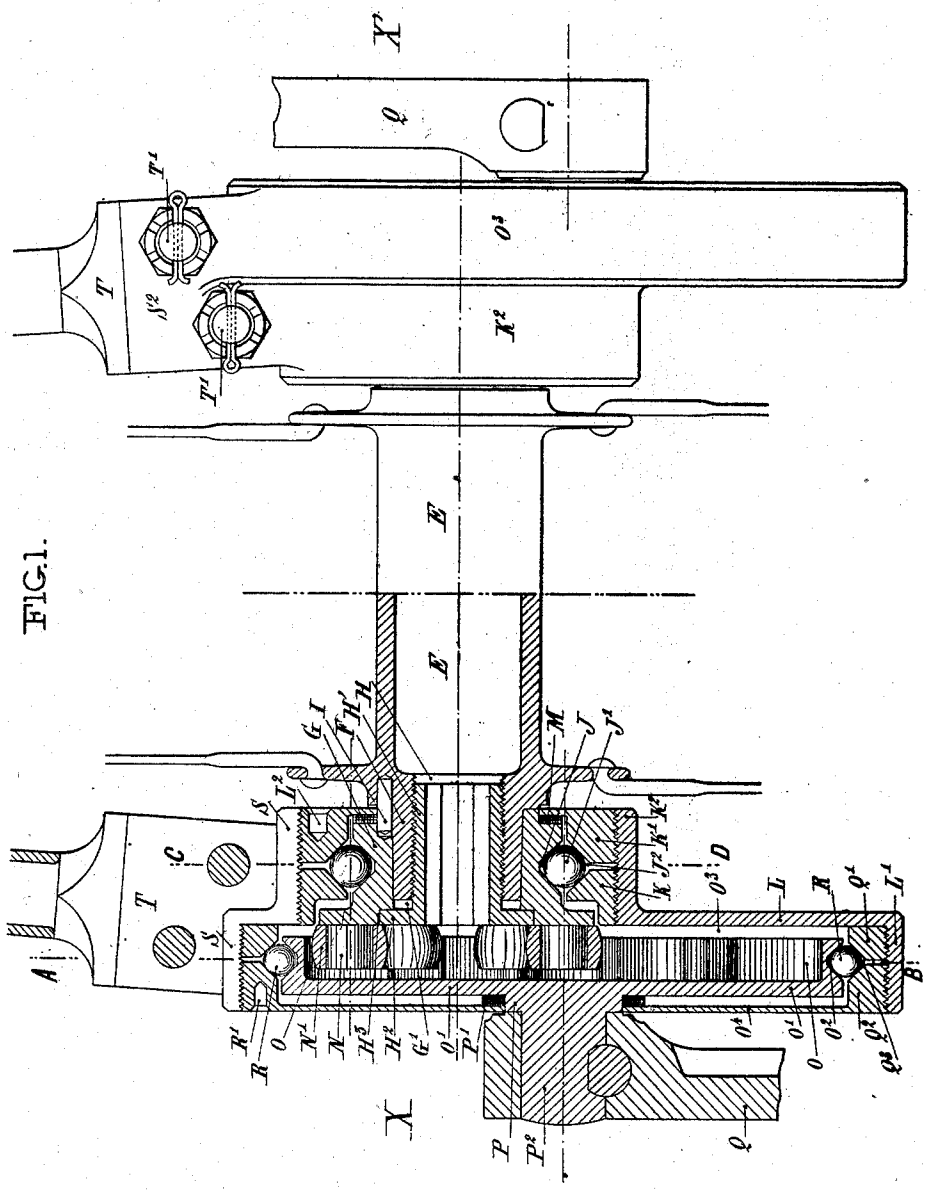
(No Model.) 2 Sheets—Sheet 1.

H. TRÉPREAU.

SPEED MULTIPLYING MECHANISM FOR CYCLES.

No. 502,332. Patented Aug. 1, 1893.

FIG. 1.



Witnesses
J. M. Fowler Jr
Alex. Stewart

Inventor
Henri Trépreau
By Church & Church
Attorneys.

