(No Model.) 3 Sheets—Sheet 1.

J. H. BAKER.

DRIVING GEAR FOR VELOCIPEDES.

No. 462,191. Patented Oct. 27, 1891.

Fig. 1.

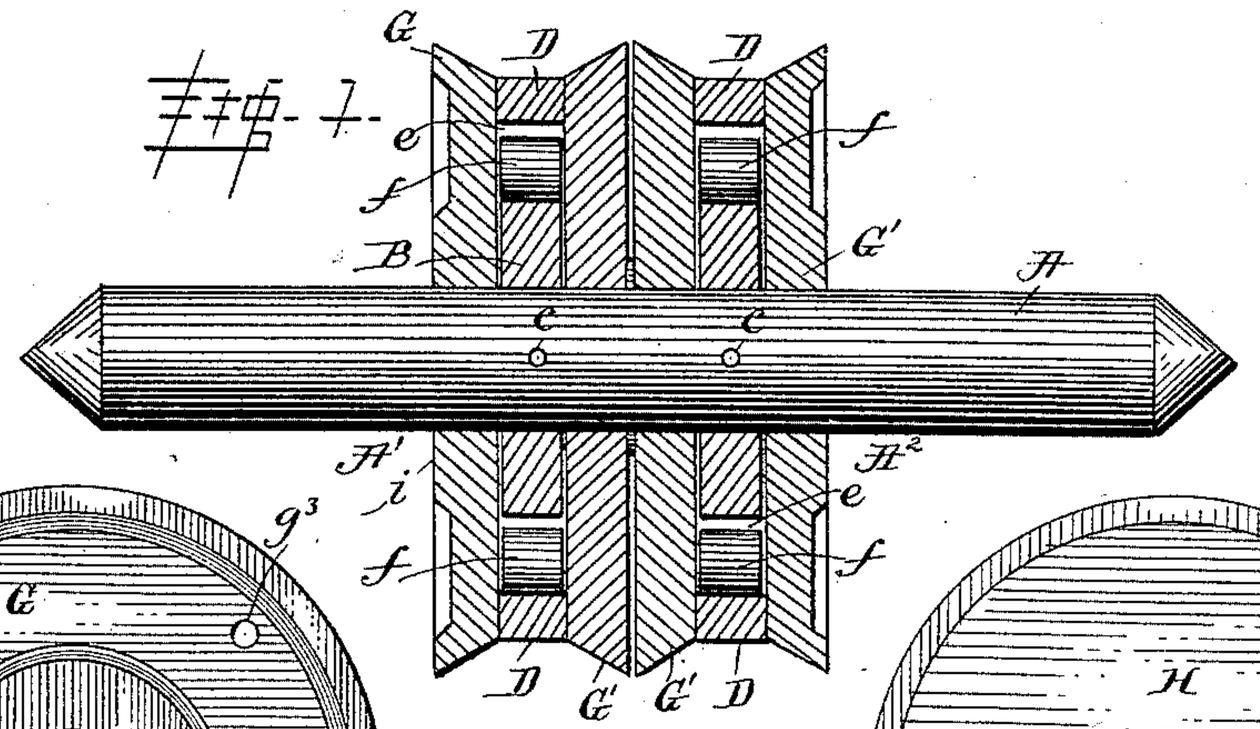


Fig. 2.

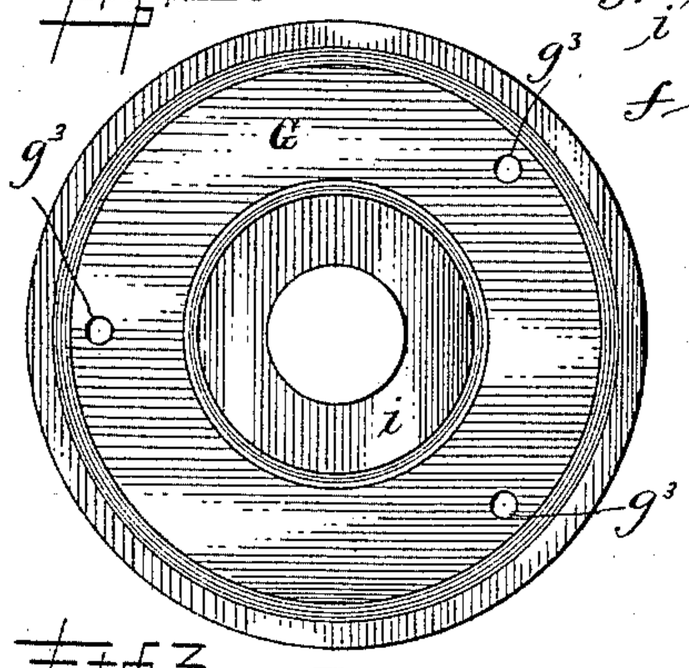


Fig. 5.

