(No Model.) 4 Sheets—Sheet 1.

J. H. EICKERSHOFF.

BICYCLE OR OTHER VEHICLE.

No. 588,697. Patented Aug. 24, 1897.

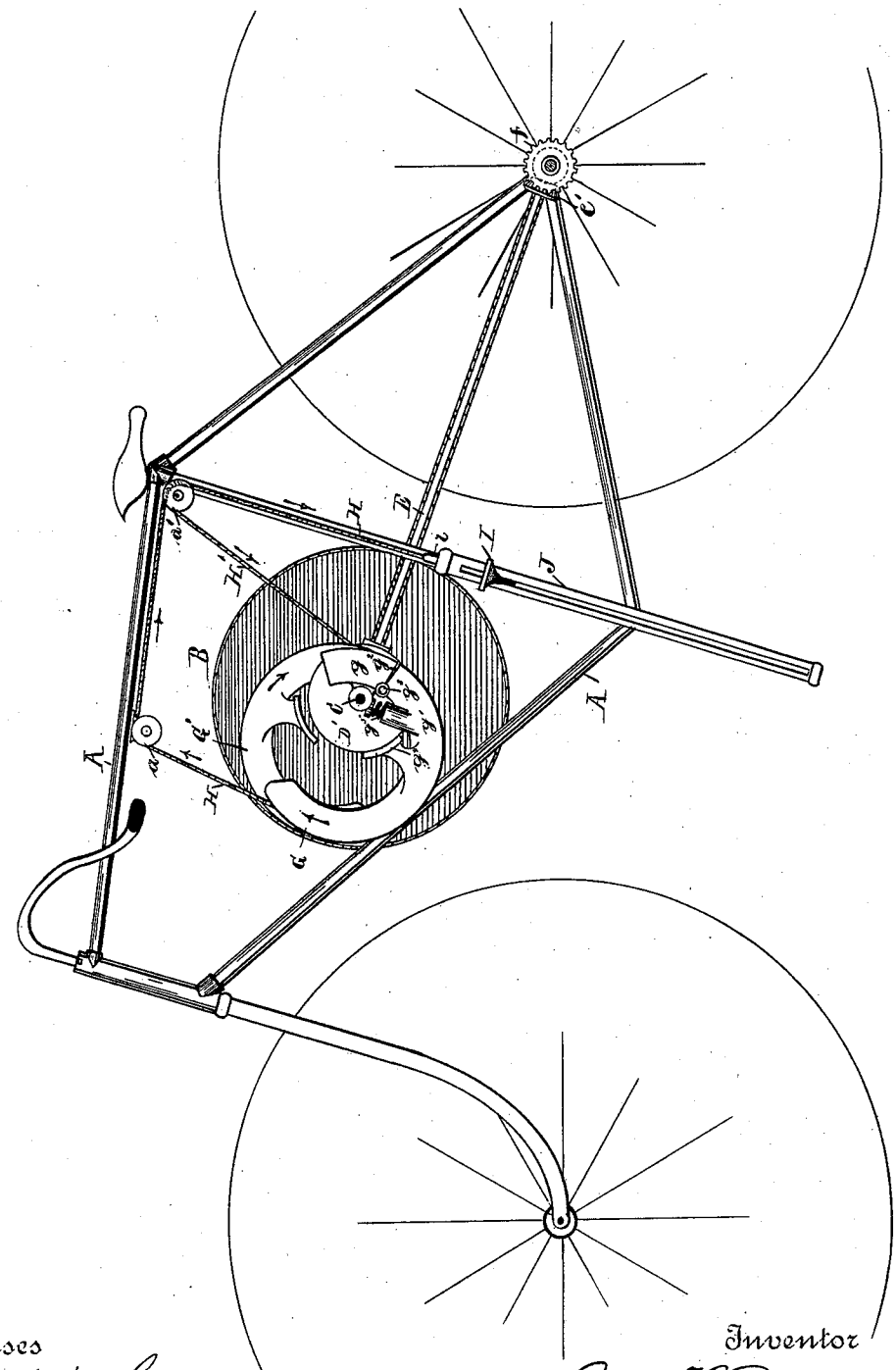


Fig. 1.

