(No Model.)

G. W. FERNALD.

BICYCLE.

No. 464,324. Patented Dec. 1, 1891.

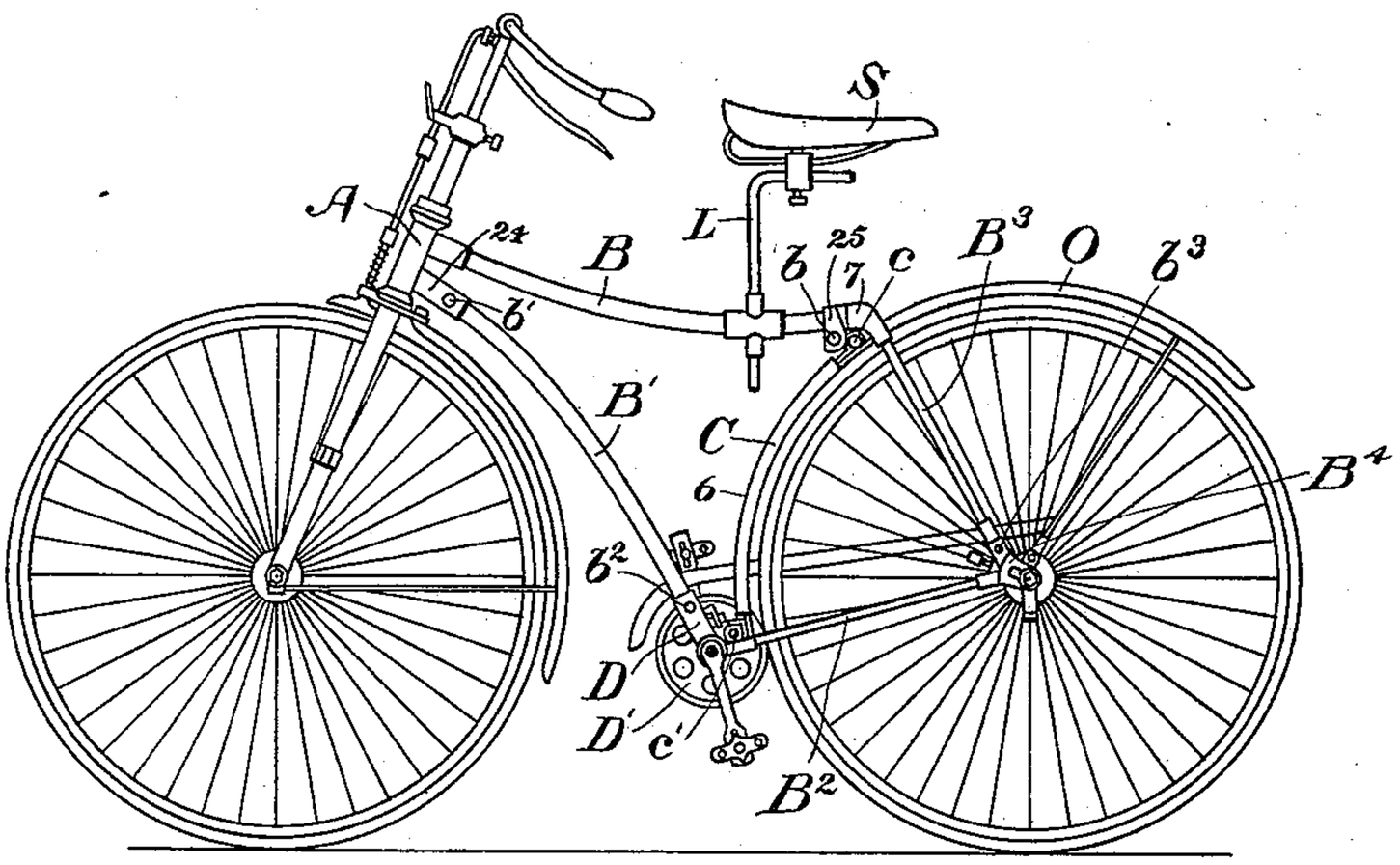

Fig. 1.

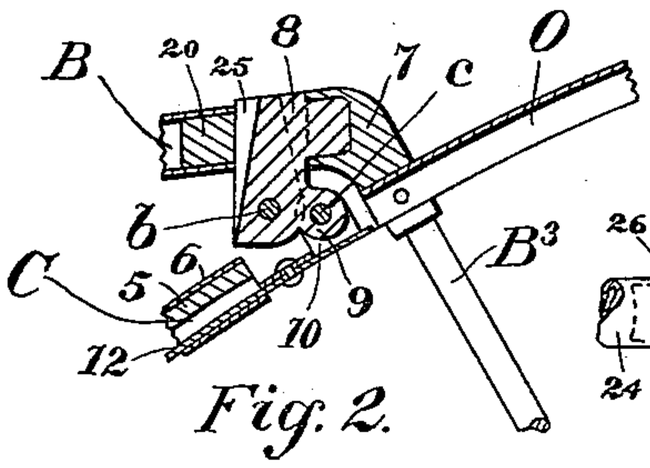

Fig. 2.

