

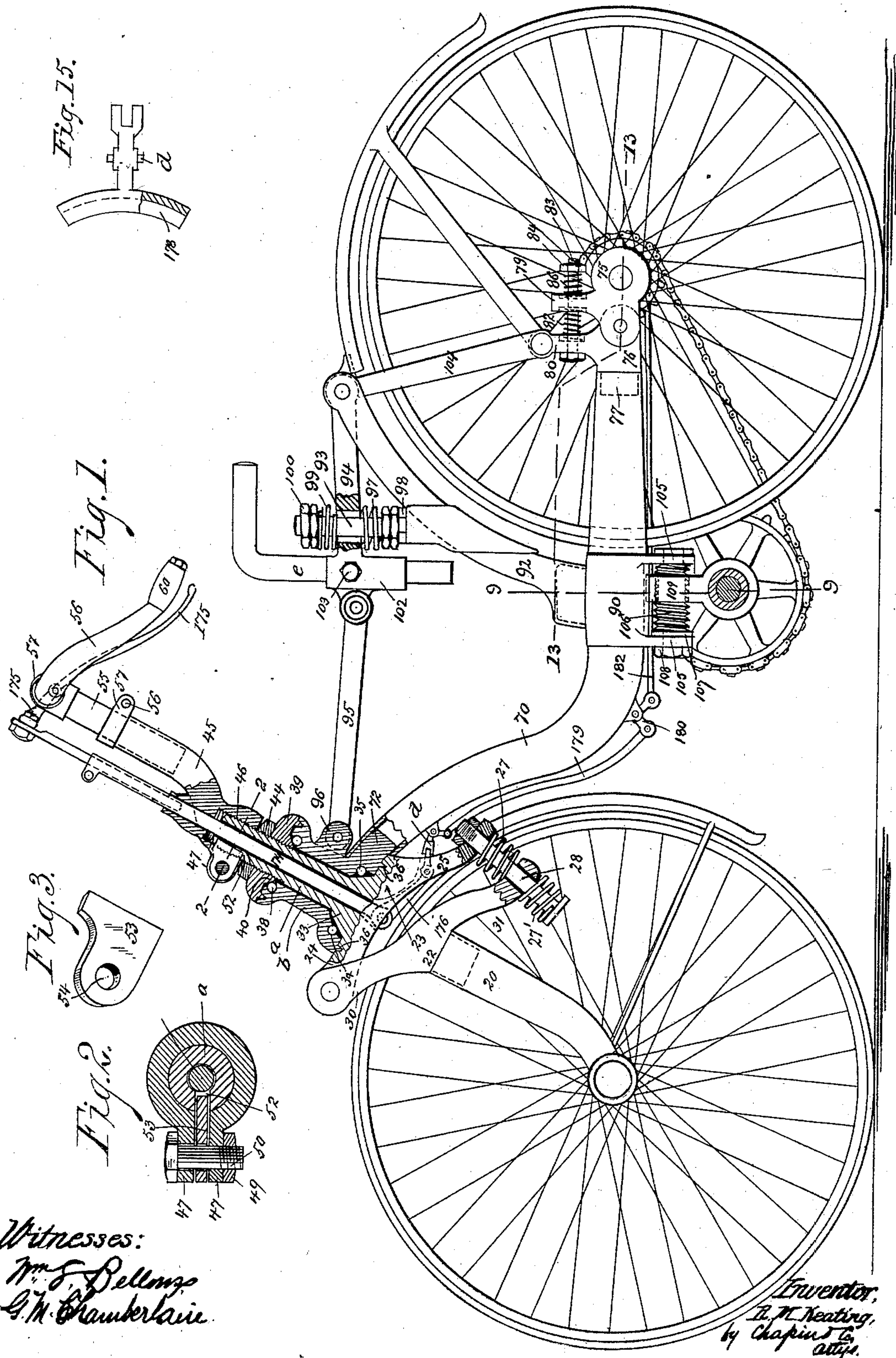
(No Model.)

3 Sheets—Sheet 1.

R. M. KEATING.  
VELOCIPÈDE.

No. 426,670.

Patented Apr. 29, 1890.





