spokes, each spoke at its head resting on an elastic cushion or spring.

In carrying out my invention, I combine and arrange with the hub, the wooden felloe, and the metallic spokes, an inner or auxiliary annular and arched tire, whose office is to support the felloe, and prevent it from being split or broken under and by the draught of the spokes upon it.

In the drawings, A denotes the hub, B the felloe, C the main or wheel-tire, and D the auxiliary arched tire. The inner tire is a metallic annulus, bent transversely in a semicircle or curved form, or thereabouts, in manner as shown in fig. 3, so as to embrace or nearly embrace and fit to the wooden felloe B. Each spoke is formed with a head, *a*, at its outer end. A screw, *b*, formed on its inner end, goes through the wooden felloe and the auxiliary tire D, and screws into the hub. The head of the spoke is arranged within a chamber, *c*, made in the felloe. An elastic annulus or cushion, *d*, of vulcanized India rubber or its equivalent, is placed within the chamber, and on its bottom. The shank of the spoke goes through the cushion, and the head *a* rests against it. The arched ring or auxiliary tire D may be fastened to the felloe by means of screws *e* going through the said tire, and being screwed into the felloe. This tire not only performs the function above mentioned, but supports the felloe against the strain or pressure tending to crowd upward that part of it which may be next the ground when the wheel may be in use.

This wheel is designed to be used for locomotive steam engines, or railway carriages of other descriptions, as well as for common road vehicles and wagons. Each of the spokes being arranged obliquely with respect to the plane of its junction with the felloe, contributes greatly to the strength of the wheel, and enables it to resist lateral strains.

What I claim as my invention, is—

The combination as well as the arrangement of the metallic annulus or inner tire D with the wooden felloe and the spokes and hub, as explained.

I also claim the combination as well as the arrangement of the metallic annulus or inner tire D with the wooden felloe, the hub, spokes, and outer tire, as described.

I also claim the combination as well as the arrangement of the metallic annulus D, the wooden felloe, the springs and chambers therein, the spokes, and the hub, as described, the hub, under such a combination of the spokes with it and the felloe, being suspended from the upper half of the felloe and on springs, while the wheel may be in revolution and use.

CHARLES C. AYER.

Witnesses:

R. H. EDDY,

F. P. HALE, Jr.



D. DIMMICK.  
Vehicle Wheels.

No. 143,813.

Patented Oct. 21, 1873.

Fig. 1.

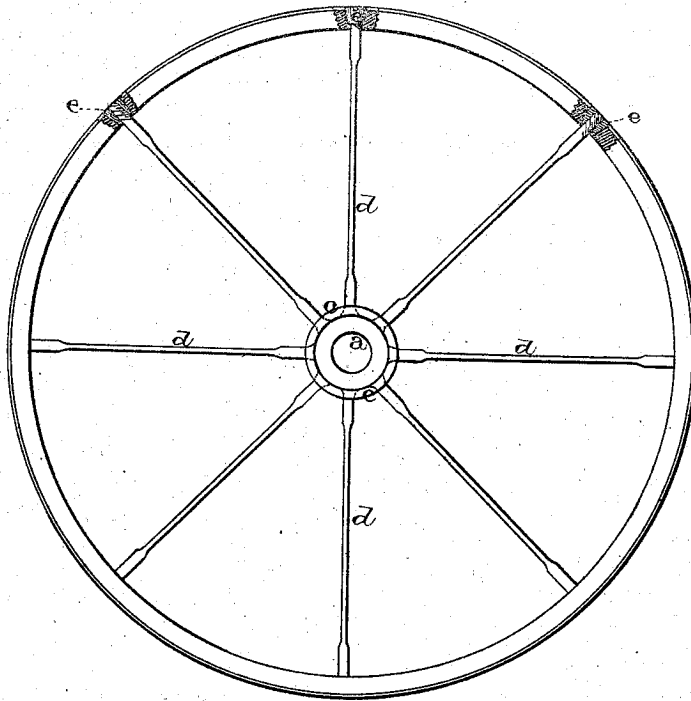
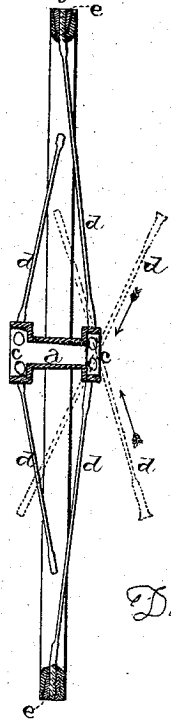


Fig. 2.



WITNESSES.  
F. A. Lehmann  
Wm. Hale

INVENTOR.  
Daniel Dimmick

# UNITED STATES PATENT OFFICE.

DANIEL DIMMICK, OF ORWELL TOWNSHIP, BRADFORD COUNTY, PA.

## IMPROVEMENT IN VEHICLE-WHEELS.

Specification forming part of Letters Patent No. **143,813**, dated October 21, 1873; application filed October 2, 1873.

*To all whom it may concern:*

Be it known that I, DANIEL DIMMICK, of Orwell township, in the county of Bradford and State of Pennsylvania, have invented certain new and useful Improvements in Wheels for Vehicles; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

The nature of my invention relates to an improvement in wheels for vehicles; and it consists in, first, the manner of securing the spokes in the rim and hub; second, the construction of the hub itself.

The accompanying drawings represent my invention.

*a* represents the hub, cast in one solid piece, so as to form both the hub and box. Upon each end of the hub is formed a flange, *c*, of sufficient width and thickness to allow the spokes *d* to be passed upward through them, as shown, so that their outer ends can be fastened in the rim. The inner ends of the spokes have enlarged tapering heads, which catch in the flange, while the outer ends have screw-threads cut upon them, and are secured in the rim by means of the tapering recessed nuts *e*. By means of the flanges the spokes are secured in position by means of only a single fastening, thus decreasing the weight, cost, time, and trouble in constructing the wheel. Should one of them be broken, by loosening the nut in rim a new one can be inserted at very little cost of time or money. The central part of the hub, between the two

flanges, is made as light and thin as is consistent with safety, having the inner flange made large enough to fit over the shoulder of the axle, while the outer one is just large enough to receive the burr or nut on the end of the axle. The spokes are placed staggering, and each one is made thicker at its ends where the strain comes than in the middle, so as to dispense with metal and the consequent weight.

A wheel constructed in this manner is very light and cheap, and is adapted for vehicles of all kinds and sizes, but especially so for light road wagons and sulkies.

I am aware that the spokes have heretofore been passed downward through the rim, and had their inner ends secured inside of the hub by means of nuts; but this manner of fastening them causes the hub to be made so large and heavy that the wheels cannot be used for light vehicles. By passing spokes up through the hub, and securing their outer ends in the rim, the hubs can be made very light and small.

Having thus described my invention, I claim—

The combination of the hub *a*, having the perforated flanges *c*, spokes *d*, and recessed nuts *e* in the felloes, substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand this 2d day of October, 1873.

D. DIMMICK.

Witnesses:

F. A. LEHMANN,  
WM. HALE.

T. T. FURLONG.  
Vehicle-Wheels.

No. 156,992.

Patented Nov. 17, 1874.

Fig. 1

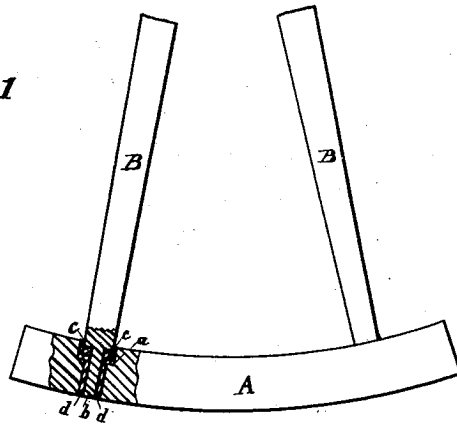


Fig. 2

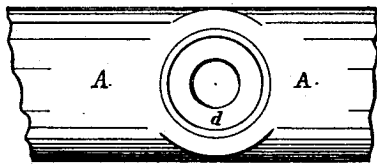
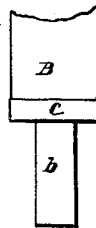


Fig. 3



WITNESSES.

*J. H. Lawlor*

*A. A. Herring*  
"

INVENTOR.

*Thomas D. Furlong*  
By *Gudley & Warner*  
*Attys*

# UNITED STATES PATENT OFFICE.

THOMAS T. FURLONG, OF CHICAGO, ASSIGNOR OF ONE-FOURTH HIS RIGHT  
TO CORNELIUS B. CUMMINGS, OF PEKIN, ILLINOIS.

## IMPROVEMENT IN VEHICLE-WHEELS.

Specification forming part of Letters Patent No. **156,992**, dated November 17, 1874; application filed  
August 25, 1874.

*To all whom it may concern:*

Be it known that I, THOMAS T. FURLONG, of the city of Chicago, in the county of Cook and State of Illinois, have invented a new, useful, and Improved Wheel for Vehicles, of which the following is a full, clear, and exact description, which will enable others skilled in the art to which my invention appertains to make and use the same, reference being had to the accompanying drawing, forming a part hereof, and in which—

Figure 1 is a side elevation of a portion of a vehicle-wheel, with parts broken away to show the connection of the spokes and felly. Fig. 2 is a top view of the felly, showing the form of the mortise therein; and Fig. 3 is a detached elevation of a part of a spoke.

Like letters of reference indicate like parts.

My invention relates to the construction of of wheels for vehicles; and consists in providing each spoke, upon and around the tenon thereof, with an elastic cushion, and in constructing the mortises in the felly in which the spokes are inserted, with an annular shoulder, and inserting in each mortise a metallic bush or lining, as hereinafter more particularly described.

In the drawing, A represents the felly, and B the spokes, of a wheel for vehicles. The felly is provided with the usual number of mortises to receive the spokes. I enlarge the mouth or opening of each mortise, so as to form an annular shoulder, *a*. Upon, around, and at the base of the tenon *b* of each spoke I place an annular elastic cushion, *c*, made of any suitable elastic material, preferably of india-rub-

ber. For the purpose of strengthening, and to prevent brooming and splitting of the felly at the several mortises, I insert a metallic bush or lining, *d*, corresponding to the shape of the mortise, so as to closely fit therein, and flush with the inner periphery of the felly.

In uniting the felly and spokes there is a small space between the end of the tenon *b* and the outer periphery of the felly. The elastic cushion *c* rests upon the shoulder *a* of the bush or lining *d*; and the lower part of the body of the spoke is also inserted in the mortise and bush, as shown, thereby preventing brooming and splitting of the spoke, and strengthening the general construction of the wheel.

The blows or jars that the wheel receives while in use are received through the felly upon the elastic cushion between the felly and spokes, and the wheel is thereby made more durable.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The felly of a vehicle-wheel, having the shouldered mortises sunk therein to receive both the tenon *b* and the lower part of the body of the spoke, in combination with the correspondingly-formed bush or lining *d*, sunk in said mortises flush with the inner periphery of the felly, and with the elastic cushion *c*, substantially as described.

THOMAS T. FURLONG.

Witnesses:

N. C. GRIDLEY,  
J. H. LAWLOR.

C. JEANTAUD.  
Vehicle-Wheel.

No. 165,587.

Patented July 13, 1875.

Fig. 1

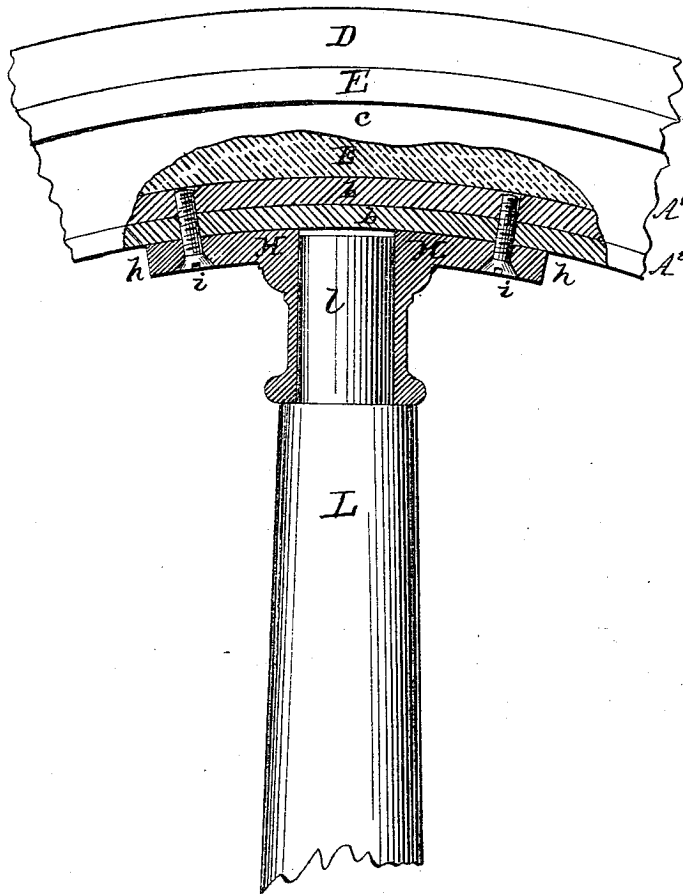


Fig. 2

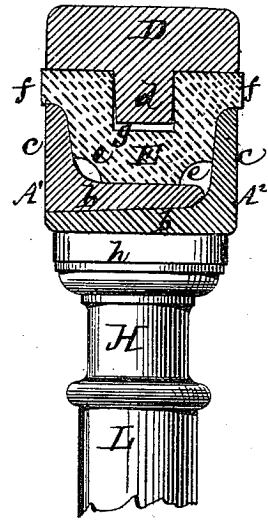


Fig. 3

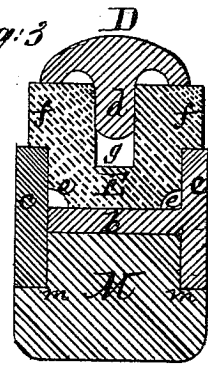
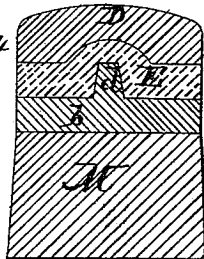


Fig. 4



Witnesses:  
Michael Ryan  
Fred Reynolds

C. Jeantaud  
Clyde Attorney  
Brown Allen

# UNITED STATES PATENT OFFICE.

CHARLES JEANTAUD, OF PARIS, FRANCE.

## IMPROVEMENT IN VEHICLE-WHEELS.

Specification forming part of Letters Patent No. 165,587, dated July 13, 1875; application filed May 21, 1875.

*To all whom it may concern:*

Be it known that I, CHARLES JEANTAUD, of Paris, in the Republic of France, have invented certain Improvements in Wheels for Vehicles; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, which forms part of this specification.

My invention relates to certain improvements which are designed more particularly for application to wheels of vehicles traveling upon common roads, but which may be applied to wheels of railway-cars or vehicles of any description.

The invention consists in a novel construction and combination of the tire and fellyes, or a band surrounding said fellyes, and an elastic packing interposed between the tire and the fellyes or band, whereby the shock, jar, and noise resulting from the contact of the wheels with the road is lessened to a considerable degree, the elasticity of the packing is preserved, and its displacement is prevented.

In the accompanying drawing, Figure 1 is a side view, partly in section, of a portion of a wheel constructed according to my invention. Fig. 2 is a transverse sectional view of the same. Fig. 3 is a transverse sectional view of a modification. Fig. 4 is a similar view of another modification.

When the wheel is constructed in the manner illustrated in Figs. 1 and 2 the wooden felly is dispensed with, and an iron band or continuous felly is substituted therefor. This band may be made in one piece, if desired; but, as shown herein, it is constructed in two parts,  $A^1 A^2$ , each of which is formed with a band portion,  $b$ , parallel with the axis of the wheel, and with an annular web or rim,  $c$ , extending outward at right angles with the band  $b$ , and in one piece therewith. The two parts  $A^1 A^2$  are placed together, with the band  $b$  of one part outside of, and surrounding, the band  $b$  of the other part, in which position the webs  $c$  form the sides, and one of the bands  $b$  the bottom, of a continuous groove, extending entirely around the circumference. The tire  $D$  has its exterior surface made in the usual or any suit-

able form, either flat or rounded, as may be desired. On the interior surface is a continuous tongue or rib,  $d$ , extending entirely around said inner surface, which rib may be formed with the tire, or attached afterward. The width or thickness of the rib or tongue  $d$  is equal to about one-third, more or less, of the width of the groove or space between the webs  $c$ , and the depth of said rib or tongue is slightly less than the depth of said groove or space.  $E$  represents a ring, band, or packing, of india-rubber or other suitable elastic substance, interposed between the band  $A^1 A^2$  and the tire  $D$ . This band or packing  $E$  is provided with a groove,  $g$ , extending entirely around its exterior surface, corresponding in shape with the rib or tongue  $d$ , and sufficiently larger than said rib to allow it to fit easily therein. The inner side of the packing  $E$  is of corresponding form with the space between the webs  $c$ , except that the edges are rounded off or cut away, as shown at  $e e$ , to allow for expansion and contraction. The outer edges of the band or packing are formed with flange-like projections  $f f$ , which lie between the edges of the webs  $c c$  and the inner surface of the tire  $D$  when the parts are in place together, as shown in Figs. 1 and 2. The band or continuous felly  $A^1 A^2$ , constructed as above described, is connected with the spokes by means of metallic sockets  $H$ , provided with extensions or ears  $h$ . The outer ends of the spokes  $L$  are provided with tenons  $l$ , which are inserted in the sockets. Screws  $i$  are passed through the ears  $h$  and into the band portions  $b b$ , by which means the sockets and felly are secured together, and lateral displacement of the two parts  $A^1 A^2$  is prevented.

By the construction, arrangement, and combination of the various parts, as hereinabove described, I produce a wheel in which the shock, noise, and other inconveniences resulting from the rolling of the wheels over the road, and especially upon rough or uneven ground, are lessened to a considerable extent, and a degree of elasticity is imparted to the wheel such as is unattainable in a wheel of ordinary construction without augmenting the draft of the vehicle; and, while all the advantages resulting from the elasticity of the pack-

ing are obtained, said packing is protected from actual contact with the ground, and consequent wear and deterioration.

Fig. 3 of the drawing represents the application of my invention to a wheel constructed with wooden fellies.

The tire D is provided with the rib *d*, and the packing-ring E is of the same general construction as the one before described. The metallic band surrounding the wooden felly M is made in two parts, one of which is of T shape in its cross-section, forming a band, *b*, and annular web *e*; and the other part forms another annular web, *c*, which is attached to the band portion *b* by screws. The wooden felly M is provided with rabbets *m m*, into which fit the inner edges of the webs *c c*, while the portions of said webs outside the periphery of the band *b* form a groove for the reception of the inner edge of the packing-ring.

In some cases the band surrounding the wooden fellies may be made in one piece, and may be placed in position when hot, after the usual manner of attaching tires to wheels with wooden fellies; and, where the wooden felly is dispensed with, the grooved band or continuous iron felly may be made in one piece, and attached to the spokes in any suitable manner.

The elastic packing-ring may be made com-

plete, and sprung into place; or, if desired, the rubber may be placed between the band and the tire while in a plastic state, and afterward vulcanized.

The construction, arrangement, and combination of the various parts hereinabove described may be applied to wheels of any description; and the details of construction may be varied according to circumstances without changing the nature of the invention.

If preferred, the tire may be grooved, and the band may be ribbed, and the packing made of corresponding form, as shown in Fig. 4.

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

In a wheel for vehicles, the combination of a tire having a tongue or a groove on its inner surface, a metallic band, made in one or more pieces, serving as a continuous felly, and having a tongue or a groove on its outer surface, and an elastic packing-ring, interposed between said tire and band, and constructed to allow for its expansion and contraction and prevent its displacement, substantially as described.

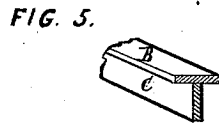
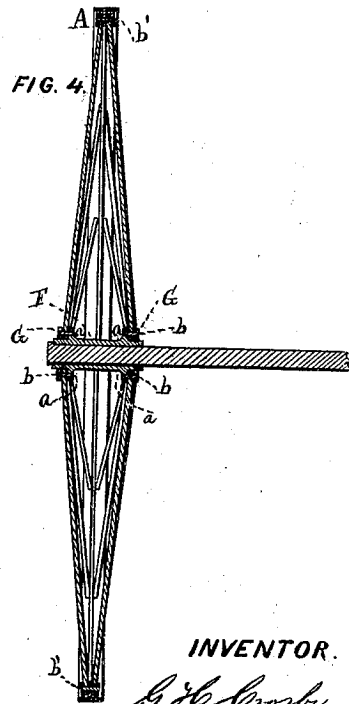
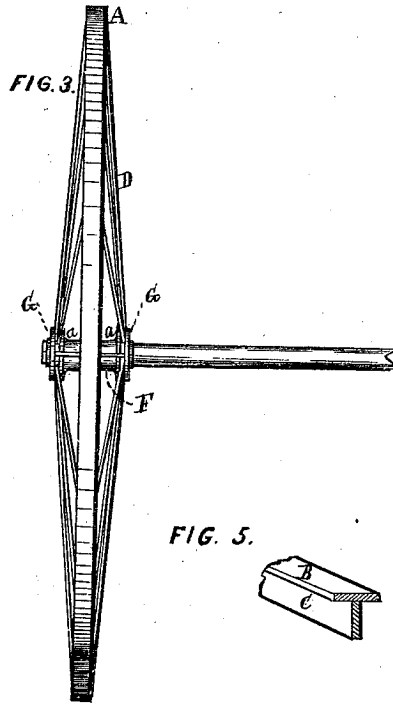
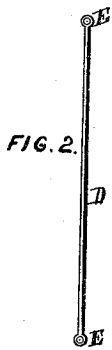
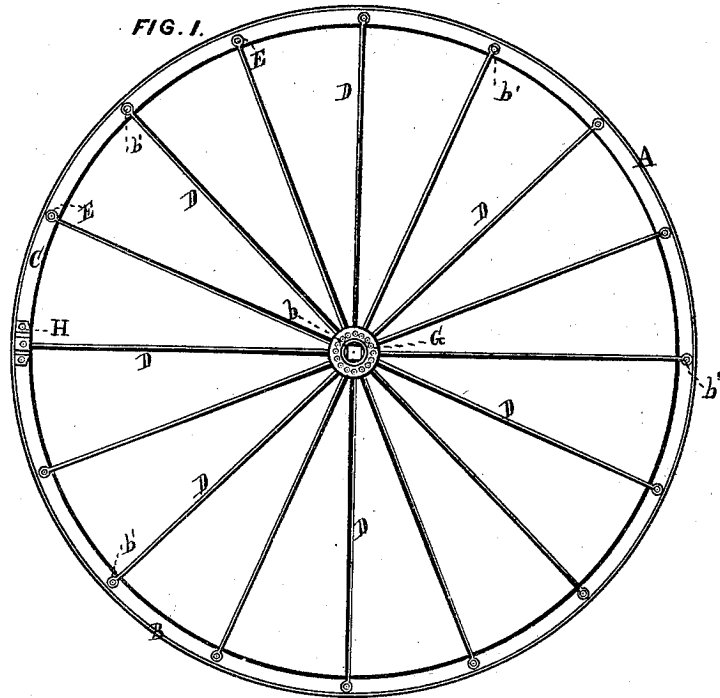
CHARLES JEANTAUD.

Witnesses:

G. H. CROSBY.  
CARRIAGE-WHEEL.

No. 170,994.

Patented Dec. 14, 1875.



WITNESSES.

*A. H. Corneille,*  
*J. Mayo Smith*

INVENTOR.

*G. H. Crosby*  
*Per. Burridge & Co.*

*Atty.*



# UNITED STATES PATENT OFFICE.

GILES H. CROSBY, OF ROME, OHIO.

## IMPROVEMENT IN CARRIAGE-WHEELS.

Specification forming part of Letters Patent No. **170,994**, dated December 14, 1875; application filed October 26, 1875.

*To all whom it may concern :*

Be it known that I, GILES H. CROSBY, of Rome, in the county of Ashtabula and State of Ohio, have invented a certain new and Improved Carriage-Wheel; and I do hereby declare that the following is a full, clear, and complete description thereof, reference being had to the accompanying drawings, making part of the same.

Figure 1 is a side view of the wheel. Fig. 2 is a detached section. Fig. 3 is an edge view. Fig. 4 is a transverse section of the wheel. Fig. 5 is a transverse section of the tire.

Like letters of reference refer to like parts in the several views.

The nature of this invention relates to a metal carriage-wheel; and the object of the same is to support the hub of the wheel from the rim by the suspensory strength of the spokes above the hub, instead of from the sustaining power of the spokes below the hub.

Said wheel is constructed substantially as follows: The rim A of the wheel referred to consists of a single piece of T-shaped metal, as shown in Fig. 5, of which B is the tread of the wheel or tire, and C the inner annular flange or web. D, the spokes of the wheel, consist of metal rods, having formed on each end an eye, E, whereby they are secured to the felly and hub. F is the hub, near each end of which is a flange, *a*, Fig. 3, forming a part of the hub. Each end of the hub projects beyond the flange, forming a sand-band, whereon is fitted a collar or follower, G.

It will be seen that there are two sets of spokes, the ends of one set of which are secured to one end of the hub, between the flange *a* and the collar G, by means of rivets or bolts *b*, Figs. 1 and 4, passing through the collar and flange, and through the eye on the end of the spoke, as will be seen in Fig. 4. To the opposite end of the hub, in like manner, is secured a second set of spokes. The

opposite ends of both sets of spokes are secured to the felly, respectively, on each side of the web. The ends are secured by one bolt or rivet, *b'*, passing through the eyes of the spokes and the web, as shown in the drawings. In securing the two sets of spokes at each end of the hub, they are, therefore, some distance apart; hence they are, to some extent, bracing in respect to the felly, and which, also, allows a larger number of spokes to be used. The tension of the spokes, in their connection with the hub and felly, is such as to suspend the weight of the hub, axle, &c., from the upper section of the felly, little or no support being effected from the spokes below a point of suspension.

The suspensory power of the spokes above a horizontal line is mainly depended on for the strength of the wheel. For greater security, a strap may be used, in addition to the bolt or rivet, for fastening the spokes to the web of the wheel, as will be seen at H, Fig. 1, one such strap to each side of the web.

The spokes are represented in the drawing as being straight. They may also be made with a slight curve, to obtain a degree of elasticity to them, and which may also be formed of twisted rods, instead of being smoothly plain ones.

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

The herein-described wheel, consisting of the felly A, made of T-iron spokes D, having an eye in each end, whereby they are secured to the hub and felly by means of rivets, hub F, having flanges *a*, collars G, and bolts or rivets *b'*, with or without the straps H'', substantially as described, and for the purpose set forth.

GILES H. CROSBY.

