

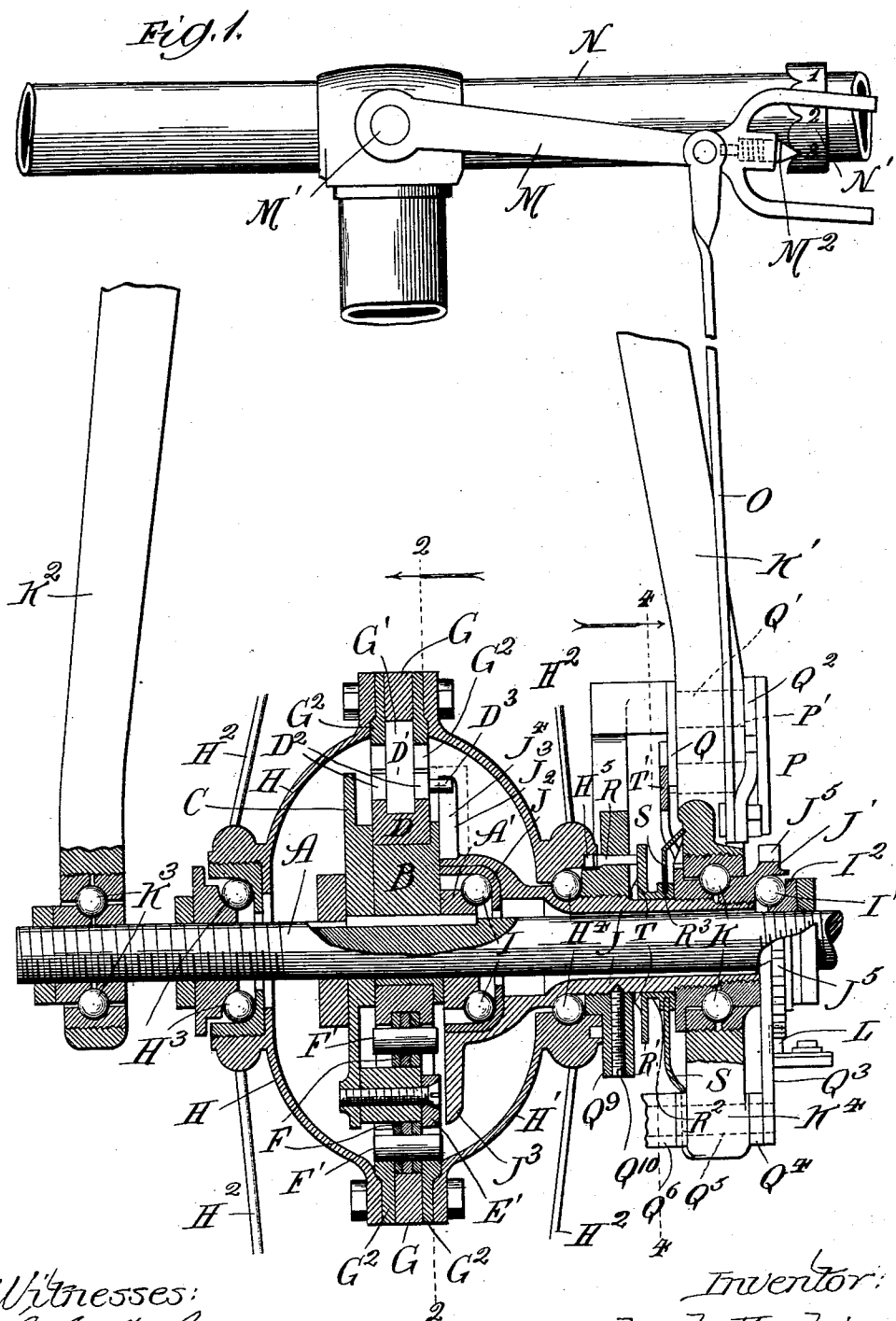
(No Model.)

