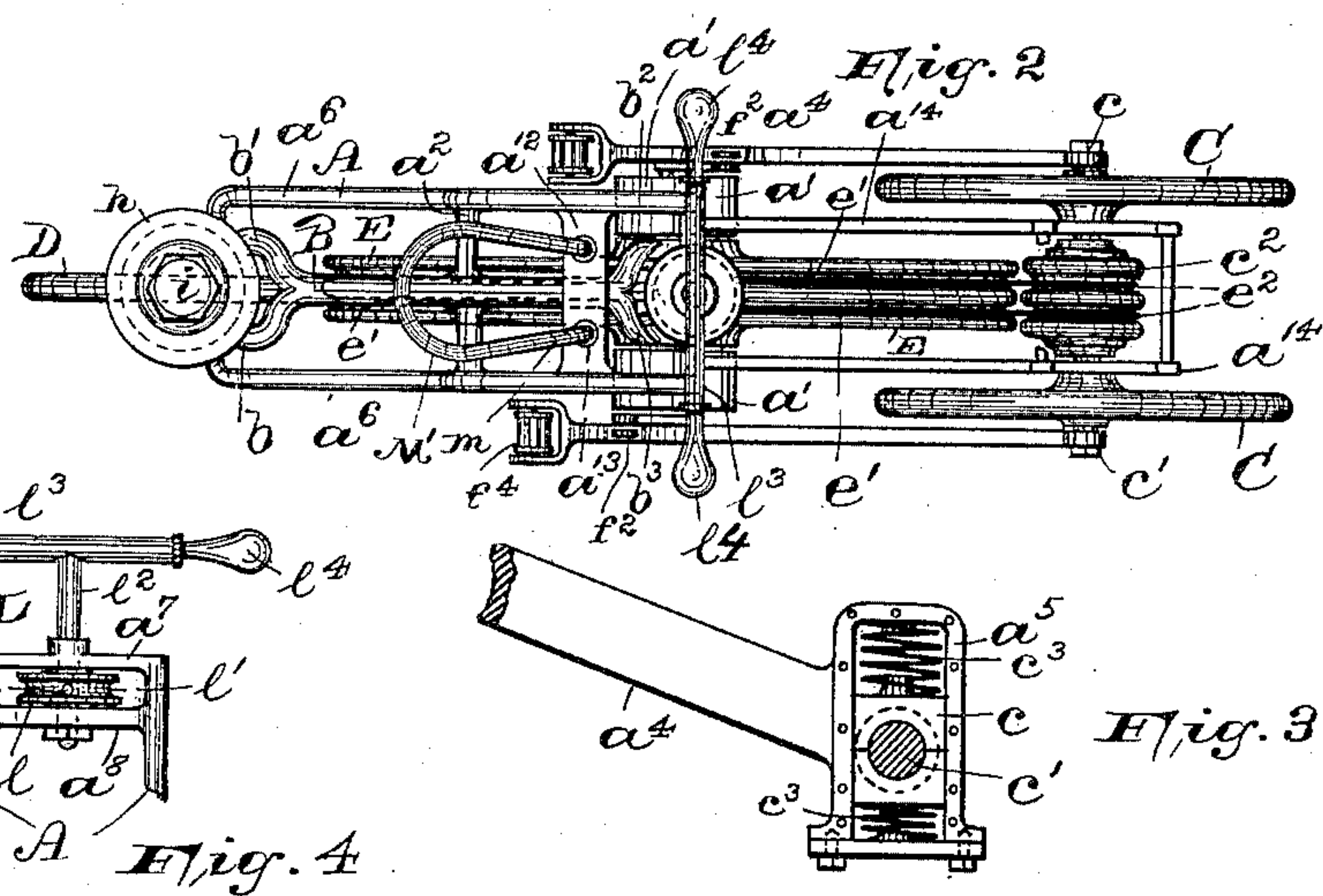


3 Sheets—Sheet 1.

Patented Sept. 23, 1890.



INVENTOR:

Emery E. Hardy
BY *Fred C. Fraentzel* ATT'Y.

