(No Model.)

4 Sheets—Sheet 1.

C. O. E. MATTHERN.

BICYCLE.

No. 559,299.

Patented Apr. 28, 1896.

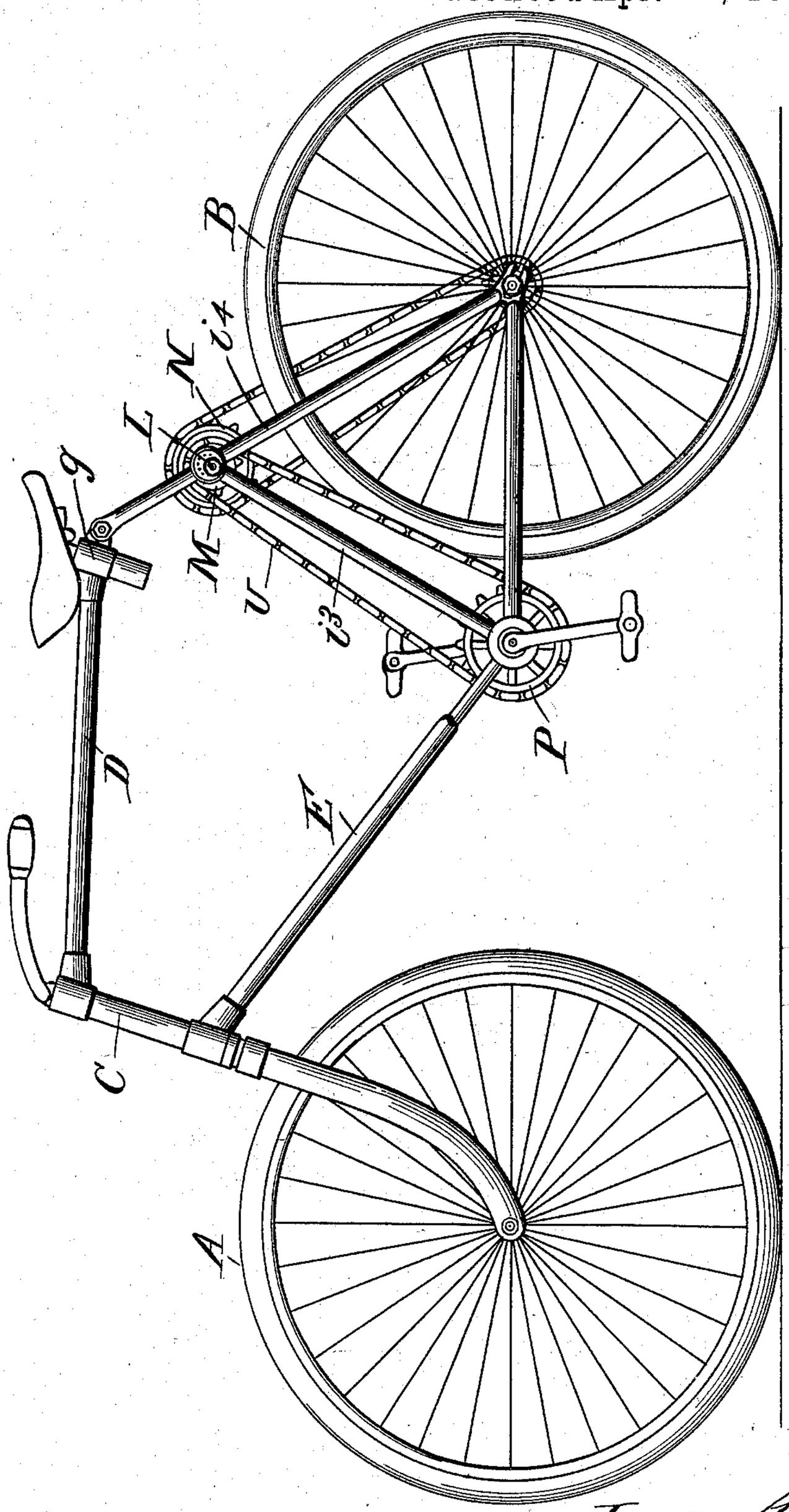

Fig. 1.