2 Sheets—Sheet 1.

M. HOPKINS.
SPEED GEAR.

No. 570,638.

Patented Nov. 3, 1896.



Witnesses:
John H. Lee.
Lute S. Miller.

Inventor:
Mesach Hopkins,
By *Dyrenforth & Dyrenforth*
Attys.

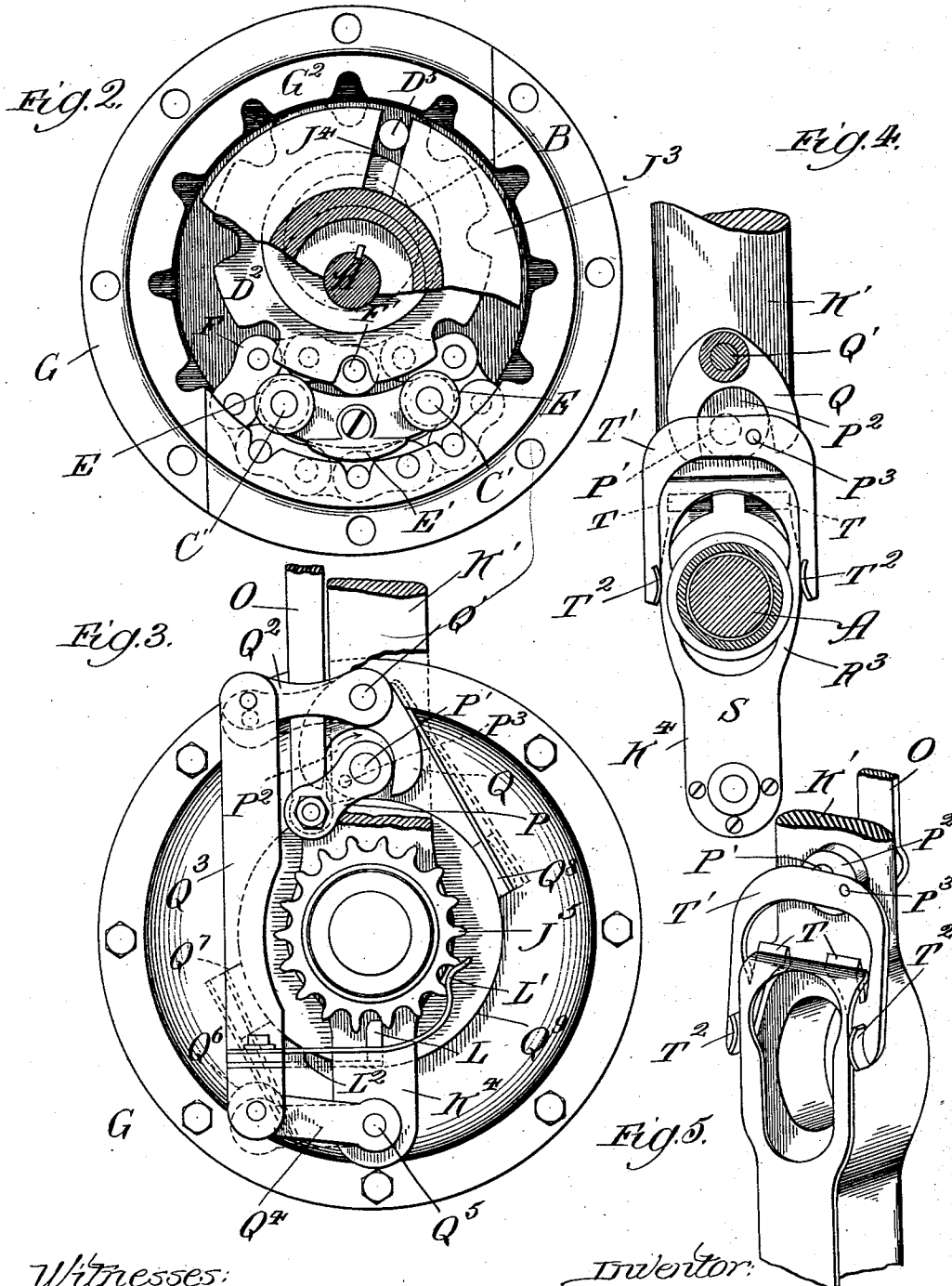
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2 Sheets—Sheet 2.

