

No. 712,165.

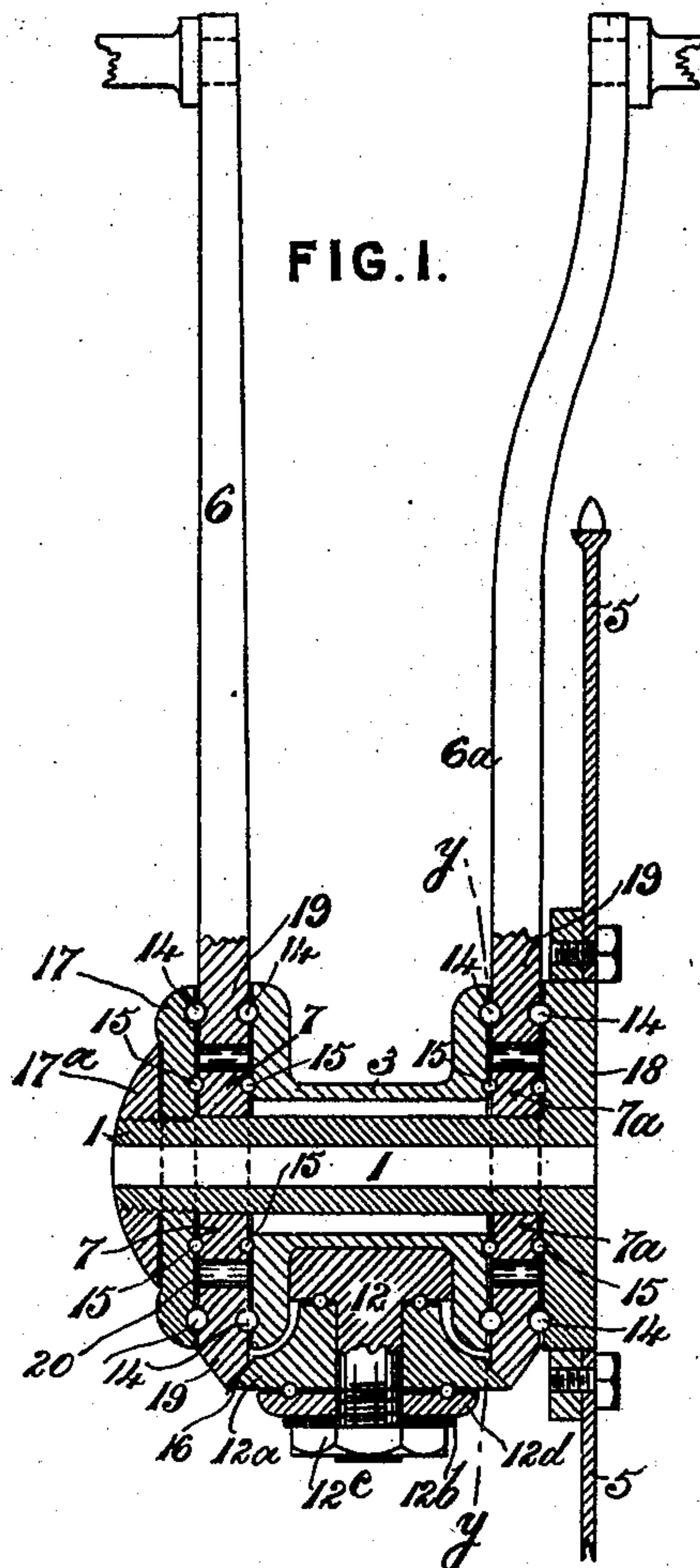
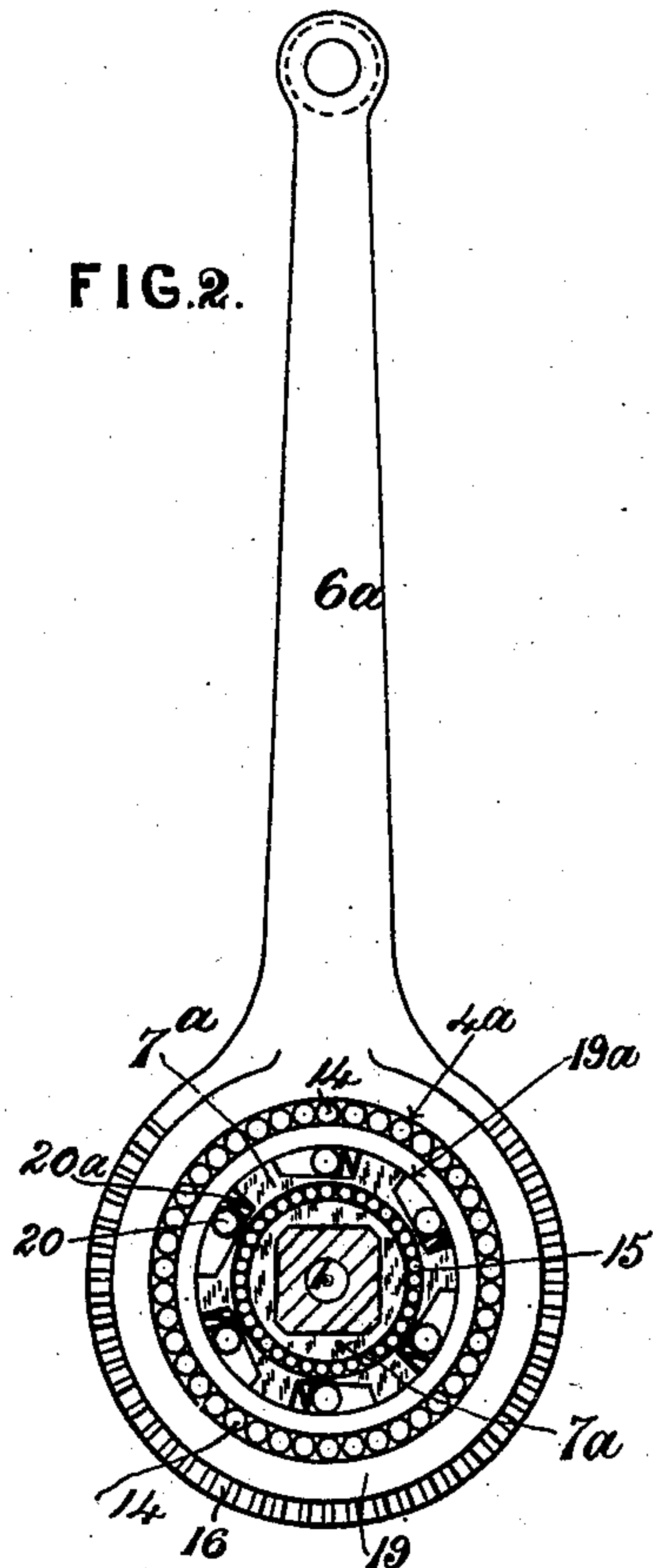
Patented Oct. 28, 1902.

