

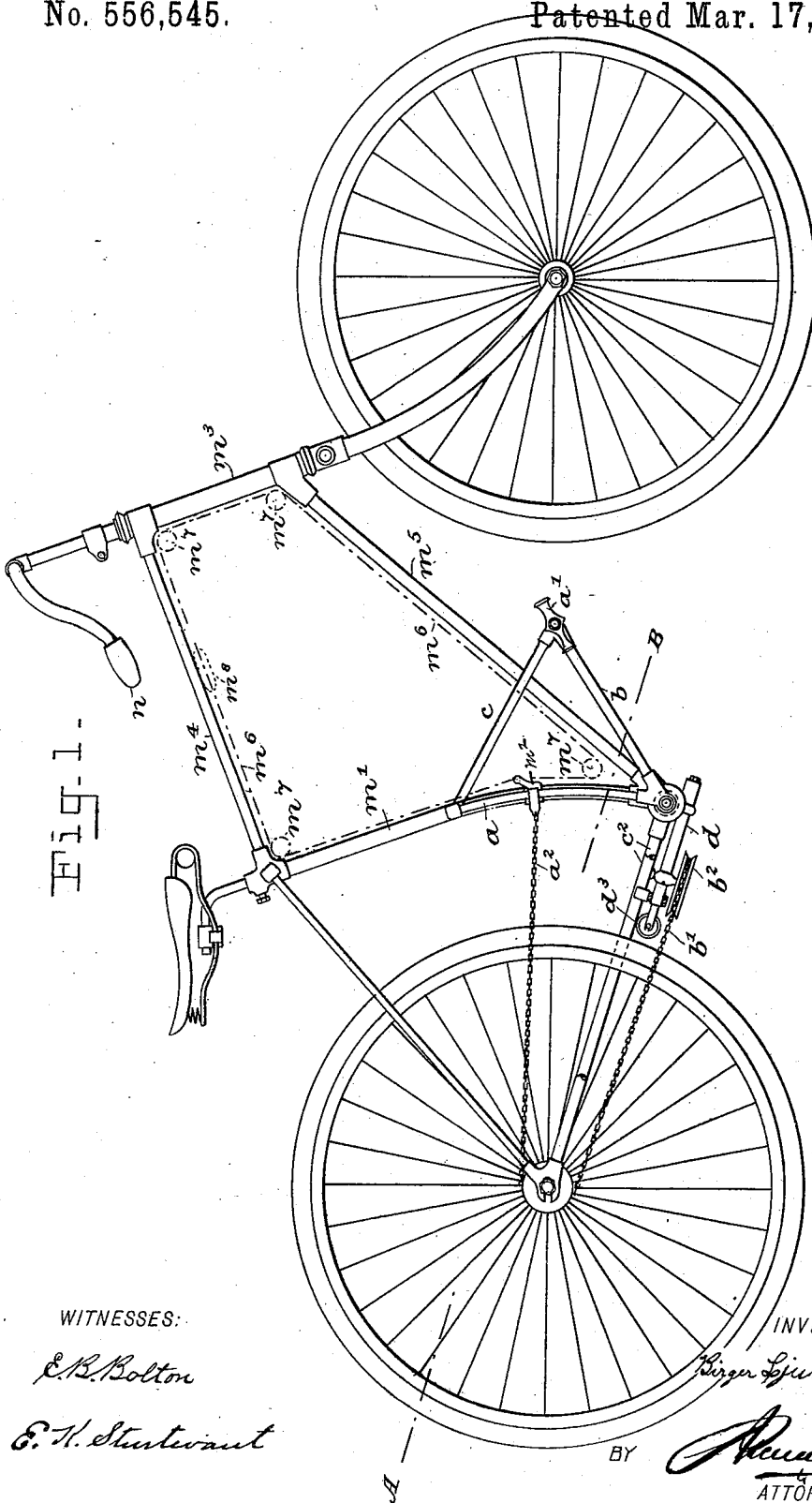
(No Model.)