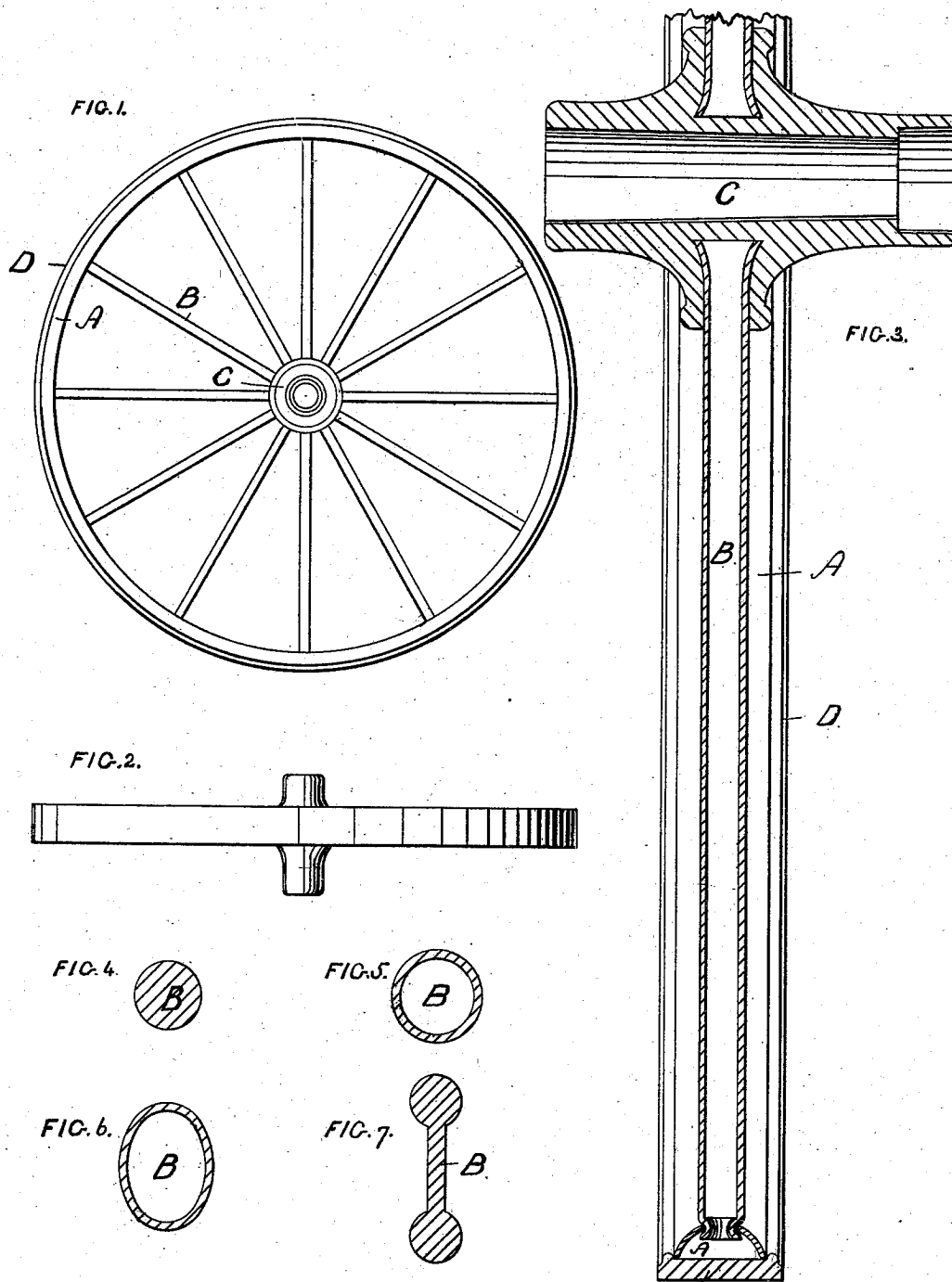
Witnesses:

W. H. BURRIDGE,  
A. F. CORNELL.

C. S. TEGNANDER,  
WAGON-WHEELS.

No. 194,272.

Patented Aug. 14, 1877.



WITNESSES.

*Saml. Stephens*  
*Geo. W. Carl.*

INVENTOR.

*C. S. Tegnander*  
*Per Brown Bros,*  
*Attorneys.*

# UNITED STATES PATENT OFFICE.

CONRAD S. TEGNANDER, OF GOTTENBURG, SWEDEN, ASSIGNOR OF ONE-THIRD OF HIS RIGHT TO ANDREW L. JOHNSON, OF BOSTON, MASS.

## IMPROVEMENT IN WAGON-WHEELS.

Specification forming part of Letters Patent No. 194,272, dated August 14, 1877; application filed July 6, 1877.

*To all whom it may concern:*

Be it known that I, CONRAD S. TEGNANDER, of Gottenburg, in the Province of Gottenburg and Kingdom of Sweden, have invented a certain new and useful Improvement in Wagon-Wheels, of which the following is a specification:

This improved wheel is made of iron, steel, brass, or other suitable metal, and in its construction embraces the usual four elements of a wheel, to wit: a hub or nave, spokes, felly, and tire, each and all of which are respectively constructed and applied together substantially as hereinafter described, making a wheel which is light yet strong and durable, and reasonable in price, all of which will fully appear from the description hereinafter given of the same, reference being had to the accompanying plate of drawings, in which—

Figure 1 is a side elevation; Fig. 2, a plan view; Fig. 3, a vertical central section; Figs. 4, 5, 6, and 7, views in detail, to be hereinafter referred to.

In the drawings, A represents the felly; B, the spoke; C, the hub, and D the tire, each and all made of metal, such as iron, steel, brass, or other suitable metal, applied together in the manner as follows, to wit:

The felly A is a metal band of gutter shape, bent into the circular size of the wheel, and its two ends welded together with the convex side of the gutter-shaped band toward the inside.

The spokes B, of proper length, are then inserted through holes of the felly, at proper and regular distances apart, and within the concavity of the felly, clinched and riveted,

as shown in Fig. 3. These spokes may be hollow or solid.

The wheel thus in part produced is then placed in a mold of suitable shape and construction, and a solid hub or nave cast upon and about the inner ends of the spokes.

The tire D is cut out of a suitable band of metal of the required length, its two ends welded together in any suitable manner, and when heated to a red heat is then applied to the outer periphery of the felly and then clinched against the sides thereof. The hub is then bored out for the reception of the axle, completing the wheel.

The nave or hub may be molded in any ornamental style desired, as is obvious.

Fig. 5 is a view in cross-section of the spoke shown in Figs. 1 and 3; Figs. 4 and 7 views, in cross-section, of solid spokes of different form; and Fig. 6, view, in cross-section, of a spoke of elliptical form, instead of round, as shown in Fig. 5.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

A vehicle-wheel composed wholly of metal, and having the spokes B inserted through openings in the concave felly A, and clinched in place at their outer ends, the hub C, cast upon the inner ends of the spokes, and the tire D applied to the felly, the whole being combined substantially as and for the purpose described.

CONRAD SAMUEL TEGNANDER. [L. S.]

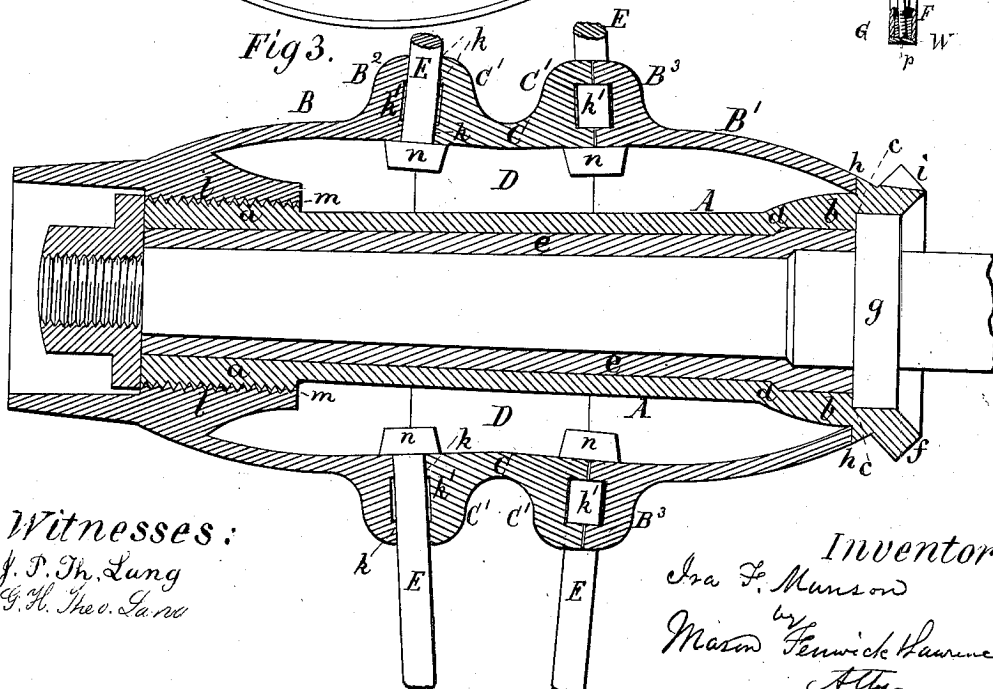
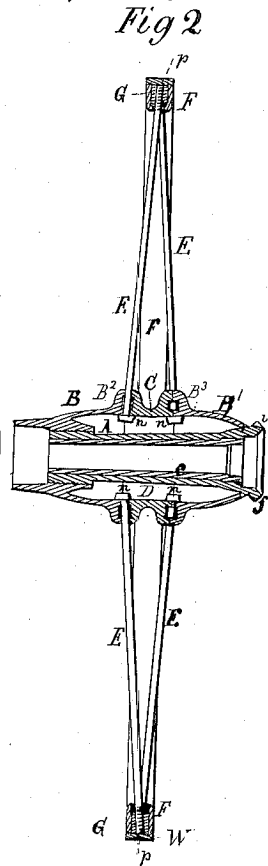
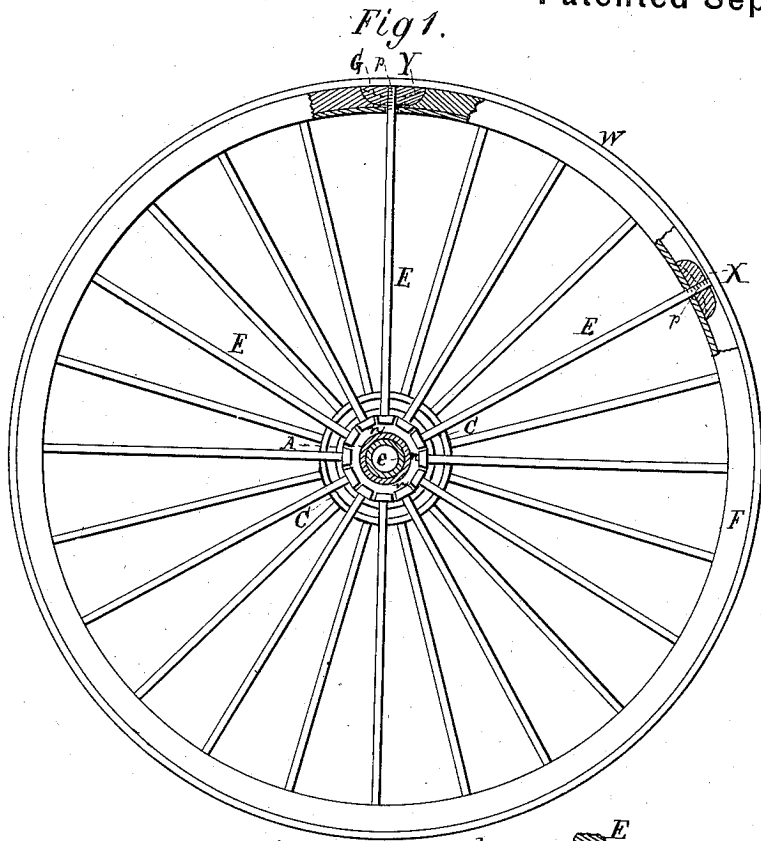
Witnesses:

MAGNUS DAHLGREN,  
CARL ÖRNSKÖLD.

I. F. MUNSON.  
Vehicle-Wheel.

No. 219,500.

Patented Sept. 9, 1879.



*Witnesses:*  
J. P. Th. Lung  
G. H. Theo. La. no

*Inventor:*  
Ira F. Munson  
Mason Fenwick Lawrence  
Atty.

I. F. MUNSON.  
Vehicle-Wheel.

No. 219,500.

Patented Sept. 9, 1879.

Fig 4.

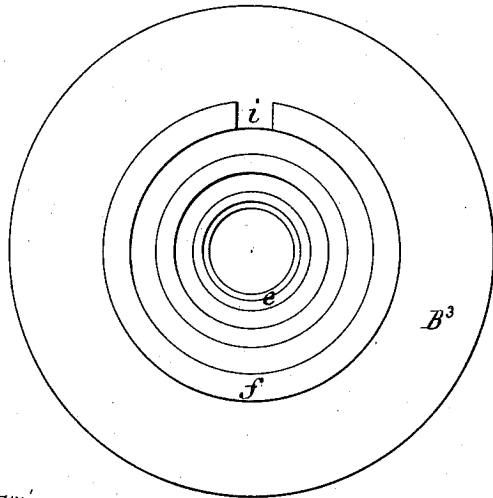


Fig 8.

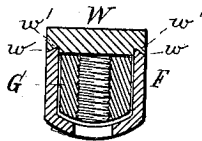


Fig 5.

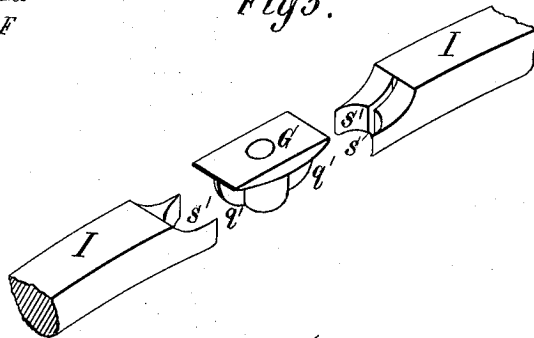


Fig 9.

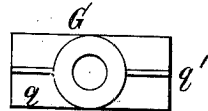


Fig 11.

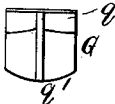


Fig 12.

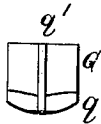


Fig 10.

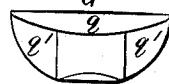


Fig 6.

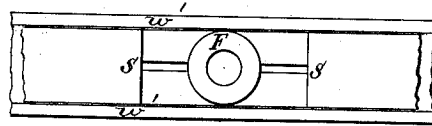
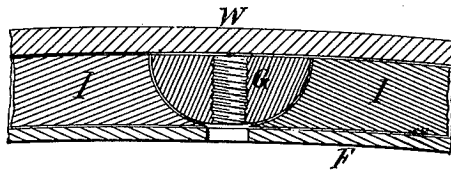


Fig 7.



Witnesses:

J. P. Th. Lang.  
G. H. Theo. Lang

Inventor:

Sra F. Munson  
by  
Mason & Tenwick  
Attys

# UNITED STATES PATENT OFFICE.

IRA F. MUNSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

## IMPROVEMENT IN VEHICLE-WHEELS.

Specification forming part of Letters Patent No. 219,500, dated September 9, 1879; application filed July 14, 1879.

*To all whom it may concern:*

Be it known that I, IRA F. MUNSON, of Washington, in the county of Washington and District of Columbia, have invented a new and useful Improvement in Carriage and other Wheels; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a partial section and partial side elevation of the improved wheel. Fig. 2 is a vertical longitudinal section of the hub and cross-section of the rim of the wheel and nuts with the spokes in elevation. Fig. 3 is a vertical longitudinal section of the hub, showing the spokes broken off. This view is on a larger scale than the others. Fig. 4 is an end view of the hub. Fig. 5 is a perspective view of one of the nuts and two pieces of wood filling. Fig. 6 is a top view of the rim or felly with wooden filling-pieces in its hollow. Fig. 7 is a detail section of the rim, tire, nut, and filling-pieces at Y, Fig. 1. Fig. 8 is a transverse section of the same. Fig. 9 is a bottom view of the nut at Y, Fig. 1. Fig. 10 is a side elevation of the same. Fig. 11 is an end elevation of the nut shown in Figs. 9 and 10, and Fig. 12 is an end elevation of the nut shown at X in Fig. 1. This nut is similar to the other except that the flanged portion is rounded to conform to the transverse shape of the rim or felly, while the nut shown in Fig. 10 and at Y in Fig. 1 has its flanged portion flat in transverse section, to conform to the shape of the tire transversely, while its body portion, at bottom, is rounded off.

The object of my invention is to render more practicable than heretofore the substitution of wrought and cast metal combined for wood and metal combined in the construction of carriage-wheels, using wood only when desired as a filling for the hollow rims of the wheels.

The nature of my invention consists, first, in nuts for the screw ends of the spokes, provided with flanges, which form a long and broad bearing-face, and with longitudinal ribs, which strengthen flanged nuts, in combination with a hollow rim or felly and screw-bolt spokes, as will be hereinafter described; second, in the combination of an axle-box bolt, a

hub composed of flanged radially-grooved clamping-sections, which form a chamber between themselves and the axle-box bolt, screw-bolt spokes, with heads on their inner and screw-threads on their outer ends, as will be hereinafter described; third, in the combination of the flanged and braced nuts, wooden filling-segments, semi-tubular rim or felly, and screw-bolt spokes, whereby abutments of wood are provided for the nuts, as will be hereinafter described; fourth, in a sand-shedding band formed on the inner end of the axle-box bolt, said band being inclined on three sides and arranged just beyond the collar of the axle, as will be hereinafter described; fifth, in a wheel having metal rim and tire, metal spokes and nuts, metal hub, and axle-box bolt, constructed and combined as hereinafter described, whereby the spokes can be screwed up separately for tightening the wheel throughout, and they are free to yield radially under severe concussions; also the sections of the hub serve for clamping the spokes in position, while they are removable for the withdrawal of the spokes, said clamping-sections being drawn together and made separable from one another by simply turning the axle-box bolt in the proper directions; sixth, in nuts for fitting in the rim or felly of the wheel, of segmental form longitudinally and rounded at their bottoms transversely, and provided with flanges and ribs, as will be presently described.

In the accompanying drawings, A is the axle-box, which I have termed an "axle-box bolt," inasmuch as it serves both as a box for the axle and as a bolt for drawing the sections of the hub together. It is formed with a screw-threaded collar, *a*, at its outer end, and with an enlarged flaring inner end, *b*, provided with a shoulder, *c*, for the collar *g* of the axle to bear against, and a shoulder, *d*, for a brass or Babbitt-metal bushing, *e*, to abut against. The extreme portion of this inner end of the box is made with three inclined surfaces, so as to form a sand-band, *f*, beyond the collar *g* of the axle, which sand-band sheds the sand from its inclined surfaces, both on its bottom and top sides, the sand escaping either around the axle or around the band *f*, as will be clearly understood from the drawings.

A shoulder, *h*, is also formed on the axle-box

bolt A by a beveled extension formed in the sand-band, for the inner end of the hub of the wheel to abut against.

In the sand-band a notch is provided, at *i*, for the insertion of a wrench or key when it is desired to screw in or out the box A.

The hub is composed of tubular sections B C B<sup>1</sup>, the sections B B<sup>1</sup> being flared from their inner to their outer ends, and the section C being cylindrical.

The diameter of the parts B C B<sup>1</sup>, except where the parts B and B<sup>1</sup> unite with the box A, is much greater than the said box, so as to give the hub the proper arching form in longitudinal section, and at the same time make it symmetrical in appearance and light and strong, and also provide a chamber, D, between the axle-box bolt A and the inner circumference of the sections of the hub, for the heads of the screw-bolt spokes to move in radially when the wheel is subjected to violent concussions.

The sections of the hub are respectively formed with flanges or clamping-faces B<sup>2</sup> C' B<sup>3</sup>, in which radial semi-cylindrical bearing-grooves *k* are provided for the reception of the necks of the screw-bolt spokes E.

In order to make the sections light, the grooves *k* are intersected by a concentric circular groove, *k'*, cut into the flanges a little deeper than the diameter of the half-circular radial grooves. By this means, also, the grooves *k* can be more easily reamed out, as a shorter distance has to be traveled through solid metal by the reamer. This construction also gives a better clamping action upon the necks of the spokes than does a surface with a continuous groove through the flanges.

It will be seen that the respective pairs of the semicircular grooves form, when the faces of the flanged portions of the hub-sections are brought together, circular boxes for the respective spokes.

The hub-section C has grooves *k* on both of its faces, and when the sections B and B<sup>1</sup> are screwed up against it boxes for two sets of spokes set inclined in reverse directions are formed, the spokes having one inclination occupying positions between those having a reverse inclination.

It is practicable to make the section C in two parts in the same manner as in a former patent to me, and for the same purpose, and when thus made in two parts the office of clamping the spokes will be effected in the same way as when it is made in one piece, as shown in my present case.

On the outer thickened end of the hub-section B an inner screw-threaded shoulder, *l*, is provided, and into the thread *m* thereof the shouldered screw-threaded end *a* of the axle-box bolt screws, when said bolt is operated by a wrench applied in the notch *i* and the axle-box bolt turned inward thereby.

The spokes E are round bolts with heads *n* on their inner ends and screw-threads *p* on their outer ends.

The heads *n* pull upward or radially outward against the inner circumference of the hub-sections, and the screw ends pass through holes in the felly or rim F of the wheel and enter nuts G placed in the hollow of said rim.

The rim or felly is of semi-tubular or inverted-arch form in transverse section, and it is produced by rolling it in one piece out of thin plate metal and uniting its ends by welding after it is bent into a circular form, or in any suitable manner.

The nuts G are circular on their body portion, and are provided near their tops or bottoms with flanges *q*, whose sides are flat; and they are ribbed longitudinally and centrally, as shown at *q'*. This construction is adopted in order that the nuts shall not turn in the hollow of the felly when the spokes are screwed into them, and shall have great strength. These nuts are of a thickness nearly equal to the depth of the hollow of the rim or felly, in order to give a sufficient length of screw-thread for holding the screw-threaded ends of the screw-bolt spokes E.

The straight sides of the nuts, by bearing against the inner sides of the hollow felly, prevent the nuts from turning, and therefore the spokes can be turned into them when the wheel is first made, and afterward, for the purpose of tightening up the wheel in case of shrinkage, or when from any other cause it is necessary to turn the spokes. The nuts G are segmental in form in one direction. They are rounded off at their bottoms, so as to fit the curvature of the hollow rim cross-wise.

In wheels where it is desirable to fill the hollow felly with wood, as at I, it is done by turning the nuts G upside down, as shown in Fig. 1 at Y. The wood segments I are provided with channels *s*, to receive the ribs *q'* of the nuts, and with segmentally-recessed ends *s'*, to receive the circular body portion of the nuts, as shown in the drawings, and the wood segments serve as abutments for the nuts to rest against when the wheel is in use, and also for strengthening the rim and wheel.

The tire W is of wrought metal, and provided with a beveled rabbet, *w*, which fits upon the beveled upper edge, *w'*, of the felly. The tire thus constructed will, when shrunk upon the wheel, be held in place without any other fastening, and the pressure upon the same will tend to make it fit tighter to its seat.

In some descriptions of wheels, especially heavy ones, the rim or felly might be made of cast malleable metal; but I prefer for all light wheels to make the felly of wrought metal.

What I claim is—

1. The combination of nuts G, provided with flanges *q* and ribs *q'*, a hollow rim or felly, F, and screw-bolt spokes E, substantially as and for the purpose described.
2. The combination of the axle-box bolt A, the hub composed of sections B C B<sup>1</sup>, having radially-grooved clamping-flanges B<sup>2</sup> C' B<sup>3</sup>, and shaped to form chamber D, the screw-bolt spokes E, having heads on their inner ends

and screw-threads on their outer ends, substantially as and for the purpose described.

3. The combination of the flanged and braced nuts G, segmental wooden filling-pieces I, channeled at *s* and recessed at *s'*, semi-tubular felly, and screw-bolt spokes, substantially as described.

4. The sand-band *f*, formed on the inner end of the axle-box bolt A, and inclined on three sides, substantially as described.

5. In a metal wheel, the combination of the axle-box bolt A, clamping-sections B C B<sup>1</sup>,

having radially-grooved flanges B<sup>2</sup> C' B<sup>3</sup>, chamber D, screw-bolt spokes, rim or felly F, of semi-tubular form, a suitable tire, W, and nuts G, substantially as and for the purpose described.

6. The flanged and ribbed nuts G, of segmental form and rounded at their bottoms, substantially as described.

I. F. MUNSON.

Witnesses:

H. A. HALL,

J. P. THEODORE LANG.



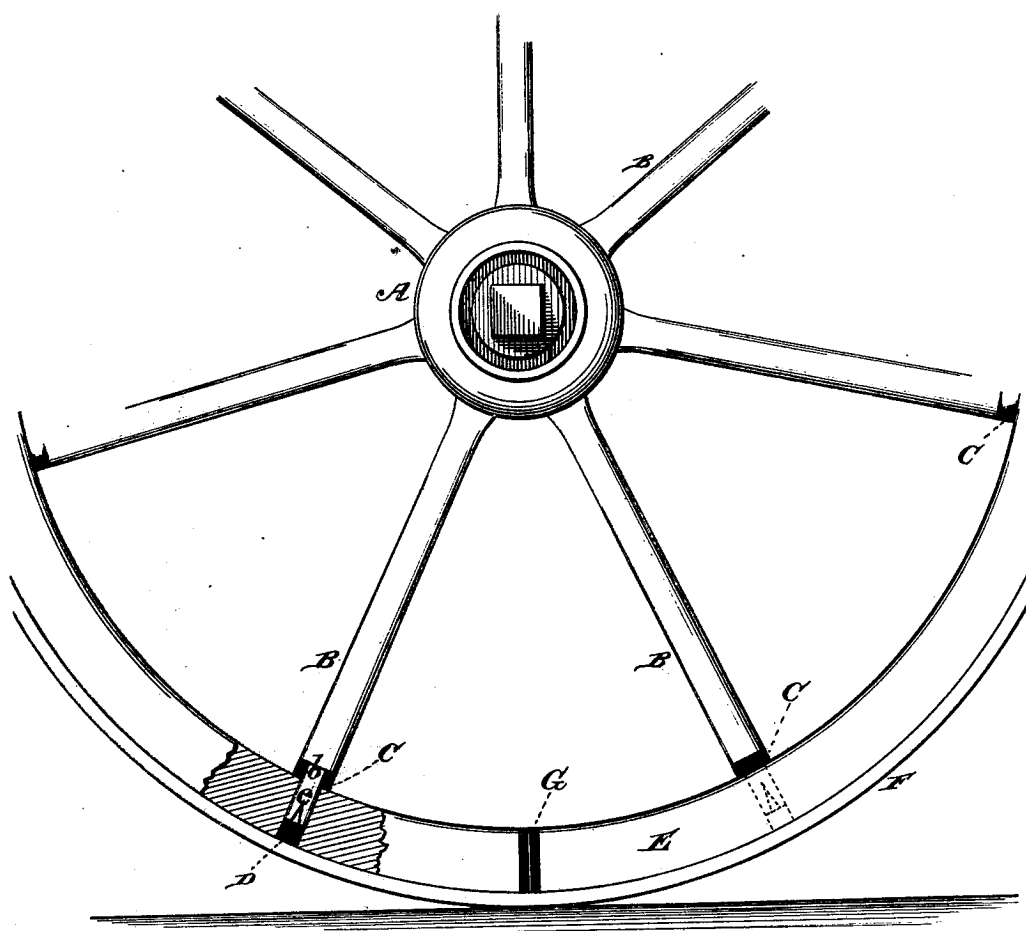
(No Model.)

A. McI. WILLIAMSON.

Carriage Wheel.

No. 233,311.

Patented Oct. 12, 1880.



WITNESSES  
*Robert Everett*  
*James J. Sheehy*

INVENTOR  
*A. Mcintosh Williamson*  
*Gilmore, Smith & Co,*  
ATTORNEYS

# UNITED STATES PATENT OFFICE.

A. McINTOSH WILLIAMSON, OF PHILADELPHIA, PENNSYLVANIA.

## CARRIAGE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 233,311, dated October 12, 1880.

Application filed April 5, 1880. (No model.)

