



No. 744,038.

PATENTED NOV. 17, 1903.

A. T. BROWN & C. E. LIPE.

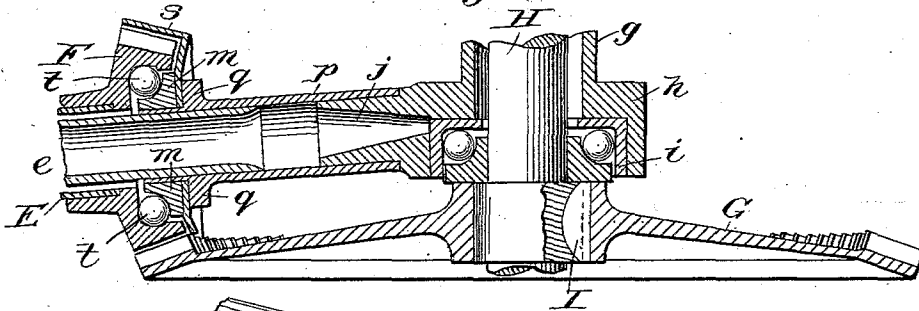
DRIVING MECHANISM FOR BICYCLES OR LIKE VEHICLES.

APPLICATION FILED MAR. 31, 1893.

NO MODEL.

2 SHEETS—SHEET 2.

*Fig. 4.*



*Fig. 5.*

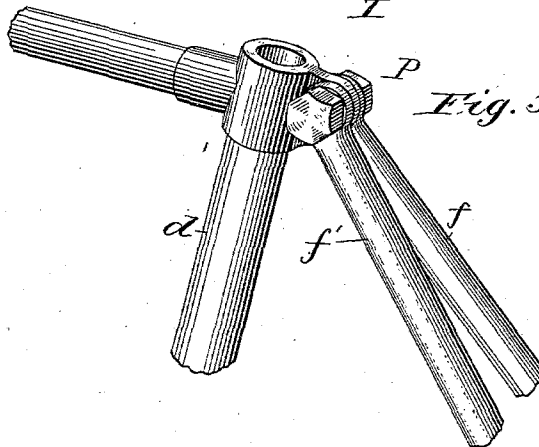
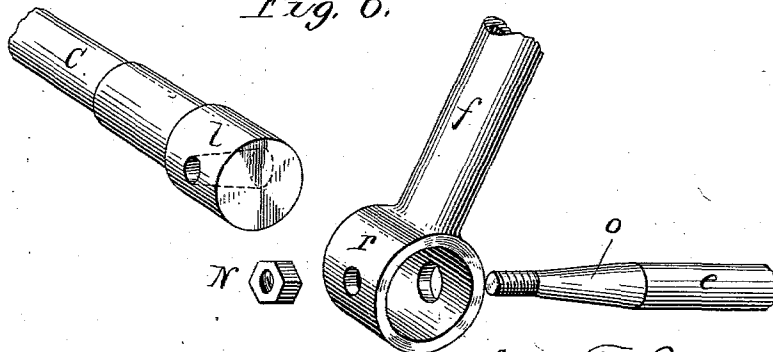


Fig. 6.



**WITNESSES:**

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# UNITED STATES PATENT OFFICE.

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## DRIVING MECHANISM FOR BICYCLES OR LIKE VEHICLES.

SPECIFICATION forming part of Letters Patent No. 744,038, dated November 17, 1903.

Application filed March 31, 1893. Serial No. 468,566. (No model.)

*To all whom it may concern:*

Be it known that we, ALEXANDER T. BROWN and CHARLES E. LIPE, citizens of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Driving Mechanism for Bicycles or Like Vehicles, of which the following is a specification.

Our invention pertains to bicycles, tricycles, and like vehicles; and it consists in a novel construction and arrangement of parts whereby a peculiarly neat, strong, and simple structure is produced and facility is afforded for assembling and disassembling the parts.

The invention further consists in various novel features, details, and combinations hereinafter recited.

In the drawings accompanying this description, Figure 1 is a side elevation of a bicycle embodying our improvements; Fig. 2, a longitudinal section through the driving-shaft and driving-gear; Figs. 3 and 4, sectional views of the gearing and attendant parts on a somewhat larger scale than in Fig. 2; Fig. 5, a detached view showing the attachment of the rear braces to the saddle-post; Fig. 6, a perspective view illustrating the manner of attaching one of the rear braces to the axle of the rear wheel.

The invention has reference more particularly to that class of vehicles in which power applied to a pedal-shaft located between the front and rear wheels is transmitted to the rear wheel through the medium of a shaft and bevel-gearing, a mode of transmission which, broadly considered, is quite old in its application to bicycles, tricycles, and the like. Under prior constructions, however, of this general type no proper provision has been made for assembling and disassembling the parts or removing a particular part in the event of wear, breakage, or injury, nor has there been due provision of means of adjustment to maintain the parts in proper working relation. Our invention is designed to supply these deficiencies, and in so doing to produce a peculiarly strong and rigid construction, which shall preclude the springing apart or slipping of the gear.

