(No Model.)

# G. SINGER & R. H. LEA.

## VELOCIPEDE.

No. 373,570. Patented Nov. 22, 1887.

FIG. 1.

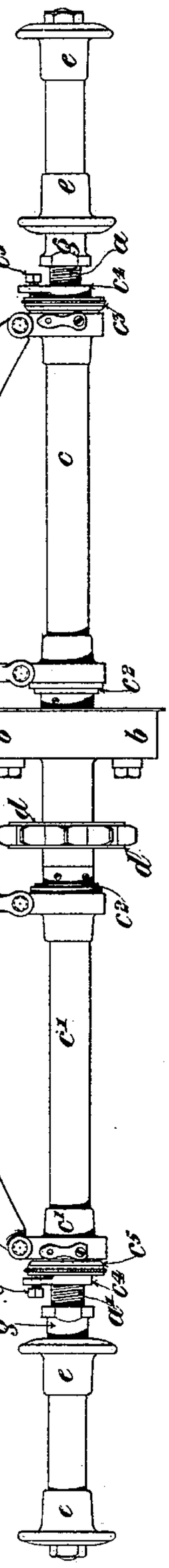
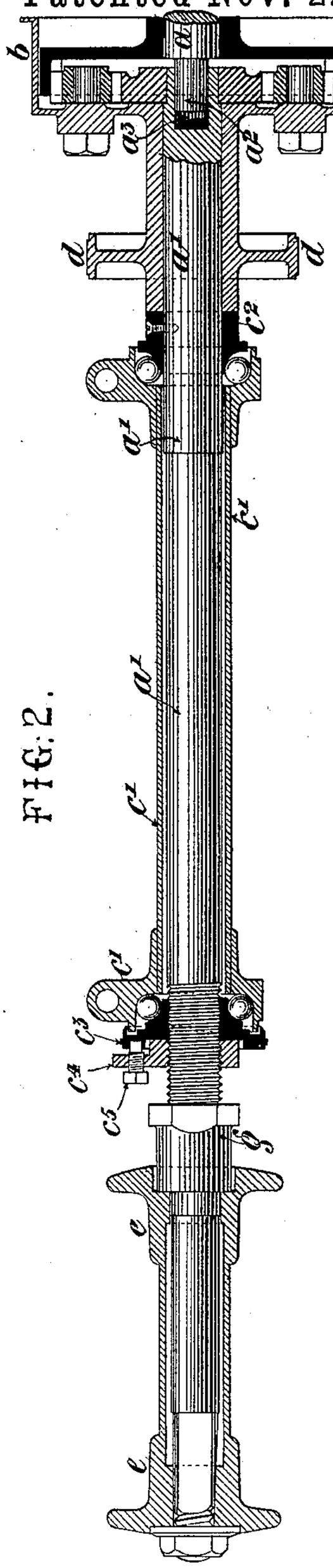



FIG. 2.

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# UNITED STATES PATENT OFFICE.

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## VELOCIPEDE.

SPECIFICATION forming part of Letters Patent No. 373,570, dated November 22, 1887.

Application filed July 22, 1887. Serial No. 244,981. (No model.) Patented in England July 6, 1885, No. 8,180, and December 9, 1885, No. 15,131.

*To all whom it may concern:*

Be it known that we, GEORGE SINGER, bicycle and tricycle manufacturer, and RICHARD HENRY LEA, machinist, subjects of the Queen of Great Britain, residing at Coventry, in the county of Warwick, England, have invented certain new and useful Improvements in the Construction of Axles and Axle-Bearings of Tricyles and other Velocipedes, (for which patents have been granted us in Great Britain, dated July 6, 1885, No. 8,180, and December 9, 1885, No. 15,131,) of which the following is a specification.

Our invention refers to improvements in the construction of axles and axle-bearings of tricycles and other velocipedes, which improvements have special reference to that class of tricycles having the driving-chain or other gear at or near the center of the axle.

In order that our invention may be fully understood, we will describe the same with reference to the accompanying drawings and to the letters of reference marked thereon—

Figure 1 being a back elevation showing our improved axle and bearing constructed according to our invention. Fig. 2 is a portion of a similar view, showing the axle and bearings in partial section, drawn to a larger scale than Fig. 1.