3 Sheets—Sheet 1.

B. LJUNGSTRÖM.  
DRIVING MECHANISM FOR VELOCIPEDES.

No. 556,545.

~~Patented~~ Mar. 17, 1896.



WITNESSES:

E. B. Bolton

E. H. Sturtevant

INVENTOR

Birger Ljungström

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(No Model.)

3 Sheets—Sheet 3.

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Fig. 2.

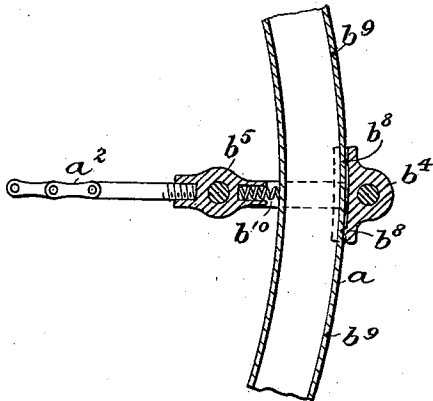


Fig. 10.

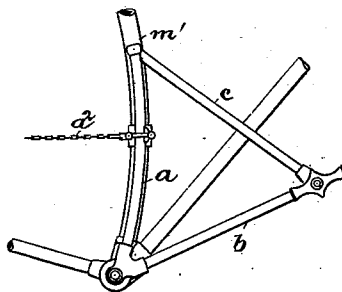


Fig- 11.

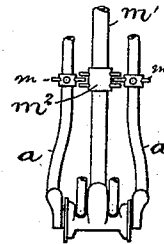


Fig-12.

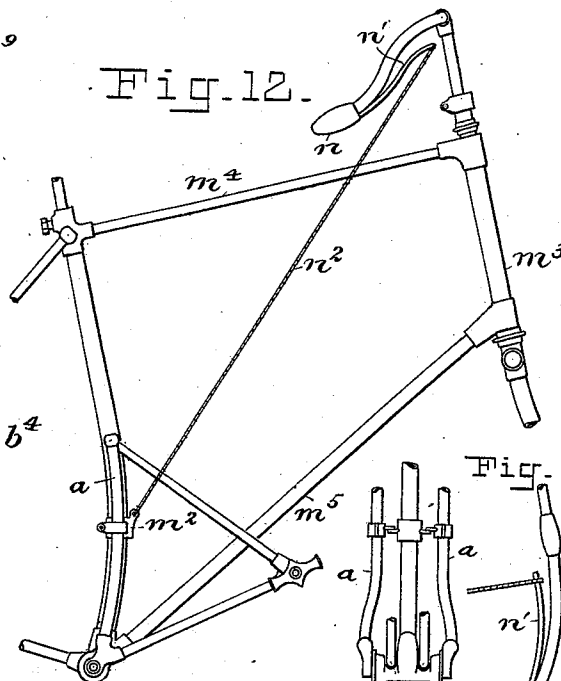


Fig. 9.

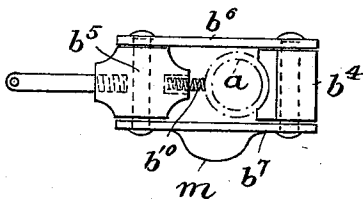


Fig. 14.

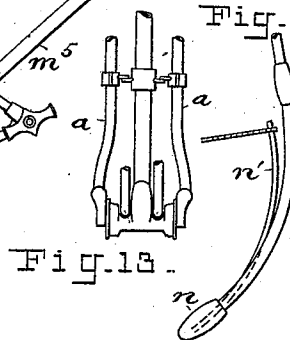


Fig. 13.

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# UNITED STATES PATENT OFFICE.

BIRGER LJUNGSTRÖM, OF STOCKHOLM, SWEDEN.

## DRIVING MECHANISM FOR VELOCIPEDES.

SPECIFICATION forming part of Letters Patent No. 556,545, dated March 17, 1896.

