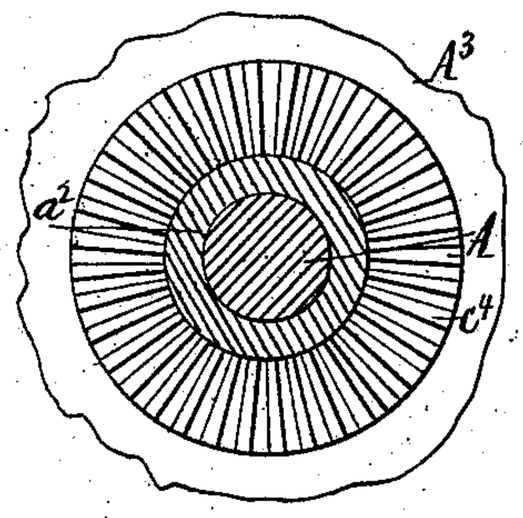
(No Model.) 3 Sheets—Sheet 1.

E. G. LATTA.

BICYCLE.

No. 294,640. Patented Mar. 4, 1884.

Fig. 2.



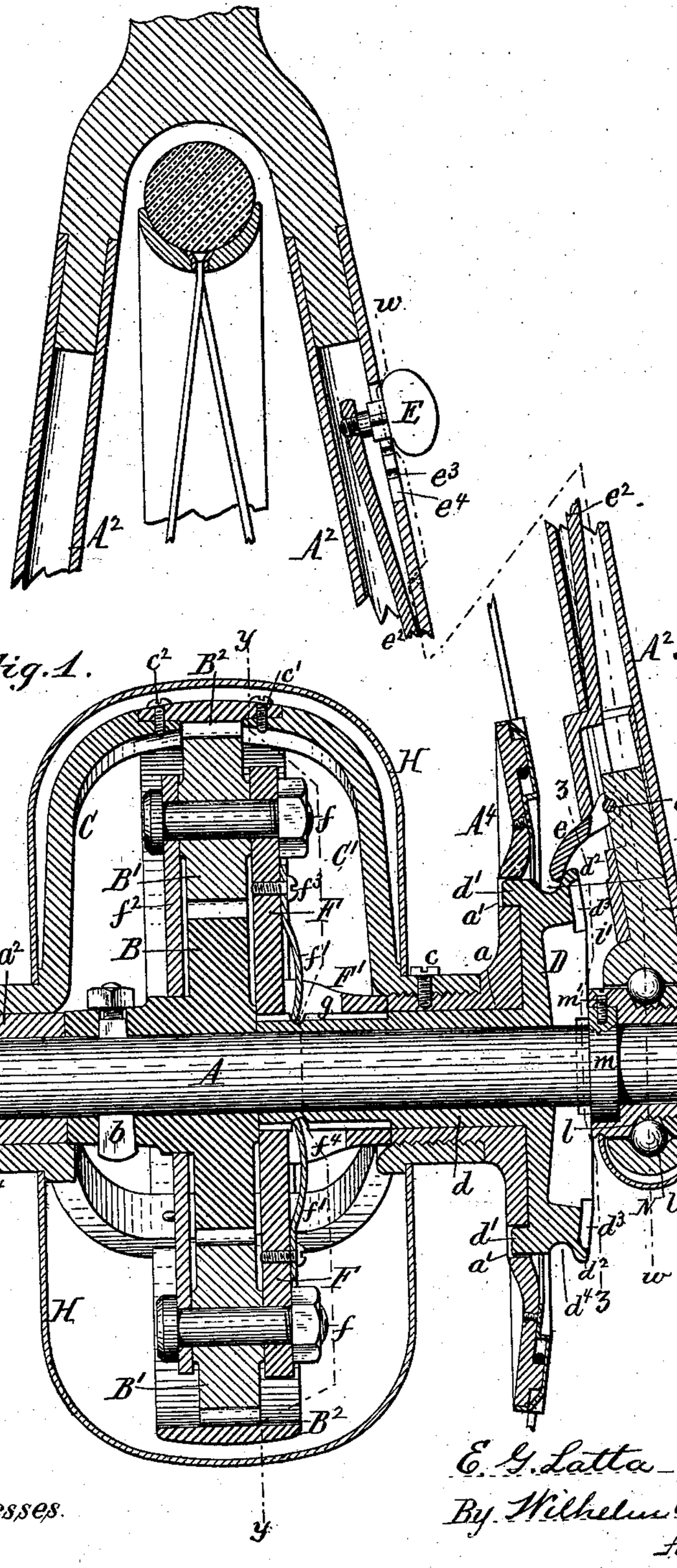


Fig. 1.

Witnesses.
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(No Model.) 3 Sheets—Sheet 2.

E. G. LATTA.

BICYCLE.

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Fig. 4.