*To all whom it may concern:*

Be it known that I, A. McINTOSH WILLIAMSON, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Carriage-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawing, making a part of this specification, and to the letters and figures of reference marked thereon.

The drawing is a representation of a side elevation of a carriage-wheel, partly broken away to show my improvements.

The nature of my invention relates to the construction of wheels for vehicles.

The essential features of the improvement relate to means for securing elasticity of the wheel, the parts connected being allowed to have a certain amount of play, which will prevent breakage of the wheel in striking or passing over any obstacle upon the road. It also admits of each spoke receiving its share of the jar incident to driving the vehicle over pavements or rough roads. Many other advantages might be enumerated, but these will all be apparent to those skilled in the art. It will be noticed, however, that the fellies are not weakened by mortises having metal sockets set into them, as has been done in a former instance.

In the drawing, which fully illustrates my invention, A designates the hub of the wheel, and B B the spokes.

The spokes have elastic rings C, which fit against the fellies E, and the tenons *b* of the spokes, which pass into mortises in the fellies, come against elastic cylindrical or other equivalent-shaped pads D, which are fitted in the mortises in the fellies.

The tire F, which is passed around the fellies of the wheel, compresses to some extent the elastic pads D, thus tending to keep the fellies in their original form and symmetry, relieving the spoke from springing through

careless hooping of the wheel, taking up the expansion incident to light tires from hot weather, and giving to wood-wheeled vehicles, to a greater extent, the results derived from the ordinary springs.

At the points of juncture between the fellies elastic plates G are interposed, these plates being fitted to the ends of the fellies. These elastic plates or pads constitute auxiliaries to the previously-mentioned pads, and tend to keep the wheel from breaking or becoming rim-bound. The pads, which are set against the tenons of the spokes, also act as a preventive against the breakage of the wheel, and will further accommodate themselves to the contraction or expansion of the tire.

The mortises or holes through the fellies or bent rims are made round, so that the tenons will fit into them, and the elastic pads or cushions are made of cylindrical shape, so as to fit into the said round holes of the fellies. The end of the spoke is more securely held to the felly by a wedge, *e*, driven into the end of the spoke to spread it in a well-known manner, and the said wedge will also serve an important function to compress the cushion-rings C, so as to allow them a limited degree of elasticity only, which is regulated by the distance the wedge is driven into the end of the spoke.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

The carriage-wheel as described, constructed with the elastic pads interposed between the spokes and the fellies, between the ends of the spoke-tenons and the tire, and between the meeting ends of the fellies, substantially as and for the purpose specified.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

A. McINTOSH WILLIAMSON.

Witnesses:

ROBERT EVERETT,  
JAS. J. SHEEHY.

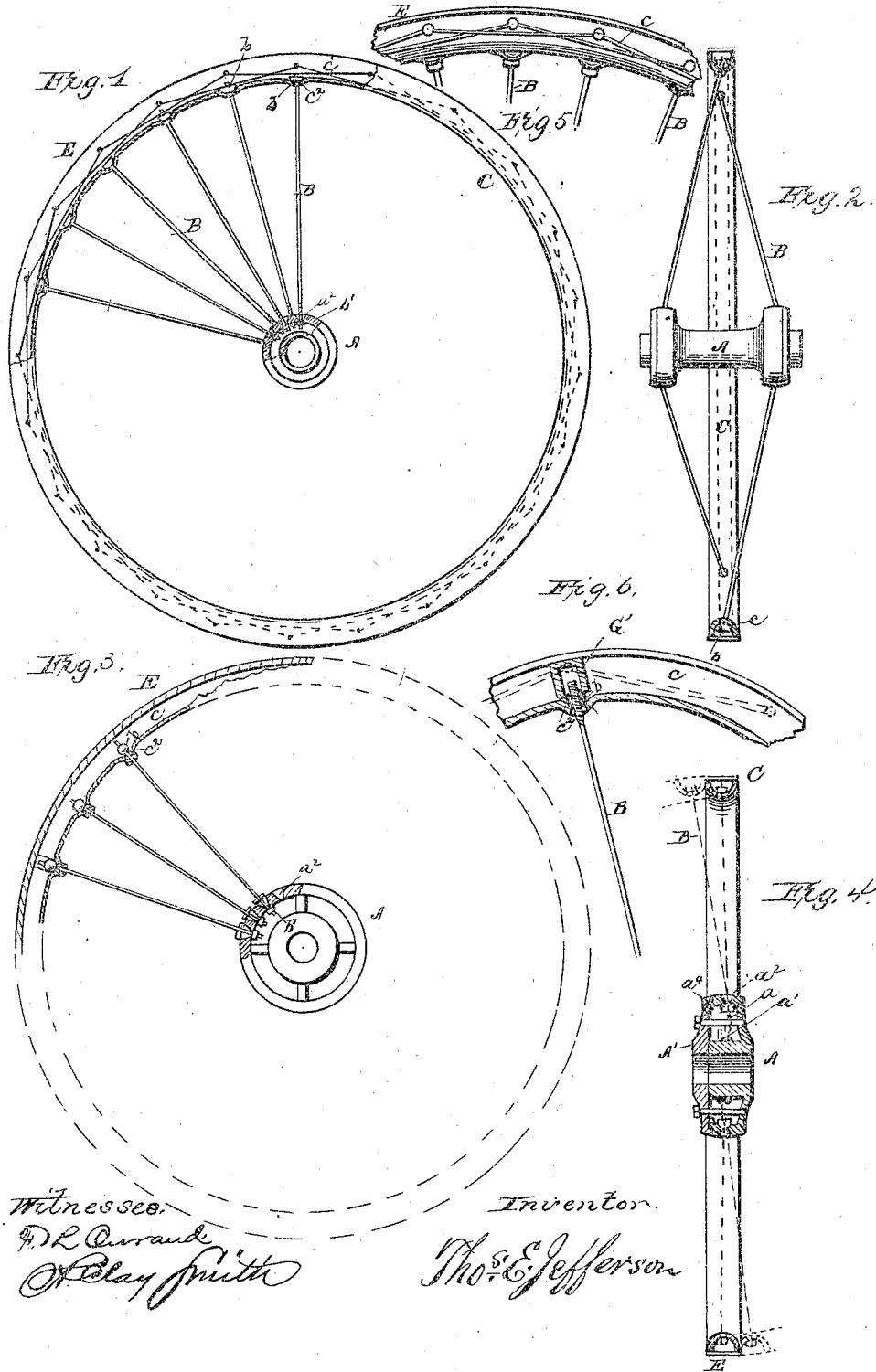
(No Model.)

5 Sheets—Sheet 1.

T. E. JEFFERSON.  
Vehicle Wheel.

No. 243,569.

Patented June 28, 1881.



Witnesses.

*D. R. Curran*  
*W. Clay Smith*

Inventor.

*Thos. E. Jefferson*

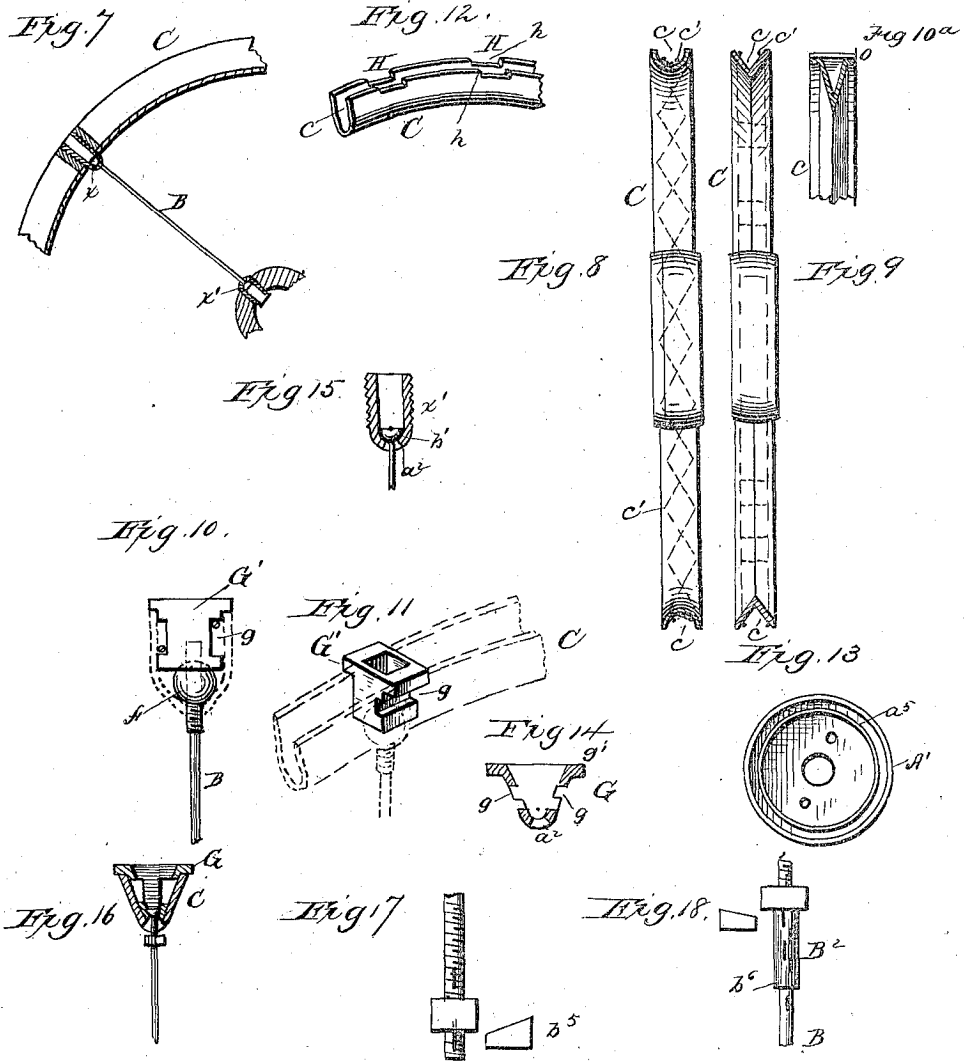
(No Model.)

5 Sheets--Sheet 2.

T. E. JEFFERSON.  
Vehicle Wheel.

No. 243,569.

Patented June 28, 1881.



Witnesses.  
D. L. Curran,  
A. Clay Smith

Inventor  
T. E. Jefferson

(No Model.)

5 Sheets—Sheet 3.

# T. E. JEFFERSON. Vehicle Wheel.

No. 243,569.

Patented June 29, 1881.

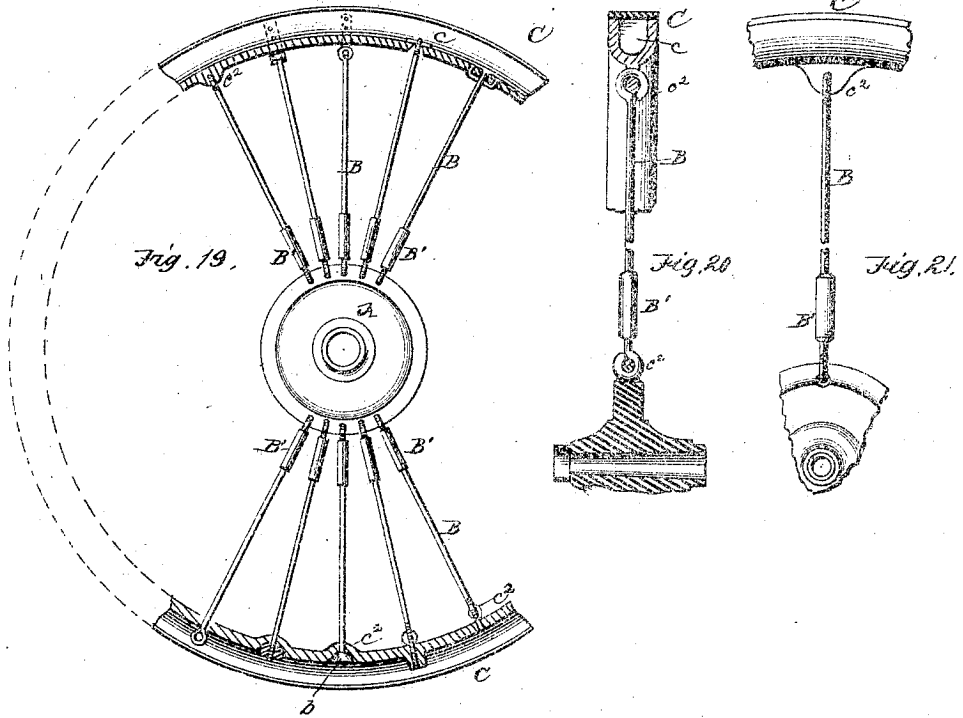


Fig. 22.

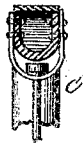


Fig. 23.



Fig. 24.

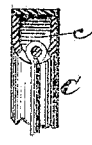


Fig. 25.

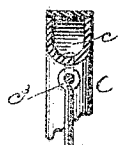


Fig. 26.

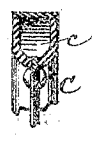


Fig. 27.

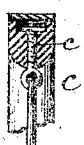


Fig. 28.

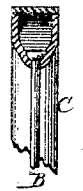
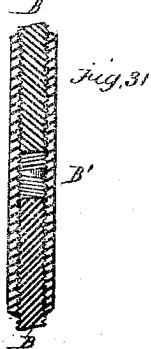


Fig. 29.



Fig. 30.



Attest,  
 W. H. Knight  
 A. Clay Smith

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 Thos. E. Jefferson

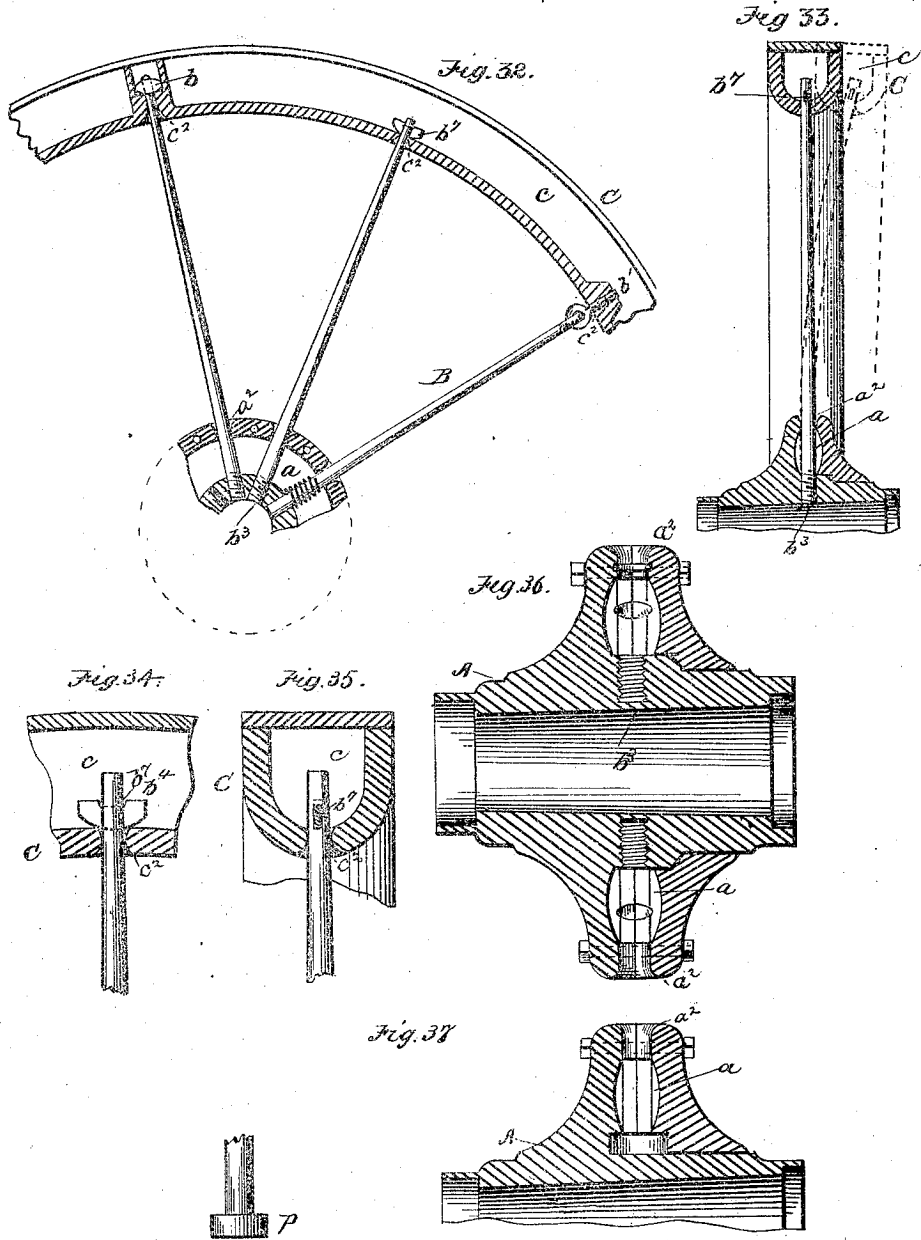
(No Model.)

5 Sheets—Sheet 4.

T. E. JEFFERSON.  
Vehicle Wheel.

No. 243,569.

Patented June 28, 1881.



Attest,  
W. H. Knight  
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(No Model.)

T. E. JEFFERSON.  
Vehicle Wheel.

5 Sheets—Sheet 5.

No. 243,569.

Patented June 28, 1881.

Fig. 38.

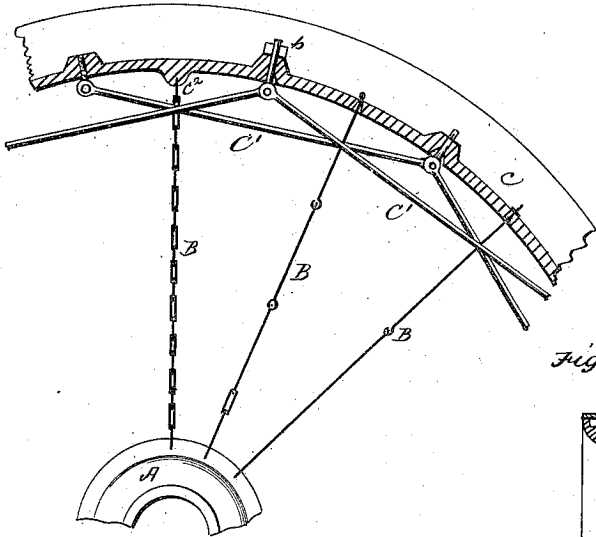


Fig. 38<sup>a</sup>.

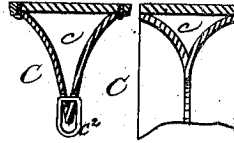


Fig. 40.

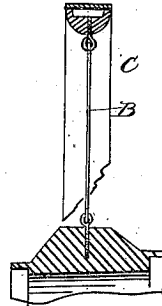


Fig. 41.

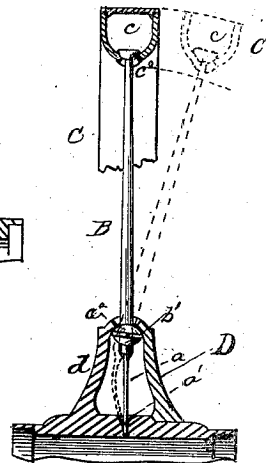


Fig. 39.

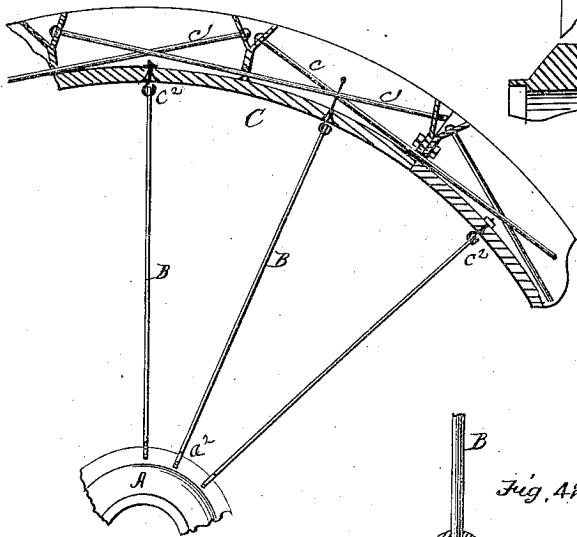
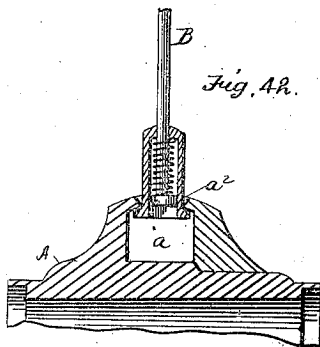


Fig. 4A.



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W. H. Knight  
A. Clay Smith

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Thos. E. Jefferson

# UNITED STATES PATENT OFFICE.

THOMAS E. JEFFERSON, OF BOSTON, MASSACHUSETTS.

## VEHICLE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 243,569, dated June 28, 1881.

Application filed May 23, 1881. (No model.)

*To all whom it may concern :*

Be it known that I, THOMAS E. JEFFERSON, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Vehicle-Wheels; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to a vehicle-wheel adapted for useful service in buggies, carriages, bicycles, sulky's, and other devices wherein transportation is effected by the revolutions of the wheel or wheels over the surface of the ground; and the novelty consists in the construction and arrangement of parts, as will be more fully hereinafter set forth, and specifically pointed out in the claims.

The object of the invention is to provide a wheel having a hub and periphery, the same being held in relative positions by tension-spokes; and to this end the invention consists, first, in a trussed rim having an annular groove, and a tire having its bearings upon the edges thereof, so as to cover the said recess, adapted to serve with tension-spokes or radial tension-ties; second, in a tension spoke or tie having rounded bearings or hooks, combined with a rim and hub having connections which will allow play to the spokes at either or both ends, both laterally and in the line of travel; and, third, in means for taking up slack in the tension-spokes, means for allowing the spokes to have a universal movement in the rim or hub, or both, means for strengthening the rim, and means for impelling the spokes to resume a vertical position after they have been deflected therefrom by lateral strain from any cause, as will be explained.

In the accompanying drawings, which form a part of this specification, Figure 1 is a side elevation, partly in section, showing the trussed rim, the rounded bolt-heads and recesses in the rim, and the flaring openings in the hub; Fig. 2, an edge view, showing a double hub with tension-spokes extending alternately to-

ward different sides; Fig. 3, a side elevation, partly in section, showing universal joint in the rim and flaring apertures in the hub, each being provided with flexible washers to prevent the accumulation of dirt therein; Fig. 4, an edge section, showing the deflection of the rim and tension-spokes laterally, and means for inciting their return to a vertical position when the strain has been removed; Fig. 6, a detail in section, showing a female-threaded ball and a threaded spoke screwed therein, a flaring aperture allowing universal play to the spoke within limits; Fig. 5, a detail section, showing the trussed rim and a modified spoke-connection; Fig. 7, a detail section, showing a staple or socket screwed into rim and hub and loose tension-spoke connections; Figs. 8 and 9, edge elevations, showing the recessed rim and the trusses arranged differentially; Fig. 10, a detail section, showing a threaded-ball within the recessed rim in which the threaded spoke is screwed. Fig. 11 is a perspective detail, showing a ball-holding block with recessed sides to allow the truss-rods to pass, said block operating in the recess of the rim. Fig. 12 is a perspective detail, showing the edges of the rim recessed laterally to receive the blocks. Fig. 13 is an inside elevation of the hub-cap; Fig. 14, a detail section of an inverted cone-shaped bracket or box having side recesses, through which the truss-rods pass, and a flaring aperture below, which receives the spoke, the said bracket operating in the recessed rim, as seen in Figs. 12 and 16. Fig. 15 is an enlarged detail sectional view of the spoke-sockets shown in Fig. 7; Fig. 16, a detail section of the bracket or box shown in Fig. 14, and the recessed rim, a nut upon the spoke serving to cover the flaring-mouthed spoke-aperture to prevent ingress of dirt; Figs. 17 and 18, means for holding the nut in place and taking up slack without removing the locking-key. Fig. 19 is an elevation, partly in section, showing a right-and-left-hand-threaded sleeve connecting a duplex spoke and situated between the hub and the rim; Fig. 20, a similar device for taking up slack, the spoke, in duplex form, being secured by an eye at each end. Fig. 21 is a detail view, showing a modification of Figs. 19 and 20. Figs. 22 to 30, inclusive, show sectional



details of several ways of securing the spokes to the rim. Fig. 31 is an enlarged view of the right-and-left-hand screw shown in Figs. 19, 20, and 21. Fig. 32 is a detail section, showing a spring for taking up slack at all times, in addition to the screw means, and several modified ways of attaching the spoke to the rim. Fig. 33 is an edge section, showing clamp for holding the spoke which is screwed into the hub and keyed to the rim, the dotted lines showing the deflection of the rim and spoke from lateral strain. Figs. 34 and 35 are detail views, partly in section, showing a rounded recessed key and a slotted spoke operating as securing means within the rim. Fig. 36, an enlarged view in edge section, with the spoke screwed into the hub and outer holding-clamps, that portion of the spoke between these two parts acting as a spring to bring the rim back to a vertical position after it has been deflected, as shown in Fig. 33. Fig. 37 shows a means for securing the hub end of the spoke. Fig. 38 is a sectional view, showing the trusses outside of the inner surface of the rim; Fig. 38<sup>a</sup>, modified forms of rim and tire; Fig. 39, a sectional view, showing the spokes secured to the rim between the truss-bearings; Fig. 40, a view of another form of spokes; Fig. 41, another detail view; and Fig. 42 represents a detail showing a modified means for fastening the spoke to the hub and a spring for taking up slack by a constant and continual force.

The different modifications shown in the several figures of the drawings are deemed to be equivalents of each other, and comprise some of the features and means which I have devised in carrying out the invention. For instance, any of the means shown for securing the tension-spokes to the rim or hub, or both, the location of the trusses for strengthening the rim or the construction of the same, the springs for taking up slack constantly, and for inciting the return of the deflected rim to its normal position, the means for allowing lateral play and play in the line of travel at either spoke-connection without injuriously bending the spoke, means for holding the ball in place after the spoke is removed, and other details of construction may be varied without departing from the principle of my invention, the essential features of which are a strengthened rim and means for allowing lateral play thereto without injury to the wheel, with or without springs to induce its return after deflection, in contradistinction to a giving or flexible rim and vertical play or rigidly-secured spokes.

Referring to the drawings, A represents the hub of the wheel, having the ordinary journal-bearing for the axle, (not shown) and provided with the cap A', which is bolted thereto by means of bolts, leaving an annular space, *a*, within for the manipulation of nuts or other securing means for tension-spokes, the insertion of spring, or other desired purposes. The hub is provided upon its periphery with flaring apertures *a*<sup>2</sup>, which connect with the annular chamber *a*,

and these apertures *a*<sup>1</sup> receive the hub end of the spokes B, the inner extremities of which are secured by threaded rounded nuts, double eyes, or other equivalent means, *b*<sup>1</sup> which will allow the spoke to deflect in any direction, the flaring mouth *a*<sup>2</sup> allowing this action without the bending of the spoke at that point. The outer end of the spoke B is provided with a rounded head, a rounded nut, an eye, or a slot, or other equivalent means, for securing it to the rim C.

In Fig. 1, a rounded head, *b*, operates in a recess, *c*<sup>2</sup>, having a flaring mouth, in Fig. 32 a double eye, in Figs. 10 and 11 a threaded ball, and in Figs. 34 and 35 a rounded key, *b*<sup>4</sup>, having a recess operating in a slot, *b*<sup>5</sup>, in the end of the spoke B, are employed. In either of these or equivalent constructions the outer end of the spoke B is secured to the rim with a view to allowing lateral and universal play without bending the spoke at that point, and by frequent bendings breaking it.

