

(No Model.)

3 Sheets—Sheet 1.

P. Z. DAVIS.
VEHICLE WHEEL.

No. 578,597.

Patented Mar. 9, 1897.

Fig. 1.

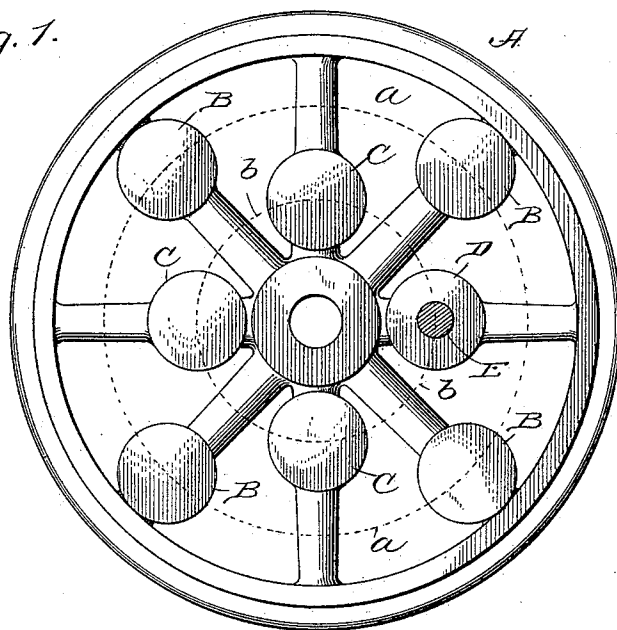
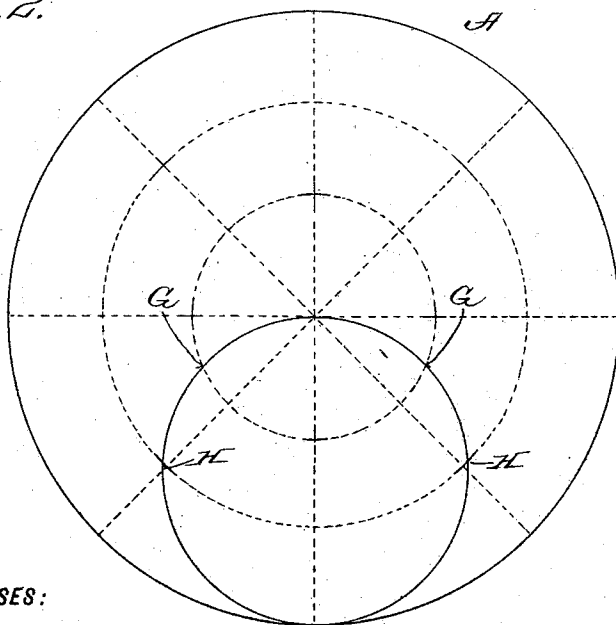


Fig. 2.



WITNESSES:

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(No Model.)

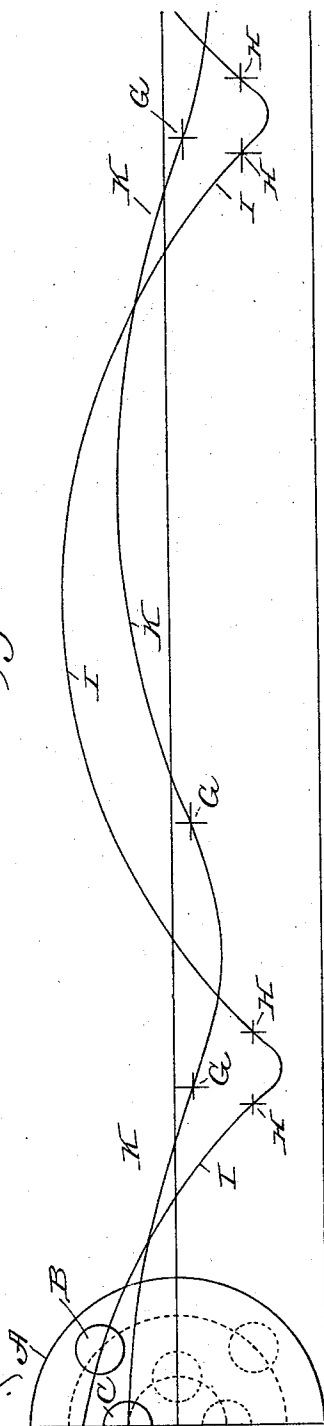
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Fig. 3.