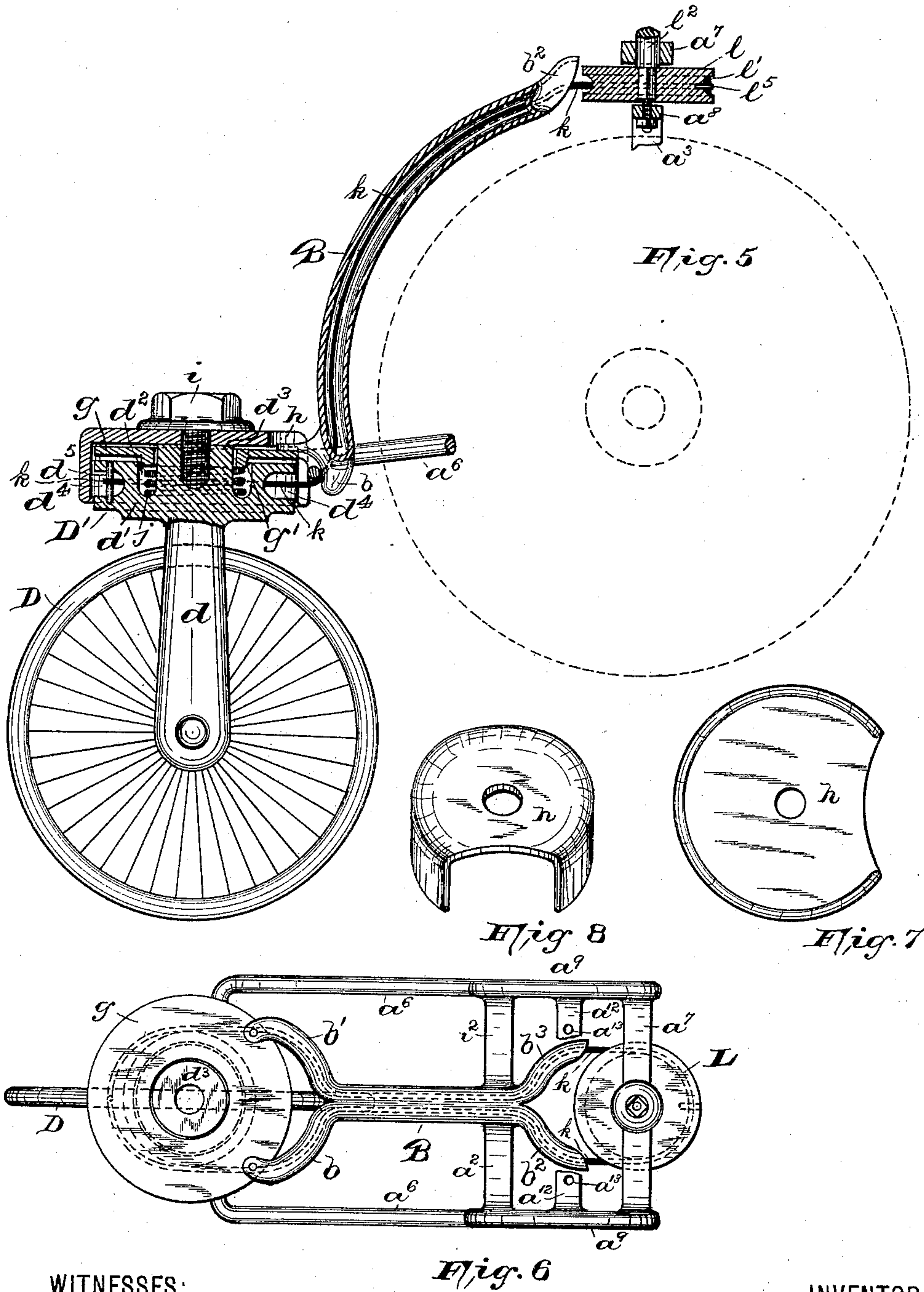
(No Model.)

3 Sheets—Sheet 2.

E. E. HARDY.
VELOCIPÈDE.

No. 436,873.

Patented Sept. 23, 1890.



WITNESSES:

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John G. Tinsley

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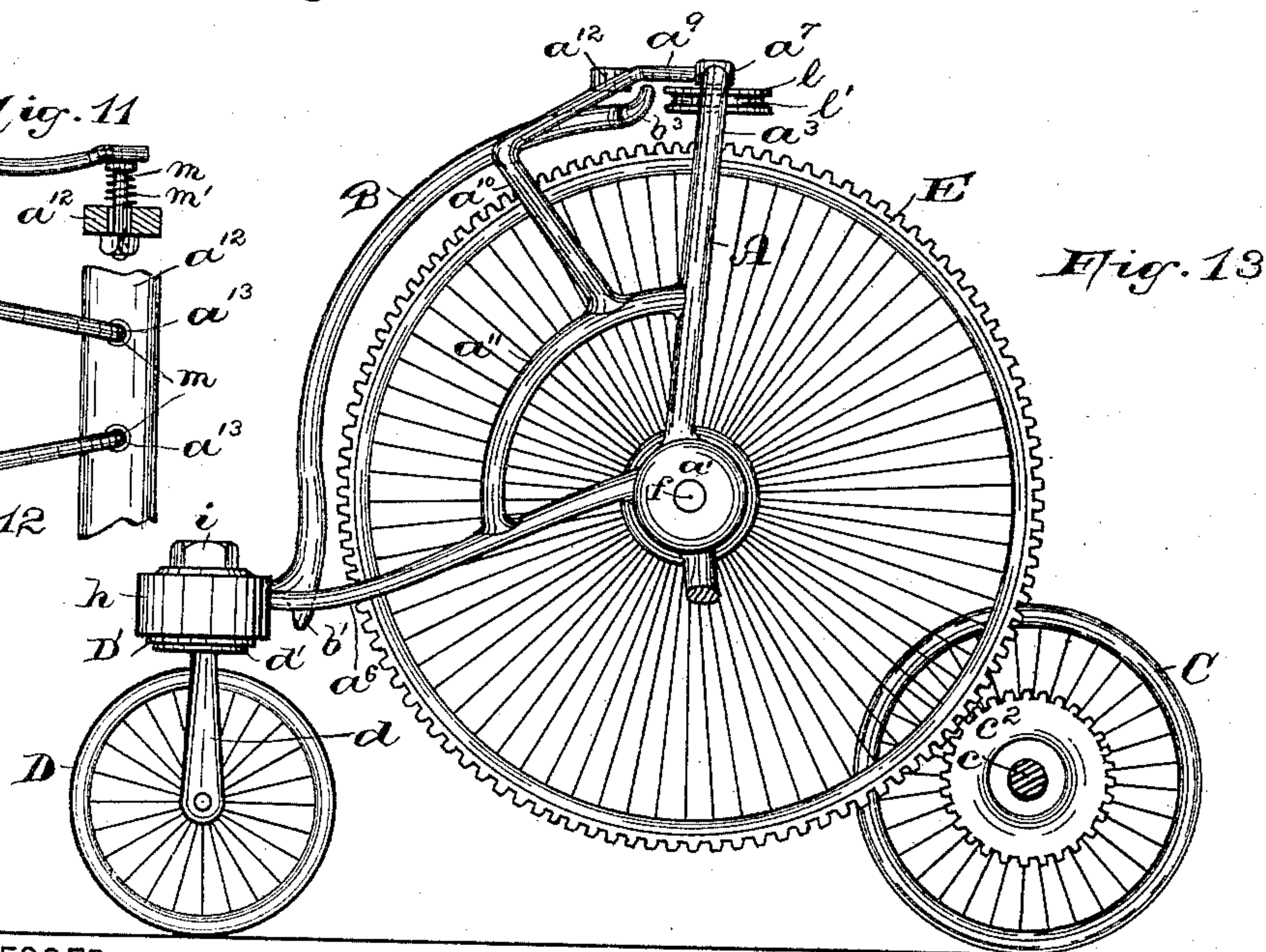