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Fig. 2.

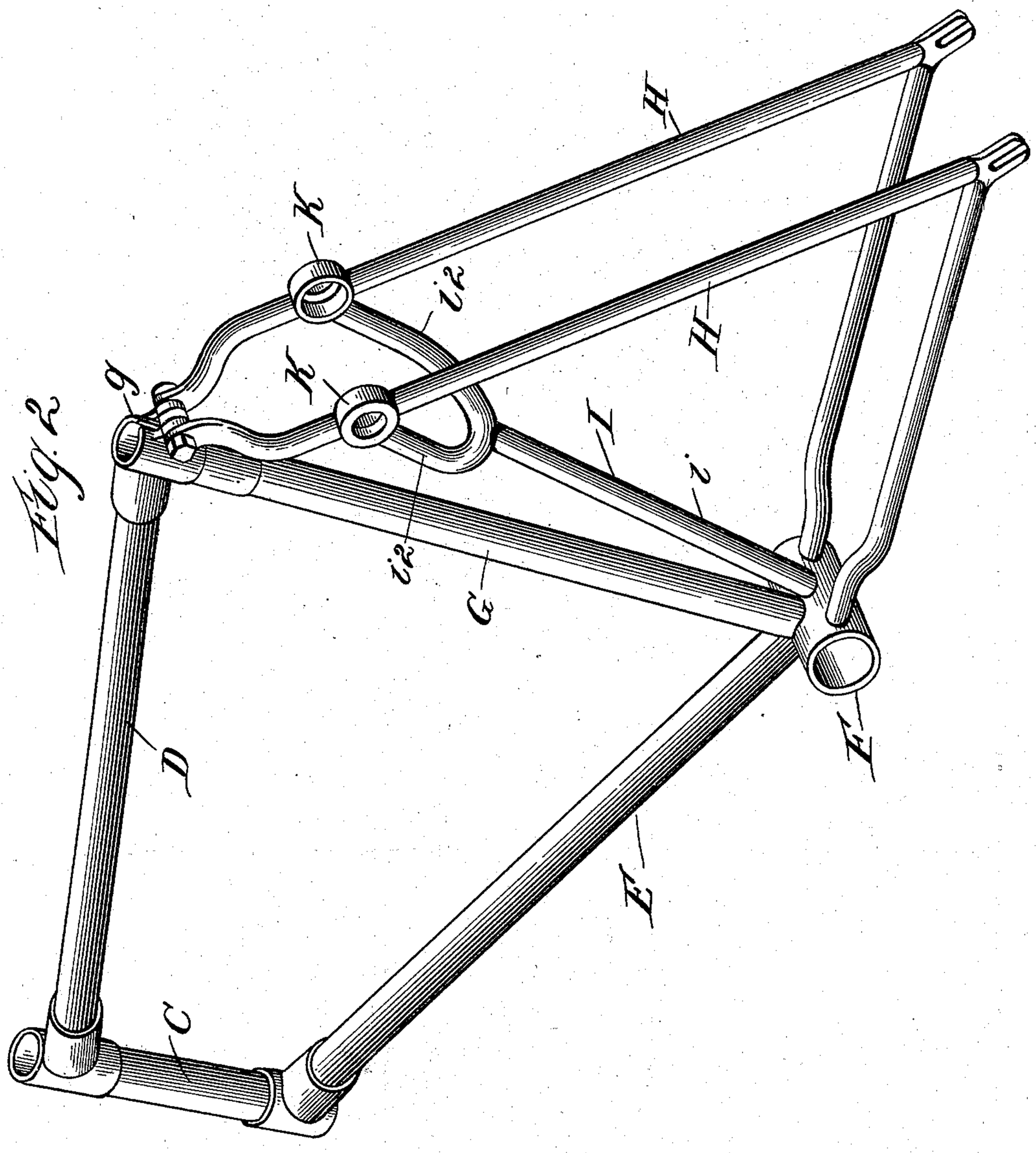

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Fig 3.

