

(No Model.)

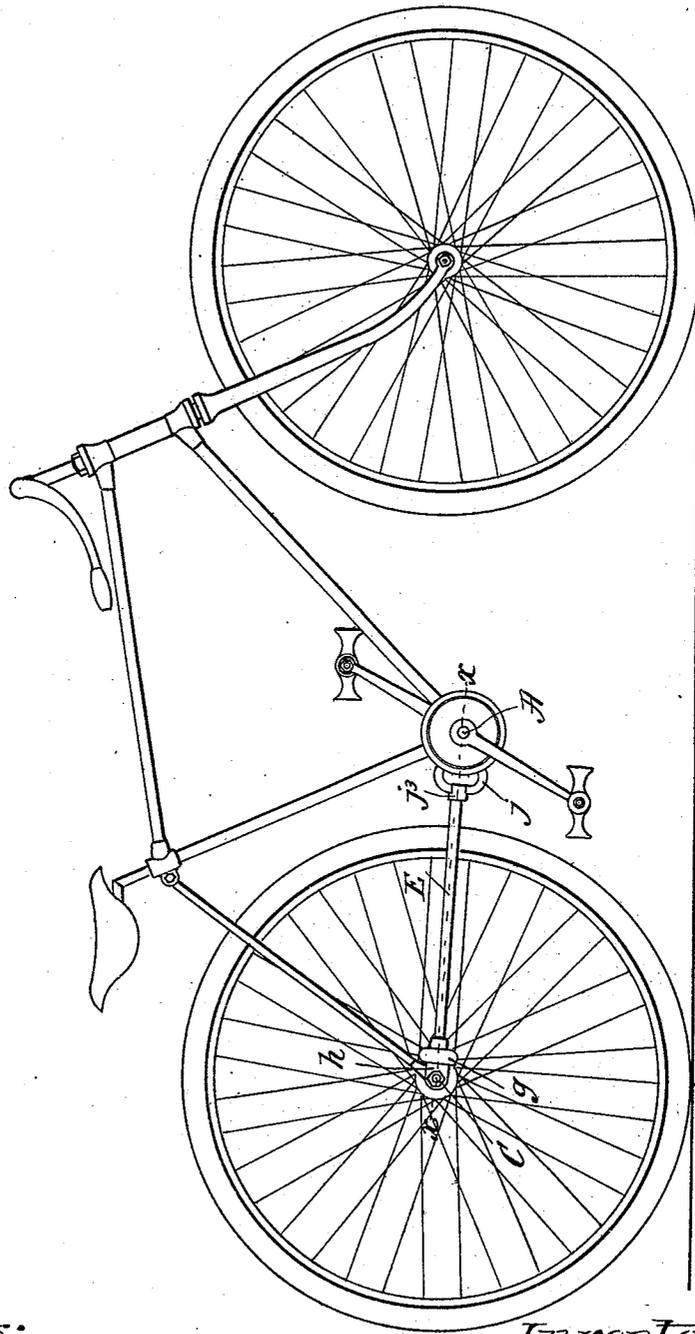
S. A. GRANT.  
VELOCIPÈDE.

2 Sheets—Sheet 1.

No. 509,079.

Patented Nov. 21, 1893.

*Fig. 1.*



Witnesses:

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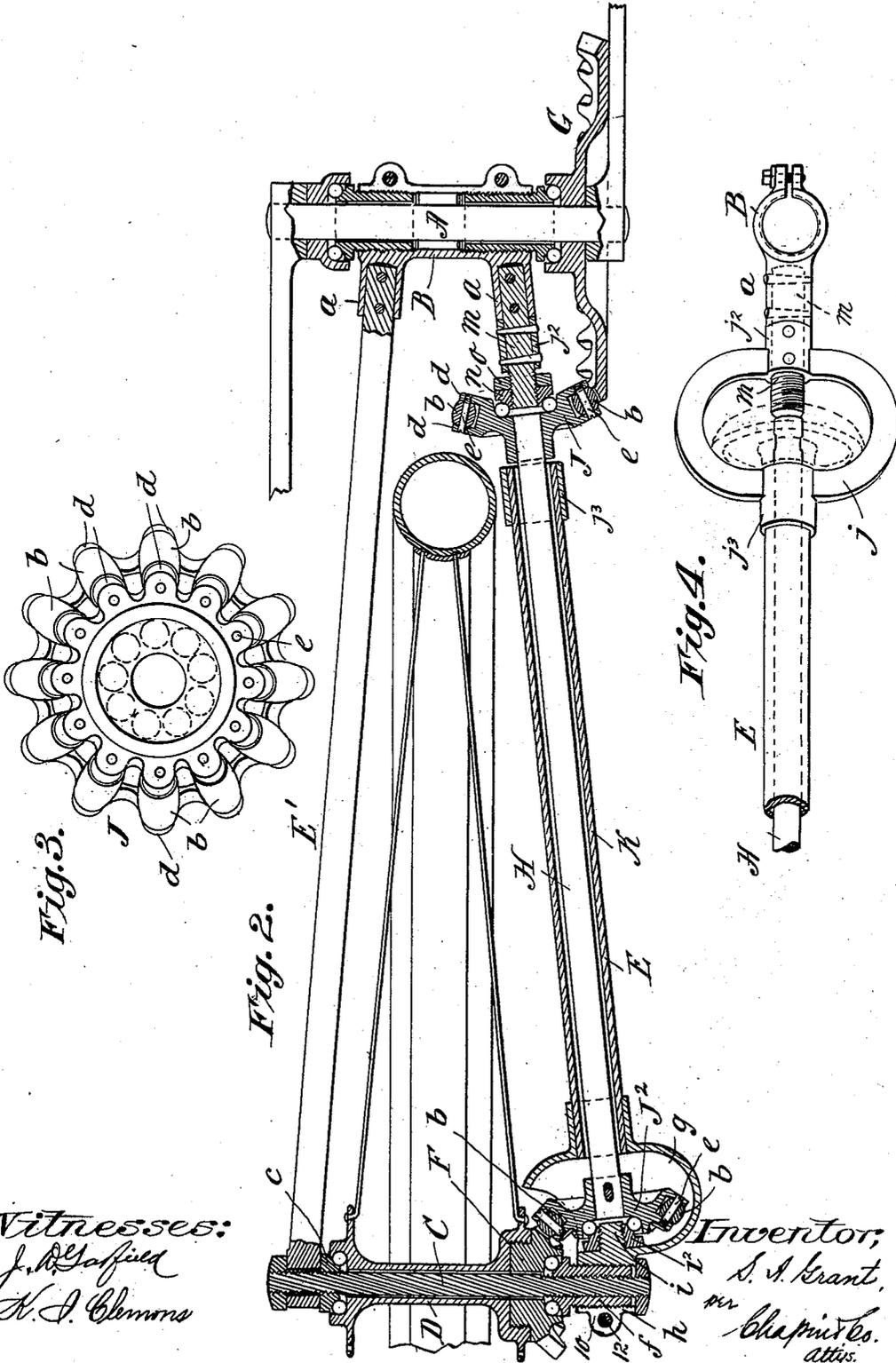
Inventor,

*S. A. Grant*  
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VELOCIPEDE.

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# UNITED STATES PATENT OFFICE.

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## VELOCIPEDA.

SPECIFICATION forming part of Letters Patent No. 509,079, dated November 21, 1893.

Application filed December 19, 1892. Serial No. 455,731. (No model.)

*To all whom it may concern:*

Be it known that I, SIDNEY A. GRANT, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Velocipedes, of which the following is a specification.

This invention for improvement in velocipedes more particularly pertains to bicycles of the class comprising shaft and gear connections between the crank-axle and the driven wheel, which is usually the rear one.