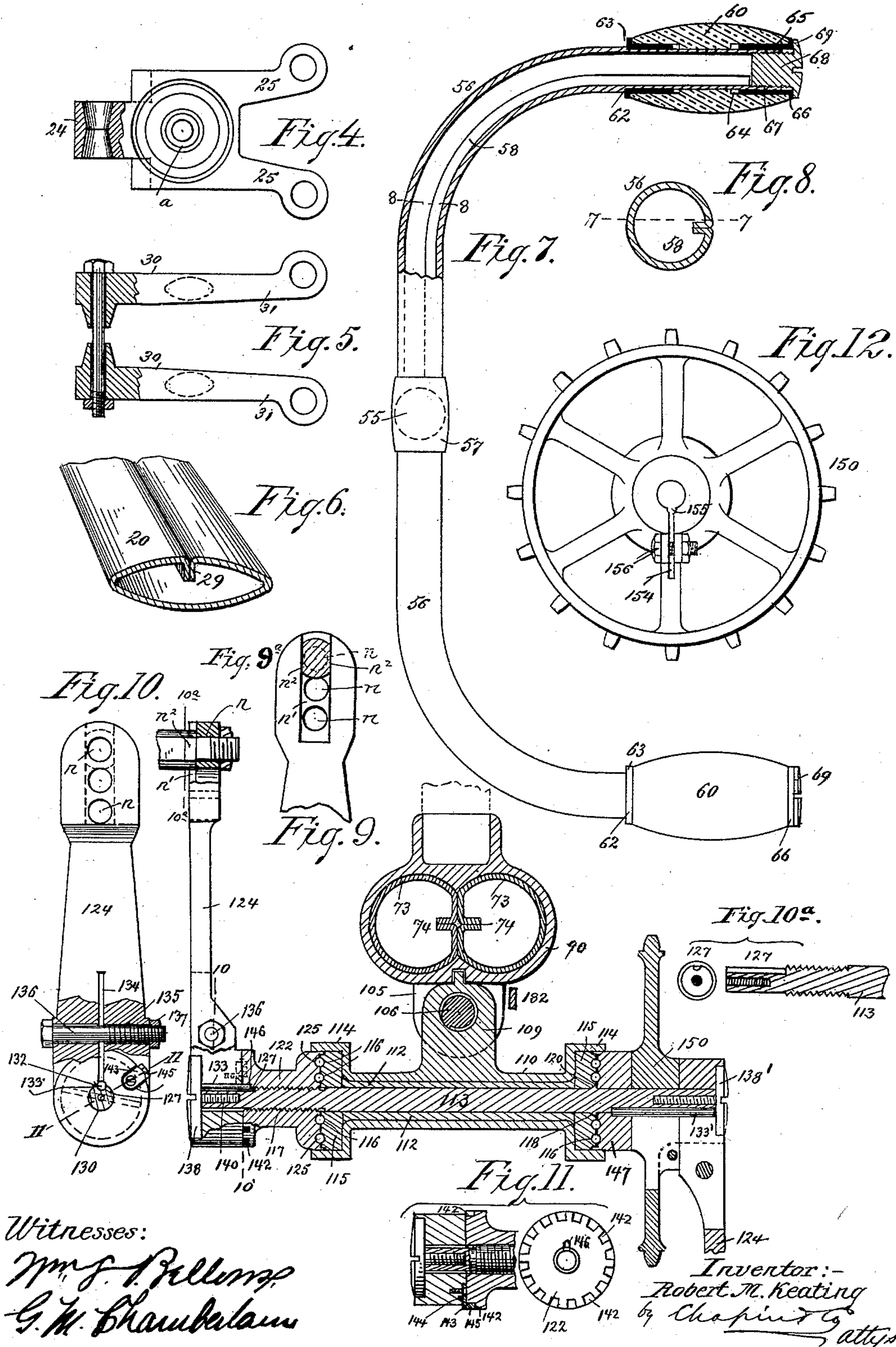
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3 Sheets—Sheet 2.

R. M. KEATING.  
VELOCIPÈDE.

No. 426,670.

Patented Apr. 29, 1890.



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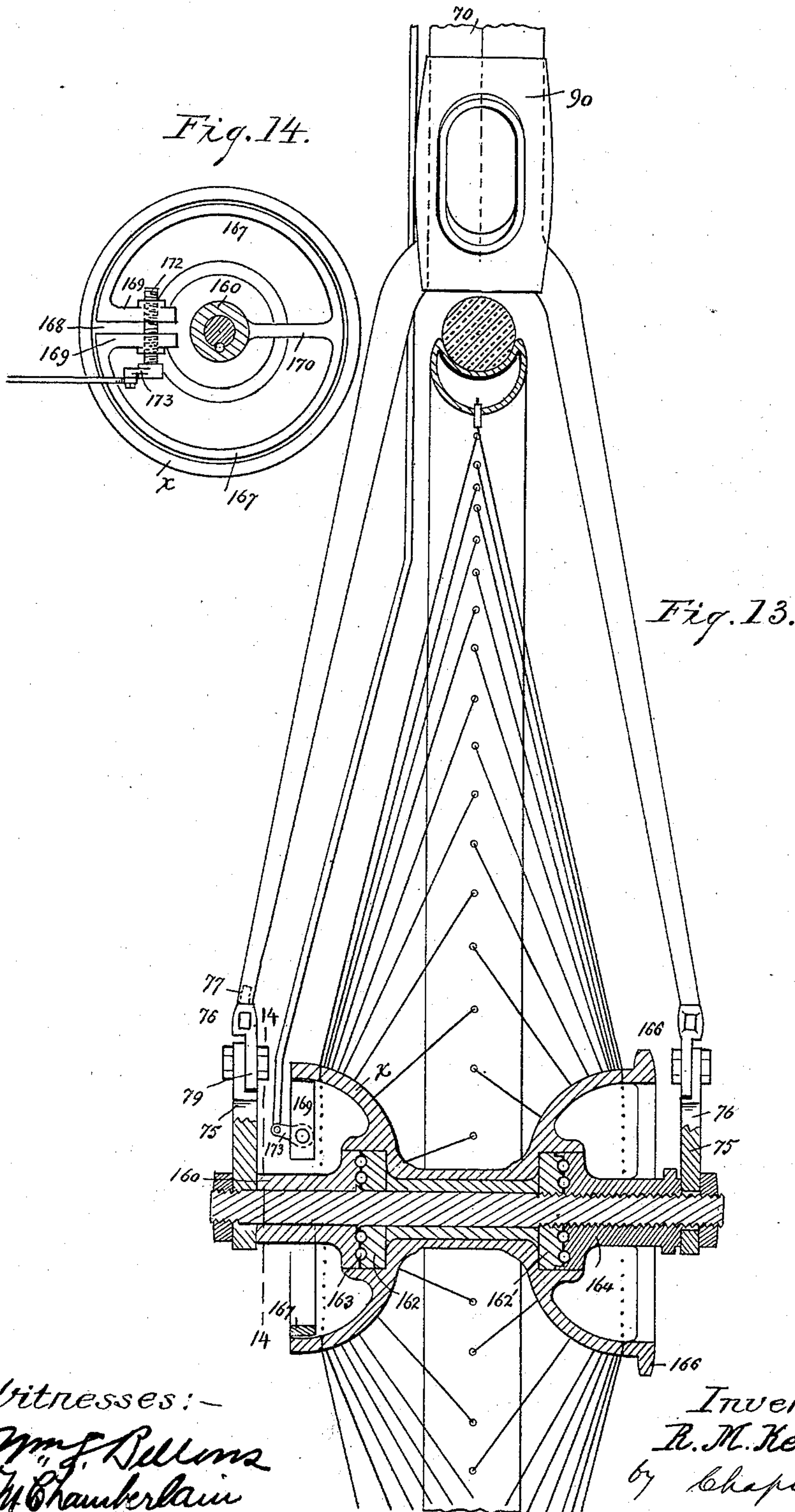
(No Model.)

