No. 648,972. Patented May 8, 1900.

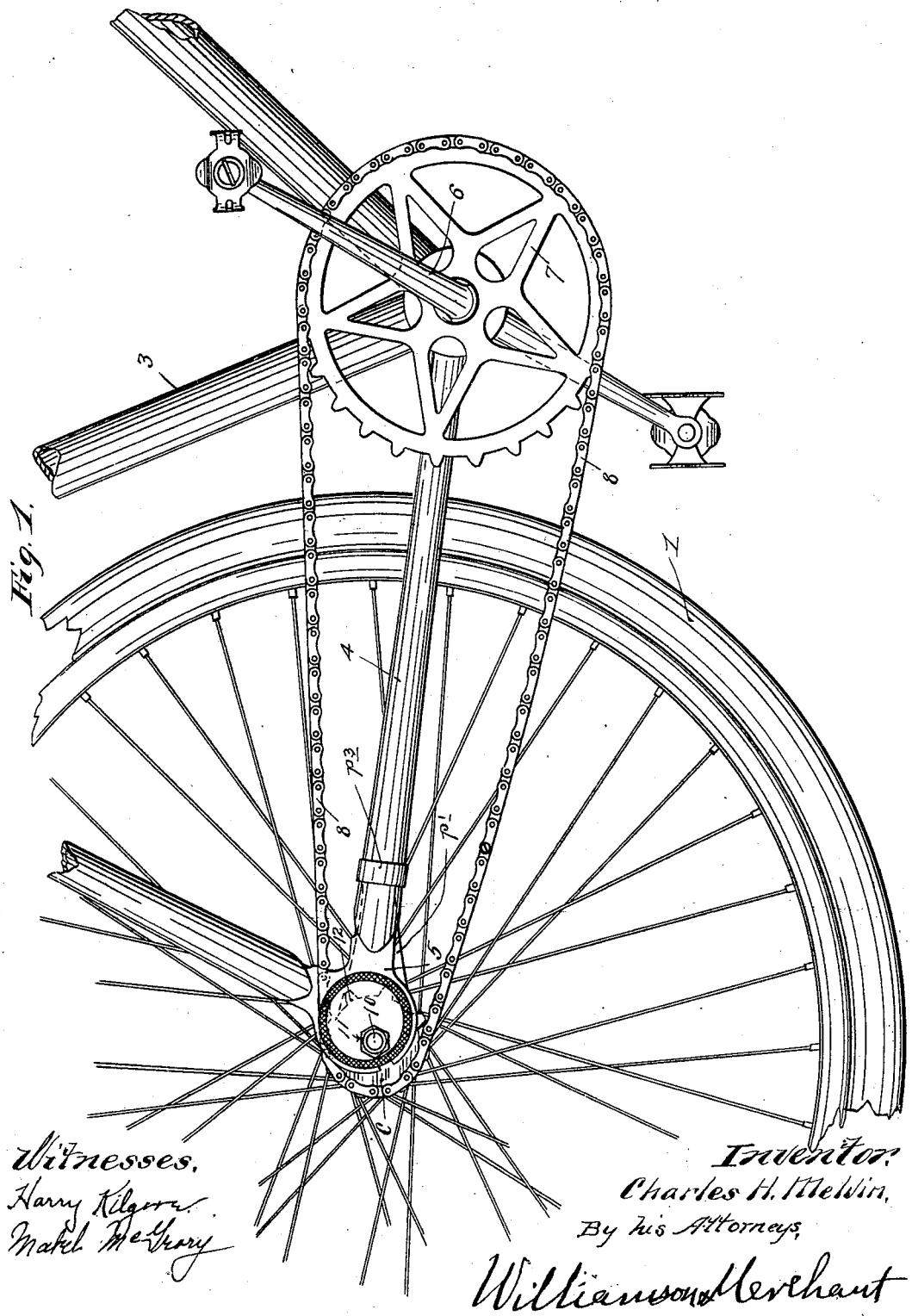
C. H. MELVIN.

BACK PEDALING BRAKE.

(Application filed Jan. 26, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses,
Harry Kilgore.
Mabel McGrary.

Inventor:
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By his Attorneys,
Williamson & Merchant

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Fig. 2.

