

(No Model.)

2 Sheets—Sheet 1.

E. C. F. OTTO.  
VELOCIPEDE WHEEL.

No. 309,355.

Patented Dec. 16, 1884.

FIG. 2A.

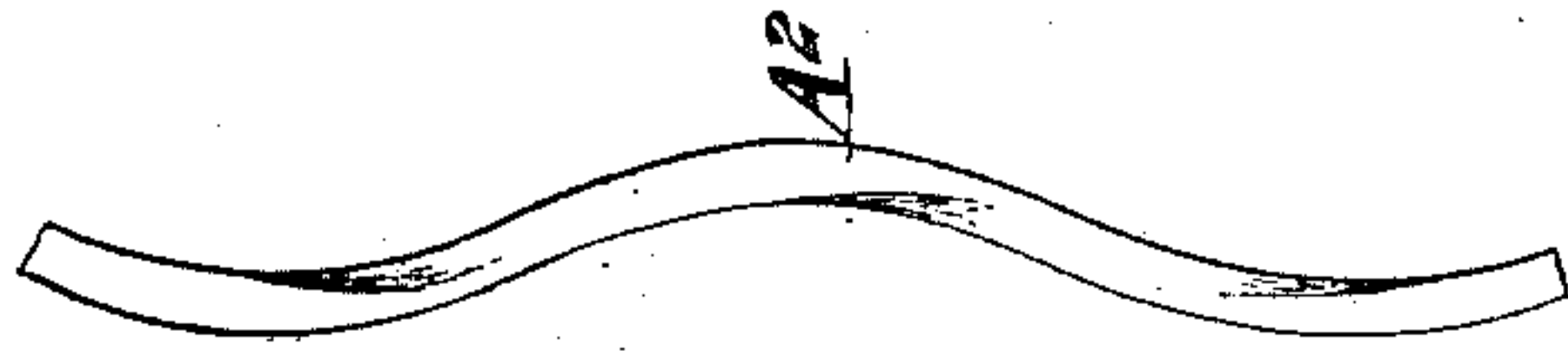


FIG. 4.

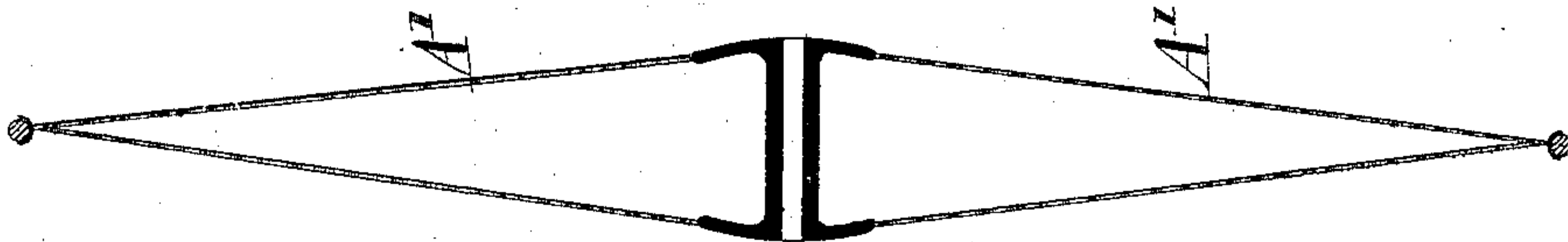


FIG. 3.

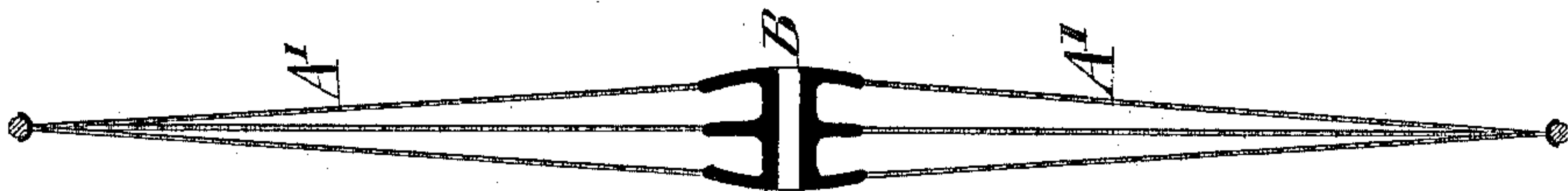


FIG. 1.