3 Sheets—Sheet 3.

R. M. KEATING.  
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No. 426,670.

Patented Apr. 29, 1890.



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# UNITED STATES PATENT OFFICE.

ROBERT M. KEATING, OF SPRINGFIELD, MASSACHUSETTS.

## VELOCIPEDÉ.

SPECIFICATION forming part of Letters Patent No. 426,670, dated April 29, 1890.

Application filed December 30, 1889. Serial No. 335,369. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT M. KEATING, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Velocipedes, of which the following is a specification.

This invention relates to improvements in velocipedes, the object being to improve the construction of vehicles of this class; and the invention consists in the construction and combination of parts, all substantially as will hereinafter more fully appear, and be set forth in the claims.

Reference is to be had to the accompanying drawings, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of a velocipede of the class known as the "safety-bicycle," parts of the bicycle being shown as broken away and in vertical section for a clearer illustration of some of the constructions. Fig. 2 is an enlarged cross-sectional view on the line 2 2, Fig. 1. Fig. 3 is a perspective view of a part employed at the place of the last-named section, to be hereinafter referred to. Figs. 4 and 5 are plan views of parts in horizontal section of details comprised in the jointed frame. Fig. 6 is an enlarged sectional projection illustrating the construction of the side forks. Fig. 7 is a plan view of the handle-bars, a portion thereof being broken out and shown in horizontal section. Fig. 8 is a cross-section taken on the line 8 8 of Fig. 7. The parts shown in section in Fig. 7 are on the line 7 7 of Fig. 8. Fig. 9 is a transverse vertical section of parts of the machine comprising and adjacent to the sprocket-shaft and driving mechanism, taken on the line 9 9, Fig. 1; and Fig. 9<sup>a</sup> is a detail view of pedal adjustment. Fig. 10 is an inner face view of one of the pedal-cranks, parts thereof broken out and in section, as indicated by the line 10 10 on Fig. 9; and Fig. 10<sup>a</sup> shows in detail the crank-fastening. Fig. 11 is in part a longitudinal sectional view through part of the mechanism shown in Fig. 9, the plane on which said section is taken being determined by line 11 11, Fig. 10, and said Fig. 11 as to another part is an outer end view of the

sleeve with which the pedal has an engagement. Fig. 12 is a face view of an improved sprocket-wheel which is especially adapted for a rigid engagement with the sprocket-carrying shaft of a velocipede. Fig. 13 is a plan view in part and in part a horizontal section taken on the line 13 13, Fig. 1. Fig. 14 is an end or partial sectional view as seen inside of the line 14 14, Fig. 13. Fig. 15, Sheet 1, is a plan view, partially in section, of a part comprised in the brake-actuating connections, to be hereinafter more particularly referred to.

Each of the legs 20 of the front fork supports at its upper end a cross-head or rigid member 22, which ranges longitudinally of the machine and in a more or less nearly horizontal position, as shown, and, as shown, each cross member projects forwardly and also rearwardly from the longitudinal line of the fork-legs in the extensions 30 and 31, respectively. To the forward end of the said fork-extensions 22 is pivotally jointed the base 23 of the head *a* of the velocipede. The base of the head consists of a central or intermediate body portion, from which the post-like head *a* is upwardly extended, said base being forwardly projected in the extension 24, and is also rearwardly extended in the arms 25 25, (see Figs. 1 and 4,) which in the setting up of the parts of the machine stand above the rear extensions 31 of the fork cross-extensions, and between extensions 31 and arms 25 at each side of the central longitudinal line of the machine is inserted a spring or cushion 27. The said arms and extensions are perforated from top to bottom in common lines, through which bolts 28 loosely pass, the bolts extending below the under side of the extensions 31 and are headed at their extremities, and between the said heads and the under sides of the said extensions are placed cushions 27'. The bolts are headed at their upper ends, which heads rest upon the top of the arms 25. The cushions, as shown, consist of spiral springs, through which the bolts axially pass; but said cushions may consist in whole or in part of rubber, as common in cushions for uses analogous to that set forth.

Each fork 20 is formed from a single blank



of sheet metal bent, substantially as shown in Fig. 6, to form an elliptical tube, the terminal or edge portions of the blank being turned inwardly to form an internal rib 29, running longitudinally of the fork-leg and projecting in a plane substantially coincident with the short diameter of the ellipse which is formed by a cross-section of the fork-leg. The fork-leg, having the greater extent from front to rear, is of course efficiently adapted to resist strains coming thereon at the front or rear, while the rib 29 insures a greater resistance to lateral strains upon the leg.