Referring now to the drawings, Fig. 1 affords a general view of the machine complete,

showing the framework and gearing entire. The frame A of the machine may vary considerably, following any of the approved types as to its general features, though we prefer and shall describe that shown in the drawings. This frame A comprises a tubular head *a*, in which the front fork B is swiveled, two rods or braces *b* and *c*, extending backward and downward from the head *a*, an upright post *d*, joining the rear ends of the rods or braces *b* and *c*, and two rear forks, each comprising a horizontal or substantially horizontal member *e* or *e'* and an upwardly-extending brace or member *f* or *f'*, uniting at or about the axle C of the rear wheel D, the members *e e'* and *f f'*, respectively, connecting with the lower and the upper ends of post *d* at their forward ends, the upper connection being by a bolt or equivalent removable fastening, as shown in Fig. 5. At the meeting-point of the members *c*, *d*, *e*, and *e'* is located the pedal-shaft barrel *g*, as in many existing machines, the parts *c*, *d*, *e*, and *e'* being joined or united thereto by brazing, welding, screwing, or in any well-known and approved manner.

The pedal-shaft barrel is of the form shown in Figs. 2 and 4—that is to say, it comprises a cylindrical body with circular swells or enlargements *h* at opposite ends, each of which enlargements is turned true to receive a series of balls, or, as is generally deemed better, is bushed with a steel cup *i*, formed by drop-forging or in any equivalent way, the separate cup admitting of more ready and perfect finish and permitting renewal whenever desired. These cups may be merely crowded or pressed firmly to their seats or secured in any other convenient way. Projecting rearwardly from each swell or enlargement *h* is a neck *j*, preferably tubular, which afford means of connection for the horizontal members *e* and *e'*. The members *e* and *e'* of the two sides differ somewhat, and for convenience of distinction the side on which the driving-gear is located will be referred to as the “driving side” of the machine, represented as the right-hand side in the drawings, but variable in practice, as desired. The horizontal member or bar *e'* of the left-hand side of the machine consists simply of a tube brazed, screwed, or welded at its forward end

to the neck *j* of the pedal-shaft barrel *g* and having its rear end joined to the rear or lower end of the brace *f'*. At the meeting-point of the members *e'* *f'* there is a flattened tang *k*, having an open-ended slot to receive the axle C of rear wheel D. This tang *k* may be formed integral with the bar or tube *e'* or it may be made separate and afterward welded or brazed thereto and also to the member *f'*, this latter being the construction illustrated in the drawings.

The end of axle C at the driving side of the machine is formed with a head or enlargement *l*, as best shown in Fig. 3, which has a tapering hole bored through it in axial alignment with said bar or member *e*.

The member *e* on the driving side of the machine differs somewhat from the corresponding member *e'* of the opposite side—that is to say, it has a conical or tapered rear end to enter the hole in the head of rear axle C and is furnished with cones or collars *m* and *n*, hereinafter referred to, upon which anti-friction-balls run to support a tubular shaft E, which encircles the bar or member *e*. The tapered end also passes through a collar *r*, formed upon the lower end of brace or member *f* and encircling the head of axle C. Hence it serves to bind together the axle and the members *e* and *f* of the frame. This construction will be readily understood upon referring to Fig. 6.

The tapering rear end of bar or member *e* of the driving side is preferably formed of a piece of metal *o*, separate from the tube *e* thereof, a reduced neck of the end piece *o* being extended into the tube and welded, brazed, or otherwise made fast therein, as found expedient.

The forward end of the body or tube of member *e* is connected with the rearwardly-extending neck *j* of the pedal-shaft barrel *g* by a short tubular coupling-piece *p*, Figs. 2 and 4, which is suitably welded, brazed, or joined to the tube and to the neck *j* and is formed with a swell or shoulder *q* near its rear end. Against this shoulder *q* rests and is clamped a guard *s*, which encircles the rear end of coupling-piece *p* and is retained in place by the collar *m*, which is generally referred to in the trade as a "cone," though not of strictly conical form.

The collar or cone *m* is made fast in any convenient or usual way and affords a bearing or seat for a series of anti-friction balls or rollers *t*, which are interposed between said collar and the cup or recessed face of a bevel-pinion F, firmly secured upon the forward end of the tubular shaft E. It is to protect the pinion F that the guard *s* is provided.

The pinion F meshes with and receives motion from a bevel gear-wheel G, keyed or otherwise made fast upon the pedal-shaft H, which is carried in ball-bearings of usual construction in the pedal-shaft barrel *g*.