The objects of this invention are to provide gear-connections between the driving and driven axle which will involve a minimum of friction and in a large measure avoid the considerable difficulty heretofore experienced by reason of non rigidity or derangement of the bearing supports for the gearing, and also to provide a construction and combination of mechanical elements for the medium of transmission which shall be mechanical and practicable, easy of assemblage, susceptible of all required adjustments with the utmost facility, and very light though not inconsistent with the required degree of strength.

To these ends the invention consists in construction and combinations of parts all substantially as will hereinafter fully appear and be set forth in the claims.

The improved bicycle is illustrated in the accompanying drawings forming part of this specification,—Figure 1 being a side elevation of the machine showing the inclosing devices for the improved driving gear. Fig. 2 is a horizontal, longitudinal section taken on the line,  $x-x$ , of Fig. 1. Fig. 3 is a face view, on a larger scale, of one of the improved bevel-gears. Fig. 4 is a perspective view of parts of the driving connection and supports which will be hereinafter more particularly referred to.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings A represents the crank-axle having the pedal-cranks rigidly affixed thereto, as usual, this shaft being mounted in the tubular bearing-support, B, which is equipped with suitable ball-bearing devices, and this bearing support, as here shown, is lo-

cated at the lower angle of the frame. Said tubular bearing support, B, is provided with the rearwardly extended socket-lugs,  $a, a$ .

C represents the rear-wheel-axle on which the hub, D, of the rear-wheel is mounted for rotation, the axle being held fixed to what may be termed the rear-wheel fork-legs, or lower rear members, E, E, of the frame, the forward extremities of these members being entered within the aforesaid socket-lugs,  $a, a$ , and keyed, or otherwise secured, thereto. There is, affixed to the hub of the rear-wheel, a bevel-gear, F, and also affixed to the crank-axle, a bevel-gear, G. Between said bevel-gears is a shaft, H, suitably supported, or supported in a manner which is particularly hereinafter set forth, and having, at its forward and rear ends, bevel-gears, J, J<sup>2</sup>, the teeth of which mesh respectively with those of the said gears, G and F. Either (or both) of the meshing gears of each pair thereof has the bearing surfaces of its teeth constituted by rollers,  $b, b$ , which have free rotary movements independent of the revolutions of the ear-pieces,  $d, d$ , on and between which they are individually mounted. These rollers are preferably convex in the direction of their axes, partaking of a spheroidal form. These rollers, when mounted as shown in the ear-pieces,  $d, d$ , are axially perforated, the pintles,  $e$ , passing through the rollers and into the ear-lugs. The pintles are screw-threaded at one end and slotted at the other, one of each pair of the ear-lugs being tapped to receive the screw-engagement of the threaded end of the pintle.

The rear-wheel-axle, C, is suitably extended at either side of the face of the rear-wheel hub, the extremities being screw-threaded. The threaded axle extremity at one side of the wheel receives the annular bearing member,  $c$ , for the ball-bearings and also receives the connection therewith of the one lower hind member, E', of the frame, the forward end of which part is fitted into one of the aforesaid socket-lugs,  $a$ , and keyed, pinned, or otherwise detachably united, thereto. The other and longer screw-threaded extension of the rear-wheel-axle receives the sleeve,  $f$ , which is both internally and externally threaded. The inner end of this sleeve is to be brought

into suitable proximity with the adjacent gear-wheel, F, of the hub for bearing upon the intervening balls.

K represents a tube somewhat shorter than the distance between the rear-wheel-axle and the crank-axle bearing, this tube having at its rear end a yoke, *g*, which is shown as in the form of an elliptical framing, although limitation is not to be made to this particular shape, and the yoke has an externally and rearwardly extended socket-lug, *h*, which is internally screw-threaded to engage the aforesaid threaded sleeve, *f*, and to be adjustable thereon longitudinally of the axis thereof. This sleeve is indicated, in Fig. 2, at 10, as being split and having at this so-formed part ear-pieces through which the constricting screw, 12, passes. The said yoke, *g*, also has at its rear boundary and axially in line with the tube, K, the stud, *i*, which has thereon a part to constitute one of the bearing surfaces between which and the gear, J<sup>2</sup>, the hardened balls for that gear are comprised. As shown, and preferably practiced said stud, *i*, is externally threaded receiving thereon the annular section, *i*<sup>2</sup>, which may be adjusted to take up wear in this ball-bearing. Said gear, J<sup>2</sup>, is keyed or pinned to the rear end of the shaft, H, which extends therefrom forwardly within and beyond the end of the said tube, K, having keyed, or pinned, on said extended end the bevel-gear, J, in mesh with the crank-axle bevel-gear.