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Fig. 2.

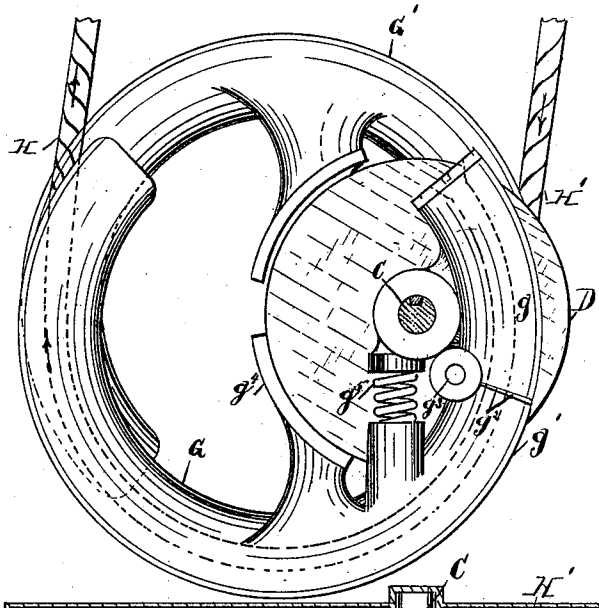


Fig. 3.

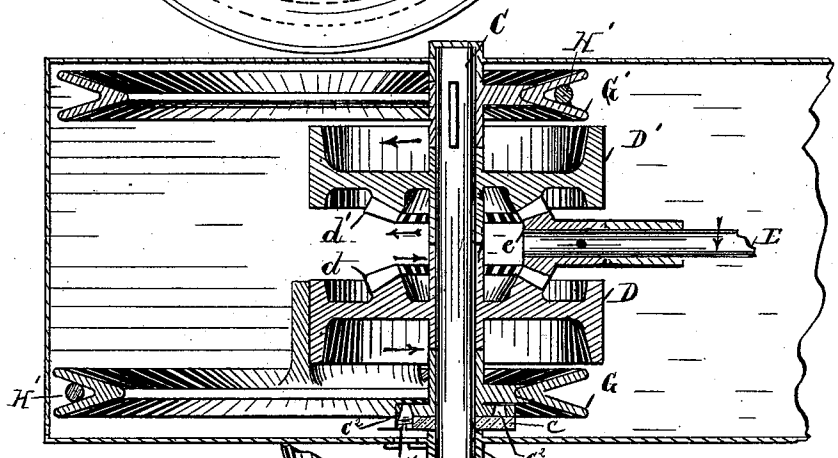
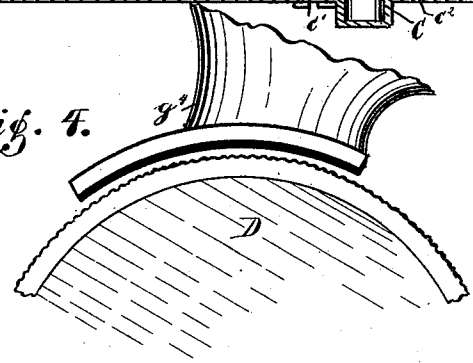


Fig. 4.



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J. H. EICKERSHOFF.

BICYCLE OR OTHER VEHICLE.

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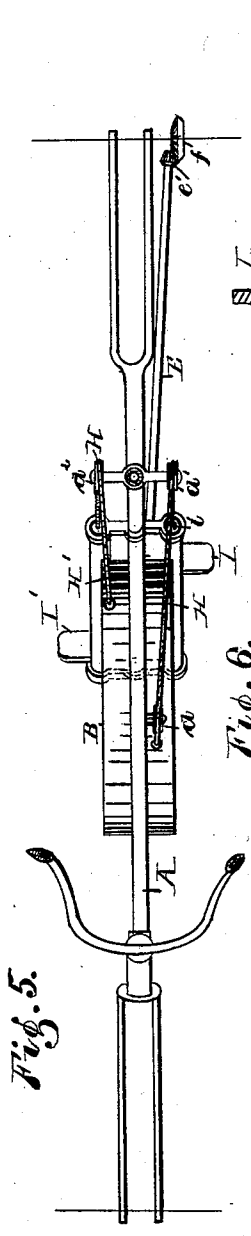


Fig. 5.

