(No Model.)

3 Sheets—Sheet 1.

A. E. WALLACE.

TRICYCLE.

No. 284,782. Patented Sept. 11, 1883.

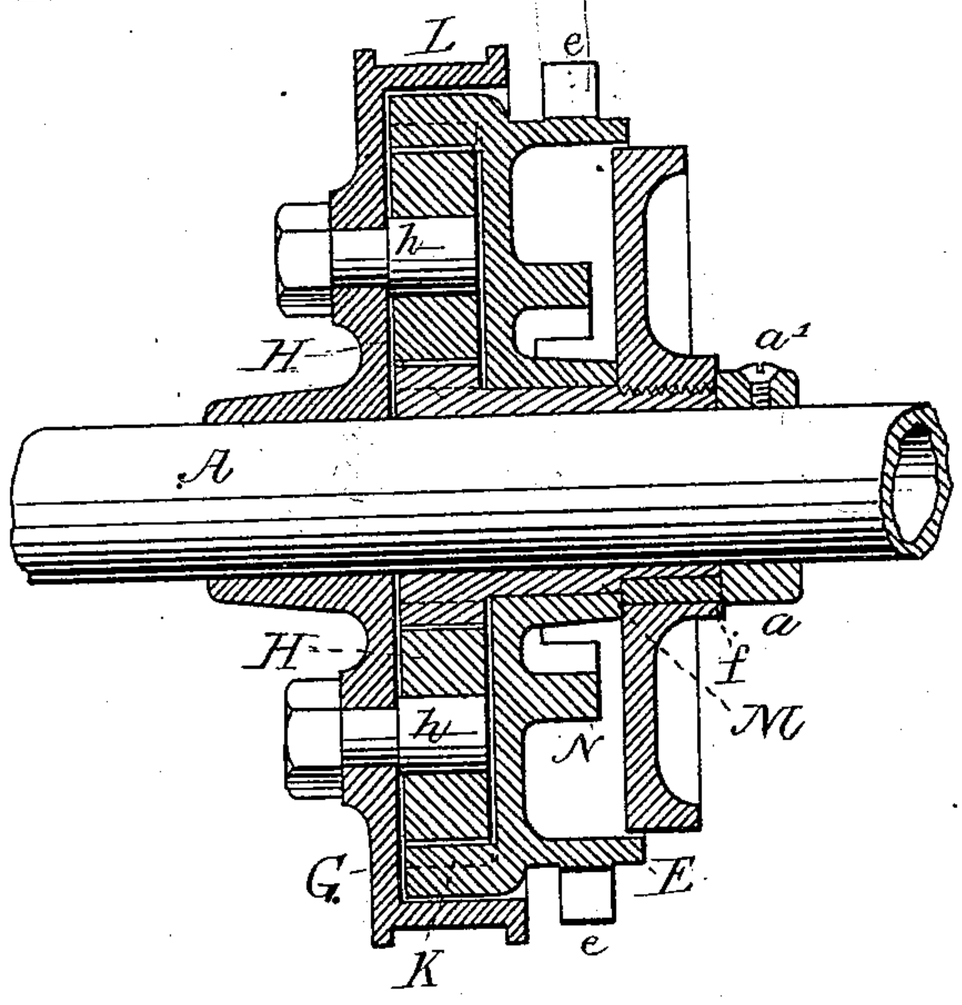

Fig. 1.