M. HOPKINS.
SPEED GEAR.

No. 570,638.

Patented Nov. 3, 1896.



Witnesses:
John H. Lee.
Lute S. Allen.

Inventor:
Meshach Hopkins,
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UNITED STATES PATENT OFFICE.

MESHACH HOPKINS, OF LONDON, ENGLAND, ASSIGNOR OF ONE-HALF TO
WILLIAM H. CORK, OF CHICAGO, ILLINOIS.

SPEED-GEAR.

SPECIFICATION forming part of Letters Patent No. 570,638, dated November 3, 1896.

Application filed September 16, 1895. Serial No. 562,670. (No model.) Patented in England June 13, 1893, No. 11,593.

To all whom it may concern:

Be it known that I, MESHACH HOPKINS, a subject of the Queen of England, residing at Peckham, London, county of Surrey, England, have invented certain new and useful Improvements in Speed-Gears, (for which I have obtained Letters Patent in Great Britain, No. 11,593, dated June 13, 1893,) of which the following is a specification.

This invention relates to a gear which, without stopping the machine to which it is attached, may be adjusted so that the speed transmitted therethrough may either equal or be increased within certain limits to a desired extent beyond that imparted to it.

The invention is specially applicable to cycles, in which connection it is hereinafter described; but it may be applied to various other machines.

In the accompanying drawings, Figure 1 is a view, partly in section and partly in elevation, of as much of a cycle as is necessary to illustrate the application of my invention thereto. Fig. 2 is a section on line 2 2 of Fig. 1. Fig. 3 is an elevation of the right-hand side of the lower part of Fig. 1. Fig. 4 is a section on line 4 4 of Fig. 1, and Fig. 5 is a perspective view of part of the adjusting mechanism of the gear.

Like letters indicate like parts throughout the drawings.

In carrying my invention into practice I key or otherwise rigidly secure upon or form in part with the crank or driving axle A an eccentric or eccentric-bearing B and a flange or arm C, which may either be circular in the form of a disk concentric with the axle or a segment of a disk. For convenience the flange C is hereinafter referred to as a disk, in which form it is shown in the drawings. On the bearing B is mounted a ring or wheel D, formed with a peripheral groove D', and two notched or toothed flanges D², all hereinafter collectively referred to as the "chain-wheel" D. This chain-wheel is free to rotate on the eccentric-bearing B, which, if desired, may be provided with balls or other anti-friction devices, although such are not represented in the drawings.

The disk C is provided with a chain-carrier comprising two studs C', rigidly secured in the disk, two rollers E, mounted on and free

to rotate on the studs, and between the two rollers E a block E', pivoted to the disk C. The last-described device, which as a whole is hereinafter referred to as the "chain-carrier" E, serves to support an endless chain F, which while rotated bodily along with the chain-carrier E around the axis of the axle A is also capable of rotating in the direction of its length around the said chain-carrier.

The chain F works in the groove D' of the wheel D, and all or some of its joint-pins, for example, as shown in the drawings, every alternate joint-pin F', are extended laterally of the chain, so as to engage with the notches of the flanges D², as shown in Figs. 1 and 2.

G is an internally-toothed wheel mounted concentrically to and capable of rotating independently of the axle A, and in the example illustrated is rigidly secured between two cups H H', forming the hollow boss of a wheel H², of which only the central part is shown in Fig. 1. The wheel G is formed with a groove G' and two notched or toothed flanges G², all hereinafter collectively referred to as the "chain-wheel" G, and with this wheel the outer part of the chain F engages, the inner part of said chain engaging, as before explained, with the chain-wheel D.