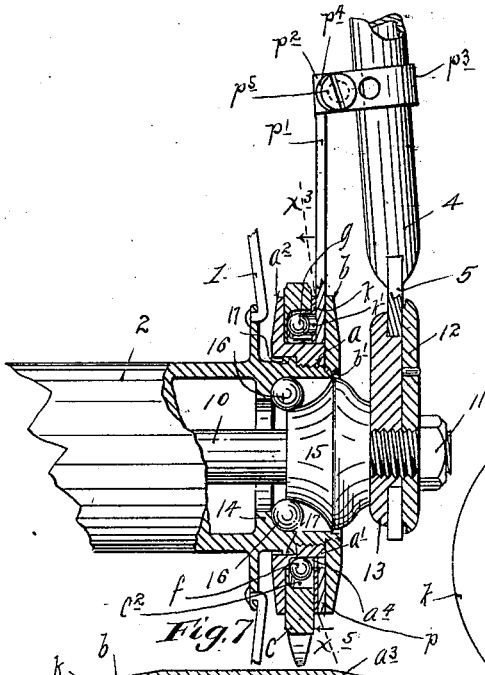


Fig. 3.

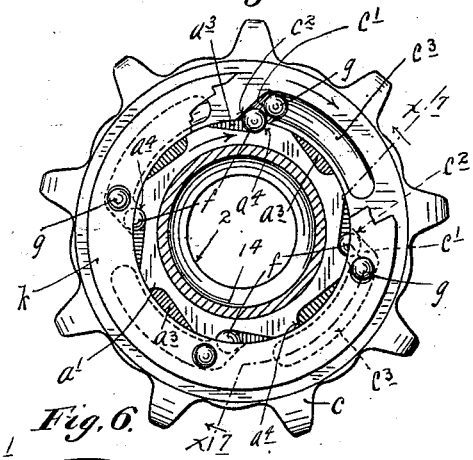


Fig. 6.

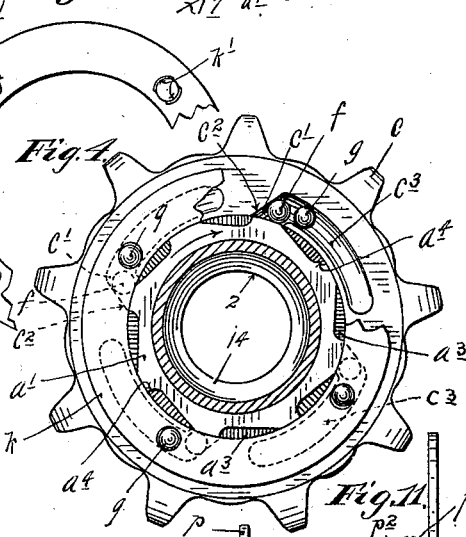


Fig. 4.

Fig. 7.

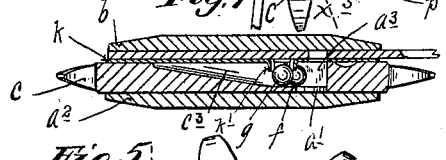


Fig. 5.

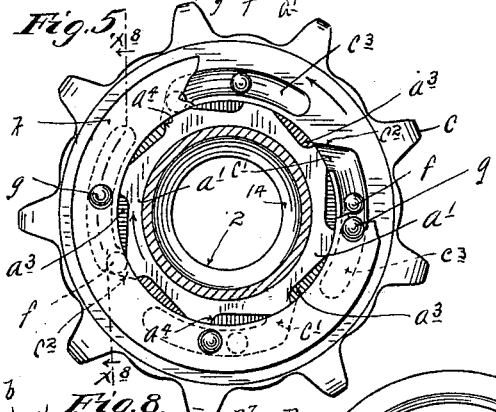


Fig. 8.

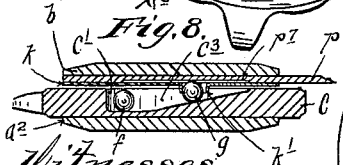


Fig. 10.