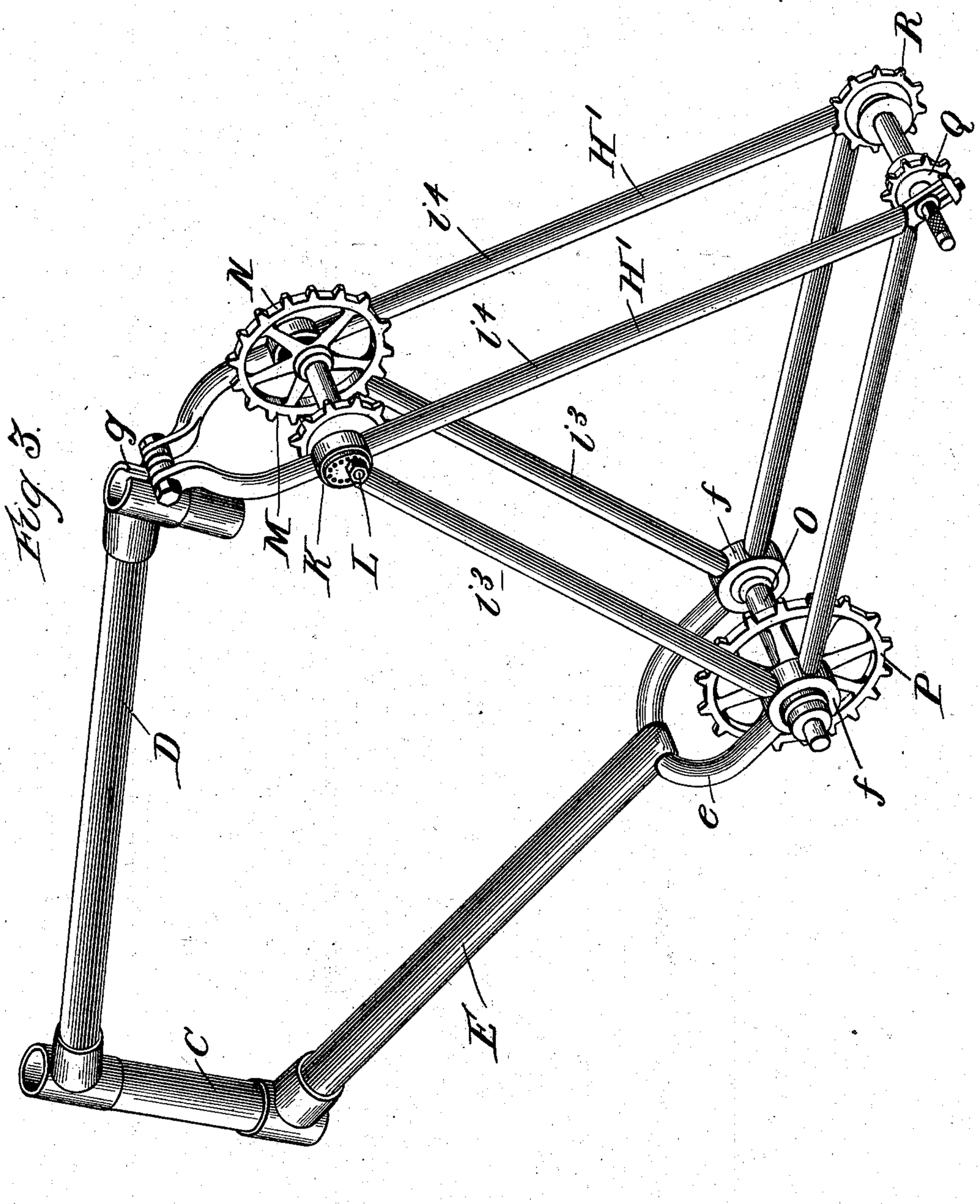

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Fig. 4.