(No Model.) 2 Sheets—Sheet 2.

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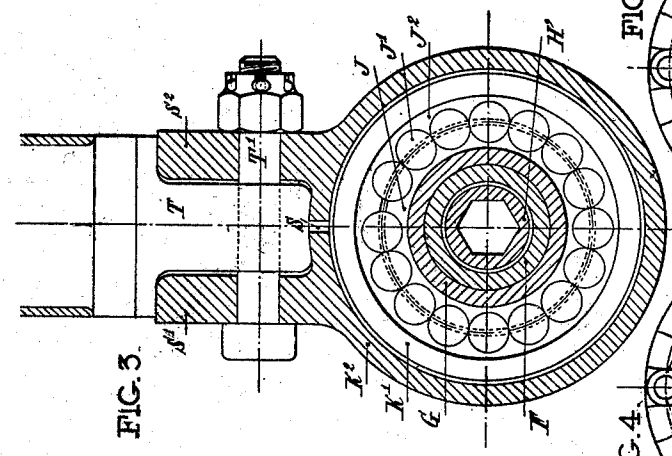

FIG. 3.

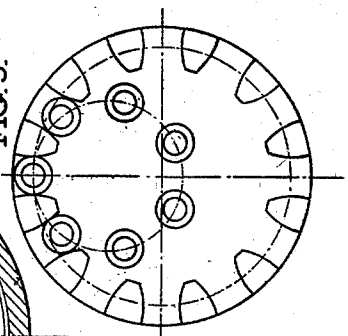

FIG. 5.

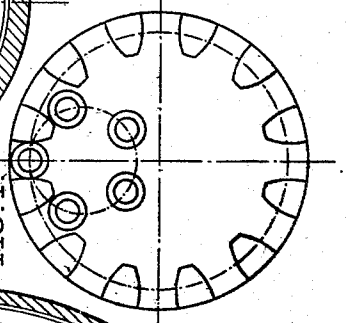

FIG. 4.

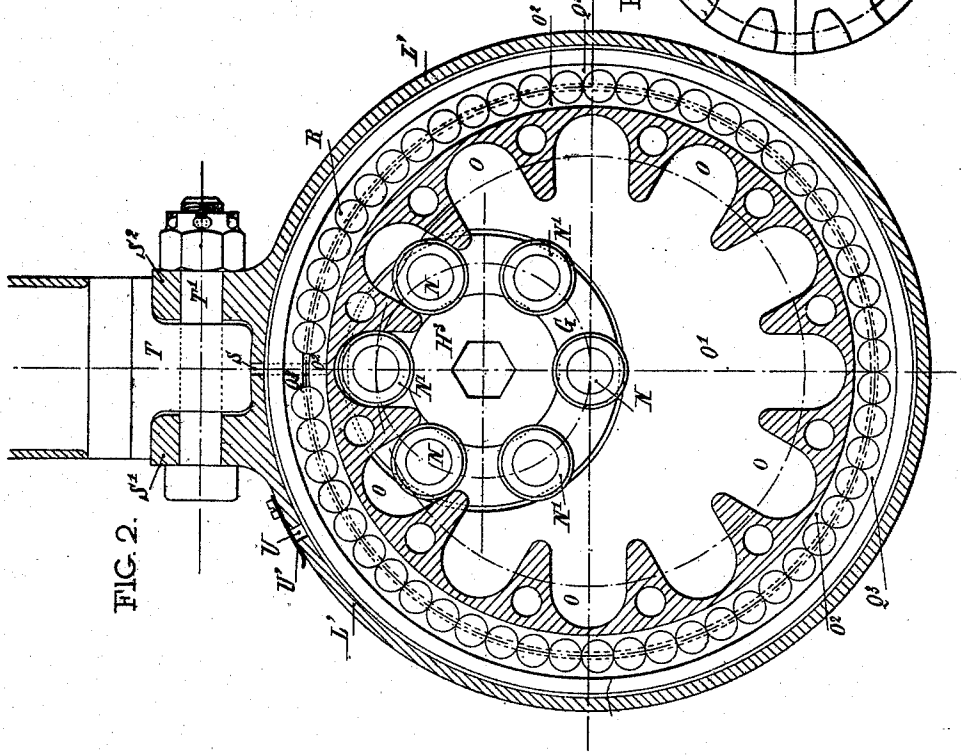

FIG. 2.