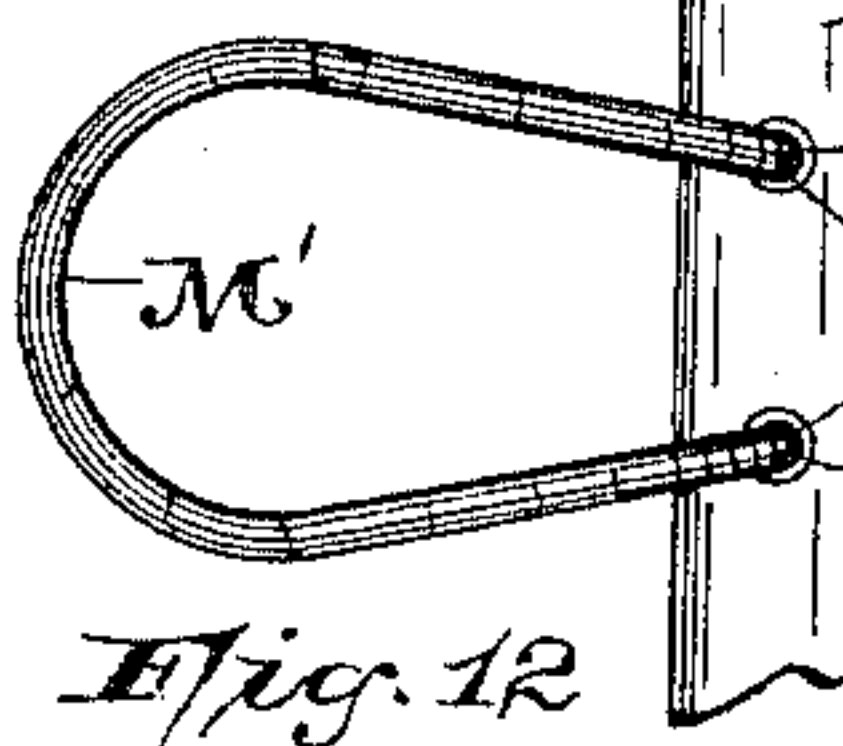
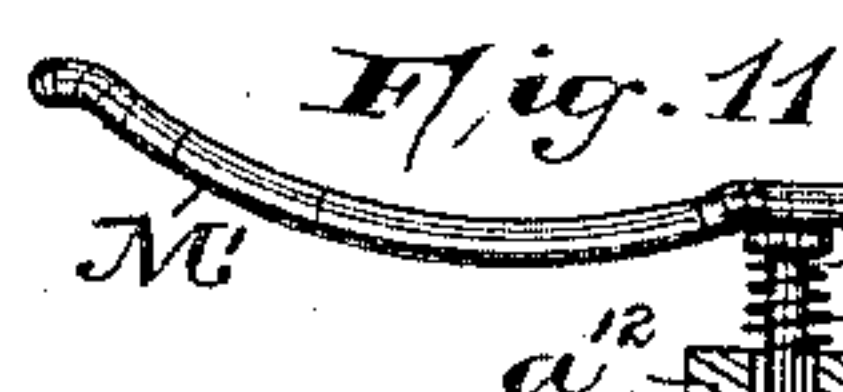
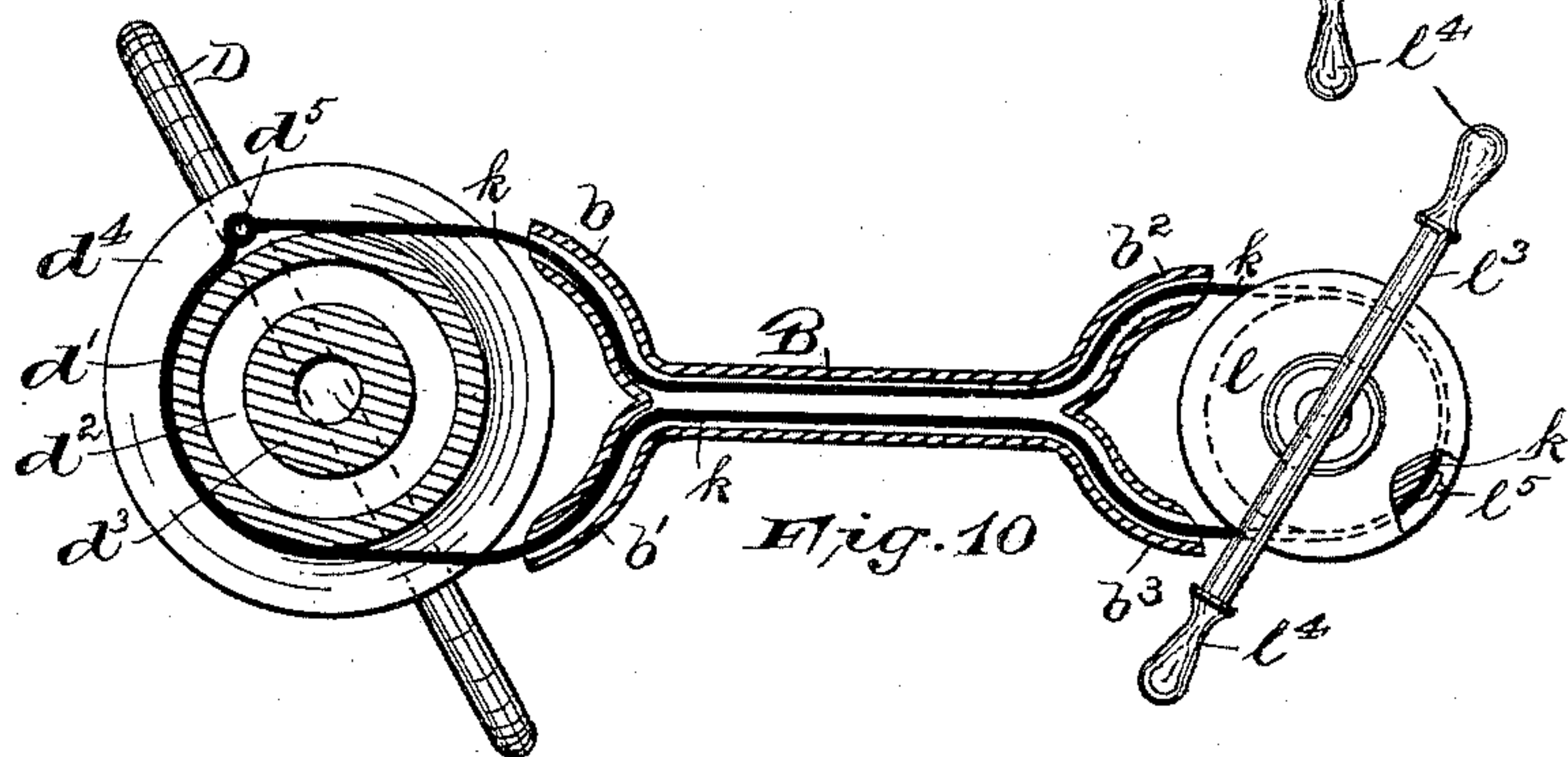
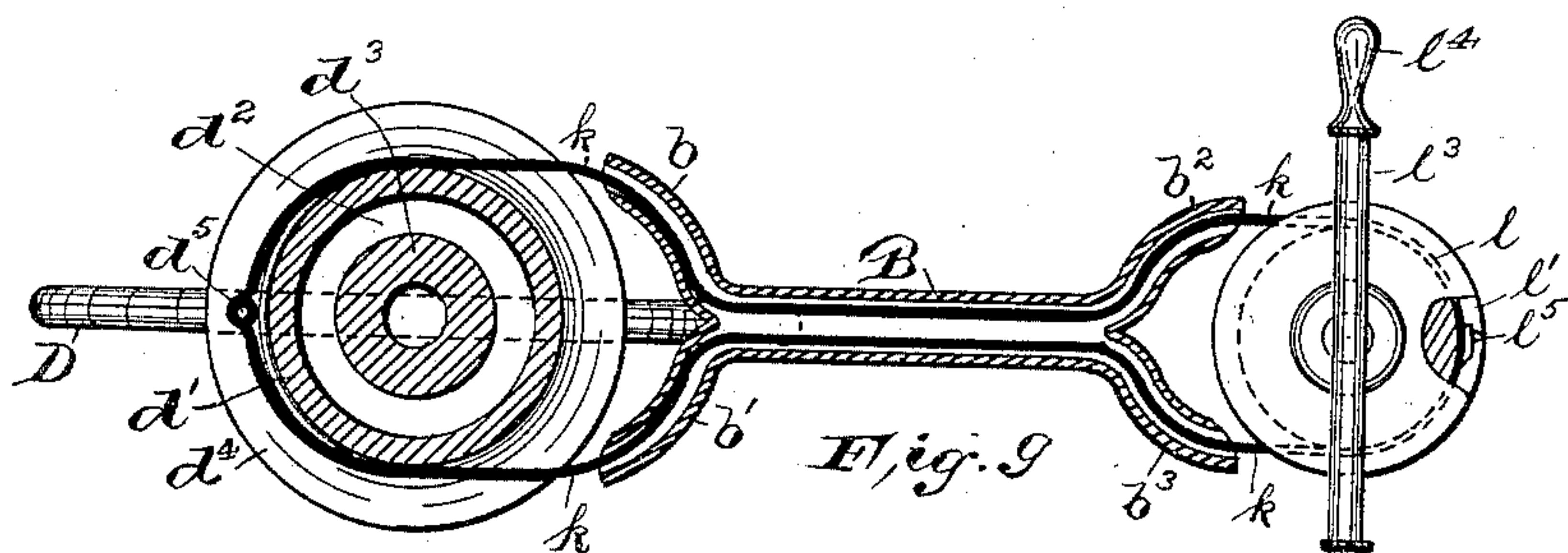
(No Model.)