On the axle A is rigidly secured a collar A', which forms a running-surface for a ring of balls I, on which is supported the inner end of a short hollow shaft or sleeve J, whose outer end is similarly supported on a ring of balls I', free to rotate between a bearing-collar I², adjustable on the shaft A, and a cup J', secured on the sleeve J, as by screwing and a key or pinching-screw. The inner end of the sleeve J is cupped and hardened or provided with a separate hardened-steel cup J² at the part where it runs upon the balls I and at this end it also has rigid upon it a flange or disk J³, in which is formed a radial slot or recess J⁴, with which engages a pin D³, secured to the chain-wheel D, these two parts—viz., the sleeve J and chain-wheel D—always rotating together and at the same speed.

The sleeve J is free to rotate in a ball-bearing K in the lower end of the fork-arm K', the corresponding fork-arm K² at the opposite side of the wheel H² being provided with a ball-bearing K³, in which the axle A is free to

rotate. The inner end of the cup J', as shown in Fig. 1, may itself constitute a portion of the race within which the balls of bearing K run.

5 The hollow boss H H' at one side is supported directly by the axle through the medium of a ball-bearing H³, and at the other side by the sleeve J through a ball-bearing H⁴.

10 The before-mentioned cup J' is provided with a notched or toothed flange or rim J⁵, with which are adapted to engage a detent or stop L, and also, if desired, the spring end L' of a plate or arm L², on which the stop is carried. The spring end L' may, however, be
15 entirely dispensed with.

M is a lever pivoted at M' to the handle-bar N of the cycle and adapted to be operated by the hand of the rider. This lever is provided with a spring-controlled detent M²,
20 capable of engaging with the notches 1, 2, and 3 of a collar N', secured on the handle-bar N. To the lever M is pivoted the upper end of a link O, whose lower end is pivoted to a lever-arm P, secured on one end of a short shaft
25 P', pivoted in the fork-arm K'. On the opposite end of the shaft P' is secured an eccentric P², Figs. 3, 4, and 5, in which is mounted a crank-pin P³, for a purpose hereinafter specified. The eccentric P² is located between the
30 arms of a fork or yoke Q, secured on one end of a short shaft Q', pivoted in the fork-arm K', and on the other end of the shaft Q' is secured an arm Q², connected by a link Q³ to a similar arm Q⁴, secured on the outer end of
35 a short shaft Q⁵, pivoted in a downward extension K⁴ of the fork-arm K'. On the inner end of the shaft Q⁵ is secured an arm Q⁶, carrying a brake block or shoe Q⁷, which, like a similar brake-shoe Q⁸, securely mounted on
40 the before-mentioned yoke Q, is adapted to bear upon the periphery of a brake-disk Q⁹, secured, as by a pinching-screw Q¹⁰, upon the sleeve J.

In the disk Q⁹ is formed a perforation
45 through which passes a pin or stud R, rigidly secured in a disk R', formed in part with a sleeve R², which is capable of sliding in the direction of its axis on the before-described sleeve J. The sleeve R² is provided with a
50 peripheral groove R³, with which engages, as shown in Fig. 4, a spring-plate S, secured at its lower part to the fork extension K⁴. The pin R in certain positions of adjustment, as hereinafter explained, is adapted to engage
55 with a clutch projection or abutment-surface H⁵ in the adjacent part of the cup H', while at other times it is withdrawn from and held out of engagement with the projection H⁵ by means of a spring T, interposed between the
60 two disks Q⁹ R', the whole forming a spring-controlled clutch.

The upper end of the spring-plate S is bent outward, so that it may be acted upon by
65 cams T, carried by a yoke or frame T', pivoted on the before-mentioned crank-pin P³. The arms of the frame T' are provided with lugs T², which by bearing against the edges

of the spring-plate S prevent the frame from moving out of position while allowing it to move up and down under the influence of the
70 eccentric P².