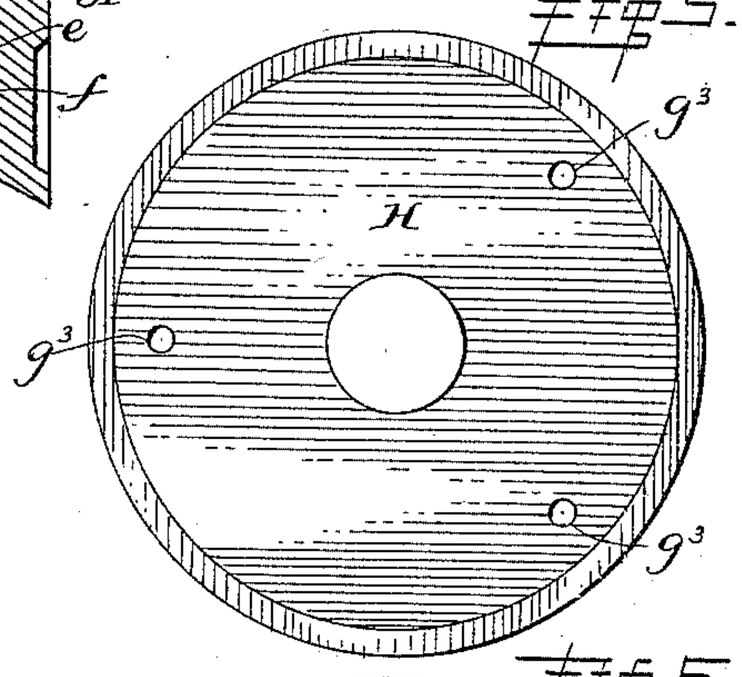


Fig. 3.

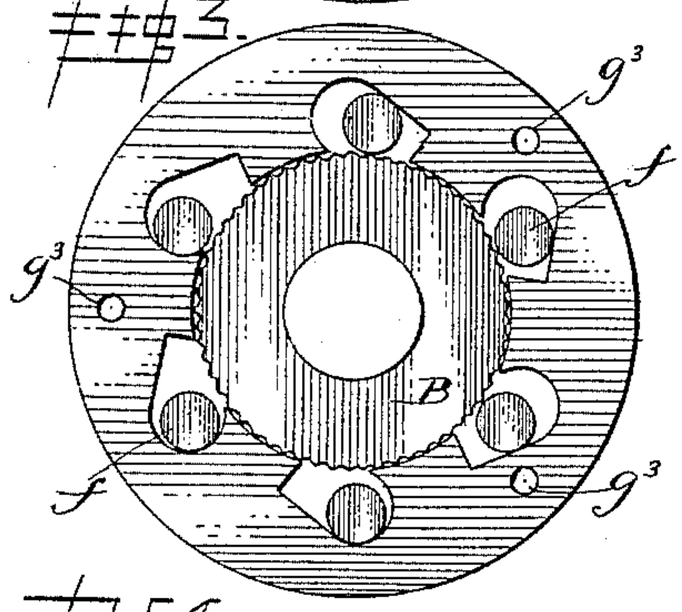


Fig. 6.

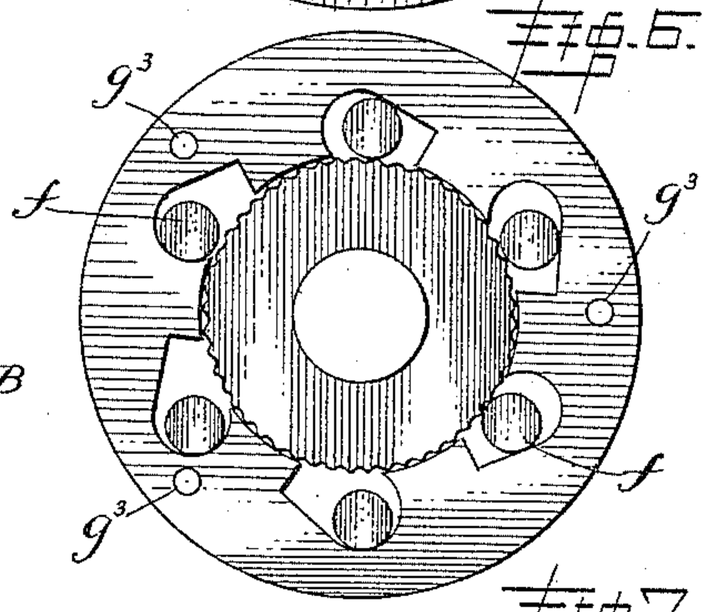


Fig. 4.