Witness

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FIG. 6.

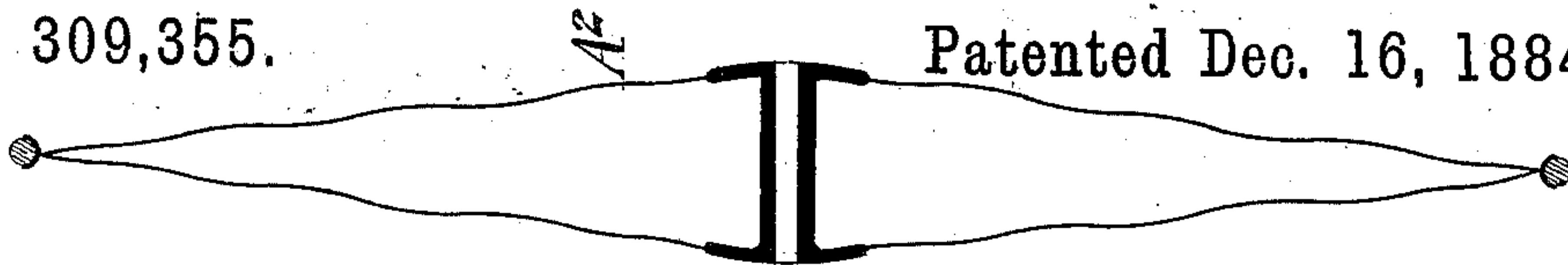


FIG. 2.