F. S. WILLOUGHBY.

CYCLE.

(Application filed Jan. 21, 1902.)

(No Model.)



Witnesses.
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UNITED STATES PATENT OFFICE.

FRANK STANLEY WILLOUGHBY, OF MANCHESTER, ENGLAND.

CYCLE.

SPECIFICATION forming part of Letters Patent No. 712,165, dated October 28, 1902.

Application filed January 21, 1902. Serial No. 90,621. (No model.)

To all whom it may concern:

Be it known that I, FRANK STANLEY WILLOUGHBY, a subject of the King of Great Britain and Ireland, and a resident of 12 Mosley street, Manchester, county of Lancaster, England, have invented certain new and useful Improvements in Cycles, (for which I have filed application for British Patent No. 12,805, dated June 24, 1901;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My said invention relates to improvements in the propelling mechanism of velocipedes. Although for purpose of illustration it is only shown in its application to a rear-driven bicycle, it is to be understood that with suitable modifications it is also applicable to other types of such vehicles.

The main feature of my invention lies in the combination, with what is known as a "free" wheel or clutch or clutches—that is, a clutch which only operates when power is applied, so as to drive in a forward direction—of levers or cranks each of which only makes a reciprocating or oscillating angular motion through a part of a circle and returns automatically in the reverse direction. The extreme range of movement of the oscillating cranks—that is, their maximum stroke—is limited by stops fixed so as to give any desired maximum stroke. The rider may, however, propel the vehicle by a succession of strokes each shorter than the maximum stroke. The amplitude of the strokes will depend on the speed and the other factors of the resistance to be overcome. On a smooth level road, for example, the cycle may be propelled by a rapid succession of mere vibratory motions of the feet, while on a heavy road or steep gradient the rider will utilize the full or nearly the full stroke. Since I dispense with the necessity for the feet following the cranks through an entire revolution about the axes, I am enabled to use cranks of comparatively great length, and thus enable the driver to apply considerable force when great resistance has to be overcome. The ratio of the driving and driven chain-wheels or other gears may be consequently higher. The position and action of the cranks

are also better adapted and safer for ladies' bicycles than is the case of revolving cranks.