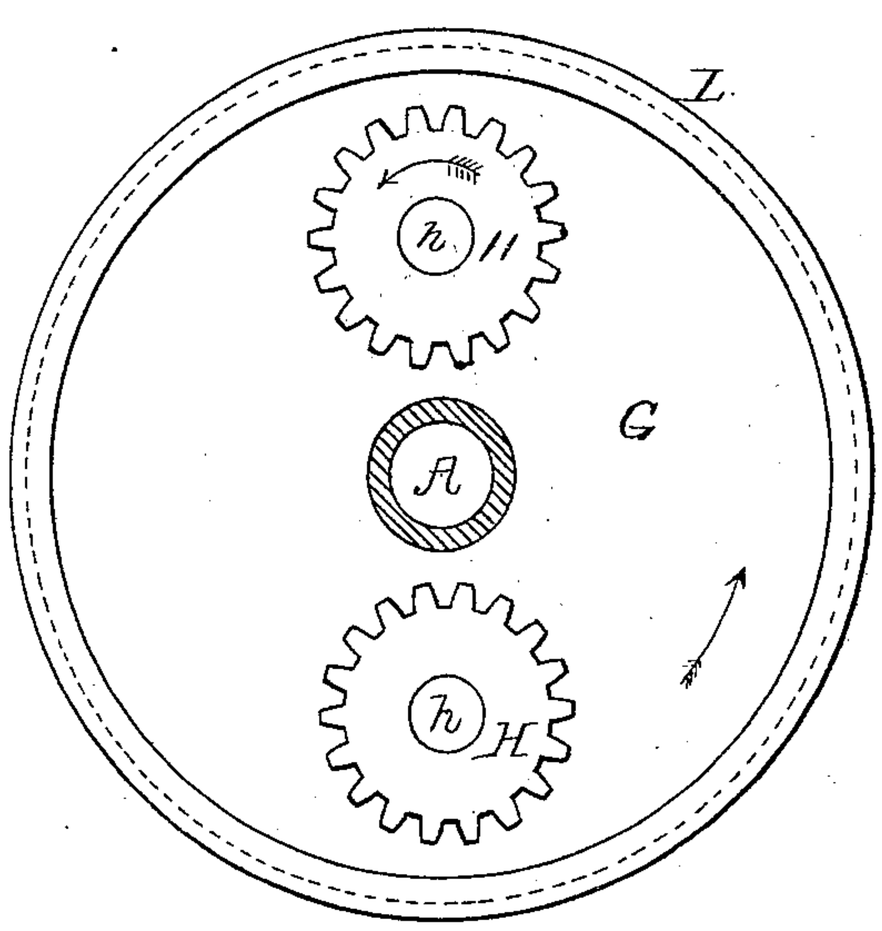

Fig. 2.

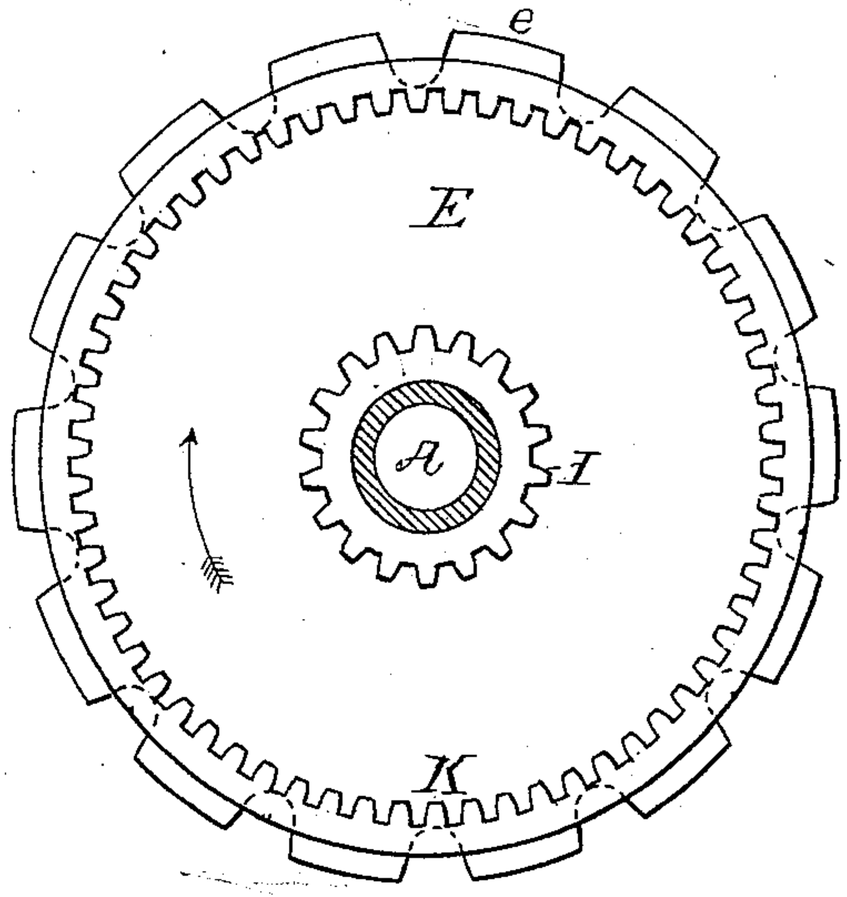

Fig. 3.

WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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TRICYCLE.