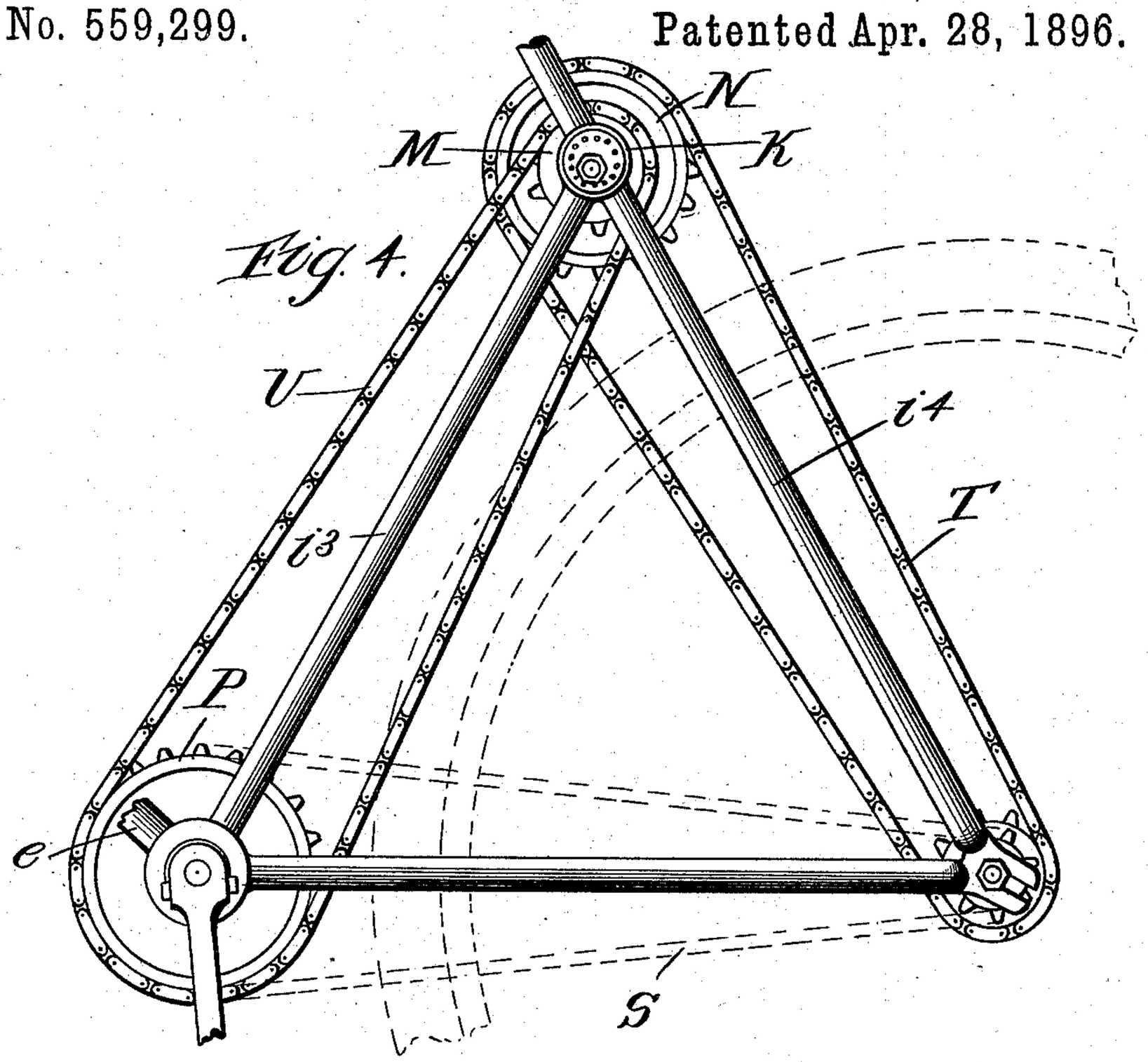


Fig. 5.