Witnesses.
J. M. Fowler Jr.
Alex. J. Stewart

Inventor
Henri Trépreau
By Church & Church
Attorneys.

UNITED STATES PATENT OFFICE.

HENRI TRÉPREAU, OF ANGERS, FRANCE.

SPEED-MULTIPLYING MECHANISM FOR CYCLES.

SPECIFICATION forming part of Letters Patent No. 502,332, dated August 1, 1893.

Application filed June 23, 1892. Serial No. 437,761. (No model.) Patented in France January 29, 1892, No. 218,905.

To all whom it may concern:

Be it known that I, HENRI TRÉPREAU, a citizen of the Republic of France, residing at Angers, France, have invented certain new and useful Improvements in Speed-Multiplying Mechanism for Cycles, (for which I have obtained Letters Patent of France, No. 218,905, dated January 29, 1892,) of which the following is a specification.

This invention relates to an improved mechanism for multiplying the speed of cycles without the employment of a chain.

In the accompanying drawings, Figure 1 is a front elevation, partly in vertical section of a portion of a driving wheel of a velocipede provided with the improved speed multiplying mechanism. Fig. 2 is a sectional side elevation the section being taken on line A B of Fig. 1. Fig. 3 is another sectional front elevation, on line C D of Fig. 1. Figs. 4 and 5 are supplemental diagrams.

From the drawings it will be seen that the improved chainless gearing for multiplying the speed of velocipedes is constructed as follows:—The hub E of the driving-wheel is provided on each side with a slightly tapering sleeve F upon which is fitted a collar or disk G, the central opening G′ of which is also tapered so as to tightly fit the sleeve F. The central perforation H of the sleeve F is screw-threaded and adapted to receive a sleeve or socket H′ which acts as a nut, and the head H^2 of which, by engaging in a corresponding recess H^3 provided in the collar or disk G secures this disk G in the desired position upon the driving-wheel. This adjustment is further assisted by a pin I acting as a key and engaging with the hub E of the wheel at one end and with the hub of the disk G at the other end. The hub of the collar or disk G on its outer edge is provided with a groove J which receives the balls J′ which are also partly received in the groove J^2 formed by the two rings K K′ arranged close to each other so as to cover in the disk G. These rings are provided with an external screw-thread and are adapted to be screwed into an eccentric bushing or perforation K^2 provided in the circular plate L flanged and internally screw-threaded at L′. Openings L^2 are provided in the external surface of the ring K′ to enable the same to be more or less tightly screwed, or unscrewed by means of a suitable tool or key for the insertion of balls; the ring K is stationary and by suitably tightening or loosening K′, the pressure upon the balls between the two rings may be increased or decreased as required. The external surface of the ring K′ extends partly over the hub of the disk G, which is provided with a washer M of any suitable material, forming an air-tight joint with the ring K′ screwed against it. The disk G is provided on its outer surface with a suitable number of spindles, studs or journals N (which may be integral with the said disk) arranged in a circle concentric with the axis of G. These spindles or journals carry loose rollers N′ with slightly rounded edges, which are adapted to come into contact with, and travel in recesses O provided on the inner side of the flange of a plate or disk O′ arranged at the outside of G. This disk O′ on its periphery is provided with a groove O^2 for the reception of balls R; and it is located within the casing O^3 formed by the plate L.