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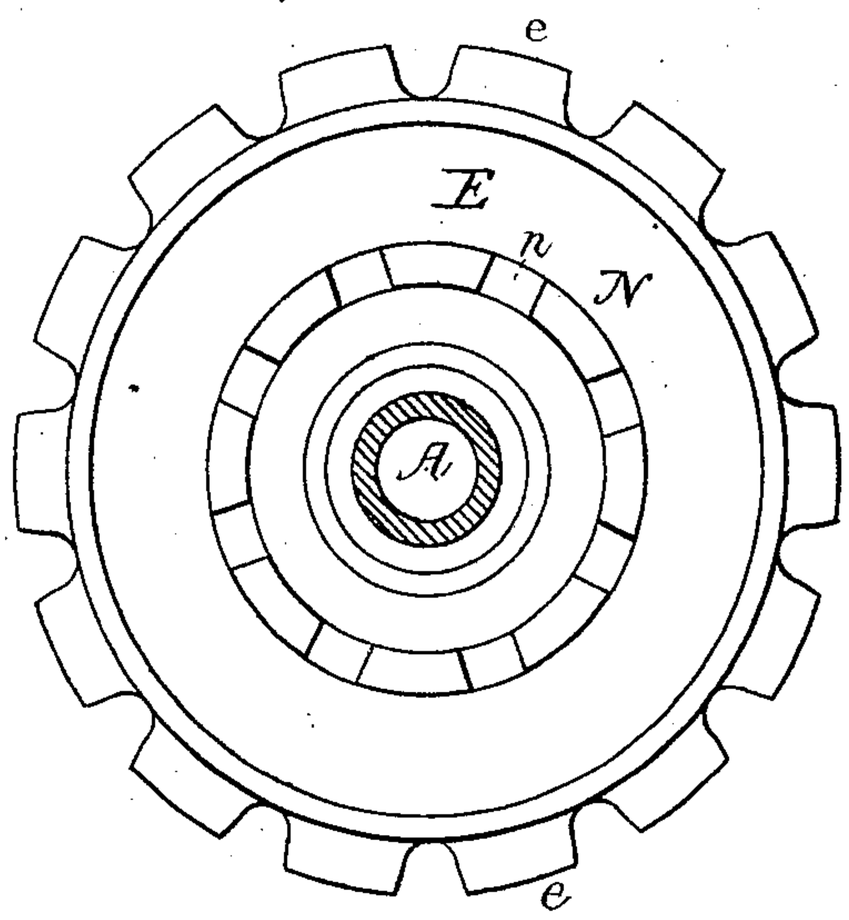

Fig. 4.

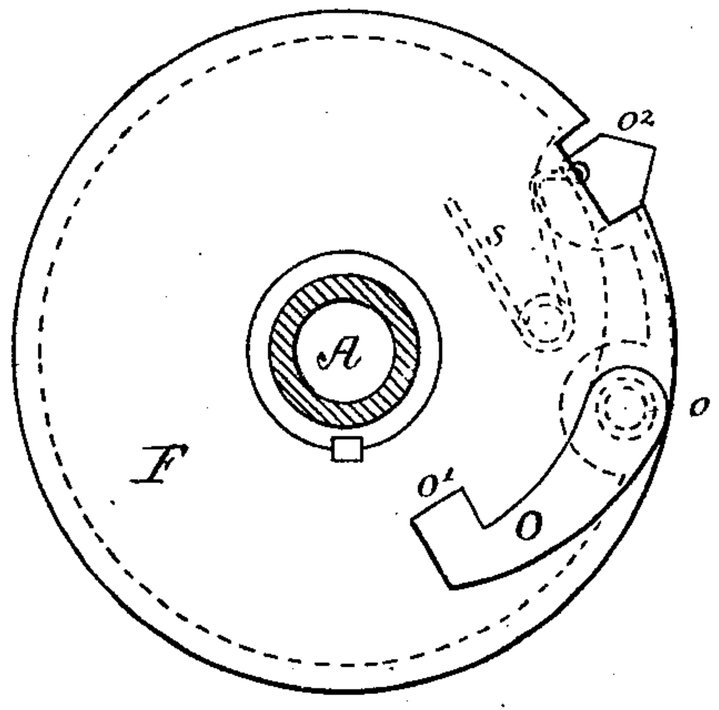

Fig. 5.

