No. 625,644. **Patented May 23, 1899.**

A. T. COLLIER.

DRIVING GEAR FOR BICYCLES, &c.

(Application filed Aug. 8, 1898.)

(No Model.) 2 Sheets—Sheet I.

Fig. 1.

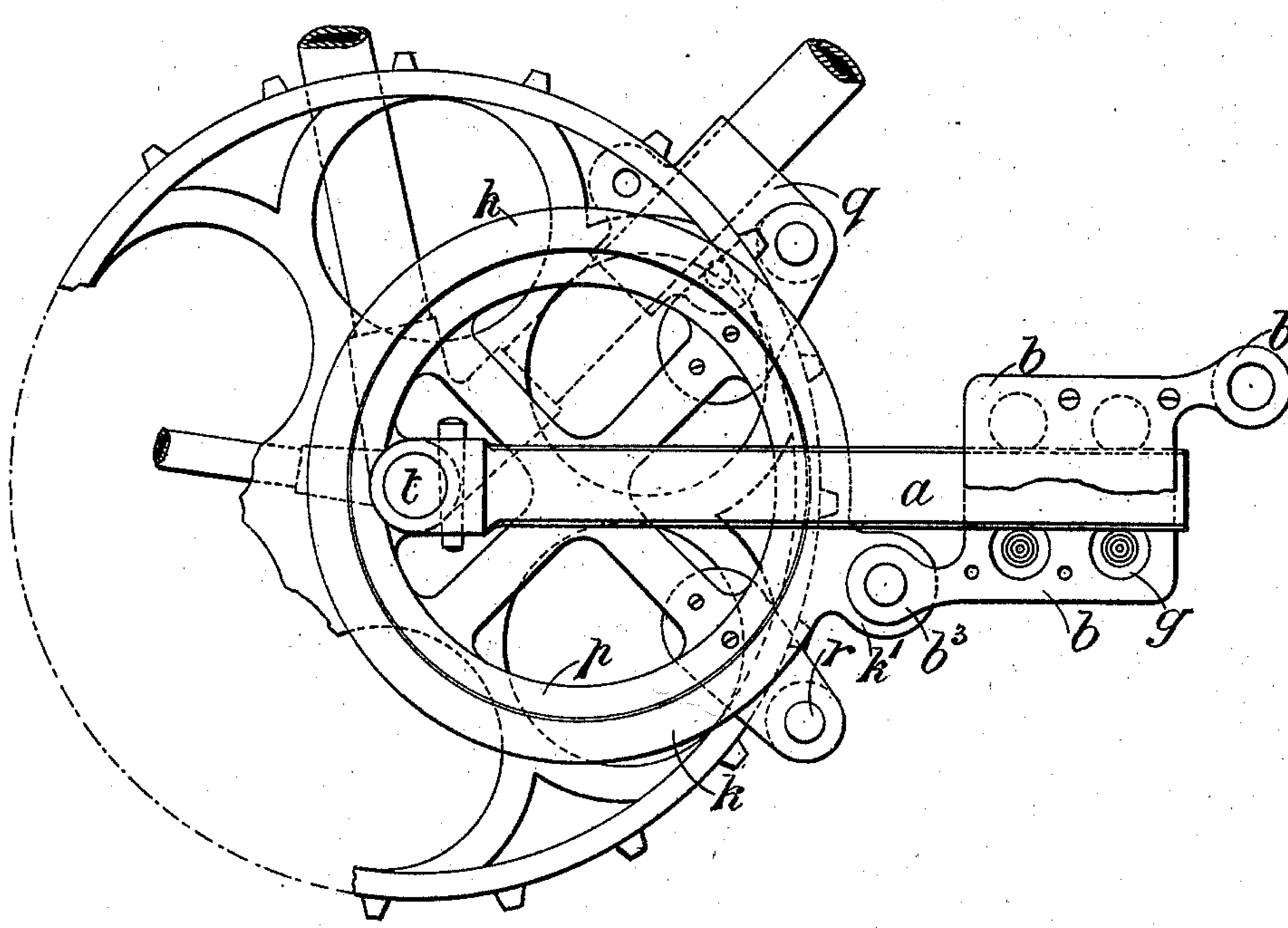
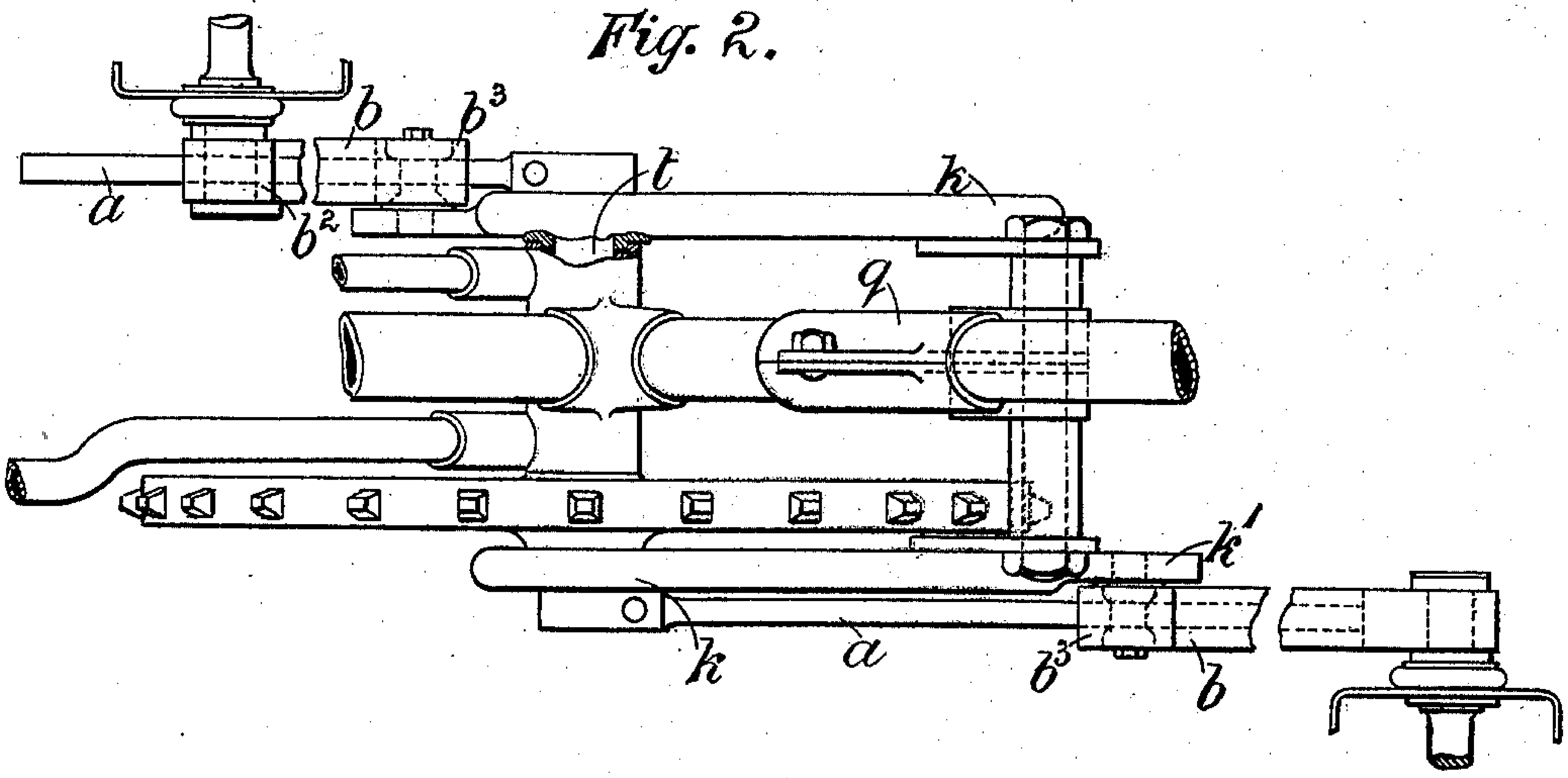