From the center of the disk O′ projects a boss P provided with a washer or suitable packing P′, and from its center also extends the spindle P^2 adapted to receive the crank Q to the end of which is secured the pedal. Into the internally screw-threaded flange L′ of the disk L is tightly screwed a ring Q′ which is stationary, and in front of which is adjustably arranged its counterpart or companion ring Q^2. The opposite surfaces of these two rings are so grooved as to form a way or race, corresponding to the groove O^2 for the balls R to rest and travel in. The outer surface of the ring Q^2 is extended at O^4 so as to partly overlap the boss P and press upon the packing P′ in order to tightly close the joint between the parts just described. Recesses R′ provided in the external surface of the ring Q^2 enable the said ring to be adjusted by screwing or unscrewing by means of a suitable tool or key in order to increase or decrease the pressure upon the balls R as required.

It will be seen from Figs. 1, 2 and 3 that the body of the case, formed by the disk L, its flange L′ and the sleeve K^2 is split at the upper part (at S) and provided with ears or lugs S′ S^2 which engage with the lower ends

of the arms of the front fork T of the machine and are permanently fixed therein by means of bolts and nuts T′ which cannot become accidentally unscrewed or loosened. Owing to the slit S the parts fitted together by means of screw-threads, as the rings Q′ Q^2 within the flange L′ of the disk L, or the rings K K′ within the sleeve or boss K^2 may be very powerfully and tightly clamped in position.

At X Fig. 1 the inner arrangement of the parts is clearly shown, while at X′ of the same figure may be seen the outer aspect assumed by the whole of the parts on each side of the hub E of the driving wheel, as described above.

Special attention is called to the fact that the space allowed for the balls or rollers above referred to is closed with absolute tightness by means of the washers or packing rings M and P′ so that every essential portion of this mechanism is thoroughly protected from dust, mud, moisture, or other damaging influences; and the whole is inclosed in a case containing a sufficient quantity of oil for the continuous lubrication of the inner parts of the mechanism. The oil is admitted through a channel U closed by a spring or spring-controlled lid U′ as shown in Fig. 2.

From the foregoing the operation of the improved speed multiplying mechanism will be readily understood.

The principle is based upon the fact that when a circumference of a certain diameter rolls without sliding within another circumference of a larger diameter, all the points of the smaller circumference are displaced; and that this displacement takes place, first, on straight lines diametrical to the large circumference, where the diameter of the large circumference is double that of the small circumference, as in Figs. 1 and 2, or, second, along a curve termed hypocycloid where the diameter of the large circumference is either more or less than double that of the small circumference, as illustrated by Diagrams 4 and 5.

This principle is carried out in practice, as applied to velocipedes, by arranging within the disk O′ a second disk G so that, first, if the multiplied speed should be double the initial speed, the pivots of the rollers N′ pass through the center of the disk O′ and the inner periphery of the said disk O′ is provided with diametrically opposite recesses O; second, if the multiplied speed is to be more than double the initial speed, it is by making the diameter of the disk G less than half that of the disk O′ and by providing the inner circumference of the said disk O′ with recesses O formed on hypocycloid lines (Fig. 4), or, third, if the multiplied speed is to be less than double that of the initial speed, by making the diameter of the disk G more than half of that of the disk O′ and by providing as before the inner periphery of the disk O′ with recesses O having hypocycloid outlines. The result of this special arrangement is that by acting upon the crank Q the rotation of the disk O′ is directly produced, and is transmitted by the contact between the recesses O and the rollers N′ to the disk G which in its turn conveys the motion to the driving wheel, upon the hub E of which is secured the said disk.

I claim—

In a chainless speed multiplying mechanism for velocipedes, the combination with the internally toothed plate or disk O′ moving within the case O^3 (secured to the handle bar) upon balls arranged in contact with its external periphery, two rings Q′ and Q^2 screw threaded and chamfered for precise lateral adjustment, and means for closing the case containing the mechanism, of the hub E moving on balls contained in the groove formed by rings K K′, the pinion in gear with the internal teeth of disk O′, formed by a spindle head or crown N having loosely mounted rollers N′ adapted to rotate freely and capable of a limited displacement for purposes of adjustment, substantially as described.

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

HENRI TRÉPREAU.

Witnesses:
S. HULLIGER,
J. ROBILET.