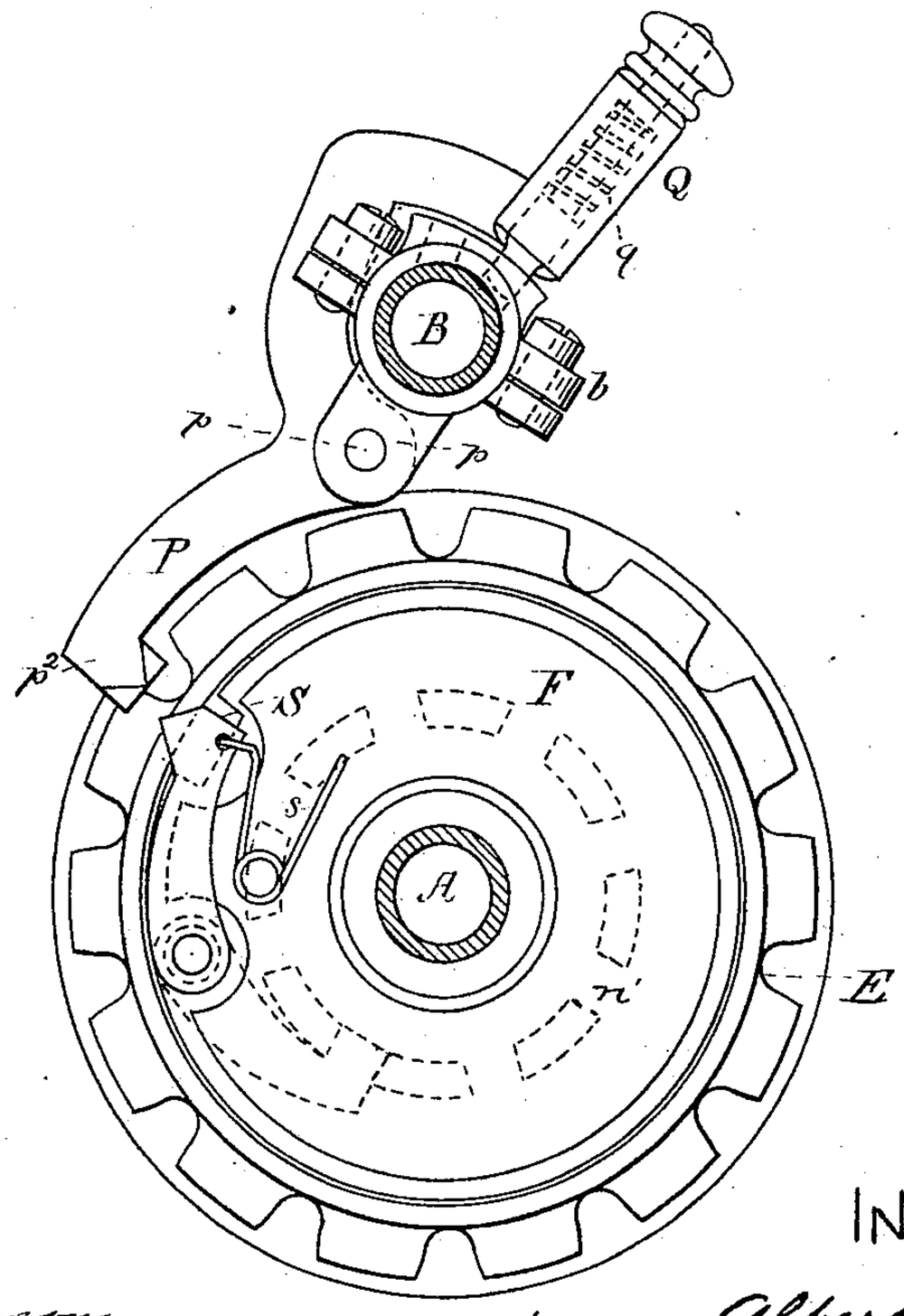

Fig. 6.

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TRICYCLE.

No. 284,782. Patented Sept. 11, 1883.