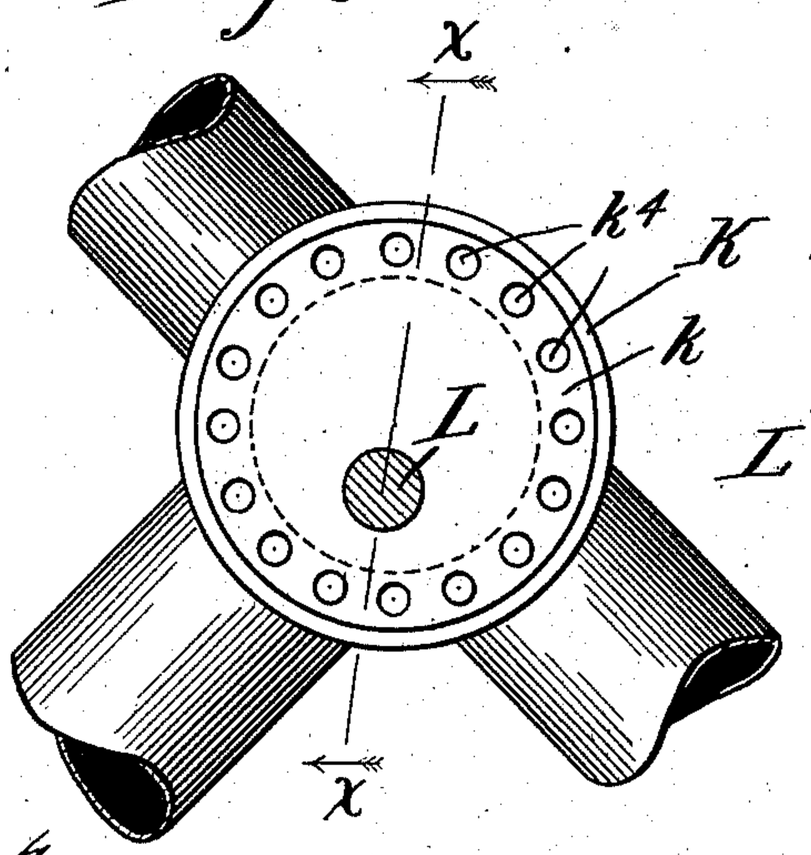
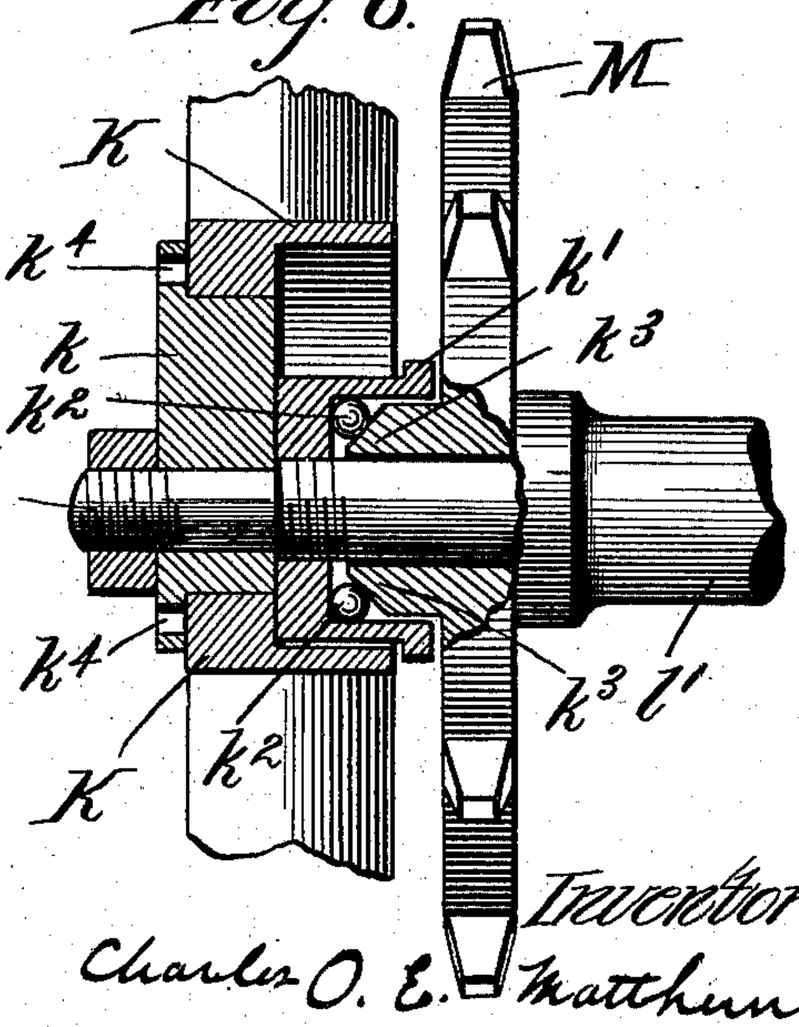