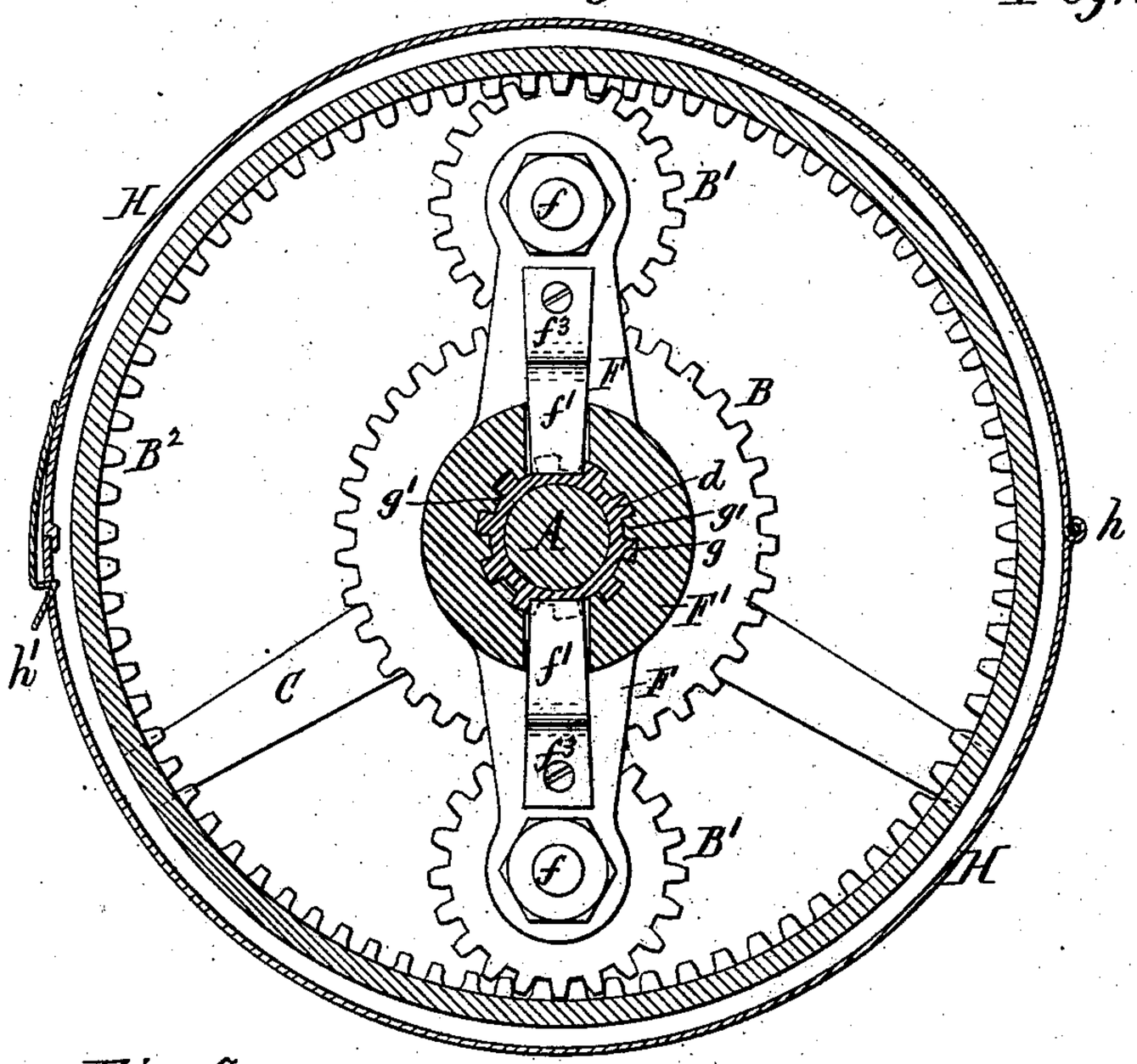


Fig. 6.

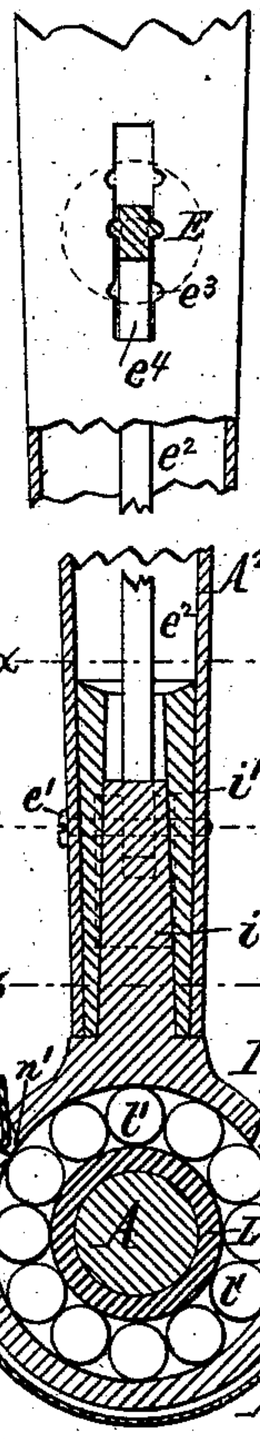


Fig. 5.