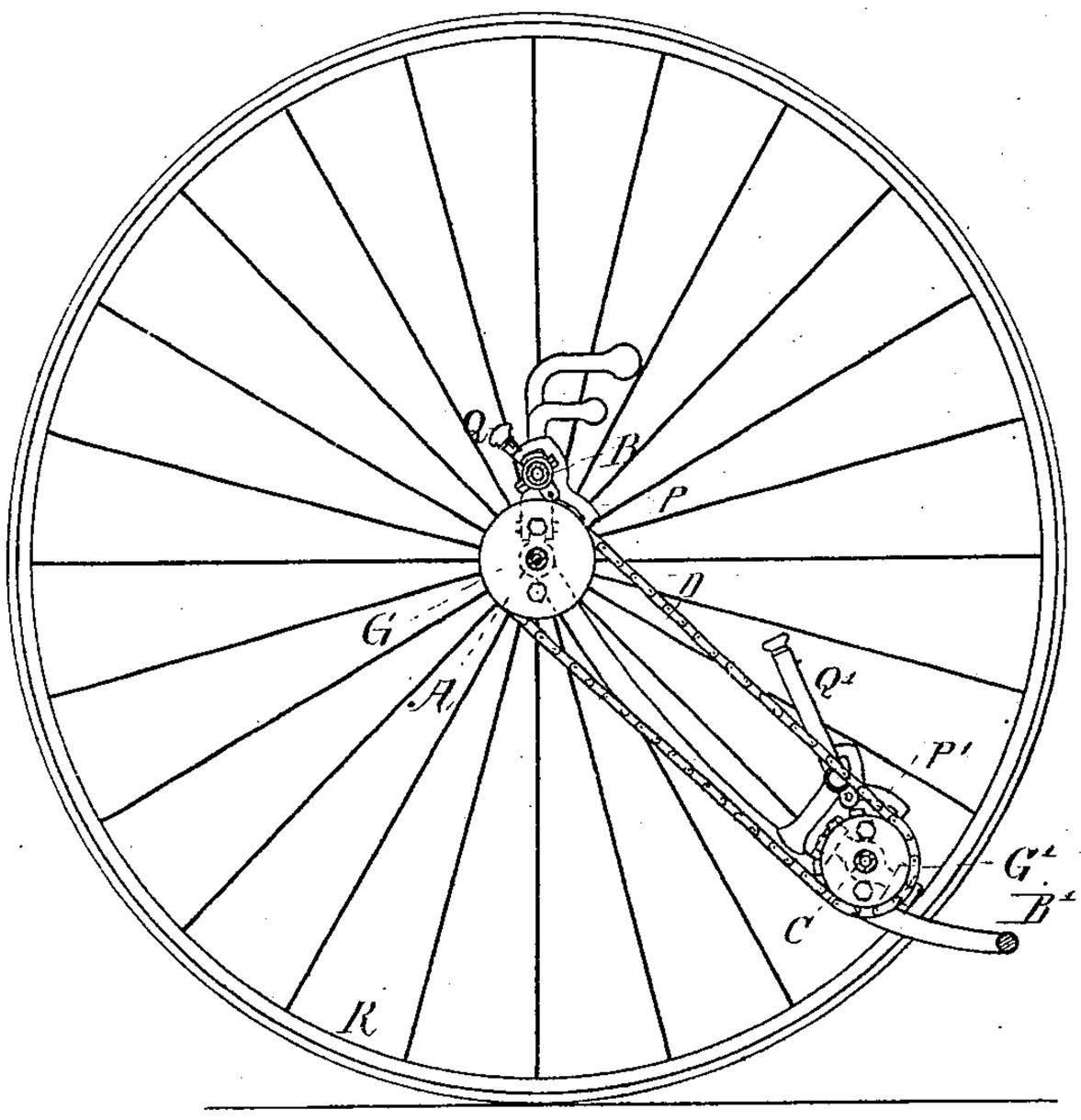

Fig. 8.

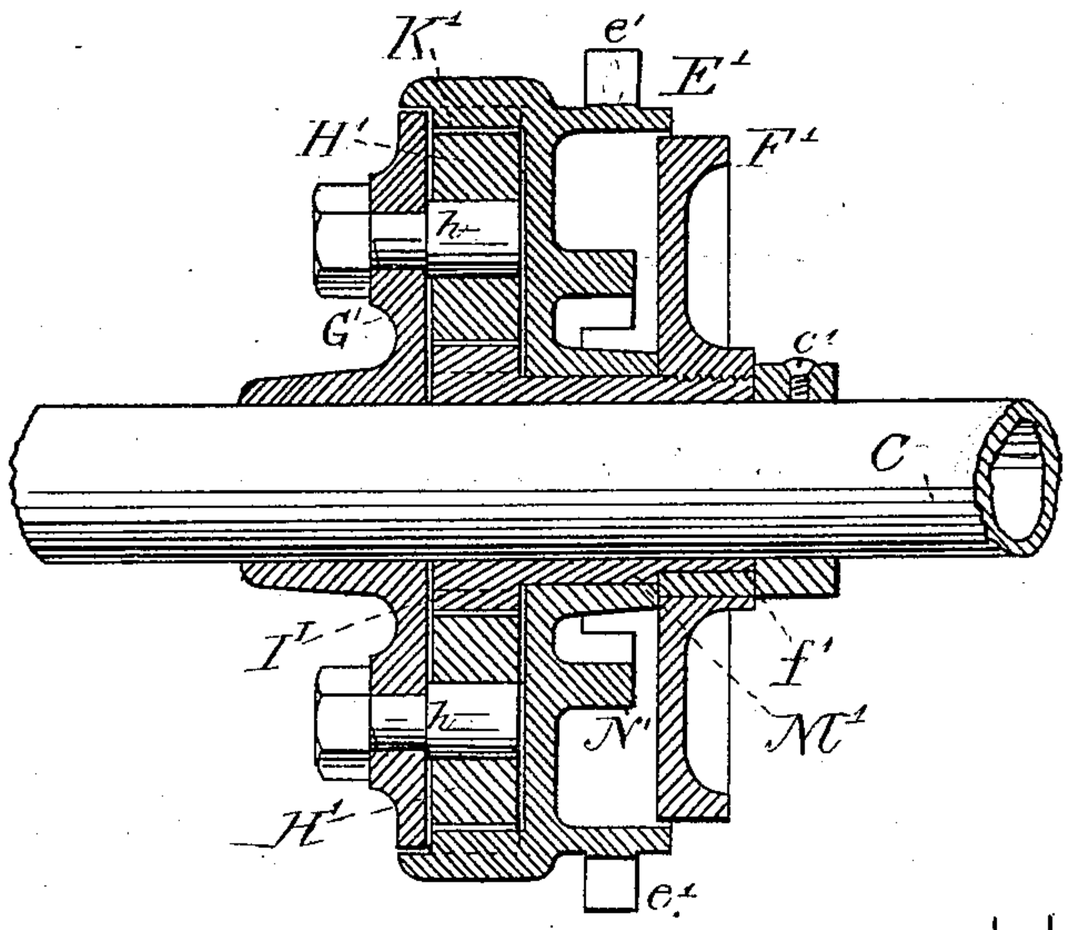

Fig. 7.