Application filed May 12, 1894. Serial No. 510,997. (No model.) Patented in Belgium December 29, 1893, No. 107,835; in Norway December 30, 1893, No. 3,614; in Italy December 31, 1893, XXVIII, 35,496, LXIX, 368; in France January 3, 1894, No. 235,259; in Switzerland January 5, 1894, No. 7,952; in Spain February 14, 1894, No. 15,336, and in Austria April 23, 1894, No. 1,177.

*To all whom it may concern:*

Be it known that I, BIRGER LJUNGSTRÖM, instrument-maker, a subject of the King of Sweden and Norway, and a resident of Grefgatan 44<sup>b</sup>, Stockholm, in the Kingdom of Sweden, have invented certain new and useful Improvements in Driving Mechanism for Velocipedes, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention has been patented in Norway, No. 3,614, dated December 30, 1893; in France, No. 235,259, dated January 3, 1894; in Belgium, No. 107,835, dated December 29, 1893; in Italy, XXVIII, 35,496, LXIX, 368, dated December 31, 1893; in Spain, No. 15,336, dated February 14, 1894; in Switzerland, No. 7,952, dated January 5, 1894, and in Austria, No. 1,177, dated April 23, 1894.

This invention relates to such velocipedes which have a driving-gear consisting of treadles, chains and ratchet-couplings, the object of the invention being substantially that the gear may be easily changed for a quicker or a slower speed. The treadles have therefore the shape of bent levers, which are located immediately ahead of the hind wheel and directed so that their one arm is directed upward and their other arm forward. With the former arms the driving-chains are connected and to the latter ones the pedals are fixed. The chains are attached to the upward-directed arms by means of clamps movable along the arms and provided with lateral projections so as to be easily caught. It will thus be possible to raise or to lower the clamps by the feet or by means of some special device, and in this way to displace the points of application of the chains nearer to or farther from the fulcrum of the arms, and in this way to increase or to diminish the gearing.

Figure 1 is a side view of the velocipede, and Fig. 2 is a horizontal section of the same on the line A B, Fig. 1. Fig. 3 is a detail view of a brake device. Fig. 4 is a detail view, partly in section, of the pivot-bearings for the treadles. Figs. 4<sup>a</sup> and 4<sup>b</sup> show details of the spring at the pivots of the treadles. Fig. 5 is a view showing in section and elevation the driving-

couplings in connection with the rear-shaft 50 axle. Figs. 6 and 7 are detail views relating to the driving-couplings. Fig. 8 is a sectional elevation of the movable chain-clamp. Fig. 9 is a plan view of the same. Fig. 10 is a side view of a treadle-arm with the chain-clamp 55 in place. Fig. 11 is a detail view showing the treadle-arms with their clamps engaging an adjustable slider on the frame. Figs. 12, 13 and 14 are detail views showing hand operating means for adjusting the clamps. 60

The treadles have, as stated, the shape of bent levers, the one arm, *a*, of these being directed upward and bent so as to be concentric with the hind wheel when the treadle is occupying its middle position. The other 65 arm, *b*, is directed forward and united with the arm *a* by means of a stay *c*.

To the arm *a* the driving-chain *a*<sup>2</sup> is fixed, and at the junction between the arms *b* and *c* the pedal *a*<sup>1</sup> is located. The driving-couplings, by means of which the motion from the chains *a*<sup>2</sup> is transmitted to the driving-wheel, consist each of two rings *a*<sup>3</sup> *a*<sup>4</sup>, Fig. 5, the one inserted in the other. The inner of these rings is screwed upon the end of the nave of 75 the driving-wheel and runs on the shaft *a*<sup>5</sup> by means of the ball-bearing formed by the flange *a*<sup>6</sup> and the balls *a*<sup>7</sup>. The rings likewise run on ball-bearings arranged in such a way that at either side of the track for the rollers 80 *a*<sup>8</sup>, which are in the usual way placed in recesses *a*<sup>9</sup> between the rings, are grooves containing the balls *a*<sup>10</sup>. The coupling will by this arrangement run very light and the wear be reduced to a minimum. The chains *a*<sup>2</sup> are 85 wound in one direction around the rings *a*<sup>3</sup>, and another chain, *b*<sup>1</sup>, running around the pulley *b*<sup>2</sup> fixed to the frame, has its end wound in the other direction around the rings *a*<sup>3</sup>. In this way the coupling will in the known manner have an alternate motion to and fro, thus taking along the wheel alternately, when the treadles are actuated in the usual way. 90