The lower end of the head *a*, where it meets the base 23, is of conical form, as shown at 33. The forward portion of the backbone consists in an annular extremity *b*, which fits about the lower portion of the head *a*. The lower orifice in the axial circular passage through said backbone extremity *b* is of outwardly-flaring or conical form to conform to the lower portion 33 of the head, and in said flaring orifice is a peripheral groove 34 for the reception of hardened balls 35, which also bear upon the conical portion 33 of the head. Between the base 23 of the head and the end of the backbone extremity is an engagement formed by an annular groove on the one part and an annular groove on the other part, as seen at 36 in Fig. 1, which serves as a dust-guard to the ball-bearing at the lower part of the head just described. The head *a*, which, as shown, projects considerably above the said annular backbone extremity, at such projecting portion is exteriorly screw-threaded. The upper orifice of the passage through the backbone extremity is of outwardly-flaring or conical form, in which is formed a peripheral groove for the reception of the hardened balls 38. A nut of annular form confining part 39, (which is internally screw-threaded to engage the threads on the head *a*,) when turned down in place against the end of the backbone extremity *b* by its annular inclined rib 40, surrounding the opening at the under side of said nut 39, forms the other wall for the said balls 38. An annular rib-and-groove joint is made between the upper end of the part *b* and the said confining part 39, as shown at 43, which is similar to and for a purpose similar to the one shown at 36. A jam or check nut 44 or other equivalent means for preventing loosening of the part 39 in place is to be provided, the same screwing onto the threaded head *a*.

The steering-post 45 is by its lower end axially bored and tapped, as at 46, whereby it may be screwed upon the upper extremity of the head *a*. The said steering-post outside of its bored portion is extended in ear-pieces 47, which are separated slightly from each other, the opening between them also extending through to the bore 46, as particularly shown in Fig. 2. This slitting through the wall of the steering-post inside of the ear-pieces permits, when said ear-pieces are drawn together by turning up the nut 49 on the bolt

50, which passes through both ear-pieces, a contraction of the lower end of the steering-post, whereby it is caused to bind on the upper end of the head *a* and prevent any loosening or unscrewing of the post from the head.

As a further means for insuring a certainty of non-rotation of the post upon the head, the same in its forward side is provided with a groove or kerf 52, and when the opening between the ear-pieces 47 is brought opposite said groove 52, and before the bolt 50 has been passed through the ear-pieces 47, a dog 53 is inserted between the ear-pieces and by its rear edge portion into said groove 52, said dog being confined in place by the engagement of the bolt 50, which passes through the ear-pieces 47, also passing through the hole 54 in said dog.

The upper portion of the steering-post is made tubular to receive the spindle-like portion 55, to which the handle-bar 56 is angularly attached. The said handle-bar spindle 55, of course, may be raised and lowered in the tubular steering-post, and when adjusted in place as desired it is confined by contracting the upper portion of the steering-post, which may be done by turning up the bolt 56, which passes through the ear-pieces 57 of the steering-post, the wall of the tubular steering-post between the ear-pieces being cleft, as described, for the lower end of said steering-post, and at this upper connection of the steering-post with the handle-bar spindle a dog—such as the one 53—may be employed in the same way as at the connection with the post and head to prevent the turning of the spindle 55 in the post. The handle-bar 56 passes through and is confined in the apertured head 57 of the spindle 55, and said handle-bar consists of a single tube formed from one blank of sheet-metal, which is rolled into circular or other similar cross-sectional form, the edges of the blank being turned inwardly toward the axis of the handle-bar tube, forming a rib 58, which runs substantially the entire length of the handle-bar. This construction of the handle-bar is particularly illustrated in Figs. 7 and 8 of the drawings, and that such rib may be of the greatest efficiency in the handle-bar it is disposed so as to resist the most common strains, and, as shown, the rib 58 runs along the inner side of the handle-bar or the side thereof which is toward the rear of the machine, although, if desired, said rib might be placed on the opposite side of the handle-bar.

The handles are secured on the handle-bars as follows: The extremities of the handle-bars 56 are necked down back from their ends a little less than the length of the handles 60, whereby a shoulder 62 near each end of the handle-bar is formed. Against this shoulder 62 is placed a short flanged sleeve 63, the flange of which extends outwardly. A handle 60, which is usually of rubber or other non-metallic material and is axially bored and of a length so that when placed by its



forward end against the flange of the sleeve 63 it will project outwardly beyond the end of the handle-bar 56, is then placed over the extremity of the handle-bar to its limit, as shown in Fig. 7. The bore through said handle 60 toward its outer end is a little greater in diameter than the diameter of the necked-down extremity of the handle-bar, as shown at 64, and into the annular space formed by said bore enlargement 64 about the end portion of the handle-bar is entered a sleeve 65 of hard material—such as steel (of which material the other sleeve 63 is also formed)—said sleeve 65 having at its outer end an outwardly or laterally extending flange 66, which as the sleeve is forced inwardly abuts against the handle or grip 60. The extremity of the handle-bar is internally tapped, as at 67, to receive therein a screw-plug 68, which by its head 69 overlies the flange 66 of the sleeve 65, and when said screw is turned inwardly the handle 60 is endwise confined between the flanges of the two sleeves 63 and 65 and also against any endwise movement on the handle-bar. The provision of the means just described for the confinement of the handle upon the handle-bar is to afford sufficient bearing area for the ends of the handle, whereby they may be rigidly held in place with no liability of the ends of their bores becoming reamed out, as would be the case were the ends of the handles to bear directly upon the shoulder 62, which, due to the desired thinness of the tubular handle-bar, can afford but little bearing area.