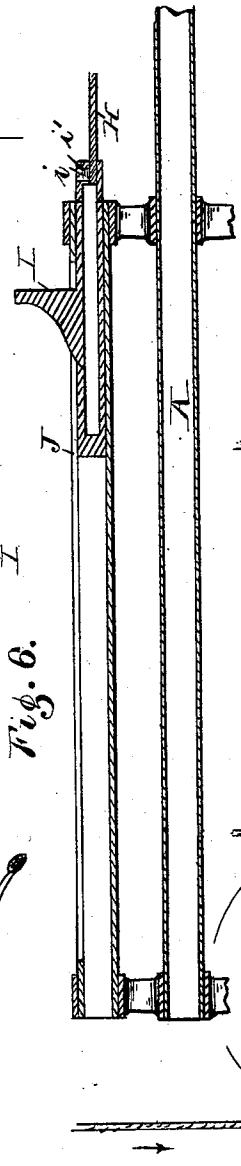


Fig. 6.

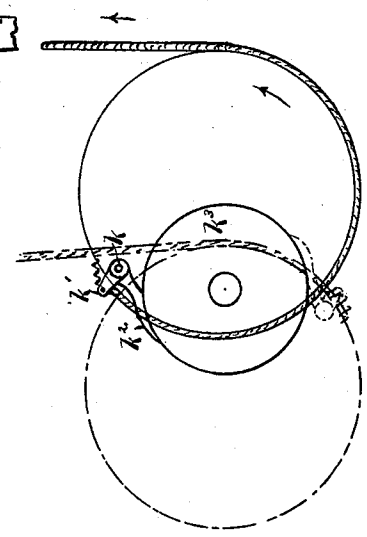


Fig. 8.

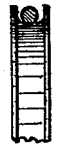


Fig. 9.

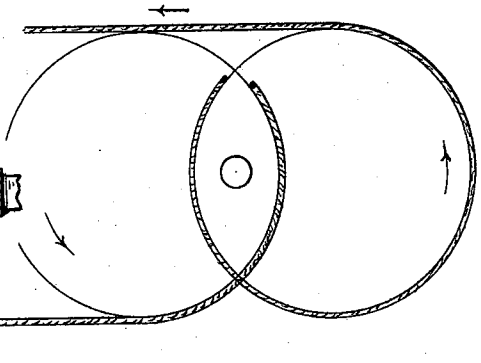


Fig. 7.

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J. H. EICKERSHOFF.

BICYCLE OR OTHER VEHICLE.

No. 588,697. Patented Aug. 24, 1897.

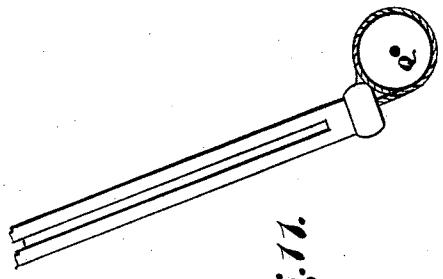


Fig. 11.

