(No Model.)

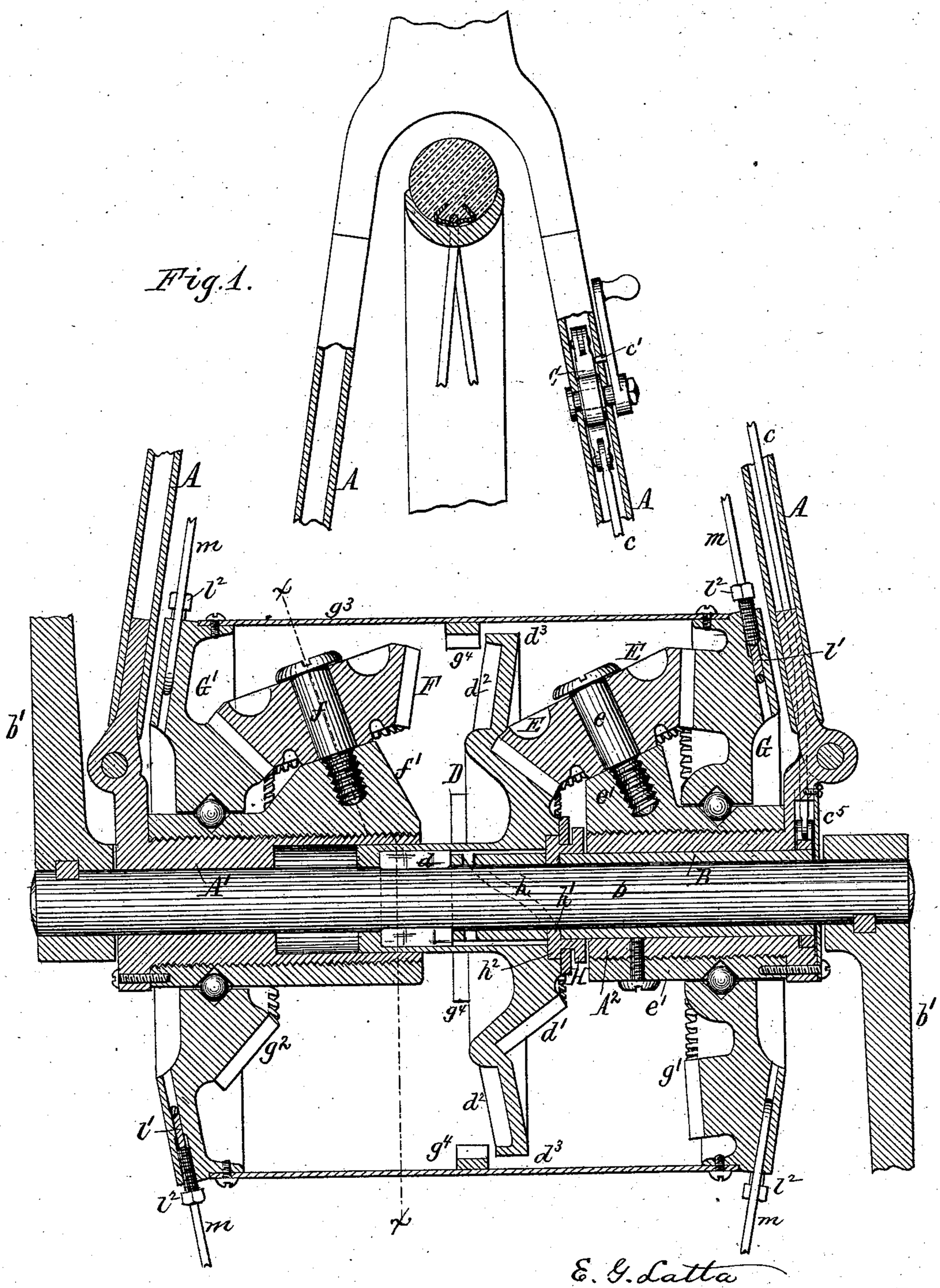
5 Sheets—Sheet 1.

E. G. & A. C. LATTA.

VELOCIPEDE.

No. 294,641. Patented Mar. 4, 1884.

Fig. 1.



Edw. J. Brady.
Theo. L. Popp. Witnesses.

E. G. Latta
A. C. Latta. Inventors.
By Wilhelm & Bonner.
Attorneys.

(No Model.) 5 Sheets—Sheet 2.

E. G. & A. C. LATTA.

VELOCIPEDE.

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Fig. 2.