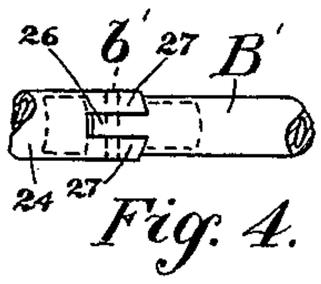

Fig. 4.

Fig. 3.

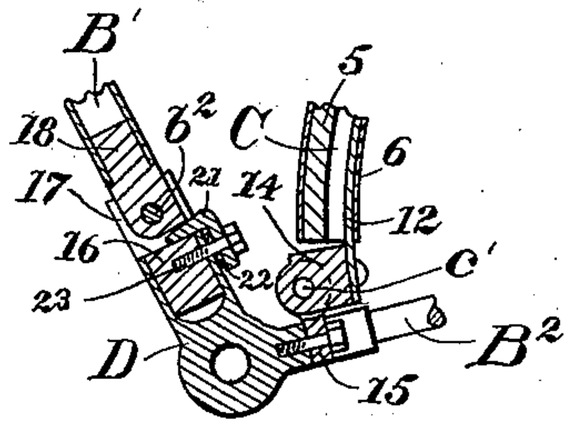

Fig. 5.

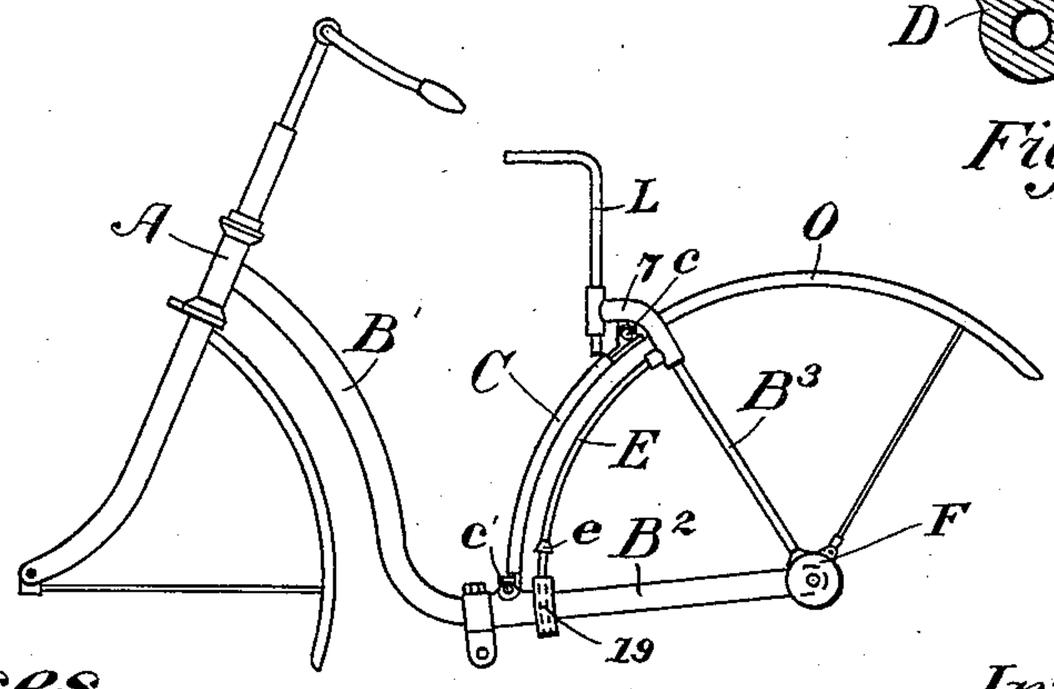

Fig. 6.

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UNITED STATES PATENT OFFICE.

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BICYCLE.

SPECIFICATION forming part of Letters Patent No. 464,324, dated December 1, 1891.

Application filed August 5, 1891. Serial No. 401,721. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. FERNALD, a citizen of the United States, residing at Needham, in the county of Norfolk and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Bicycles, of which the following is a full specification.

My invention consists of certain improved features of construction in bicycle-frames, my main object being to cushion the rider against the jarring ordinarily met with on roads and tracks in a more thorough manner than is possible with a spring-saddle, or with any form of spring-frame now in use. To this end I make my frame in parts jointed together and capable of motion about the joints in a vertical plane, though stiff laterally. I moreover interpose between certain parts of the frame a spring which receives all the jarring and cushions the rider perfectly. This spring does not detract from the appearance of the machine and is not apparent to the casual observer, being a part of the mud-guard to the rear wheel. In addition, the spring acts as a stiff brace laterally. The details of construction are as hereinafter fully described.