The said invention has particularly for its object to provide side support for the long cranks, and thus prevent their lateral deflection and preserve the alinement of the chain-wheel hereinafter described, while also reducing the parts.

To this end my invention consists in the construction and combination of parts hereinafter particularly set forth and claimed.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section through the driving-shaft and proximate parts of a velocipede embodying my invention, the cranks being shown in elevation; and Fig. 2 represents a cross-section through the same, taken on a plane *yy* corresponding to the inner face of crank 6^a.

In the said drawings, 1 designates the driving-shaft, having at one end an enlargement or disk 18, to which a chain-wheel 5 is screwed, the said wheel serving to transmit motion to the running-gear. The bearing has annular outward-facing flanges 4 at its ends, each of said flanges being provided with a circular series of recesses corresponding to similar recesses 4^a in the inner faces of the heads of the two cranks. The enlargement or disk 18 aforesaid has its inner face similarly recessed to receive an outer series of the said antifriction-balls 14, which likewise fit into corresponding recesses in the outer face of the head 19 of crank 6^a. The said disk also serves as an extra bracing-plate for crank 6^a, preventing the loosening and the lateral outward bending of the same and keeping the chain-wheel in alinement. Another bracing-plate 17, similarly arranged against the outer face of the head 19 of crank 6, is turned home on screw-threads of the proximate end of said shaft, which it is screw-tapped to fit, and held in place by a nut 17^a. This plate is also provided with a circular series of recesses or races corresponding to another set in the exterior face of the said head 19 to receive another circular series of antifriction-balls 14. The balls 14 of all four series are at equal distances from the shaft 1 and lessen friction between the crank-heads and their bracing parts. The shaft 1 carries at 7 and 7^a the inner elements of free clutches, having clutch-

rollers 20, each lying in a wedge-shaped recess and having a spring 20^a, as is usual in clutches, adapted to seize in one direction only. The inner perforations 19^a of the crank-
5 heads 19 embrace the inner elements 7 and 7^a, so that as each crank 6 and 6^a is alternately depressed it binds on the inner element 7 or 7^a, as the case may be, and turns the
10 shaft 1 through a partial rotation; but such depression turns back the other crank by reason of the intermeshing gears 16 and 17, hereinafter described, to precisely the same extent, making an additional means of return of the said crank quite needless. The in-
15 ner elements 7 and 7^a have antifriction-balls 15 between them and adjacent surfaces.

The heads 19 have bevel-gear teeth 16 formed on their peripheries, meshing with intervening connecting bevel-pinion 12^a, turning on a short shaft 12 and held in position by
20 a washer 12^b and nut 12^c. Small antifriction-balls 12^d are also provided at the outer and inner faces of the said bevel-wheel, being set into annular recesses or grooves of the proximate faces.
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Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a driving-shaft 1
30 carrying a chain-wheel 5 and the inner parts of free clutches 7 and 7^a a bearing 3 reciprocating cranks 6 and 6^a, the integral heads of

which form internally the outer parts of the free clutches and have teeth on their peripheries, an intervening tooth-wheel 12^a gearing
35 therewith, an adjustable clamp-plate 17 and annular ball-races and balls 14 on the faces of the hub of the chain-wheel of the cranks of the bearing-bracket and of the clamp-plate substantially as described and shown. 40

2. In a velocipede, a pair of cranks each having a gear-wheel formed thereon, in combination with an intervening pinion meshing with the wheels aforesaid in order that the forward motion of one crank may turn back
45 the other, a driving-shaft on which the said cranks are mounted, a disk or plate integral with said shaft and exterior to one of the said cranks a plate held in similar position with respect to the other crank, and balls arranged
50 in annular series between the free clutches, of which the inner elements 7 and 7^a are secured to the shaft 1 and of which the crank-heads are the outer members, and the said external plates bracing the cranks against
55 outward lateral deflection, also preserving the alinement of the chain-wheel, substantially as set forth.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

FRANK STANLEY WILLOUGHBY.

Witnesses:

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ALFRED T. WHITELOW.