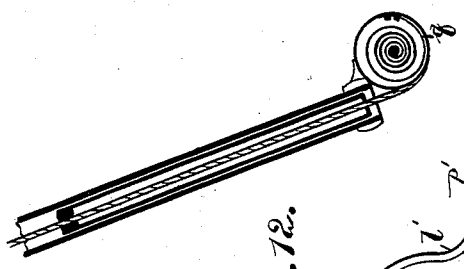
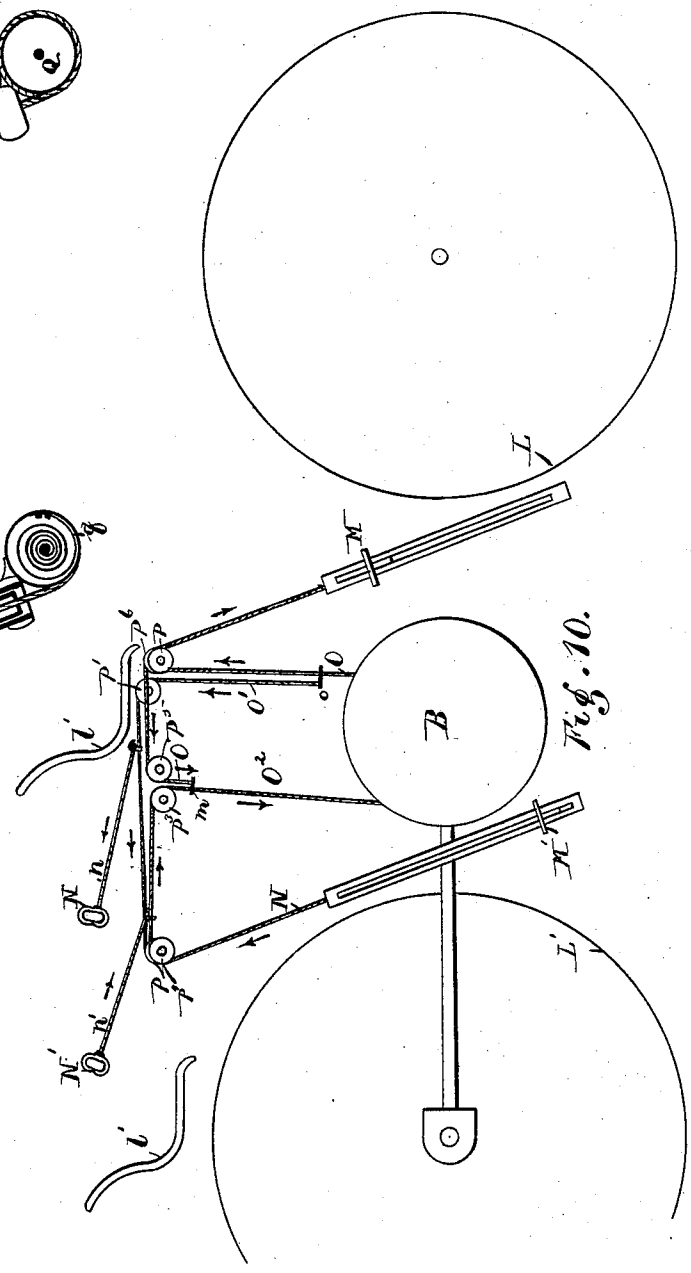


Fig. 12.



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UNITED STATES PATENT OFFICE.

JOHN HENRY EICKERSHOFF, OF CINCINNATI, OHIO.

BICYCLE OR OTHER VEHICLE.

SPECIFICATION forming part of Letters Patent No. 588,697, dated August 24, 1897.

Application filed July 6, 1896. Serial No. 598,228. (No model.)

To all whom it may concern:

Be it known that I, JOHN HENRY EICKERSHOFF, a citizen of the United States of America, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Bicycles or other Vehicles Adapted to be Driven by the Rider, of which the following is a specification.

The means in most common use for driving bicycles is the crank movement, although its disadvantages are well recognized. In any crank movement there are two dead-centers, at which, if power is applied to either crank, the result is zero. The leverage of a crank, beginning with zero, increases to the most effective point near the middle of the stroke and decreases again to zero. In bicycles the continuous revolution of the crank is objectionable in coasting and in mounting. The objections to the bicycle-brake are so well recognized that a large proportion of the bicycles are made and used without brakes in spite of the danger of losing control of the wheel on steep inclines.