In order that the point of application of the chains *a*<sup>2</sup> on the arms *a* may be moved along 95 the arms these are provided with movable clamps, to which the chains are attached. The clamps are shown in detail in Figs. 8 and

9 and consist of two cross-pieces  $b^4 b^5$ , united by two side pieces  $b^6 b^7$ . The piece  $b^4$ , which rests against the front side of the arm  $a$ , is provided with short points  $b^8$ , entering into 5 corresponding shallow recesses  $b^9$  in the front side of the arm. The chain is fixed to the piece  $b^5$ , and between the piece and the arm there is a spring  $b^{10}$ , pressing the piece  $b^4$  against the arm just enough to prevent the 10 clamp to move by itself, but so that it may be displaced by pressure or by pulling upward. In order that the rider may be able to easily displace the clamp with the foot the outer side piece of the same is provided with a lug 15  $m$  to be caught by the shoe-sole below or above, according as the clamp is to be raised or lowered. The velocipede is besides provided with a special arrangement for the simultaneous displacement of the clamps. 20 This arrangement is shown in Fig. 12 in several modifications.

The standard  $m'$ , which is bent in the same way as the arm  $a$ , is provided with a slider  $m^2$ , with which both clamps will engage when 25 the treadles are opposite each other, as shown in Fig. 11. To the frame, which is formed by the standards  $m'$   $m^3$  and the stays  $m^4 m^5$ , is connected an endless chain or rope  $m^6$ , running on rollers  $m^7$ . This chain or rope is 30 connected with the slider  $m^2$  and is provided with a handle  $m^8$  under the stay  $m^4$ . This chain is shown in Fig. 1. By seizing the handle and conducting it in the one or other direction the clamps are moved upward or 35 downward on the arms  $a$ . The slider, as shown in Fig. 11, has two laterally-projecting lugs, between which the lugs on the side arms of the clamp fit.

Instead of the arrangement now described 40 for adjusting the gear the steering-handle  $n$  may be pivotally mounted on the steering-arm and provided with an arm  $n'$ , which by means of a rope  $n^2$  is connected with the slider  $m^2$ . By turning the handle so as to stretch 45 the rope the clamps, engaging with the slider, are brought upward, but if the handle is turned in the opposite direction the slider and the clamps fall down by their own weight. This modification is shown in Fig. 12. The 50 springs  $b^{10}$  may in this case be left out, as the chains are always pulling the clamps a little, thus preventing them from sliding on the arms  $a$ . If, on the other hand, the treadles are simultaneously brought upward, the chains 55 will slacken and the clamps slide downward. Upward they are however moved in the above-mentioned manner.

When the treadles are left free they will both occupy the position shown in Fig. 10— 60 that is, placing themselves one opposite the other. This is obtained partly thereby that their point of gravity is situated ahead of the turning-shaft, partly thereby that they are united with each other in such a way that 65 they tend to place themselves one opposite the other. This latter is effected by means of