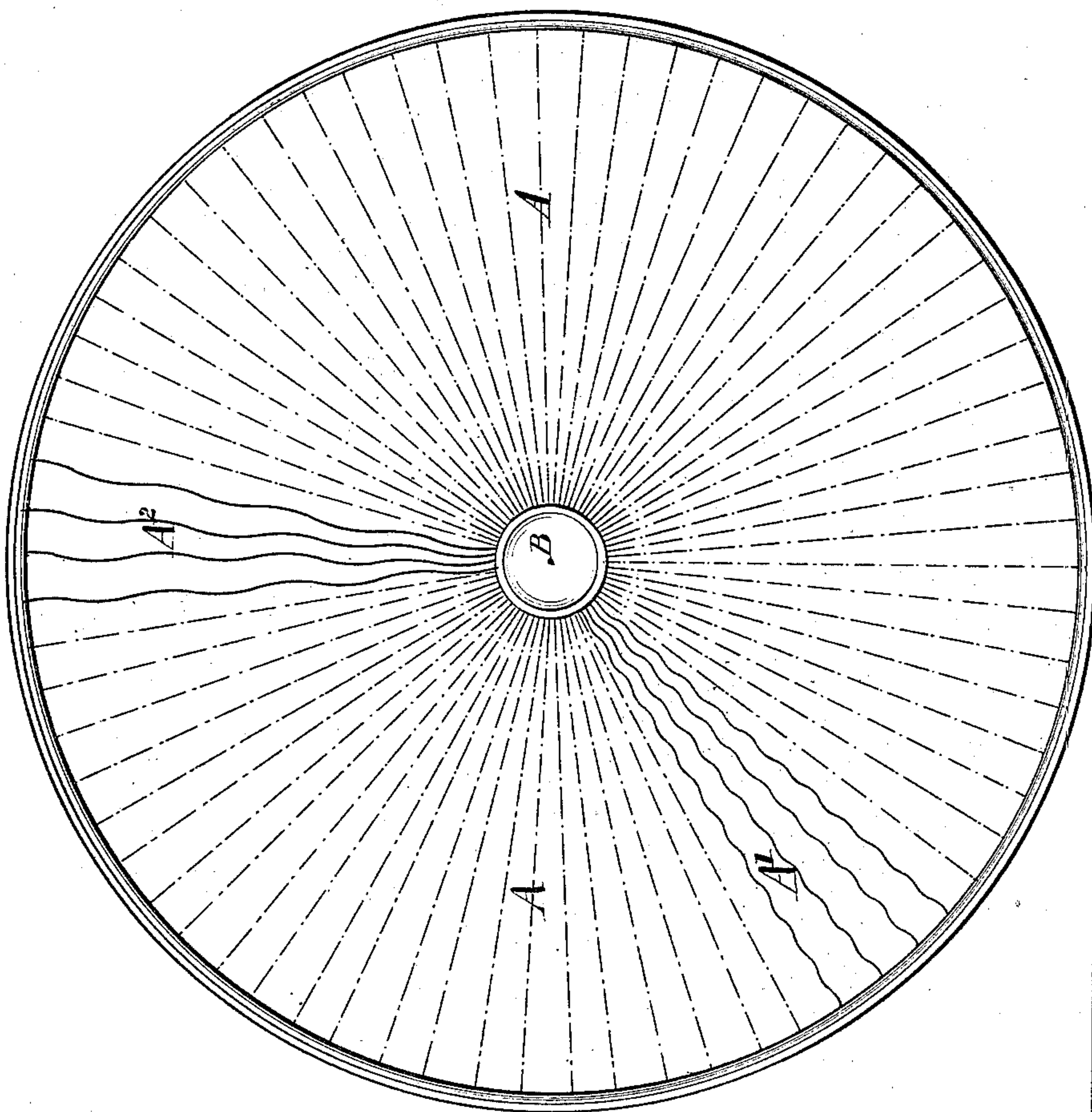
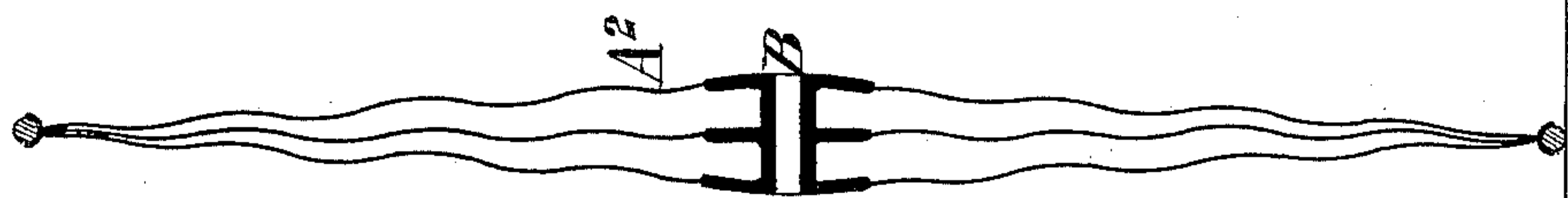


FIG. 5.



Witnesses

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# UNITED STATES PATENT OFFICE.

EDWARD C. F. OTTO, OF PECKHAM, COUNTY OF SURREY, ENGLAND.

## VELOCIPEDE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 309,355, dated December 16, 1884.

Application filed February 27, 1884. (No model.) Patented in England November 17, 1883, No. 5,433.

*To all whom it may concern:*

Be it known that I, EDWARD CARL FRIEDRICH OTTO, a subject of the Queen of Great Britain, residing at Peckham, in the county of Surrey, England, have invented certain new and useful Improvements in Velocipede-Wheels, of which the following is a specification.