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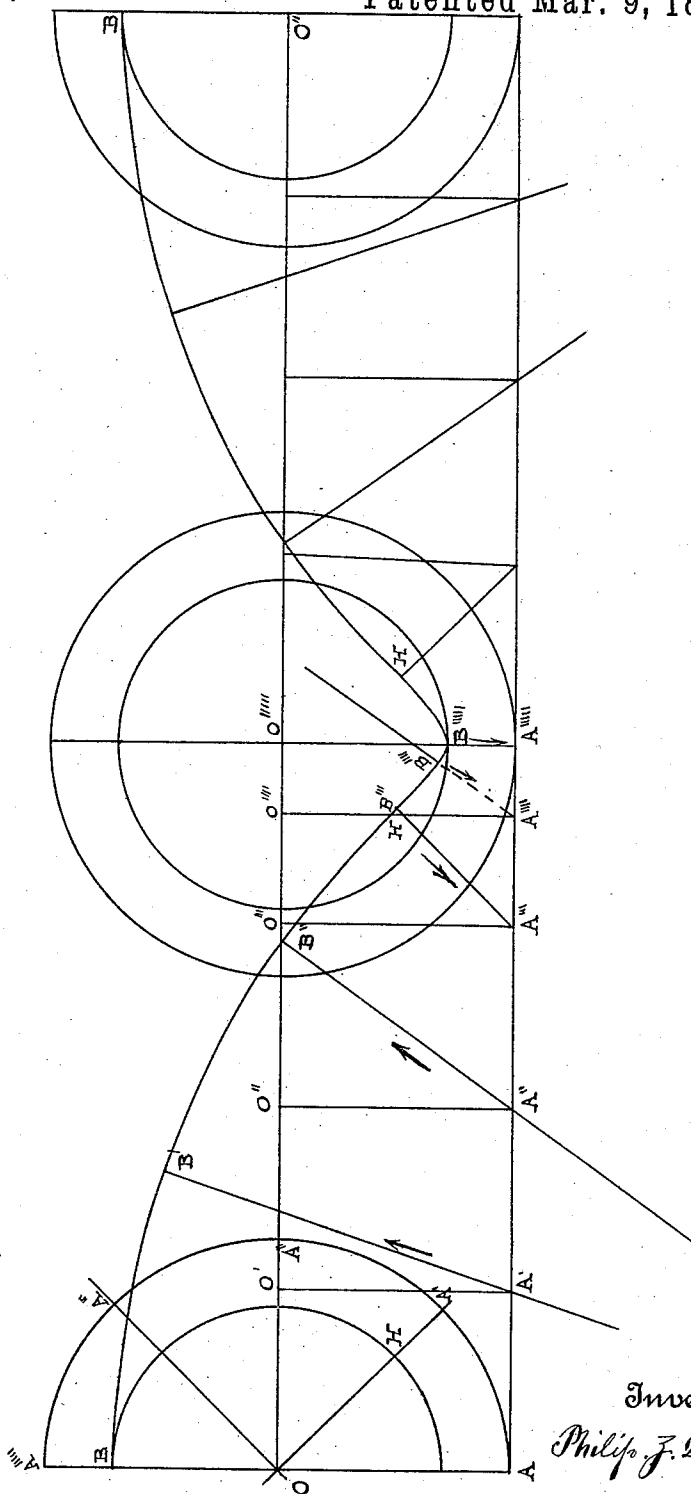
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Fig-4-



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UNITED STATES PATENT OFFICE.

PHILIP Z. DAVIS, OF LOMETA, TEXAS.

VEHICLE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 578,597, dated March 9, 1897.

Application filed June 27, 1896. Serial No. 597,193. (No model.)

To all whom it may concern:

Be it known that I, PHILIP Z. DAVIS, a citizen of the United States, residing at Lometa, in the county of Lampasas and State of Texas, 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.

This invention relates generally to vehicle-wheels, and particularly to driving-wheels for locomotives; and it has for its object to provide an approximately perfect balanced driving-wheel and thereby materially decrease the internal disturbances to the mechanism of the locomotion due to the present methods of counterbalancing in the driving-wheel the reciprocating and revolving parts thereof. This object I accomplish by equalizing the vertical effect of the normal forces exerted by the crank-pin and boss and counterweights as they move or travel through the path of a prolate or inflected cycloid, thus neutralizing their effect and reducing the hammer-blow on the rail to zero.

To this end my invention, generally stated, consists in the arrangement and distribution of the weight of the crank-pin and counterweights and all other weights placed on the wheel in such manner that their vertical and horizontal forces will exactly balance each other at all times during the revolution of the wheel, and thus entirely obviate the hammer-blow given the rail at the point of instantaneous contact of wheel and rail which is the center of rotation of wheel when the wheel is moving on the rail.