3 Sheets—Sheet 3.

E. E. HARDY.
VELOCIPEDE.

No. 436,873.

Patented Sept. 23, 1890.



WITNESSES:

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UNITED STATES PATENT OFFICE.

EMERY E. HARDY, OF NEWARK, NEW JERSEY.

VELOCIPED.

SPECIFICATION forming part of Letters Patent No. 436,873, dated September 23, 1890.

Application filed January 14, 1890. Serial No. 336,886. (No model.)

To all whom it may concern:

Be it known that I, EMERY E. HARDY, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Velocipedes; 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in mechanism for converting motion, and is applicable to velocipedes or other similar motors in which foot-power is generally employed; and with this end in view the invention consists in certain novel features of construction and combination of parts, as will be hereinafter more fully described, and finally embodied in the clauses of the claim.

The general purpose of the invention is to so construct a velocipede that it will better withstand the severe strains and to greatly increase the speed, and to provide a motor in which foot-power is employed, in which the motion required for the feet is easy and less fatiguing. This I accomplish by the peculiar arrangement of a driving-wheel suspended between bifurcated or forked arms of the carriage-frame intermediately between the front vehicle-wheels and the rear steering-wheel, above the surface of the ground and directly and centrally beneath the backbone of the machine, whereby a free and easy motion is obtained, and, also, owing to the suspended position of the driving-wheel, which acts as a fly-wheel, an increased speed at a reduced energy of power is the result.

In the accompanying three sheets of drawings, in which similar reference-letters are employed to indicate corresponding parts in each of the several views, Figure 1 is a side elevation of my improved velocipede, illustrating the construction thereof. Fig. 2 is a top view of the same. Fig. 3 is a side view of one of the boxes in which the axle carrying the front wheels is arranged, and which is provided with spring-actuated journal-bearings; and Fig. 4 is a front view of the steering-head and neck. On Sheet 2, Fig. 5 represents in section the

steering-head and neck and the backbone and also the rear or hind steering-wheel attached to a pivotal post having an annular socket in which is arranged a correspondingly-formed bearing-plate secured to the backbone, said figure also illustrating the steering means arranged within and passing up the hollow or tubular backbone and attached to the steering-head, by means of which the rear or hind wheel may be turned on its pivotal post. Fig. 6 represents a top view of the same, illustrating more clearly the hollow backbone bifurcated or forked at its ends, through which the ends of a chain or cable or its equivalent pass and are attached to the bearing-plate and the steering-head, respectively. Fig. 7 is a plan view of a cap adapted to be arranged over the several parts of the steering device above the hind wheel, and Fig. 8 is a perspective view of the same. On Sheet 3, Fig. 9 is a sectional view taken horizontally through the steering-head above the driving-wheel and of the steering device above the hind wheel, the bifurcated and hollow backbone also being represented in section. The several parts are shown in their normal positions when the driving-wheel and the steering-wheel are in the same vertical plane. Fig. 10 is a view similar to that shown in Fig. 9; but illustrating the position of the hind wheel when the same has been turned out of the vertical plane of the driving-wheel by means of the chain or cable arranged within and passing through the hollow backbone and secured to the steering-head. Fig. 11 is a side elevation, and Fig. 12 a top view, of the seat-frame, illustrating the manner of securing the same to the vehicle or to the main frame of the same. In Fig. 13 is illustrated a modified form of construction in which the periphery of the driving-wheel is provided with teeth or cogs which mesh with the teeth on a pinion arranged on the axle of the front wheels between the latter.

In the accompanying drawings, A represents the main frame, to which is secured in a convenient manner the hollow or tubular backbone B. Said main frame A consists of two frames made up of a series of arms or bars secured to each other in any suitable manner, and to which are secured a pair of front wheels C and a hind steering-wheel D. Said frames are connected together at the front

by means of an axle c , carrying the wheels C, at the top by cross-bars a^2 , a^7 , and a^8 , and at the back said frames are secured to the bearing-plate on the end of the hollow backbone B, which is arranged directly above the central axis of the pivotal post to which the steering-wheel D is attached. On the main axle f in the main frame, as shown in Fig. 1, is arranged a driving-wheel E, suspended from said axle in a position above the surface of the ground, so that the periphery of said wheel is at all times above the surface of the road-bed, and thereby acts like a fly-wheel.

Although the relative positions of the front wheels C and the rear steering-wheel D may vary, it will be understood that the diameter and size of the driving-wheel is not limited to that shown in the drawings, it being essential, however, that said driving-wheel is situated in a vertical plane which shall pass through the central axis of the pivotal bearing of the rear steering-wheel, and also centrally between the pair of front wheels.

As shown more particularly in Figs. 1 and 2, the frame-work on opposite sides of the driving-wheel E is provided with central plates a' , having perforations or journal-boxes therein, in which is arranged the main axle or shaft f . Said plates have secured thereto upwardly-projecting arms a^3 , between which and above the driving-wheel is arranged the steering-head L. On the lower ends of said plates a' are arranged the arms a^4 , preferably bent, as shown, and provided at their ends with boxes a^5 , in which are arranged the spring-actuated journal-bearings c' and the journal or front axle c . Extending back from said plates a' on opposite sides of the driving-wheel E are arms a^6 , which are secured on opposite sides of a steering device D', to which is also attached or fastened the lower ends of the bifurcated and hollow or tubular backbone B. The main axle or journal f is provided on opposite sides of the driving-wheel E with crank-arms f' , to which are pivotally connected links f^2 , which in turn are pivotally attached to treadle-carrying arms or propelling-levers f^3 , pivoted at one end in any convenient manner to the arms a^4 , as will be seen from Figs. 1 and 2. Beyond the point where the links f^2 are attached to the arms or vibrating propelling-levers f^3 said arms are bent upwardly and provided with the ordinary treadles f^4 .