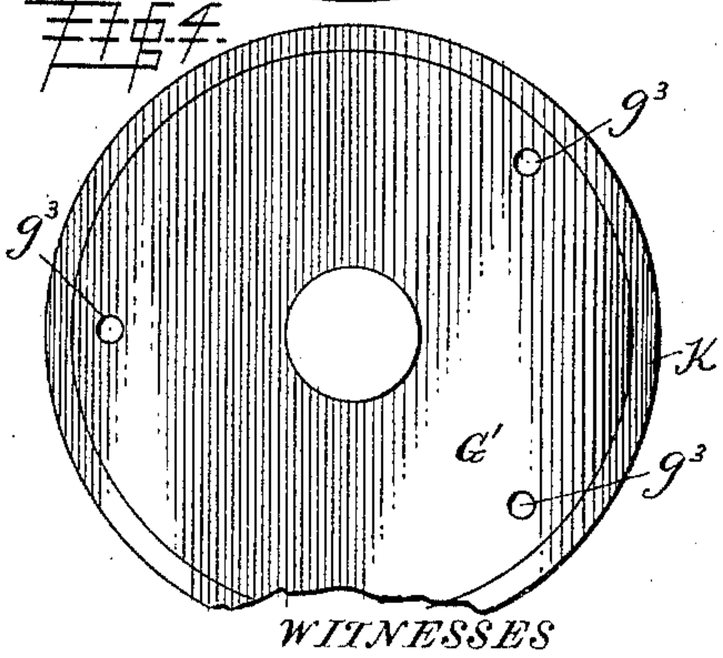


Fig. 1.

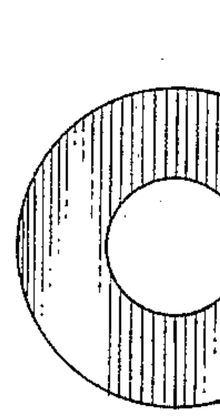


Fig. 1.ᴬ

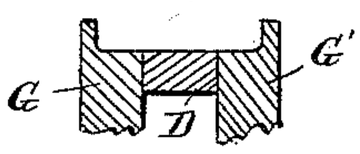


Fig. 1.ᴮ

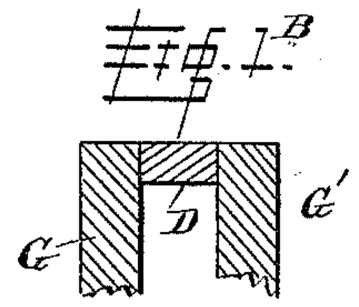
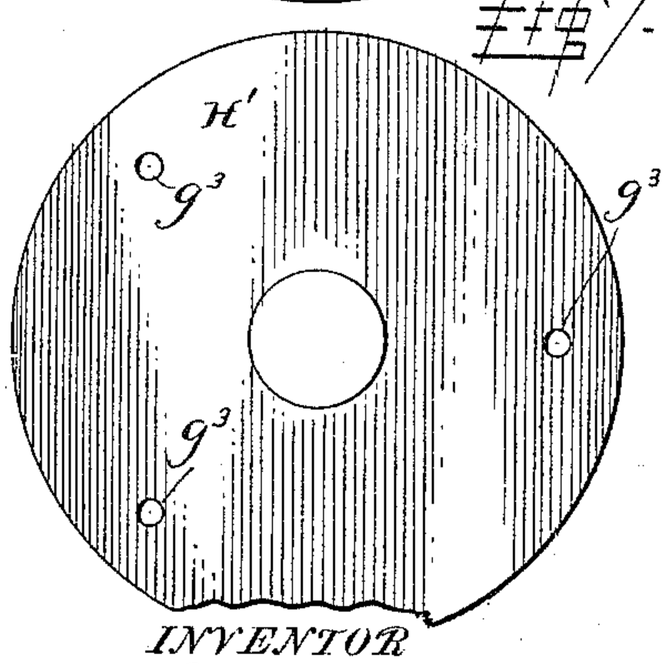


Fig. 7.



WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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DRIVING GEAR FOR VELOCIPEDES.

No. 462,191. Patented Oct. 27, 1891.

Fig. 8.