To accomplish the object of my invention, I arrange two series of weights within the circumference of the wheel, one series being arranged in a circle coincident with the center of the wheel, which will hereinafter be denominated a "balancing-circle," adjacent the periphery of the wheel, and the other series on a circle coincident with the center of the wheel adjacent the axis of the wheel and which will be denominated a "crank-circle," said last-named weights being arranged at like distances apart and at points intermediate the first-named weights, which are also

arranged at like distances from each other on the balancing-circle.

In the accompanying drawings, forming a part of this specification, Figure 1 is a side elevation of a driving-wheel constructed according to my invention; Fig. 2, a diagrammatic view illustrating the inflection-points in the path of movement of the weights; Fig. 3, a diagrammatic view illustrating the path traveled by the weights while the wheel is moving on the rail, such path being a prolate cycloid; and Fig. 4 a diagrammatic view showing the relation of a prolate cycloid to the instantaneous center of rotation and the manner in which the normal forces are developed.

Similar letters refer to similar parts throughout all the views.

Referring to the drawings illustrating the preferred form of my invention, A represents a driving-wheel, and B a series of weights arranged in a line on the balancing-circle, (indicated by a dotted line and lettered a,) around the wheel near its periphery and coinciding with the axis of the wheel, said weights being spaced the same distance apart and preferably cast therewith, although they may be secured thereto in any desired or convenient manner.

C represents a series of weights arranged in a line on the crank-circle, (indicated by a dotted line marked b,) coincident with the axis of the wheel and adjacent its hub, said weights being cast with or otherwise secured to said wheel in any convenient manner, and D represents the boss for the crank-pin E, said crank-pin and boss being equal to and forming one of the weights of the series C, and said series of weights being arranged at equal distances apart and intermediate the weights B.

As an illustration of the application of my invention to a wheel of a given size, take, for instance, a wheel sixty (60) inches in diameter with crank-circle twelve (12) inches radius and balancing-circle twenty (20) inches radius, I apply on crank-circle b three weights C of equal size, which with the boss D and pin E, which together form another weight, are arranged at a distance of ninety (90) degrees apart around the circle, and on the

balancing-circle a I arrange a series of four weights B of equal weight at a distance apart of ninety (90) degrees around the circle. This arrangement of the two series of weights spaces them forty-five (45) degrees apart relative to the circumference of the wheel.

For wheels of other diameters or different radii for crank or balancing circles, or when the above ratios of crank and balancing circles and the circle or circumference of the wheel vary relative each other, the weight of the weights are varied, but are always spaced forty-five (45) degrees apart relative the circumference of the wheel.

In Fig. 2 the dotted lines G represents the inflection-points of the weights on the crank-circle, and the dotted lines H the inflection-points of the weights on the balancing-circle.

In Fig. 3 the paths traveled by the weights B and C in prolate cycloid is indicated by the lines I and K , respectively, as the wheel moves on the rail. A prolate cycloid or right trochoid is the curve traced out by a point within the circumference of a circle which rolls, without sliding, on a fixed straight line in the same plane. Thus, as in Fig. 4, the path traveled by the weight B is located within the circle $A A' A'' A''' A''''$. When the center O of the wheel has an advance to the point O' , the circle has an angular advance to the point A' and the point or weight B reaches the point B' , and when the angular advance of the circle equals the point A'' the point or weight B reaches the point B'' . The point or weight B travels in a path which is always at right angles to the line which passes through point B and the instantaneous center of rotation, and its velocity is in the ratio of the distance that point B is from the instantaneous center of rotation (or point of contact with rail) to the radius of the circumference of the circle. The normal forces are always exerted at right angles to the tangent at the point in question. Hence the normal force always passes through

the instantaneous center of rotation, and at inflection-points H the radius of curvature being infinity there is no normal force, but on passing beyond the inflection-point the force is exerted in the opposite direction—*i. e.*, at A' B' the force is exerted in the direction from A' to B' . At point H there is no normal force. At B'''' the force is in the direction from B'''' to A'''' , at B''' in the direction from B''' to A''' , at B'' in the direction from B'' to A'' , all as indicated by arrows.

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

1. A wheel having a series of weights arranged at equal distances apart in a circle adjacent to and coinciding with the axis of the wheel, and a series of weights arranged at equal distances apart on a circle adjacent the periphery of and coinciding with the axis of the wheel the weights of both circles being at equal angular distances apart relative to the circumference of the wheel, substantially as described.

2. A wheel having a series of weights arranged in a circle and a weight arranged on the line of a circle within the series of weights, all of said weights being an equal angular distance apart relative to the center of the wheel, substantially as described.

3. A wheel for a locomotive having a series of weights arranged in a circle thereon and a series of weights arranged on the line of a circle within the outer series of weights, the weights of each circle being an equal angular distance apart relative to the center of the wheel, substantially as described.

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

PHILIP Z. DAVIS.

Witnesses:

W. H. WOFFORD,

H. M. STERLING.