The main frame 70 of the machine, which may be of any proper or approved design, is connected to the backbone extremity by forming a lug 72 on said extremity, over which lug the end of the hollow backbone is placed and confined by brazing or otherwise. As shown, the frame consists of two parallel and adjoining tubes 73, a cross-section of which is clearly shown in Fig. 9, wherein each tube is formed from a single blank rolled around to form a segment of a circle which embraces the greater part of the area thereof. The part of the sheet metal constituting the chord line of the cross-sectional segment and comprising the edge portions of the metal blank, which are inwardly turned to form the rib 74, form an obliterated side wall to the tube. In making up the frame the said obliterated side walls of the pair of tubes are placed alongside of each other, whereby a double strengthening-wall is formed which runs vertically and longitudinally along the frame, and, as is plain, the ribs 74 constitute a strengthening element which extends horizontally and longitudinally of the machine, and by the provision of the strengthening-ribs or re-enforced walls, substantially as described, the frame is rendered of a maximum strength by the employment of comparatively thin sheet metal.

The tubes 73, which constitute the frame, are continued in offset lines rearwardly to form the rear-wheel fork-legs. The bearings

for the rear wheel are supported in jointed extensions 75, which project rearwardly and horizontally from the rear ends of the fork-legs, as shown in Figs. 1 and 13. To afford the proper means of connection and support for said extensions 75, a solid iron or steel member 76, which is of inverted-T shape, is by its one extension 77 entered into and brazed upon the tubular leg of the fork, while to its other extension 78 the forward end of the jointed fork-extension 75 is pivoted. Said fork-extension 75 has a vertically-extending lug 79, which is to the rear of, separated from, and parallel with the vertical part 80 of the T-shaped member 76. Said vertical part or lug 80 receives the impact of one end of a spring or cushion 82, which by its other end rests upon the forward face of the lug 79. A rod or bolt 83 passes horizontally through the lug 80 and through and to the rear of the lug 79, receiving at its rear end a nut 84, between which nut and the rear face of the lug 79 is interposed a cushion or spring 86. This cushioning of the spring forward and rearward of the lug 79 renders insignificant the effect of any concussion upon the rear wheel as the same meets an obstruction in advance of its tread or as it passes over the obstruction, which obstruction generally consists in stones or uneven places in the road, and this cushioning means just described for the rear wheel accomplishes for such rear wheel practically the same result as the cushioning devices arranged in relation to and between the arms of the base of the head and the extensions of the cross-head 22 accomplish or provide for the front wheel.

From a yoke 90, which embraces and is secured to the frame just in advance of the rear wheel, the saddle-supporting extension 92 is upwardly and rearwardly projected in an arc line corresponding more or less closely to the rim of the wheel, in advance of which said extension 92 is located, as shown. Intermediately of said extension the same is provided with a vertical upright 93, which is brazed or otherwise secured thereto in any suitable manner. From the upper end of the arc-shaped frame-extension 92 a link-bar 94 forwardly and horizontally extends, to the forward end of which is pivotally connected the rear end of another link-bar 95, which by its forward end is pivoted to an ear-piece or lug 96, which forms a rigid part of the backbone extremity. The vertical upright 93 projects through or by the link-bar 94, and between the under side of said bar 94 and the abutment 98 a cushion or spring 97 is provided, while above said link-bar 94 and bearing on the upper side thereof is another spring 99, which is held in compression by a nut 100, screwing upon the said upright 93. The forward end of the said link-bar 94 is provided with a vertical socket-piece 102, in and through which the saddle-post *e* is entered and adapted to be confined by the screw or bolt 103. A brace-bar 104 is connected to



the upper end of the frame-extension 92, and also to the lug 80, supported on and vertically projected from the rear end of the fork-leg, one of such bars 104 being provided at each side of the rear wheel. The linked bars 95 and 94 and the bar 104, together with the frame of the form shown, constitute a diamond braced frame.

The yoke 90, which is intermediately supported on the frame, is provided with two downwardly-extending lugs 105, from which the pedal and sprocket driving mechanism is supported. A shaft 106 is passed through bearing-holes in said lugs 105, and is prevented from any endwise movement in said lug-bearings by the shoulders 107 and the head 108. The whole or a portion of the length of said shaft 106 is screw-threaded, as shown in Fig. 1, with which screw engages the outer portion of an extension or lug 109, formed upon the sleeve 110, which projects horizontally and laterally under the frame and at right angles to the length of said screw 106. Said sleeve 110 is provided with an internal hardened bushing, in which the pedal and sprocket-wheel shaft has a bearing for rotation. The ends of said sleeve 110 are provided with cup-shaped enlargements 114, in which are immovably fitted annular blocks or collars 115, in the outer faces of which are formed peripheral grooves 116. The left-hand extremity of the shaft 113 is screw-threaded except as to its portion directly adjacent the end of the shaft, the extent of said screw-threaded portion being indicated at 117. The said shaft at a little distance from its other end is provided with a shoulder, as indicated at 118, and when the shaft is passed through the bushed sleeve the extent of projection of its left-hand end with respect to Fig. 9 beyond the end of the left-hand sleeve is limited by the said shoulder coming to a bearing in the seat indicated at 120 in the right-hand collar 115. On the threaded left-hand end of the shaft 113 is screwed a sleeve 122, and on the projecting end of said shaft outside of said sleeve is secured the hub of one of the pedal-cranks 124. The inner end of the sleeve 122 has formed therein peripheral grooves 125, which, with the grooves 116 in the adjacent part 115, constitute annular chambers, the one concentric with the other, in which are placed the hardened balls, as shown in Fig. 9. The extremity of the shaft 113, on which the pedal-crank fits loosely, is provided with a longitudinal groove 127, (see Fig. 10<sup>a</sup>), and the circular hole 130 through the hub of the pedal-crank is apertured, as at 132, so that when the hub of the crank is placed on the extremity of the shaft a longitudinal hole is formed between and within the outer periphery of the shaft extremity and the inner periphery of the hub, into which a pin 133 may be entered to act as a key. The pedal-crank centrally between its edges and longitudinally, commencing at said aperture 132, is partially cleft or formed with a kerf

