

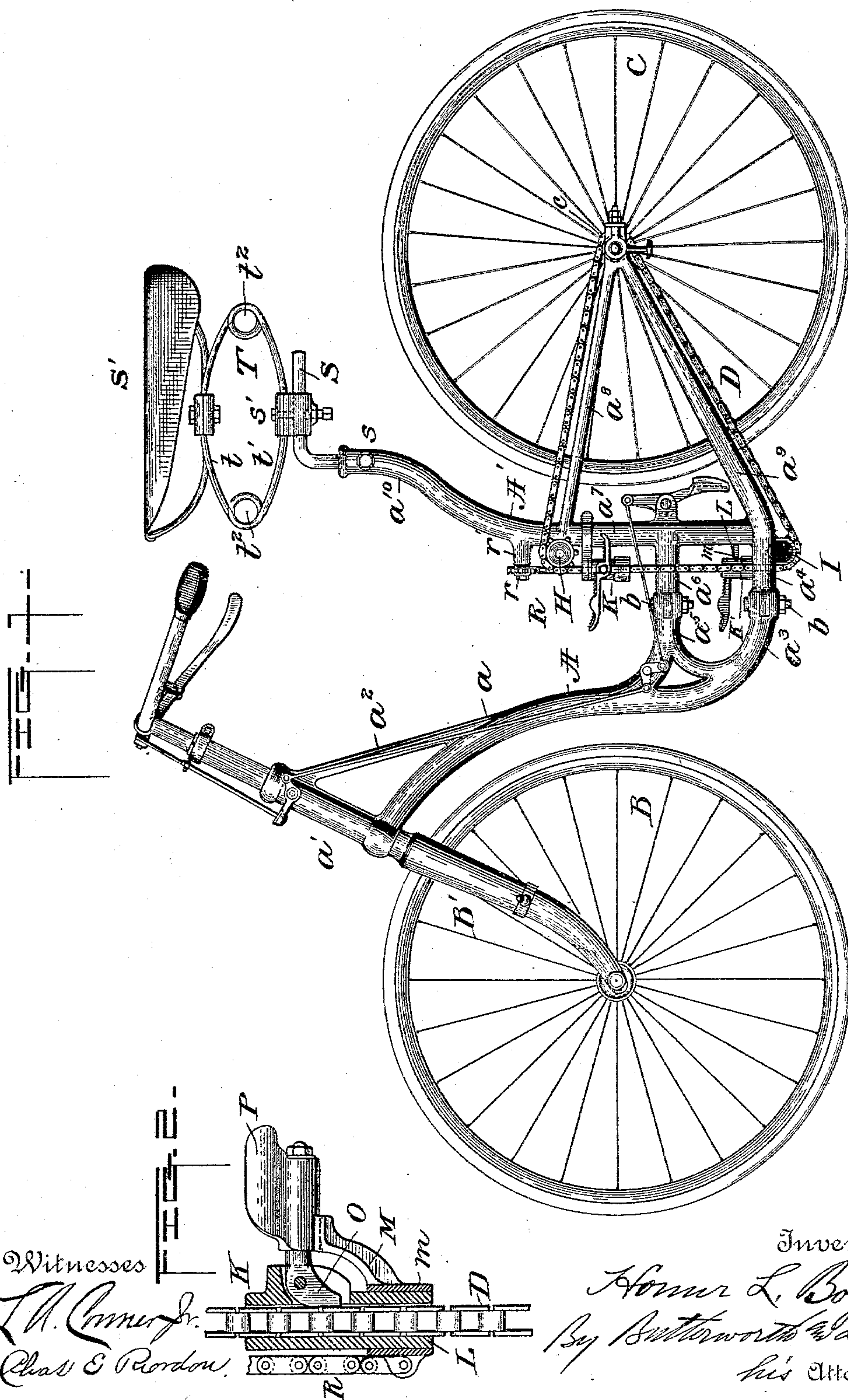
(No Model.)

H. L. BOYLE.
BICYCLE.

2 Sheets—Sheet 1.

No. 556,802.

