

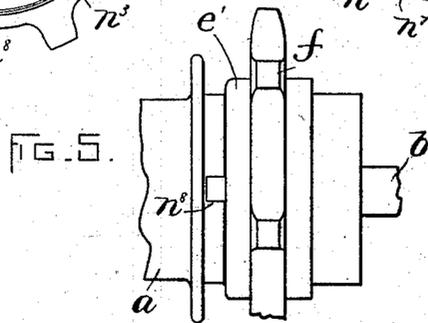
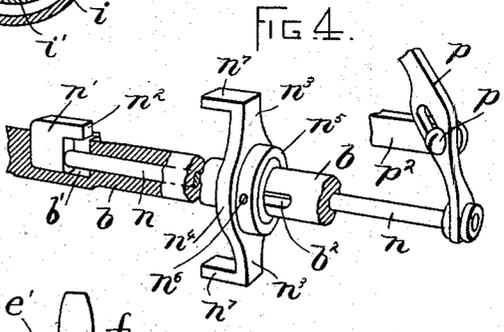
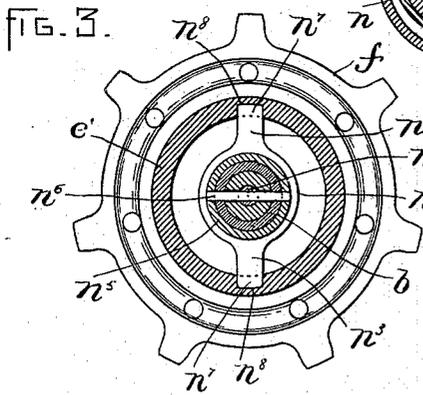
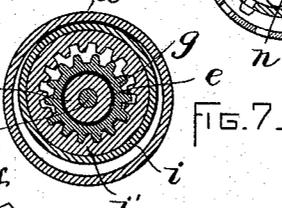
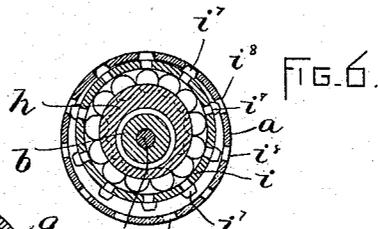
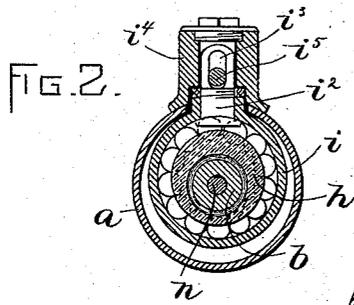
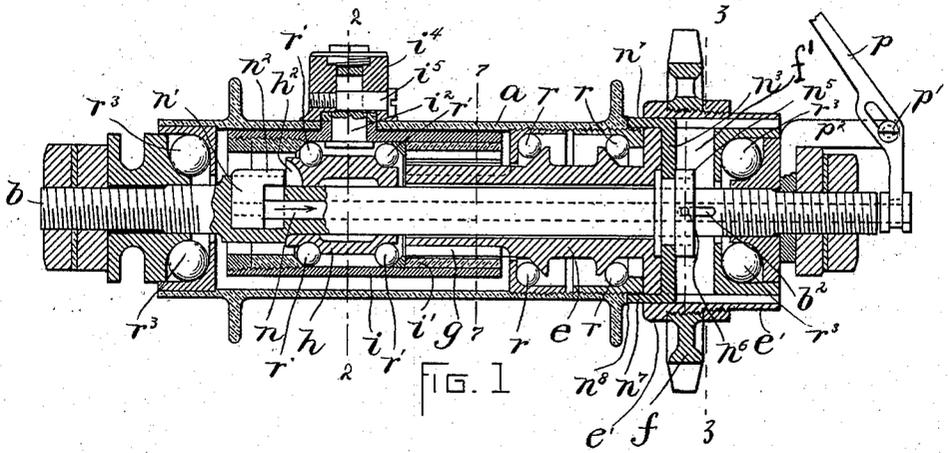
(No Model.)