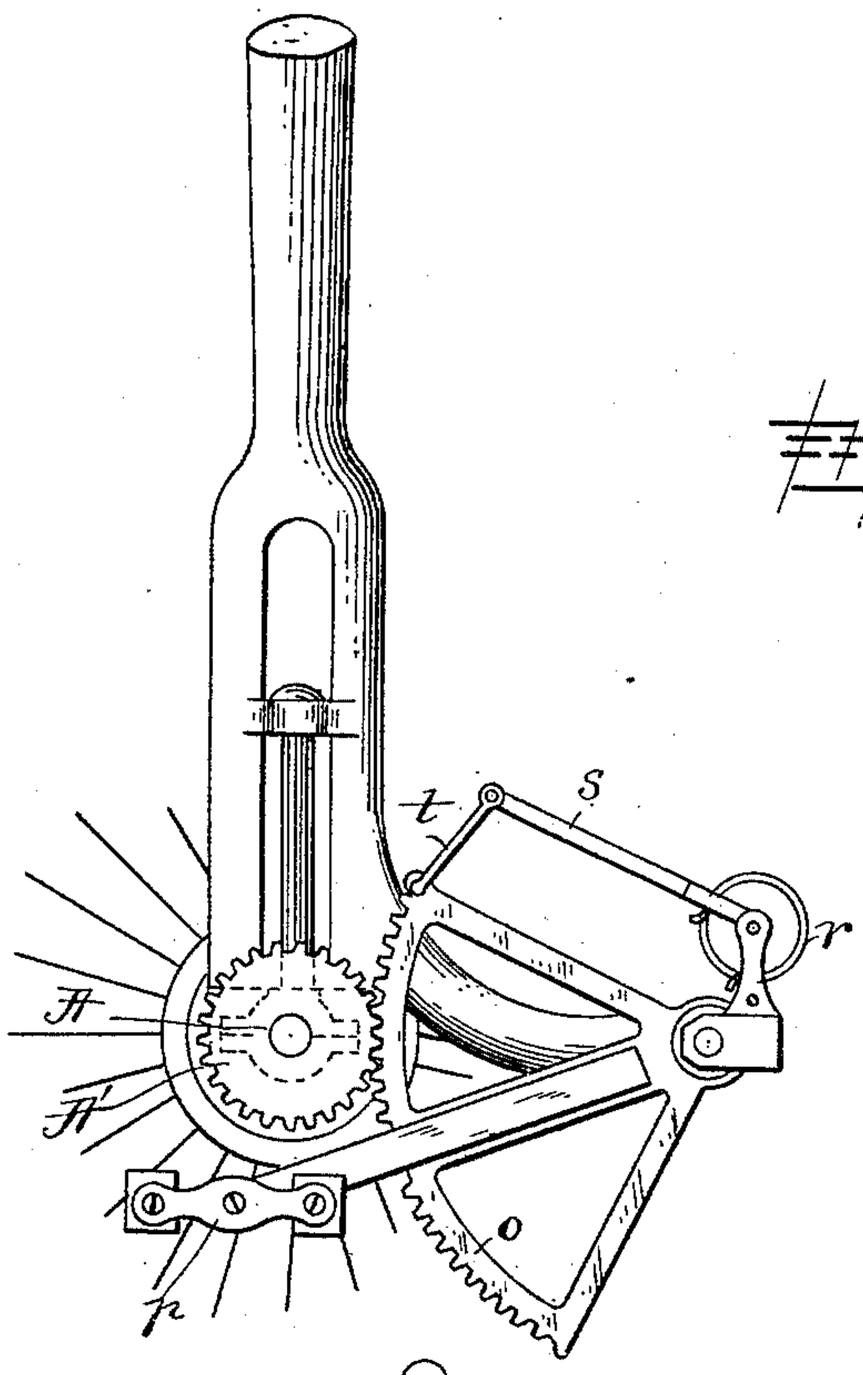

Fig. 9.