WITNESSES

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UNITED STATES PATENT OFFICE.

ALBERT E. WALLACE, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE POPE MANUFACTURING COMPANY, OF SAME PLACE.

TRICYCLE.

SPECIFICATION forming part of Letters Patent No. 284,782, dated September 11, 1883.

Application filed April 30, 1883. (No model.)

To all whom it may concern:

Be it known that I, ALBERT E. WALLACE, of the city of Hartford, and the State of Connecticut, have invented certain new and useful Improvements in Velocipedes, of which the following is a specification.

My improvements relate particularly to that variety of velocipedes known as "tricycles," though they are applicable to other varieties, and have for their object to enable the rider of such velocipedes to gain either more or less than one revolution of the main shaft or driving-wheel for each revolution of the crank-shaft, or for each complete foot movement; or, expressed in a different way, the object of my improvements is to make the leverage between the application of the power of the rider and the surface of the road variable at the option of the rider, so that he may exchange power for speed on level and down grades, and speed for power on rough roads and upgrades. Hence my contrivance may be classed with those devices sometimes denominated "two-speed gears." Heretofore this object has been sought in velocipedes by devices having drums of two different diameters on the main shaft, with straps connecting them with pedal levers; and also by devices containing toothed wheels of different diameters on the main shaft, and a toothed wheel on the crank-shaft, with two intermediate toothed wheels or open wheels meshing one in the wheel on the crank-shaft and both in the wheels on the main shaft, the operating-wheel on the main shaft being determined by the movement of a spline and feather; and also by devices containing two toothed wheels on the main shaft and two toothed wheels on the crank-shaft connected by two chains, and the operative wheel on the main shaft determined by the movement of a disk with pins projecting from it through another disk and into one or the other of the toothed wheels on the main shaft. With these devices only two speeds or two variations of leverage are practically obtainable, and they require considerable additional weight to the machine, and either two chains or two sets of gear-wheels, or two drums with additional mechanism for their operation; and besides the addition of weight, they involve space and surface in the machine, and divers inconveniences and uncertainties of operation.

In designing my improvements I have sought to avoid the inconvenience and overcome the difficulties found in other devices, and to produce a simple, compact, and certain variable speed attachment for the main shaft or for the crank-shaft, or for both, (for with the modifications herein pointed out my device may be used in either of these three combinations with the other parts of the velocipede,) which may be operated by a single driving-chain or any other usual driving mechanism, the same as if the machine were constructed as a single-speed one, and in which the variable-speed mechanism shall be covered, add little to the weight, and be convenient in its adjustment.

The nature of my improvements will be more fully apparent from the following description and the accompanying drawings, in which—

Figure 1 shows in vertical section a contrivance embodying my improvements, or a part of them, in connection with an axle and a chain-wheel. Figs. 2 and 3 are inside views, in elevation, of the same, thrown apart, looking to left and to right, respectively. Fig. 4 is an inside view of the chain-wheel with part of my improvements, looking to the left; and Fig. 5 is an inside view of the disk adjustment to the chain-wheel, looking to the left. Fig. 6 is an end elevation of the same parts shown in Fig. 1, looking to the left, and also of other parts of my improvements in connection with a part of the frame of a velocipede shown in section. Fig. 7 shows in vertical section on a shaft a part of my improvements represented in Fig. 1, but in a modified form; and Fig. 8 shows in section part of one form of a tricycle embodying my improvements, with end elevation of driving-wheel and chain-wheel and chain.

A is a shaft or axle, which may be the main shaft of a velocipede, and so a driven shaft.

B is a part of the main frame of a velocipede, of which B′ is another part connected therewith.

C is a shaft, which may be a crank-shaft of a velocipede, and so a driving-shaft.

The shafts A and C may have any ordinary

bearings and connections with the frame B B′ of the velocipede.

D is a driving-chain.

E E′ are wheels having teeth *e e e′ e′* on their peripheries, which are connected by a chain, D, and may be called "chain-wheels.

F F′ are disks threaded and keyed to the sleeves M M′, respectively.

G G′ are disks fixed on the shafts A and C, respectively.

H H and H′ H′ are toothed wheels free to revolve on pinions *h h h′ h′*, and attached to the disks G G′, respectively.

I I′ are toothed wheels attached to or made part of the sleeves M M′, respectively.

K K′ are annular gears or internally-toothed flanges attached to or projecting from the chain-wheels E E′, respectively.

L is a flange to the disk G, presenting a cylindrical exterior surface for a band-brake.

The sleeves M M′, to which the disks F F′ are threaded and attached by the splines *f f′*, and to which also the toothed wheels I I′ are attached, are freely fitted on the shafts, and may have any ordinary bearings thereon, and are held in place by the collars *a* and *c* and screws *a′* and *c′*.