Fig. 6.



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UNITED STATES PATENT OFFICE.

CHARLES O. E. MATTHERN, OF CHICAGO, ILLINOIS.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 559,299, dated April 28, 1896.

Application filed July 31, 1895. Serial No. 557,684. (No model.)

To all whom it may concern:

Be it known that I, CHARLES O. E. MATTHERN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Bicycles, of which the following is a specification.

The objects of my invention are to provide improved means for varying the driving-gear in bicycles without removing or otherwise disturbing the gears thereon, to permit such variation to be made without adjusting the length of the driving-belting employed, and to provide certain improvements in the construction of the frame of the machine, with reference to the provision of multiple or speed gearing.

In a bicycle characterized by my invention the rear supporting-wheel or hub thereof is provided with a couple of sprocket-wheels of different relative sizes and respectively arranged at opposite sides of the wheel, and the crank-axle is provided with a sprocket-wheel which can be connected with one of the two rear sprocket-wheels by a chain or driving-belt. At a point over the forward portion of the rear supporting-wheel the frame of the machine is provided with a rotary hub or axle having a couple of sprocket-wheels of different relative sizes, the arrangement of these sprockets being such that one of them can be connected with one of the sprockets on the rear wheel by a driving-belt, while the other can be similarly connected with the sprocket-wheel on the crank-axle when the sprocket last mentioned is not connected by a driving-belt with one of the rear sprockets. By this arrangement the rear supporting-wheel can be driven directly from the crank-axle sprocket by means of a single driving-belt, or on the other hand when it is desired to change the speed of the machine the driving-belt referred to can be transferred from the rear sprocket to one of the elevated sprockets, in which way the power from the driving-sprocket on the crank-axle can be transmitted to the rear wheel through the medium of a couple of driving-belts, respectively connecting the driving-sprocket and one of the rear sprockets with one and the other of the two intermediate or elevated sprockets which are arranged over the forward portion of the rear supporting-wheel. The two elevated sprocket-wheels are of different relative sizes and all of the sprockets are relatively sized, so that the machine can be geared for high or low speed by simply shifting or rearranging the driving-belting without changing or disturbing the sprocket-wheel.

The rear portion of the frame of the machine comprises a couple of triangular frame portions, between which the rear supporting-wheel is arranged. The bearings for the hub or axle which carries the two elevated sprocket-wheels are arranged at the apices of these triangular frames, whereby a simple, practicable, strong, and durable arrangement is provided, and this arrangement also permits me to provide certain further details of improvement in the frame of the machine, as hereinafter more conveniently described in connection with the accompanying drawings, in which—

Figure 1 represents in side elevation a bicycle embodying my invention. Fig. 2 represents the frame of the machine in perspective on a larger scale. Fig. 3 is a like view illustrating certain structural changes or modifications in the frame, constituting matters of further improvement. Said figure also illustrates the arrangement of sprockets. Fig. 4 represents said frame in side elevation with the driving-belting applied to the two upper sprockets. Fig. 5 is an enlarged detailed view illustrating a belt-tightener. Fig. 6 is a section on line $x\,x$ in Fig. 5.

