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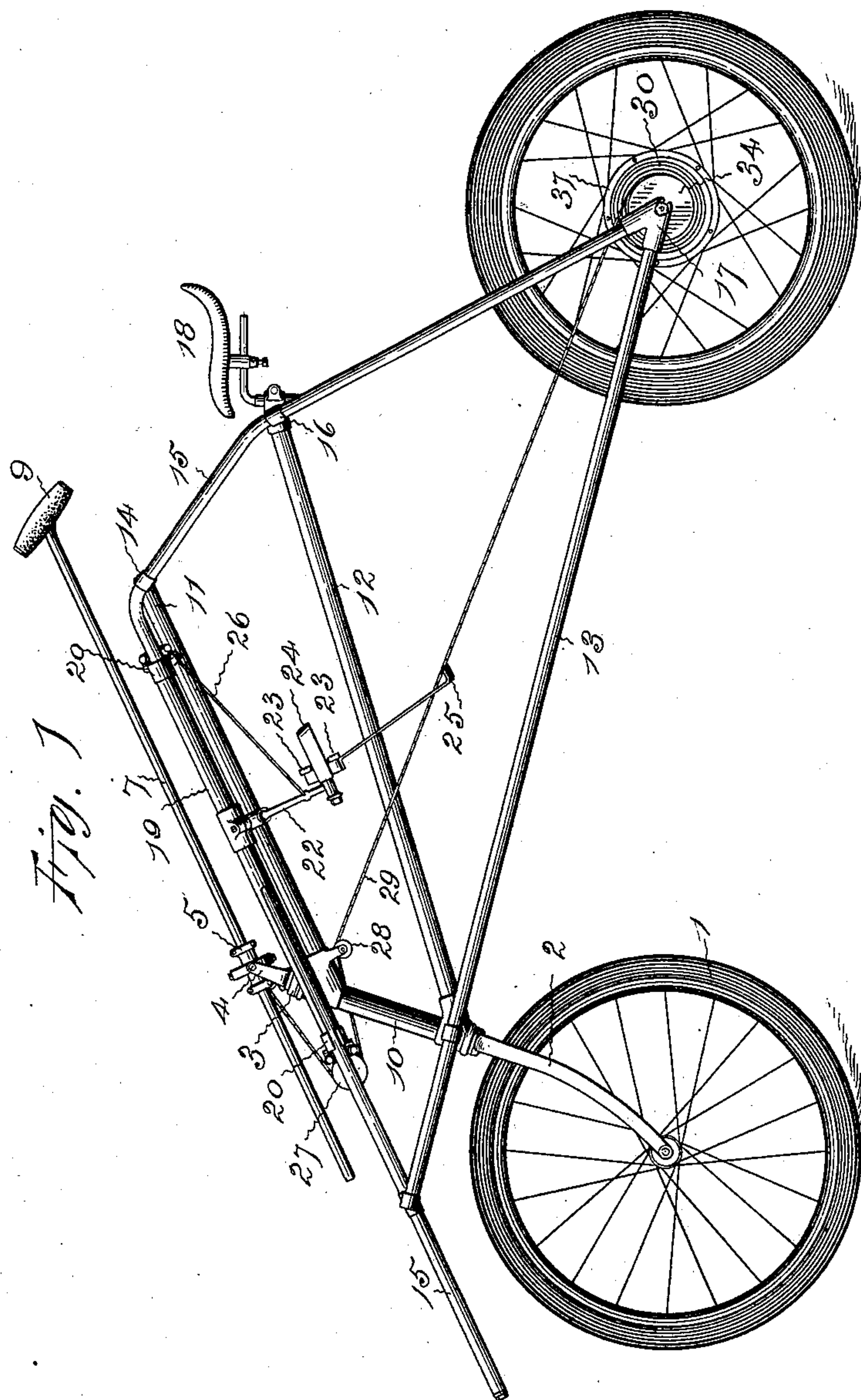
Patented July 5, 1898.

J. H. BERGSTROM.  
BICYCLE.