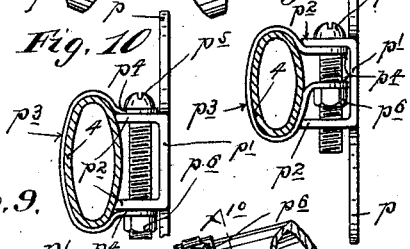
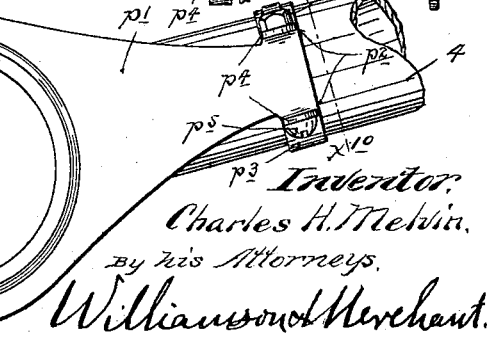


Fig. 11.

Fig. 9.



Witnesses:
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Mabel McGrory.

Inventor:
Charles H. Melvin.
By his Attorneys.
Williamson & Merchant.

UNITED STATES PATENT OFFICE.

CHARLES H. MELVIN, OF ST. PAUL, MINNESOTA.

BACK-PEDALING BRAKE.

SPECIFICATION forming part of Letters Patent No. 648,972, dated May 8, 1900.

Application filed January 26, 1900. Serial No. 2,838. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. MELVIN, a citizen of the United States, residing at St. Paul, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Back-Pedaling Brakes and Coasters; 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 present invention relates generally to so-called "back-pedaling brakes" for bicycles and other cycles of the type set forth in my prior application, Serial No. 721,014, filed June 19, 1899, and has for its object to improve the same as hereinafter noted.

To these ends the invention consists of the novel devices and combination of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like notations indicate like parts throughout the several views.

Figure 1 is a right-side elevation of a portion of a bicycle of standard construction equipped with my invention, some parts thereof being broken away. Fig. 2 is a detail view, partly in plan and partly in horizontal section, showing the right-hand portion of the hub of the rear or traction wheel and immediately-connected parts, including my improved combined brake, coaster, and clutch device. Figs. 3, 4, and 5 are vertical sections taken approximately on the line x^3 x^5 of Fig. 2, but illustrating different positions of the parts, some parts being broken away. Fig. 6 is a view in left-side elevation, showing a portion of the so-called "spacing-ring." Fig. 7 is a transverse section taken on the irregular line x^7 x^7 of Fig. 3. Fig. 8 is a transverse section taken on the irregular line x^8 x^8 of Fig. 5. Fig. 9 is a left-side elevation showing a portion of the bicycle-frame and a so-called "brake-plate" which is anchored thereto. Fig. 10 is a transverse section taken on the line x^{10} x^{10}. Fig. 11 is a view corresponding to Fig. 10, illustrating different positions of the parts.

Of the ordinary parts of the bicycle the numeral 1 indicates the rear or traction wheel, provided with an ordinary barrel-hub 2.

The numerals 3, 4, and 5 indicate the machine-frame.

The numeral 6 indicates the pedal-crank, provided with a large sprocket 7, and the numeral 8 indicates a sprocket-chain which runs over the sprocket-wheel 7 and over a sprocket-wheel to be hereinafter noted, and which it may be here stated is loosely mounted on the hub 2 of the said traction-wheel 1. As is also ordinary in certain standard constructions, the rear or traction wheel is mounted on a spindle or axle 10, which is screw-threaded at its ends and provided with nuts 11 for securing it to the pronged forks 5 of the frame. In the illustration given a pair of coöperating plates 12 and 13 directly engage the forks 5.

The ends of the hub 2 are provided with internal annular ball races or runways 14, with which bearing-cone 15 on the screw-threaded ends of said spindle 10 coöperates to confine bearing-balls 16 in working positions in the ordinary manner. One end—as shown, the right-hand end—of the hub 2 is reduced to form a shoulder 17, as best shown in Fig. 2.

We are now to consider the features of construction which relate more particularly to my present invention. Tightly screwed, preferably by right-hand threads a, onto the reduced right-hand end of the hub 2 and against the shoulder 17 is a ring or collar a', provided at its inner extremity with an outward-projecting peripheral friction-flange a^2. A friction-flange in the form of an annular nut or ring b is secured by left-hand threads b' on the still-further-reduced right-hand end of the hub 2, the same being tightly screwed against the adjacent edges or side of the collar or ring a'. An annular seat or channel having parallel sides is thus formed between the peripheral collar or flange a^2 and the opposing face of the coöperating friction flange or ring b. In this annular channel or seat an annular sprocket wheel or driver c is loosely mounted. The collar a' is provided with a plurality of pockets or recesses a^3, that terminate at one extremity in ball-engaging driving-shoulders a^4.