134, extending toward the outer end of the crank. (See the face view of the crank, Fig. 10.) The crank is bored through from edge to edge, crossing said kerf intermediately at right angles thereto, the portion 135 at one side of the kerf being tapped, and a bolt 136 loosely passes through the smooth-bore portion and with a screw engagement with the tapped portion 135 of the crank, as shown. By turning the bolt in the proper direction, its head resting against one edge of the crank, it serves to draw the material at each side of the kerf inwardly, contracting the hole through the hub, whereby the walls thereof bear with a bind upon the extremity of the shaft, and whereby the pin 133 is pinched. A lock-nut 137 is screwed upon the projected threaded end of the bolt 136. The crank is prevented from moving endwise off of the shaft 113 by the head of the screw 138 resting against the outer face of the crank-hub, the shank of said screw screw-engaging the axial hole 140 in the shaft.

To further relieve the parts from any tendency to be rotated under excessive force—that is, the crank upon the shaft—and also with relation to the sleeve 122, the end face of the sleeve is provided with a series of notches or serrations 142, and a dog 143 is secured on the inner face of the crank-hub, being let into a depression 144 therein, as shown, said dog having one or more angular extensions 145, which project laterally from the face of the crank-hub into an interlocking or engagement with said sleeve-serrations. It will be further noted that the pin 133 projects inwardly along the shaft 113 far enough to interlock with the groove 146, which is in the sleeve 122. At the other end of the shaft 113 the same is provided with an annular block or collar 147, having on its inner face peripheral grooves the same as the other sleeve 122, which latter-named grooves, together with the grooves in the adjacent part 115, conduce to form chambers for the hardened balls shown as constituting the anti-frictional bearings between the parts 115 and 147, the former of which is removable, while the latter rotates with the crank-shaft. Against and outside of said collar 147 is placed the hub of the sprocket-wheel 150, and outside of and against the hub of said wheel is placed the hub of the other of the pair of crank-shafts 124 124. A means for insuring a non-rotation of the collar 147 and sprocket-wheel 150 and the crank-hub and crank 124 upon the said shaft 113 consists, substantially, in the same or similar elements or features as are embodied in the non-rotatable parts upon the other end of the shaft 113. The shaft is longitudinally grooved, as is also the bore through the collar 147 and the bore through the sprocket-wheel and right-hand crank-shaft, and a pin similar to the one 133, which pin is numbered 133', is entered into the longitudinal chamber or passage



formed by the said grooves, and the screw 138' prevents any endwise movement of the three movable parts shown on the right-hand end of the shaft. A web or spoke connecting the rim of the sprocket-wheel with its hub is cleft or kerfed, as shown at 154, from the groove 155 in its inner periphery a suitable distance outwardly, as shown. (See Figs. 9 and 12.) Means for contracting the part of the spoke and hub embracing said kerf are provided, whereby, when the said contractible parts are brought together, they bind upon the shaft and the pin 133', as has been already described with respect to the pedal-crank, and for such contraction a screw or bolt 156 is passed through the said spoke or through lugs or ear-pieces integrally formed therewith at right angles to the plane of said kerf.

To adjust the inclosures for the hardened balls of the ball-bearing just described, the same may be done by turning the sleeve 122, when the end faces of the sleeves 122 and 147 may be brought into still greater proximity to the parts 115 155, in which latter-named pairs of parts are formed the ball-grooves.

By turning the screw-shaft 106 the said sleeve 110, which carries the pedal and sprocket shaft, will be constrained to move endwise of the machine and in a direction at right angles to its own axis, and it will be seen that should there be any slack in the sprocket-chain which it is desired to have taken up the same may be readily accomplished. As shown in Fig. 9, there is a rib-and-groove engagement between the lug on the sleeve 110 and the under side of the yoke 90, whereby any swinging movement of the sleeve and pedal and sprocket mechanism is prevented. The axle 139 for the rear wheel is supported in the fork-leg extensions 75 and held therein against rotation, the rear wheel freely rotating on said axle. With reference to Fig. 13, just inside of the left-hand extension 75 a sleeve 160 is placed on the axle and fixed thereon in any suitable manner. The end of said sleeve is annularly grooved, and the hardened collar 162' within the hub of the wheel is provided with similar grooves for the reception of the hardened balls 163, and in the other end of the hub a corresponding block 162' is provided as a part of the hub, and a sleeve 164, annularly grooved in its end to match the annular grooves in the hardened block or collar 162', is also provided and fixed on the axle, but by means of the internal screw-threads therein engaging the threaded end portion of said axle. The means employed for confining the sleeve 160 and the extension 75 the one upon the other against rotation may consist in similar parts or features to those shown in Fig. 9 with respect to the pedal-cranks and sprocket-wheel and the carrying-shaft therefor. By turning on the sleeve 164 in the right direction said sleeve may be moved to the desired contact against the hardened balls between it and the part 162' of the

hub, and the sleeve 160 may be also drawn inwardly to properly bear upon the balls in the other end of the hub.

166 in Fig. 13 represents in cross-section the teeth of the sprocket for the rear wheel, which is formed on the hub of said wheel.