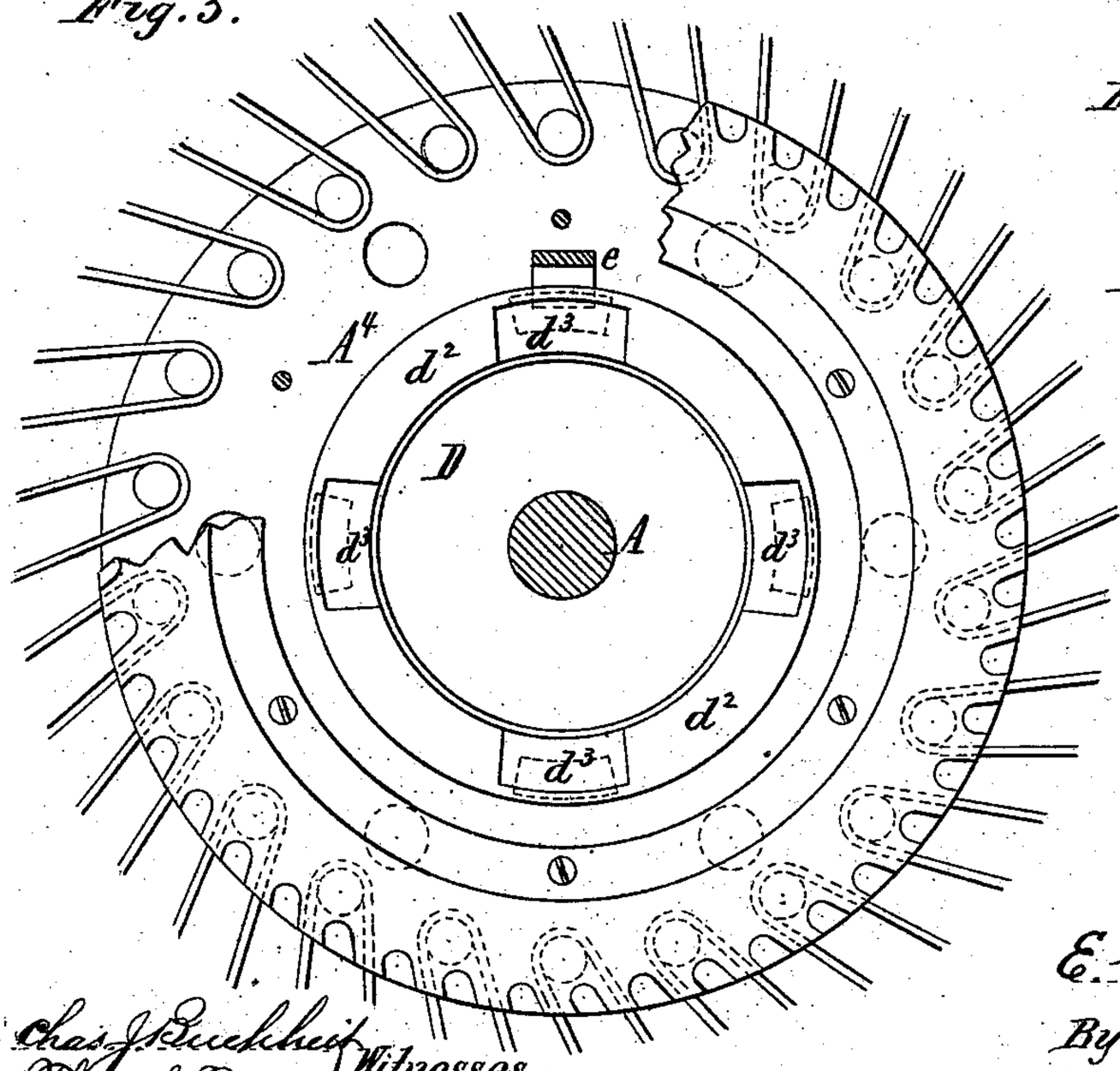


Fig. 7.

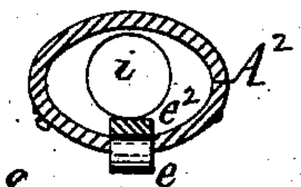


Fig. 8.

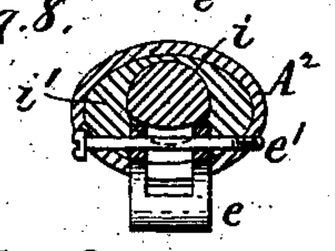
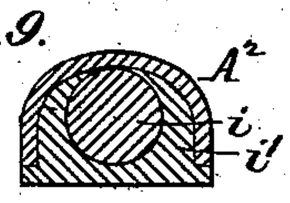


Fig. 9.



Chas. J. Buckheit
Theo. L. Popps. } Witnesses.

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(No Model.) 3 Sheets—Sheet 3.