The arms a^3 of the main frame are joined together at their tops by means of connecting arms or plates a^7 and a^8 , thus forming the downwardly-projecting forked arm A', between which is arranged the steering-head L and the driving-wheel E, and directly behind said arms a^3 and projecting back therefrom, on opposite sides of the wheel E, are arms a^9 and a^{10} , which are secured to the arms a^3 and a^6 by means of a connecting-piece a^{11} . Said arms a^9 , on opposite sides of the driving-wheel, are connected with each other by means of the braces a^2 and a^{12} , to the latter of which

is secured the seat M, as will be described hereinafter. As has already been stated in the above, the hollow backbone B is secured to said cross-brace a^2 in any well-known manner.

As will be more clearly seen from Fig. 5, the wheel D is provided with a bifurcated post d , having on the top thereof a circular bearing-plate d' , provided with an annular groove in its upper side, forming a socket d^2 , and an upwardly-projecting post or pivotal pin d^3 , centrally arranged in said socket d^2 . Said plate d' is also provided on its periphery with a rounded groove d^4 . Arranged directly above said plate d' is a second plate g , provided with a downwardly-projecting ring g' , which fits into the socket d^2 in the plate d' , and upon the top of said plate g is arranged a cap or cover h , provided with a perforation therein, all of said parts being secured and held together by means of a nut and screw i , and said parts thereby being adapted to rotate upon each other. Arranged within said socket d^2 and engaging with the under side of the ring g' is a spiral spring j , which prevents the adjacent surfaces of the bearing-plates d' and g from grinding upon each other, and also gives an easy motion to the backbone, thereby preventing the jarring of the rider when passing over rough roads.

As has been stated, the backbone B, which is tubular or hollow, is provided at both ends with oppositely-projecting tubes formed integrally therewith or secured thereto in any convenient manner, and by means of the forked ends b and b' said backbone is attached to the bearing-plate g , as will be seen from Fig. 5, and the said ends b and b' are bent on opposite sides of the backbone, so that a chain or cable or its equivalent passing through and out of the same may be readily placed around and within the groove d^4 in the periphery of the bearing-plate d' without any danger of the displacement of the same while being operated by means of the handle on the steering-head of the velocipede. Said cable or chain k or its equivalent is secured within the groove d^4 in the back of the same to a pin d^5 , as will be evident, and passes around said plate on opposite sides within the said groove, the ends of said cable or chain passing up into the tubular ends b and b' of the backbone, extending up through the hollow interior of the latter, and passing out of the forked ends b^2 and b^3 at the opposite end of the backbone. The ends of the chain or cable are then wound around the steering-head L, which consists of a wheel l , provided with a peripheral groove l' , and which wheel l is pivotally secured between the arms a^7 and a^8 of the forked arm A' by means of a turning rod or bar l^2 , provided with a cross-piece l^3 , having handles l^4 thereon. The projecting ends of the cable or chain from the tubular portions b^2 and b^3 of the backbone are arranged within this groove l' in the wheel l , and secured thereto at its forward end by means of a pin l^5 , as will be

clearly seen from Figs. 9 and 10. Any rotary movement of the wheel l , produced by the handle, will cause an equal rotary motion or pull on the chain or cable k , which causes the bearing-plate d^2 to rotate on its pivotal bearing-post within the plate g on the backbone, and thereby turn the wheel D into a different plane of movement, as will be noticed from Fig. 10, and the vehicle is steered by means of the said rear wheel in the desired direction.

I will now proceed to describe the operation of the driving-wheel: Said wheel, as has been stated, is of the ordinary construction, and is provided with a solid rim e , having one or more grooves e' therein, around which is passed a cross-belt e^2 or its equivalent, and which is passed over and around the grooved wheel c^2 , which is firmly fastened on the front axle c' , as shown in Fig. 2. When the treadles f^4 are caused to be moved downwardly and upwardly by the rider, a rotary motion of the cranks f' and the axle or shaft f is produced by means of the links f^2 , and the wheel E is rotated upon its axis or shaft f . To enable the mechanism to operate quickly and more effectively, the wheel E is made of a large diameter, while the grooved wheel c^2 is of a considerably smaller diameter, and the operating or driving wheel E is caused to rotate quite rapidly, which is readily accomplished with but comparatively little friction and strain upon the parts, owing to the light construction thereof. This motion of the driving or fly wheel E is communicated by means of the cross chain or cable or its equivalent to the pinion or wheel c^2 on the front axle, which pinion, being of a very much smaller diameter, causes the number of revolutions of the wheels C to be greatly increased, and hence a greater velocity of the machine or vehicle.

The great advantage derived from the present construction of arranging my driving-wheel in the main frame above the surface of the ground is that when a high rate of speed has been obtained, the same rate can easily be kept up with very little labor to the rider, as the driving-wheel, which does not at any time touch the ground, and therefore has no obstructions presented in its path of motion, acts like a fly-wheel, the momentum of the wheel causing a uniform rate of speed at the same time.

Instead of employing one driving belt or chain from the wheel E , to communicate with the small wheel c^2 , two or more such belts or chains may be used, as will be understood.