The bicycle herein illustrated comprises the front supporting and steering wheel A, the rear supporting-wheel B, the steering post or head C, the upper reach or back-bone D, and the lower reach E.

In Fig. 2 the bearing F for the crank-axle unites with one end of the lower reach E, and it also unites with the lower end of a tubular standard G, which latter unites at its upper end with the rear end of the reach or back-bone D. With such arrangement the standard G is provided at its upper end with a socket for the seat-standard. In said Fig. 2 the rear frame portion comprises a couple of V-shaped frames H, which have their ends rigid with the bearing F and also rigid with the seat-standard socket on the upper portion of the standard G. These frames H are

braced and strengthened by and in part formed with a fork I, having a stem *i*, which is rigid with the bearing F, and prongs i^2, which are rigid with the upper arms of said V-shaped frames. With this arrangement bearings K for the axle of the two upper sprockets M and N are arranged at the points where the prongs of the fork unite with the upper arms of the V-shaped frames H.

In Fig. 3 the frames H′ are triangular and correspond with the frames H in Fig. 2, with the exception that in Fig. 2 the fork I is substituted for the two forward portions i^3 of the frames H, (shown in Fig. 3,) the practicable result, however, being at each case a couple of triangular frames, since in Fig. 2 the fork I may be said to form the forward side portion of each triangular frame. With this understanding the bearings for the axle which carries the upper sprockets M and N are in all of the several figures arranged at the upper corners or apices of the two triangular frames, and as a matter of further improvement the upper sides i^4 of these triangular frames are extended upwardly and beyond the upper corners of the frames, so that they can extend and be bolted to the socket *g* for the seat-standard whether said socket be secured to or formed with the standard G or whether the standard G be omitted, as it may be, as in Fig. 3. The crank-axle O is provided with a suitable sprocket-wheel P, and upon the rear wheel or the hub thereof I arrange a couple of differently-sized sprocket-wheels Q and R, which in practice are rigid with the wheel.

For ordinary work the rear wheel can be driven directly from the sprocket P by means of a driving-belt, as indicated by dotted line S in Fig. 4, and at such time it will not be necessary to have any further belting upon the machine, although as a matter of convenience I may leave upon the machine the driving-belt T, which connects the upper sprocket N with the lower rear sprocket R, it being seen that during such use the upper sprockets N and M will simply run as idlers. When, however, a change of gear and speed is desired, it will only be necessary to connect up the sprockets by the driving-belts, as illustrated in Fig. 4, omitting, of course, the connection indicated by dotted lines S in said figure, whereby power from the driving-sprocket on the crank-axle will be transmitted to the rear wheel through the medium of the belts U and T, as in Fig. 4, wherein the belt U connects the driving or crank-axle sprocket with the small elevated sprocket M, which is rigid with its companion larger sprocket N, which latter is in turn connected with a relatively small sprocket R on the rear supporting-wheel through the medium of the driving-belt T.

For certain purposes I may employ one or two belts at one time, according to the requirements of speed, as hereinbefore set forth, and while the belts can be taken off or changed or placed as may be desired I propose as a matter of further improvement to arrange the sprockets so that the driving-belt U can be used for connecting the sprocket P with the sprocket M and also for connecting the sprocket P with the sprocket Q in alternation, and in this way the machine can always carry the two belts illustrated in Fig. 4, wherein it will be seen that whenever it is so desired the belt U can be shifted from the sprocket M to the sprocket Q, and this will be found particularly desirable where the sprockets are all arranged within the frame, since in such case the labor of applying and removing a belt or belts will be obviated.