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BICYCLE.

No. 294,640. Patented Mar. 4, 1884.

Fig. 10.

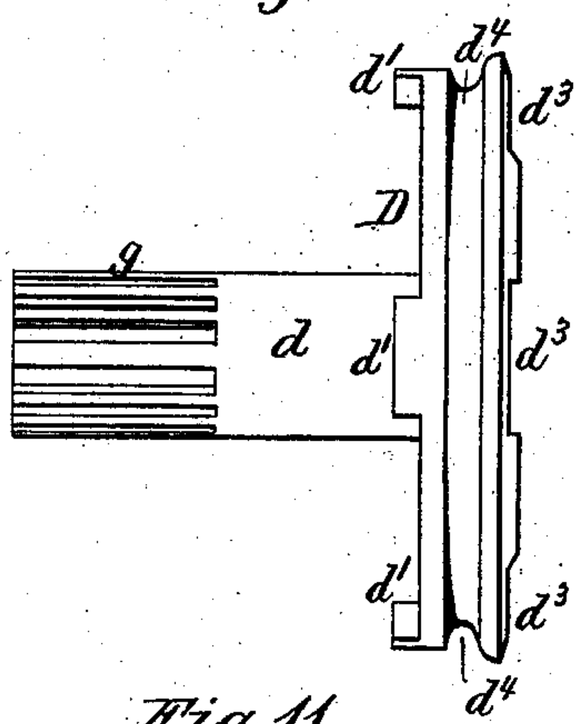


Fig. 11.

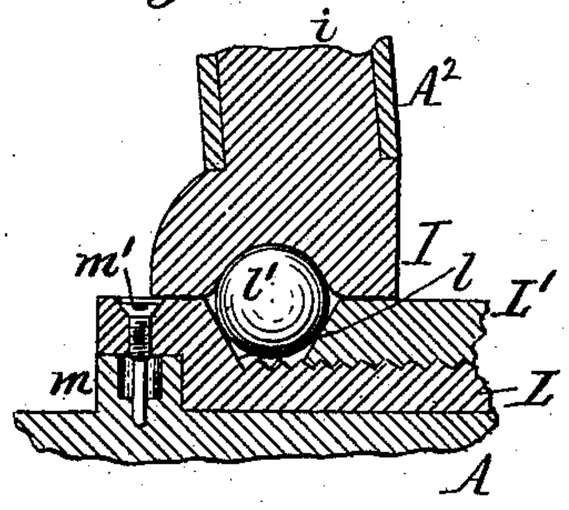


Fig. 12.

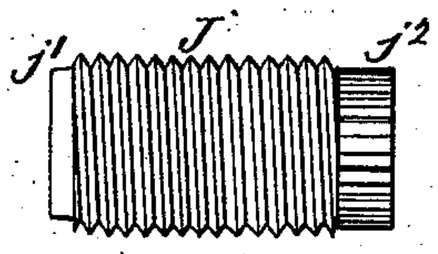


Fig. 13.