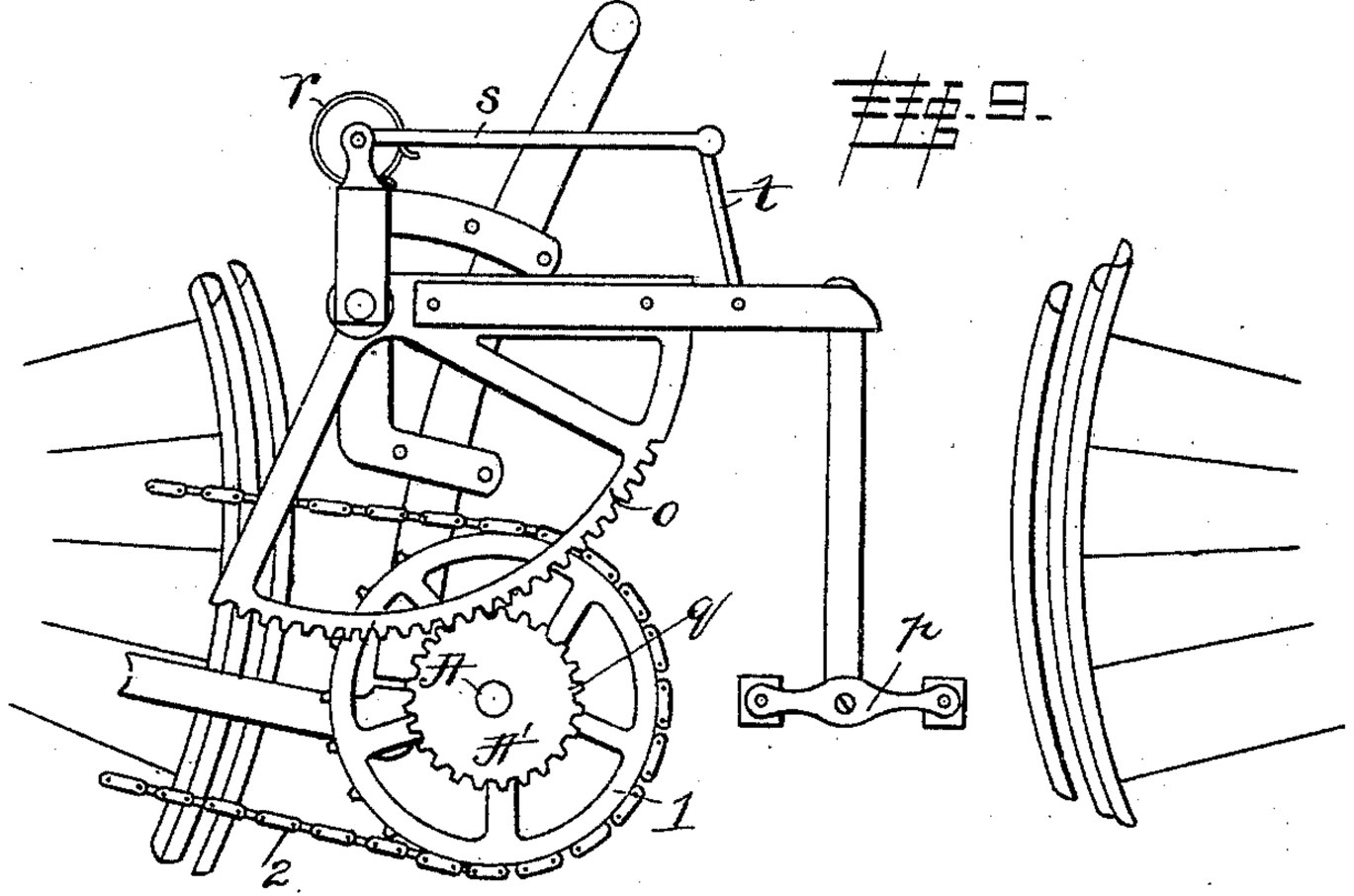

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Fig 10.

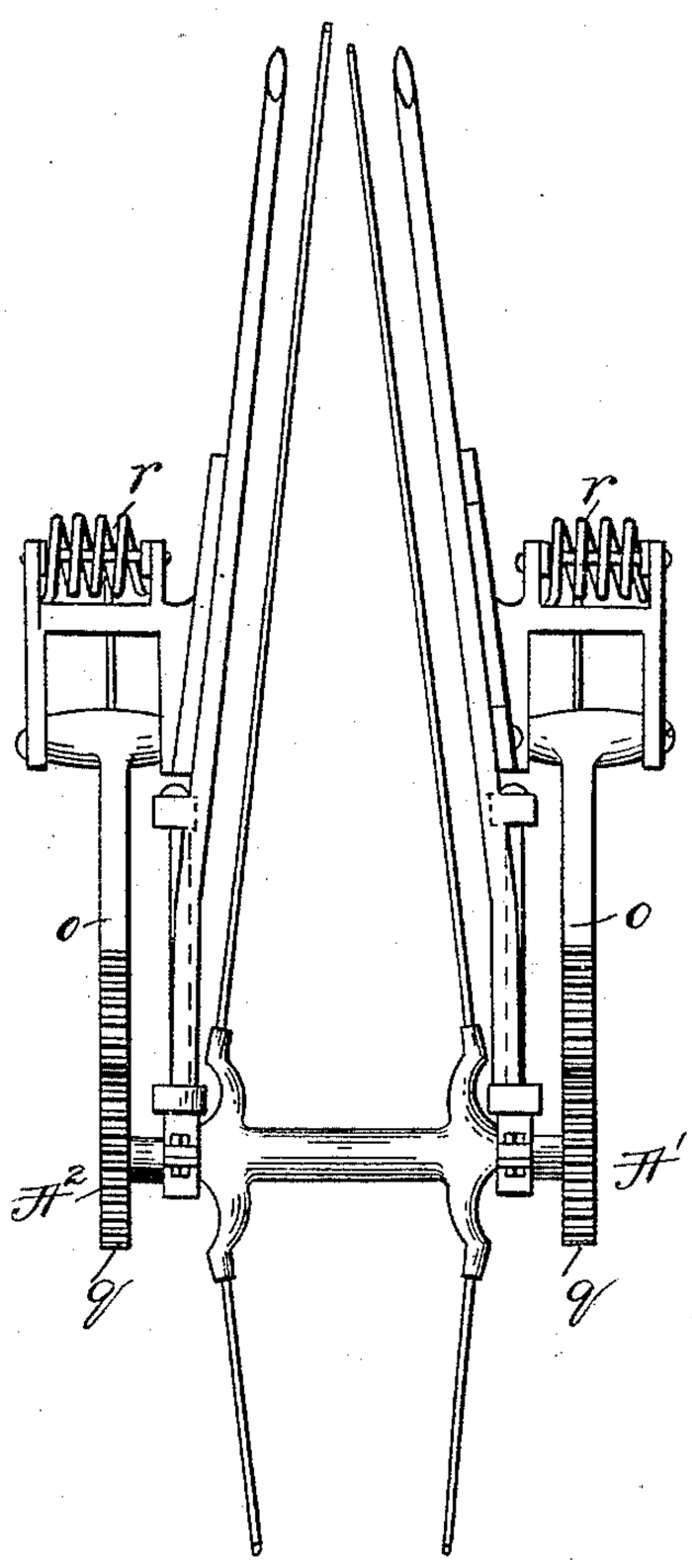
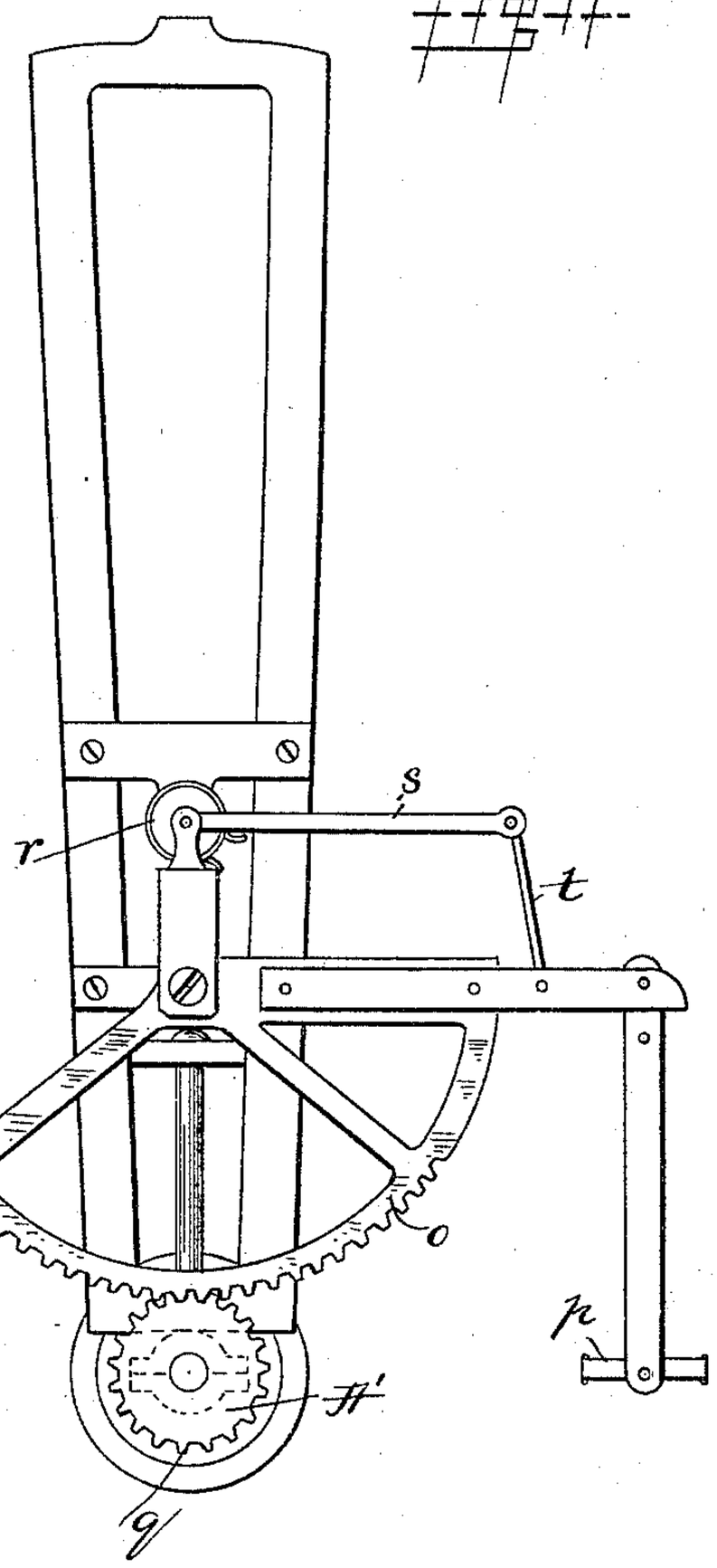