The object of the invention being to furnish a stiff and firm wheel which will run vertically in all ordinary uses, it is necessary that the spokes should be held with great tension, and that the rim should have considerable strength of itself; also, that the spokes should be very securely fastened to the hub.

In Figs. 1 and 2 I have shown a simple nut, which may be keyed against return, (see Figs. 17, 18;) in Figs. 19, 20, 21, single and double eyes; in Figs. 32, 33, 36, the spoke screwed into the hub; in Fig. 37, a clamped head, &c.; but in cases of great lateral strain my construction allows the rim to deflect, and in such cases it is desirable that the rim should return to its normal position as soon as the strain is released. In some instances the spring-action inherent in the several spokes will be sufficient; but to render this action more certain I provide means for inciting and forcing the spoke and rim back after deflection.

In Figs. 32, 33, and 36 an annular disk, *d*, is formed in one piece with the hub, and a removable disk, D, is bolted thereto to form a clamp. The spoke is screwed or otherwise secured into the hub-ring which forms the journal, and the clamp grasps it at the periphery, leaving a considerable portion of the spoke free in the annular space *a*. This portion exerts a constant influence as soon as the rim is deflected to either side to force it back, and also to limit its lateral movement. This feature is fully shown in Fig. 41.

The slack in the spokes is taken up ordinarily by screw-thread connections, either by a nut, *b*<sup>1</sup>, inside the hub, by threaded eyed bolts, or right-and-left-hand-threaded sleeve B'. (See Figs. 19, 20, 21, and 31.) I also use inclined keys or wedges, with or without nuts. In cases where considerable strain or load requires very firm and tight connections these devices may be sufficient; but a spring, in addition to other devices, may be employed when desired. (See, for instance, Figs. 32 and 42.)

In contradistinction to devices where the

rim is designed to yield or spring inward, my invention is intended to have a considerable inherent strength in itself, which I acquire by forming the same, C, of an approximately V shape in transverse section, thus forming a recess, *c*, entirely around the rim. In this recess the rounded heads of the spokes or the threaded balls or eyebolts or links are secured. To add to the strength inherent in the rim itself when necessary I truss the same with tie-rods *e'* or their equivalents, which may be made in sections, or of a single piece going entirely around the wheel, and the spoke-connections with the rim may be arranged in any manner which will utilize the greatest strength of the trusses *e'*. The trusses are preferably arranged in duplex series, and may extend one upon each side of the recess *c* in alternate relations or cross each other from side to side. (See Fig. 8.)

E represents a tire, which has its bearing upon the outer edges of the rim C, and it is secured thereto by bolts or otherwise, and completely incloses the recess or chamber *c*, which may be filled with wood or other material, if desired.

By referring to Fig. 12 it will be noticed that the rim C is provided with lateral recesses, H, which have shoulders *h*. Blocks G' are constructed with upper flanges, so as to fit snugly in the transverse recesses H *h*, and leave a flush face upon the outer edge of the rim. The spoke and threaded ball *f* may be passed through the opening in the block G', and when the spoke is detached for any purpose the said block holds the ball against displacement. An inverted cone-shaped box or bracket for similar service with the rim C is shown in Figs. 14, 16, which I prefer in practice.

In Fig. 7 is shown two perforated threaded thinblades, *x'*, each receiving a headed end of a spoke, B, one headed after insertion, which are adapted to be screwed into hub and rim until the spoke has the proper tension.

In Fig. 38 the truss is shown outside the rim, which arrangement may be preferred in some cases; and in Fig. 2 a double hub is shown as better adapted to resist extreme side pressure.

I design to construct the parts and adapt them to each other in such a manner that they will serve efficiently in a vertical position without slack or play; but the necessary contraction and expansion (due to heat and cold, lateral strain, ordinary wear and tear will render tightening the parts necessary at times, and the various equivalent devices shown are adapted to subserve this purpose.

In Fig. 37 a recess in the annular space *a* receives one portion of a disk or head, P, of the spoke, and a similar recess in the removable disk D receives another portion of the head P, and when the bolts are drawn firmly together the head is held rigidly. The clamp at some distance from the head P also holds the spoke firmly, and this construction greatly stiffens the spokes in their vertical position.

In this construction means equivalent to those described may be employed to tighten the parts should they, from any cause, become loosened.

In some cases and for some kinds of service it may be desirable or necessary to have a limited lateral play, and this I have provided for by the flaring-mouthed openings and the eye-connections described.

In Fig. 10<sup>a</sup> is shown an elongated V-shaped rim, C, having flanges *x* perforated at proper distances to admit bolts by which the tire is secured thereto with a broad seat or bearing. This form gives a maximum of strength to a minimum of material.

In Fig. 38<sup>a</sup> the outer sides of the rim C are formed concave or are bellied inward. Consequently the great strain upon the rim from the spokes B may tend to straighten these sides. If the trusses cross each other from side to side in the recess *c* they operate in the opposite direction, and thus working against each other they counterbalance each other's effects to produce slackness by reason of the tendency to straighten the sides. The opposite of this is the result where U-shaped rims are used, as both truss and spoke strain would be in the same direction.

It is intended by the construction of parts hereinbefore described and shown that the spokes will serve with efficiency and usefulness with any form of rim or hub, and that the rim, re-enforced substantially as shown, will serve efficiently with any kind of spoke or hub; and also that the truss device will serve effectually with any form of rim, spokes, or hub.

The portion of the wheel which endures the tension is preferably made of stretched refined steel, and as the strength of the wheel lies in the tension of the parts from many radial points to a common center, it is apparent that great advantages will accrue, among which are durability; properly protected from oxidation by paint, varnish, galvanization, or otherwise; the parts, with the means for adjustment at will, will last a much longer time than if made of other material; reliability in use and in cases of accident; when concussion occurs with any object the single-hubbed wheel will deflect from its normal or vertical position until the obstruction is passed, when it will immediately resume its operative condition; lighter, with the same amount of strength, and, generally, more efficient in ordinary use.

While I have mentioned a particular kind of material of which the wheel is preferably made, I wish it to be understood that any other material which will subserve the purpose may be employed.

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

1. A vehicle or other wheel having a hub, tension-spokes, and a suitable rim, combined with means for allowing universal play at either end without bending the spokes, and with threaded means for tightening the parts, as specified.

- 4
2. A hub having annular recess, a removable cap, and peripheral flaring apertures, combined with tension-spokes, a re-enforced rim, and means for tightening the parts, as specified.
- 5 3. A recessed rim having bottom recesses with flaring apertures, combined with tension-spokes having rounded heads or nuts, a hub having flaring apertures and an annular chamber, and with means for tightening the parts, as specified.
- 10 4. A rim of V-shaped form in transverse section, forming a recess in the entire face thereof, having a contained series of trusses to re-enforce said rim, combined with a tire adapted to cover said recess, as set forth.
- 15 5. The rim C, having the V-shaped recess  $c$  and flanges, the contained trusses, the tension-spokes having rounded nuts or heads, and the flaring apertures in the recesses  $c^2$ , as set forth.
- 20 6. The rim C, having V-shaped or concave sides, the contained trusses crossing from side to side, and devices therein for securing the tension-spokes, combined with the hub, the spokes, and means for tightening the parts in such a manner that the tension of the spokes and the tension of the trusses will equalize each other and prevent relaxation, as specified.
- 25 7. The recessed re-enforced rim C  $c$ , having recesses  $c^2$ , with flaring apertures, combined with a threaded rounded nut or head, and a threaded tension-spoke, and with a hub and tightening means, as and for the purposes set forth.
- 30 8. In a vehicle-wheel having a hub, tension-spokes, and means for adjusting the same, a recessed rim, re-enforced and strengthened against yielding inward by a series of trusses contained in said recess, arranged to overlap each other and break joints, as specified.
- 35 9. The spoke B, having threaded end and a slot below the threaded portion, combined with a securing-nut and a thimble having differentially-arranged similar slots, adapted to bear against the nut as the said slots register and the wedge-key is inserted to prevent the retreat of the nut, as specified.
- 40 10. The hub A, having journal-bearing for the axle, annular flange  $a^1$ , flaring apertures  $a^2$ , and annular chamber  $a$ , combined with the cap  $A'$ , having annular recess  $a^5$ , which receives the flange  $a^1$ , and with securing means, as set forth.
- 45 11. In a wheel having annular clamping-disks, one of which,  $d$ , is formed in one piece with the hub, and the other, D, removable, the tension-spokes secured to the journal and clamped at a distance therefrom to give a spring-action to the portion of the spoke within the chamber  $a$ , as shown in Fig. 41, and serve with a constant force to keep the spokes and re-enforced rim in a vertical position, as specified.
- 50 12. In a vehicle or other wheel, a recessed rim re-enforced by a series of contained trusses, and adapted to serve with a hub and a series of tension-spokes, as and for the purposes specified.
- 55 13. The combination of the hub A  $A'$   $a$   $a^2$  and the rim C  $c$   $c'$  with the spokes B, having spring-arms  $b$  secured in the journal and allowed to spring laterally in the chamber  $a$  without displacement, (see Fig. 41,) as specified.
- 60 14. In a vehicle or other wheel, the hub having peripheral flaring or enlarged apertures, the series of tension-spokes and the rim, the said rim and spokes being positioned in a direct vertical plane with each other and with the said flaring apertures, as and for purposes specified.
- 65 70 75 80
- In testimony whereof I affix my signature in presence of two witnesses.
- THOS. E. JEFFERSON.
- Witnesses:  
H. CLAY SMITH,  
E. R. BROWN.

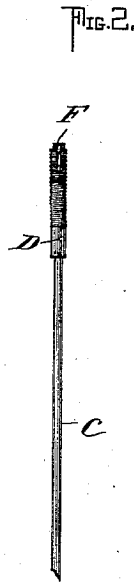
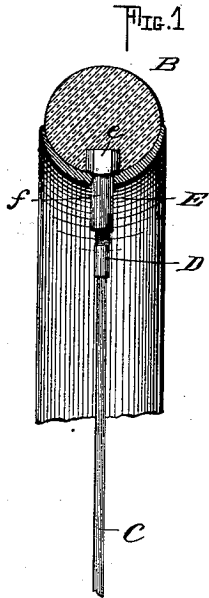
(No Model.)

J. B. McCUNE.

WHEEL.

No. 334,393.

Patented Jan. 12, 1886.



WITNESSES.

*Wm. Rheem.*

*David H. Mead.*

*Joseph B. McCune* INVENTOR.

*By Ymerius Intero*

ATTY.

# UNITED STATES PATENT OFFICE.

JOSEPH B. McCUNE, OF CHICOPEE, MASSACHUSETTS.

## WHEEL.

SPECIFICATION forming part of Letters Patent No. 334,393, dated January 12, 1886.

Application filed October 5, 1885. Serial No. 179,014. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH B. McCUNE, a citizen of the United States, residing at Chicopee, Massachusetts, have invented new and useful Improvements in Means for Fastening Spokes, of which the following is a specification.

This invention relates to vehicle-wheels, and particularly to means for fastening the spokes in wheels used upon "bicycles" and "tricycles," so called.

The most generally practiced method of securing the spokes in wheels of this kind is by cutting a screw-thread upon the end of the spoke and applying a nut directly thereto, the said nut bearing against the outer face of the tire, and serving when turned to give tension to the wire of which the spokes are formed, thus giving the proper strain to impart rigidity to the wheel. The cutting of this screw-thread materially weakens the spoke, as is evidenced by the fact that they most frequently break at the point where the screw-thread is placed; also, a comparatively large wire has to be used in order to allow the thread to be cut thereon without weakening the spoke sufficiently to render it useless.

The object of my invention is to produce a fastening for the spokes of a bicycle-wheel which will in no way weaken the same, and which may be renewed when worn without removing the spokes.

With these objects in view my invention consists in a fastening device for spokes, consisting of a sleeve of proper length placed upon the end of the spokes and retained thereon by means of an enlarged head or the like, the said sleeve being screw-threaded on its surface, and a nut adapted to be screwed upon the said sleeve and bear on the rim, against which it is forced to put tension upon the spokes.

In order that those skilled in the art to which my invention relates may know how to make and use the same, I will now proceed to describe it in connection with the accompanying drawings, in which—

Figure 1 is a sectional view showing a portion of the rim and tire of a bicycle-wheel and my improved spoke-attaching device in place. Fig. 2 is a detail view showing the end of a

spoke and the sleeve which is placed thereon, and forms part of the attaching device; and Fig. 3 is a detail view showing the preferred shape of the end of a spoke upon which the sleeve is placed.

In the drawings, A represents a short section of the rim or felly of a bicycle-wheel as usually made, and B represents the tire, which is generally made of rubber and of a form to fit into the groove in the face of the felly.

C represents a spoke, which is preferably made of steel wire. In the general form of bicycle-wheels these spokes are provided with screw-threads, the cutting of which materially weakens the spoke. In my improved spoke the ends are "headed up" sufficiently to form a shoulder, against which a sleeve, D, bears, and the spokes are also preferably formed with one or more ribs or flanges, F, which enter slots in the sleeve D and prevent the said sleeve from turning independent of the spoke. The sleeve D is screw-threaded from its top downward to near its lower end, and its upper end is provided with slots G, into which enter the flanges from the spoke.

E represents a screw-cap, consisting of the octagonal head *e* and the depending hollow and internally-screw-threaded portion *f*. This portion *f* is of a size to receive the sleeve D, and the lower portion of the nut *e* is slightly tapering, in order to conform to the curved shape of the outer portion of the tire, and thus present no sharp edges to the said felly.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The fastening device for spokes, consisting of the spokes provided with enlarged heads and lateral flanges, the exteriorly-screw-threaded sleeves placed upon the spokes and provided with slots for the reception of the flanges upon the spoke, and the screw-cap receiving the end of the screw-threaded sleeve.

2. The combination, with the curved felly and the spokes provided with enlarged flanges, of the screw-threaded sleeves provided with slots for the reception of the flanges on the spokes, and the screw-caps consisting of the lower tubular portion and an operating nut-head, substantially as described.

3. The combination, with the curved felly

and the spokes provided with enlarged ends  
and lateral flanges, of the screw-threaded  
sleeves provided with slots for the reception  
of the said flanges, and the tightening-nut in-  
5 closing the sleeve and having that part which  
bears upon the tire slightly tapering to con-  
form to the shape of the tire.

In testimony whereof I have hereunto set  
my hand in the presence of two subscribing  
witnesses.

JOSEPH B. McCUNE.

Witnesses:

PRESTON C. POND,

WALTER W. BRADBURY.

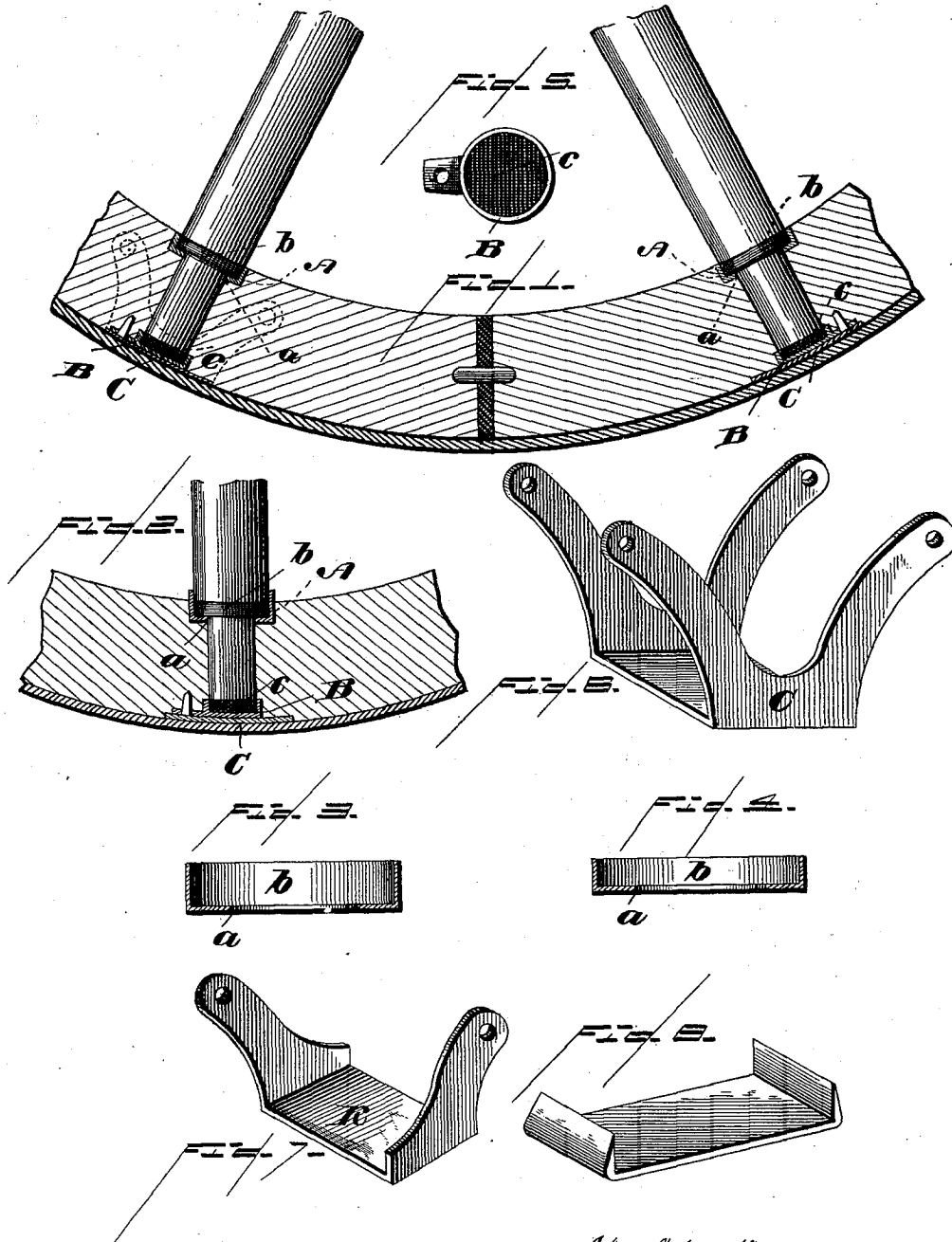
(No Model.)

2 Sheets—Sheet 1.

A. McI. WILLIAMSON.  
WHEEL.

No. 387,549.

Patented Aug. 7, 1888.



WITNESSES.

*W. H. Shill*  
*J. Ed. Turpin.*

*A. McI. Intosh Williamson*  
INVENTOR,

*By Smith & Sheehy*

Attorneys.

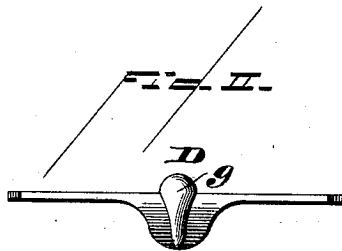
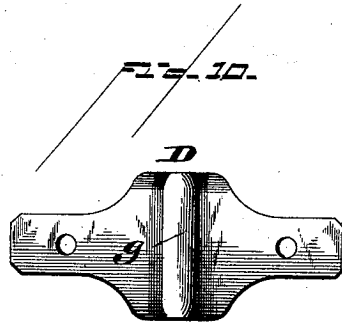
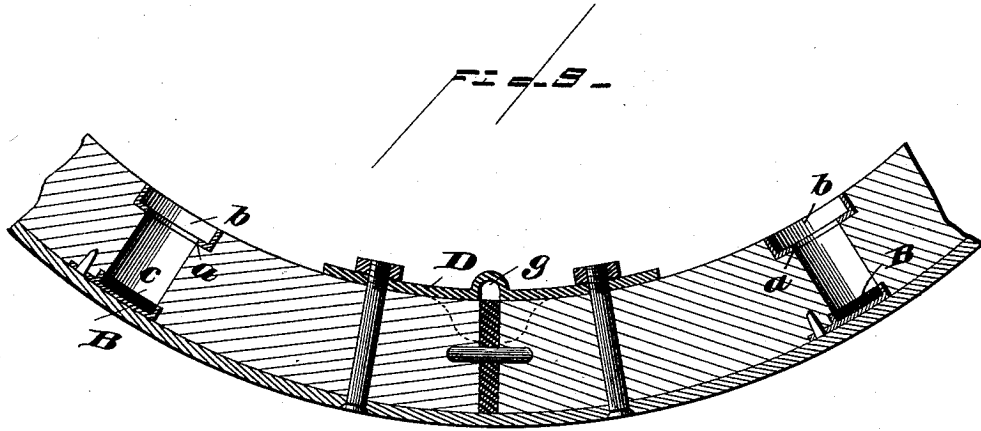
(No Model.)

2 Sheets—Sheet 2.

A. McI. WILLIAMSON.  
WHEEL.

No. 387,549.

Patented Aug. 7, 1888.



WITNESSES,

*T. Ed. Turpin*  
T. Ed. Turpin.

*A. McI. Williamson*  
INVENTOR,

*By Smith & Sheehy*  
Attorneys,



# UNITED STATES PATENT OFFICE.

A. McINTOSH WILLIAMSON, OF PHILADELPHIA, PENNSYLVANIA.

## WHEEL.

SPECIFICATION forming part of Letters Patent No. 387,549, dated August 7, 1888.

Application filed October 22, 1887. Serial No. 253,076. (No model.)

To all whom it may concern:

Be it known that I, A. McINTOSH WILLIAMSON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Carriage-Wheels; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Figure 1 is a longitudinal sectional view through the rim of a wheel, showing my improvements in connection therewith. Fig. 2 is a similar view in detail, showing a modified form of socket. Figs. 3 and 4 are detail views of different forms of sockets. Fig. 5 is a plan view of the cup or socket that is designed to receive the lower end of the spoke-tenon. Figs. 6, 7, and 8 are detail views of different forms of clasping-plates. Fig. 9 is a sectional view through the rim of a wheel, showing the corrugated clasping-plate secured thereto. Figs. 10 and 11 are detail views of the clasping-plate.

My invention relates to wheels for vehicles; and it consists in the novel construction of parts, as hereinafter specified, and claimed.

In Letters Patent No. 233,311, granted to me October 12, 1880, I have set forth and claimed elastic pads interposed between the spokes and the fellies, between the ends of the spoke-tenons and the tire, and between the meeting ends of the fellies.

The present invention consists in improvements on the construction so patented, and is especially designed for use therewith; but it is not my intention to limit its use to that purpose only.

The letter A of the drawings represents an annular metallic socket for the spoke of a wheel. This socket is constructed with a shoulder (marked *a*) which is adapted to receive an elastic cushion, preferably of rubber, interposed between the shoulder of the spoke and the said shoulder *a*, in the manner represented in Fig. 1 of the drawings. The elastic cushion above mentioned is marked *b* on the drawings. This socket is countersunk in the felly, as shown in Fig. 1.

B indicates a metal socket, preferably closed

at its lower end, and is designed to hold an elastic cushion, *c*, which is interposed between the end of the spoke and the base of said last-mentioned socket. It is well known that changes in weather from heat to cold act with great force upon the tire and wood of a vehicle-wheel.

By the expansion of the tire and felly in extremely hot weather the rubber will be enlarged. Wet and dry weather also affect the felly in a similar manner. This may be called the "ebb and flow" of the rubber. In my Patent No. 233,311 rubber was interposed between the meeting ends of the fellies, but no provision was made for the overflow of the rubber. In order to accomplish this end I have invented a corrugated clasping-plate, D, which is bolted or otherwise secured to the felly, as shown on Fig. 9 of the drawings, and clasps the felly, as shown on each side, at the meeting ends or joints of the fellies. In the center of this plate I form a recess or corrugation, *g*. This recess serves to hold a large portion of the overflow of the cushion when the iron or wood of the wheel-rim press upon its sides. This plate D is substituted for the ordinary joint-plate employed on vehicle-wheels. It will be observed that the socket B is countersunk in the felly in the same manner as the socket A, but upon the opposite side thereof.

Between the socket B and the tire I interpose a clasping-plate, (marked C,) which is preferably constructed with bifurcated arms, as shown on Fig. 3, or oblique arms, (represented on Fig. 4,) or it may be formed without such arms, as shown on Fig. 7. When arms are employed on the clasp or plate, they are perforated, so that the plate may be secured to the felly by screws or rivets. This plate C clasps the felly on each side and serves to hold the parts in place with great firmness. For light carriages a simple perforated plate with one holding-arm is sufficient. Such plate is represented on Fig. 7 by the letter K.

It is obvious that by my construction of the wheel and arrangement of the elastic pads and holding-plates the wear and strain upon a carriage are lessened, for the reason that a great part of the jarring and vibration incident to travel over rough roads or pavements and waterbreaks are reduced. It is furthermore ob-

vious that wheels of this construction will in great measure neutralize the drumming and rumbling noises that are so common with close carriages.

5 Having described this invention, what I claim is—

1. The combination, with the elastic cushion and the fellyes of a vehicle-wheel, of the corrugated plate, substantially as specified.
- 10 2. The combination, with the spokes and fel-

lies of a vehicle-wheel and the cushions C, of the clamping-plate interposed between the felly and tire, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

A. McINTOSH WILLIAMSON.

Witnesses:

C. W. DESHIELL,  
T. ED. TURPIN.

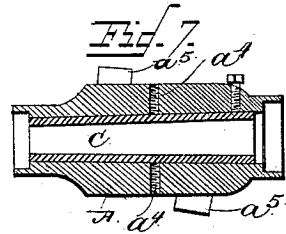
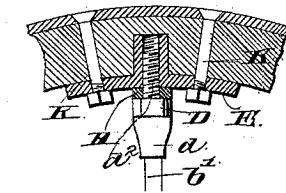
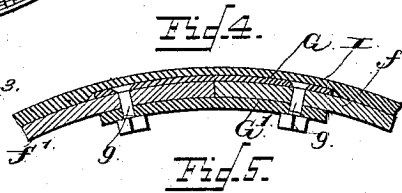
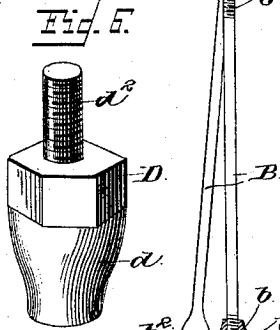
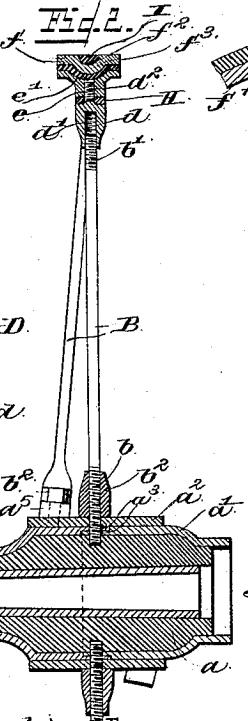
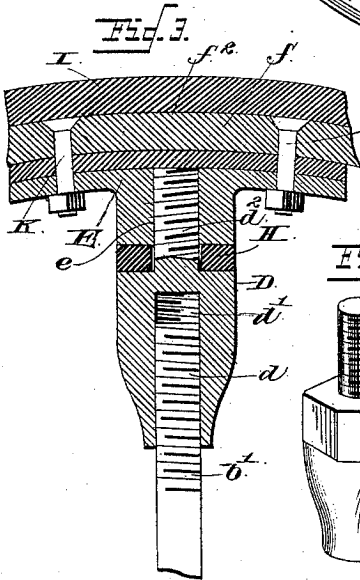
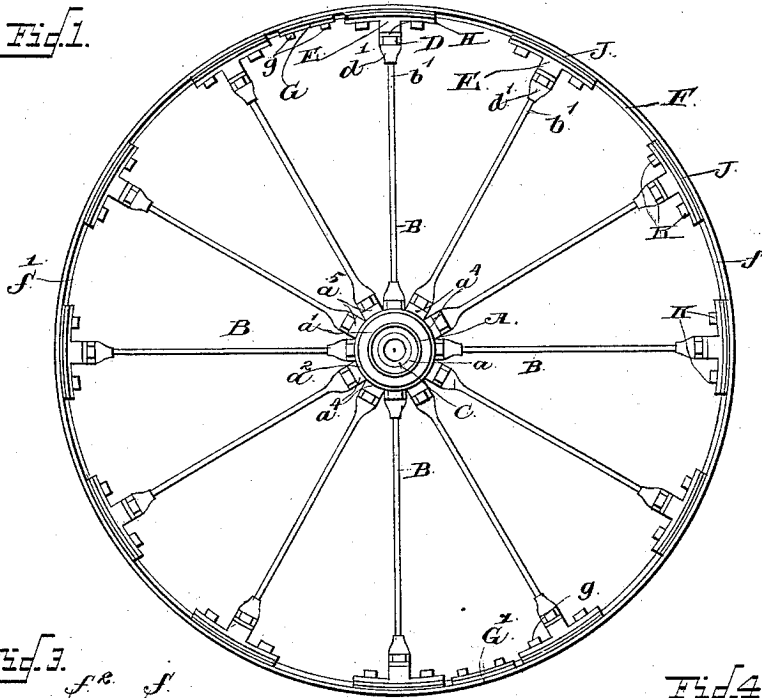
(No Model.)