Referring to the accompanying drawings, Figure 1 shows in side elevation a bicycle embodying my invention. Fig. 2 is an enlarged sectional view through the upper portion of the mud-guard spring and adjacent parts, showing the mode of connection of the parts together. Fig. 3 is a transverse section through the mud-guard spring, on an enlarged scale. Fig. 4 shows in plan one of the joints to the frame. Fig. 5 shows in section the mode of connection of the bottom of the mud-guard spring to the frame and certain other details of construction, and Fig. 6 shows in side elevation a modified form of frame embodying my improvements.

Referring to the form of machine illustrated in Figs. 1 to 5, inclusive, of the drawings, which has what is known as the "diamond" style of frame, A is the socket-head, to which is rigidly connected by brazing or otherwise the upper tubular portion B of the frame, which portion B may be made up of one or more sections, as desired, but is rigid throughout its length from front to rear.

B^3 shows the rear upright frame-fork, each leg of which is brazed at the top thereof to the piece 7, which is jointed at b, in the manner more fully described hereinafter, to a rear connection of the tubular piece B. Each leg B^3 of the rear upright fork is jointed at b^3 to a fulcrum-piece B^4 on each side of the rear wheel, to which fulcrum-pieces are rigidly attached the rear of each leg of the lower or horizontal frame-work B^2. Each leg B^2 is rigidly secured in front to a branch of the piece D, which forms a bearing for the axle of the sprocket driving-wheel D'. Between the head A of the machine and the piece D is interposed the curved piece B' of the frame, jointed at b' to a connection 24 of the head and at b^2 to the piece D. The frame is thus composed of the pieces B, B', B^2, and B^3, having joints at b, b', b^2, and b^3, admitting of motion in the plane of the frame.

The mud-guard to the rear wheel is made in two pieces O and C. Of these the piece O is fixed, being attached to the top of the rear upright fork, while the part C, which in outward appearance conforms to the shape of the portion O, is in reality a spring jointed, as at c, at the top to a connection of the rear upright frame-fork and at c' to a connection of the bearing-piece D. By this construction all the jarring and vibration due to the roughness of the track are taken up by the spring portion C of the mud-guard, which bends back and forth slightly as rough places are encountered, thus serving to thoroughly cushion the rider.

The exact manner of jointing the various portions of the frame together is immaterial so long as it is capable of motion in the plane of the frame, but is quite stiff and rigid laterally. I have illustrated in detail, on an enlarged scale, in Figs. 2, 4, and 5 forms of joints employed in the machine shown in Figs. 1. Where two portions of the frame are movably jointed together, I prefer to have one portion provided with embracing-lugs, as 27, (see Fig. 4,) while the other has a single central lug, as 26, which accurately fits between the other two, the pivotal pin, as b', being passed through them in the usual manner. When desired, the motion of the two parts may be limited by a rule-joint, as shown in Fig. 2, which indicates one manner in which the spring is secured to the junction of two parts of the

frame. As here shown, the spring proper consists of a curved piece of thin metal 12, of the same width practically as the mud-guard. Over this is placed a curved filling 5, preferably of hollow rubber, passing along nearly the entire length of the spring, the filling 5 and the spring 12 being held together by a cover 6, consisting, preferably, of thin rubber tubing, the contour of the complete spring portion C of the mud-guard being the same as that of the fixed portion O so far as the curved shape is concerned.

With reference now to Fig. 2, 20 is a piece brazed to the rear of the upper tube B of the frame and has the two embracing-lugs 25. 8 is a piece similarly brazed into the top 7 of the rear upright frame-fork. The central portion of the piece 8 projects forward and downward and is adapted to be embraced by the lugs 25 on the piece 20, the two being hinged together beneath at *b*. The lugs 25 at the rear are tapered backward, and the front of the lug 8 is also tapered in such a manner that a rule-joint is formed, which limits the motion of the two parts hinged together at *b*.

9 is an ear extending rearwardly from the lug 8 and embraced by two lugs 10 on a piece firmly riveted or otherwise secured to the top of the spring 12. To the bottom of the spring 12 is riveted or otherwise secured the box 14, which is adapted to fit between lugs on the piece 15, this piece being bolted to the bearing-piece D for the sprocket-wheel *c'*, being the pivot about which the bottom of the spring turns.