*j* represents another yoke which may, though not necessarily, be of elliptical form, as shown in Fig. 4, and it has at its forward and rear boundaries the tubular hubs, *j*<sup>2</sup> and *j*<sup>3</sup>, the latter of which encircles and is connected to the forward extremity of tube, K, while a shaft or bar, *m*, has its intermediate portion fitted and secured by pins, or otherwise, within the forward tubular hub, *j*<sup>2</sup>. The rearward extremity of said bar, *m*, is screw-threaded and receives the adjustable, annular section, *n*, for the ball-bearing between which and the end-face of the gear, J, the hardened balls for this bearing are comprised. The other end of said bar, *m*, is forwardly extended within the adjacent socket-lug, *a*, and pinned, or otherwise secured, thereto.

*o* indicates a lock-nut for holding the bearing section, *n*, in its proper adjustment.

The assemblage of the parts, which intimately pertain to the present improvements, may be made in this manner: The sleeve, *f*, is first screwed through the yoke-extension, *h*, and the annular bearing member is screw-engaged with the threaded stud; the gear-wheel, J<sup>2</sup>, is then slipped into the rear yoke, the balls being inserted between this gear and the adjacent ball-bearing member, *i*<sup>2</sup>, and the shaft, H, is entered within the tubular fork-leg and keyed to the gear. The rear-wheel-axle is now passed through the hub of the rear-wheel and the bevel-gear thereon, and screwed through the part, *f*, and at this time the opposite rear-wheel fork-leg or frame

member, E, may be connected with the other end of the axle; the gear, J, is now placed within the forward yoke and slipped over and keyed upon the forward end of the shaft; the adjacent ball-bearing member, *n*, is brought into the proper relative position to the gear with the balls between said parts, and the bar, *m*, is forced through the tubular forward hub of the yoke and by its rearward screw-threaded end takes a screw-engagement through the said bearing member, *n*, it first, however, passing through the lock-nut, *o*. This bar, *m*, is now immovably pinned to the yoke. The rear-wheel and the connected rear frame members, E, E', are now connected to the socket-lugs, *a*, *a*, of the crank-axle-bearing and confined by the keys or pins. The adjustment of the ball-bearings may, as plain, be now insured by properly turning the annular ball-bearing members, *c*, *f*, *i*<sup>2</sup>, and *n*.

I purpose to inclose all of the gearing within suitable light casing, of thin metal, whereby when the machine is set up it will assume the appearance shown in Fig. 1, but no claim is made to any particular construction of inclosing casings, and hence no thorough illustration or description thereof need be herein given.

It will be noticed that the shaft, H, has no bearing for friction upon its inclosing tube or upon any other parts, its support being through the medium of the gears, J and J<sup>2</sup>, which rest against the balls and the weight of which is sustained by the annular bearing members, *i*<sup>2</sup> and *n*.

What I claim, and desire to secure by Letters Patent, is—

1. In a velocipede, the combination with the crank-axle with a bevel-gear thereon, and the rear-wheel-axle, the crank-axle-bearing having a rearwardly extended member and the rear-wheel having a bevel-gear on its hub, of a tubular side member of the frame having a support on an extension of the rear-wheel-axle, the shaft inclosed in said tubular member and having bevel-gears at each end which mesh with the aforesaid gears, and said tube having a yoke encircling the forward shaft gear and having at its forward end the hollow hub, the bar, *m*, supported in said hollow hub and having on a rearwardly extended portion a bearing member, *n*, and having its other end adapted to engage for support the said rearwardly extended member of the crank-axle-bearing, substantially as described.