(Application filed Apr. 22, 1897.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses:  
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Inventor:  
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Harry R. Williams,  
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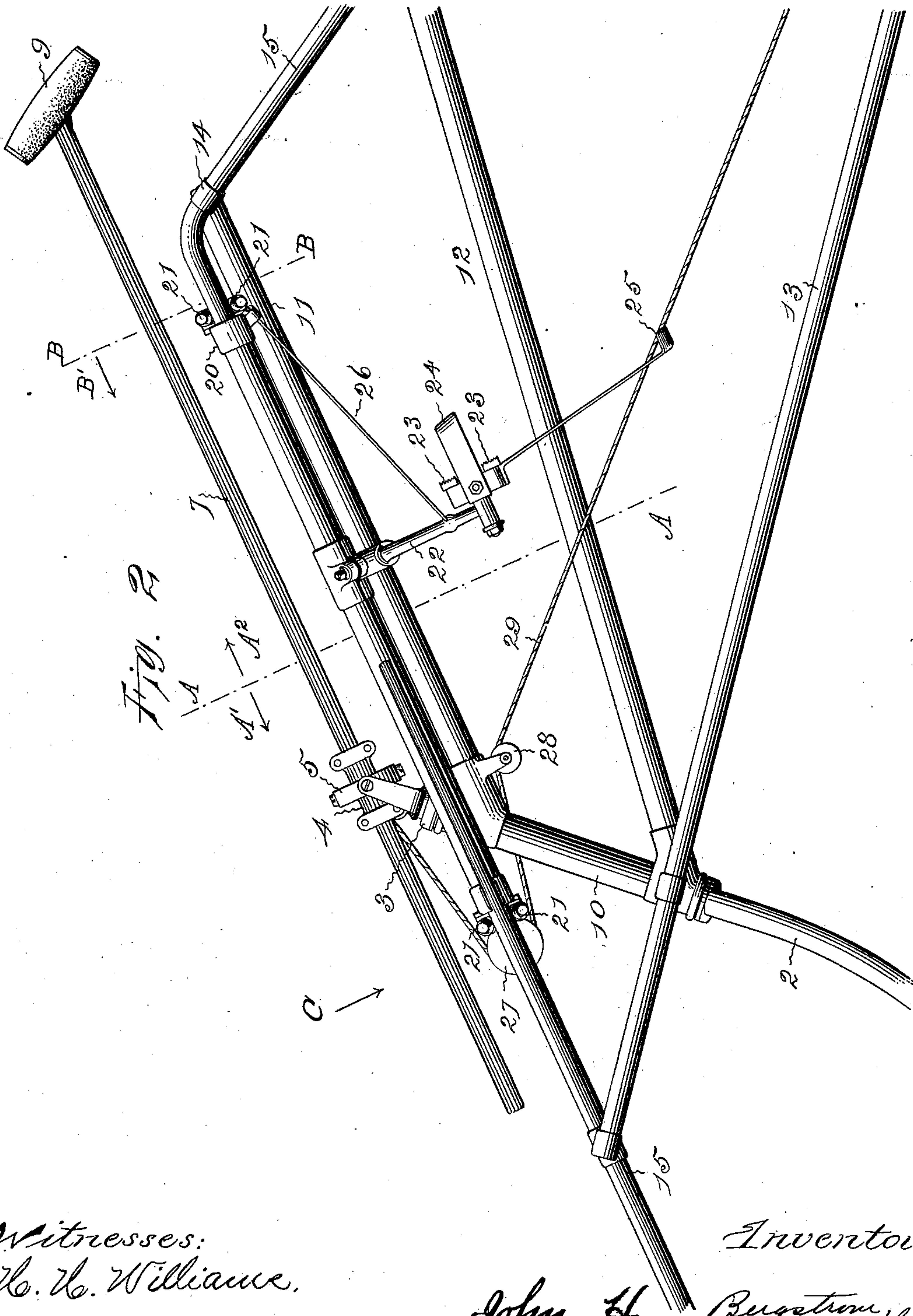
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