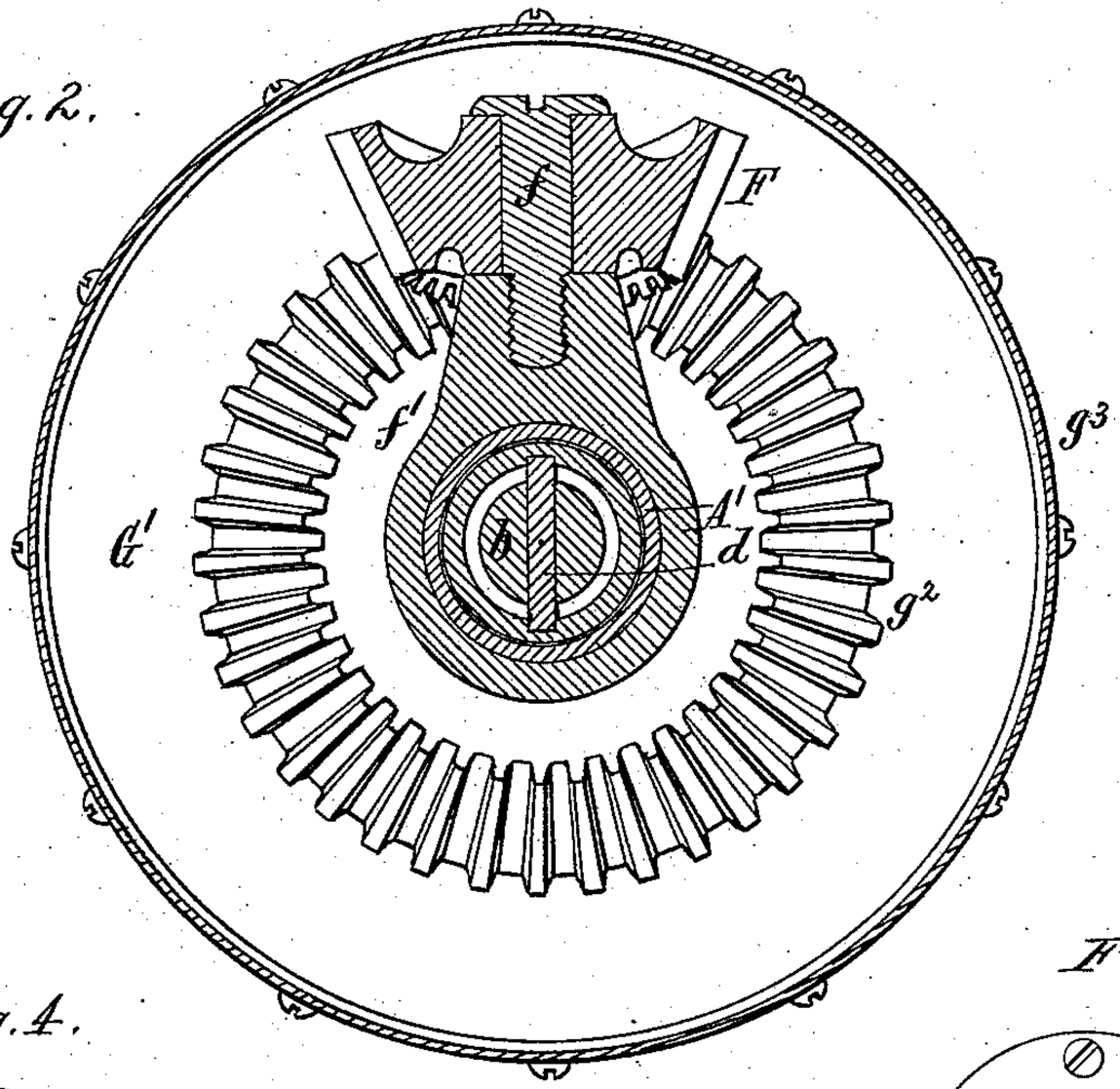


Fig. 4.

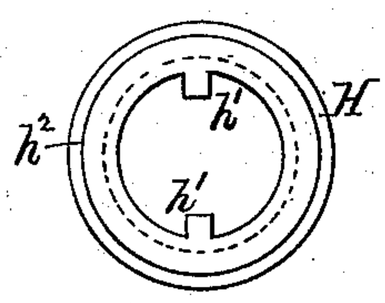


Fig. 6.

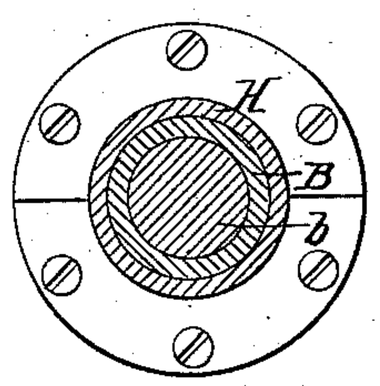
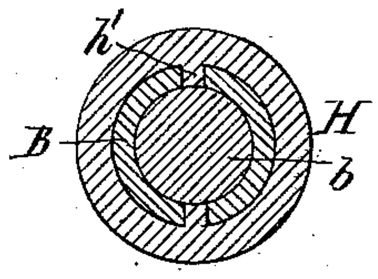


Fig. 3.

Fig. 5.



Witnesses:
Edw. J. Brady.
Theo. L. Popp.

Inventors:
E. G. Latta
A. C. Latta
By Wilhelm & Bonner.
Attorneys.

(No Model.) 5 Sheets—Sheet 3.

E. G. & A. C. LATTA.

VELOCIPEDE.