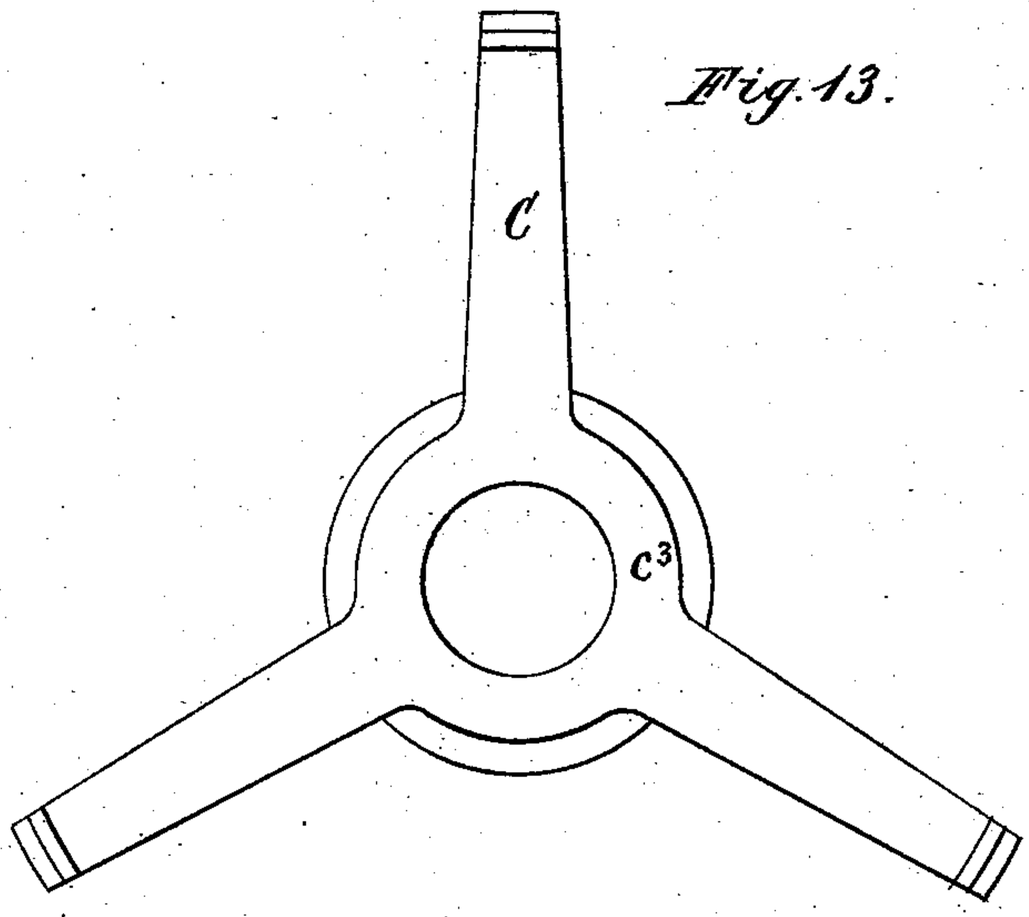
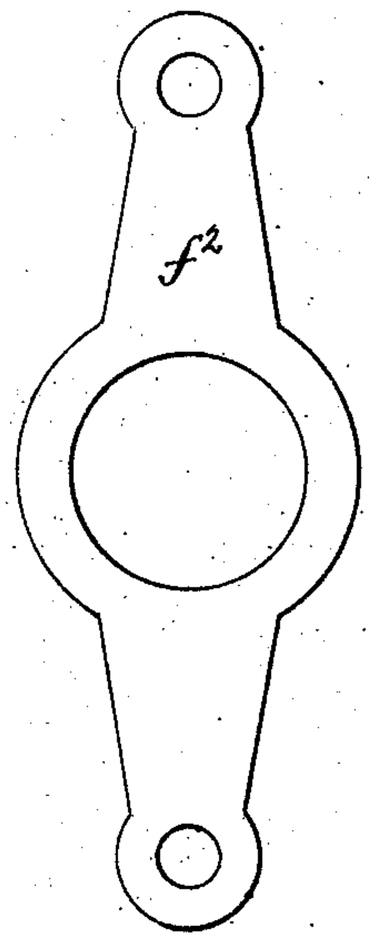


Fig. 14.



Witnesses.
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Theo. L. Popper.

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UNITED STATES PATENT OFFICE.

EMMIT G. LATTA, OF FRIENDSHIP, NEW YORK, ASSIGNOR OF ONE-HALF TO ADRIAN C. LATTA, OF SAME PLACE.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 294,640, dated March 4, 1884.

Application filed April 17, 1883. (No model.)

To all whom it may concern:

Be it known that I, EMMIT G. LATTA, of Friendship, in the county of Allegany and State of New York, have invented a new and useful Improvement in Bicycles, of which the following is a specification.

This invention relates to an improvement in bicycles and tricycles; and the first part of my invention has for its object to provide a driving-gear which will permit the driving-wheel to be operated in the manner of an ordinary crank-motion when so desired, and which will permit the speed of the driving-wheel to be reduced in going over bad roads or uphill, and which will permit the cranks and the shaft to which they are secured to be disengaged from the driving-wheel, so that the latter can rotate without rotating the cranks in going downhill. This part of my invention consists of the novel construction of the driving-gear, which will be hereinafter fully set forth.

The second part of my invention relates to the improved construction of the axle-bearings, whereby the bearing is easily adjusted for wear and rendered safe in case of breakage, and whereby it is secured to the fork or frame in such manner as to prevent binding in turning the machine by twisting the forks. This part of my invention consists of the improved construction of the bearings, which will be hereinafter fully set forth, and pointed out in the claims.

In the accompanying drawings, consisting of three sheets, Figure 1 is a sectional elevation of the driving-gear applied to the axle of the driving-wheel. Fig. 2 is a sectional elevation of the upper portion of the fork. Fig. 3 is a cross-section in line *x x*, Fig. 1. Fig. 4 is a cross-section in line *y y*, Fig. 1. Fig. 5 is a cross-section in line *z z*, Figs. 1 and 2. Fig. 6 is a cross-section in line *w w*, Fig. 1. Figs. 7, 8, and 9 are cross-sections in lines *x x*, *y y*, and *z z*, Fig. 6, respectively. Fig. 10 is a side elevation of the shifting sleeve. Fig. 11 is an enlarged sectional view of one of the bearings. Fig. 12 is a side elevation of the threaded sleeve of one of the bearings. Fig. 13 is a detached view of one of the open frames. Fig. 14 is a detached view of one of the supports of the planet-wheels.

Like letters of reference refer to like parts in the several figures.

A represents the axle; A′, the cranks secured to the ends thereof; A^2, the forks; A^3 A^4, the disks of the hub.

B represents a spur-wheel, which is secured centrally to the axle A by means of a key, *b*, or other suitable means.