In Fig. 3 the reach E has its rear portion formed by a yoke or fork *e*, which at its rear end unites with bearings *f* for the crank-axle, thereby providing an exceedingly strong construction and maintaining the bearings *f* in perfect alinement, it being observed that said bearings are also rigid with the lower forward corners of the frames H. The sprockets in Fig. 3 are all arranged between the triangular frames H, and with such arrangement it is particularly desirable that the machine shall be permanently equipped with the two belts U and T and that the relative arrangement of the sprockets shall be such that the belt U can be shifted from the upper sprocket M to the lower rear sprocket Q, as indicated by dotted lines S in said Fig. 4.

It will also be observed that the sprockets P, M, and Q are arranged in a vertical plane at one side of the rear supporting-wheel and that the sprockets N and R are arranged in a vertical plane at the opposite side of said wheel, and in this way the machine will be properly balanced.

As a matter of further improvement I provide, in connection with the elevated axle L for the upper sprockets, means for laterally adjusting said axle so as to tighten up the belting, and to such end I provide each bearing K with a rotary adjustable block or hub *k*, with which an end of the axle is eccentrically connected.

In Figs. 5 and 6, L represents one end portion of the axle, upon which latter is arranged a hub or sleeve *l*′, carrying the sprockets M and N. The sleeve *l*′ is provided with the said sprocket-wheels M and N, and the axle L, which extends through said sleeve, is also understood to extend through the eccentric blocks *k*, it being observed that a belt-tightener is provided at each end of the axle. Description of one belt-tightener will therefore serve for both. The eccentric or eccentric block *k* is fitted to turn in bearing K, and at the rear side of such eccentric a cup-bearing *k*′ is screwed upon the axle, so as to provide the outer bearing for a set of antifriction-balls k^2, arranged between the inner wall of the cup-bearing and a cone k^3 on the sleeve *l*′. By adjusting the eccentrics the belts (and particularly the belt U) can be tightened or loosened. The eccentrics *k* are provided with

sockets k^4, in which projections on a tool for turning the eccentrics can be inserted.

What I claim as my invention is—

1. The combination and arrangement in a bicycle, of a couple of rear sprockets respectively at opposite sides of the rear supporting-wheel, a couple of connected elevated sprockets supported over the forward portion of the rear supporting-wheel and respectively in the planes of one and the other of the rear sprocket-wheels, the crank-axle having a single sprocket, a driving-belt for connecting one of the elevated sprocket-wheels with one of the rear sprocket-wheels, and a driving-belt for connecting the sprocket-wheel on the crank-axle in alternation with one of the rear sprocket-wheels and one of the elevated sprocket-wheels, substantially as and for the purpose described.

2. The combination and arrangement in a bicycle, of the frame having its rear part constructed with a couple of triangular frame portions between which the rear supporting-wheel is arranged, a couple of rear sprockets respectively at opposite sides of the rear supporting-wheel, a couple of elevated sprocket-wheels supported at the apices of the triangular frame portions, the crank-axle arranged at the lower forward corners of the triangular frame portions and provided with a single sprocket-wheel, and belting for transmitting power from the sprocket-wheel on the crank-axle directly to one of the rear sprocket-wheels, or indirectly from one to the other of said members by way of the elevated sprockets, substantially as described.

3. The combination and arrangement in a bicycle of the frame having its rear part constructed with a couple of substantially triangular frames having upper sides which are extended upwardly and forwardly from the apices of said frames and connected with a socket for the seat-standard, a couple of rear sprocket-wheels respectively at opposite sides of the rear supporting-wheel, a couple of elevated sprocket-wheels arranged between and supported by said frames, a sprocket-wheel on the crank-axle, and driving-belting for the within-described service, substantially as set forth.

4. The combination in a bicycle, of the frame having its rear part constructed with triangular frame portions formed with bearings K at their apices, sprockets M and N upon a hub or sleeve, eccentrics k fitted to turn within the bearings K, the axle for said hub or sleeve supported by the eccentrics, a sprocket on the crank-axle, a couple of sprockets respectively at opposite sides of the rear supporting-wheel, and driving-belting for the within-described service, substantially as set forth.

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Witnesses:
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