(No Model.) 2 Sheets—Sheet 1.

G. H. RICHMOND & J. CROWTHER.

BICYCLE.

No. 600,450. Patented Mar. 8, 1898.

FIG. 1.

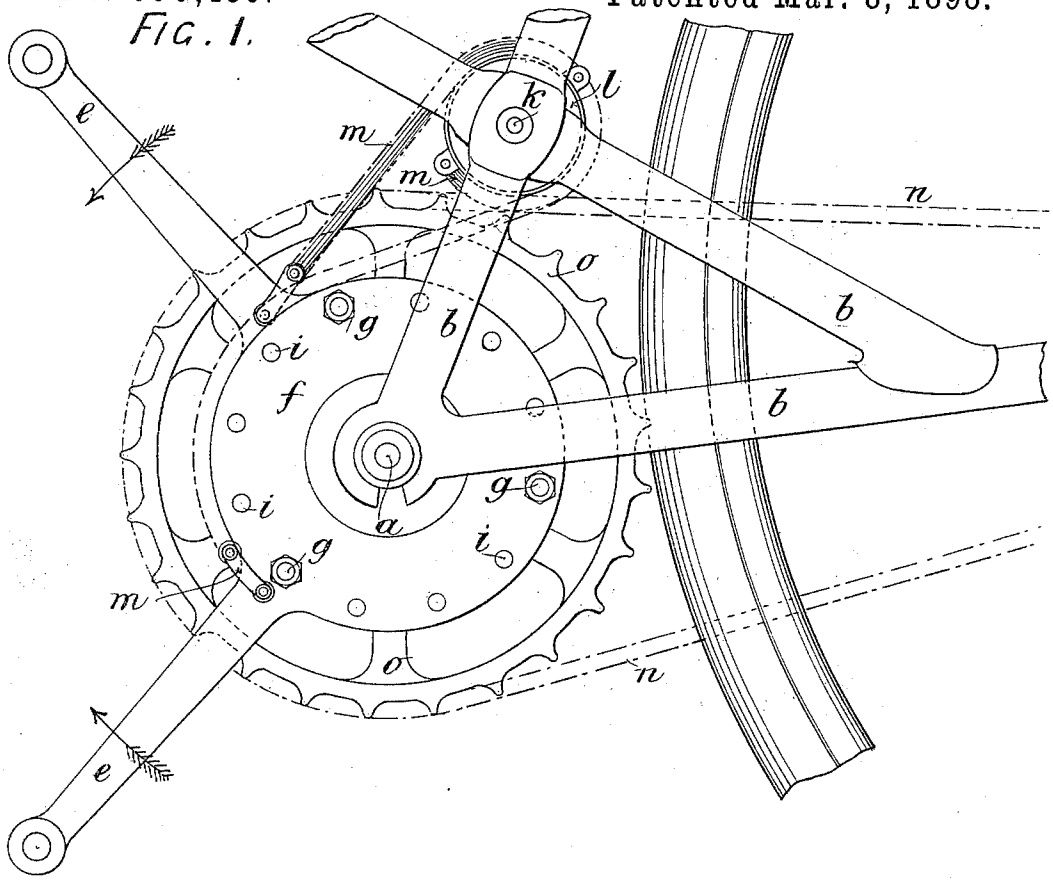
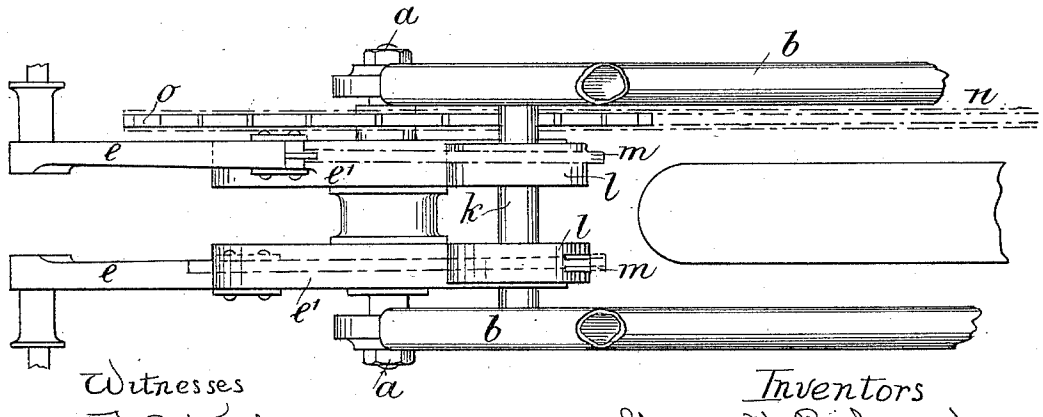


FIG. 2.



Witnesses

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By James L. Norris.

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(No Model.)

2 Sheets—Sheet 2.

G. H. RICHMOND & J. CROWTHER.

BICYCLE.

No. 600,450.

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FIG. 3.