Fig 11.



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UNITED STATES PATENT OFFICE.

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DRIVING-GEAR FOR VELOCIPEDES.

SPECIFICATION forming part of Letters Patent No. 462,191, dated October 27, 1891.

Application filed March 11, 1891. Serial No. 384,640. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. BAKER, of St. Joseph, in the county of Buchanan and State of Missouri, have invented certain new and useful Improvements in Bicycles, Tricycles, or other Treadle-Propelled Vehicles; and I do hereby declare that the following is a full, clear, and exact description of the invention, which 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 letters and figures of reference marked thereon, which form a part of this specification.

The objects of my improvements are in part as follows: to double or nearly double the velocity or momentum with but slight increase of power; to take up all lost motion should any occur; to overcome or neutralize the dead-points; to permit the working with full downward weight or pressure on both treadles at one and the same time, and thus to get up high speed in about half or less than half the time required when working them alternately; to start the machine instantly with such downward pressure on both treadles, and to avoid any movements of the treadles, even when running downhill by gravity, unless when positively actuated by the rider's feet. The means for effecting these ends will be apparent from the following description, aided by the drawings, in which—

Figures 1 to 7 show the driving clutch-wheels, (or parts of the same,) and a pair of which I use in the vehicle applied to the axle of the wheels or to an auxiliary shaft from which the wheels are driven, Fig. 1 being a central section of the two clutch-wheels on a shaft, Fig. 2 one of their outside covering-plates, Fig. 3 the recessed interior ring of one of the wheels, Fig. 4 its inner covering-plate, and Figs. 5, 6, and 7 corresponding parts of the other or fellow wheel. Fig. 8 illustrates sufficient of a vertical-fork bicycle to show the location of the clutches on its axle and in relation to the treadles; Fig. 9, a fragmentary view showing the location of the clutches on a "Safety" chain-bicycle and their relation to the treadles. Figs. 10 and 11 show, respectively, partial side and end views of a Safety bicycle and the location of the clutches thereon.