The object of my invention is to provide a cycle in which these objections are obviated and a more efficient leverage obtained; and my invention consists in mechanism whereby the dead-centers and circular movement of the pedals incident to the crank movement are avoided; in mechanism whereby the greatest leverage is obtained at the highest and weakest part of the stroke; in mechanism whereby the leverage decreases as the strength and speed of the stroke increases; in mechanism whereby a stroke of equal or greater efficiency may be obtained with less travel of the foot than is required by the crank movement; in mechanism whereby the pedals remain stationary in coasting or mounting; in mechanism which permits of coasting without removing the feet or losing control of the pedals; in improved braking mechanism; in mechanism whereby the driving mechanism may be used as a brake without back-pedaling; in mechanism whereby both foot and hand power may be utilized in driving the wheel, and in the various parts and combinations of parts hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of a bicycle, showing my improved driving mechanism; Fig. 2, a side elevation of the driving mechanism; Fig. 3, a horizontal section of the same; Fig. 4, a detail showing one of the clutches; Fig. 5, a top plan of a wheel-frame equipped with my driving mechanism; Fig. 6, a section of one of the pedals and guide; Fig. 7, a diagrammatic view showing one method of driving; Fig. 8, a diagrammatic view showing a modified form; Fig. 9, a view of a portion of the wheel-rim shown in Figs. 7 and 8; Fig. 10, a diagram showing my driving mechanism applied to a tandem; Fig. 11, a side elevation of a portion of one pedal-guide, showing tension mechanism for the driving-rope; Fig. 12, a section of same.

A represents a bicycle-frame; B, a housing mounted on the frame between the front and rear wheels; C, a shaft mounted in the housing at right angles to the frame, and D D′ friction-disks loosely mounted upon shaft C. The friction-disks carry on their opposing faces bevel-gears *d d′*, adapted to mesh with a bevel-gear *e* on a shaft E at right angles to shaft C and carrying at its outer end a bevel-wheel *e′*, adapted to mesh with a bevel-gear *f* on the axle of the rear wheel. It will be seen that power applied to the friction-disks will be transmitted through shaft E to the rear wheel of the bicycle.

G G′ are sheave-segments mounted eccentrically on shaft C and adapted to actuate the shaft in different directions, thereby imparting a rocking movement. The sheave-segments are preferably made in two parts *g* and *g′*, divided at g^2. The part *g* is rigidly secured to the shaft and the part *g′* is hinged to part *g* at g^3. The parts *g′* carry friction-shoes g^4, adapted to contact with the peripheries of the friction-disks, but normally held out of engagement therewith by means of a spring g^5, mounted between suitable bosses on parts *g* and *g′*.

H and H′ are cords, preferably non-stretchable, clamped to the heel ends of the sheave-segments. In the form shown the cord H passes around the segment G and over guide-sheaves *a* and *a′* on the frame and is attached to a sliding rod *i*, carrying a pedal I and adapted to slide in a slotted tube J, secured to the frame. Cord H′ passes around its

sheave G', over a guide-sheave a^2, and is secured to a corresponding sliding rod carrying a pedal I'. The rods should be of some length in order to afford long bearing-surfaces and prevent cramping. For the purpose of adjustably securing the cords to the segments the latter are provided with a clamping-screw g^7. The peripheral grooves in the segments are preferably V-shaped, as shown in Fig. 3, in order that they may grip the cords.

It will be seen that actuation of either pedal downwardly will impart a tensile strain to the cord, thereby causing the friction-shoe upon the sheave to which that cord is connected to engage with and rotate the adjacent friction-wheel, thereby imparting motion to shaft E and through that to the rear wheel of the bicycle.

The cord on one segment will be wound as that on the other is unwound, and downward action of one pedal will raise the other. The stroke may be long or short at the will of the rider, the engagement of the sheave with the friction-disks being broken by the action of spring g^5 the moment the driving pressure upon the pedal is released. In coasting the feet may remain upon the pedals, and so long as the pressure is not sufficient to overcome the resistance of the spring g^5 the pedals will not move. If the speed becomes too great or a quick stop is required, pressure upon both pedals at the same time will cause the friction-surfaces of the segments and disks to act as a brake. Any required braking pressure may be applied and the wear and tear on the tires caused by the ordinary bicycle-brakes is avoided.

The leverage obtained by the eccentric sheave-segments, as shown, is greatest when the pedal is in its raised position, when the power of the leg is exerted at the greatest disadvantage. As the leg is straightened and more pressure can be applied the leverage shortens, enabling the muscles to be used to the best advantage. For the purpose of adjusting the position of the eccentric sheaves to increase or decrease their leverage the shaft C carries at one end a flange c, having an aperture, through which passes a threaded pin c', adapted to take into either of a series of apertures c^2 in the adjacent eccentric sheave. The other sheave being fixed to the shaft, adjustment of one serves all purposes.