The operation of the before-described apparatus is as follows: The device is shown
75 adjusted for obtaining the maximum speed of rotation of the wheel H² in relation to the rotation of the axle A. When it is desired to travel at a slow speed, the lever M is raised to its highest position, so that the detent M² will engage with the notch 1. By this operation the lever-arm P is raised, and through
80 the shaft P' and crank-pin P³ the yoke T' is also raised, and through the cams T, spring-plate S, and sleeve R² the pin R is moved into the path of the projection H⁵, so that the hollow boss H H', with the internal-toothed wheel G fixed thereto, and the sleeve
85 J, with the toothed wheel D connected therewith, are thereby locked together. By this same operation also, through the eccentric P² and its accessories, the former being turned
90 in the direction indicated by the arrow p in Fig. 3, the brakes Q⁷ Q⁸ are moved out of contact with the disk Q⁹, as shown in chain lines in Fig. 3. When, therefore, under this condition of adjustment, the axle A is rotated,
95 the chain-carrier E is rotated along with it, as it always is, and the chain is also moved with it, but as by said adjustment the sleeve J, to which (through the slotted disk J³ J⁴ and pin D³) the chain-wheel D is secured, and the hol-
100 low boss H H', carrying the chain-wheel G, are locked together the chain cannot rotate in the direction of its length or independently of the chain-carrier, the result of which is that any rotation imparted to the axle A must
105 be transmitted through the chain F to the chain-wheels D and G, all the last-named parts rotating as one piece.

When it is desired to travel at an accelerated speed, that is to say, that the wheel H² should rotate quicker than the axle A, the lever M is lowered so that the detent M² engages
110 with the notch 2, which operation, through the crank-pin P³, lowers the cams T, and thereby
115 allows the spring T to withdraw the pin R from out of the path of the projection H⁵, thereby leaving the wheel H² free to rotate independently of the sleeve J, the brake-blocks
120 Q⁷ Q⁸ by this same operation being caused to bear with a medium amount of pressure upon the brake-disk Q⁹. By the raising of the link Q³ the spring or spring end L' (when such is provided) is brought into engagement with
125 the notched flange J⁵, so that when the axle is rotated said flange J⁵ is also capable of rotating, but only under the retarding influence of the brake-blocks Q⁷ Q⁸ or brake-blocks and spring L', the result being that as the chain
130 F is rotated bodily around the axis of rotation of the axle A it is also caused (by the resistance presented by Q⁷ Q⁸ or Q⁷, Q⁸, and L') to rotate in the direction of its length independently of the axle, and thus impart to the

wheel H² a higher speed of rotation than that of the axle A. When the lever M is moved from its last-mentioned position to the lowest position, (in which latter the device is represented in the drawings,) the detent M² engages with the notch 3, and the only other material difference is that the brake-blocks Q⁷ Q⁸ are caused to bear with their maximum power on the brake-disk Q⁹ and the stud L is brought into engagement with the toothed flange J⁵, so as to positively prevent any rotation of the sleeve J, the result being that as the chain F is carried around with the axle A and the chain-wheel D locked said chain must rotate in the direction of its length independently of and to its maximum speed in relation to the rotation of the axle, the wheel H² consequently being rotated at its maximum speed, the ratio of the speed of the wheel H² and axle A depending upon the relative diameters of the wheels D and G.

As shown in Fig. 1, the chain-carrier is mounted upon the disk C in such a manner as to be diametrically opposite the eccentric-bearing B, and as both the disk and the eccentric are rigid with the shaft they maintain this relative position always. Such a provision affords space between the chain-wheel D and the annular gear G for the carrier-block to move in as it carries the chain around the shaft, the chain itself keeping up an independent rotation under the action of the chain-wheel D. Thus it is possible to employ a larger chain-wheel by mounting it eccentrically rather than concentrically, and so to increase the ratio of the speed between the driven wheel and the driving-shaft. I would employ a chain instead of a spur-gear upon the revolving arm, even were the chain-wheel D concentrically mounted, since it is thus possible to obviate the difficulties which would otherwise arise from the use of too small an intermediate spur-gear with its necessarily small teeth and the consequent danger of breaking.