18 is a lug-piece brazed to the bottom of the tubular portion B′ of the frame, being hinged at b^2 between the embracing-lugs 17 on the piece 16, brazed to the bearing-piece D. The motion of the joint at b^2 is naturally upward, while that at *b* is downward when the rider is on the saddle, and the mud-guard spring C bends or gives outwardly. The bend of the mud-guard spring C lengthwise and the distance between the middle of the vibrating spring and the wheel-rim may be adjusted by varying the natural position the joint b^2 would assume when the machine is at rest. In order to admit of this adjustment, I have provided at the lower end of the hinge-lug 18 a wedge-shaped angle-piece 21, which, by means of the bolt 23, is secured to the bearing-piece D and against the wedge-shaped inner tongue of which the bottom of the hinge-lug 18 bears when the machine is at rest—*i. e.*, with the rider off the saddle. In this position the middle of the spring mud-guard C is obviously at its nearest position to the wheel-rim. By interposing washers 22 of varying thickness around the bolt 23 the position of the wedge-shaped angle-piece 21 in its slot may be varied at will and with it the bend or curvature of the mud-guard spring when at rest.

In adapting my improved construction to a drop-frame for ladies' use some slight modifications are necessary. In Fig. 6 I have shown such a frame embodying my improvement. In this form of frame the horizontal rear fork B^3 is rigidly secured to the drop portion B′ of the frame, which portion B′ is rigidly brazed to the head A. The fulcrum-pieces F on each side of the wheel, to which pieces are rigidly secured the legs B^3 of the upright rear fork, are separate from the horizontal frame-fork B^2, as shown. The piece 7 at the top of the upright rear fork bears directly the saddle-supporting rod L, and has the top of the spring mud-guard C, jointed thereto at *c*. The bottom of the mud-guard spring is jointed at *c'* to the junction of the rear horizontal fork. In order to limit the motion of the spring in this case, I preferably provide on each side the curved rod E, secured at its upper end either to the piece 7 or to one of the rods B^3, as desired. This rod is bent to a circular arc and plays in the sleeve 19, which is fixed on the fork B^2, the rod E being provided with the shoulder *e*, which, before the spring has reached the limit of its resiliency, engages with the top of the sleeve 19 and prevents further bending of the spring, this construction serving the same purpose as the rule-joint at *b* in Fig. 1, which closes together and prevents further motion of the parts about the joint when the spring has been bent as far as it safely can. The spring which forms a part of the mud-guard also serves as a firm brace to the machine laterally, so that the piece C serves the threefold functions of a spring, a brace, and a mud-guard combined. The spring, being entirely concealed in the body of the mud-guard, does not detract from the appearance of the machine, nor in any way modify the graceful lines of a diamond frame, as is the case with the variously-shaped curved springs already in use. With this construction of frame the spring-saddle ordinarily used is unnecessary, since the frame itself is perfectly cushioned. For this reason I show the saddle S a rigid one, secured, without any spring, directly to its supporting-rod L. If through any cause the spring 12 should break, the frame cannot collapse, since the lock-joint at *b* would close up. The filling 5 and the outer cover 6 of the part C would prevent the parts of the spring from flying apart or causing any injury, even should the spring through any unusual accident break.

While I have shown and described a combined spring, mud-guard, and brace as applied to the rear wheel of a bicycle, I might also adapt such a spring and mud-guard to the front wheel, if desired.

I claim—

1. A jointed bicycle-frame capable of motion about its joints in the plane of the frame, in combination with a combined cushioning-spring mud-guard so arranged between parts of the frame as to hold said frame in normal open position, and a locking device whereby the frame is prevented from closing too far together against the pressure of the spring

and from collapsing should the spring break, substantially as described.

2. A bicycle-frame made in parts jointed together, whereby it is capable of motion about its joints in the plane of the frame, in combination with a combined mud-guard, spring, and lateral brace pivoted at both ends to parts of the frame, substantially as and for the purposes described.

3. In a bicycle, a flexible frame, in combination with a resilient cushioning mud-guard pivoted at both ends to parts of the frame, substantially as described.

4. In a bicycle, a flexible frame, in combination with a resilient mud-guard pivotally connected at its ends with parts of said frame, said mud-guard consisting of the spring 12, filling 5, and cover 6, substantially as and for the purposes described.

5. In a bicycle, the combination, with the head A, of the piece B, rigidly fixed to said head, rear upright fork B^3, pivotally connected at b with said piece B or an attachment thereto, fulcrum-pieces B^4, jointed to the legs of said fork, rear horizontal fork B^2, rigidly secured to said fulcrum-pieces, the piece B′, pivotally connected at b' with said head and at b^2 with said rear horizontal fork, and the combined spring and mud-guard C, interposed between the rear upright and the rear horizontal forks, substantially as described.

6. A bicycle having a flexible frame, in combination with a fixed rear wheel, mud-guard O, and a resilient rear-wheel mud-guard C, forming a continuation of the guard O, said guard C being interposed between the upright and horizontal rear forks, substantially as and for the purposes described.

In witness whereof I have hereunto set my hand.

GEO. W. FERNALD.

Witnesses:
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ALBERT E. LEACH.