J. BOLICK.  
VEHICLE WHEEL.

No. 417,977.

Patented Dec. 24, 1889.

Fig. 1.



Witnesses.

*M. Sawyer*  
*S. J. Riley*

By his Attorneys,

*Chas. Snow & Co.*

Inventor

*Jerome Bolick*

# UNITED STATES PATENT OFFICE.

JEROME BOLICK, OF CONOVER, NORTH CAROLINA.

## VEHICLE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 417,977, dated December 24, 1889.

Application filed September 24, 1889. Serial No. 324,871. (No model.)

*To all whom it may concern:*

Be it known that I, JEROME BOLICK, a citizen of the United States, residing at Conover, in the county of Catawba and State of North Carolina, have invented a new and useful Wheel, of which the following is a specification.

The invention relates to improvements in wheels.

The object of the present invention is to improve, simplify, and cheapen the construction of wheels and increase their strength and durability.

The invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

In the drawings, Figure 1 is a side elevation of a wheel constructed in accordance with the invention. Fig. 2 is a transverse sectional view. Fig. 3 is a detail sectional view showing the manner of securing a spoke to the tire. Fig. 4 is a similar view illustrating the manner of securing the ends of the tire together. Fig. 5 is a sectional view illustrating a modification of the invention, and showing the manner of securing a spoke to the ordinary wooden felly. Fig. 6 is a detail perspective view of the nut for tightening the spoke. Fig. 7 is a sectional view illustrating a modification of the hub.

Referring to the accompanying drawings by letter, A designates a hub, which consists of the wooden body  $a$ , the metallic sections  $a'$ , and the central band  $a^2$ . The sections  $a'$  have their inner edges rabbeted and overlapping and provided with registering perforations  $a^3$ , through which pass spokes B, whereby the metallic sections  $a'$  are secured together on the wooden body  $a$ . The central bands  $a^2$  are provided with sockets  $a^4$ , which are arranged in three rows, the outer rows being slightly inclined toward each other to permit spokes to be staggered at each side of a central vertical row. The sockets  $a^4$  are internally threaded, and the lower ends  $b$  of the spokes are threaded and engage said sockets  $a^4$ , and the central spoke extends through the socket, the band  $a^2$ , and the registering perforations of the metallic sections  $a'$  and pro-

jects a suitable distance into the body  $a$  of the hub. The hub is provided with an axle-box C, which is secured in the wooden body  $a$  in the ordinary manner. The upper ends  $b'$  of the spokes B are threaded and engage internally-threaded openings  $d$  of sockets  $d'$ , formed integral with nuts D. The nut D has a socket  $d'$  on its lower side and provided on its upper face with a threaded stem  $d^2$ , which engages a threaded opening  $e$  in a felly-plate E. The nut D has its threaded stem provided with right-hand threads and its opening provided with left-hand threads, or vice versa, whereby the spokes may be tightened or loosened, as desired, by turning the nut.

The felly-plate E is bolted to a tire F, which is constructed in two sections  $f f'$ , that are secured together by plates G G', that are arranged upon each side of the section and fastened thereto by bolts and nuts  $g$ , the plates conforming to the configuration of the tire. The tire F is provided on its exterior face with an annular groove  $f^2$ , which is semicircular in cross-section and adapted for the reception of an auxiliary tire I, which is constructed of rubber or other similar elastic material. The groove  $f^2$  of the tire F is formed by curving the middle portion  $f^3$  of the tire, and the felly-plate is provided with a groove or concavity  $e'$ , whereby the said felly-plate is made to conform to the configuration of the inner face of the tire and the parts enabled to fit closely and securely together without liability of being accidentally displaced by moving laterally upon each other. A rubber plate J is interposed between the tire and the felly-plate, and a rubber washer H is placed between the nut and the lower end of the felly-plate, whereby the wheel is adapted to pass over rough surfaces without experiencing damage from the shocks. The felly-plate is secured to the tire by bolts K, which pass through perforations in the tire and plate and have their heads countersunk in the former.

The lower ends  $b$  are provided with hexagon collars  $b^2$ , which may either be formed or pressed integral with the spokes or be constructed separate and suitably secured in place. These collars  $b^2$  form a broad bearing for the spokes, and the sockets  $a^4$ , which re-

ceive the staggered spokes, are preferably formed in projections  $a^5$ , while the sockets for the central vertical spokes may be simply openings or perforations, which, together  
 5 with the perforations of the metallic sections  $a'$ , are preferably threaded to engage the lower threaded end  $b$  of the spoke.

In Fig. 5 I have illustrated a modification of the invention, in which the spokes B are  
 10 secured to an ordinary wooden felly. The felly is provided with a felly-plate that is secured in place by bolts, and is provided with a threaded opening to receive the threaded stem  $d^2$  of the nut D.

15 In Fig. 7 is illustrated a modification of the hub, which modification consists of a solid metal body in which the axle-box is secured in place by set-screws. The hub is provided with a series of centrally-arranged  
 20 threaded openings to receive the vertical spokes, and is provided with integral inclined projections to receive the inclined or staggered spokes.

I desire it to be understood that I do not  
 25 limit myself to the precise detail of construction herein shown and described, as I may, without departing from the spirit of the invention, make various minor changes therein.

From the foregoing description and the ac-  
 30 companying drawings the construction, operation, and advantages of the invention will be readily understood.

Having thus described my invention, what I claim, and desire to secure by Letters Pat-  
 35 ent, is—

1. In a wheel, the combination of the body  $a$  of the hub, the overlapping metallic sections  $a'$ , provided with registering perforations, the central band  $a^2$ , having openings  
 40 registering with the perforations of the metallic sections, and the spokes B, passing through the perforations and openings and securing the parts together, substantially as described.

2. The combination of the body  $a$  of the hub, the metallic sections  $a'$ , overlapping and provided with registering perforations, the central band having openings registering with said perforations and provided with inclined projections  $a^5$ , and the spokes, sub-  
 50 stantially as described.

3. The combination of the spokes, the tire, the felly-plates secured to the tire and provided with threaded openings, and the nuts D, having threaded stems to engage the open-  
 55 ings in the felly-plates and the sockets to receive the ends of the spokes, substantially as described.

4. The combination of the spoke, the tire, the felly-plates suitably secured to the tire and having a threaded opening, the nut D, provided with a threaded stem to engage the opening in the felly-plate and having a socket to receive the end of the spoke, and the rubber interposed between the tire and  
 65 the felly-plate and the felly-plate and the nut, substantially as described.

5. In a wheel, the combination of the tire provided with a groove semicircular in cross-section and the auxiliary tire constructed of rubber or similar material and fitting in said  
 70 groove, and being semicircular in cross-section and lying flush with the top of the tire on each side of the groove, substantially as described.

6. The combination of the tire having its central portion  $f^3$  curved and forming a groove  $f^2$ , the felly-plate provided with a groove and conforming to the configuration of the inner face of the tire, the spoke, and the nut  
 80 having a socket to receive the spoke and provided with a stem to engage the felly-plate, substantially as described.

7. The combination of the hub provided with a series of central openings and having  
 85 inclined projections provided with sockets, the vertical spokes fitting in said openings and the inclined spokes inserted in said sockets, the tire, and the felly-plates bolted to the tire and provided with sockets to receive the  
 90 spokes and adapted to engage the felly-plates, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

JEROME BOLICK.

Witnesses:

GEO. E. COULTER,  
 P. C. SHUFORD.

(No Model.)

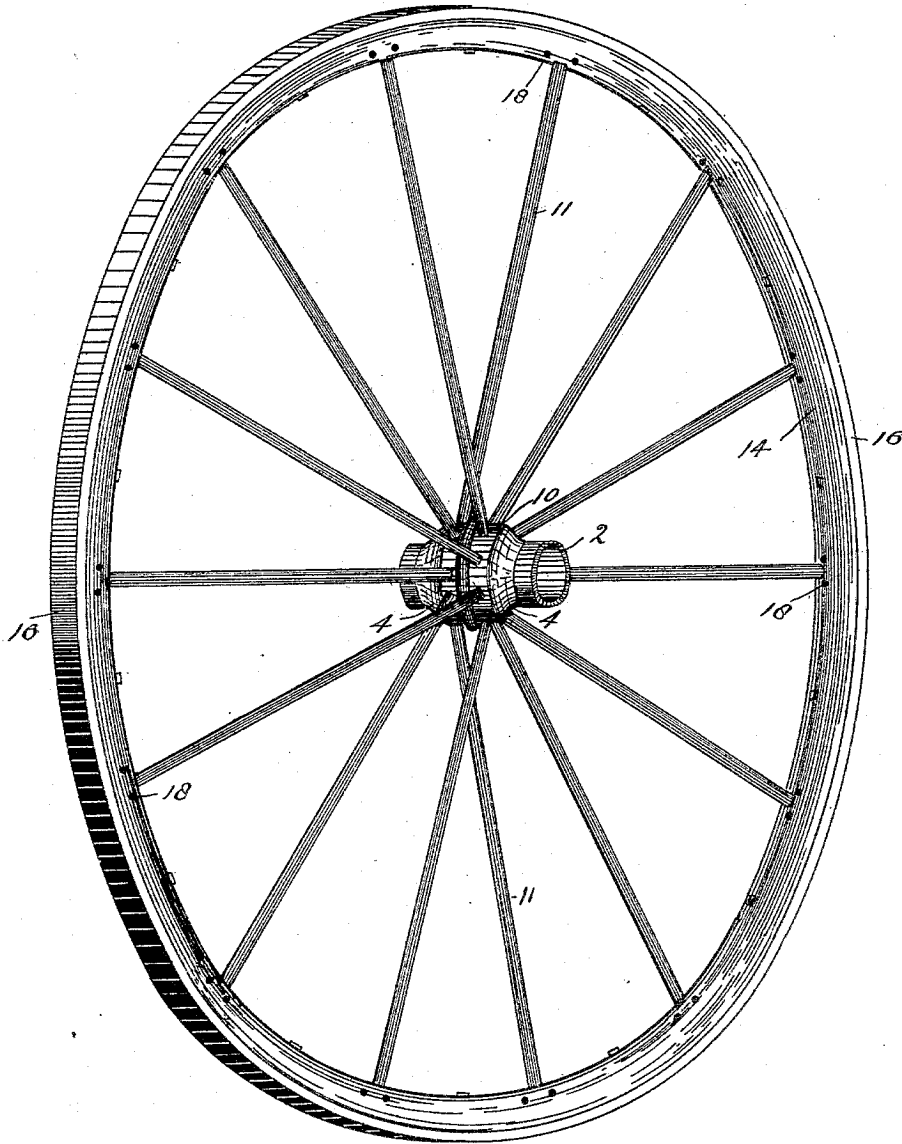
2 Sheets—Sheet 1.

A. C. HALL.  
VEHICLE WHEEL

No. 425,506.

Patented Apr. 15, 1890.

*Fig. 1*



WITNESSES:

*G. J. Rolland*  
*Wm. M. Cornell*

INVENTOR

*Albert C. Hall*

BY

*A. J. O'Brien*  
ATTORNEY.

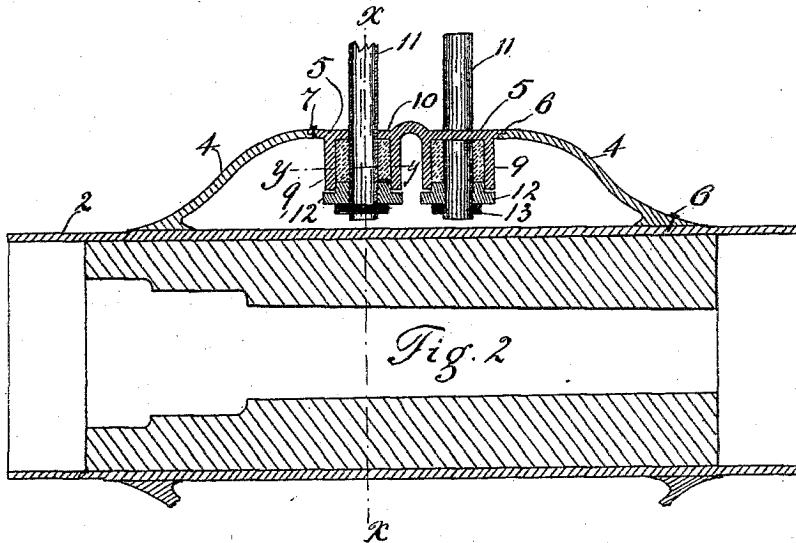
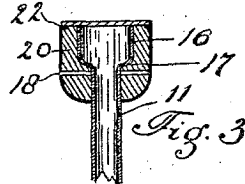
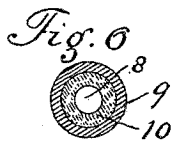
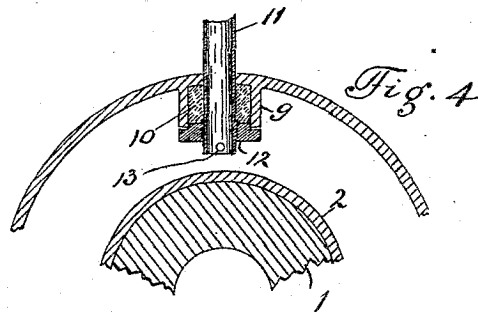
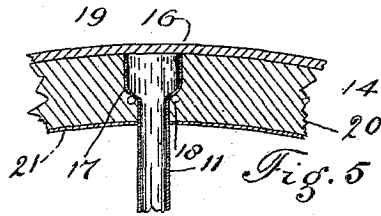
(No Model.)

2 Sheets—Sheet 2.

A. C. HALL.  
VEHICLE WHEEL.

No. 425,506.

Patented Apr. 15, 1890.



WITNESSES:  
*G. J. Rolland*  
*Wm. M. Cornell*

INVENTOR  
*Albert C. Hall*  
BY *A. J. O'Brien*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

ALBERT C. HALL, OF DENVER, COLORADO.

## VEHICLE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 425,506, dated April 15, 1890.

Application filed January 2, 1890. Serial No. 335,571. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT C. HALL, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Wheels for Vehicles; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in vehicle-wheels, and the object of my invention is to provide a wheel of the class stated which shall be of simple construction, economical in cost, durable and not liable to get out of repair, and at the same time so constructed that the noise of the wheel while running shall be reduced to the minimum.

To these ends my improvement consists of the features, arrangements, and combinations hereinafter described.

In the drawings is illustrated an embodiment of my invention, in which drawings—

Figure 1 is a perspective view of the complete wheel. Fig. 2 is a longitudinal section taken through the center of the hub. Fig. 3 is a cross-section taken through the felly and through the center of a spoke. Fig. 4 is a vertical section taken through the hub on the line  $x x$ , Fig. 1. Fig. 5 is a section taken through the felly, being really a portion of Fig. 4, the central portion of the spoke connecting the two figures being broken away. Fig. 6 is a cross-section taken on the line  $y y$ , Fig. 2.

In the views, let the reference-numeral 1 indicate the body of the hub, constructed of any suitable material, preferably wood. Surrounding the body of the hub is the cylindrical metallic shell 2, which tapers slightly from one end to the other end, so that the diameter at one extremity shall be a little less than the diameter at the opposite extremity. Surrounding the cylindrical part 2 is a shell composed of two end sections 4 4 and a central intermediate section 5. The outer extremity of parts 4 are made heavier than the main portion and are suitably secured to part 1, as by screws 6,

passing through these enlarged extremities into cylinder 2. The inner extremities of parts 4 are suitably united to the outer edges of the central portions 5, as at 6, where the edges of the two parts are shown joined by oppositely-disposed abutting shoulders. As an additional security in forming this joint, screw 7 may be used, inserted in a continuous aperture formed in the overlapping edges of the two parts.

The central portion 5 of the outer shell of the hub is provided with apertures 8 for the reception of the inner extremities of the spokes. Apertures 8 in the outer shell of part 5 are so fashioned that the spokes 11 shall fit nicely and securely therein. After passing through the outer shell of part 5 the spoke enters the chamber inclosed by the cylindrical box 9 and provided with a packing 10, of elastic or resilient material, surrounding and engaging the spoke. The packing 10 is retained within the chamber by a nut 12, screwed upon the inner extremity of each spoke, which is threaded to correspond with the threads upon its nut. The inner surface of the nut engages the packing 10 and holds it securely in place under all circumstances. The nut should be screwed tightly against the packing, so that when in use the nut is thrust inward with the spoke, thus enlarging for the instant the packing-chamber. The packing will by virtue of its resilience keep the chamber full and remain at all times in contact with the inner surface of the nut.

Nuts 12 are provided with outwardly-projecting rims or caps, which extend beneath but do not quite engage the inner edges of boxes 9. The inner extremities of the spokes are never in contact with the cylindrical part 2. These extremities of the spokes are provided with suitable keys 13 or their equivalent for locking the nuts 12 securely in position.

The spokes 11 may be either solid or tubular, the latter form being preferable. The outer extremities of the spokes are enlarged at 16 and provided with shoulders 17. This enlarged extremity is secured within a suitable socket in the felly or rim of the wheel and retained in place therein by pins 18, passing through the felly and engaging the shoulders 17 on opposite sides of the spoke.

19 is the tire, which surrounds the felly and



engages the outer extremities of the spokes, retaining them in place.

As before stated, the cylindrical part 2 should taper slightly from one extremity to the other extremity thereof. The object of this is to enable part 2, together with the enclosed body portion of the hub, to be drawn or forced out of the surrounding shell whenever it is necessary to have access to the mechanism connected with the inner extremity of the spokes for the purpose of repairing.

The felly 14 is composed of a wooden body 20, inclosed by a U-shaped metal covering 21, provided with inwardly-projecting flanges 22, engaging the periphery of the wheel and covered by the tire.

Having thus described my invention, what I claim is—

1. In a wheel for vehicles, the combination, with the hub, of the spokes 11, provided near their outer extremities with the shoulders 17, a suitable felly provided with apertures for the reception of the shouldered extremities of the spokes, and pins 18, passing horizontally through the felly on opposite sides of the spokes and engaging shoulders 17 externally and supporting the spokes, but not passing therethrough, substantially as described.

2. In a wheel for vehicles, the combination, with the main cylindrical part 2, of the hub inclosing the body portion 1, the outer circumferential shell consisting of the end sections 4 and the intermediate section 5, section 5 being provided on its interior with suspension-boxes 9, having external apertures for the reception of the spokes, and a packing 10, of elastic or resilient material, surrounding the spokes, a nut 12, screwed upon the inner extremity of the spokes and retaining the packing in place, and a suitable key 13, or its equivalent, for locking the nut, substantially as described.

3. In a wheel for vehicles, a felly composed of a body portion 20, constructed of wood, and a U-shaped metal covering 21, inclosing the wooden portion and provided with the interior projecting flanges 22, engaging the periphery of the wooden portion and lying beneath the tire, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALBERT C. HALL.

Witnesses:

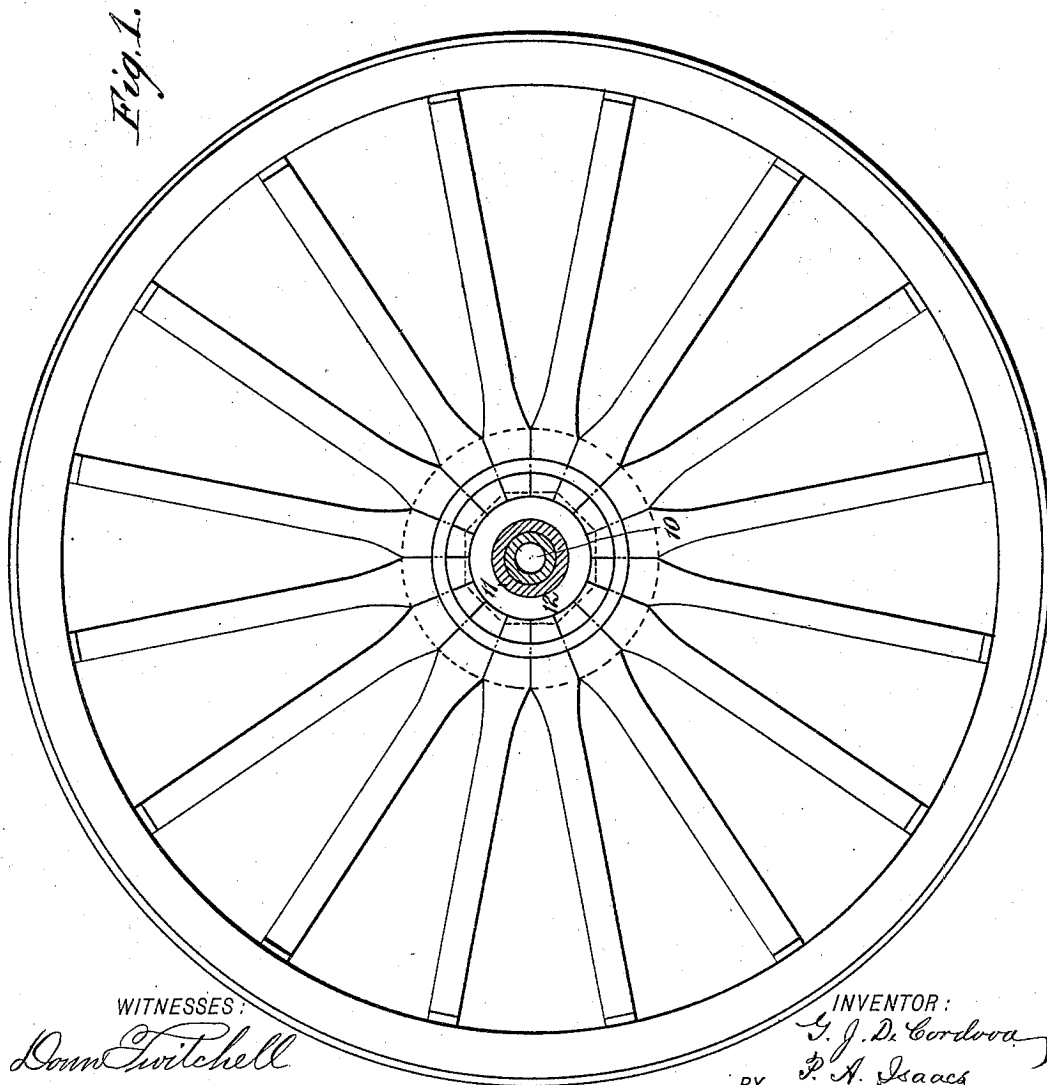
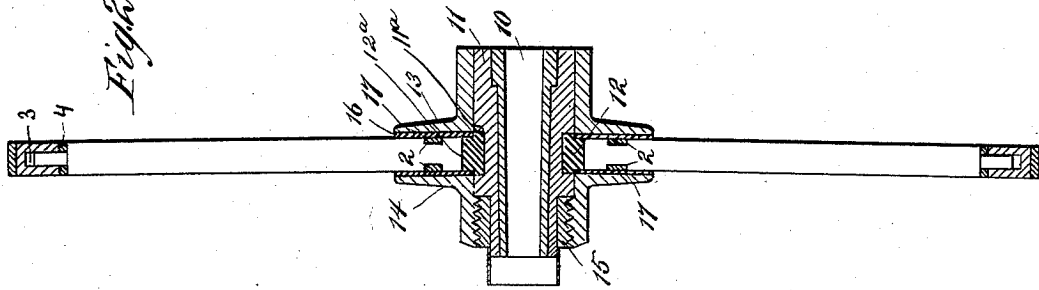
G. J. ROLLAUDET,  
WM. MCCONNELL.

(No Model.)

G. J. DE CORDOVA & P. A. ISAACS.  
VEHICLE WHEEL.

No. 431,334.

Patented July 1, 1890.



WITNESSES:  
*Donn Twitchell*  
*C. Sedgwick*

INVENTOR:  
*G. J. De Cordova*  
*P. A. Isaacs*  
BY *Munn & Co*  
ATTORNEYS.

# UNITED STATES PATENT OFFICE.

GABRIEL JOSHUA DE CORDOVA AND PERCY ALBERT ISAACS, OF KINGSTON,  
JAMAICA, WEST INDIES.

## VEHICLE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 431,334, dated July 1, 1890.

Application filed September 11, 1889. Serial No. 323,665. (No model.)

*To all whom it may concern:*

Be it known that we, GABRIEL JOSHUA DE CORDOVA and PERCY ALBERT ISAACS, both of Kingston, Jamaica, West Indies, have invented a new and Improved Wheel, of which the following is a full, clear, and exact description.

This invention relates to vehicle-wheels; and it has for its object to prevent jar and noise when traveling, to decrease the wear and tear upon the vehicle, to provide for the ready repair of the wheel, and to so construct the wheel that the tire will at all times be tight.

To this end our invention consists in certain novel features of construction and peculiar combination of parts, all of which will be hereinafter fully described in the annexed specification, and particularly pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of a wheel embodying our invention, parts being shown in section; and Fig. 2 is a cross-sectional view of the wheel.

Referring to the drawings, 10 represents the box or thimble, which is arranged within a wooden nave 11 in the ordinary manner. Centrally of the nave 11 we form an annular recess 11<sup>a</sup>, in which is seated a rubber band 12, the upper portion 12<sup>a</sup> of which projects beyond the nave 11 and forms an abutment for the inner ends of the spokes, said spokes being preferably cut to the form shown in the drawings, their inner ends bearing against the rubber band 12.

To prevent lateral movement of the spokes we provide a flange 13, which is driven upon the rear end of the nave 11, the forward face of the flange being substantially flush with the rear edge of the band 12. In connection with the flange 13 we employ another flange 14, the hub or sleeve of which is internally threaded at 14<sup>a</sup> to engage an externally-threaded washer 15, secured to the forward end of the nave.

Between the side faces of the spokes and the flanges 13 and 14 we place rubber wash-

ers 16, the lower ends of which bear against the upper or projecting portion 12<sup>a</sup> of the elastic band 12. By this construction and by seating the band 12 in a recess 11<sup>a</sup> in the nave it will be seen that lateral spread or displacement of said band is entirely prevented, even should some of the parts become loosened by wear. It will also be seen that by compressing the upper portion of the band by means of a tight adjustment of the washers 16 and flanges 13 and 14 said band is pressed radially outward, thereby always presenting a strong cushion for the abutting ends of the spokes.

