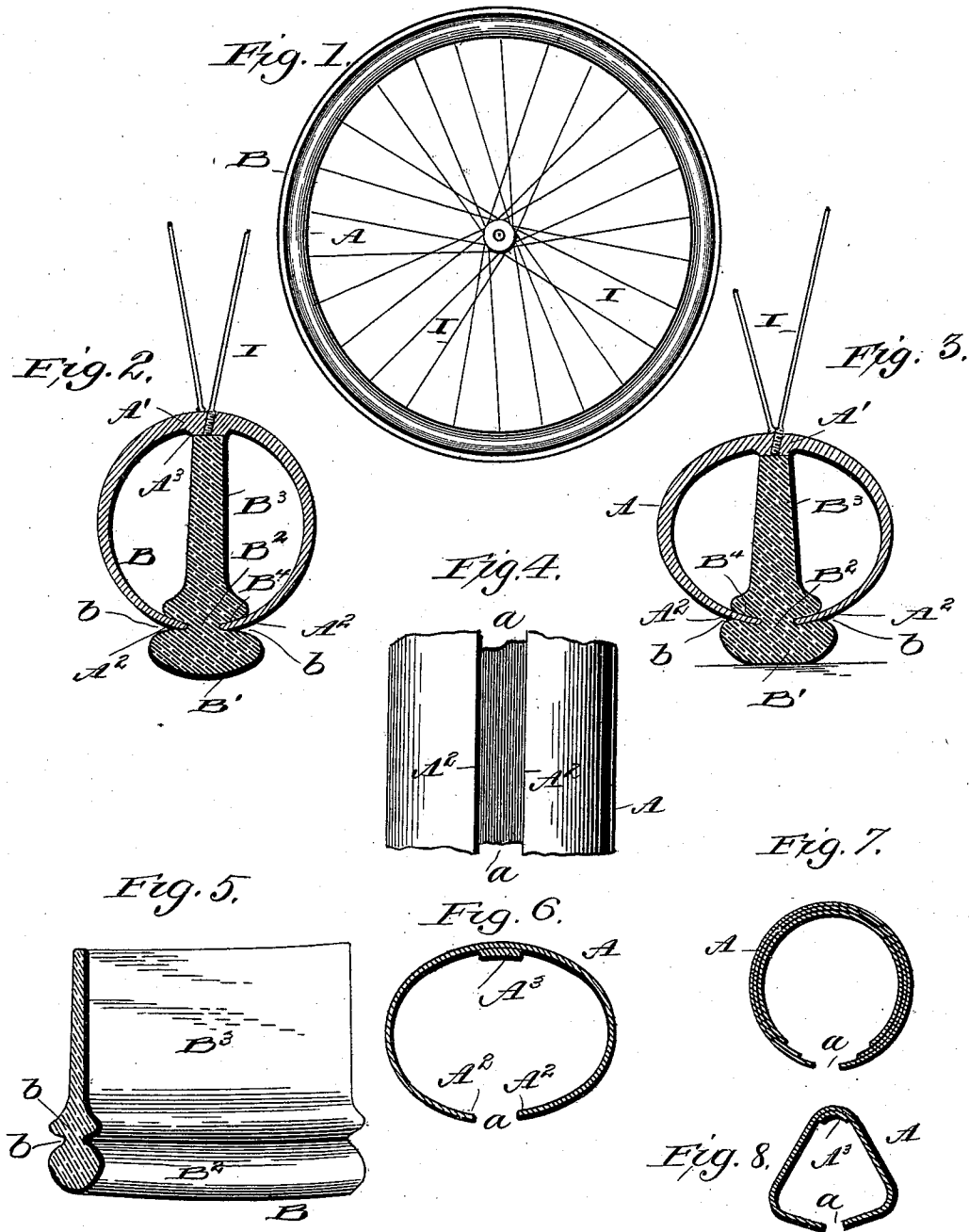


(No Model.)

C. E. BULKLEY.
VEHICLE WHEEL.

No. 578,035.

Patented Mar. 2, 1897.



Witnesses:
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UNITED STATES PATENT OFFICE.

CHARLES E. BULKLEY, OF SUMMIT, NEW JERSEY.

VEHICLE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 578,035, dated March 2, 1897.

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To all whom it may concern:

Be it known that I, CHARLES E. BULKLEY, a citizen of the United States, residing at Summit, in the county of Union and State of New Jersey, have invented a certain new and useful Improvement in Vehicle-Wheels, of which the following is a specification.