By means of the brake device Q⁷ Q⁸ Q⁹ and, if it be provided, the spring L' the pressure necessary for retarding and stopping the rotation of the sleeve J is gradually applied, so that the change for obtaining an increase of speed may be made without too great a shock being imposed on the rider.

From the foregoing the manner of adjusting the gear for a reduction of speed will be sufficiently understood to render any special description thereof unnecessary.

If desired, other mechanism than that before described may be used for locking and releasing the wheel D or disk J³, and moreover the speed-gear may be applied to machines other than cycles and, if desired, in the reverse manner, that is to say, the wheel G may be driven first and the motion therefrom transmitted to the wheel D, so as to enable the speed to be decreased instead of in-

creased, as before described. The chain F and teeth of the wheels D and G may be of the ordinary type instead of the form shown.

The device may be applied to the driving-chain wheel of a rear-driving cycle instead of, as shown in the drawings, directly to the road-wheel.

I claim—

1. The combination with the driving and driven parts of a speed-gear, and an eccentric-bearing and chain-carrier, comprising an-
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tifric-tion-rollers on one part, a chain-wheel on the eccentric-bearing and a chain-wheel on the other part, and chain gearing with both chain-wheels, of a pin on the eccentrically-
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mounted chain-wheel, a slotted flange engaging the pin, a toothed flange rigid with the slotted flange, a detent for the toothed flange, a lever for operating the detent, and link mechanism in operative connection with the
85
detent and lever substantially as set forth.

2. The combination with the driving and driven parts of a speed-gear and an eccentric-bearing and chain-carrier on one part, a chain-wheel on the eccentric-bearing, a chain-
90
wheel and clutch projection on the other part, a chain gearing with both chain-wheels, a flange, a pin-and-slot connection between this flange and the eccentrically-mounted chain-wheel, and a disk rigid with the flange, of a
95
clutch permanently engaged with the disk for engaging with the clutch projection, a clutch-lever and link-and-lever mechanism in operative connection with the clutch and clutch-lever, substantially as set forth.

3. The combination with the driving and driven parts of a speed-gear and an eccentric-bearing and chain-carrier on one part, a chain-wheel on the eccentric-bearing, a chain-
105
wheel and clutch projection on the other part, a chain gearing with both chain-wheels, a flange, a pin-and-slot connection between this flange and the eccentrically-mounted chain-wheel, and a disk rigid with the flange, of a clutch permanently engaged with the
110
disk for engaging with the clutch projection, a sleeve carrying the clutch, a cam for moving the sleeve, and a crank-pin, lever-arms, links and a clutch-lever all operatively connected together, substantially as set forth.

4. The combination with the driving and driven parts of a speed-gear and an eccentric-bearing and chain-carrier on one part, a chain-wheel on the eccentric-bearing, a chain-wheel and clutch projection on the other part, a
120
chain gearing with both chain-wheels, a flange, a pin-and-slot connection between this flange and the eccentrically-mounted chain-wheel, and a disk rigid with the flange, brake-shoes adapted to bear on the disk, lever-arms
125
carrying the brake-shoes, a clutch permanently engaged with the clutch projection, a sleeve carrying the clutch, a cam for moving the sleeve, a crank-pin for moving the cam, and a brake and clutch lever and lever-and-
130

link mechanism in operative connection with the brake and clutch devices, substantially as set forth.