It is important to prevent the key which holds the gear-wheel G to shaft H from work-

ing endwise out of place, and it is also desirable that it shall seat itself squarely and firmly both in the shaft and in the wheel. To insure these results, we form the seat in the shaft with a curved bottom, the curvature being in the direction of the length of the shaft, as shown in Figs. 2 and 4, and the key I is curved to accurately fit the seat, but is of a width to project a proper distance beyond the circumference of the shaft, as shown. The seat formed in the wheel G for said key is straight, and when the wheel is brought to proper position and pressed or driven to place thereon the key turns and slides slightly in its seat in the shaft until its outer face and the bottom of the seat in the wheel come into alinement and contact throughout their length. The curved seat thus serves to give the desired adjustment and prevent displacement of the key and may be readily cut by a rotating tool.

It will be observed that by reason of the coupling-section *p* encircling the end of tubular member *e*, the formation of the shoulder or enlargement *q*, and the encircling of both the tube and the coupling-piece *p* by the cone or collar *m* great stiffness and strength are secured at the bearing or supporting point of pinion F, which is quite important, because the entire driving strain or pressure is brought upon said bearing.

The tubular shaft E carries at its rear end a bevel-pinion J, which, like pinion F, has a quite long tubular neck encircling and welded, brazed, or otherwise made fast to the tube. The neck gives adequate strength and permits firm joinder of the parts.

Pinion J is made cup-shaped and has an undercut groove or channel *u* to receive anti-friction balls or rollers *v*, which are retained in position by and travel upon the ring or cone *n*, screwed upon the threaded body of the end piece *o* of bar or member *e*, as shown in Figs. 2 and 3. By screwing this cone forward or backward upon the part *o* the ball-bearings at both ends of shaft E may be simultaneously and accurately adjusted, as required. This provision is highly important with the system of driving here described.

A follower or jam-nut *w* locks the cone or ring *n* and prevents it from working loose.

Pinion J meshes with and gives motion to a similar bevel-pinion K, secured to or preferably made integral with the hub of rear wheel D, as shown in Figs. 2 and 3.

The hub of wheel D is of usual construction aside from the pinion or gear K, its recessed ends being preferably bushed or provided with removable cups *z*, similar to those of the front wheel L, to form seats for the balls or rollers commonly employed.

M indicates a guard conforming as closely as practicable to and serving to protect the pinions J and K from injury and from dust or other matters which might otherwise enter between them or clog their teeth. This guard comprises two circular portions meet-

ing at an angle of ninety degrees, or thereabout, each part having a central circular opening—one to receive the axle C of the rear wheel and the other to receive the end piece 5 *o* of lower bar or member *e* of the driving side—said parts holding the guard accurately in position.

The axle C of rear wheel D is furnished with cones or collars *x* and *y* to form seats or 10 bearings for the antifriction-balls *z*, as shown in Fig. 2. The cone *x* is placed within the guard M, and consequently the axle C must be passed through it after passing through the central opening of the guard.

15 In assembling the driving-gear it will be found convenient to proceed as follows, assuming that guard *s* and cone *m* have first been placed and secured in position: The axle C of rear wheel D will be passed through the central opening of its section of guard M until the head *l* of the axle bears against the guard, and the cone or collar *x* will then be placed upon the axle and pressed firmly against the guard, where it may be retained 25 by friction, key, set-screw, or other means. The rear wheel will then be placed upon its side, the end of the axle started into the hub, the balls or rollers *z* placed in the cup or recess of the hub, and the axle passed through the hub and beyond until the cone *x* seats itself within the circle of balls. The wheel is then turned over, care being taken to retain the axle in place. Balls *z* are introduced into the cup at the then upper side 30 of the wheel. The cone *y* is placed upon the axle and moved up against the balls. If desired, the cone *y* is screwed upon the axle C. The tubular shaft E is now passed over the bar or member *e*, and its pinion F is moved toward cone *m*; but before being moved close up to the latter the pinion has a series of balls or rollers placed within its cup or recessed face to form a rolling support between the pinion and the cone. Balls or 35 rollers are next placed in the cup or recess of pinion J. The cone or collar *n* is applied and screwed to proper position to secure the requisite adjustment of the ball-bearings of the two pinions F and J, and the follower or jam-nut is then screwed up firmly against the rear face of the cone *n*. The upwardly-extending brace *f* of the driving side, as yet disconnected from the frame, now has its ring or collar *r* slipped upon the head *l* of axle C, and the 40 openings of the head *l*, the ring or collar *r*, and guard M are brought into alinement with the end piece *o* of member *e*, upon which piece the parts are passed to the position indicated in Figs. 1, 2, and 3, the opposite end of axle 45 C at the same time entering the open slot of tang *k*. The extreme end of the piece *o* of member *c* is threaded to receive a nut N, which binds the parts together, as shown in Figs. 1, 2, and 3.