To serve as an additional means of securing said spokes in proper alignment we provide their outer lower faces with coincident recesses, which form a continuous annular recess 17<sup>a</sup>, in which are fitted metallic rings 17, said rings being held in position by the rubber washers 16.

From the foregoing construction it will be observed that the spokes rest upon an elastic center, and as they are held under continual pressure it follows that any expansion of the tire due to heat or any contraction of the felly due to shrinkage will be compensated for by the outward movement of the spokes, such movement being caused by the elastic base.

Although not positively essential, we prefer to place rubber cushions between the outer ends of the spokes, either at the points marked 3 or at the points marked 4 in Fig. 2.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a wheel, the combination of a nave provided with an annular recess 11<sup>a</sup>, an elastic band held therein and projected beyond said recess, spokes which rest upon said band, and the flanges 13 and 14 for holding said spokes from lateral displacement, substantially as shown and described.

2. The herein-described improvement in vehicle-wheels, consisting of a nave provided with an annular recess 11<sup>a</sup>, an elastic band fitted in said recess, having a portion 12<sup>a</sup> pro-

jected beyond said nave, spokes resting upon  
said projecting portion, provided with coinci-  
dent recesses in their lower outer faces, metal  
rings fitted in said recesses in said spokes,  
5 flanges 13 and 14, adjusted on said nave, and  
elastic washers 16, disposed between the outer  
lower faces of the spokes and the flanges 13  
and 14, the lower edges of said washers pressed  
by said flanges against the projecting portion  
10 of said elastic band 12, whereby said portion

is compressed radially outward, substantially  
as and for the purpose described.

GABRIEL JOSHUA DE CORDOVA.

PERCY ALBERT ISAACS.

Witnesses for G. J. de Cordova:

EDWARD KENT, Jr.,

C. SEDGWICK.

Witnesses for Percy A. Isaacs:

CHAS. E. BARRAN,

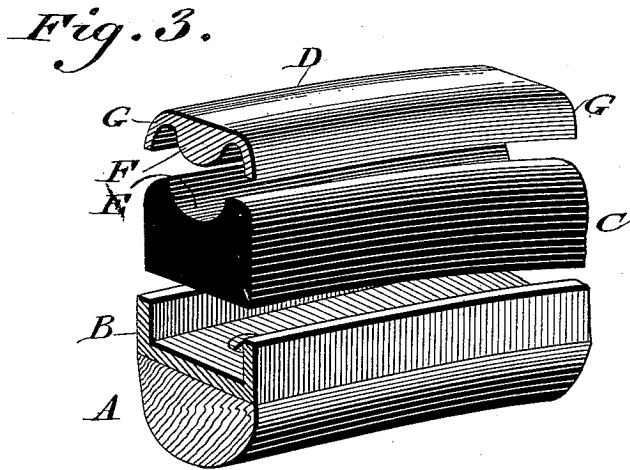
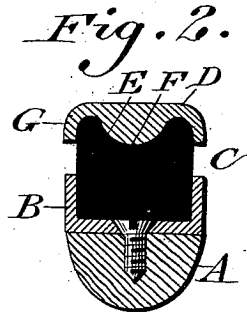
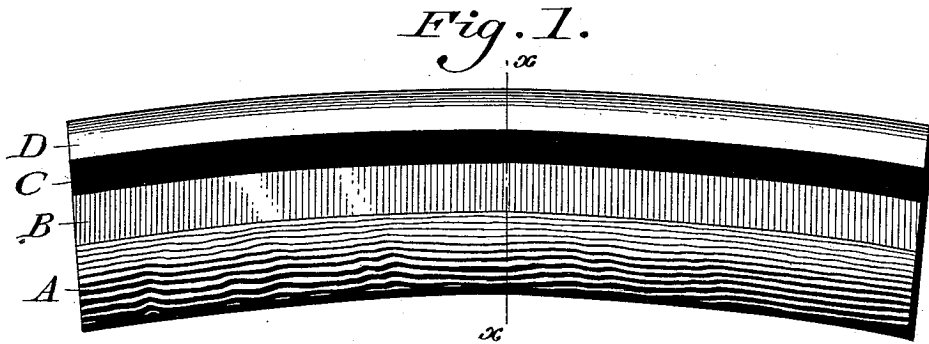
J. R. DE CORDOVA.

(No Model.)

H. M. DU BOIS.  
TIRE FOR VEHICLE WHEELS.

No. 431,512.

Patented July 1, 1890.



WITNESSES:

*P. F. Bagley.*  
*L. Dowville.*

INVENTOR  
*Howard M. Du Bois.*  
BY  
*John A. Dieberstein.*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

HOWARD M. DU BOIS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE  
DU BOIS MANUFACTURING COMPANY, OF PENNSYLVANIA.

## TIRE FOR VEHICLE-WHEELS.

SPECIFICATION forming part of Letters Patent No. 431,512, dated July 1, 1890.

Application filed March 1, 1890. Serial No. 342,255. (No model.)

*To all whom it may concern:*

Be it known that I, HOWARD M. DU BOIS, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Tires for Vehicle-Wheels, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of a tire for a vehicle-wheel having on its inner face a semi-cylindrical rib or tongue which enters a groove in an elastic cushion, which is interposed between the tire and fellyes of the wheel, said tire having also flanges on its sides, the same embracing said cushion, the tire being upset, by which provision the tire may be firmly and securely seated on the cushion.

Figure 1 represents a side elevation of a portion of a tire embodying my invention. Fig. 2 represents a section thereof on line *x x*, Fig. 1. Fig. 3 represents a perspective view, the parts being separated.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings, A designates a portion of a felly of a vehicle-wheel, to which is screwed or otherwise fastened the channeled plate B.

C designates an elastic cushion, which is interposed between the tire D of the wheel and said plate B, and having its inner peripheral portion located within the side walls or flanges of said plate. The outer periphery of the cushion C has a circumferential groove E, and the inner periphery of the tire is formed with a circumferential rib or tongue F, which enters said groove, and the tire is furthermore formed with side flanges G, which project inwardly and embrace the sides of the outer peripheral portion of the cushion D. The tongue is wide and deep, whereby the thickness of the tire is centrally preserved.

When the parts are primarily located in position, the tire, which is integral, is upset,

whereby its diameter is reduced, and it thus embraces the cushion and holds the latter upon the plate B. The tongue F, entering the groove E, serves to compress the central portion of the cushion to a certain but uninjurious extent, and as said tongue is of semi-cylindrical form its tendency is to distend the outer peripheral portion of the cushion in lateral direction, the same being, however, resisted by the flanges G and thus confined within the same, whereby the cushion is held firmly and true between the plate and tire, and the latter remains seated on said cushion in a secure and reliable manner, the general elasticity of the cushion being preserved.

The side flanges G are rounded and embrace the rounded and contiguous portions of the cushion C, and as the groove E is of semi-cylindrical form, or nearly so, to accord with the shape of the tongue F, there is no cutting action of the tire upon the cushion, it being noticed that angles on the inner periphery of the tire are avoided by the construction presented.

If desired, the plate B may be an integral portion of the felly, instead of a separate piece, as shown.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

A vehicle-wheel having a channeled plate, an elastic cushion therein, and a surrounding tire, the latter being provided with a semi-cylindrical tongue which enters a semi-cylindrical groove in said cushion, and flanges which embrace the sides of the same, said tire with its tongue and flanges being upset, the parts being combined substantially as described.

HOWARD M. DU BOIS.

Witnesses:

JOHN A. WIEDERSHEIM,  
WM. C. WIEDERSHEIM.

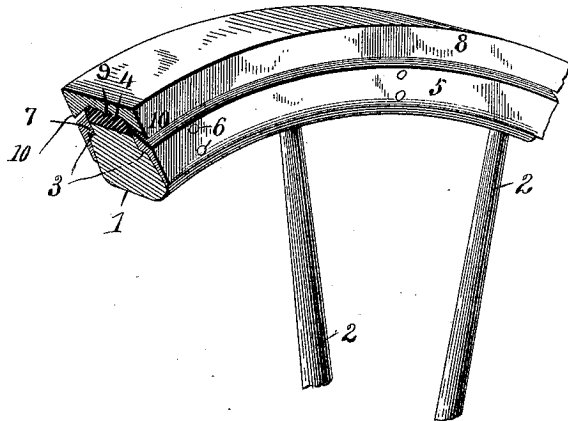
(No Model.)

E. WOOLSON.  
VEHICLE WHEEL.

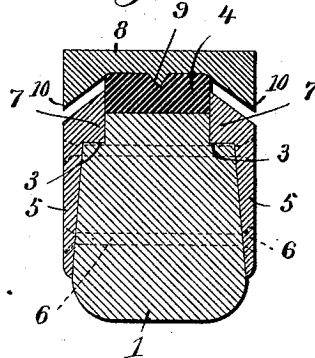
No. 446,910.

Patented Feb. 24, 1891.

*Fig. 1.*



*Fig. 2.*



WITNESSES:

*C. D. Smith*  
*Azley J. Munson*

INVENTOR

*Egbert Woolson*  
BY  
*A. M. Wooster*  
HIS ATTORNEY.

# UNITED STATES PATENT OFFICE.

EGBERT WOOLSON, OF BROOKLYN, NEW YORK, ASSIGNOR TO ALDEN SOLMANS, OF SOUTH NORWALK, CONNECTICUT.

## VEHICLE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 446,910, dated February 24, 1891.

Application filed January 2, 1891. Serial No. 376,500. (No model.)

*To all whom it may concern:*

Be it known that I, EGBERT WOOLSON, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Vehicle-Wheels; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the class of vehicle-wheels in which a cushion tire is interposed between an outer metallic tire and the felly, and has for its objects to provide a wheel of this class which shall be simple and economical in construction, in which the elasticity of the wheel shall be retained during the life thereof, which shall be thoroughly durable, and in which it shall be impossible, no matter how severe may be the usage, to compress the cushion tire outward laterally to any appreciable extent, the result being that the elastic and noiseless qualities of the wheel are made practically permanent instead of temporary. With these ends in view I have devised the simple and novel construction which I will now describe, referring by numerals to the accompanying drawings, forming part of this specification, in which—  
Figure 1 is a perspective of a section of a wheel embodying my novel invention, and Fig 2 is a cross-section of the felly, side pieces, cushion tire, and metallic tire.

In use my novel wheel is equally adapted for the purposes of heavy trucking or for light road-wagons. When used upon heavy wagons, it greatly increases the durability of the wheels, as it prevents the stretching of the tires and the crushing of the fellyes. The same result follows when the invention is applied to light road-wagons, in which latter use it is particularly valuable in that it causes the wagons to run noiselessly and ride easily.

1 denotes the felly, in which the spokes 2 are secured in any ordinary or preferred manner. At both edges of the felly on its outer periphery the wood is removed, leaving shoulders 3, the central portion of the felly, extending straight outward from said shoulders.

4 denotes the cushion tire, which is prefer-

ably a band of rubber rectangular in cross-section.

5 denotes metallic side pieces, which are secured on opposite sides of the felly by rivets 6, extending through the felly transversely. These side pieces are provided on their inner sides with projections 7, the inner faces of which rest against the central portion of the felly and the lower faces of which rest against shoulders 3. These projections extend outward beyond the periphery of the felly and part of the height of the cushion tire, supporting the latter on both sides and preventing it from expanding laterally. The tops of said projections—that is, their outer peripheries—incline from their inner faces downward and outward, as clearly shown in Fig. 2.

8 denotes the tire, the central portion of which rests against the cushion tire. One or more ribs 9, one only being shown in the drawings, are provided on the inner face of the tire, which engage the cushion tire and assist in holding the tire against lateral displacement. On the inner periphery of the tire at the edges are projections 10, said projections being widest on their outer faces and inclining upward and inward parallel, or substantially so, with the inclines upon the outer peripheries of the side pieces, leaving a space between said projections and side pieces. The inclines upon the tire terminate at about the edges of the cushion tire, so that the edges of the cushion tire lie in the angles formed by the intersection of the inner faces of projections 10 with the inner face of the central portion of the tire, as is clearly shown in Fig. 2. In practice the tire is shrunk into place, and is held firmly without the use of bolts passing through the felly. It will be seen that this special construction of parts holds both the tire and the cushion tire against lateral movement, thereby dispensing with the necessity for bolts, renders it practically impossible for the cushion tire to be compressed outward between the tire and the side pieces, and, furthermore, that the engagement of the projections on the side pieces with the shoulders on the felly insures that all the compressive strain upon the side pieces be taken up by the felly itself, so that there is no strain



upon rivets 6, and consequently no tendency to displace the side pieces in use. The fact that bolts through the tire and the felly are entirely dispensed with proves to be a very valuable feature in use and adds greatly to the life of the wheel.

Having thus described my invention, I claim—

1. A vehicle-wheel having a felly provided with shoulders on its outer periphery, side pieces having inward projections, the lower faces of which bear against the shoulders and the inner faces against the felly above the shoulders, the peripheries of said side pieces inclining from their inner faces downward and outward, a cushion tire resting upon the felly between said projections, and a tire resting upon the cushion tire and having on its inner periphery projections thickest at their outer edges, the inner faces of which incline

from the outer edges upward and inward, leaving spaces between the peripheries of the side pieces and the projections on the tire on opposite sides of the cushion tire.

2. A vehicle-wheel consisting of a felly having shoulders 3, side pieces having projections resting on said shoulders and inclines on their peripheries, a cushion tire resting on the felly between said projections, and a tire resting on the cushion tire and having a rib engaging said cushion tire, and projections on its inner periphery made thickest at their outer edges, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EGBERT WOOLSON.

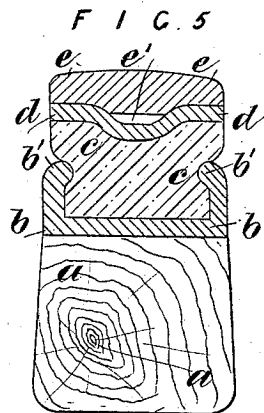
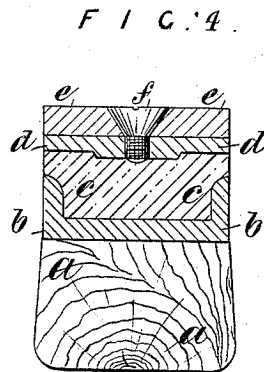
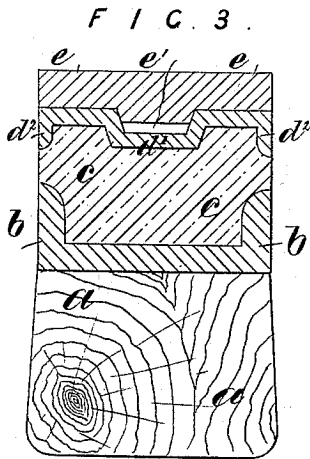
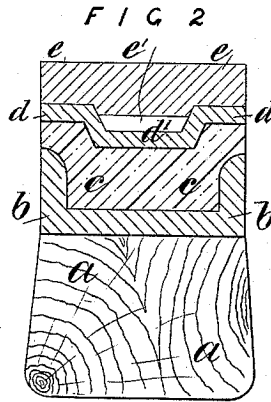
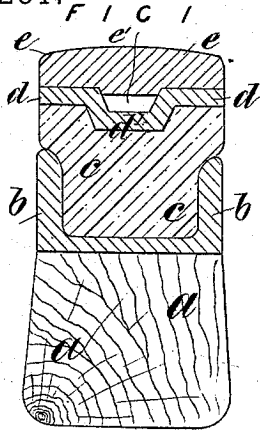
Witnesses:

JACOB M. LAYTON,  
HENRY W. BODWELL.

C. CHALLINER.  
TIRE FOR VEHICLE WHEELS.

No. 449,281.

Patented Mar. 31, 1891.



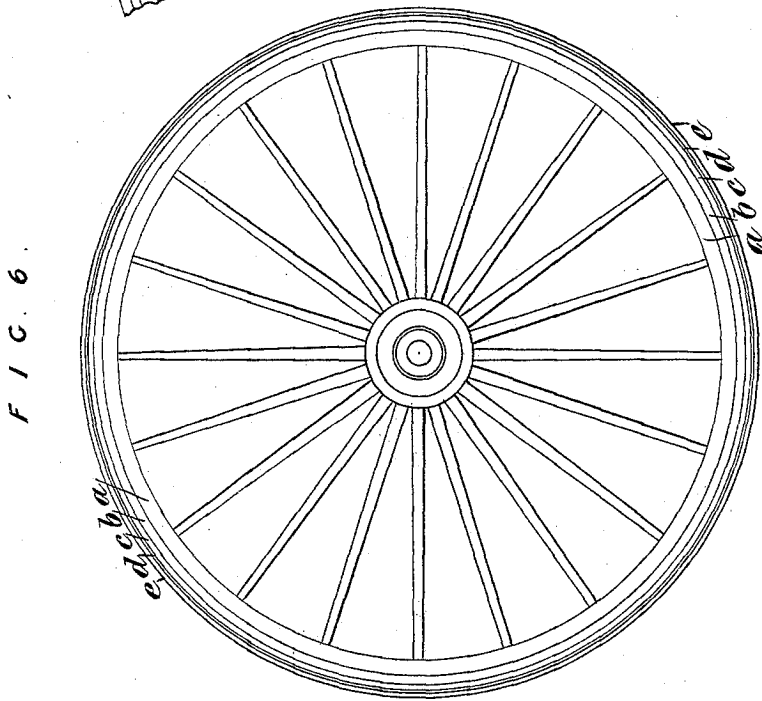
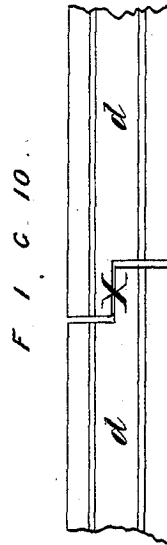
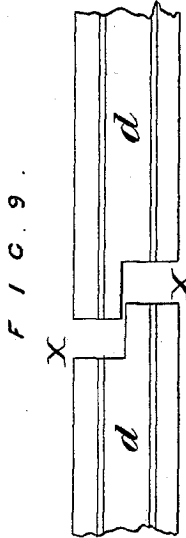
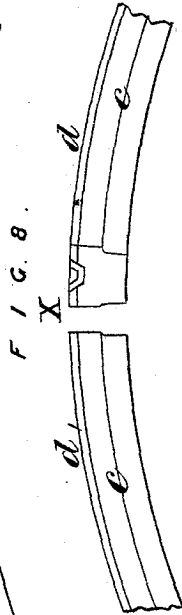
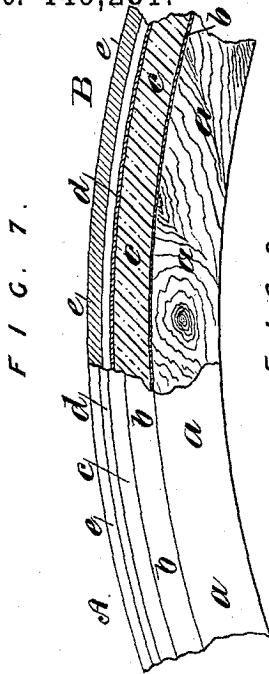
Witnesses  
*Les B. Sampson*  
*E. L. Richards*

INVENTOR  
*Charles Challiner*  
 By his atty. *Richardson*

C. CHALLINER.  
TIRE FOR VEHICLE WHEELS.

No. 449,281.

Patented Mar. 31, 1891.



Witnesses:  
*C. D. Smith*  
*Chas. Rhodes.*

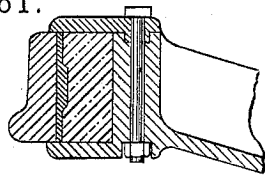
Inventor:-  
*Charles Challiner,*  
 by *Richards & Co.*  
 attys.

C. CHALLINER.  
TIRE FOR VEHICLE WHEELS.

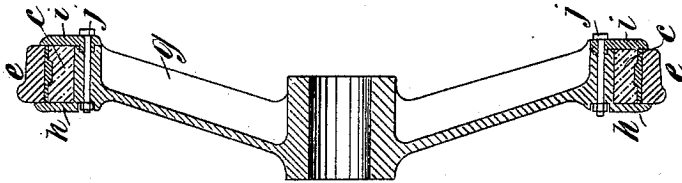
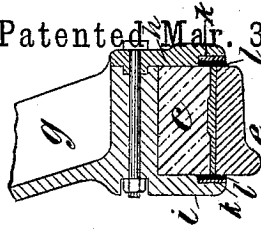
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Patented Mar. 31, 1891.

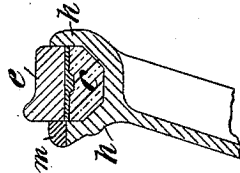
F I C. 13.  
F I C. 12.



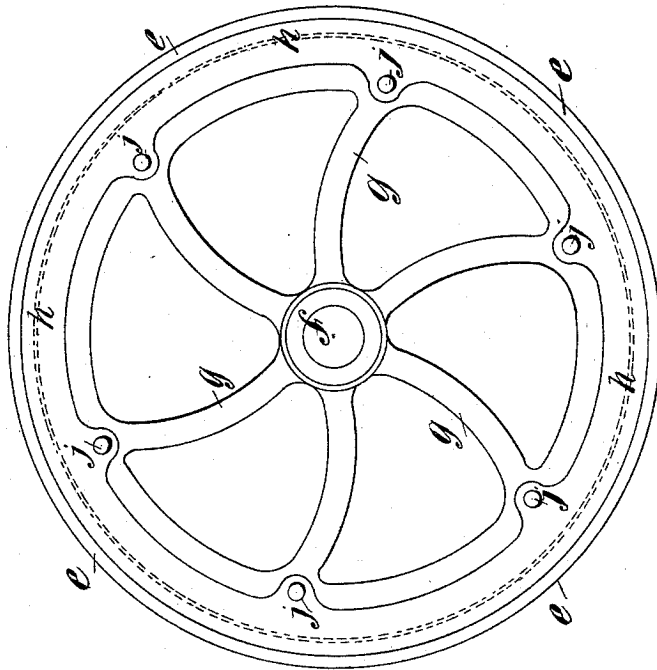
F I C. 14



F I C. 15.



F I C. 11



Witnesses  
C. H. Smith  
Chas. Rhodes.

Inventor :-  
Charles Challiner,  
by Richards & Co  
attys.

# UNITED STATES PATENT OFFICE.

CHARLES CHALLINER, OF LONGSIGHT, ENGLAND.

## TIRE FOR VEHICLE-WHEELS.

SPECIFICATION forming part of Letters Patent No. 449,281, dated March 31, 1891.

Application filed September 30, 1890. Serial No. 366,703. (No model.) Patented in England July 26, 1888, No. 10,819.

To all whom it may concern:

Be it known that I, CHARLES CHALLINER, a subject of the Queen of Great Britain and Ireland, residing at 15 Plymouth Avenue, Longsight, Manchester, Lancaster county, England, have invented certain new and useful Improvements in and Relating to the Tires of Carriages and other Vehicles, (for which I have obtained Letters Patent of Great Britain, No. 10,819, dated July 26, 1888;) and I hereby declare the following to be a full, clear, and exact description of the same.

My said invention relates to the tires of wheeled vehicles, and particularly to those in which rings of india-rubber or other suitable material are employed.

My invention has for its object to lessen the noise and vibration caused by the passing of the vehicle over the roadway, or over plates or rails where the vehicle is destined to run on such, and is at the same time intended to prevent the destruction of the india-rubber ring or tire. With this object I surround the india-rubber ring or tire with a metal facing, which protects it from wear, and to permit of the shrinking on of the said outer metal facing or tire I first surround the rubber ring with a metal hoop, to which the rubber is preferably vulcanized, although the said hoop and the rubber might also be united by cement or other means. The rubber ring thus united to the metal hoop is formed with an open half-checked or butt or other joint, or is split or formed in halves or in segments, so that it can be easily applied to the wheel, and when in position on the felly the whole is surrounded and held firmly in position by the outershrunk-on tire. The inner surfaces of the hoop and tire are formed so as to prevent displacement.

To render my invention more clear, I will now proceed to describe the same more particularly with reference to the annexed three sheets of drawings.

On Sheet 1 of the said drawings, Figures 1, 2, 3, 4, and 5 illustrate in cross-section the most obvious forms of my invention.

Sheet 2 contains a view of a complete wheel and detail views explanatory of the method of forming and applying the ring, hoop, and tire.

Sheet 3 illustrates a tramway-wheel made in accordance with my invention.

Referring in the first place to Sheet 1 of the drawings, Fig. 1 is a section of a wheel-rim with my improvement applied, and intended for use in such a vehicle, for example, as a hansom or other cab. The felly *a* is surrounded by a trough-shaped ring *b*, which is shrunk onto the felly or otherwise properly secured thereto. Within the trough-shaped ring *b* I place a rubber ring *c*, having a metal face or hoop *d*, the rubber being vulcanized to the hoop. The rubber *c* is recessed, as shown, and a projection *d'* on the inner circumference of the hoop fills the recess of the rubber. By this means the hoop *d* is more firmly secured to the rubber, and sidelong displacement or separation of the hoop and the rubber is prevented. When the hooped rubber has been applied to the rim in a manner which will be described with reference to Sheet 2, the outer tire *e* is placed round the whole and shrunk on in position, compressing the metal-faced rubber ring *c* firmly in the trough-ring *b*. The recess which appears in the back of the hoop *d* or metal face of the rubber ring is occupied by a rib or projection *e'*, formed on the inner circumference of the tire *e*, so that the tire *e* cannot move to one side or the other.

Fig. 2 shows a section similar to Fig. 1, but adapted for a heavier class of vehicle—such, for example, as a cart or heavy carriage. It will be observed that a less thickness of rubber is used.

In Fig. 3, which is designed for use in still heavier vehicles—such as lorries and the like—the hoop *d* is formed with side flanges or lips *d''*, which embrace this rubber ring *c* on each side in the same manner as the trough-shaped ring *b*. By this means greater stiffness is given to the elastic tire or rim, so as to qualify it to resist the heavy strains brought upon it. The construction is otherwise the same as in the foregoing figures.

In Fig. 4 the hoop *d* has no recess in its outer circumference, and the inner circumference of the outer tire *e* is also flat. To give the requisite or desirable attachment between the outer tire *e* and the hoop *d*, I secure

them together by means of screws or studs *f*, the heads of which occupy countersunk holes in the outer tire *e*, so as to be flush with the outer surface, while the screwed shanks enter 5 tapped holes in the thickest part of the hoop *d*.

Fig. 5 shows the rubber ring *c* forced into a trough-shaped ring *b*, having overhanging sides or retaining-ridges *b'*, which hold the 10 rubber *c* in the ring *b* independently of the retaining effect of the hoop and tire. The ring *b* may either be formed as shown in Fig. 5, or it may have dovetail or inclined sides, although I do not make any claim for such 15 dovetail or inclined sides in the ring *b* independently of or apart from my present invention. The depression in the hoop *d* may also be rolled in the curved form shown at Fig. 5. In all cases I prefer to further secure the 20 hooped rubber ring *c* in the ring *b* by means of cement.

In Sheet 2 of the drawings, Fig. 6 shows a complete wheel fitted with my improved tire.

Fig. 7 shows a portion of the felly and tire 25 to a larger scale, the part marked A being an outside view and the part marked B being in section. I have already observed that for convenience in applying the rubber the ring is or may be cut so as to form a butt or 30 checked joint.