Fig. 2.



Witnesses

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 3.

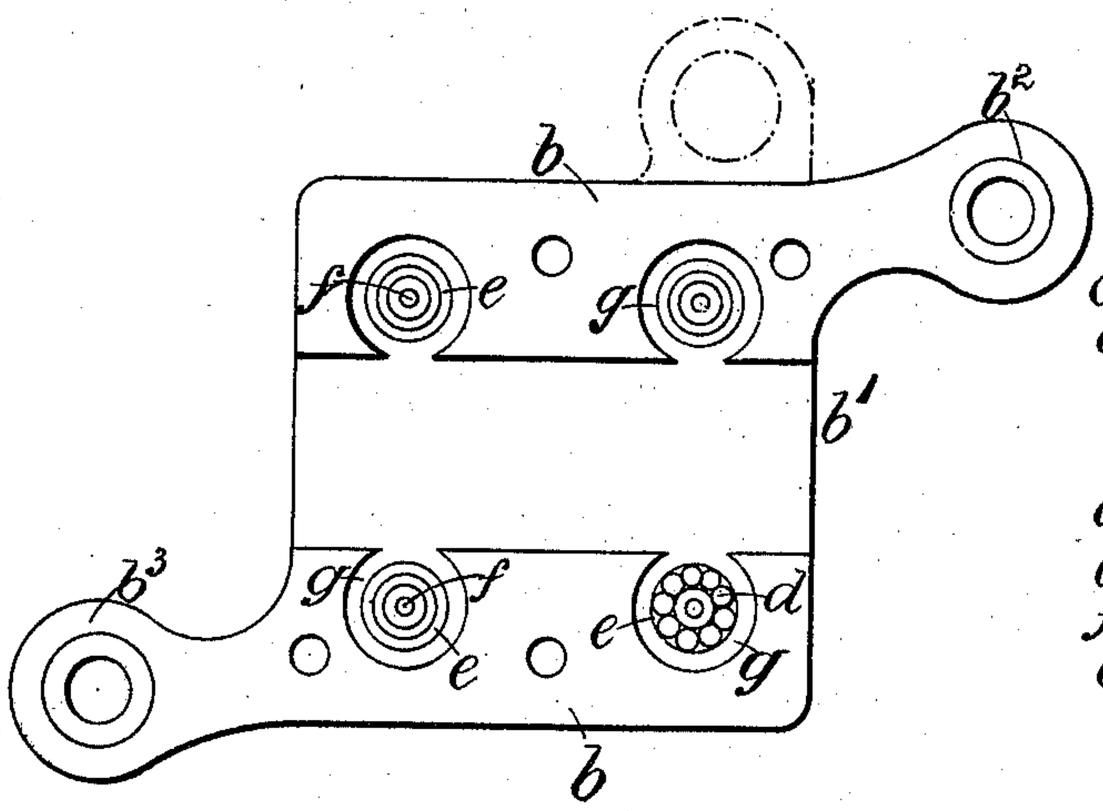
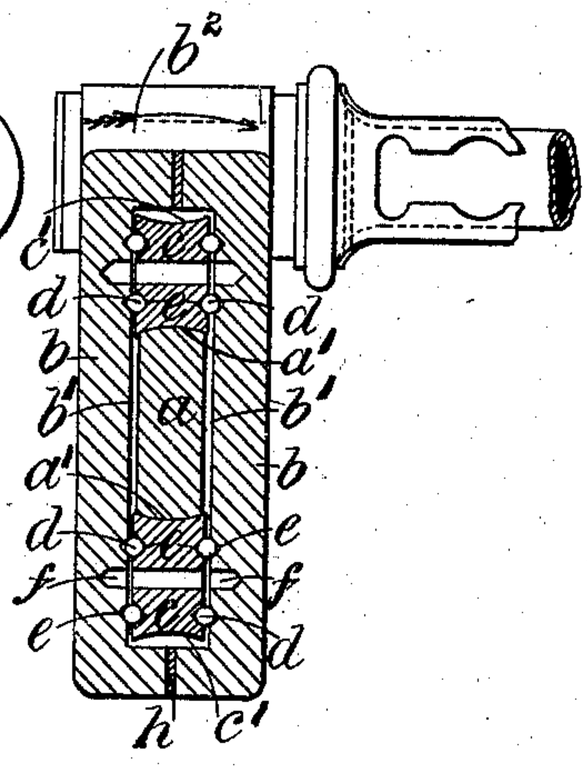


Fig. 4.



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UNITED STATES PATENT OFFICE.

ARTHUR THOMAS COLLIER, OF ST. ALBANS, ENGLAND.

DRIVING-GEAR FOR BICYCLES, &c.

SPECIFICATION forming part of Letters Patent No. 625,644, dated May 23, 1899.

Application filed August 8, 1898. Serial No. 688,052. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR THOMAS COLLIER, engineer, a subject of the Queen of Great Britain, residing at Gonvena, St. Albans, in the county of Herts, England, have invented certain new and useful Improvements in Driving-Gear for Bicycles and other Velocipedes, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved driving-gear, a portion of the slide-block being broken away. Fig. 2 is a plan or top view of the said driving-gear. Fig. 3 is a side elevation, drawn to an enlarged scale, showing one of the halves or sides of the slide-block; and Fig. 4 is a transverse section through the crank-arm or concentric lever and the slide-block, drawn to the same scale as Fig. 3.