The sprocket or annular driver c is provided at its inner surface with a plurality of ball channels or passages c', that terminate at one side in ball-engaging driving-shoulders

c^2, arranged to oppose the shoulders a^4 of the pockets a^3 in the collar a and to coöperate therewith at the proper times to firmly clamp coöperating driving-balls f, as hereinafter more specifically described. The ball-channels c' are advisably not cut entirely through the sprocket or driving ring c, but only deep enough to entirely contain the coöperating balls f, as best shown in Figs. 7 and 8. The said ball-channels c' terminate in grooves that are extended concentric to the axis of the sprocket or driver c, as best shown in Figs. 3, 4, and 5 and indicated at c^3. The grooves c^3 are what may be well termed "profile" cam grooves, and they become shallower and shallower as they extend from the channel-sections c', as best shown in Figs. 7 and 8. In each cam-channel c^3 is a brake-setting ball g, which is run toward the shallow end of the said grooves in the brake-setting action, as will hereinafter appear.

The balls g are kept equally spaced and are simultaneously thrown into action by means of a so-called "spacing-ring" k, which is preferably formed of very light and thin sheet metal and is provided with coöperating pairs of ball-engaging lips k', (best shown in Figs. 6, 7, and 8,) the ring itself being preferably perforated between the said lips to make better clearance for the balls and to permit them to directly engage the "brake-plate." This ball-spacing ring k is placed in frictional engagement with the outer face of the sprocket or driver c, with its pairs of lips k' embracing the coöperating balls g, and when thus placed the said ring serves to cover the open sides of the ball-grooves c' and c^3.

From what has been stated in the earlier part of this description it will be readily understood that the driving-chain 8 runs over the sprocket c.

Working between the outer face of the ball-spacing ring k and the inner face of the friction-flange b is an annular section p, which on account of the function which it performs may be designated as the "brake-plate." This brake-plate p has a stem portion p', which terminates at its outer end in a pair of outwardly-projected ears p^2. For coöperation with this pronged end p^2 a split clamping-ring p^3, having ears p^4, is provided. The ears p^2 and p^4 are adapted to be secured together by a bolt or screw p^5, provided with a nut p^6. Preferably the brake-plate p is provided with a profile groove p^7 on its inner face, which runs concentric with and centrally of the segmental cam-grooves c^3 of the driving-sprocket c. In the brake-setting action the balls g are forced into this channel p^7.

To secure the brake-plate p to the machine-frame so that it cannot rotate in either direction, the split ring p^3 is placed around the adjacent frame-tube 4, and the ears p^4 thereof are secured to the ears p^2 of the plate extension p', and the said ring is drawn tighter onto the said frame-tube by the application of the bolt p^5 and nut p^6 either in the manner illustrated in Fig. 10 or Fig. 11, according to the size of the said tube. This connection, as is obvious, adapts the brake-plate for ready application to bicycle-frames having tubes varying materially in size and form.

Operation: Under the forward-pedaling action the sprocket or driver c will of course be moved in the direction indicated by the arrow marked on Fig. 3, and the so-called "ball-spacing ring" k by its frictional contact with the brake-plate p will be held backward, so that the balls g, directly engaged thereby, will be forced toward the deep channels c', and they in turn will engage the balls f and drive them all simultaneously into the said channels c', partially projecting into the pockets a^3 of the hub-ring a, where they will be positively engaged by the coöperating driving-shoulders a^4 and c^2. Hence the traction-wheel will be driven by a positive clutch action. In the coasting action the pedals and the driving-sprocket g will of course be held stationary or against rotation in either direction, while the traction-wheel and the collar a, carried thereby, will be rotated, as indicated by the arrow marked on Fig. 4. Under this coasting action the balls f will suddenly be caused to recede slightly into the deep channels c', as shown in Fig. 4, and will therefore offer no perceptible resistance to the advancement of the machine. In the brake-setting action the pedals are rotated backward, or, in other words, the machine is back-pedaled, so that the driving-sprocket c will will be rotated in the direction indicated by the arrow marked thereon in Fig. 5, while the traction-wheel and its collar a will continue to rotate, as indicated by the arrow marked on the said collar in said Fig. 5. Under this back-pedaling action the so-called "spacing-ring" k by reason of its greater friction with the brake-plate will tend to remain stationary, and will thus simultaneously carry the balls g in the direction of the shallow end of the cam-grooves c^3 of the sprocket c, and this movement of the balls will then be stopped when they have been tightly wedged between the said cam-grooves and the channel p^7 of the brake-plate p. When the said balls g are thus wedged between the said parts, they force the outward surfaces of the sprocket c and the brake-plate p, respectively, against the inner surfaces of the friction-flanges a^2 and b, which flanges are carried by the traction-wheel hub, and by increasing or decreasing the back-pedaling action the brake may be set with more or less force, as desired.