The invention relates more particularly to wheels for bicycles and like vehicles, in which strength, lightness, and resiliency are the most necessary characteristics. Pneumatic tires secured to light and strong rims are perhaps the nearest approach to perfection previously attained, but the liability to puncture is great, and unless means for repairing are at hand in case of such accident the wheel is useless. A wheel embodying the good points of the air-cushion without its attendant disadvantages is much to be desired. The present invention is intended to supply such, and it is believed successfully attains that object.

It consists of an annulus or hollow ring of steel or other strong and resilient material forming the wheel-rim, receiving the spokes on the inner face and having a continuous open channel or slot cut through to the interior on the periphery along the line of the tread.

When a load is applied, the rim tends to flatten at the point in contact with the ground into an approximately elliptical cross-section by increasing the width. This tendency is resisted by the stiffness of the curved springs forming the sides of the rim. The resistance increases in proportion to the weight of the load for the reason that the effective length of the springs is reduced by the amount of the increased area thereby brought in contact with the ground.

In the most approved form of the invention the cross-section of the rim is crescent-shaped, being thicker along the line at the junction with the spokes and gradually thinning in both directions toward the slot. The edges or lips so produced engage and hold an annular shoe or thread of soft vulcanized rubber, grooved on the opposite faces to receive them. The portion of the shoe exterior to the rim is curved away from the latter on the adjacent face, so that the flattening of the rim and the compression of the shoe combine to

close the joint between them and thus lessen the effective length of the springs. A narrow flange of rubber forming another portion of the shoe extends vertically across the interior of the rim and aids in resisting the tendency to flatten.

The accompanying drawings form a part of this specification.

Figure 1 is a side view of a complete wheel constructed in accordance with my invention. The remaining figures are on a larger scale. Fig. 2 is a cross-section through the rim and shoe. Fig. 3 is a corresponding view showing the form assumed by the same parts when sustaining a load. Fig. 4 is an edge view of a portion of the rim alone. Fig. 5 is a face view of a portion of the shoe. Figs. 6, 7, and 8 are cross-sectional views showing several modified forms of the rim alone.

Similar letters of reference indicate like parts in all the figures.

Referring to Figs. 1, 2, 3, 4, and 5, which show the invention in its most complete form, A is the wheel-rim, of steel or other material having a high degree of elasticity. It is produced in the form of a strip thickened along the center line and gradually thinned toward each edge. The strip is rolled into tubular form by treatment in suitable dies or otherwise bringing the edges nearly in contact with each other, and the ends are joined by brazing to form a hollow annulus, the section of which shows as a crescent, thicker at A' and terminating in the thin lips A² A². A central rib A³ on the inner surface of the portion A' extends completely around and affords sufficient metal in which to set the spokes I, which may be of any of the well-known forms and secured in any ordinary or approved manner. I have in these figures shown them as screwed into holes drilled and tapped at the proper intervals in the rim.

The adjacent edges of the lips are smoothly finished and rounded to avoid cutting and match to annular grooves b b, provided on each face of a ring of soft vulcanized rubber B. This shoe is inserted by forcibly parting the lips A² and crowding it through the peripheral slot a between them. It affords means for insuring a reliable frictional hold on the ground and comprises the tread B',

connected by the narrow neck B^2 between the grooves $b\ b$ to the supporting-flange B^3 , extending vertically across the interior of the rim and finding a bearing against the face of the rib A^3 . The flange is thickened just above the neck at B^4 to match to and increase its effective base on the inner face of the lips A^2 and tapers slightly therefrom.

The portion B' , forming the tread, is elliptical in cross-section, as shown, the upper surface curving away from the adjacent faces of the lips, so as to lie against a narrow line only on each close to the edge when the wheel is not sustaining a load. When the load is applied, as by a person mounting the wheel, the tread B' flattens somewhat at the point in contact with the ground, as does also the rim A , the several parts assuming positions approximating those shown in Fig. 3, increasing the area of the joint between the lips A^2 and the shoe, thereby reducing the length of the free arms of the crescent on each side, forcing the flexion to take place at points farther from the lips and where the metal is thicker and correspondingly stiffer. The flange B^3 is also compressed, thereby extending the bearing-surface forming its base and assisting the tread B' in holding the thin edges A^2 against springing, and also by acting strutwise between the lips and the rib A^3 resists the tendency of the rim to shorten its diameter on that line.

The elasticity or resiliency may be described as obtaining in three portions of the rim and shoe: first and principally, in the springs formed by the curved sides of the rim; secondly, in the compression of the tread of the shoe, and, third, in the compression of the flange B^3 . In applying a light load the first effect is to deflect inward the sides of the rim nearest the lips A^2 , to slightly compress the tread B' and also the flange B^3 , if the latter fills the space very exactly. A further accession of weight still further flattens the cross-section of the rim, compresses the tread of the shoe, and closes the surfaces of the grooves b upon the lips. The flange asserts itself by opposing its mass to the crushing strain and any additional weight finds all the parts working together to resist further depression.