My invention relates to driving-gear for velocipedes of the kind or class wherein compound cranks are employed, so that a greater leverage will be obtained during the downward or operative movement of the crank than during the upward or return movement thereof, and my said invention relates more particularly to driving-gear of that kind or class wherein the variation of the leverage is brought about by means of eccentric levers and straps turning about stationary disks fixed to the frame of the machine eccentrically to the driving-shaft, which straps are coupled to slide blocks or heads arranged to slide to and fro upon the crank-arms or concentric levers, respectively. In such driving-gear as heretofore constructed the twisting or torsional stress to which the parts are subjected by reason of the driving force or pressure applied to the pedal is borne mainly by the crank-arm or concentric lever, the force exerted upon the pedal being transmitted to the said crank-arm or concentric lever through the said slide block or head, and consequently there is excessive friction between the slide-block and the crank-arm when the driving force is applied to the pedal.

Now the object of my present invention is to prevent increase of the friction between the crank-arm and slide-block by the force applied to the pedal, and thus permit the slide-block to travel much more freely upon the said crank-arm by so constructing the driving-gear that all the twisting or torsional stress to which the parts are subjected when pressure is applied to the pedal will be transmitted to the stationary disks or eccentrics.

To this end my said invention partly consists in the combination, with the crank-shaft, of slide-blocks mounted on the crank-arms thereof without any lateral bearing against the same, pedals carried by said slide-blocks, respectively, stationary disks or eccentrics fixed to the frame of the machine, and eccentric-straps mounted upon said disks or eccentrics and coupled to said slide-blocks and adapted to withstand the twisting or torsional stresses due to the driving force applied to the pedals, which stresses are transmitted to said eccentric-straps through said slide-blocks without coming upon said crank-arms.

My said invention further consists in the construction and combination of the parts, as hereinafter particularly described.

Each crank-arm or concentric lever *a* is made with its upper and under surfaces curved in transverse section, as shown more clearly at *a' a'* in Fig. 4, so that the curves form parts of a circle struck from the center of the said crank-arm. The rollers *c*, carried by the slide block or head *b*, are made with peripheral grooves *c'*, correspondingly curved in transverse section, and the longitudinal slot *b'* through the slide-block *b* is made of greater width than the crank-arm *a*, so as to leave spaces between the sides of each crank-arm and the slide-block thereon. By this arrangement, notwithstanding any slight twisting or turning of the said slide-block about the center of the said crank-arm in the direction indicated by the arrow in Fig. 4 by the force exerted upon the pedal, the friction between the slide-block and crank-arm will not be increased, and therefore the resistance to movement of the said slide-block along the crank-arm will be approximately constant for any given relative position of these parts.

I find it advantageous to make the slide-block from two solid pieces of steel of about one-half the thickness of the said slide-block and to form in the said pieces suitable recesses *g* to receive the rollers *c* and suitable slots *b'* to permit the crank-arm or concentric lever *a* to pass through the said slide-block.

One or more liners *h* may, if desired, be fitted between the two halves of the slide-block to keep them at such a distance apart as to insure the proper working of the ball-bearings *d*.

I fix the pedal-pin in a lug or eye b^2, formed on the front end of the slide-block *b* at or near the top thereof, or this lug may be formed on the top of the slide-block, as shown by dotted lines in Fig. 3, and on the rear end of the said slide-block *b*, at or near the bottom thereof, I form another lug or eye b^3, whereby it is coupled to the eccentric-strap *k*.

To effectually insure rigidity of the stationary disks or eccentrics *p p'*, I not only attach them rigidly to a clamp *q*, fixed on the frame of the machine, but I also connect them together by means of a bridge piece or stay *r*, so constructed as to be clear of the chain-wheel when such is employed.

It will be seen from the foregoing description that the crank-arm or concentric lever cannot be subjected to the twisting or torsional stress due to the driving force exerted on the pedal and that the twisting or torsional stress due to such force cannot increase the friction between the slide-block and the said crank-arm or concentric lever.

What I claim is—

In driving-gear for velocipedes, the combination of a crank-shaft, crank-arms having their upper and under surfaces curved in transverse section so that the curves form parts of a circle struck from the center of said crank-arms respectively, slide-blocks arranged to slide on said crank-arms, spaces being left between the sides of each crank-arm and the slide-block thereon, rollers mounted with ball-bearings in said slide-blocks and having circumferential grooves curved in transverse section to correspond to the curved surfaces of said crank-arms, pedals carried by said slide-blocks, disks or eccentrics fixed to the frame of the machine, and rotary straps mounted on said eccentrics and coupled to said slide-blocks, substantially as, and for the purpose, above specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ARTHUR THOMAS COLLIER.

Witnesses:
ALEXANDER WILLIAM ALLEN,
WILMER MATTHEWS HARRIS.