B′ represents planet-wheels, which are arranged on diametrically-opposite sides of the wheel B, and which mesh therewith.

B^2 represents an internally-toothed gear-wheel, which incloses the planet-wheels B′ and meshes therewith, and which is secured to the hub-flanges A^3 A^4 by frames C C′, so as to turn therewith.

d represents a sleeve, which surrounds the axle A, and is free to move on the same both lengthwise and concentrically. The sleeve *d* is fitted loosely in the hub *a* of the disk A^4, and slides in the same.

D is a disk which is formed on the outer end of the sleeve *d*, and provided on its inner side, near its periphery, with projecting pins or studs *d′*, which engage in openings *a′* in the disk A^4, so that when the disk D rests against the disk A^4, as represented in Fig. 1, the two disks will turn together, while by moving the disk D outwardly away from the disk A^4 the two disks are separated, and each will turn independently of the other. The disk D is constructed on its outer side, near its periphery, with a rim, d^2, having depressions d^3, which are adapted to engage over the adjacent portion of the fork A^2 when the disk D is moved outwardly sufficiently, and thereby lock the disk against rotary movement. The disk D can therefore be placed in either of three positions, in the first of which it will turn with the wheel, in the second of which it will be detached from the wheel and the latter can turn freely, and in the third it will be held against rotary movement upon the fork. The disk D is adjusted and held in either of these three positions by a lever, *e*, which is pivoted to the fork by a bolt, *e′*, and which projects with its depending free end into a groove, d^4, formed in the periphery of the disk D, as clearly represented in Fig. 1. The lever *e* is actuated by a spring-rod, e^2, which bears with its lower

end upon the upper inclined surface of the lever *e*, and extends upwardly through the hollow fork, and is provided at its upper end with a catch or thumb-piece, E, whereby it can be secured in either of three positions by engaging said catch in notches e^3, formed in the sides of the vertical slot e^4, with which the outer side of the fork is provided. The bar e^2 is constructed of spring-steel or other elastic material, and curved lengthwise, so as to bear against the outer side of the hollow fork with sufficient force to lock the bar against accidental displacement and prevent it from rattling.

F represents two arms, which are arranged on diametrically-opposite sides of the axle A, and connected by a hub, F′, which surrounds the inner end of the sleeve *d*.

f are screw-bolts, which form arbors on which the planet-wheels B′ turn. The bolts *f* are supported at one end in the arms F, and at their opposite end in a plate or cross-head, f^2, which is arranged on the opposite sides of the wheels B and B′, and surrounds the hub of the wheel B.

f′ are springs, which are secured with their outer ends to the arms F by screws f^3, as shown in Fig. 1, or by means of the screw-bolts *f*, as may be preferred. The inner ends of the springs *f′* engage in depressions in the inner end of the inner portion of the sleeve *d*, and the springs are so constructed that they will tend to hold the sleeve *d* with its inner end against the wheel B, and the disk D against the disk A^4, as represented in Fig. 1. The hub F′ is provided with openings f^4, through which the springs *f′* pass. The inner end of the sleeve *d* is provided with cogs or teeth *g*, and the hub F′ is provided with cogs or teeth *g′*, meshing with the teeth *g*, so that a rotary movement can be transmitted from the hub F′ to the sleeve *d*, and vice versa, while the sleeve *d* can at the same time move lengthwise in the hub F′.

The spider or frame C′ is secured to the hub *a* by a screw-thread and a locking-screw, *c*, and to the gear-wheel B^2 by screws *c′*. The spider or open frame C on the opposite side of the gear-wheel B^2 is secured to the latter by screws c^2, and its hub c^3 turns loosely upon the hub a^2 of the disk A^3. The end of the hub c^3 and the adjacent rear side of the disk A^3 are provided with ratchet-teeth c^4, which interlock with each other and securely hold the disk A^3 in contact with the hub c^3 by the pressure or tension of the spokes. The latter can be tightened by turning the disk A^3 in the proper direction, the ratchets permitting the forward movement of the disk and locking it against backward movement.

When the parts are in the position represented in Fig. 1, the planet-wheels B′ and their supporting-arms F are connected with the driving-wheel by the sleeve *d* and disk D, whereby the planet-wheels and their supporting parts are compelled to turn with the wheel, and the whole mechanism therefore is caused to operate like an ordinary crank mechanism. Upon depressing the bar e^2 sufficiently to disengage the disk D from the hub A^4 of the driving-wheel, the latter is disengaged from the driving mechanism and permitted to turn freely, so that the cranks can hang stationary while the driving-wheel revolves, thereby enabling the rider to keep his feet on the pedals without turning the same in going downhill. Upon moving the disk D out far enough to lock it against the fork, the disk D, the arms F, and the arbors of the planet-wheels B′ are held stationary, whereby the motion of the gear-wheel B is transmitted to the gear-wheel B^2 in a reverse direction and with less speed and a corresponding increase of power, so that in this position of the parts the cranks are rotated backwardly, in order to drive the wheel forwardly, and the power applied to the cranks is transmitted with an increase, thereby adapting this adjustment to be used in running uphill and on bad roads or against a head-wind.