5 5. The combination with the driving and
driven parts of a speed-gear, of an eccentric-
bearing and chain-carrier on one part, a chain-
wheel on the eccentric-bearing, a chain-wheel
and clutch projection on the other part, a pin
10 on the eccentrically-mounted chain-wheel, a
slotted flange engaging the pin, a toothed
flange and a disk rigid with the slotted flange,
a clutch permanently engaged with the disk,
a detent to engage the toothed flange, brake-
15 shoes to bear on the disk, a cam to move the
clutch into engagement with the clutch pro-
jection, an operating-lever and link-and-lever
mechanism in operative connection with this
lever and the detent, brake-shoes and cam,
20 substantially as set forth.

6. The combination with the driving and
driven parts of a speed-gear, an eccentric-
bearing and a chain-carrier upon one of said
parts, a chain-wheel upon said eccentric-bear-
25 ing, a chain-wheel concentric with the shaft,
and a chain upon said carrier confined be-
tween and engaging said chain-wheels of a
pin upon the eccentrically-mounted chain-
wheel, a sleeve upon said shaft provided with
30 a slotted flange engaging said pin, a toothed
flange rigid with said sleeve, a detent for the
toothed flange, and link-and-lever mechanism
in operative connection with the detent, sub-
stantially as set forth.

35 7. In a speed-gear, the combination of a
shaft, an eccentric-bearing rigid therewith,
a chain-wheel loosely mounted on the eccen-
tric, a brake for the chain-wheel, an annular
gear mounted concentrically with and capa-
40 ble of independent rotation upon said shaft,
an arm rigid with the shaft, a chain-carrier
attached thereto to rotate about said chain-
wheel, and an endless chain upon the carrier
confined between said annular gear and chain-
45 wheel, free to revolve about the carrier under
the action of the chain-wheel when the shaft
is turned and the chain-wheel retarded, sub-
stantially as and for the purpose set forth.

8. In a speed-gear, the combination of a
50 shaft, a chain-wheel loosely mounted thereon,
a brake for said wheel, an annular gear
mounted concentrically with and capable of

independent rotation upon said shaft, an arm
rigid with the shaft, a chain-carrier attached
to the arm between said chain-wheel and an-
55 nular gear, and an endless chain upon the
carrier between the chain-wheel and annular
gear, substantially as and for the purpose set
forth.

9. In a speed-gear, the combination of a 60
shaft, a chain-wheel loosely mounted thereon,
a brake for said wheel, an annular gear
mounted concentrically with and capable of
independent rotation upon said shaft, an arm
rigid with the shaft, a chain-carrier attached 65
to the arm, an endless chain upon the carrier
confined between said annular gear and chain-
wheel and free to rotate about said chain-
carrier under the action of the chain-wheel,
and means for locking the parts together, sub- 70
stantially as and for the purpose set forth.

10. In a speed-gear, the combination with
the driving and driven parts, of an eccentric-
bearing and chain-carrier on one part, a chain-
wheel on the eccentric-bearing, a chain-wheel 75
on the other part, and an endless chain upon
said carrier confined to rotate between and
geared to said chain-wheels as it is itself car-
ried around one of said chain-wheels in the
operation of the gear, substantially as de- 80
scribed.

11. In a speed-gear, the combination of a
shaft an eccentric-bearing rigid therewith, a
chain-wheel on said bearing, a chain-wheel 85
mounted concentrically with and capable of
independent rotation upon said shaft, an arm
rigid with the shaft, a chain-carrier upon the
arm, a chain upon said carrier engaging the
chain-wheels, a sleeve upon the shaft having
a flange provided with a radial slot, a pin upon 90
said eccentrically-mounted chain-wheel en-
gaging said slot, brake-shoes engaging said
sleeve, lever-arms carrying the brake-shoes,
a brake-lever and link-and-lever mechanism
in operative connection with the lever-arms 95
and brake-lever, substantially as set forth.

In testimony whereof I have hereto set my
hand in the presence of the two subscribing
witnesses.

MESHACH HOPKINS.

Witnesses:

HAROLD WADE,
HARRY S. BRIDGE.