2 Sheets—Sheet 1.

V. BÉLANGER. CHANGE GEARING FOR BICYCLES.

No. 568,154.

Patented Sept. 22, 1896.



WITNESSES:
H. A. Hall,
A. H. Abell.

INVENTOR:
Victor Bélanger.

UNITED STATES PATENT OFFICE.

VICTOR BÉLANGER, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO MARY E. BRADY AND MARY E. BRADY, TRUSTEE, OF SAME PLACE.

CHANGE-GEARING FOR BICYCLES.

SPECIFICATION forming part of Letters Patent No. 568,154, dated September 23, 1896.

Application filed December 17, 1895. Serial No. 572,404. (No model.)

To all whom it may concern:

Be it known that I, VICTOR BÉLANGER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Change-Gearing for Bicycles, of which the following is a specification.

This invention relates to change-gearings for bicycles of the type shown in Letters Patent of the United States granted to me June 18, 1895, No. 541,260, and has for its object to provide an improved construction of change-gearing whereby greater compactness and durability are secured, as well as a dust-proof construction, the chief object being to include the entire mechanism of the change-gearing within the space inclosed by a standard hub, such as is employed for the rear wheel of the Columbia and other standard bicycles.

The invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a longitudinal section of the hub of a bicycle driving-wheel provided with my improvements. Fig. 2 represents a section on line 2 2 of Fig. 1. Fig. 3 represents a section on line 3 3 of Fig. 1. Fig. 4 represents a perspective view of the coupling device and a portion of the axle, the latter being shown partially in section. Fig. 5 represents an elevation of a portion of the construction shown in Fig. 1. Fig. 6 represents a sectional view corresponding to Fig. 2, showing different means for maintaining a self-adjusting connection between the hub and the eccentric strap or sleeve within the hub. Fig. 7 represents a section on line 7 7 of Fig. 1. Fig. 8 represents a longitudinal section showing a different arrangement of antifriction-bearings. Figs. 8^A and 8^B represent details hereinafter referred to. Fig. 9 represents a section on line 9 9 of Fig. 8. Figs. 10 and 11 represent top views of a portion of the construction shown in Fig. 8. Fig. 12 represents a longitudinal section showing a different arrangement of the gears.

The same letters of reference indicate the same parts in all the figures.

In the drawings, and referring first to Figs.

1 to 7, *a* represents the hub of the rear wheel of a bicycle, said hub being mounted to rotate on a fixed axle *b*, which is fastened, as usual, to the frame of the bicycle. A sleeve *e* is mounted loosely on the axle *b* within the hub *a* and has an enlarged end *e'* projecting from the hub. To the enlarged end of said sleeve is affixed a small sprocket-wheel *f* for engagement with the usual driving-chain, and on the inner end of the sleeve within the hub there are formed pinion-teeth *g*.

h represents an eccentric which is loosely mounted on the axle *b* within the hub *a*.

i represents a strap or sleeve which surrounds the eccentric and is mounted on ball-bearings interposed between its inner surface and the periphery of the eccentric. To the sleeve *i* is affixed an internal gear *i'*, which is in mesh with the pinion *g*. As shown in Figs. 1 and 2, the eccentric strap or sleeve carries an arm *i²*, which is movable in a hollow guide *i⁴*, affixed to the hub *a*, and has a slot *i³*, which receives a stud or pin *i⁵*, affixed to the guide, the said arm and guide constituting a self-adjusting connection between the eccentric and the hub. An equivalent connection is shown in Fig. 6, in which the eccentric strap or sleeve has a series of teeth *i⁷* and the hub a series of orifices *i⁸*, formed to engage said teeth.