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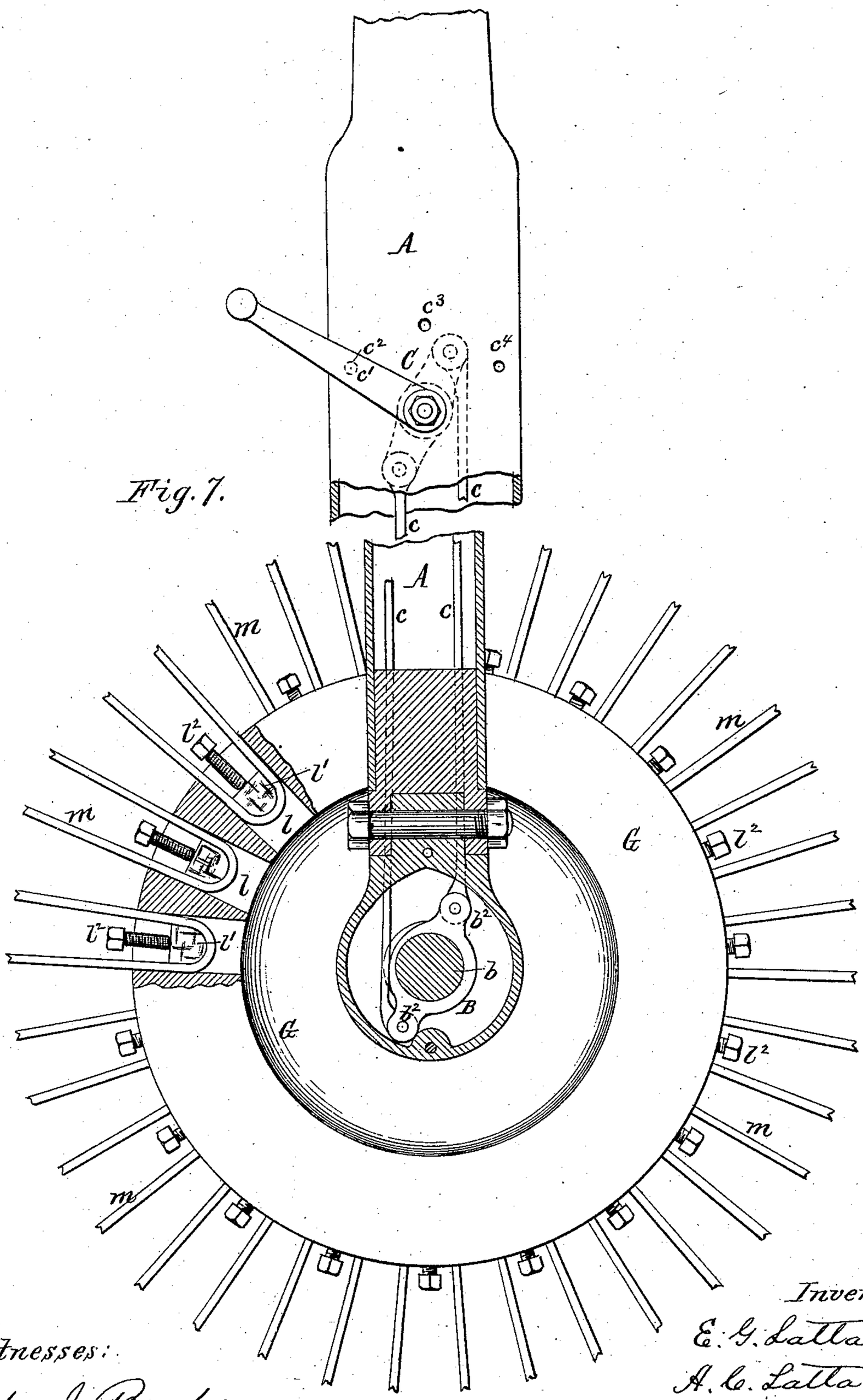
Fig. 7.



Witnesses:
Edw. J. Brady.
Theo. L. Popp.

Inventors:
E. G. Latta
A. C. Latta
By Wilhelm & Bonner.
Attorneys.

(No Model.) 5 Sheets—Sheet 4.

E. G. & A. C. LATTA.

VELOCIPEDE.

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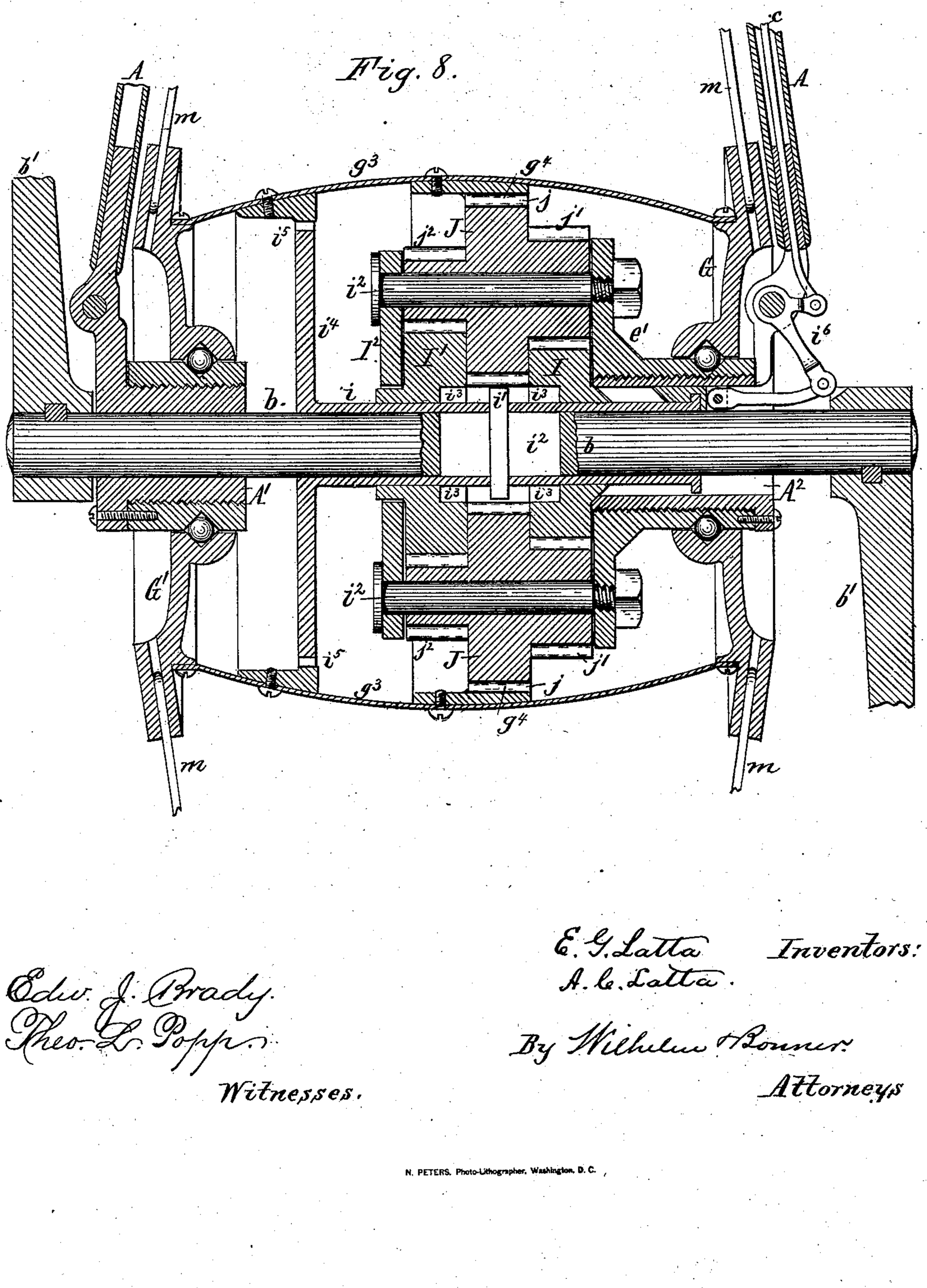
Fig. 8.