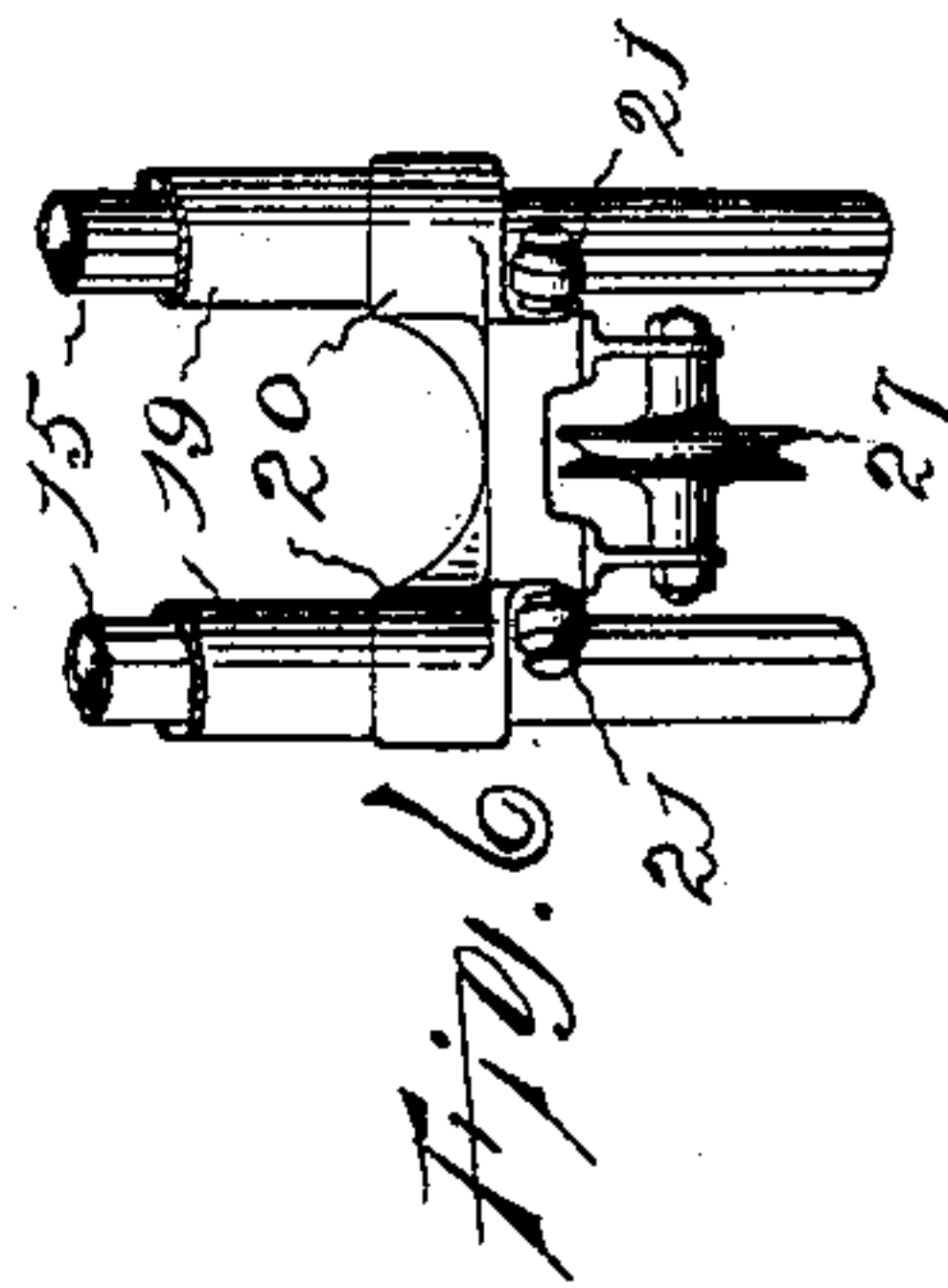
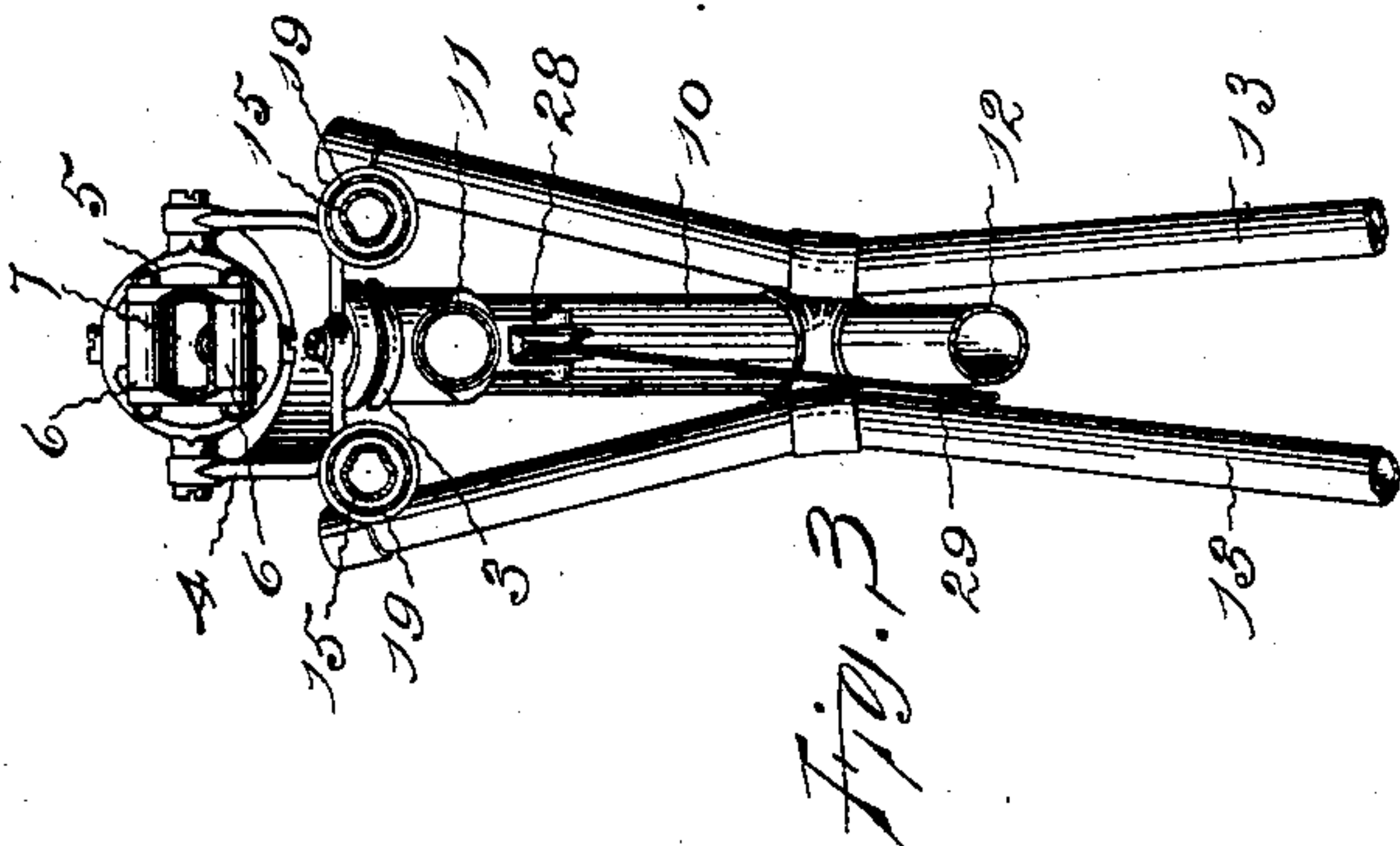
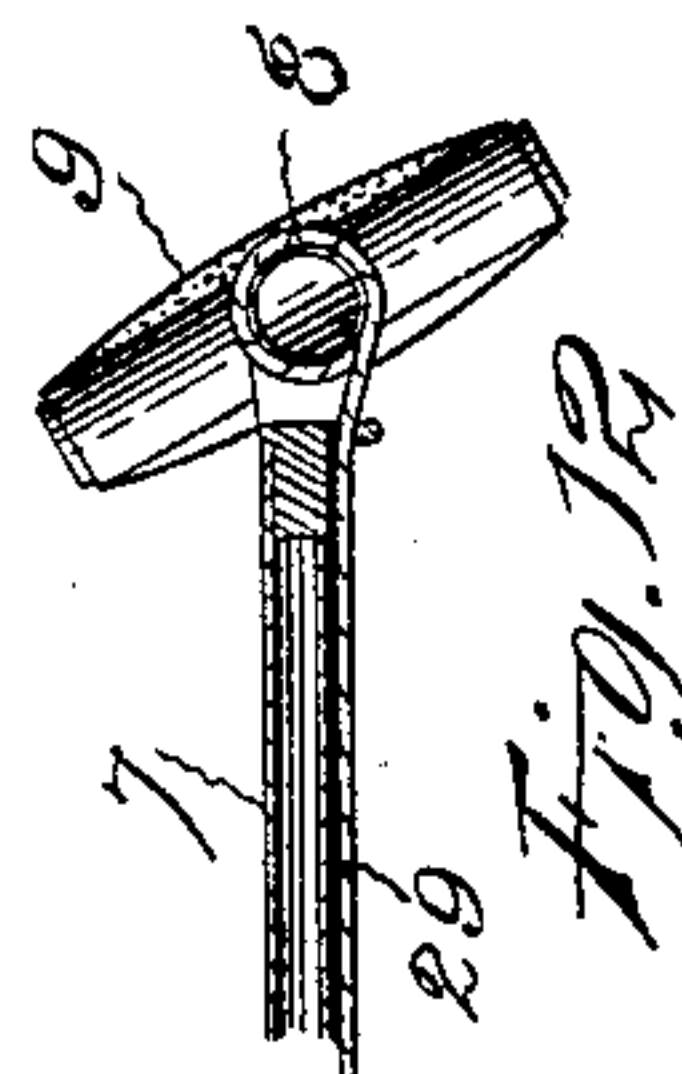