From Fig. 3 it is evident that the axle-carrying boxes or journals c are provided with springs c^3 , which give an easy motion and prevent the jarring of the rider when passing over a rough road.

From Figs. 11 and 12 it will be clearly seen that the seat-frame consists of a piece of bent wire M' of the requisite strength and bent U shape to conform with the shape of the

seat or saddle M , and which is provided with downwardly-projecting arms or lugs m , which extend into and pass through perforations a^{13} in the arm a^{12} , and are held in position therein by means of spiral springs m' on the upper side and the nuts m^2 on the under side of the arm or cross-piece a^{12} . The object of providing the seat-frame with the arms m and springs encircling each of said arms is that thereby the seat adapts itself more readily to the sitting position of the rider.

As will be noticed from Figs. 1 and 5, the cap h , secured above the steering device over the rear or hind wheel can be used as a step in getting on or off the machine.

In lieu of using a belt or chain for communicating the motion of the driving-wheel E to the front axle of the vehicle, I may provide the circumference of said driving-wheel with teeth or cogs which mesh or engage with the teeth of a pinion secured to the front axle of the velocipede, as will be clearly seen from Fig. 13. The construction of the wheel and pinion, however, provided with a chain belt or its equivalent is the preferred construction, as thereby the friction of the parts is greatly reduced, and hence an increased speed is obtained.

In Figs. 1 and 2 is shown an arrangement of arms a^{14} , which extend out from the main frame on opposite sides of the driving-wheel E and above or between the wheels C . Said arms may be provided at their free ends with straps or similar means for securing parcels to the same.

Having thus described my invention, what I claim is—

1. In a velocipede or similar motor, a main frame provided with a forked arm having arranged therein a fly-wheel or driving-wheel suspended therein above the ground, a non-driven rear steering-wheel, and a pair of front wheels mounted in bearings on a front axle driven from the periphery of said fly-wheel, as and for the purposes set forth.

2. In a velocipede or similar motor, a rigid main frame, a rear steering-wheel pivotally attached to the backbone of the vehicle, a pair of wheels mounted in bearings on a front axle, an intermediately-arranged driving-wheel suspended in the main frame above the ground and directly beneath and in front of the backbone, pedals mounted on an axle or shaft carrying the said driving-wheel, and means on said driving-wheel connecting with and adapted to communicate the rotary motion of said driving-wheel to the front axle of the velocipede, for the purposes set forth.

3. In a velocipede or similar motor, a rigid main frame, a rear steering-wheel pivotally attached to the backbone of the vehicle, a pair of wheels mounted in bearings on the front axle, an intermediately-arranged driving-wheel suspended in the main frame above the ground and directly beneath the central longitudinal axis of the backbone, pedals mounted on an axle or shaft carrying the

driving-wheel, means on said driving-wheel for communicating the rotary motion thereof to the front axle of the velocipede, a hollow or tubular backbone pivotally secured to the rear steering-wheel; a steering-head in the main frame directly above the driving-wheel, means for operating the same, and a chain or its equivalent passing through said tubular backbone and connecting the steering-head with a steering device arranged directly above and connected with the rear steering-wheel, for the purposes set forth.

4. In a velocipede or similar motor, the combination, with the non-driven steering-wheel and a driving-wheel or fly-wheel suspended in a fixed frame above the ground, of a curved backbone, a steering-head and handle-bar for operating the same, and means connecting said steering-head with the rear wheel to transmit the power from the handle for controlling said wheel, for the purposes set forth.

5. In a velocipede or similar motor, the combination of the steering-head and the handle-bar for operating the same, the main frame provided with a fly or driving wheel suspended above the ground, a hollow or tubular backbone, a non-driven rear steering-wheel, and means in said hollow backbone connecting said steering-head with the rear steering-wheel for communicating the motion of said steering-head to said rear wheel, for the purposes set forth.

6. In a velocipede or similar motor, the combination of a non-driven rear steering-wheel, a backbone provided with a bearing-plate having an annular ring thereon which projects down into a socketed bearing-plate arranged on a bifurcated post on the rear steering-wheel, and means for securing said parts together, for the purposes set forth.

7. In a velocipede or similar motor, the combination of a non-driven rear steering-wheel, a backbone provided with a bearing-plate having an annular ring thereon, which projects down into a socketed bearing-plate arranged on a bifurcated post on the rear steering-wheel, a spring in said socket engaging with the under side of said ring on the bearing-plate on the backbone, and means for securing said parts together, for the purposes set forth.

8. In a velocipede or similar motor, the combination, with a driving-wheel suspended above the ground between the forked arm on the main frame, of a steering-head provided with a handle-bar for operating the same, a hollow or tubular backbone, a non-driven rear steering-wheel pivotally secured to a steering device arranged on the lower end of said hollow backbone, and a chain belt or its equivalent connecting said steering-head with the steering device over the rear wheel, for the purposes set forth.

9. In a velocipede or similar motor, the combination, with a driving-wheel suspended above the ground between a forked arm on the main frame, a steering-head on said arm

directly above said driving-wheel, and a tubular curved backbone, of a non-driven rear steering-wheel pivotally secured to the backbone by means of a bearing-plate thereon, which engages with a bearing-plate on a bifurcated arm on the rear steering-wheel, a cap arranged over and concealing said plates, and means for securing said parts together, and connections extending through said curved backbone, serving to transmit power from the steering-head for controlling the steering-wheel, for the purposes set forth.