In Fig. 8 I show a portion of the rubber ring *c* with the hoop *d* vulcanized thereto, the joint at *x* appearing open. This joint might 35 either be a flat butt-joint or I might half-check the ends to be joined, as shown at Fig. 9, which represents the rubber ring and hoop before being closed up by the binding action of the outer encircling tire *e*.

Fig. 10 shows the joint after having been 40 closed by the pressure of the said outer tire. When fitting wheels with my improved tire, I first vulcanize the hoop *d* to the outer circumference of the split rubber ring *c*, the hoop being split at the same point as the rubber. 45 Then having coated the interior of the trough-ring *b* with cement when *in situ* on the wheel-felly I insert the rubber ring, on the completion of which operation the joint of the hooped ring is open, as in Fig. 9. I 50 now heat the outer tire *e* till it has expanded sufficiently to embrace the hooped rubber ring, after which it is cooled and shrunk on in position, binding the whole of the parts together and closing the open joint of the hooped ring, 55 as shown in Fig. 10. The faces of the joint might also be coated with cement to secure cohesion and prevent opening. Instead of having the joint of the hooped ring half-checked, as shown in the drawings, I might make it a 60 plain butt-joint, as aforesaid, or a V-joint, or of any other suitable shape.

In Sheet 3 of the drawings, Fig. 11 shows a tramway-wheel in side elevation, and Fig. 12 65 the same in cross-section, Fig. 13 showing the rim in section to a larger scale. The boss *f*, arms *g*, and ring *h* are formed in one piece,

while the ring *i* is bolted on by means of the bolts *j*, thus forming a trough-shaped recess round the circumference, into which the 70 hooped rubber ring *c* is inserted, as aforesaid. The flanged tire *e* is thereafter shrunk on, as already described with reference to the other drawings, and the wheel is completed.

In order to soften sidelong thrusts and shocks—such, for example, as take place when 75 rounding a corner or when the car is switched from one track to another—I introduce elastic material between the flanged tire *e* and the sides of the recess into which it is shrunk, so as to prevent the unyielding contact be- 80 tween metal and metal. This modification is shown to an enlarged scale at Fig. 14 on Sheet 1. In this case I introduce rings *k* of rubber, leather, or other suitable yielding material between the sides of the tire *e* and the faces 85 of the rings *h* *i*, so that when the tire *e* is forced against one side or the other of the recess these rubber rings *k* act as buffers and soften the shock. Thin rings of metal *l* are introduced between the said side rings and 90 the rubber and tire, as shown; but these might be dispensed with.

The invention might be applied to the construction of railway-wheels.

Fig. 15 is a sectional view of the rim of a 95 tramway-wheel showing a mode of construction different from the methods hereinbefore set forth. I cast the rim or ring *h* with a recess to take the hooped rubber ring *c*. When the said hooped rubber ring has been inserted, 100 I shrink on the flanged tire *e*, and finally shrink the retaining-ring *m* upon the side of the rim *h*, thus boxing in the rubber and making all secure without the aid of bolts or screws. Side rings of rubber might be ap- 105 plied to this form of wheel, as shown at Fig. 14.

The details of manufacture, shape, and construction of the wheel may be varied so long 110 as the principle of my invention is adhered to, which consists in the use of a rubber tire applied to the felly of the wheel, in combination with an outer metal coating or ring or tire to protect the rubber from too rapid wear.

I claim as my invention— 115

1. In a vehicle-wheel, the combination of a grooved or trough-shaped rim, a compound tire consisting of a rubber ring *c* and an in- 120 closing metallic hoop *d*, and an outer metallic tire shrunk in place over the said hoop, substantially as set forth.

2. In a vehicle-wheel, the combination of a grooved or trough-shaped rim, a compound tire consisting of a divided rubber ring *c*, and an inclosing divided metallic hoop *d*, vulcan- 125 ized thereto, and an outer metallic tire shrunk in place over the said hoop, substantially as set forth.

3. In a vehicle-wheel, the combination of a grooved or trough-shaped rim, a compound 130 tire consisting of a rubber ring *c* and a metallic hoop *d*, having a recess *d'*, and an outer

metallic tire having a projection  $e'$ , and shrunk in place over said hoop, substantially as set forth.

4. The combination of a rim having a peripheral groove or recess, a rubber ring  $c$  therein, an outer metallic tire encircling said ring, and elastic cushions  $k$ , interposed between the sides of said metallic tire and the flanges or sides of the recessed rim, substantially as set forth.

5. The combination, with a rim having a

peripheral groove or recess, one side or flange of which is shrunk upon the main portion of the rim, of a rubber ring  $c$ , an inclosing metallic divided hoop  $d$ , and an outer tire shrunk upon said hoop, substantially as set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CHARLES CHALLINER.

Witnesses:

DAVID FULTON,

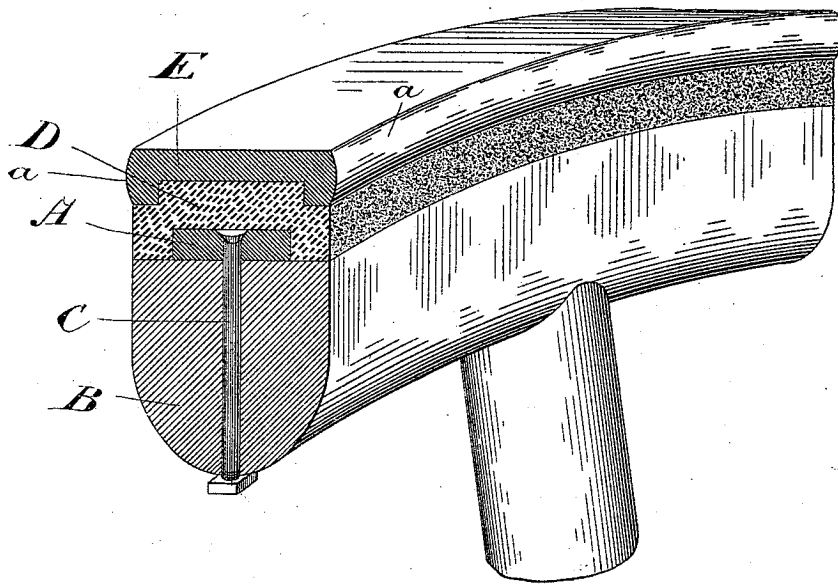
RICHARD IBBERSON.

(No Model.)

W. LANGMUIR.  
CUSHION TIRE.

No. 490,714.

Patented Jan. 31, 1893.



*Witnesses*

*A. C. Cameron,*  
*John. E. Cameron*

*Inventor*

*Woodburn Langmuir*  
*by Donald C. Ridout Esq.*  
*Attys.*



# UNITED STATES PATENT OFFICE.

WOODBURN LANGMUIR, OF TORONTO, CANADA.

## CUSHION-TIRE.

SPECIFICATION forming part of Letters Patent No. 490,714, dated January 31, 1893.

Application filed April 25, 1892. Serial No. 430,614. (No model.)

*To all whom it may concern:*

Be it known that I, WOODBURN LANGMUIR, of the city of Toronto, in the county of York, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Cushion-Tires, of which the following is a specification.

The object of the invention is to provide a cushion tire which is so perfectly held to the felly that the joint cannot be affected by dampness, and it consists, essentially, of a metal band bolted or riveted to the felly, a rubber band overlapping the metal band and an outer steel band shrunk onto the rubber band so as to compress its outer edge tightly against the felly; substantially as hereinafter more particularly explained.

The drawing represents a perspective sectional view, showing a portion of a felly provided with my improved cushion tire.

In the drawing, A, represents a metal band preferably made of iron and secured tightly to the felly B, by the bolts or rivets C. It will be observed that the metal band A, is narrower than the felly B, and that the heads of the bolts C, are counter-sunk so as to leave the outer surface of the band A, perfectly smooth.

D, is a rubber band made the exact width of the felly B, and having a recess in its center to receive the band A. The portion of the band D, which overlaps on each side of the band A, fits against the felly B, and the recess in the band D, is preferably made slightly deeper than the thickness of the band A, so that it will touch the felly before it comes in contact with the surface of the band A.

E, is an outer band preferably made of steel substantially the same width as the felly and having flanges *a*, to fit into grooves made in the top edge of each side of the rubber band D. This outer band is shrunk onto the band D, and compresses the outer edges of the said band tightly against the felly, the force of the shrinking being sufficient to form hermetically sealed joints between the felly B, and

the band D, and the flanges *a*, and band D. In this way all the parts forming the tire are not only rigidly held together, but the joints being hermetically sealed as it were, no moisture can find its way into the joints and in this way the tire is much more durable. Moreover, the band A being entirely inclosed by non-conducting substances it is not likely to expand by heat, as it is protected from the direct rays of the sun, and therefore the joints of the fellyes always remain tight.

What I claim as my invention is:—

1. As an improved tire, a metal band bolted, or otherwise secured to the felly, a rubber band overlapping the metal band and an outer metal band shrunk onto the rubber band so as to compress its outer edges tightly against the felly, substantially as and for the purpose specified.

2. As an improved tire, a metal band narrower than and rigidly secured to the felly, a rubber band substantially the same width as the felly and having an inner recess to fit over the metal band and an outer metal band shrunk upon the rubber band, substantially as and for the purpose specified.

3. As an improved tire, a metal band narrower than and rigidly secured to the felly, a rubber band substantially the same width as the felly and having an inner recess to fit over the metal band, the outer edges of the rubber band being grooved to receive the flanges formed upon the outer metal band which is shrunk upon the rubber band, substantially as and for the purpose specified.

4. As an improved tire, a metal band bolted or otherwise secured to the felly, a rubber band overlapping the metal band and touching the felly so as to inclose the same and an outer metal band surrounding the rubber band.

WOODBURN LANGMUIR.

In presence of—

CAMPBELL RIDOUT,  
DONALD C. RIDOUT.

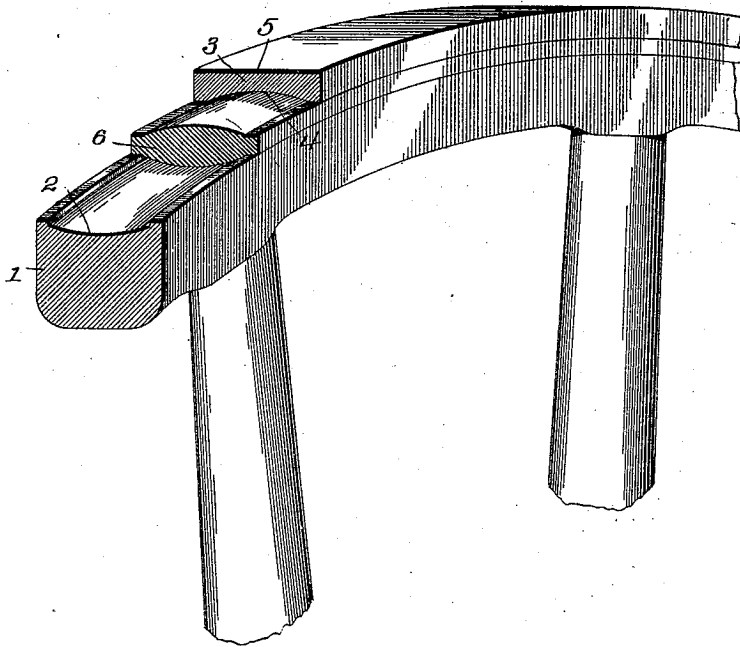
(No Model.)

E. A. THUSTON & G. E. GILL.  
WHEEL TIRE.

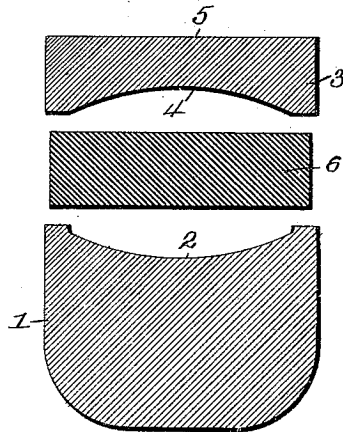
No. 553,698.

Patented Jan. 28, 1896.

*Fig. 1.*



*Fig. 2.*



WITNESSES  
*Jos. L. Stacke.*  
*Guy L. Hoynes.*

INVENTORS  
*E. A. Thuston,*  
*Gerge E. Gill,*  
*by Finckel & Finckel, Attorneys*

# UNITED STATES PATENT OFFICE.

ELI A. THUSTON AND GEORGE E. GILL, OF COLUMBUS, OHIO.

## WHEEL-TIRE.

SPECIFICATION forming part of Letters Patent No. 553,698, dated January 28, 1896.

Application filed May 17, 1895. Serial No. 549,662. (No model.)

*To all whom it may concern:*

Be it known that we, ELI A. THUSTON and GEORGE E. GILL, citizens of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Wheel-Tires; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates more particularly to elastic tires for vehicle-wheels which are intended to prevent the noise and jar incident to the use of the rigid and inflexible wheels at present in common use.

Several attempts have been made to provide a wheel having a cushioned metallic tire, but owing to their complexity and cost they do not appear to have been generally adopted.

The object of our invention is to provide a cushioned tire which shall be economically constructed and easily applied and which shall be durable and satisfactory in use.

In the accompanying drawings, Figure 1 illustrates a sectional perspective view of a fraction of a wheel having our cushioned tire. Fig. 2 illustrates a sectional view of the parts separated.

In practicing our invention we first groove or channel out the rim or felloes 1 of the wheel, the groove being rounded, as indicated at 2. We then form upon the inner side of the metal tire 3 a channel or groove 4 rounded like that upon the rim of the wheel, the outer surface of the metal tire being made straight in cross-section, as shown at 5. In putting on the elastic band 6 it is first fastened at a point on the rim and then stretched tightly around the groove, and in this stretching the

elastic material will sink into and fill the groove or concave, as shown in Fig. 1. The metal tire is then heated and shrunk onto the rubber band. In doing this the rubber is compressed by the concaved bottom of the tire, which is also filled, as shown in Fig. 1.

The compression of the rubber into both the rim and tire prevents the accidental removal from the wheel of either the elastic cushion or the tire.

Instead of shrinking on the tire in the usual way the rim may be expanded out to the tire by such a device as shown in the patent granted to Hays and Thuston, No. 522,162, dated June 26, 1894.

It will be seen that with our invention the only part which we employ in addition to what has heretofore been employed in the ordinary wheel is the elastic cushion, which, by means of our improvements, we are enabled to use without the aid of any additional parts.

What we claim, and desire to secure by Letters Patent, is—

A wheel having its rim made with a circumferential groove curved or rounded throughout its cross section, a flat elastic band in said groove, and a tire having a groove around its inner side curved or rounded throughout its cross section whereby when the tire is shrunk onto the elastic band the latter is compressed inward and outward toward and at its central line, substantially as shown and described.

In testimony whereof we affix our signatures in presence of two witnesses.

ELI A. THUSTON.  
GEORGE E. GILL.

Witnesses:

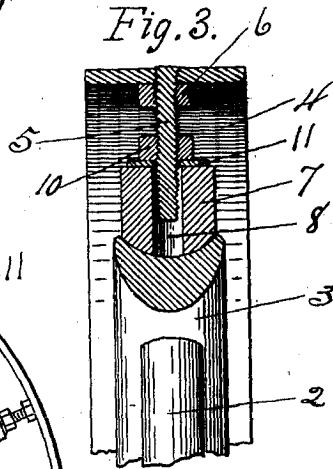
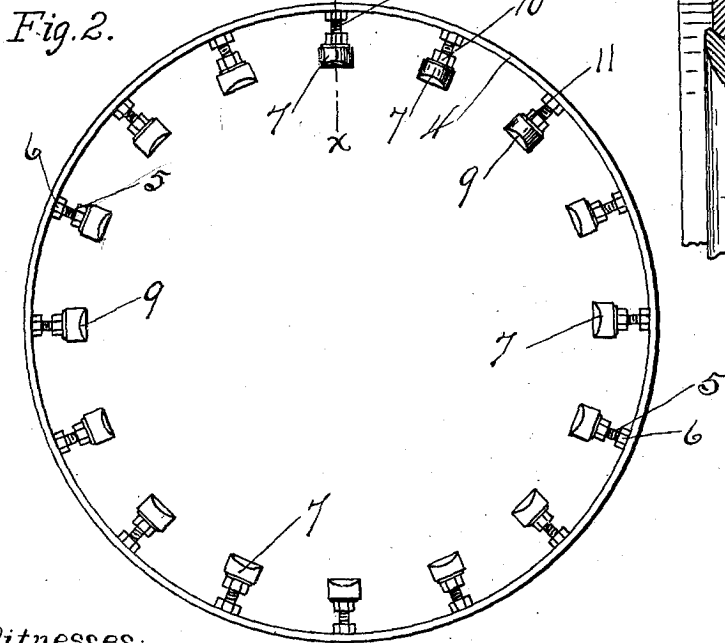
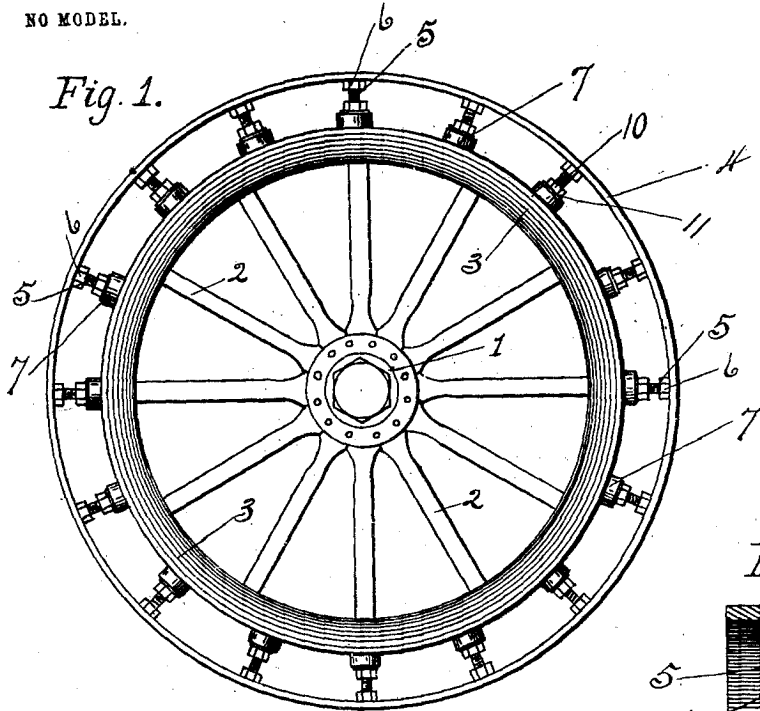
GEORGE M. FINCKEL,  
WM. B. JORDAN.

No. 732,199.

PATENTED JUNE 30, 1903.

S. C. LINES.  
VEHICLE WHEEL TIRE.  
APPLICATION FILED DEC. 28, 1902.

NO MODEL.



Witnesses:

David C. Walter  
Lowell Schreiber.

Inventor:

Samuel C. Lines,  
By *Arthur C. C. C.*  
His attorneys.

# UNITED STATES PATENT OFFICE.

SAMUEL C. LINES, OF CURTICE, OHIO.

## VEHICLE-WHEEL TIRE.

SPECIFICATION forming part of Letters Patent No. 732,199, dated June 30, 1903.

Application filed December 26, 1902. Serial No. 136,594. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL C. LINES, a citizen of the United States, residing at Curtice, in the county of Ottawa and State of Ohio, have invented certain new and useful Improvements in Vehicle-Wheel Tires; and I do hereby declare the following to be a full, clear, and exact description of my invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to a supplemental tire or tread for use on automobile and other vehicle wheels of that class in which a pneumatic tire or resilient tread portion is provided to absorb vibration; and it consists of a supplemental tire or tread carrying a plurality of rubber blocks adapted to find bearings in the ordinary concave periphery of such wheels.

The primary object of my invention is to provide a resilient tire of novel and improved construction that may be readily and easily applied to the ordinary vehicle-wheel of the class above described in cases of emergency, such as the puncturing or otherwise disabling of the pneumatic or rubber tire, without defacing or injuring the rim of such wheel in any way and that may be conveniently carried in the vehicle by tourists for immediate application in case of such disabling of the tire.

While the essential features of my invention are necessarily susceptible of modification, still the preferred embodiment thereof is illustrated in the accompanying drawings, in which—

Figure 1 is a view of a vehicle-wheel equipped with my improved tire. Fig. 2 is a view of the tire detached from the wheel; and Fig. 3 is a cross-sectional view of the supplemental tire and wheel-rim, taken on the dotted line *xx* in Fig. 2.

Like figures of reference mark the same parts in all the figures of the drawings.

Referring now to the drawings, 1 represents the hub; 2, the spokes, which may be either of wire or wood, and 3 the concave rim of an or-

dinary vehicle-wheel of the class above described.

4 represents a metal tire or tread of greater diameter than the rim 3, to the inner periphery of which I rivet or otherwise rigidly secure within suitable apertures provided therein the inwardly-projecting bolts 5, the same being reinforced and prevented from any outward or longitudinal movement in said tire by means of the nuts 6, which are turned tightly against the inner periphery of the tire.

7 represents blocks of rubber or other yielding substance adapted to rest in the concave periphery of the rim 3 of the wheel and to receive the projecting ends of the bolts 5. These blocks 7 are provided with a central channel or bore 8, within which the ends of the bolts 5 loosely rest, and they have their lower or inner surfaces convexed, as shown at 9, to conform to the concave periphery of the rim 3. In order to support the tire 4 and hold the same in proper relation to the rim 3 of the wheel and also to retain the blocks 7 within the periphery of the rim, I provide the adjustable bearing-nuts 10 and washers 11, which bear against the outer portions of the blocks 7. Normally the blocks 7 maintain the tire and rim in proper relation; but when the tire is depressed or displaced inwardly in riding said blocks permit it to yield and absorb vibration in the same manner as the ordinary pneumatic tire.

When the tire is properly secured to the rim of a wheel, the ends of the bolts 5 are supported a sufficient distance above the rim 3 of the wheel by means of the blocks 7, as shown in Fig. 3, to permit them to vibrate and have a longitudinal play in said blocks when riding without striking and injuring the rim.

In placing my tire on or removing the same from a wheel it will only be necessary to loosen the bearing-nuts 10 on one-half of the tire sufficiently to permit of the blocks 7 on that half being forced over the edge of the rim 3, the said nuts being then properly tightened and adjusted to retain the tire 4 on and in proper relation to the rim 3 of the wheel.

It is apparent that if desired my improved tire may entirely take the place of the pneumatic tire now in use, and thus obviate the

necessity of continually repairing punctures and placing new tires on the wheels, such being the case with tires used on heavy vehicles, especially in country travel, or it may be used  
 5 simply as an emergency-tire to be placed on the wheel after the removal of the disabled tire.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

10 1. A supplemental tire or tread carrying a plurality of blocks of a yielding substance, said blocks adapted to find bearings in the ordinary concave periphery of a vehicle-wheel.

15 2. The combination, with a vehicle-wheel carrying a rim having a concave periphery, of a supplemental tire or tread carrying a plurality of rubber blocks adapted to find bearings in the concave periphery of said rim.

20 3. The combination, with a vehicle-wheel provided with a concave periphery, of a supplemental tire, a plurality of supporting members secured to the inner periphery of said tire, a rubber block carried by each of said

supporting members and adapted to find bearing in the concave periphery of said wheel, 25 and means provided for adjusting said blocks with relation to said wheel.

4. The combination, with a vehicle-wheel provided with a concave periphery, of a supplemental tire or tread, a plurality of inwardly-projecting bolts secured to the inner 30 periphery of said tire or tread, a block of yielding substance carried by each of said bolts and adapted to rest in the concave periphery of said wheel and so shaped as to conform to the contour thereof, and nuts threaded on said bolts and adapted to bear against 35 said blocks and retain the said tire in proper adjustment to said wheel.

In testimony whereof I have subscribed my name to this specification in the presence of 40 two witnesses.

SAMUEL C. LINES.

Witnesses:

WILBER A. OWEN,  
 EMIL J. VOGELSONG.

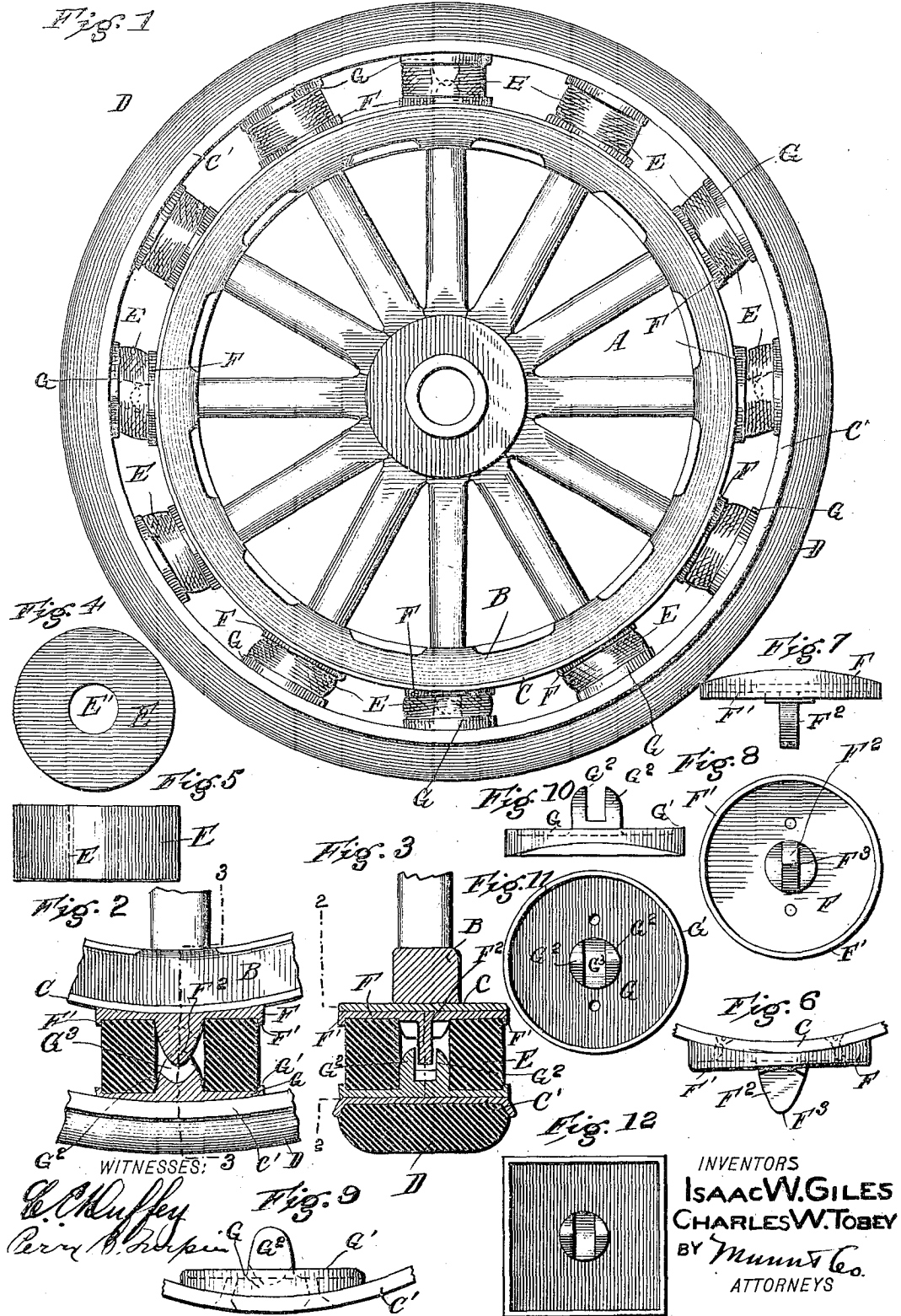
No. 825,821.