Witnesses.
Edw. J. Brady.
Theo. L. Popp.

Inventors:
E. G. Latta
A. C. Latta.

By Wilkins & Bonner.
Attorneys

(No Model.) 5 Sheets—Sheet 5.

E. G. & A. C. LATTA.

VELOCIPEDE.

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Fig. 9.

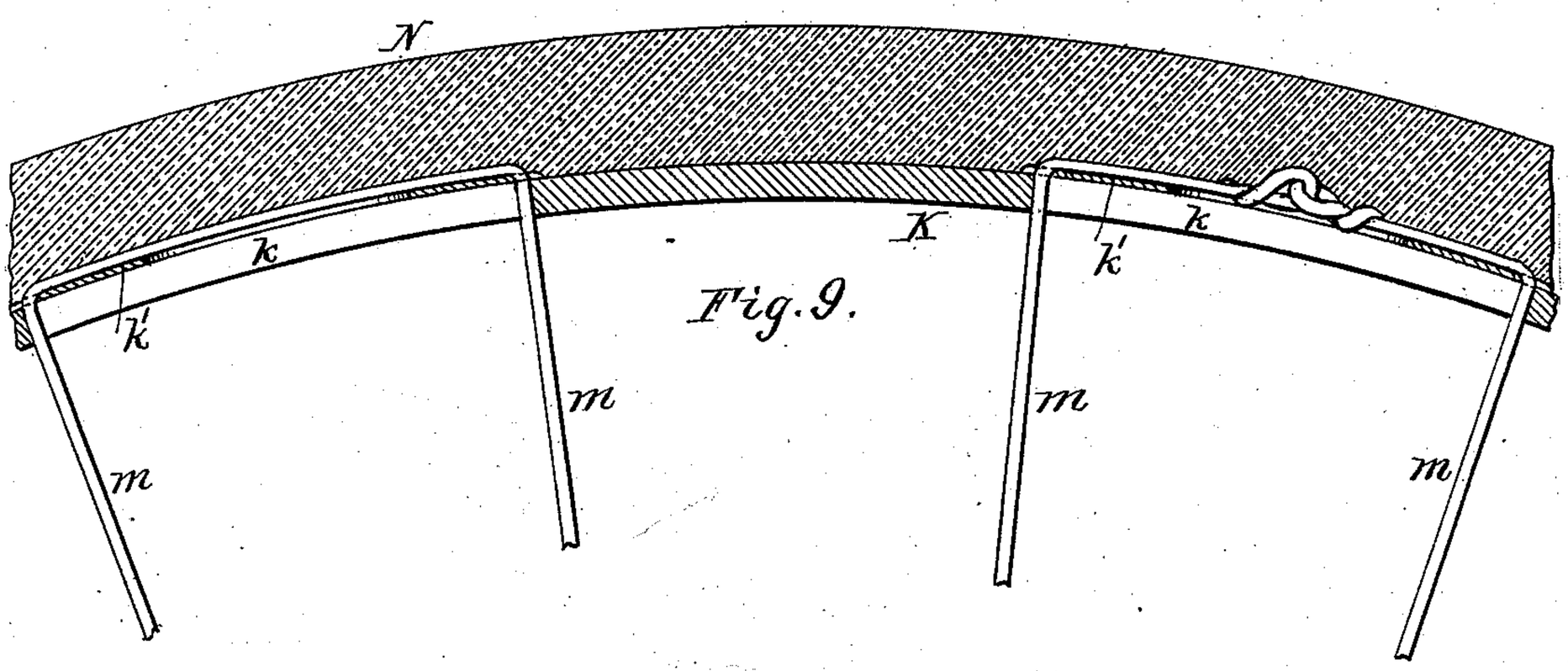


Fig. 10.