n represents a rod which is movable in a longitudinal orifice formed for its reception in the axle *b*, and is provided with coupling devices adapted to lock the eccentric *h* to the axle and the sprocket-wheel *f* to the hub. Said coupling devices comprise, first, an arm *n¹*, which is affixed to the rod *n* and is movable therewith in a slot *b¹*, formed in the axle *b*, said arm having a tooth *n²*, formed to enter a recess *h²* in the eccentric *h*, and, secondly, arms *n³* *n³*, connected by a hub or plate *n⁴* and provided with teeth *n⁷* *n⁷*, formed to enter recesses *n⁸* *n⁸* in one end of the hub *a*, the said hub or plate *n⁴* being mounted loosely on a grooved collar *n⁵*, which is movable on the axle *b* and is connected with the rod *n* by a pin *n⁶*, passing through slots *b²* in the axle. The collar *n⁵* and arms *n³* are movable in a chamber *f¹* in the enlarged end *e'* of the sleeve *e* and rotate with said sleeve and with the sprocket affixed thereto.

The operation is as follows: In the normal condition of parts the sprocket-wheel is locked to the hub a by the teeth n^7 , and the tooth n^2 is withdrawn from the eccentric h , as shown in Fig. 1. Under these conditions power applied to rotate the pinion g is transmitted directly to the hub, the pinion and internal gear remaining in engagement at one side of the axis, and the bicycle is propelled the same as though the sprocket-wheel was permanently affixed to the hub, as usual.

To obtain increased power for hill-climbing or other purpose, the rider by moving the operating-rod n in the direction indicated by the arrow in Fig. 1 engages the detent n^2 with the recess h^2 of the eccentric. When this takes place, the eccentric is held stationary, the arms $n^3 n^3$ being at the same time displaced to disconnect the sprocket-wheel from the hub, and then the pinion g turns the internal gear on the eccentric and the motion is transmitted through said gear to the wheel, the described self-adjusting connection between the hub and the internal gear permitting the internal gear to move laterally or at right angles to its axis, as required by its rotation on the fixed eccentric.

It will be seen that the tooth or detent n^2 constitutes a coupling device adapted to lock the eccentric to the axle, while the teeth $n^7 n^7$ constitute a coupling device adapted to lock the sprocket and driving-pinion to the hub, said coupling devices being alternately operative, so that when the sprocket and driving-gear are locked to the hub the eccentric is loose and when the eccentric is locked to the axle the sprocket and driving-pinion are adapted to rotate independently of the hub.

The rod n may be moved endwise to operate the said coupling devices by any suitable means. I have here shown a lever p , connected at p' to an arm p^2 , affixed to the axle and engaged with the outer end of the rod n . Said lever may be extended to any point where it may be conveniently reached by the rider.

The described construction is compact and is practically dust-proof. Ball-bearings $r r$ are provided between the sleeve e and the hub to minimize the friction when the sprocket and driving-pinion are rotating independently of the hub. Similar bearings $r' r'$ are interposed between the eccentric h and sleeve i . Both the hub and the sleeve are provided with suitable seats for the balls $r r'$, as shown in Fig. 1. The end portions of the hub rest, as usual, on balls $r^3 r^3$, interposed between suitable seats on the hub and axle.

In Figs. 8 and 9 I show the eccentric h' provided at one end with a tubular extension h^4 , closely fitting the axle b , and at the other end with an extension h^5 of greater diameter, inclosing the detent n^2 . The outer ends of the said extensions are provided with seats $h^6 h^6$ for the balls $r^3 r^3$. Rollers r^4 are interposed between the eccentric and the sleeve i , and balls $r^5 r^5$ are interposed between the

sleeve e and suitable ball-seats affixed to the hub. The clutch n^8 is engaged in this case with a collar n^{10} , which is adapted to slide on the axle and on which the clutch is adapted to rotate. A flange on said collar is grasped by a yoke n^{12} , Fig. 8^B, affixed to the rod n , with which are pivotally connected arms $n^{13} n^{13}$ on a rod n^{14} , which extends upwardly to a point where it can be reached and partially rotated by the rider, said rod being journaled in a bearing or bearings n^{16} , Fig. 8^A, on the frame of the machine. The upper end of the rod n^{14} is provided with a suitable handle n^{15} , which is preferably adapted to be locked to a detent n^{17} on the bearing n^{16} , to hold the rods n^{14} and n in the high-gear adjustment with the detent n^2 engaged with the eccentric h , the rod n being pressed outwardly by a spring n^{18} , which normally disengages the detent from the eccentric. The extensions $h^4 h^5$ of the eccentric materially add to the strength of the construction.