2. In a velocipede the combination with a frame fixedly supporting the rear-wheel-axle, and also the bearing support for the crank-axle, of the rear-wheel and the crank-axle each having a gear-wheel thereon, and the tubular fork-leg or frame member at the side of the rear-wheel having at its rear end a yoke which has a supporting connection to said fixed rear-wheel-axle, the shaft inclosed in the tube and having within said yoke a gear in mesh with the rear-wheel gear, and

having connected to its forward end a gear in mesh with the crank-axle gear, a yoke adapted to encircle the forward gear of the said shaft and having tubular portions at opposite sides thereof one of which receives connection with a forward end portion of the gear shaft, and a stud rigidly fixed to and rearwardly projected from the crank-axle bearing and entered for engagement in the forward tubular member of the said yoke, substantially as described.

3. In a velocipede the combination with a frame fixedly supporting the rear-wheel-axle and also the bearing support for the crank-axle, said rear-wheel-axle being projected outwardly beyond the rear-wheel hub, and screw-threaded, the rear-wheel having a bevel-gear secured thereto and an internally screw-threaded sleeve longitudinally adjustable on the rear-wheel-axle extension and having its inner end formed to constitute a member of the ball-bearing which is comprised between it and said rear-wheel gear, the tubular side member carrying at its rear a yoke which comprises a device to embrace and be connected to said adjustable sleeve, the shaft provided with the beveled roller toothed gear inclosed in said yoke and in mesh with the rear-wheel gear and having at its forward end a gear-wheel which has a gear connection with the crank-axle, substantially as and for the purpose set forth.

4. In a bicycle the combination with the frame having the rigidly supported crank-axle bearing, and the fixed rear-wheel axle having the rear-wheel rotatable thereon said axle having the end extension projected beyond the wheel-hub and screw-threaded, the bevel-gear on the rear-wheel-axle, the sleeve internally and externally screw-threaded and having its inner portion constituting the bearing surface of the ball-bearing which is between the said sleeve and said bevel-gear, the tubular side member of the frame having at its rear portion the yoke provided with a rearwardly extended hub or lug which is internally screw-threaded for adjustable and detachable connection with said bearing sleeve, and said yoke comprising at its rear boundary a forwardly extended externally threaded

stud, an internally threaded annular ball-bearing member adjustably screw-engaged with said stud, the gear-shaft having the gear on its rear end and the balls between said gear and said annular bearing member, and a gear connection between the forward end of said shaft and the crank-axle, substantially as and for the purposes set forth.

5. In a bicycle, the combination with the tubular bearing for the crank-axle having rearwardly extended members, of the crank-axle having a bevel-gear thereon, the gear-shaft, gear-connected to the rear-wheel, and having at its forward end a bevel-gear, J, engaging the crank-axle gear, the side member, E', of the frame and the tube, H, both rearwardly supported by the rear-wheel-axle, the yoke connected to the forward end of the tube and having at the rearward and forward boundaries thereof tubular hubs, a bar having its intermediate portion fitted and connected in the forward one of said yoke-hubs, the extremities thereof extended rearwardly and forwardly therefrom, the forward extremity having a detachable connection with one of said members of the crank-axle-bearing and the rearward extremity supporting the gear-wheel, J, and the forward end of the frame member, E', connected to the other of said members of the crank-axle bearing, substantially as described.

6. In a velocipede, the combination with the bearing support, B, having a rearwardly extended socket-lug, *a*, and the crank-axle having the bevel-gear thereon, the shaft geared to the rear-wheel and having a gear in mesh with the crank-axle-gear, the tubular lower rear member of the frame inclosing the shaft and the yoke connected to the tube and having the hollow hub, *j*<sup>2</sup>, the bar, *m*, intermediately encircled by said yoke-hub, and having the rear extremity screw-threaded with the adjustable annular ball-bearing member, *n*, thereon, and the forward extension of said bar, *m*, entered and confined in the socket-lug, *a*, substantially as described.

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