The brake mechanism for the velocipede consists of the combination and arrangement of parts, substantially as follows, reference being had to Figs. 1, 13, 14, and 15, it being borne in mind that the parts shown in Fig. 13 are seen in horizontal section and plan view, while Fig. 14 is an end view or elevation: The hub of the rear wheel, as common in velocipede-wheels, is provided with cup-shaped end enlargements  $\alpha$  for receiving the spokes. Within one of these cup-shaped parts at one end of the hub is provided a spring-ring 167, which at one portion of its circumference is cleft, as at 168, and continued annularly in lugs 169, substantially as shown, the said ring being supported from the sleeve 160 by a spoke or arm 170, which is to be arranged between the sleeve and the ring at a place opposite to or removed from the line of cleft 168, all whereby said arm, while properly supporting the ring, offers no substantial impediment to its expansion or contraction. A right and left hand screw 172 is passed with a screw engagement through both of the lugs 169, on one end of which screw is provided a lever-arm 173, to which one end of connections which extend therefrom to the head of the machine is attached. The head  $\alpha$  of the machine (see Figs. 1 and 4) is of tubular form, and through the central opening therein is passed a plunger-rod 174, which at its upper end is connected with the brake-lever 175, which, as is common in bicycles, is pivoted on the handle-bar 56. To the lower end of said plunger-rod 174 is connected the forwardly-extending arm of an angular lever 176, which is pivotally supported on and between the arms 25, which project rearwardly from the base of the head  $\alpha$ .  $d$  represents an angular lever, which at its elbow is pivotally connected under the backbone, its forward arm engaging with the rearward arm of said angular lever 176. As the backbone on which the said angular lever  $d$  is connected has a motion of partial revolution upon the head, to the extension of which the said angular lever 176 is connected, it is necessary that a peculiar engagement be had between the contiguous parts of the angular levers 176 and  $d$ , and, as shown in Fig. 15, the extremity of the forward arm of the angular lever  $d$  is provided with an arc-shaped bearing-piece 178, the center of which is coincident with that of the head. The end of the rear arm of angular lever 176 has an engagement with said arc-shaped bearing part in such a manner that any vertical movement of the former will impart motion to the latter, while on any laterally-swinging movement of the former it will slide upon the arc-shaped bearing part without effect thereon, and for this purpose the



said part 178 is channeled, while the rear end of the other lever-arm fits in said channel. To the rear end of the angular lever *d* is attached a connecting-rod 179, which by its rear end is 5 pivotally connected with the forward arm of a bell-crank lever 180, to the rear arm of which bell-crank lever the forward end of a connecting-rod 182 is attached, the rear end of said connecting-rod being connected to 10 the lever 173, which is on the right and left screw for operating the brake-ring. It will of course be plain that any downward movement of the plunger 174 will through the connections described turn said right and left 15 hand screw to expand the brake-ring. As the handle-bar is shown vertically adjustable on the steering-post, provision is also made whereby the brake-plunger is rendered extensible. The means for so rendering the plunger 20 extensible is substantially the same as that shown in the steering-post, although, a part of the plunger being tubular, split at its upper end, and provided thereat with contracting ear-pieces and a screw, and the upper 25 separable portion of the plunger adapted to enter said lower tubular part, I may provide, if deemed necessary, one of the dogs 53, such as shown in Fig. 3, at the place on the lower part of the plunger adapted to grip or bind 30 the upper section thereof, forming in said upper section the necessary groove similar to the one shown at 52, Fig. 1, in the head.

It will be noted on reference to the drawings, Figs. 9 and 9<sup>a</sup>, that the outer face of the 35 pedal near its extremity is provided with a series of holes *n*, through either of which the pedal-pin may pass, according as to whether the pedal is desired to be in adjustment nearer to or farther from its center of revolution. 40 The face of the crank is milled out longitudinally to form the channel *n'*, crossing the ends of each of said holes. Said pedal-pin just inside of its portion which passes through one of the holes is of an enlarged diameter, 45 the opposing sides *n*<sup>2</sup> of which are squared to closely fit or engage the edge walls of said channel, and thereby the pedal-pin is prevented from turning, the said pin being held 50 against axial movement in any desired manner, as by a nut.

What I claim as my invention is—

1. In a velocipede, the combination, with the front fork consisting of the pair of legs 20, each having at its upper end a rigid cross 55 member disposed longitudinally of the machine, the head of the machine by its base pivotally connected to said cross members of the fork, of springs or cushions interposed between the base of the head and said cross 60 members, substantially as described.

2. In a velocipede, the head *a* of the machine, provided with an enlarged base having the forward extension 24 and the rearwardly-extending arms 25 25, vertically apertured, 65 combined with the fork-legs 20 20, each having at its upper end a rigid cross-extension having the forward and rearward extensions

30 and 31, the former of which are pivoted to the forward extension of the base of the head, and the springs 27, interposed between the 70 said extensions 31 and the arms 25.

3. In a velocipede, the head *a* of the machine, provided with an enlarged base having the forward extension 24 and the rearwardly-extending arms 25 25, vertically apertured, 75 combined with the fork-legs 20 20, each having at its upper end a rigid cross-extension having the forward and rearward extensions 30 and 31, the former of which are pivoted to the forward extensions of the base of the 80 head and the rearward extensions being vertically apertured, the springs 27, interposed between the said extensions and the arms 25, and the rods or bolts 28, connected to said arms 25 and passed downwardly through and 85 below said apertures in the extensions 31, and provided with a head or shoulder, and springs 27' between the said shoulders and the under side of said extensions, substantially as described. 90

4. In a velocipede, the combination, with a head of cylindrical or post-like form externally screw-threaded and provided in its side with the longitudinal groove 52, of the steering-post axially bored and screw-threaded in 95 its lower extremity and longitudinally slit through its wall, which wall adjacent to said slit is continued in the ear-pieces 47 47, the dog 53, as shown, inserted between the ear-pieces and through said slit and into the 100 groove, and the screw passing through the ear-pieces and dog and adapted to secure a contraction of the ear-pieces and the lower extremity of the steering-post around the head, substantially as described. 105

5. In a velocipede, the combination, with a frame by its forward end connected to the head of the machine and having its rear end formed into a fork for the rear wheel, each leg of which is provided with a lug 80, vertically extended, and also having pivoted there- 110 to a rearward extension in which the rear wheel has its bearing, of springs applied between the extremity of the fork-legs and said extensions 75, the upwardly and rearwardly 115 projecting saddle-supporting extension 92, rigidly affixed to the frame in advance of the rear wheel, the brace 104, connecting said lug 80 and the upper end of said extension 92, and brace-connections between the upper end 120 of said extension 92 and the head of the machine, substantially as described.