If it is desired to construct the driving-gear so that the wheel can be rotated with an increase of speed, instead of an increase of power, this is readily accomplished by securing the supporting-arms F and hub F′ to the axle and connecting the gear-wheel B with the inner end of the sleeve *d* in the same manner in which the hub F′ is connected with said sleeve, as represented in Fig. 1.

The frames C and C′ may be secured to the wheel B^2 by corresponding notches and projections formed in the adjacent portions of these parts and held in contact with each other by the tension of the spokes. These frames answer the double purpose of spreading the hub-flanges and transmitting power from the axle to the wheel. The open spaces between the arms of these frames permit the gearing to be oiled and the parts thereof to be removed, when required, without separating the two disks of the hub of the wheel.

Instead of spiders or frames C C′, straight bars extending from one hub-disk to the other may be employed, if preferred; but they would not be as compact and neat in appearance as those shown and described. The frames C and C′ and the gear arranged between the same are covered by a dust-cap, H, which incloses these parts, and which is constructed of two parts secured together on one side by a hinge, *h*, and on the opposite side by a spring-catch, *h′*, as represented in Fig. 4, so that upon releasing the spring-catch *h′* the dust-cap can be removed.

I I′ represent the box portions of the bearings, in which the axle A turns. The portion I is provided with an upwardly-extending tapering shank, *i*, which is inserted in a correspondingly-shaped socket secured to the frame in the lower end of the fork. This socket is formed in a lining, *i′*, secured in the lower portion of the tubular fork, preferably by brazing. The shank *i* is secured in the fork by the bolt *e′*, on which the lever *e* swings, and the notch or depression on the inner side of the

shank *i*, through which the bolt *e'* passes, is curved horizontally or made convex toward the bolt, so that the shank *i*, although being held against longitudinal movement by the bolt *e'*, can turn in the socket when the forks are twisted in turning the wheel, thereby preventing binding of the bearings. The shank i^3 of the bearing I' is secured to the fork by a horizontal bolt, i^4, which passes through a depression of the same form in said shank.

J represents a cylindrical sleeve, which is fitted around the axle within the bearing I'; and J' J^2 represent, respectively, the outer and inner cone-bearings, between which balls *j* are arranged. The box I is provided on its inner surface with a suitable groove, in which these balls move. The sleeve J is provided with an external thread, and the cone-bearings J' J^2 are provided with internal screw-threads, which engage with the external thread on the sleeve J, so that by turning these parts the cone-bearings can be adjusted toward or from each other, as may be required for properly tightening the balls. The outer end of the sleeve J is provided with a collar, *j'*, which projects into an annular recess on the inner side of the crank, and the inner end of the sleeve J is provided with a collar, j^2, which projects into an annular recess in the outer side of the hub-disk A^3, whereby dust is excluded from the bearing-surfaces. The inner end of the inner cone-bearing, J^2, is provided with a flaring flange, to which is secured a spring, *k*, which engages with its free end in an opening, *k'*, formed in the disk A^3. The contact of the spring with the depression in the disk A^3 is sufficient to cause the cone-bearing J^2, the sleeve J, and the cone-bearing J', with which it is connected, to turn with the disk A^3, whereby the friction is thrown upon the balls and the surfaces which are in contact with the same. If a ball should break or the ball-bearing become inoperative from any other cause, the increased friction between the balls and the adjacent surfaces will cause the sleeve J and the cone-bearings J' J^2 to cease their rotary movement, and cause the end of the spring *k* to be drawn out of the depression in the disk A^3, and the axle A will rotate in the sleeve J as a bearing. It is obvious, therefore, that this improved bearing combines in its structure a parallel or cylindrical bearing with the ball-bearing, the parallel bearing being called into action when the ball-bearing becomes inoperative, thereby rendering the machine safe and preventing a fall, even if the ball-bearing should break or otherwise get out of order. The cone-bearings are adjusted by holding the inner cone, J^2, from turning and turning the sleeve J in one or the other direction, which causes the cones to approach each other or separate, as may be desired. After the cones have been adjusted, they are held in position by a set-screw, k^2, which passes through the cone J and impinges against the inner end of the sleeve J, whereby these parts are prevented from rotating with reference to each other. The inner end of the sleeve J is preferably grooved lengthwise to prevent the set-screw k^2 from slipping on the same. The set-screw k^2 may also be employed for securing the spring *k* to the cone J^2.