Patented Mar. 24, 1896.



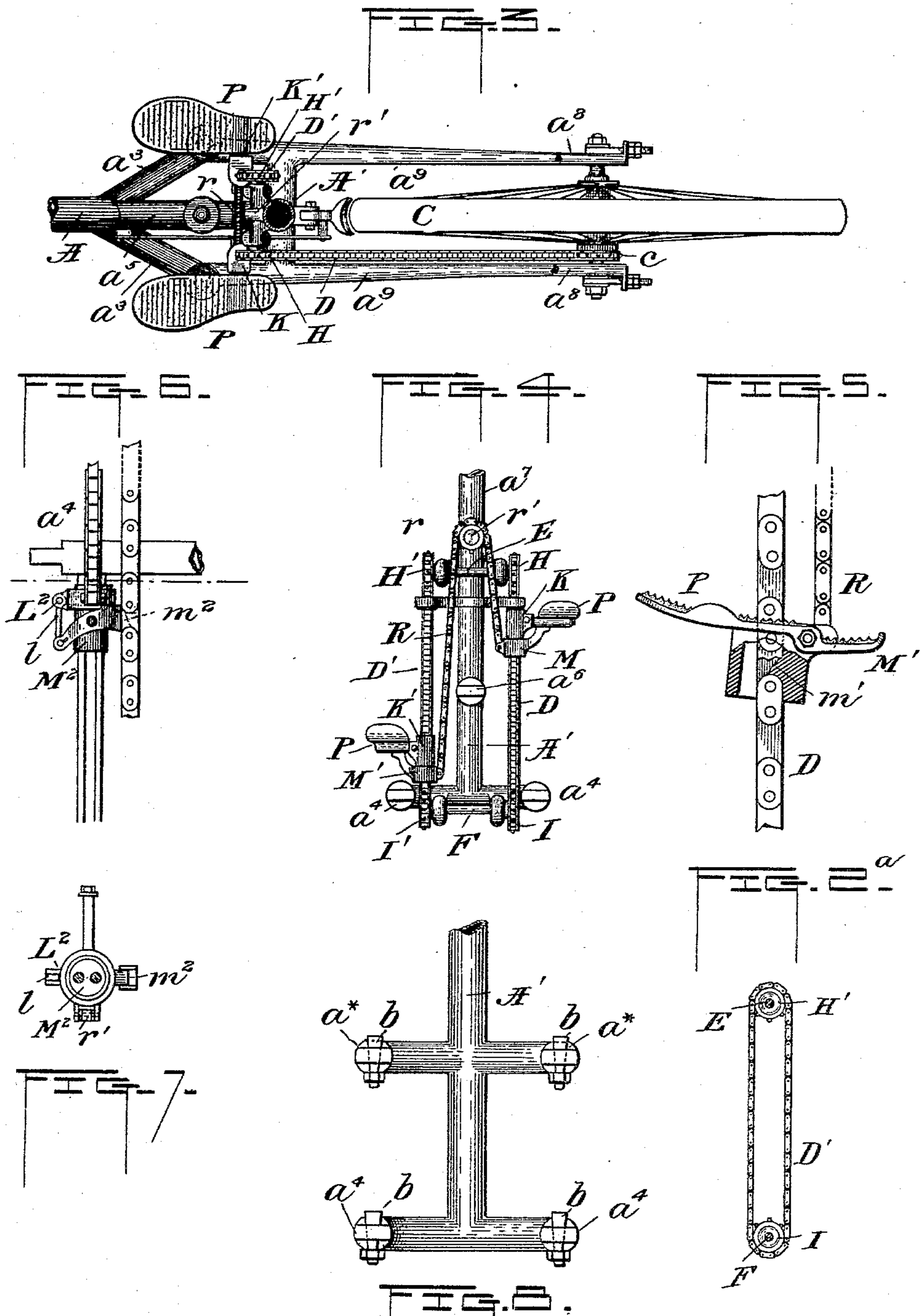
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No. 556,802.