50 O indicates a nut, which may conveniently be prolonged to constitute also a mounting-step, and which is screwed upon the end of

axle C opposite the head *l* and is turned firmly up against the slotted tang *k*, care being taken 70 that the position of the axle in the slot is such as to insure proper alinement or trail of the rear wheel with the front or steering wheel L. Finally the braces *f* and *f'* are joined to post *d* or to a coupling-piece thereon by a bolt P or other suitable fastening. Q represents the 75 cranks.

The seats upon which the antifriction-balls travel are so formed that the balls afford a rolling support for the wheels and the pedal-shaft both in the plane of rotation of said 80 parts and laterally without slip or rubbing friction in either case; but this feature is not new.

The invention is applicable also to tricycles and other analogous vehicles. 85

It is apparent that the rear end piece of member *e* is not necessarily made tapering, though this is preferred. It may be made straight with a suitable shoulder to determine the position of the axle-head thereon. 90

It will be observed that by the construction above set forth we are enabled to give to the tubular driving-shaft E the same external diameter as the bar or member *e'* at the opposite side of the machine, and we are also 95 enabled to assemble, adjust, disassemble, and replace or renew the working parts at will.

The appearance of the machine is peculiarly trim and neat, the two sides being essentially identical except as to the gear-wheels. 100

Having thus described our invention, what we claim is—

1. In a bicycle or like vehicle, the combination of a rear fork comprising at one side a bar *e'*, brace *f'* and slotted tang *k*, and at the 105 other side a bar *e*, and removable brace *f* provided with an eye or ring *r*; a rear-wheel axle C having one end seated in the slotted tang and the other end perforated; the rear end of bar *e* being passed through the perforated end 110 of the axle and through the encircling ring *r* of brace *f*, substantially as described and shown.

2. In a bicycle or like vehicle, the combination of a rear-wheel axle, a side bar or member 115 of the frame, and a power-transmitting shaft encircling the side bar or member, the end of the side bar passing through the axle, and the two parts being firmly secured together substantially as described. 120

3. In a bicycle or like vehicle, the combination with the wheels and main frame, of a side bar or member extending from the power-shaft to the rear wheel, a rigid tubular shaft encircling the side bar, extending from the 125 power-shaft to the driving-wheel, and provided with pinions to mesh with pinions of the power-shaft and driving-wheel, the tubular shaft being removable from the side bar at will. 130

4. In a bicycle or like vehicle, the combination of a rear axle transversely perforated at one end, a brace having an eye or collar to encircle the perforated portion of the axle,

and a side bar or member of the frame passing through the collar and the axle, and provided with a nut or fastening device to bind said parts together.

- 5 5. In a bicycle or like vehicle, the combination of a main frame and front and rear wheels; a pedal-shaft; a gear-wheel carried by said pedal-shaft; a pinion carried by the rear wheel; a continuous, integral, tubular shaft encircling a member of the main frame and provided at opposite ends with pinions to mesh with the gears of the pedal-shaft and rear wheel; and adjustable ball-bearings for both ends of said tubular shaft mounted directly upon the member of the main frame which supports the tubular shaft.

6. In a bicycle or like vehicle, the combination with axle C and with side bar or member *e* passing through the axle, brace *f*, encircling the axle C at one end and having its other end detachably secured to the main frame of the machine.

7. In a bicycle or like vehicle, the combination with a suitable frame, wheels, and power-shaft, of stationary side bar or member *e*, having cone or collar *m*, rigid power-transmitting shaft E encircling said member and provided with pinions F and J, adjustable cone *n*, screwed upon side bar *e* and balls or rollers interposed between the cones and the

pinions, substantially as shown and described.

8. In combination with fixed side bar or member *e* of a bicycle-frame, and with a tubular shaft encircling said bar, a pinion secured upon the tubular shaft, and a guard secured to the bar *e* and open on the side toward the pinion, whereby said pinion may be inserted into and removed from the guard without disturbing the latter.

9. In a bicycle or like vehicle, the combination of side bar *e'* provided with slotted tang *k*; side bar *e* provided with end piece *o*; tubular shaft E encircling side bar *e* and provided with pinion J; wheel D provided with pinion K; guard M inclosing the gearing J, K; and axle C passing through the guard and the wheel and having one end secured in the slotted tang *k*; the end piece *o* of the side bar also passing through the guard and through the axle C, substantially as shown and described.

In witness whereof we hereunto set our hands in the presence of two witnesses.

ALEXANDER T. BROWN.  
CHARLES E. LIPE.

Witnesses:

K. F. CASSIDY,  
A. A. SCHENCK.