The bearing I is provided with a cylindrical sleeve, L, which is fitted around the axle within the bearing I, and provided at its inner end with a cone-bearing, *l*. L' is the opposite cone-bearing, which is attached to the sleeve L by a screw-thread, as clearly shown in Fig. 1.

l' represents the balls, which are arranged between the cone-bearings *l* and L'.

l^2 is a jam-nut, which is applied to the outer end of the sleeve L, for securing the cone-bearing L' in position after it has been adjusted. The outer end of the sleeve L projects into an annular depression on the inner side of the crank, and the inner end of the sleeve L rests against a collar, *m*, which is formed on the axle A. The sleeve L overlaps with its inner end the collar *m*, and is secured thereto by a screw, *m'*, which is screwed into the sleeve L, and projects with its inner reduced end into a cavity in the collar *m*, as shown in Fig. 12. The screw *m'* secures the sleeve L and cone L' to the shaft A, and compels these parts to turn together so long as the ball-bearing remains in its operative condition. If the ball-bearing should get out of order by reason of a broken ball or otherwise, the screw *m'* breaks, thereby releasing the sleeve L and permitting the axle to turn on said sleeve, as in an ordinary cylindrical bearing, so that in this case, also, the ball-bearing is supplemented by a cylindrical bearing, which is called into action when the ball-bearing ceases to be operative.

The construction last described—in which a cone is formed on the sleeve which surrounds the axle—is the cheapest of the two constructions shown; but the construction in which both cones are separate from the sleeve is more desirable, because in that case the sleeve is not required to be hardened, and is therefore less liable to break.

N represents an oil-cup, which is arranged on each of the bearings, for receiving the drippings, and which is held in position by catches *n*, which enter oil-holes *n'* in the box. The inner edges of the oil-cup N enter recesses or grooves n^2, which are formed in the outer sides of the cone-bearings, and whereby a sufficient close fit of the oil-vessels with the bearings is obtained to exclude dust and dirt therefrom. When parallel bearings alone are used, the outer edge of the oil-cup is turned outwardly so as to enter the annular recess n^3 in the inner side of the crank, and the inner edge of the oil-cup is turned inwardly and enters an annular recess, n^4, in the adjacent disk of the hub, and whereby the same object is obtained.

The inclosing-box of the ball-bearing may be made separate from the part which is attached to the fork, and may be loosely secured therein, if so desired.

I claim as my invention—

1. In an internally-geared driving-wheel, the combination of a sliding shifting-sleeve adapted to be held rigidly against rotary movement by being engaged with the fork or frame, and to be detached from the fork or frame at desire for changing the motion of the wheel, and a spring whereby the sleeve is held away from the fork or frame, substantially as set forth.

2. The combination, with the axle A, of a gear-wheel, B, a planet-wheel, B′, attached to a supporting frame or arm, and a gear-wheel, B^2, secured to the driving-wheel of a sliding sleeve, whereby the planet-wheel support can be released or held rigidly at will, substantially as set forth.

3. The combination, with the axle, of the gear-wheel B, a planet-wheel, B′, a gear-wheel, B^2, secured to the wheel, an arm, F, supporting the planet-wheel, and provided with teeth g', and a sliding sleeve, d, provided with teeth g, substantially as set forth.

4. The combination, with the axle, gear-wheel B, planet-wheel B′, and a driving-wheel provided with a gear-wheel, B^2, of an arm, F, supporting the planet-wheel, a spring, f', and a sliding sleeve, d, substantially as set forth.

5. The combination, with the axle, of the gear-wheel B, planet-wheel B′, gear-wheel B^2, secured to the driving-wheel, arm F, provided with hub F′ and spring f', and a sliding sleeve, d, provided with disk D, having devices for connecting it with the hub or fork at desire, substantially as set forth.

6. The combination, with the axle and driving-gear mounted thereon, of hub-disks A^3 A^4, arranged on opposite sides of the driving-gear, and the skeleton frame C C′, whereby said hub-disks are connected, substantially as set forth.

7. The combination, with the axle, variable driving-gear, and fork or frame, of a sliding shifting sleeve, d, having a grooved disk, D, a lever, e, pivoted to the frame and engaging in the groove of the disk, and a shifting rod, e^2, bearing upon the lever e, substantially as set forth.

8. The combination, with a hollow fork, of a bent shifting rod arranged in the same, substantially as set forth.

9. In a bearing, the combination of a ball-bearing and an auxiliary parallel bearing, which is called into action when the ball becomes inoperative, substantially as set forth.

10. In a bearing, the combination of a ball-bearing and an auxiliary parallel bearing attached to the axle or other rotating part by a connection which is broken or released when the ball-bearing becomes inoperative, substantially as set forth.

11. The combination, with the bearing-box I and axle A, of the sleeve L, provided with a conical face, l, a cone-bearing, L′, surrounding the sleeve L, and balls interposed between the cones l L′ and the box I, substantially as set forth.

12. The combination, with the bearing-box I and axle A, provided with collar m, of the sleeve L, having a conical face, l, a fastening-screw, m', a cone-bearing, L′, and balls l', substantially as set forth.

13. The combination, with a fork provided with a socket at its lower end, of a bearing-box provided with a shank seated in said socket and capable of turning therein, substantially as set forth.

14. The combination, with the bearing-box I, provided with shank i, of the fork A^2, provided with the lining i', forming a socket, in which the shank i is seated, substantially as set forth.

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