In Fig. 12 I show a reversal of the arrangement of the gears, the pinion (designated g^{10}) being affixed to the strap or sleeve i , while the internal gear (designated i^{10}) is affixed to the sprocket-carrying sleeve e . The detent n^2 is normally held in engagement with the eccentric and the clutch n^8 out of engagement with the sprocket-wheel by means of a spring n^{19} , so that normally motion is communicated from the sprocket-wheel to the hub through the sleeve e , the gears $i^{10} g^{10}$, and the self-adjusting connection between the strap or sleeve i and the hub, namely, the teeth i^7 and orifices i^8 or their equivalent. (Shown in Figs. 1 and 2.) When the rod n is displaced from its normal position, the sprocket is locked to the hub and the gears become inoperative. In other respects the construction is or may be the same as that shown in Fig. 8.

I claim—

1. The combination of a fixed axle, a hub mounted to rotate thereon, an eccentric rotatable on the axle, an actuating-wheel at one end of the hub, two intermeshing gears within the hub, one affixed to the actuating-wheel and the other rotatable on the eccentric, a self-adjusting connection between the last-mentioned gear and the hub, with provision for independent lateral movement of said gear, a rod longitudinally movable in the axle, and a coupling device engaged with said rod and adapted to lock the eccentric to the axle.

2. The combination of a fixed axle, a hub mounted to rotate thereon, an eccentric rotatable on the axle, an actuating-wheel at one end of the hub, two intermeshing gears within the hub, one affixed to the actuating-wheel and the other rotatable on the eccentric, a self-adjusting connection between the last-mentioned gear and the hub, with provision for independent lateral movement of said gear, a rod longitudinally movable in the axle, and two alternately-operative coupling devices engaged with said rod and adapted

respectively to lock the eccentric to the axle and sprocket and its connected gear to the hub.

3. The combination of a fixed axle, a hub
5 mounted to rotate thereon, a driving-pinion
loosely mounted on the axle and having a
sleeve extending beyond the hub, an actuat-
ing-wheel affixed to the said sleeve, antifric-
tion-bearings between the sleeve and hub, an
10 eccentric rotatable on the axle, an internal
gear rotatable within the hub and meshing
with the driving-pinion, said internal gear
having a sleeve or extension inclosing the ec-
centric, antifriction-bearings interposed be-
15 tween the eccentric and the sleeve of the in-
ternal gear, a self-adjusting connection be-
tween the internal gear, and hub, and means
for locking the eccentric to the axle.

4. The combination of a fixed axle, a hub
20 mounted to rotate thereon, antifriction-bear-
ings between the hub and axle, an eccentric

rotatable on the axle and provided with tu-
bular extensions having seats at their outer
ends in contact with the said antifriction-
bearings, a driving-pinion rotatable on one 25
of said extensions and having a sleeve ex-
tended from one end of the hub, an actuat-
ing-wheel affixed to said sleeve, an internal
gear supported by and rotatable about the
eccentric and meshing with the driving-pin- 30
ion, a self-adjusting connection between the
internal gear and hub, and means for locking
the eccentric to the axle.

In testimony whereof I have signed my
name to this specification, in the presence of 35
two subscribing witnesses, this 13th day of
December, A. D. 1895.

VICTOR BÉLANGER.

Witnesses:

M. E. BRADY,
C. F. BROWN.