

(No Model.)

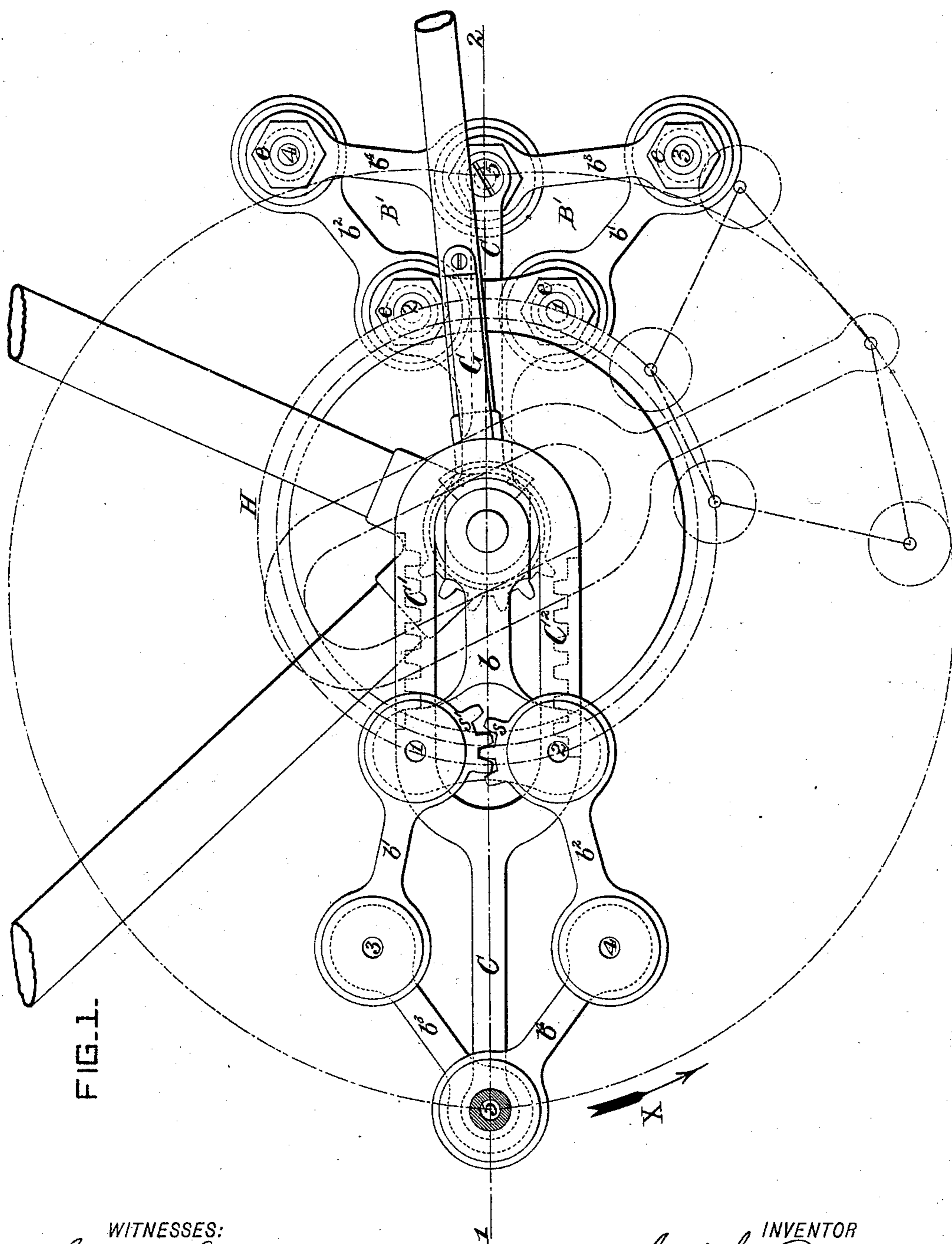
2 Sheets—Sheet 1.

A. PRUNIER.

JOINTED CRANK OF VARYING LENGTH FOR DRIVING CYCLES, &c.

No. 540,189.

Patented May 28, 1895.



WITNESSES:
George Taumann
S. C. Connor

INVENTOR
Adolphe Prunier
BY
Howson and Howson
his ATTORNEYS.