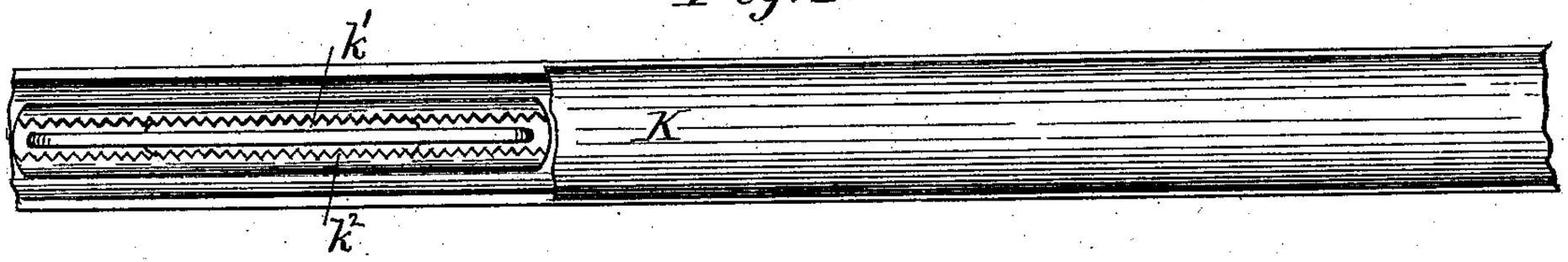


Fig. 14.

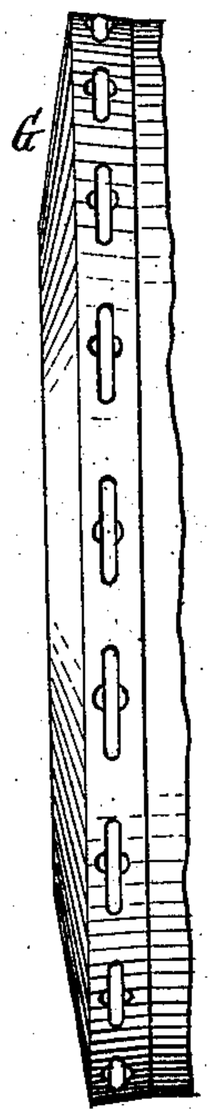


Fig. 11.

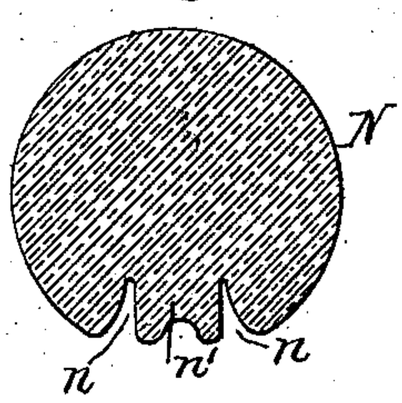


Fig. 12.

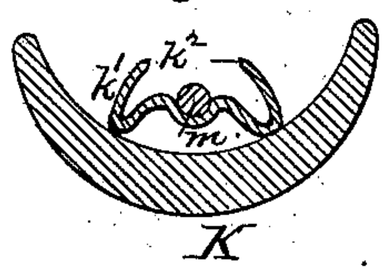


Fig. 13.

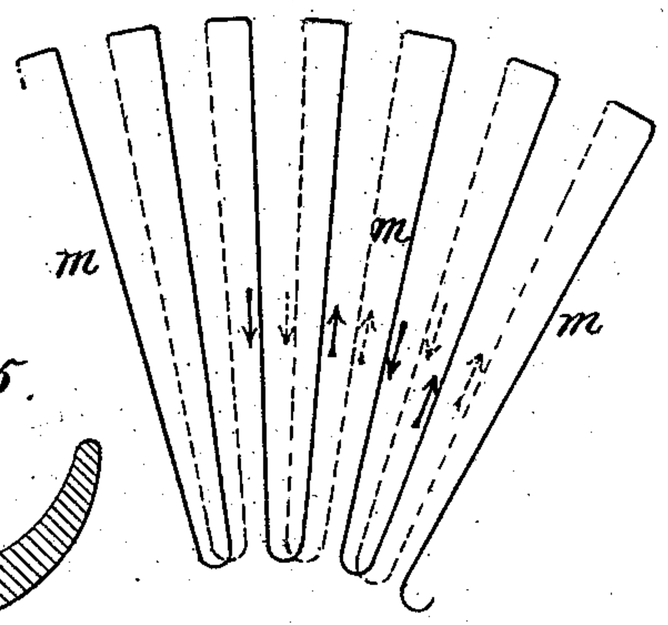


Fig. 15.

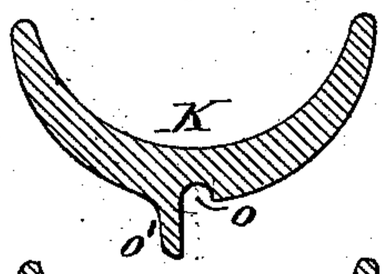
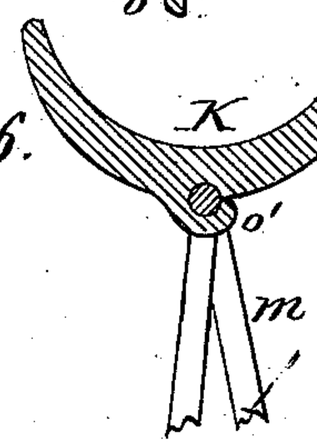


Fig. 16.