a spring, which will occupy the equilibrium when the treadles are opposite each other, but will be strained when the treadles occupy different positions, and therefore tend to bring 70 them back to the former position. The pivots  $c'$  of the treadles are inserted into a tube or muff  $c^4$ , Fig. 4, fixed to the frame. Grooves in the pivots and similar grooves in a flange  $c^5$  in the tube and in caps  $c^3$  secured to the 75 ends of the tube together with balls inserted into these grooves form ball-bearings for the pivots, as distinctly shown in Fig. 4. A bar  $c^6$  is passed through the pivots longitudinally. This bar, which unites the pivots but is only 80 at the ends tightly clasped by them, consists of thin steel blades or plates of the same width and length as the whole bar. This bar can therefore be turned (twisted) and is thereby 85 strained as a spring. Such a twisting, although small, is effected alternately in the one and the other direction when actuating the treadles; but if the treadles are left free the spring will rest in its normal state and the treadles are brought one opposite the 90 other. As when using treadles in lieu of cranks the direction of motion of the foot is permanently changing it may prove advantageous, by means of a spring or such like, to take up the living force acquired by the 95 foot at the end of each downstroke. A suitable returning-spring may be used for this purpose to raise the treadles, being connected thereto and to the frame.

The application of the brake of the machine 100 is effected by displacing the pulley  $b^2$ . This latter is therefore fixed to a slider  $d$ , which is guided partly by the cross-piece  $d'$  extending between the stays  $c^2$  and partly by the fixed cylinder  $d^2$ , in which the end of the slider is 105 entering. On the end directed toward the driving-wheel the slider is provided with a small brake-pulley  $d^3$ . The slider is kept away from the wheel by an interior spring  $d^4$ , the one end of which is fixed to the tubular 110 slide and the other end to the said cylinder by means of an adjusting-screw  $d^5$  screwed through the end of the cylinder. The screw-pin  $d^5$  determines the action of the spring. If the rider is pressing the two treadles simul- 115 taneously the chain  $b'$  will be stretched and the slider is pressed against the wheel and acts thus as a brake.

Having now described my invention, what I claim as new, and desire to secure by Letters 120 Patent, is—

1. In combination, in a bicycle, the ratchets at the hind wheel, the chains extending therefrom, the triangular treadles, the curved 125 arms  $a$ , turned upward, the movable chain-clamps thereon provided with lugs  $m$ , whereby the chain-clamps may be moved upward and downward directly by the feet.

2. In combination, in a bicycle, the ratchets at the hind wheel, the chains extending 100 therefrom, the triangular treadles, the upwardly-turned curved arms  $a$ , the movable

chain-clamps, the support-standard  $m'$  curved in the same manner as the arm  $a$ , and of the same width, and the slider  $m^2$  on the standard  $m'$ , by which slider the chain-clamps may  
5 be moved upward or downward.

3. In combination, in a bicycle, the frame, the driving-wheel, the ratchet-drums, the chains extending therefrom, the treadle-arms pivoted to the frame and having perforations  
10 or sockets and the chain-clamps embracing said arms and including a toothed spring-pressed part  $b^4$  adapted to engage with the perforations in the treadle-arms, substantially as described.

15 4. In combination, in a bicycle, the frame, the driving-wheel, the ratchet-drums thereon, the treadle, the chain and the chain-clamps comprising the pieces  $b^4$   $b^5$  on opposite sides of the arm, the links connecting  
20 said pieces and the spring  $b^{10}$  between the arm and the piece  $b^5$  adapted to press the piece  $b^4$  into contact with the arms, substantially as described.

5. In combination in a bicycle, the frame,  
25 the driving-wheel, the driving connections

and the treadles for operating the same comprising the arms, the laterally-extending pivots  $c'$   $c'$ , the tubular bearing  $c^4$  into which the pivots extend, the ball-bearing within the tube and the spring-bar  $c^6$  connecting the pivots  
30 of the treadles, substantially as described.

6. In combination, the frame, the driving-wheel, the ratchet-drums, the chain  $b'$  connected thereto, the pulley  $b^2$  about which the chain runs when one treadle is depressed, the  
35 treadles connected to the chain, the spring-piece  $d$  carrying the pulley  $b^2$  and movably supported on the frame and the brake  $d^3$  carried by the moving piece and adapted to be thrust against the driving-wheel when both  
40 treadles are depressed simultaneously, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

BIRGER LJUNGSTRÖM.

Witnesses:

ERNST SVANQVIST,

CARL TH. LUNDHOLM.