N N′ are internal flanges on the chain-wheels E E′, having recesses *n n′* cut therein.

O is a pawl or lever hinged at *o*, and having the click *o′* at one end and the catch or beveled click o^2 at the other end, the lever O being shown in this contrivance in two parts, one on either side the disk F, and connected and hinged thereto by a pivot, *o*.

P is a lever or pawl pivoted at *p* to a bracket, *p′*, attached by clamps *b*, or otherwise, to the frame B, and having the click p^2 at one end, and connected at the other end with a handle, Q.

q is a spring in the handle Q.

R is a driving or main wheel of a velocipede axled on a shaft, A, and connected so as to revolve therewith.

s is a spring attached to the disk F and operating upon the pawl O.

The operation of my improvements embodied in the form shown and described is as follows: The handle Q, being placed in the position shown in Fig. 6, detains the pawl P, with its click p^2, disengaged from the recess S in the disk F, and from the click or spur o^2. The pawl-lever O is forced upward at one end by the spring *s*, and the catch or click *o* is thereby depressed into one of the recesses, *n*, in the flange N, whereby the disk F, the wheel E, the sleeve M, the concentric spur-wheel I, and the annular gear K are held in constant relative positions. Now, the chain D, being operated by the revolution of the crank-shaft C and the chain-wheel on it, (disregarding for the moment the speed attachment,) causes the wheel E and all the parts in constant relative position with it to revolve in the same direction as the chain is moving, and the intermediate spur-wheel is held from revolving on its pinion by the constant relation of the annular gear and the concentric spur-wheel I, the intermediate gear, and its pinion *h* and the disk G, and therefore the axle A, to which the disk is fast, are caused to revolve directly in the same direction and at the same speed. If, now, while the chain is operating as before the rider pulls slightly the knob on the handle Q, releasing the stud at the lower end from the slot in which it is shown in Fig. 7, and moving the handle Q forward or to the left in the figure until the stud drops in the other slot, (shown by dotted line,) and is held there by the spring *q*, the pawl P will be moved so that its click or catch p^2 will engage in the recess S in the disk F, and hold the disk F from revolving, and also hold from revolving the sleeve M and the concentric spur-wheel I, the pawl P, with its catch and its pivot *p*, and the bracket *p′* and the clamp *b*, making a fast connection with the frame B. At the same time that the catch p^2 engages in the slot S, it depresses the spur o^2 and raises the pawl O, releasing its catch *o′* from the recess in the flange N. The operation of the chain now is to cause revolution of the wheel E and the annular gear K to revolve on the sleeve M and to communicate motion to the intermediate spur-wheel, H; and as the motion of the spur-wheel H is in the direction of the movement of the chain and wheel E at its outer periphery, it would tend to revolve on its pinion *h*, and to move in the opposite direction at the inner part of its periphery. This latter action, however, is prevented by its being trigged by the concentric spur-wheel, and the intermediate gear not only revolves on its pinion, but travels about the concentric spur-wheel, carrying its pinion and the disk G, and therefore the axle A, with it; but as the operation described permits a revolution of the intermediate gear on its axis for every revolution of the wheel E, the travel of the pinion *h* is slower than the travel of the wheel E, and the parts thus described in operation act as a reducing-speed gear.

I have shown this contrivance as applied to the main shaft of a tricycle and as a reducing-gear, and with the annular gear formed as a part of the chain-wheel E; but the parts may be modified in respect to form, may be applied to any other shaft as well as that of a tricycle, may be applied exactly as described to the crank-shaft, (where, however, in this form it would act as an increasing-speed gear,) or one part of it may be attached to the hub of the main wheel, or the intermediate spur-wheel may be pinioned to the wheel E and the annular gear connected with the disk G, so as to make it an increasing-speed gear, and other modifications may be made without departing from the spirit of my invention, so that I do not limit myself to the precise form shown in the drawings. It is obvious, too, that instead of a driving-chain connecting the large spur-wheels E E′, an intermediate gear may be used, or a belt or other transmitting device.

In Figs. 7 and 8 a similar mechanism and a similar operation to that last described are shown, where a differential-speed gear embodying my improvements in part, in one form, is shown attached to the crank-shaft or driving-shaft of the velocipede. When the handle Q is in the position as shown in Fig. 8, the pawl P engages with the disk F′, and frees the pawl exactly like O′ within the wheel E′, and allows the latter pawl to hold the parts F′ E′ M′ I′ K′ in the same relative positions. When power is then applied to the shaft C, by means of foot-cranks or otherwise, causing the shaft C to revolve, the fixed disk G′ is also caused to revolve with it, causing the pinion *h*′ to travel; and as the pinion H is prevented from revolving on its pinion H′ by its engagement with the annular gear K′ and the concentric gear I′, these parts and the chain-wheel E′ are caused to revolve or travel with the disk G′ at the same speed. If, now, the handle Q′ is moved so as to engage the pawl P′ with the disk F, and the pawl similar to O inside the wheel E′ is disengaged from the flange N′, then the parts F′, M′, and I′ are held by connection with the frame B′ from revolving at all, and the revolution of the shaft C and the disk G′ causes the pinion *h*′ to travel as before; but the intermediate gear, H′, is trigged at its inner edge by the concentric gear I′, around which it travels once for each revolution of the disk G′, but in traveling the outer edge of the spur-wheel H′ is caused to move faster than the disk G′, and so the wheel E′ is caused to revolve faster than the shaft C, and the device operates as an increasing-speed gear.