Witnesses.
Edw. J. Brady.
Rhod. L. Bopst.

Inventors.
E. G. Latta.
A. C. Latta
By Wilhelm & Bonner.
Attorneys.

UNITED STATES PATENT OFFICE.

EMMIT G. LATTA AND ADRIAN C. LATTA, OF FRIENDSHIP, NEW YORK.

VELOCIPEDE.

SPECIFICATION forming part of Letters Patent No. 294,641, dated March 4, 1884.

Application filed March 15, 1883. (No model.)

To all whom it may concern:

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

The first part of this invention relates to the construction of the driving mechanism of a bicycle or tricycle, whereby the rider is enabled to drive the vehicle at great speed on level or descending ground, or at less speed and with greater power on bad roads, uphill, or against the wind, or whereby the cranks may be applied to the wheel without change of motion when desired.

The second part of the invention relates to the construction of the hub, spokes, and rim of the wheel, and the means whereby these parts are connected together.

The invention consists of the improvements which will be hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, consisting of five sheets, Figure 1 is a vertical section of our improved driving mechanism. Fig. 2 is a cross-section in line *x x*, Fig. 1. Fig. 3 is a fragmentary sectional elevation of the axle and connecting parts. Fig. 4 is an end elevation of the collar which engages with the spirally-grooved sleeve. Fig. 5 is a cross-section in line *x x*, Fig. 3. Fig. 6 is a cross-section in line *y y*, Fig. 3. Fig. 7 is a sectional elevation of the central portion of the driving-wheel and one arm of the fork of the machine. Fig. 8 is a sectional elevation of a modified construction of the driving mechanism. Fig. 9 is a sectional elevation of the rim of the wheel. Fig. 10 is a face view thereof. Fig. 11 is a cross-section of the tire. Fig. 12 is a section of the inner metallic portion of the rim. Fig. 13 illustrates the manner in which the wire is bent of which the spokes are constructed. Fig. 14 is a face view of a portion of one of the hub-flanges. Figs. 15 and 16 are cross-sections, illustrating a modified construction of the rim.

A A represent the legs of the forked frame which straddles the driving-wheel, and A′ A^2 are cylindrical bearings secured to the lower ends of the legs A.

b represents the axle, which is supported in the bearings A′ A^2, and *b′* are the cranks, which are keyed or otherwise firmly secured to the ends of the axle *b*. The bearing A′ is constructed with a cylindrical bore, in which the axle *b* turns directly, and the bearing A^2 is constructed with a somewhat larger bore, to receive a sleeve, B, inclosing that portion of the axle *b* which passes through the bearing A^2. The sleeve B is arranged to turn in the bearing A^2 and on the axle *b*, and is provided at its outer end with two cranks, b^2, arranged on diametrically-opposite sides of the shaft *b*.

c represents wires which extend upwardly from the cranks b^2 through the hollow leg A of the fork to a bell-crank lever, C, which is pivoted near the upper end of the leg A, and provided at the end of its long arm with a thumb-piece or handle, whereby it can be seized. The long arm of the lever is provided on its inner side with a projection, *c′*, which can be sprung into either of three depressions, c^2 c^3 c^4, formed in the side of the fork for securing the lever in position. By turning the lever C on its pivot the sleeve B is turned on the shaft *b*. The cranks b^2 are protected against dust by a face-plate, c^5, secured to the outer side of the bearing A^2.

D represents a compound-gear wheel, which is arranged on the central portion of the axle *b*, and has a limited sliding movement on the same. The wheel D receives motion from the axle *b* by means of a key or feather, *d*, which is secured in the axle and projects into grooves in the hub of the wheel. The wheel D is provided, nearest its center, with a bevel-gear, *d′*, and, farther removed therefrom, with a bevel-gear, d^2, facing in an opposite direction, and on its periphery with a spur-gear or clutch, d^3.

E represents a bevel-wheel, which is adapted to engage with the smaller bevel-gear *d′*, and F is a bevel-wheel adapted to engage with the larger bevel-gear d^2. The bevel-wheel E turns on an arbor, *e*, which is secured to a support, *e′*, attached by means of a screw-thread or otherwise to the bearing A^2, which latter passes through the hub of the support *e′*. The wheel F turns upon an arbor, *f*, which is secured to a similar support, *f′*, attached to the bearing A′. The wheels E and F are arranged so far

apart that the wheel D can assume a position between these wheels in which it does not mesh with either of them.