10. In a velocipede or similar motor, the combination, with a driving-wheel, of a steering-head provided with a handle-bar, a main frame, a hollow or tubular backbone secured to said frame, a non-driven rear steering-wheel pivotally secured to a steering device arranged on the lower end of said hollow backbone, said backbone being bifurcated at its opposite ends to allow the ends of a chain belt or its equivalent to pass readily around a grooved wheel in the steering-head and around a grooved bearing-plate in the steering device above the rear wheel, for the purposes set forth.

11. In a velocipede or similar motor, a rigid main frame provided with a forked arm having arranged therein a fly-wheel or a driving-wheel suspended above the ground by means of a crank-axle, vibrating propelling-levers pivoted to said frame, and link-connections between said propelling-levers and the crank-axle, and connections serving to transmit the motion from said driving-wheel to the front axle of the vehicle, for the purposes set forth.

12. In a velocipede or similar motor, a rigid main frame, a rear steering-wheel, a tubular backbone provided with a bearing-plate having an annular ring thereon which projects down into a socketed bearing-plate arranged on a bifurcated post on said rear steering-wheel, and means for securing said parts together, a pair of wheels mounted in spring-actuated bearings on a front axle, an intermediately-arranged driving-wheel suspended in the main frame above the ground and directly beneath and in front of the backbone, pedals mounted on vibrating propelling-levers pivoted to the main frame, links connecting said propelling-levers and the crank-axle, and means on said driving-wheel connecting with and adapted to communicate the rotary motion of said driving-wheel to the front axle, for the purposes set forth.

13. In a velocipede or similar motor, the combination of the axle provided with a driving-wheel of greater diameter than any of the other wheels of the vehicle, said wheel being suspended between a forked arm on the main frame in which said axle is journaled and said driving-wheel being suspended on said axle above the level of the ground, a seat or saddle on said frame above said driving-wheel vibrating propelling-levers pivoted to said frame on opposite sides of said driving-wheel, crank-arms on said driving-wheel-sup-

porting axle, links connecting said propelling-levers and crank-arms, a chain belt or its equivalent for communicating the rotary motion of said driving-wheel to the front axle of the velocipede, a steering-head provided with a handle-bar, a rear steering-wheel provided with a steering device, and means for connecting said device with the steering-head to communicate the motion thereof to said steering device, for the purposes set forth.

14. In a velocipede or similar motor, a rigid main frame, a rear steering-wheel pivotally attached to the backbone of the vehicle, a pair of front wheels mounted in bearings in the front axle, an intermediately-arranged driving-wheel suspended in the main frame above the level of the ground and directly beneath and in front of the backbone, pedals arranged in vibrating propelling-levers secured to the frame and connected by means of links with the crank-shaft upon which said driving-wheel is mounted, one or more grooves in said driving-wheel, a grooved wheel on said front axle between the said front wheels, and a chain belt or its equivalent in said grooved wheels, all of said parts being arranged as and for the purposes set forth.

15. In a velocipede or similar motor, a rigid main frame, a rear steering-wheel pivotally attached to a tubular and curved backbone by means of a bearing-plate having an annular ring which projects into a socketed bearing-plate provided with a peripheral groove, said plate being attached on a bifurcated post to which the rear wheel is journaled, said backbone being secured to the main frame, a steering-head on said main frame in front of the upper end of the backbone provided with a grooved wheel, and flexible connections extending through said backbone provided with oppositely-arranged hollow arms b and b' at one end directly in front of the peripheral groove in the bearing-plate above the rear wheel, and also having hollow arms b^2 and b^3 at the opposite end of the backbone, directly behind the grooved wheel in the steering-head, substantially as and for the purposes set forth.

16. In a velocipede or similar motor, a main frame provided with a cross-piece a^{12} , a seat or saddle frame having downwardly-project-

ing arm m thereon, adapted to pass through perforations in said cross-piece, and nuts on said arms beneath the said cross-piece, and spiral springs around said arms m above said cross-piece, for the purposes set forth.

17. In a velocipede, a main frame provided with forwardly-projecting arms thereon, and means on said arms for securing parcels thereto, for the purposes set forth.

18. A velocipede provided with a hollow backbone having tubular and hollow arms b b' and b^2 b^3 , projecting oppositely from its ends, as and for the purposes set forth.

19. The combination, with the driving-wheel and the rear steering-wheel, the fixed frame in which said driving-wheel is suspended above the ground, and the curved tubular backbone provided at its opposite ends with the oppositely-projecting hollow arms b and b' and b^2 and b^3 , of the steering-head L , consisting of the grooved wheel l , pivotally secured between the arms a^7 and a^8 on the main frame and its handle, a pin l^5 on said grooved wheel, connections secured to said wheel and passing on opposite sides of the same into the arms b^2 and b^3 in the backbone, extending through the latter and out of the arms b and b' , and attached to a steering device over the rear wheel to control the same, as and for the purposes set forth.

20. A step secured to the backbone of a velocipede by means of a bearing-plate having an annular ring thereon which projects down into a socketed bearing-plate arranged on a bifurcated post to which the rear wheel is journaled, said bearing-wheel, with the ring and the socketed plate, being adapted to rotate one upon the other, a cap arranged over and concealing said parts, and a bolt passing through a perforation in said cap and adapted to be screwed into a post or pivotal pin d^3 in the plate d' , all of said parts being arranged substantially as and for the purposes set forth.

In testimony that I claim the invention set forth above I have hereunto set my hand this 8th day of January, 1890.

EMERY E. HARDY.

Witnesses:

FREDK. C. FRAENTZEL,
WM. H. CAMFIELD.