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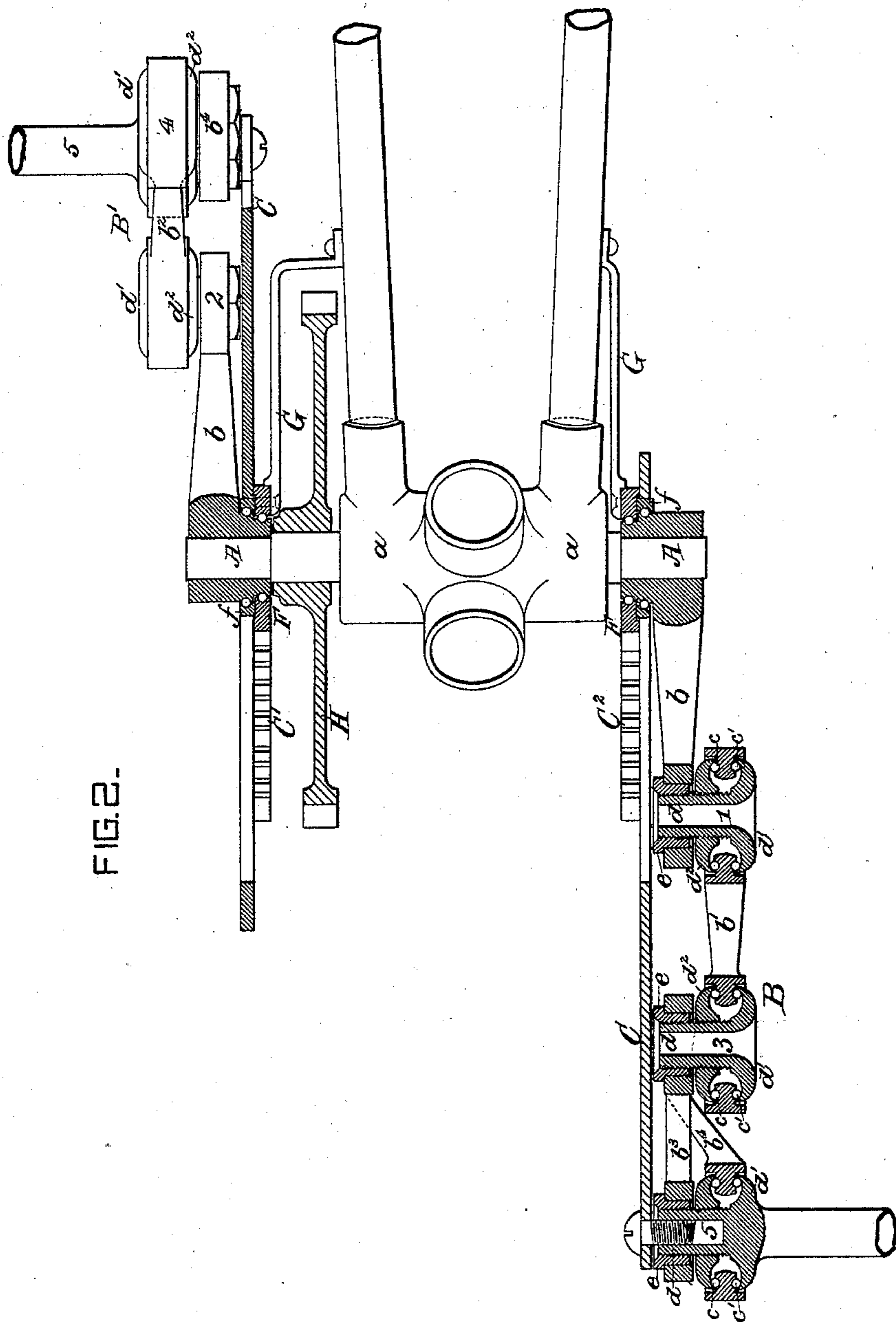
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UNITED STATES PATENT OFFICE.

ADOLPHE PRUNIER, OF PARIS, FRANCE.

JOINTED CRANK OF VARYING LENGTH FOR DRIVING CYCLES, &c.

SPECIFICATION forming part of Letters Patent No. 540,189, dated May 28, 1895.

Application filed November 16, 1894. Serial No. 529,012. (No model.) Patented in France April 10, 1894, No. 237,671.

To all whom it may concern:

Be it known that I, ADOLPHE PRUNIER, mechanic, a citizen of the Republic of France, residing in the city of Paris, France, have invented an Improved Jointed Crank of Varying Length for Driving Cycles and for other Similar Purposes, (for which I have obtained a French patent, dated April 10, 1894, No. 237,671,) of which the following is a specification.

My invention relates to an improved jointed crank of varying length for driving cycles, and for other similar purposes, and its object is to provide novel mechanism for automatically increasing the power produced at the beginning or effective part of the stroke of the crank, and alternately reducing the power toward the end or non-effective part of each stroke. I attain this object by the arrangement of mechanism illustrated on the accompanying drawings, on which—

Figure 1 is a front elevation of my improved jointed crank as applied to the pedal-axis of a bicycle, Fig. 2 being a horizontal section of the same on line 1 2, showing one crank B in section and the other B' in plan.

Similar letters and figures refer to similar parts on both views.