6. In a velocipede, the combination, with a frame by its forward end connected to the head of the machine and having its rear end 125 formed into a fork for the rear wheel, each leg of which is provided with a lug 80, vertically extended, and also having pivoted thereto a rearward extension in which the rear wheel has its bearing, of springs applied be- 130 tween the extremity of the fork-legs and said extensions 75, the upwardly and rearwardly projecting saddle-supporting extension 92, rigidly affixed to the frame in advance of the rear



wheel, the brace 104, connecting said lug 80 and the upper end of said extension 92, the upright 93, extended vertically from an intermediate portion of said extension 92, the bar 5 94, pivoted to the upper end of the extension 92 and intermediately apertured, through and above which aperture said upright 93 extends, the bar 95, pivotally connected to the head of the machine and to the forward end of said 10 bar 94, and the springs 99 and 97, confined on the upright 93 above and below said bar 94, substantially as described.

7. In a velocipede, the combination, with the rear-wheel fork, each leg of which is provided with a vertically-extended lug 80, horizontally apertured and having pivoted thereto the rearward extension 75, in which the rear wheel has its bearing, each of said extensions being provided with a vertically-extended 20 lug 79, horizontally apertured, of the spring 82, interposed between said lugs 79 and 80, a bolt 83, connected to each lug 80 and passed rearwardly through same and through and beyond the adjacent lug 79, having on its ex- 25 tremity the nut 84, and a spring 86 between each lug and the rearwardly-extended nut, substantially as described.

8. In a velocipede, the combination, with a suitable part of the frame, of a substantially 30 horizontal bar or similar saddle-supporting part by one portion pivotally hung on the frame and adapted for vertical vibration, an upright or post supported on the frame and intersecting and having a sliding engagement 35 with said saddle-supporting bar, whereby the latter is held against lateral movement, and a spring or cushion under and affording a yielding support for the free extremity of said vibrating bar.

9. The combination, with a handle-bar for a velocipede, consisting of a tube of the desired form having a short distance from its end an external shoulder 62, provided inter- 40 nally at or near its extremity with screw-threads, of the sleeve having an outwardly-extending flange which bears against said shoulder, the axially-bored handle 60, placed over the handle-bar and sleeve and by its inner end resting against the flange of the lat- 45 ter, the sleeve 65, entered over the end of the handle-bar and within the bore in the handle and provided at its outer end with the flange 66, bearing on the end of the handle, and the headed screw 68, entering the screw-threaded 50 end of the handle-bar and bearing by its head upon the end of the sleeve 65, substantially as and for the purpose described.

10. In a velocipede, the combination, with the pedal-shaft thereof having a longitudinal 60 groove in its extremity, of the pedal-crank kerfed or split from its hub-bore longitudinally between its edges for a portion of its length, said kerf terminating within the borders of the crank, said hub-bore having the

aperture 132 at the junction therewith of 65 said kerf, the pin entered in the longitudinal chamber formed by said groove and aperture, and a screw entering the end of the shaft and by its head covering the outer face of the crank-hub and said pin, substantially as de- 70 scribed.

11. In a velocipede, the combination of the pedal-shaft having thereon a fixed enlarged part, as the screw-engaging sleeve 122, which is provided in its outer end with the serra- 75 tions or separated notches 142 142, combined with the crank adapted to fit on the end of the shaft outside of the said enlarged part, provided on or within its inner face with the dog having the angularly-extended projec- 80 tions 145 to enter said serrations, substantially as described.

12. In a velocipede, the combination, with the yoke 90, embracing the frame, provided with the pending ear-pieces, and having a 85 longitudinal groove, of the screw-shaft rotatable in but confined against movement on said ear-pieces, the bearing-sleeve for the crank-shaft, having an upward extension provided with the threaded opening therein, which en- 90 gages said screw-shaft, and a rib on said extension which engages with the said longitudinal groove, substantially as and for the purpose set forth.

13. A frame for a velocipede, consisting of 95 two blanks or sections of sheet metal bent or rolled longitudinally to have the edges approached, the approached edge portions of both sections placed together, whereby a longitudinal rib is formed along the frame, sub- 100 stantially as described.

14. In a velocipede, the combination, with the driving or driven part provided with a cup-shaped hub enlargement and rotatable 105 upon a fixed shaft, of a metallic brake-ring having an internal arm whereby it is supported from the hub of said fixed shaft to lie concentrically with and in proximity to the periphery of said rotatable hub, and having at one side 110 a cleft continued in lugs or ear-pieces, an operating-screw engaging said lugs, and a lever-arm for turning said screw, substantially as and for the purpose described.

15. In a brake-operating mechanism for velocipedes, the combination of a lever piv- 115 oted on the head of the machine and a lever pivotally hung on the backbone of the machine, one of said levers being provided with an arc-shaped bearing with which the extremity of the other lever interlocks, whereby 120 vertical motion of the one part may be imparted to the other, said interlocking parts, however, being free to move laterally the one upon the other, substantially as set forth.

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Witnesses:

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