In carrying out our improvements according to our invention we form the axle proper in two halves, *a a'*, connected by a differential driving-gear, *b*, which is placed at or near the center of the tricycle-axle. Each half-axle *a a'* has its independent bearing, and is adjusted separately, as hereinafter more particularly described. At or near the end of each half-axle *a a'*, nearest the driving-gear *d*, a cone, $c^2$, is fixed, and at the opposite end of each half-axle *a a'*, and near to the inner flange of the hubs *e* of driving-wheels, there is a corresponding cone, $c^3$, screwed, capable of adjustment relatively to the fixed cone $c^2$. Between these two cones $c^2$ $c^3$, on each axle, a long sleeve, *c* and *c'*, is provided, having at each end a concave case, in which the bearing-balls run when such are employed. Each half-axle *a a'* thus runs in a bearing of the greatest width obtainable, and thereby great steadiness and the utmost freedom of running are secured. Each end of each of the two bearing-sleeves *c c'* is attached by bolt and nut or other suitable means of connection to a bridge-tube or bow-string girder-shaped tube, *f*, which runs the whole length of the axle *a a'* and passes over the central driving-gear, *d*, thus firmly connecting and supporting the two bearing-sleeves *c c'*. The bridge-tube *f* forms part of the main frame-work of the tricycle, and is preferably placed directly above the axle, and carries the weight of the said main frame-work, which is by the bridge *f* distributed between the axle-bearings, the object being to obtain the greatest amount of rigidity combined with a minimum amount of weight in such axle frame-work.

In order to prevent the possibility of any "sag" taking place (by the pull of the chain) on the otherwise somewhat unsupported end of *a'*, the two halves of the divided shaft may be conveniently provided at the point of division with a projecting end or "dowel-pin," $a^2$, say on the half *a*, which fits into a corresponding bearing, $a^3$, in the end of the half *a'*, and in such manner that the projecting end may be free to slide laterally, when required, in such bearing in the opposite half-shaft.

A suitable arrangement is made for effectually locking the adjusting-cones after the proper degree of adjustment is secured. For example, and as seen in Fig. 1, we preferably employ a collar, $c^4$, screwed onto the shafts *a a'* and fixed thereto by a set-screw in such manner that the screw $c^5$, carried by it, may reach and hold the cone $c^3$ in position.

To complete our new and improved axle, we place a small screwed bush, *g*, or sleeve between the collar $c^4$ and flange of hub *e*. By turning this bush *g* on the axle the tricycle-wheel may be easily and readily detached whenever its removal may be required, and without any liability to injure the axle end, as is the case in the common method of removal.

When it is required to adjust the bearings, the screw $c^5$, carried by the collar $c^4$, which is fixed to the axle, is loosened and withdrawn from the cone $c^3$. This cone $c^3$ is then screwed and advanced toward the central part of the axle, and acting against the end of the fixed

sleeve *c c'* will cause a very slight lateral motion of the half-axle, and the cones are tightened—that is, the cone $c^2$, together with the shaft by which it is carried, is drawn farther into one end of the sleeve *c*, and the cone $c^3$ is at the same time advanced into the other end of the said sleeve.

The construction and action of the bearings for each half-axle are similar.

It will be obvious that by reversing the positions of the fixed and adjusting cones of either *a* or *a'* the two halves of axle may both be made to move laterally in the same direction, the component parts of balance-gear being thereby kept from slightly separating; but this movement is so infinitessimal that the previously fully-described arrangement is more convenient and preferable.

We claim—

1. The combination, with frame work and wheel-hubs in a tricycle or other velocipede, of two independent half-axles, *a* and *a'*, bearings consisting of sleeves *c* and *c'*, each connected to the frame-work, and cone-bearings $c^2$ $c^3$ on each half-axle and sustaining the sleeves *c c'*, the cones $c^3$ being screwed upon the half-axle and capable of adjustment relatively to the fixed cones $c^2$, substantially as herein set forth.

2. The combination, with the wheel-hubs in a tricycle or other velocipede, of two independent half-axles, *a a'*, bearings consisting of sleeves *c* and *c'*, each connected to the frame-work, and cone-bearings $c^2$ $c^3$ on each half-axle and sustaining the sleeves *c c'*, the cones $c^3$ being screwed upon the half-axle and capable of adjustment relatively to the fixed cones $c^2$, and the bridge-tube or girder-shaped frame *f*, and the screwed bush or sleeve *g*, whereby the bearings are easily and accurately adjusted and great rigidity is obtained by the girder-frame, substantially as set forth.

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