Upon the pedal-axis A having bearings in the socket *a* in the frame of the machine, are keyed two jointed cranks B B' of similar construction arranged in diametrically opposite positions at the ends of the axle. Each of these jointed cranks consists of a fixed arm *b* secured directly upon the axis A, and four pivoted arms *b'*, *b*², *b*³, *b*⁴, of which *b'* and *b*² are separately pivoted upon the fixed arm *b*, whose extremity is forked for the purpose of receiving the two pivots. The arms *b*³ and *b*⁴ are pivoted to the other ends of *b'* and *b*², and are brought together at their farther extremities at 5 where they are pivotally attached to a rod C, one part of which is of special construction and passes around the axle A. These levers *b'* *b*² *b*³ *b*⁴ thus constitute two pairs of toggle arms connecting the rod C with the arm *b* on the axis of rotation. That portion of the rod C which is nearer to the center A is formed into an oblong link having toothed racks C' C² upon and within its longitudinal sides for the purpose of engaging with a stationary pinion F fixed around

the axis A, and provided with teeth on only one half, approximately, of its circumference so that it will gear alternately with the racks C' and C². The ends of the oblong link carrying the racks are made semi-circular for the purpose of bearing alternately against the circumference of a collar *f* mounted upon the boss of the crank arm *b*, and a retaining bar G is secured upon a convenient part of the frame of the machine to prevent the independent rotation of the stationary pinion F.

All the joints 1, 2, 3, 4 and 5 of the pivoted arms of the crank are similarly provided with friction bearings consisting of a bush *d* having two flanges *d'* *d*² screwed together and inclosing two rows of balls *c* *c'* revolving in grooves formed in the boss of the several arms. A flanged nut *e* secures the bush *d* in position.

In order to regulate the relative movement of the arms *b'*, *b*², *b*³, *b*⁴ in working toothed sectors *s*, *s'* are provided upon the inner adjacent ends of the arms *b'* and *b*².

In operation pressure being exerted upon the pedal at 5, in the direction of the arrow, brings into gear the toothed rack C' with the stationary pinion F and causes the oblong link portion of the rod C to travel across the axis A until it arrives at the end of its stroke, whereupon the semi-circular end of the link comes into contact with the periphery of the collar *f* which affords it a bearing, until the other rack C² engages with the pinion F. At the commencement of the stroke it will be seen that the jointed crank is extended to its full length, and it then gradually contracts until it reaches a position directly opposite the starting point when it will attain its minimum length, simultaneously with the pinion F being thrown out of gear with one and into gear with the other of the two racks C' and C². From this point in its revolution the crank will gradually and automatically extend until the original position or assumed starting point is reached, and this will coincide with the moment when the pressure necessarily exerted in driving is at its maximum.

To transmit motion from the crank axis to the rear wheel in the case of rear-driving machines, a chain wheel H may be mounted upon the axle A, and the ordinary chain connection provided with the pinion of the rear-axle.

I do not limit myself to the exact construction described for reciprocating the rod C, so long as this rod moves back and forth radially to the pedal axle.

5 I am aware that jointed cranks have previously been applied to driving cycles and similar purposes, and do not claim it as my original invention; but

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

1. The combination in a jointed crank of the reciprocating rod C, furnished with racks C' C², and arranged to be operated by means of a stationary mutilated pinion F, with the
15 jointed arms *b'* *b*² *b*³ *b*⁴ and toothed sectors *s* *s'*, substantially as described.

2. The combination of the pedal axle of a cycle, with a crank of varying length comprising a radially reciprocating rod, an arm fixed
20 to the said axle and toggle-arms connecting the said rod to the said arm.

3. The combination of the pedal axle of a cycle with a jointed crank, having a rod provided with an oblong link portion furnished
25 with racks and having semi-circular ends, a mutilated pinion to engage with the racks, a

revolving collar upon which the semi-circular ends bear alternately and an arm fixed to the axle and toggle arms connecting the said arm to the rod, substantially as set forth. 30

4. The combination in a jointed crank of the reciprocating rod C, furnished with racks C', C², and arranged to be operated by means of a stationary mutilated pinion F, with the jointed arms *b'*, *b*², *b*³, *b*⁴ and lever *b*, retaining
35 bar G for the purpose of securing the mutilated pinion F immovably in position, substantially as and for the purpose described.

5. A crank of varying length, comprising a stationary mutilated pinion, an arm secured
40 to the axis of rotation, a reciprocating rod provided with racks to engage with the mutilated pinion and toggle-arms connecting the said arm to the reciprocating rod.

In testimony whereof I have signed my
45 name to this specification in the presence of two subscribing witnesses.

ADOLPHE PRUNIER.

Witnesses:

LÉON CRAMKINS,

CLYDE SHROPSHIRE.