Referring first to Figs. 1 to 7, A indicates a shaft, which may be made of any appropriate length dependent on the machine on which my invention is to be used.

A′ A^2 represent my improved wheels, both on the same shaft and each constructed as follows: B is a thick circular piece or hub of metal, through the center of which this shaft is passed and to which it is fixedly secured by a pin *c* or by any suitable or equivalent key.

D is a ring provided with a series of equidistant recesses or pockets *e e′*, preferably six in number, cut out from its inner portion. These recesses are all alike, their faces being flat, and they extend through the entire thickness of the ring from one of its sides to the other, and these recesses should be made substantially of the form shown—namely, curved at their broader portion 1, and thence narrowed inwardly, as at 2, or so as to allow the play of cylindrical rollers *f*, whose diameters are less than that of the curved portion 1 and greater than the breadth of the narrow portion 2. The length of the rollers *f* must be slightly less than that of the thickness of the ring D, that they may be free to roll in their recesses *e*, and the part B must also be of lesser thickness than D, in order that it may be free to revolve and thus revolve the shaft.

G is the outer and G′ the inner face-plate or cap, and between which the parts B D and rollers *f*, above described, are situated, as shown in Fig. 1, and g^2 indicates one of a set of screws adapted for the holes g^3, made in the plates G G′ and ring D for firmly securing these parts together. In Fig. 5 the outer plate H is shown without a central boss, (shown at *i* in Fig. 2,) and in Fig. 7 the inner plate G′ is shown without any flange or incline, such as *k* in Fig. 4; but these faces may be of any desired form and the wheels of any desired size, and the perimeter of each completed wheel, when used with cords or belts, may be flat, as in Fig. 1^A, or with projecting flanges, as at 1^B, or with inward inclines, as seen in Fig. 1, or otherwise. When cords or

belts are not used, the rings D are made with cog-teeth on their peripheries. The periphery of B may, as preferred, be smooth, as in Fig. 1c, or roughened, as in Figs. 3 and 5, and this roughening may be of any kind; but when rough it is better that the roughness should be regular and uniform that it may act uniformly on the rollers, somewhat as shown exaggerated in Figs. 3 and 6; but I use no ratchet-teeth and have no ratchet-pawls or pawls of any kind, pivoted or otherwise. The wheel is not worked by friction of the rollers, but by leverage when the rollers are tightly wedged or clamped. By using rollers I get a contact-surface for the whole length of the rollers and the breadth of the recesses, and the adaptation is such that the rollers cannot get displaced or out of position and must always remain with their axis parallel with each other and with the axis of the shaft. If balls were used instead of rollers, they could touch only at a point. The rollers are also liable only to the minimum of wear and are positive and sure in action, even when the part B has a smooth periphery.

Two wheels, substantially as I have described, work together, and they may be either upon the same shaft, as shown in Fig. 1, or each upon its own shaft, as hereinafter stated, their construction being the same and their action the same in either case. The working of one of the foot-treadles on its down motion drives the shaft forward by the action of the rollers *e* of one of the wheels, (say A′,) and at the same time the reacting spring *l*, lever *m*, and link *n*, connected to the segment-gear *o*, allow the rising of the other treadle, causing it to turn the other clutch-wheel A^2 freely backward for an equal distance in the reverse direction. The upward movement of this other treadle performs a similar duty by bringing into position for action the wheel A^2 and reversing the now non-acting wheel A′. Thus the shaft is not only driven continuously by the rocking or swinging action of a treadle, but each of the wheels completely avoids, neutralizes, or overcomes the dead points or centers in the motion of the other; but should any lost motion occur with either it will be taken up by the other, and inasmuch as the segment-gears *o o* have, as shown, teeth sufficient to cause a complete revolution of the clutch-wheels every full downward movement of either treadle insures a complete revolution of the bicycle-wheel while the other treadle is rising and not driving, and thus I attain twice the velocity or momentum ordinarily attainable and without increasing the power and with no additional effort by the operator and without the need of using any intermediate multiplying-gear between the segment and the clutch-wheels or elsewhere.

Another great advantage is that the force or power of both feet may be used at the same time to press downward both treadles at once, and thus a largely-increased velocity of the vehicle is obtained either at starting or afterward, and at starting the speed can be gotten up in less than half the time required when working the treadles alternately, and for the reason that the double power is instantly applied and added to the momentum given; and another great advantage is that when the machine is running while the feet are not operating the treadles—as, for instance, while running downhill or while resting the feet—the treadles remain stationary instead of constantly rising and falling to the rider's great inconvenience, and they thus furnish also a stationary support or foot-rest to the ease of the rider.