By using in the same tricycle both these attachments, as shown and described, I am enabled to get four different rates of speed of the shaft A, with the same rate of speed of the shaft C, when K and K′ or H and H′ have different diameters, by simply moving one or both of the handles Q Q′. If the wheels E E′ have the same number of teeth, and the main wheel R be fifty inches in diameter, and the annular gear K have sixty-two teeth, and the intermediate spur-wheel, H, have eighteen teeth, and the annular gear K′ have ninety-three teeth, and the intermediate spur-wheel, H′, have eighteen teeth, (or the annular gear K′ have sixty-two teeth and the intermediate spur-wheel, H′, have twelve teeth,) then I have the following rates of speed: With the pawl P disengaged and the pawl P′ engaged, the tricycle would run as a 59.5 inch driver; with both pawls P P′ disengaged it would run as a fifty-inch driver; with both pawls P P′ engaged it would run as a 42.25 inch driver; with the pawl P engaged and the pawl P′ disengaged it would run as a 35.5 inch driver. A variation in speed or power may also be made by varying the relative diameters of the wheels E and E′. If, for instance, I have the wheel E with fourteen teeth and the wheel E′ with thirteen teeth under the same construction and relative positions as before, I should have the tricycle run as a 55.3 inch driver, 46.5 inch driver, 39.3 inch driver, and thirty-three inch driver, respectively.

It is obvious, also, that by making wheel E′ of larger diameter than the wheel E, and by reversing the adjustment of the pinion H′ and the annular gear K′, so as to make the lower variable-speed-gear attachment operate as a reducing-gear also, I may still have four speeds, and have the highest speed with both pawls disengaged; also, that any other relative speeds may be obtained by varying the proportions of the parts as above indicated.

It is also obvious that the parts shown in Fig. 1 will operate as a reducing or an increasing gear, according as the moving force is applied at the chain or at the shaft.

I claim as new and of my invention—

1. Combined with a chain-wheel or other power-transmitting device in a tricycle, a shaft and a disk fixed thereon, a concentric spur-wheel, an annular gear, an intermediate spur-wheel, a pawl locking the concentric spur-wheel with the chain-wheel, and a pawl detaining the concentric spur-wheel from revolving, with devices for actuating said pawls alternately.

2. The combination of chain D, wheel E, with teeth *e*, sleeve M, disk F, flange N, with recess *n*, pawl O, click *o*′, annular flange K, wheels H I, pinion *h*, and disk G, constructed and adapted to operate together in a power-transmitting mechanism, essentially as set forth.

3. The combination of chain D, wheel E, with teeth *e*, annular gear K, intermediate gear, H, with pinion *h*, disk G, concentric gear I, sleeve M, pawl-disk F, pawl P, and click p^2, constructed and adapted to operate together in a power-transmitting mechanism, essentially as set forth.

4. The combination, in a tricycle, essentially as set forth, of an epicyclic train connected with the main shaft A and wheel R, operating as a variable-speed gear, and of another epicyclic train connected with the driving-shaft C, and operating as a variable-speed gear, and of connecting transmitting devices and shifting-pawls, all constructed and adapted to operate to produce one or more variations in the relative rate of speed of said shafts, substantially as shown and described.

5. In combination, in a velocipede with a variable-speed attachment containing a fixed disk and a free disk, an annular gear connected with one of the disks and an intermediate gear connected with the other disk, and a spur-gear concentric with and free upon the shaft on which the attachment works, one or more projections and recesses on one of said disks, a movable pawl and click O *o*′, pivoted on a part, F, connected with a sleeve and the concentric gear, and means for freeing and engaging said pawl, whereby said disks and the concentric and annular gears are made to revolve together or allowed to move independently, substantially as described.

6. In combination, in a velocipede with an

epicyclic variable-speed attachment, a movable pawl and click P p^2, connected with the frame of the velocipede, and means for engaging and disengaging said pawl with a part of said attachment, whereby the concentric spur-gear may be held from revolving or allowed to revolve with the fixed disk, and for holding said pawl in either position, substantially as set forth.

ALBERT E. WALLACE.

Witnesses:
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