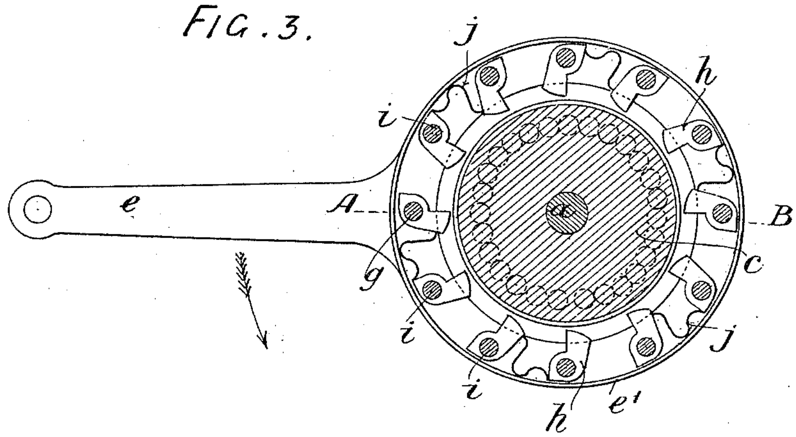
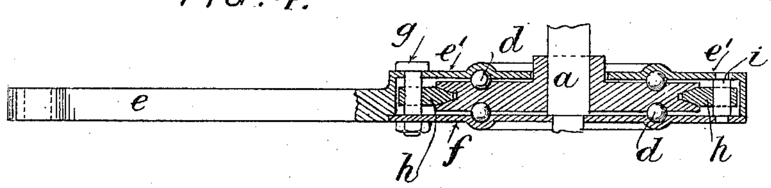


FIG. 4.



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UNITED STATES PATENT OFFICE.

GEORGE HENRY RICHMOND AND JOSEPH CROWTHER, OF MANCHESTER, ENGLAND.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 600,450, dated March 8, 1898.

Application filed July 12, 1897. Serial No. 644,317. (No model.) Patented in England July 7, 1896, No. 15,017.

To all whom it may concern:

Be it known that we, GEORGE HENRY RICHMOND and JOSEPH CROWTHER, subjects of the Queen of Great Britain, residing at 5 Derby street, Moss Side, Manchester, in the county of Lancaster, England, have invented new and useful Improvements in and Applicable to Bicycles and other Wheeled Vehicles, (for which we have obtained Letters Patent in Great Britain, No. 15,017, dated July 7, 1896,) of which the following is a specification.

The object of this invention is the construction of apparatus which shall enable greater speed to be developed with the same amount of power as hitherto in the propulsion of bicycles and other wheeled vehicles.

In the accompanying two sheets of drawings, Figures 1 and 2 are a side elevation and a plan, respectively, showing the cranks and some other parts, with a portion of a cycle-frame, made according to our invention. Fig. 3 is an end view, partly in section, of the crank-shaft and one crank-arm and pedal center on an enlarged scale; and Fig. 4 is a sectional view taken on the line A B of Fig. 3.

In the drawings, *a* is the crank-shaft carried in the frame *b*. Near each end of this shaft is secured a disk *c*, with a V groove or recess turned in its periphery according to our invention and shown plainly in Figs. 3 and 4, and on the side faces of each disk is turned an annular groove to receive antifriction-balls *d*. The central portion *e'* of each crank or arm *e* is recessed to fit over the disk *c* and is provided with a cover *f*, and each of those parts *e'* and *f* is grooved or otherwise prepared to fit over the antifriction-balls *d*. The cover *f* is secured to the crank-box *e'* by bolts *g*, and a number of friction-gabs or catch-pieces *h* are fitted around the grooved disk *c* and pivoted some on the bolts *g* and others on studs or pins *i*, carried by the box part *e'* and its cover *f*. Between each pair of catches is a light plate-spring *j*, which exerts the pressure to hold the catches in the recess of the disk *c*. There is mounted on the frame a small spindle *k*, with a small disk *l*, secured at each end, in line with the box portion *e'* of the crank-arms *e*, and a flexible connection, such as a steel band or chain *m*, is secured to each crank-arm at one end and at the other end to one of the disks *l*, as indicated in Figs. 1 and 2. The pedals in this arrangement of driving receive an up-and-down movement only in place of the usual rotary motion, and when the rider's feet are placed upon the pedals (not shown) and pressure is exerted upon the upper crank-arm *e* (see Fig. 1) and this crank is depressed the catch-pieces *h*, being held against the sides of the groove in one of the disks *c* by the springs *j*, force round the disk and the crank-shaft until the crank-arm has been pressed down to the end of its stroke. Meanwhile the other crank-arm *e* will have been raised to its highest position by the connecting-bands *m*, ready to be pressed down by the rider's foot, and thus a continuous rotary motion in one direction is imparted to the crank-shaft. As each crank-arm *e* is raised its connected catches *h* slip back along the groove in its disk noiselessly and without perceptible friction. Motion is taken from the crank-shaft by a chain *n* and chain-wheel *o* or in any other convenient manner to the wheels or one of the wheels of the cycle.

It will be obvious that although we have only described this apparatus as applicable to cycles it is equally applicable to other wheeled vehicles, and also that although only described as being driven by the foot or body it may be driven by hand or steam or other power, or all in combination, and as many of these apparatus as is necessary may be applied to one bicycle or other wheeled vehicle.

One of the great advantages of this arrangement is that in hill-climbing and on rough roads a short stroke on the pedals enables the cycle to be propelled without the fatigue of a full stroke, which is necessary in rotary pedal-levers, and it will be understood that upon descending hills the feet may remain at rest upon the pedals and that the pedals may at all times be kept out of the way of obstructions by being allowed to remain at rest in their central positions.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim, and desire to secure by Letters Patent of the United States, is—

The propelling mechanism for bicycles

herein described comprising, in combination with the crank-shaft, cranks journaled thereon having annular housings encircling and concentric with said shaft, an annular groove formed on the inner face of each of said housings, a disk located within each housing and secured to said shaft and having a grooved periphery, an annular groove formed on each face of the said disks; a series of spring-controlled friction-pawls pivotally supported around the interior of said housings and adapted to engage in the grooved peripheries of said disks, covers for said housings having annular grooves on their inner faces, friction-balls interposed between said disks and the inner faces of said housings and covers, respectively, and confined within said grooves, and means operating to return said cranks to an elevated position after they have been depressed, substantially as described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

GEORGE HENRY RICHMOND.
JOSEPH CROWTHER.

Witnesses:
S. W. GILLETT,
HERBERT R. ABBEY.