G G′ represent the end disks of the hub, which turn, respectively, upon the outer cylindrical surfaces of the supports c' and f'. The disk G is provided with a bevel-gear, g', which meshes with the wheel E, and the disk G′ is provided with a bevel-gear wheel, g^2, which meshes with the wheel F, and is smaller in diameter than the gear-wheel g'. The disks G G′ are connected to a cylindrical drum, g^3, which is provided with a central internal clutch or spur-gear, g^4, adapted to engage with the peripheral spur-gear or clutch d^3 of the wheel D. The sleeve B is provided near its inner end with a spiral groove or grooves, h, in which engages a projection or projections, h', of a collar, H, which surrounds the sleeve B, and which is attached to the wheel D by means of a projecting rim, h^2, entering a recess in the hub of the wheel D or any other suitable means. Upon turning the sleeve B, by means of the wires c, the spiral grooves h engage with the projections h' and cause the collar H and the wheel D, connected therewith, to move longitudinally on the axle b. By this means the wheel D can be shifted on the axle, so as to engage its bevel-gear d' with the wheel E, as represented in Fig. 1, or so as to engage its bevel-gear d^2 with the wheel F, or so as to engage its peripheral spur-gear d^3 with the internal spur-gear, g^4, of the drum g^3, as may be desired. When the bevel-gear d' is engaged with the wheel E, the speed is decreased and the power correspondingly increased. When the bevel-gear d^2 is engaged with the wheel F, the speed is increased, and when the peripheral spur d is engaged with the drum g^3 the motion is transmitted directly from the axle of the wheel without any change whatever. This construction enables the rider to suit the motion of the vehicle to the condition of the ground.

When either set of bevel-gears is used, the cranks are required to be turned backwardly in order to turn the wheel forwardly which enables the rider to apply more of his weight and strength to the pedals, and renders it more convenient and safe to mount and dismount from the pedals. It is also very advantageous in long distance riding, because the rider can occasionally change the direction in which the cranks are turned, whereby he is enabled to travel long distances with less fatigue than if obliged to turn the cranks at all times in the same direction.

The gears are fully protected against dust, rain, &c., and not liable to get out of order, and have no projecting parts which could catch in the clothes.

In machines designed with particular reference to use in hilly countries the speed-gear may be dispensed with, while in machines designed for use on level roads the power-gear may be dispensed with.

In the modified construction of the driving mechanism represented in Fig. 8, i represents the sleeve, which surrounds the axle b, and which receives rotary movement from the axle by means of a key, i', which passes through an elongated opening, i^2, in the axle, so that the sleeve i is capable of sliding lengthwise on the axle.

I I′ are two spur-gear wheels of different diameters, arranged loosely upon the sleeve i on opposite sides of the key i'. The wheel I rests with its outer side against the arbor-support e', which is secured to the bearing A^2, and the wheel I′ rests with its outer side against a plate, I^2, which is connected with the support e' by horizontal bolts i^2, arranged on diametrically-opposite sides of the axle b.

J J are two compound-gear wheels turning loosely on the bolts i^2, and each provided with a large central spur-gear, j, meshing with the interior spur-gear, g^4, of the drum g^3, a smaller spur-gear, j', which meshes with the wheel I, and a still smaller spur-gear, j^2, which meshes with the wheel I′. By shifting the sleeve i, so that the key i' engages in the depressions i^3 of either of the wheels I I′, the rotary motion of the axle b is transmitted to the hub of the wheel either by means of the wheels I and j', or by the wheels I′ and j^2, thereby enabling the rider to change the speed of the machine accordingly. The end of the sleeve i is provided with a disk, i^4, carrying a peripheral spur-gear, which engages with an interior spur-gear, i^5, attached to the inner side of the hub. When the key i' stands between the wheels I and I′, so as not to engage with either, with the parts in the position shown in Fig. 8, the motion of the axle b is directly transmitted to the hub without change of motion. The sleeve i is shifted by a bell-crank lever, i^6, pivoted to the lower portion of the fork, and connected with one arm to the sleeve, and with the other arm to a rod or wire, which extends upwardly to an actuating lever located near the steering-head.

K represents the rim of the wheel, and m the spokes. The rim K is constructed in the usual form—concave on its outer side—to receive the rubber tire N. The spokes m are all formed of a continuous piece of wire, or of several lengths of wire spliced together and bent to the proper form.

In Fig. 13 the full lines represent the spokes on the side of the wheel nearest to the observer, and the dotted lines the spokes on the farther side of the wheel, and the arrows indicate the direction in which the wire is bent to form these spokes. It will be observed that the wire is so bent as to run from the hub to the rim, then forwardly along the rim to the next spoke, then inwardly to the hub, forming the next spoke, then outwardly to the rim, forming the second next spoke, then backwardly along the rim, then inwardly to the hub and forming the intermediate spoke, and so on, so that the wire is doubled back every second time it runs to the rim, whereby the spokes on the back of the wheel are located between

those on the front side of it. The wire is secured to the rim by being passed through a slot, *k*, which is long enough to receive the outer ends of two adjacent spokes and the connecting-wire.

k' represents a clamping-plate which is interposed between the wire and the rim, and which is made concave on the side facing the rim, so as to rest on its edges only, and provided with biting-edges k^2, which project outwardly into the rubber tire N. The latter is provided with two grooves or depressions, *n*, located on its inner side, in which the biting-edges of the clamping-plate engage. When the spokes are tightened, the body of the clamping-plate is drawn toward the rim, whereby the biting-edges of the clamping-plate are caused to approach each other and embed themselves into the material of the tire, thereby securely fastening the tire to the rim. The bent inner portions of the spokes are inserted in radial recesses *l* in the hub-plates G G' and secured therein by followers *l'*, which bear against the outer sides of the bent portion of the wire connecting two spokes, and which are held in place by screws l^2, which work in threaded openings in the hub-flanges. By applying the screws l^2 the followers are moved inwardly and the inner ends of the spokes are similarly moved, thereby tightening the spokes between the tire and the hub and drawing the outer portions of the wire, which rest against the clamping-plates *k'* tightly against the rim. This construction of the spokes does away with the necessity of heading or screw-threading them, and permits the use of a lighter wire in the construction of the wheel, thereby offsetting, to a certain extent, the additional weight of the variable-motion gearing. A broken spoke can be readily replaced by removing the bent portion of the wire and splicing in a piece of wire to take its place. One of the hub-flanges can be removed, when necesssary to take out the gearing, by removing the fastenings whereby the spokes are attached to the flange to be removed. If desired, the outer portion of the hub-flange may be made separate, to facilitate forming the radial recesses *l* for the reception of the spokes.