In the drawings, Figure 1 is an end view, and Fig. 2 a sectional view, of a velocipede-wheel constructed according to my invention. Fig. 2<sup>a</sup> is a detail view of part of a spoke. Fig. 3 is a sectional view of a wheel with two sets of spokes. Fig. 4 is a sectional view of another form of wheel with two sets of spokes, and Fig. 5 is a sectional view of a form of wheel with three sets of spokes.

In the spider-wheels now generally used for velocipedes there are two sets of spokes, which are held in a great tension, which insures lightness and a certain amount of strength vertically or radially, but, on the other hand, produces a state of unstable equilibrium, so that a comparatively light blow against one side of the wheel by collision with some object causes the immediate buckling of the rim and collapse of the whole wheel.

The main object of this invention is to construct a velocipede-wheel in which the deleterious effect of lateral and other blows is greatly diminished, and which shall also possess great lightness, strength, and elasticity, and which may at the same time, in some cases, advantageously be made considerably narrower at the nave than those now in use. For this purpose I construct the wheel with two or three sets of spokes, which spokes are all in tension, and which are secured to the rim and to the nave. These spokes are, for the sake of affording elasticity, made undulating or wave-shaped, and that either undulating in one direction only, or twisted, or helical.

The advantage of having three sets of spokes will be understood from the following comparison. In the case of ordinary velocipede-wheels, where there are only two outer sets of spokes in high tension, these act against each other, forming, as already stated, an unstable equilibrium, which is easily disturbed by any slight lateral blow; but in these my improved

wheels I can and do employ a less tension in the spokes both when I use two and when I use three sets of spokes, so that a lateral blow has not the same destructive effect, while at the same time the third or central set of spokes, when used, neutralizes the effect of a lateral blow and adds to the stiffness of the whole wheel. The consequence of this, again, is that my improved wheel, when made with three sets of spokes, can with advantage be made much narrower at the nave, which is very desirable in bicycles, as well as in tricycles—in the former case because the rider gets his feet closer together and in a more natural and less fatiguing position for the work, and in the latter case because the width of the machine is decreased, so as to enable it to pass through narrower doorways. I make the nave with two or three flanges, according to the number of sets of spokes employed. By making the spokes of an undulating or helical form I am enabled to reduce the tension, and thus to make it a yielding tension, not only as regards lateral blows, but in a general sense as to all blows caused by the inequalities of the road, thus producing more ease and comfort in riding, greater speed over rough ground, and less wear and tear of the machine.

Fig. 1 is an end view, and Fig. 2 a sectional view, of such a wheel in which all three sets of spokes A A are made of such an undulating or helical form—viz., either, as shown at A', Figs. 1 and 2, of an undulating form in one direction only, or, as shown at A<sup>2</sup>, Fig. 1, of a helical form. (More clearly shown in Fig. 2<sup>a</sup>, which is a part view of one such helical spoke.) Fig. 3 is a sectional view of a velocipede-wheel with two sets of spokes A' of an undulating form, whereby similar advantages are gained—viz., a smaller tension and a yielding tension, a greater resistance to lateral blows, and more elasticity than the ordinary velocipede-wheels. Fig. 4 is a sectional view of a velocipede-wheel with three sets of spokes A<sup>2</sup> of a helical form, and Fig. 5 a view of a velocipede-wheel with two sets, A<sup>2</sup>, of spokes of helical form.

The numerous light steel spokes are in all cases at their outer ends formed with heads, which are countersunk into the rim. The latter is made of a concave form to receive

the india-rubber tire. The inner ends of the spokes are screwed into holes in the flanges formed on the hub or nave B.

I claim as my invention—

- 5 A velocipede-wheel consisting of a rim formed to receive an india-rubber tire, a flanged nave, B, and two sets of radial tensional undulating steel spokes, in combination with a central set of radial undulating elastic

steel spokes of a proportionately greater tension, all the said spokes being fastened to the rim and screwed into the flanges of the nave, substantially as described. 10

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Witnesses:

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