In Figs. 1, 2, and 3 I have shown the sheaves with their eccentricity in the same direction. In Fig. 7 I have shown them mounted with their eccentricity in opposite directions.

In Fig. 8 I have shown an eccentric wheel in which the cord runs loosely in the groove and is secured to the heel of a friction-shoe k^2, pivoted to k and adapted to engage with the friction-wheel k^3. The friction-shoe is normally held out of engagement with the friction-wheel by means of a spring k'. The full lines indicate the position when the pedal is raised and the dotted lines the position when the pedal is at the bottom of its stroke.

In Fig. 10 I have shown diagrammatically a tandem illustrating the method of adapting my improvement for the application of both foot and hand power. L is the front wheel of the tandem, and L' the rear wheel, to which the power is applied. B is the housing containing the sheave-wheels, disks, &c. l and l' are seats, and M and M' are pedals for the operation. N and N' are handles for hand-power, to be connected to the main cords by hooks or clamps. The arrows show the direction in which the cords travel. O is a cord fastened at one end to a sheave in housing B, running over guide-sheave P to pedal M. Fastened by clamps o to cord O is a second cord O', running over guide-sheaves P' and P^2 to the mate of pedal M', which, like M, is in a raised position. A cord n connects handle N with cord O' at a point between the guide-sheaves P' and P^2. To the other sheave in housing B is fastened a cord O^2, running over guide-sheaves P^3 and P^4 to pedal M'. Fastened by clamps M to cord O^2 is a second cord O^3, running over guide-sheaves P^5 and P^6 to the mate of pedal M, which, like pedal M', is in its down position. A cord n' connects handle N' to rope O^2 at a point between the guide-sheaves P^3 and P^4. It will be seen that the sheave-wheel to which cord O is attached turns to unwind said cord when pedal M and the mate of pedal M' are pushed downward, any pulling strain imparted by handle N assisting in the operation, while pedal M' and the mate of pedal M are raised, thereby winding the cord on the other sheave. Pushing down pedal M' and the mate of pedal M reverses the condition.

In Figs. 11 and 12 I have shown details of the slotted tubes of the pedals, in somewhat enlarged scale, in connection with a tension device to take up slack in the operating-cords when not in use. The rope is extended through the hollow sliding rod and fastened at the lower end of the slotted tube to a roller Q, which is connected with a spiral spring q, adapted to be placed under tension by the upward movement of the pedals to which the cord is connected. This avoids the necessity for disconnecting the cords when one person is operating the wheel or for any reason any of the cords are not in use.

While I have described my invention as embodied in a bicycle, I do not wish to be understood as confining myself to bicycles alone, as it may be used in any machine adapted to be operated by foot or hand.

I claim in a bicycle or other machine of the velocipede order—

1. The combination of a shaft; driving-disks loosely mounted thereon; mechanism connecting the disks with the driven wheel; a pair of sheave-segments each consisting of a part secured to the shaft carrying the disks and another part hinged thereto; friction-shoes carried by the hinged part, adapted to engage with the disks; the sheave-segments fixed to the shaft in opposite directions and

cords attached to the sheaves and to alternately-reciprocating pedals, substantially as and for the purpose set forth.

2. The combination of a shaft; driving-disks loosely mounted thereon; mechanism connecting the disks with the driven wheel; a pair of eccentrically-mounted sheave-segments, each consisting of a part, secured to the shaft carrying the disks, and another part hinged thereto; friction-shoes, carried by the hinged part, adapted to engage with the disks; the sheave-segments fixed to the shaft in opposite directions and cords attached to the sheaves and to alternately-reciprocating pedals, substantially as and for the purpose set forth.

3. The combination of a shaft; driving-disks loosely mounted thereon; mechanism connecting the disks with the driven wheel; a pair of sheave-segments each consisting of a part, secured to the shaft carrying the disks, and another part hinged thereto; friction-shoes carried by the hinging part, adapted to engage with the disks; springs, between the fixed and the hinged part, normally holding the friction-shoes out of engagement with the disks; the sheave-segments fixed to the shaft in opposite directions, and cords attached to the sheaves and to alternately-reciprocating pedals, substantially as and for the purpose set forth.

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