In building our improved wheel, the outer bent ends of the spokes are first passed through the slots *k* in the rim. The clamping-plates *k'* are then passed between the wire and the rim, thereby securing the outer ends of the spokes to the rim. The hub is next placed in position and the inner bent portions of the spokes inserted in the radial slots *l* in the hub-flanges. The followers *l'* are then inserted, and the screws l^2 started sufficiently to hold them temporarily in place. When all the spokes have been so attached to the hub, the biting-edges of the clamping-plates *k'* will be separated, as shown in Fig. 12. The rubber tire is then placed in position, so that the tongue *n'* projects between the biting-edges of the clamping-plates *k'*. The screws l^2 in the hub-flanges are then tightened, so as to draw the spokes inwardly to give them the necessary tension, whereby the biting-edges of the clamping-plates are caused to seize the rubber tire, as hereinbefore described.

The tongue *n'* of the tire may be made of material stronger than ordinary rubber, or it may be strengthened by a cord or otherwise, if there is any tendency of the tire to tear out of the clamps.

The center of each clamping-plate *k'* is preferably cut away to form an enlongated opening, which facilitates the closing of the biting-edges, and enables the ends of the wire to be spliced, when replacing a broken spoke, without removing the clamping-plates from the tire.

The clamping-plates may be made long enough to receive more than two spokes, in which case the spokes in the central part of the clamping-plates will be let in through openings cut in the side of the clamping-plate, instead of at the ends. These clamping-plates can be readily used with ordinary spokes, or with screws between the spokes, in which latter case they may be attached to the tire before it is applied to the rim.

When the continuous-wire spoke herein described is used in wheels which are not provided with gearing in the hub, the tightening-screws may be dispensed with, and the spokes tightened by spreading the hub-flanges on the axle, or drawing the bent inner ends of the spokes over the edge of the flange and toward the opposite side of the wheel.

The continuous-wire spokes may be attached to the rim without clamping-plates. In this case the rim is rolled with a groove, *o*, and flange *o'* on its inner side, as represented in Fig. 15, and slots are cut in the flange for the passage of the spokes, and after the bent outer end of the wire forming two spokes is placed in the groove of the rim, the flange is bent down on the wire, as represented in Fig. 16, thereby securing the wire to the rim.

We claim as our invention—

1. The combination, with the crank-shaft *b* and hubs G G', of a connecting-drum, g^3, an internal-gear rim secured to said drum, and gear-wheels, whereby the shaft can be engaged at desire with said gear-rim, and whereby the direct motion of the crank-shaft, or a reduced or increased motion can be imparted to said gear-rim, substantially as set forth.

2. The combination, with the crank-shaft *b*, of the hubs G G', constructed, respectively, with bevel-gears *g' g²*, bevel-wheels E and F, turning on fixed arbors, and a drum, g^3, secured to the hubs G G', and provided with an internal-gear rim, g^4, and an adjustable wheel, D, provided with bevel-gears *d' d²*, and spur-gear d^3, adapted, respectively, to mesh with the wheels E, F, and g^3, substantially as set forth.

3. The combination, with the crank-shaft *b*, of hubs G G', provided with bevel-gears *g' g²*, connecting-drum g^3, provided with the gear g^4, bevel-wheels E and F, shifting-wheel D, arranged between the bevel-wheels E and F,

and means, substantially as described, whereby the wheel D can be adjusted to mesh with either of the gears E, F, and g^4, substantially as set forth.

4. The combination, with the crank-shaft *b*, of the bearing A′, sleeve B, adapted to turn on the shaft and provided with spiral grooves *h*, collar H, engaging in the spiral grooves *h*, and shifting-wheel D, connected with the collar H, substantially as set forth.

5. The combination, with the crank-shaft *b* and gear-adjusting sleeve B, adapted to turn upon the crank-shaft, of the arms b^2, secured to said sleeve, wires *c*, and bell-crank lever C, whereby the sleeve can be turned and the gear mechanism be adjusted, substantially as set forth.

6. The combination, with a rim having an opening extending through it and the hub of a wheel, of a series of spokes constructed of a continuous piece of wire secured to the rim by extending along its outer side between two openings for the passage of the wire, substantially as set forth.

7. The combination, with the rim K and bent-wire spokes *m*, of the clamping-plates *k*′, interposed between the wire and the rim, substantially as set forth.

8. The combination, with the rim K, of a tire, N, and a clamping-plate, *k*′, secured to the rim and adapted to grasp the tire, substantially as set forth.

9. The combination, with the rim K and tire N, of clamping-plates *k*′, constructed with biting-edges adapted to be closed by an inward pressure against the clamping-plate, substantially as set forth.

10. The combination, with a hub constructed in its face with radial recesses *l*, of the bent spokes *m*, and followers *l*′, seated in said recesses, and tightening-screws l^2, working in the threaded walls of said recesses, substantially as set forth.

EMMIT G. LATTA.
ADRIAN C. LATTA.

Witnesses:
S. M. NORTON,
F. B. CHURCH.