By dispensing with the usual rim and tire and substituting the form here shown a considerable saving in weight may be effected, but the main advantage in this invention is the freedom from the evils of puncture, which require either that the rider be equipped with a repair kit and sufficient mechanical skill to use it or rely on finding a repair-shop at which the leak may be stopped. The construction here shown will allow the rider to continue, if necessary, even though the rubber shoe be cut entirely through and rendered useless by riding with the curved sides of the rim in direct contact with the ground, the resiliency afforded by the spring of the rim being suf-

ficient to enable him to ride without serious discomfort or danger of damage to the wheel.

It is believed that the peculiar effect of the pneumatic tire, namely, the property of momentarily embedding within itself any small obstruction in its path instead of requiring the entire load to be lifted in surmounting it, will be found to a great degree in this mode of construction.

Modifications may be made in the forms and proportions within wide limits without departing from the principle of the invention or sacrificing its advantages.

Fig. 6 shows a similar shape, but made from a strip of uniform thickness throughout. The strengthening-rib A^3 is here shown as a separate reinforcing-piece secured in position by riveting or otherwise.

In the modification shown in Fig. 7 the rim is built up of several slotted tubes one within the other, each having a narrower slot than the one it incloses. This form will have an action somewhat analogous to a "leaf-spring."

Fig. 8 shows a triangular form of cross-section.

I may, if it is deemed expedient, soften the yielding action of the springs by producing transverse slots or openings in the sides, or the ends of such slots may be cut away to form teeth or fingers of greater or less length engaging the shoe between their tips or ends.

The material has been described as steel throughout this specification, and I believe such to be generally preferable, but other metals may be used and any suitable materials, including hard rubber, gutta-percha, or celluloid in its various forms.

The best proportions in regard to the thickness of the rim, width of tread of the shoe, distance between the lips, and the like have not been fully determined and will depend in great measure on the material used. The drawings show these details as designed for steel.

Although I have described the invention as applied to a wheel-rim, it will be understood that it may be made to serve independently as a tire and be attached to any of the usual forms of rims to which it is adaptable.

I claim—

1. In a vehicle-wheel, a tubular rim of resilient material, having a peripheral slot on the line of the tread, the free edges and side walls of the tube serving as springs to support the load, in combination with an annular shoe serving as a bearing-surface for the wheel, and having a flange B^3 bearing against the inner face of the rim diametrically opposite said slot, substantially as herein specified.

2. In a vehicle-wheel, a tubular rim of resilient material having a peripheral slot on the line of the tread, the free edges and side walls of the tube serving as springs to support the load, in combination with an annular shoe matching said slot and held therein to

serve as a bearing-surface for the wheel, and having a supporting-flange extending across the rim and bearing against the inner face thereof diametrically opposite said slot, all substantially as herein specified.

3. In a vehicle-wheel, a tubular rim of resilient material, reinforced interiorly along the line of attachment of the spokes to receive the latter and having a peripheral slot on the line of the tread, in combination with an annular shoe matching to and held in said slot to serve as a bearing-surface for the load and having a portion extending across the rim and bearing on said reinforce, substantially as herein specified.

4. In a vehicle-wheel, a tubular rim of resilient material, receiving the spokes in a thickened portion and gradually thinned therefrom toward a peripheral slot formed on the line of the tread, in combination with an annular shoe matching to and held in said slot to serve as a bearing-surface for the wheel and having a portion extending across the rim and bearing against said thickened portion, substantially as herein specified.

5. In a vehicle-wheel, the tubular rim crescent-shaped in cross-section, the thickened portion A' receiving the spokes, and the thin

lips A² having their adjacent ends rounded and the peripheral slot *a* between them, in combination with the annular shoe having the grooves *b* engaged by said lips, the neck being thickened to form the bearing-surface B⁴ on the interior of the rim and the tread B' on the exterior thereof and the flange B³ within the rim, all substantially as herein specified.

6. In a vehicle-wheel, the tubular rim crescent-shaped in cross-section, the thickened portion A' receiving the spokes, the additional strengthening-rib A³ thereon, and the thin lips A² having the peripheral slot *a* between them, in combination with an annular shoe having grooves *b* engaged by said lips, the bearing-surface B⁴ on the interior face of the rim, the tread B' on the exterior thereof and the flange B³ extending vertically across the interior of the rim and abutting against said rim, all substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

CHARLES E. BULKLEY.

Witnesses:

VICTOR G. REYNOLDS,
LOUIS A. REPETTO.