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Witnesses
I. A. Conner Jr.
Chas. E. Riordon.

Inventor
Homer L. Boyle
By Butcherworth & Dowell
his Attorneys

UNITED STATES PATENT OFFICE.

HOMER L. BOYLE, OF GRAND RAPIDS, MICHIGAN.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 556,802, dated March 24, 1896.

Application filed September 29, 1892. Serial No. 447,282. (No model.)

To all whom it may concern:

Be it known that I, HOMER L. BOYLE, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Bicycles; 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.

This invention relates to bicycles and other vehicles adapted to be propelled by manual or foot power applied by the rider or riders mounted on the moving machine, and more particularly to a class of machines commonly known as "safety-bicycles."

One object of the invention is to provide means for the direct application of power to the propelling mechanism, so as to avoid lost motion and to utilize to the fullest extent the power expended in impelling the vehicle.

Further objects are to provide a light, simple, and inexpensive yet strong and durable frame which is adapted for either male or female riders, and to form a detachable hinge-joint between the driving and steering wheels which will afford a rigid and substantial connection in use and at the same time permit the frame to be folded, when desired, for packing purposes or for transportation.

The invention will first be described with reference to the accompanying drawings, which form a part of this specification, and then pointed out in the claims at the end of this description.

Referring particularly to the drawings by letters of reference, Figure 1 represents a side elevation of a machine embodying my invention. Fig. 2 is a detail sectional view. Fig. 3 is a detail. Fig. 4 is a plan of a portion of the machine, the steering-wheel and seat being removed. Fig. 5 is a detail front elevation of the propelling mechanism. Fig. 6 is a detached sectional view illustrating a modification of the gripping devices for applying power to the drive-chain. Fig. 7 is a detail of a further modification of the gripping device. Fig. 8 is a transverse section taken on the line 7-7 of Fig. 6, and Fig. 9 is a detail illustrating a modification of the hinge-jointed frame connection.

The main frame of the machine may be made in two parts A A', which are preferably tubular and composed of aluminium, so as to combine lightness with strength. The part A may be constructed with a neck a and tubular head or socket a' , which are connected by a diagonal brace a^2 and with a depending bifurcated portion, the two branches of which form rearwardly-projecting arms a^3 , which are recessed to receive the tongues of corresponding arms a^4 , projecting from the part A'. An auxiliary arm a^5 also projects rearwardly from the part A at a point slightly above and between the arms a^3 and is recessed to receive the tongue of a corresponding arm a^6 projecting from the part A'.

The part A' may be constructed with an upright portion a^7 connecting the rearwardly-converging bars a^8 a^9 and forming therewith an acute-angled triangle. The forward part of the bar a^9 merges into a bifurcated portion, the two branches of which form the forwardly-projecting arms a^4 , which connect with the arms a^3 , while the auxiliary arm a^6 projects from the upright a^7 , at a point slightly above and between the arms a^4 . The seat-supporting standard a^{10} may also be formed integral with the upright a^7 , as shown, or secured thereto in any proper manner.

The parts A A', as thus described, may be either forged or cast integrally with the interlocking arms, which may be perforated near their ends to receive suitable fastening bolts or wedges b , with nuts thereon, as shown in Figs. 1 and 8, whereby a rigid though detachable hinge-joint connection is formed between the two parts of the frame, which will permit the frame to be folded when desired by removing the bolts which connect the auxiliary arms and the arms a^3 a^4 at one side of the machine, the arms a^3 a^4 at the opposite side being adapted to serve as a hinge upon which the parts of the frame may turn.

B denotes the front or steering wheel, which may have its bearings in the fork B', the spindle of which may be fitted in any proper manner in the tubular head a' and provided with the usual handles and brake-lever for controlling the movements of the machine.