The device above described being of very simple construction may be very cheaply made. The grooves c' and c^3 in the sprocket or driver c and the pockets a^3 in the hub-ring a are run completely out at one side of each member, and may therefore be readily drop-forged, which is much cheaper than milling.

The so-called "spacing-ring" is an important feature, for the reason that it causes all of the driving-balls f to be simultaneously ap-

plied in the driving action and also causes all of the balls g to be simultaneously applied in the brake-setting action. Nevertheless the device will be operative without this ring. Furthermore, the device will be operative with but one ball applied in each groove c' c^3, although the pair of balls in each of such grooves and the ring coöperating therewith gives more satisfactory results and adds very little to the cost of the device.

Other alterations in the specific construction illustrated in the drawings may be made within the scope of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a cycle the combination with a rotary driver and a rotary driven member, said members having coöperating ball-engaging shoulders and one of said members having cam-grooves that are open at their deep ends and lead to the driving-shoulders of that member, balls in said cam-grooves engageable between said coöperative driving-shoulders in the driving action, and an anchored brake plate or member subject to the said balls when they are forced into said cam-grooves in the back-pedaling action, substantially as described.

2. In a cycle the combination with a traction-wheel having a ring or hub with peripheral pockets terminating at one end in driving-shoulders, of a rotary driver loose on said ring or hub and provided with profile cam-grooves open at their deep ends and terminating in driving-shoulders, balls in said cam-grooves, and a brake-plate anchored to the machine-frame and working adjacent to said cam-grooves and subject to said balls in the back-pedaling action, substantially as described.

3. In a cycle the combination with a traction-wheel, the hub of which is provided with a pair of laterally-spaced friction-flanges and is provided between said flanges with the peripheral pockets, of an anchored brake-plate working against inner surface of one of said friction-flanges, an annular driver loosely mounted on said hub between one of said friction-flanges and said brake-plate, said driver having the profile cam-groove c^3 terminating in the open groove c' with the shoulder c^2, and the pairs of balls f g working in said cam-grooves and operating, substantially as described.

4. In a cycle the combination with a traction-wheel provided on its hub with a pair of laterally-spaced friction-flanges, and formed between said flanges with peripheral pockets, anchored brake-plate working against the inner face of one of said friction-flanges, an annular driver loosely mounted on said hub between one of said flanges and said brake-plate, said driver having profile cam-grooves terminating in open-shouldered extremities, balls in said cam-grooves coöperating with said pockets, and a spacing-ring between said driver and said brake-plate provided with lips or projections acting upon the said balls, substantially as described.

5. In a cycle the combination with the traction-wheel the hub of which is provided with the flanges a^2 and b and the collar a formed with pockets a^3 a^4, of the annular driver c formed with the cam-flanges c^3 terminating at one end in the open channels c' with driving-shoulders c^2, the balls f and g in said channels, the ring k with lips or projections k' embracing the balls g, and the brake-plate p between said ring k and the hub-flange b, anchored to the machine-frame, the said parts operating substantially as described.

6. In a bicycle the combination with a back-pedaling brake applied to the hub of the traction-wheel and involving the brake-plate p with arm or extension p' terminating in the prongs p^2, of the split ring p^3, securable around one of the frame-tubes, and the nutted bolt p^5 p^6 for securing said split ring to said prongs p^2 and clamping the same onto said tube, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES H. MELVIN.

Witnesses:
WM. MCGRORY,
F. D. MERCHANT.