It will also be seen that, however small may be the forward movement or turn given to one wheel, the other wheel turns back a corresponding distance, and when its revolution is reversed performs its duty correspondingly, both wheels acting precisely alike but alternately. I have shown six rollers in each wheel, three of which, as will be seen, are always in position for immediate action without loss of motion to bring them into effective service. Fewer rollers, however, may be used in each wheel and successfully, one-half or some of them always in a vertical or upright wheel dropping by gravity into action, while the others roll or fall out of action. The wear of the parts is inappreciable.

With my invention I can start or take up the power at any point instantly at the initial movement of a treadle without losing any motion.

Another advantage due to my invention is that all risk of damage to the machine incident to turning a shaft backward or in the wrong direction is positively avoided, inasmuch as the clutches can revolve the shaft only in the forward direction. In a given time or per minute about twice the number of revolutions of the vehicle-wheels may be made as compared with any other means known to me.

In Fig. 8, A′ represents one of my improved wheels as applied to the axle of that class of velocipedes or bicycles known as "vertical-fork" machines. The toothed vibrating sector or arc *o* is actuated by the treadles *p*, (of which only one need be shown,) and, engaging with the gear *q* on A′, drives the bicycle when either of the treadles is pressed down, and as a similar wheel, like A′, on the opposite side of the axle A would be actuated by the other treadle it will be evident that the action is substantially the same as hereinbefore described. A reacting spring *r* for each treadle bearing upon lever *s*, which is connected by a link *t* to the sector *o*, serves to reverse the motion of the sectors to raise the treadles, and thereby by means of the sector-teeth to reverse the rotary movement of the clutches prior to their next forward and propelling action.

In Fig. 9 the clutch-wheels A′ A^2 (one only of which need be there shown) and their shaft A are located between the treadles and

axle of one of the vehicle-wheels of the Safety chain-bicycle, the sprocket-wheel 1 communicating the motion to the vehicle-wheel through the chain 2, the reacting spring *r*, lever *s*, and link *t* performing the same duties, as stated, with regard to Fig. 8.

In Figs. 10 and 11 one of the clutch-wheels is shown at each end of the carriage-axle, the treadles, reacting spring, lever, and link acting as in Figs. 8 and 9.

Should it be deemed necessary in any machine to which my invention is applied to convert the increase in velocity into a corresponding increase of power, it can be accomplished by simply increasing the diameters of my clutch-wheels, so as to give an increase of leverage in the same proportion as the diameter of said wheels is increased. The effect of this change would be that the wheels would not in such case describe a complete revolution forward and backward at each stroke of their respective treadles, but only a part of a revolution proportioned to the circumference of the wheel and the length of treadle-stroke; but the loss in velocity would be converted into power. In other words, by changing a wheel three inches in diameter into a wheel six inches in diameter, while retaining a treadle-stroke of nine inches, I would obtain but one-half a revolution at each stroke; but, the leverage being double, I would obtain twice as much power at the expense of velocity.

I claim—

1. In bicycles, tricycles, or other foot-propelled vehicles, the combination, with the treadles and with a pair of vibratory toothed segments actuated thereby, of two clutch driving-wheels, each having its own small exterior gear provided with no more teeth than those of the segment and having an interior hub with a roughened periphery acted upon by the inward pressure of smooth rollers, and the two wheels jointly but alternately serving to drive the vehicle with a steady continuous motion, substantially as set forth.

2. In combination with the treadles, vibratory toothed segments, and vehicle-axles, two driving clutch-wheels, each composed of an interior hub having a rough periphery, an unattached ring surrounding such hub and provided with the described recesses, a set of cylindrical rollers located in such recesses and acting inwardly upon the roughened periphery, and suitable plates serving to confine the rollers and hold the ring to place, both wheels adapted to act conjointly but alternately on their shaft or shafts and imparting thereto and to the vehicle-shaft a continuous steady rapid rotary motion, all substantially as set forth.

3. In combination with the vehicle-axle and with the treadles, the toothed segments and the driving-clutches constructed with rollers acting from without inwardly upon a hub secured to the shaft, as shown and described, the reacting spring, lever, and its link connected to the treadles and sector, all substantially as and for the purposes set forth.

4. In a Safety bicycle, a clutch-wheel-driving mechanism combined with and placed directly on the axle of the sprocket-wheel and with a segment-gear actuated by the treadle and engaging with gear on said axle, substantially as set forth.

5. In combination with the axle of the sprocket-wheel of a Safety bicycle, a clutch mechanism composed of a hub secured on said axle and having a roughened periphery, a ring surrounding the same and having narrowing recesses in its inner perimeter, a set of rollers lodged in such recesses and acting by inward pressure upon the roughened periphery of the ring, suitable plates inclosing the rollers and ring, and an exterior gear on the ring, all substantially as set forth.

6. In combination with the axle of the toothed driving-segment, a reacting spring connected to a bracket outside of the axle, and a link *t*, attached to the segment, all substantially as and for the purposes set forth.

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Witnesses:
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HORACE WYNDHAM.