C denotes the driving-wheel, the axle of which is journaled in suitable bearings at the

intersection of the frame-bars $a^8 a^9$ and provided with a sprocket-wheel or pulley c , over which passes the drive chain or belt D . Said chain also passes over pulleys or sprocket-wheels $H I$ secured to shafts $E F$, which are journaled in bearings supported upon the upright a^7 or other suitable part of the frame at or about at the angles formed at the intersection of the bars $a^8 a^9$ with the upright a^7 , thus forming a triangular connection between the drive-chain and the sprocket-wheels, by which motion is imparted to the driving-wheel. A corresponding set of sprocket-wheels and drive-chain may be provided at the opposite side of the machine, if desired, but I preferably use but one triangular chain connecting directly with the driving-gear or sprocket-wheel upon the shaft of the driving-wheel, and in connection therewith I provide an endless belt or chain D' , which connects pulleys or sprocket-wheels $H' I'$ secured to the shafts $E' F'$ at the ends thereof opposite the wheels $H I$, so that rotary motion may be imparted to said shafts and thence to the drive-wheel C through the propelling-chain D when power is applied so as to move either chain.

For the purpose of applying power direct to said chains I provide reciprocating gripping devices $K K'$, one for each chain, and flexible connections between the same, by which one of said devices is raised or moved backward simultaneously with the downward or forward movement of the other, so that they may act alternately in propelling the respective endless chains with which they engage. The gripping devices $K K'$ may each consist of a casing or sleeve L fitted to slide upon the chain D or D' , as shown more clearly in Fig. 2, and a pawl or cam-lever O pivoted to said casing, so that its short arm may bear against or engage the drive-chain, while its long arm serves as a foot-rest or support for a pedal P , whereby said device is adapted to grip and hold the chain when pressure is applied to depress the pedal or long arm of the lever and may slide freely backward when the pressure is relieved. To effect the return or backward movement of the gripping device and to prevent contact of the cam-lever or pawl with the chain during such movement, I provide a lifting and releasing device, which consists essentially of a movable sleeve m preferably having an arm M for each gripper fitted upon the casing so as to slide thereon within certain limits and lift the outer arm of the lever on the backward stroke.

The supporting ring or sleeve m of the releasing-arm M is connected to one end of a chain or cord R which passes over a roller or sprocket-wheel r supported upon a stud r' , projecting from the upright a^7 or other part of the frame, and the other end of said chain is secured to the sleeve m of the opposite releasing-arm, so that pressure applied to depress one pedal or gripper will lift the opposite gripper and simultaneously release its

grip upon the chain, permitting the gripper to rise without contact of the cam-lever with the chain, and thereby preventing undue friction and noise which would result from such contact on the backward movement. It may be desirable in some cases to attach the ends of the chain R directly to the foot-rests or outer arms of the cam-levers, in which case the releasing-arm may be dispensed with, and instead of the sprocket-wheel r a rocking lever or centrally-pivoted rod may connect the upper ends of the chains attached to the grippers.

In Fig. 5 is shown a modification of the gripping device, wherein the casing M' is provided with one or more detents or projections m' and supports a foot-rest or pedal P' , which may be pivoted at one side with its long arm resting upon the opposite side of the sleeve, so that the detent will be caused to engage a link of the chain when the gripper is depressed and move backward without moving the chain.

In Figs. 6 and 7 is shown a further modification, wherein the casing M^2 of the gripper has a pawl or dog m^2 pivoted thereto in position to engage and move the chain on the forward or downward movement and to move backward without engaging the chain. The releasing device in this instance consists of a ring or sleeve L^2 fitted upon the casing M^2 and connected with the outer free end of the pawl by a link l .

It will be understood of course that in the modifications lifting-chains or other flexible connections between the grippers or pedals will be provided, as described with reference to Figs. 1 to 4, so as to cause the grippers to move forward and back alternately and in harmony with each other.

In Fig. 8 is shown a modification of the hinge-joint connection between the two parts of the frame, wherein the auxiliary arms are duplicated—that is to say, instead of a single arm $a^5 a^6$ upon each of the parts $A A'$ two arms $a^* a^*$ are formed upon each part, so as to provide duplicate pairs of interlocking arms, which may serve in some cases to more effectually brace and sustain the frame against vertical and lateral strain, though for convenience in connecting the propelling chains and gearing and to prevent spreading the same too far apart in order to clear the space occupied by the pair of auxiliary arms the single centrally-disposed arms are preferable.