PATENTED JULY 10, 1906.

I. W. GILES & C. W. TOBEY.

WHEEL.

APPLICATION FILED DEC. 5, 1905.



G. Chaffey  
 Perry B. Drapier

INVENTORS  
**ISAAC W. GILES**  
**CHARLES W. TOBEY**  
 BY *Munn & Co.*  
 ATTORNEYS

# UNITED STATES PATENT OFFICE.

ISAAC W. GILES, OF NEW BEDFORD, AND CHARLES W. TOBEY, OF  
FAIRHAVEN, MASSACHUSETTS.

## WHEEL.

No. 825,821.

Specification of Letters Patent.

Patented July 10, 1906.

Application filed December 5, 1905. Serial No. 290,418.

*To all whom it may concern:*

Be it known that we, ISAAC W. GILES, a resident of New Bedford, and CHARLES W. TOBEY, a resident of Fairhaven, in the county of Bristol and State of Massachusetts, citizens of the United States, have made certain new and useful Improvements in Wheels, of which the following is a specification.

This invention is an improvement in wheels, and especially in wheels designed for use on automobiles and the like wherein a cushioning and a strong traction effect is desired; and the invention consists in certain novel constructions and combinations of parts, as will be hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of a wheel embodying the invention. Fig. 2 is a sectional view on about line 2 2 of Fig. 3. Fig. 3 is a section on about line 3 3 of Fig. 2. Fig. 4 is an end view, and Fig. 5 a side view, of one of the cushion-blocks. Fig. 6 is a side view of one of the block-holders. Fig. 7 is an end view of the same block-holder. Fig. 8 is a face view of the cushion-holder shown in Fig. 7. Figs. 9 and 10 are side and edge views of the socket-holder for application to the tire. Fig. 11 is a face view of said cushion-holder, and Fig. 12 is a view of a rectangular cushion-block holder.

By the invention we provide a wheel comprising a body portion A, having its rim composed of the felly B and the plate C, the tire spaced away from the rim of the body A and comprising the tire-plate C' and the rubber rim D, the cushion-blocks E between the wheel and the rim, and the holders F and G for the said cushion-blocks.

The cushion-blocks E are preferably of rubber and may be of any desired shape; but it is preferred to make them cylindrical in cross-section, as shown in Fig. 4, with their ends square or flat, as shown in Fig. 5, whereby to keep the blocks in place and prevent any tendency to roll in line with the traction, and also to form the said blocks with central openings E' to receive the devices, by which to brace the blocks against lateral displacement as well as against movement in the direction of the circumference of the wheel when the blocks are compressed.

In securing the blocks in place we prefer to employ the inner and outer holders F and G, secured, respectively, to the outer side of the

rim of the wheel proper and the inner side of the rim in radial alinement and provided at their upper edges with slightly-projecting beads F' and G' overlapping the ends of the blocks and operating to keep out dirt and the like.

The guide devices within the cushion-blocks E comprise lugs F<sup>2</sup>, projecting from one of the block-holders and lugs G<sup>2</sup>, arranged in pairs on the opposite block-holders and between which the lugs F<sup>2</sup> project, the outer ends of the lugs F<sup>2</sup> being rounded at F<sup>3</sup> and the recess or depression at G<sup>3</sup> being formed between the lugs G<sup>2</sup> at the base of the latter to receive the rounded point of the lug F<sup>2</sup> when the cushion-block is compressed to its greatest extent, as shown at the bottom in Fig. 1, in order to prevent any circumferential displacement of the body of the wheel within the rim, the overlapping of the lugs F<sup>2</sup> and G<sup>2</sup> preventing any lateral displacement in the use of the invention, as will be readily understood.

The cushion-blocks may be round, square, or oval in shape, Fig. 12 illustrating a rectangular form of holder for the same.

In assembling the parts of the wheel it will be understood the blocks E are placed in position under pressure and operate to center the wheel-body within the rim, and while normally under a certain degree of compression will yield in passing over uneven surfaces, stones, and other obstacles found on the ordinary highway.

It will be noticed from the drawings that in practice we provide a wide metal plate C upon the felly of the wheel-body and secure the inner block-holders thereon, the outer block-holders being secured to a broad metal tire-plate and the opposite holders for the block being provided with overlapping projections, which act as braces to prevent too much lateral movement in the use of the invention, also that the engagement of the projections of the inner and outer block-holders with each other under the extreme compression of the cushion-block prevent displacement in line with the traction.

In securing the block-holders in place screws or other suitable fasteners may be employed, screws being indicated in dotted lines in Fig. 6.

The wheel as a whole may be found in practice to possess all the elasticity of a pneu-



matic tire without many of the troubles incident to such form of tire, the improved wheel being puncture-proof and so constructed that dirt, grit, and mud cannot enter or  
5 obstruct the working devices.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The improvement in wheels herein described comprising the main wheel-body having a felly and a broad metal tire-plate thereon, the rim having a broad metal plate, the inner and outer cushion-block holders secured respectively to the inner and outer  
15 rims and having at their outer edges projecting beads to overlap cushion-blocks and also provided with the projecting lugs, the lugs on one of the holders of each pair extending on opposite sides of the lugs on their coöperating holders whereby to prevent lateral  
20 displacement and said holders being recessed between their pairs of lugs to receive the points of the opposing lugs, and the cushion-blocks having the flat ends and provided  
25 with the central openings and fitting within their holders with the lugs thereof projecting into the central openings of the cushion-blocks, substantially as set forth.

2. The combination in a wheel with the wheel-body and the rim spaced apart therefrom, of cushion-blocks between the body and rim, and holders receiving said blocks and secured respectively to the wheel-body and to the rim and provided with projecting overlapping lugs operating within the cushion-blocks and adapted to prevent lateral displacement substantially as set forth.

3. The combination of the wheel-body, the rim, the cushion-block between the body and rim and having a central opening, and holders for said block secured to the wheel body and rim and provided with overlapping lugs operating within the central opening of the cushion-block, the said lugs being arranged with a single lug on one holder and with a pair of lugs on the opposite holder lapping on opposite sides of the first lug and the second holder being provided between the lugs of its pair with a recess receiving the point of the single lug all substantially as and for the purposes set forth.

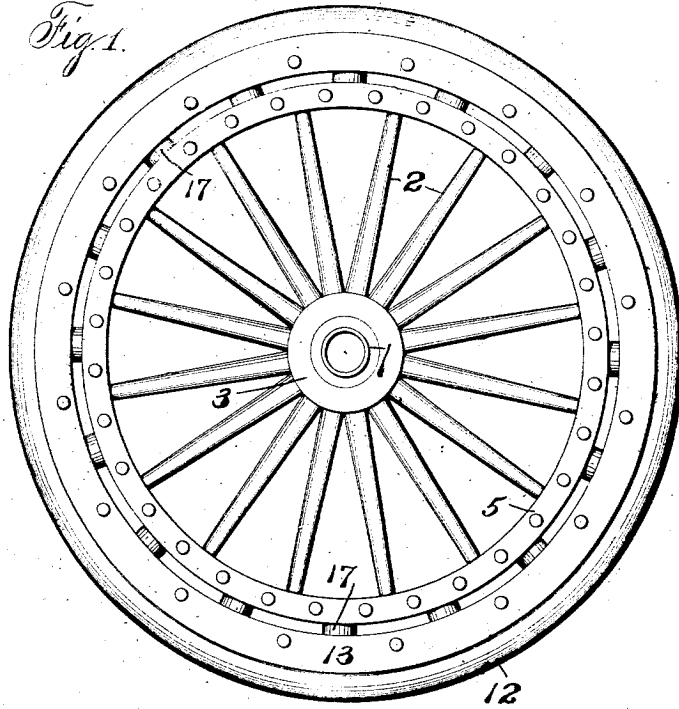
ISAAC W. GILES.  
CHARLES W. TOBEY.

Witnesses:

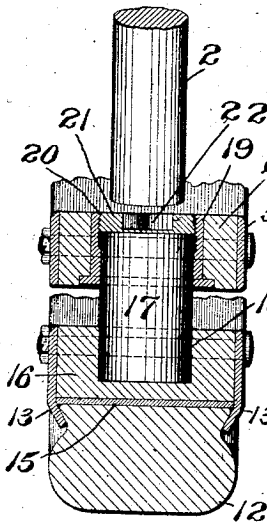
ROBERT BETAGH,  
FRANK L. DAVIS.

H. BELL.  
VEHICLE WHEEL.  
APPLICATION FILED MAY 4, 1906.

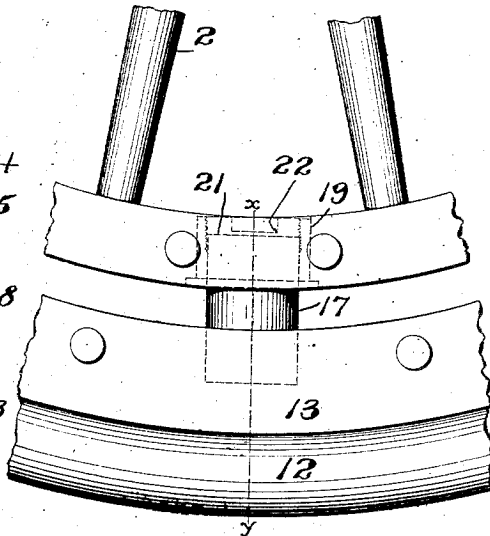
*Fig. 1.*



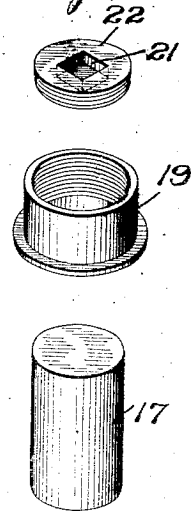
*Fig. 3.*



*Fig. 2.*



*Fig. 4.*



Witnesses:  
*A. White*  
*G. Galiani*

Inventor,  
*Harry Bell*  
By his Attys  
*Phillips, Sawyer, Rice & Kennedy*

# UNITED STATES PATENT OFFICE.

HARRY BELL, OF STAMFORD, CONNECTICUT.

## VEHICLE-WHEEL.

No. 833,115.

Specification of Letters Patent.

Patented Oct. 9, 1906.

Application filed May 4, 1906. Serial No. 315,124.

*To all whom it may concern:*

Be it known that I, HARRY BELL, a citizen of the United States, residing at Stamford, county of Fairfield, and State of Connecticut, have invented certain new and useful Improvements in Vehicle - Wheels, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The great demand for resilient vehicle-wheels is at the present time almost universally filled by providing the wheels with the well-known pneumatic tires. These tires, while giving excellent results, are objectionable, as is well known, not only on account of the great initial cost, but on account of lack of durability, because of liability to puncture and for other reasons.

The present invention has for its object to produce a comparatively inexpensive, simple, and effective wheel of the resilient type in which an outer rim is employed in connection with the felly, the rim being held in position with respect to the felly by elastic couplings introduced between it and the felly, the construction being such that the rim is effectively maintained in position against the strains incident to running, excessive movement in any direction being prevented and provision being made for readily placing the couplings in position and for removing them when made necessary by wear or for other reasons.

With this and other objects in view the invention consists in certain constructions and in certain parts, improvements, and combinations, as will be hereinafter fully described and then specifically pointed out.

In the accompanying drawings, Figure 1 is a side elevation of a wheel embodying the improved construction. Fig. 2 is a detail view, on a large scale, illustrating more particularly the construction shown in Fig. 1. Fig. 3 is a sectional view on the line  $xy$  of Fig. 2. Fig. 4 is an isometric perspective view of one of the couplings and its securing device removed from the wheel.

The wheel which has been selected to illustrate the invention is as to its general characteristics of the well-known artillery type.

The hub of the wheel is indicated at 1, the spokes at 2, and the usual spoke-holding plates at 3. The felly employed (indicated at 4) may as to its general characteristics be

of any desired construction. In the best constructions, however, the felly will be held in position on the spokes by suitable retaining devices, such as circumferential rings 5, these rings being secured in place in any suitable manner—as, for instance, by bolts. The rim (indicated at 16) may be of any suitable construction and may, if desired, be provided with a solid or cushion tire, (indicated at 12,) this tire being held in position by clencher-rings 13. A metal tire (indicated at 15) may, if desired, be employed between the rim and the outer tire for the purpose of additional strength.

The outer rim and the felly will be secured together by elastic couplings. While these couplings may be of any desired form and may vary in their construction, in the best constructions and as illustrated they will consist of resilient plugs 17, the construction being such as to permit the insertion and removal of these couplings through one of the coupled parts. In order to hold these couplings in position, the rim may be provided with a series of sockets 18, into which the couplings fit. The felly may be provided with opposing sockets, which in the particular construction illustrated are shown as extending through the felly. These sockets may be formed by boring or otherwise forming holes through the rim and inserting these holes flanged bushings 19, the lower ends of which are threaded, as shown at 20. Removable bottoms consisting of threaded stoppers 21 may be screwed into the threaded portions of the couplings, these stoppers being provided with squared sockets 22, into which the end of a wrench or other tool may be inserted.

In constructing the wheel care should be taken to so proportion the parts as to bring the outer circumference of the felly so closely to the inner circumference of the rim as to prevent the rim from yielding under sidewise strain sufficiently to pull the couplings out of their sockets. Care should also be taken not to make the couplings too resilient. A rubber composition of suitable grade is well adapted as the material for the couplings.

The construction is exceedingly simple and effective for the purpose for which it is designed. The couplings can be readily inserted, so that the wheel can be quickly as-

sembled, and when the removable bottoms are in place the couplings are very strongly and firmly held. At the same time should any coupling become damaged it can be readily removed and replaced.

Changes and variations may be made in the construction by which the invention is carried into effect. The invention is not, therefore, to be limited to the precise construction shown and described.

What is claimed is—

1. In a vehicle-wheel, the combination with a felly, of a rim independent of the felly, a series of separate flexible couplings serving to hold the rim and felly together to permit the rim to have limited movements with respect to the felly, and means for permitting the removal of the couplings through one of the coupled parts.

2. In a vehicle-wheel, the combination with a felly, of a rim independent of the felly, a series of opposed sockets in the rim and the felly, said sockets extending through one of the parts, removable means for closing the sockets, and a series of flexible couplings located in the sockets and serving to hold the rim and felly together to permit the rim to have a limited movement with respect to the felly.

3. In a vehicle-wheel, the combination with a felly, of a rim independent of the felly, a series of separate substantially solid flexible couplings serving to hold the rim and the felly together and permitting the rim to have a limited movement with respect to the felly,

and means for withdrawing said flexible couplings through one of the coupled parts.

4. In a vehicle-wheel, the combination with a felly, of a rim independent of the felly, a series of opposed sockets in the rim and felly, the sockets extending through one of the parts, a series of substantially solid flexible couplings located in the sockets, said couplings serving to hold the rim and felly together and permitting the rim to have a limited movement with respect to the felly, and means for closing the sockets.

5. In a vehicle-wheel, the combination with a felly, of a rim independent of the felly, a series of sockets in the rim, a corresponding series of opposed sockets in the felly, said sockets extending through the felly, removable bottoms for the sockets, and a series of flexible couplings located in the sockets and serving to hold the rim and felly together.

6. In a vehicle-wheel, the combination with a felly, of a rim independent of the felly, a series of sockets in the rim, a corresponding series of opposed sockets in the felly, said sockets extending through the felly, removable bottoms for these sockets, a series of substantially solid elastic plugs fitting in the sockets.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HARRY BELL.

Witnesses:

A. WHITE,  
G. GALLANI.

TITUTED FOR MISSING COPY.

152. RESILIENT TIRES AND WHEELS.

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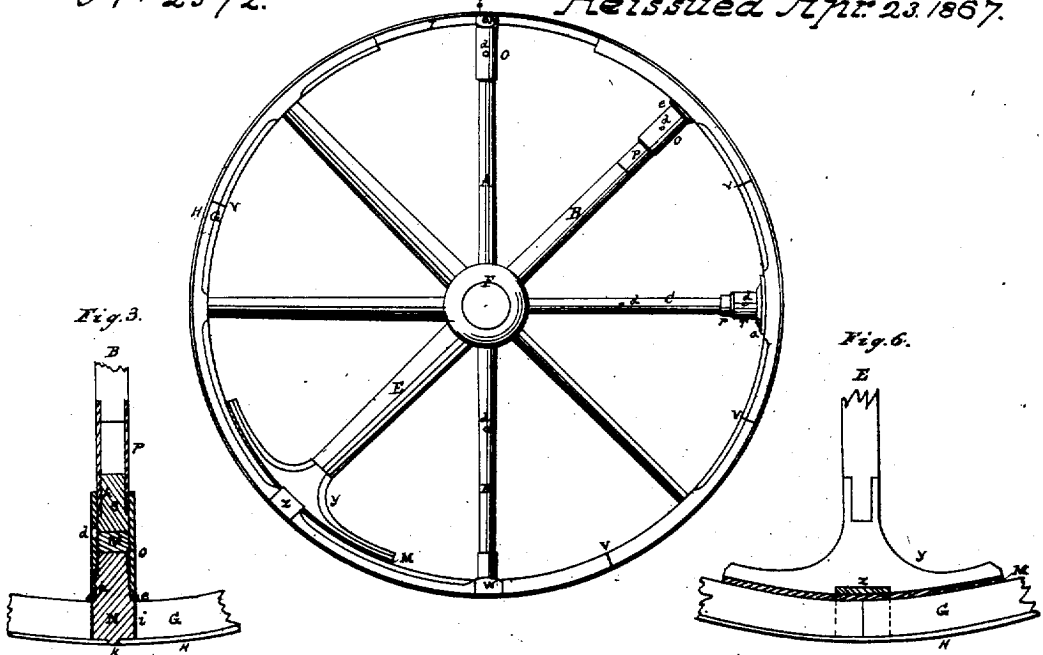
42

*J. Raddin.  
Wheel.*

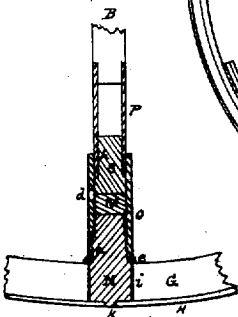
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*Fig. 1.*

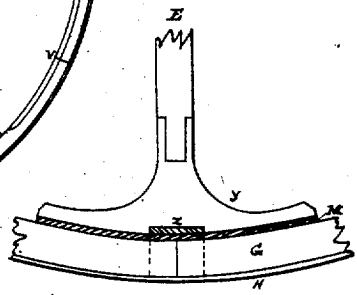
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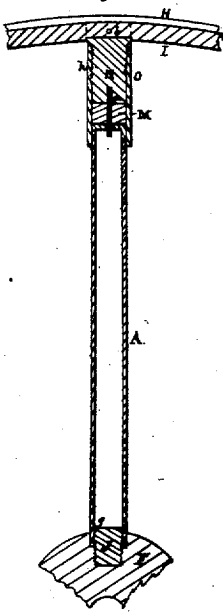
*Fig. 3.*



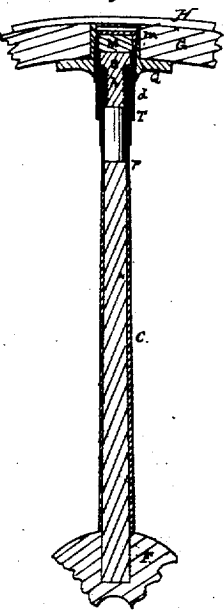
*Fig. 6.*



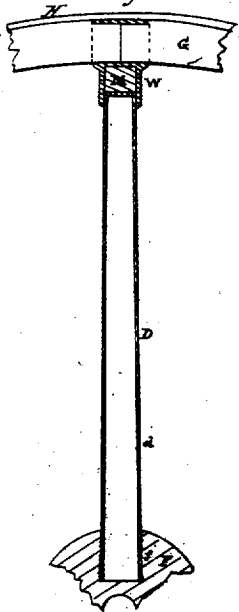
*Fig. 2.*



*Fig. 4.*



*Fig. 5.*



*Witnesses.*

*N. Jones  
Samuel Green*

*Inventor.*

*John Raddin*

## United States Patent Office.

JOHN RADDIN, OF LYNN, AND GEORGE W. CHIPMAN, OF BOSTON, MASSACHUSETTS, ASSIGNEES OF JOHN RADDIN.

*Letters Patent No. 48,207, dated June 13, 1865; reissue No. 2,572, dated April 23, 1867.*

## IMPROVEMENT IN CARRIAGE-WHEEL.

The Schedule referred to in these Letters Patent and making part of the same.

## TO ALL WHOM IT MAY CONCERN:

Be it known that JOHN RADDIN, of Lynn, in the county of Essex, and State of Massachusetts, has invented a new and useful improvement in Carriage-Wheels, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description, sufficient to enable those skilled in the art to practise the invention.

The invention relates to the construction of carriage-wheels with reference to rendering the same elastic for the purpose of relieving the carriage body from the percussive effects consequent upon driving over stones, rough pavements, &c.

Previous to this invention various attempts have been made to accomplish this object, all of which have proved more or less objectionable or impracticable. In one of such constructions a sheet or strip of rubber is interposed between the felloes and the tire. But this proved unreliable, because the felloes became loosened, and because the rubber became more or less soft or decomposed, and was pressed out at the sides of the wheel, making the wheel unsightly. In another construction a false or sub-tire was first applied around the felloes, with a strip or band of rubber interposed between this and the tire proper. But although this sub-tire remedies the liability of the felloes to loosen, the rubber has the same tendency to become soft and to be pressed out laterally. Other constructions have, to a greater or less extent, these same defects, to which, however, it is not necessary herein to refer.

To so apply the rubber to the wheel as to obtain advantage of its elasticity without involving these objectionable features is the primary object of this invention. To effect this, the rubber, instead of being extended under the whole surface of the tire in the form of a band or strip, is applied directly to each spoke in the form of a block, cylinder, or cushion, each preferably enclosed in a metal box, in which, while provision is made for lateral expansion of the rubber by the pressure or strain exerted between the hub and tire, it is not exposed to sight, or to the heating action of the tire, or to contact of extraneous substances, and is so applied that all pressure exerted in the line of the spokes is received directly upon these rubber or elastic cushions. It is in this construction; arrangement, or method of applying the rubber cushions directly to, or in connection with, the spokes, when these are provided with means for radial extension or retraction, such, for example, as the screw-threads seen in the drawings, and by which adjustment of the spokes relative to the rubber may be had, that the invention consists, and also in some details of construction of parts of the elastic wheel, which will be hereinafter set forth.

The drawings represent a wheel and parts of a wheel embodying the invention—

Figure 1 showing a side elevation of a wheel, the several spokes of which represent modifications of the invention.

Figures 2, 3, 4, 5, and 6 are enlarged longitudinal central sections through the different spokes, showing their internal construction, and the manner in which they are connected with the other parts of a wheel.

F denotes the hub of the wheel, which may be either of wood or metal; G a wooden felloe; and H the tire, all constructed like those in general use. I shows, in section, a metallic felloe, which, if desirable, may be used instead of wood. The spokes marked A, B, C, and D represent modifications of this invention as applied to a common carriage-wheel. In fig. 2 the spoke A is made of a hollow metallic cylinder, the hub end of which is provided with an internal screw, *g*, which receives the screw J, previously driven fast into the wooden hub F. The outer end of this cylinder is plugged or covered. N is a square-headed screw, the head of which is slotted so as to clasp the iron felloe I, to which it is confined by means of a pin or screw, *b*. O is a metallic cylinder or thimble, the bore of which is just large enough to receive the end of the spoke A and the screw N. One end of this thimble O is provided with an internal screw, *h*, which fits the external screw cut on N, as seen in fig. 2. *s* is a small pin, fast in the end of screw N, and passing freely through a hole in the centre of the end of the cylinder A, to form a guide for the spring or cushion M, made of rubber or other suitable elastic material, and enclosed within the thimble O between the ends of the screw N and cylinder A. This elastic cushion or packing is intended to relieve the jar and rattle of the wheel in passing over hard obstructions. In order to tighten the tire it is only necessary to turn the spoke A by any suitable instrument, and so as to move it outwardly in a radial direction, thus avoiding the necessity and expense of "resetting." In fig. 3 is represented a wooden

spoke, provided with a metallic thimble, P, into the outer end of which is screwed the round-headed plug S. N is a screw, fast in a hole through the felloe, the outer end of which screw is provided with a small square head, k, which passes through a corresponding hole in the tire, and keeps the screw from turning. i is a packing of gutta percha, which may be used, if desirable, around the said screw to hold it firmly in the hole in the felloe. e is a washer around the screw N, next to the felloe. O is a thimble, similar to O in fig. 2, and attached to the screw N in a similar manner. M is the elastic cushion, similar to that described in fig. 2. d is a hole in the side of the thimble O, by means of which, and a proper instrument inserted therein, it may be turned towards or from the felloe. By turning the screw-plug S the spoke B may be elongated, and the tightening of the tire accomplished, as in fig. 2. In fig. 4 is represented another modification of the invention, in which C is a common wooden spoke, having its felloe end provided with a fixed metallic thimble, P, in the outer end of which is cut an internal screw, h, to receive the screw s, which latter is furnished with a square head, so as to be readily turned by a suitable wrench against the elastic cushion M. Q is a flanged socket, the outer cylindrical portion of which passes through the felloe G, while the flanged portion rests against the inner edge of the same, as clearly shown in the drawing, fig. 4. In the cylindrical part of this socket Q are screw-threads m to receive the threads cut on the end of the thimble T, the latter being provided with a side hole, d, similar to the hole d in fig. 3, and for a similar purpose. Fig. 5 represents a hollow cylindrical or slightly conical metallic spoke D, provided with an external screw, f, which enters an internal screw in a metallic hub, F. The felloe end of this spoke D is closed, and enters the cylindrical part of the socket W, the outer portion of which is provided with a thimble so shaped as to receive the contiguous ends of two sections of the felloe G. M is the elastic cushion, similar to that applied to the ends of the other spokes already described, and for a similar purpose. d is a hole in the side of the spoke, by means of which, and a suitable instrument, the spoke may be screwed outward from the hub for the purpose of tightening the tire. In fig. 6 is represented a modification of the application of the elastic cushion, adapted more particularly for very heavy wagons, carriages, or cars, in which the outer end of the spoke E is provided with an expanded head, Y, of wood or metal, between which and the felloe a long strip of elastic packing, M, is placed, Z being a metallic clamp, the bottom of which is fast to the said head, and the sides of which extend each side of the felloe, (as shown in fig. 1,) whereby the latter is held in place. Other modifications will be obvious without further description, all containing the essence of the invention in having the rubber cushions combined directly with and so as to act in connection with the spokes.

It will be observed as a peculiar characteristic of my construction that the rim is so connected with the spokes and hub of the wheel as to be capable of radial movement in the line of each spoke, and that this movement is always against the yielding surface of the elastic cushion. Between the adjacent ends of adjacent felloes rubber cushions, v, may be interposed for the purpose of permitting the wheel or felloes to be slightly contracted or expanded in diameter without leaving spaces or open joints between the adjacent felloes.

What is claimed is—

A wheel, having combined directly with the spokes thereof elastic cushions or blocks of rubber so applied to or in the line of the spokes as to receive the strain exerted between the axle and the tire of the wheel, and having also means for relative adjustment of the spokes and cushions.

Also, the specific constructions described and shown in the several spokes represented in fig. 1 and in figs. 2, 3, 4, 5, and 6.

JOHN RADDIN,  
GEO. W. CHIPMAN.

Witnesses:

FRANCIS GOULD,  
W. B. GLEASON.