An angular saddle-rod S , supporting the seat S' , may be adjustably secured at one end in the tubular standard a^{10} by a set-screw s and is provided on its free horizontal arm with an adjustable clamp s' , to which the seat-supporting spring or springs T are secured. The spring T consists of a piece of spring metal wire bent in oval form, so as to provide opposing bows $t t'$ with a coil t^2 at each of the intersecting ends of the bows. The spring

thus constructed is exceedingly simple and efficient and may be manufactured at a very small cost.

5 The operation of my invention will be readily understood from the foregoing description.

10 A vehicle constructed substantially as described will have the advantage of a very light yet strong and durable frame, which while capable of being separated or folded when not in use will be rigid and firmly braced in use both vertically and laterally by the interlocking arms, and the power expended in impelling the machine will be directly applied to the propelling mechanism without the intervention of cranks, levers, or other intermediate gearing.

20 It will of course be understood that the triangular arrangement of the driving-chain and the application thereto of the grip or catch for propelling the same, so as to move in a vertical direction, are preferred arrangements, and that the grip may be applied to any part of the chain, and two or more sprocket-wheels may be used with or without a pulley or idler in place of the third sprocket-wheel. A tubular two-part frame of the form described, composed wholly or in part of aluminium, is also preferred, as it 30 combines lightness with strength, but any suitable frame may be employed.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

35 1. In a bicycle, the combination with the driving-wheel and the endless chains, of a casing fitted to slide on each chain, a gripping device arranged upon the casings, together with flexible connections between the casings adapted to positively hold the gripping devices out of engagement with the chains on the backward movement of the casings, but to allow same to engage the chain on the forward movement, substantially as 45 described.

2. The combination in a bicycle of the frame having the rearwardly-converging bars and the upright with sprocket-wheels journaled at the intersection of said bars with said upright, a sprocket-wheel secured to the drive-wheel shaft, the triangularly-arranged drive-chain fitting over said sprocket-wheels, and the reciprocating gripping device fitted upon

said chain so as to impart motion thereto on the forward or downward movement of said device and to move freely backward or upward thereon, substantially as described. 55

3. The combination in a bicycle of the frame having the rearwardly-converging bars and the upright with sprocket-wheels journaled at the intersection of said bars with said upright, a sprocket-wheel secured to the drive-wheel shaft, the triangularly-arranged drive-chain fitting over said sprocket-wheels, and the reciprocating gripping device fitted upon said chain so as to impart motion thereto on the forward or downward movement of said device and to move freely backward or upward thereon together with the sprocket-wheels at the opposite side of the upright having the endless chain fitted thereon, and flexible connections between the gripping devices whereby the latter are adapted to move simultaneously the one forward or downward and the other in the opposite direction, substantially as described. 60 65 70 75

4. In a bicycle, the supporting-frame composed of two parts or sections having the bifurcated interlocking arms at their lower adjacent ends, and the auxiliary arms arranged in proximity to said bifurcated portions, the said arms being pivotally and detachably connected together, whereby the frame is braced against vertical and lateral strain in use and is adapted to be folded into a compact form for transportation, substantially as described. 80 85

5. In a bicycle, the combination with the driving-wheel and an endless chain connected therewith, of a gripping device comprising a casing fitted to slide on the chain, a treadle pivoted to the casing and carrying on its inner end a cam to engage the chain and firmly bind the gripping device thereto, and a movable sleeve arranged on the casing and means connected therewith for automatically lifting the treadle for disengaging the cam from the chain on its backward movement, substantially as described. 90 95

In testimony whereof I affix my signature in presence of two witnesses. 100

HOMER L. BOYLE.

Witnesses:

CHAS. E. RIORDAN,
CYNTHIA E. DOWELL.