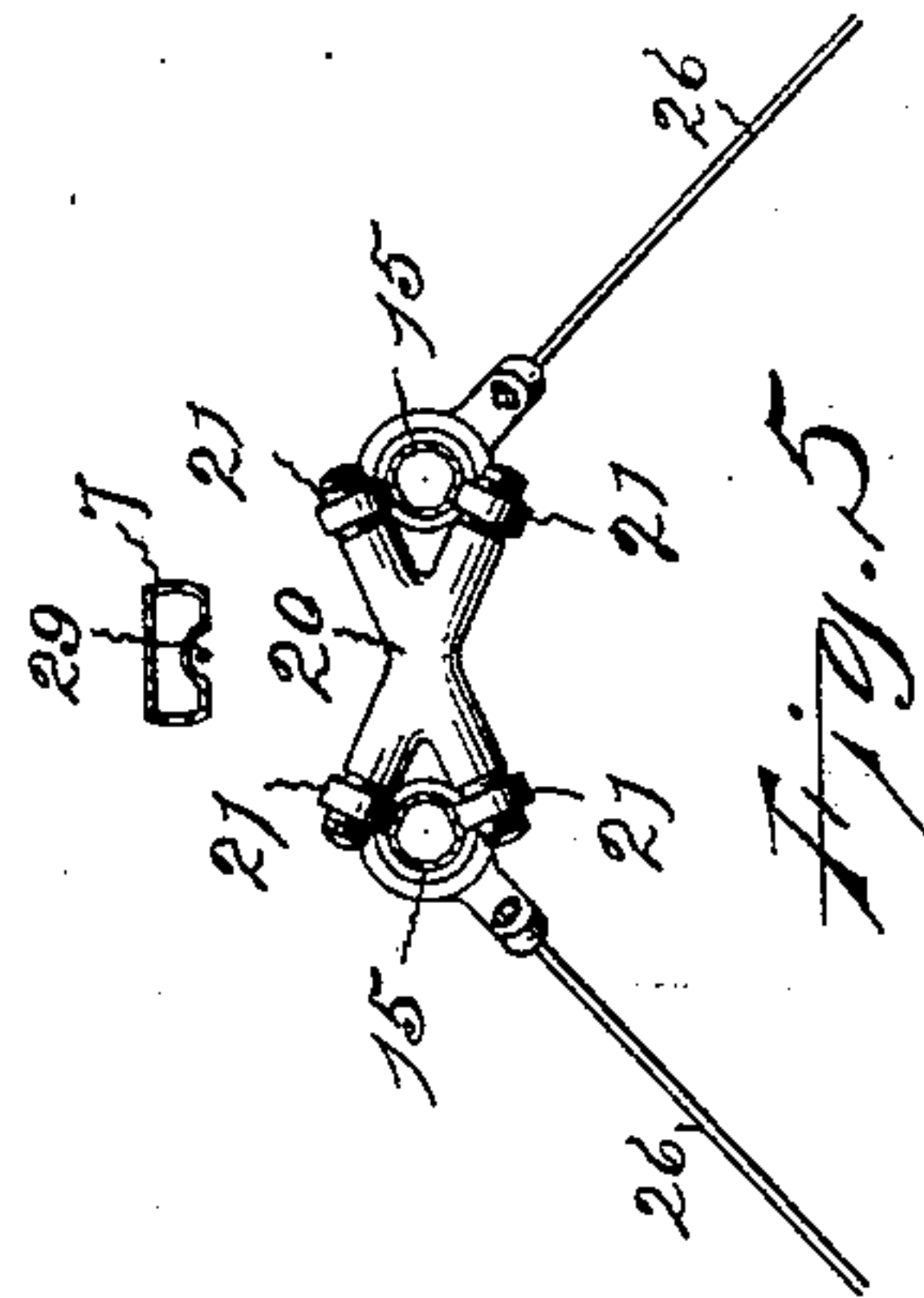
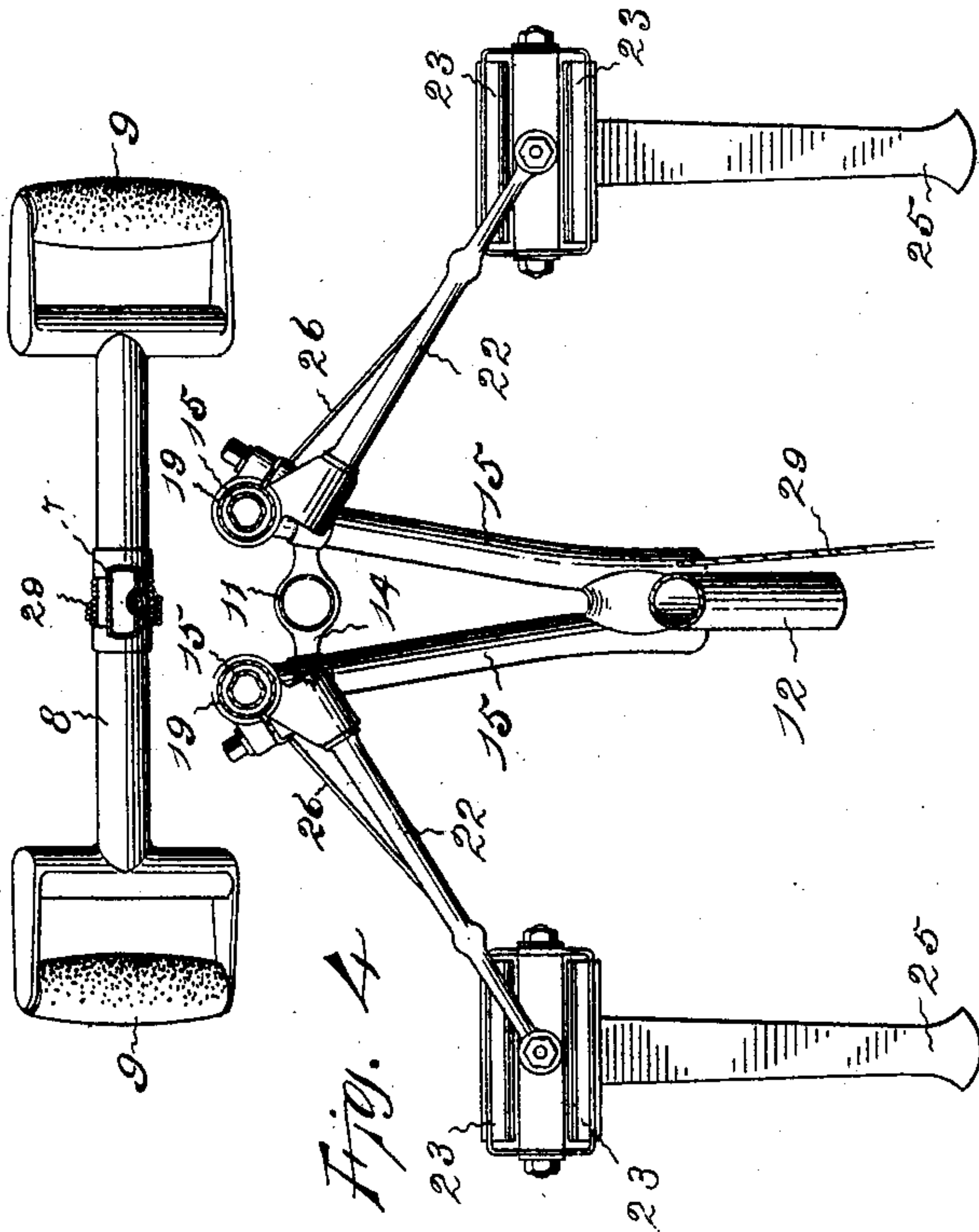
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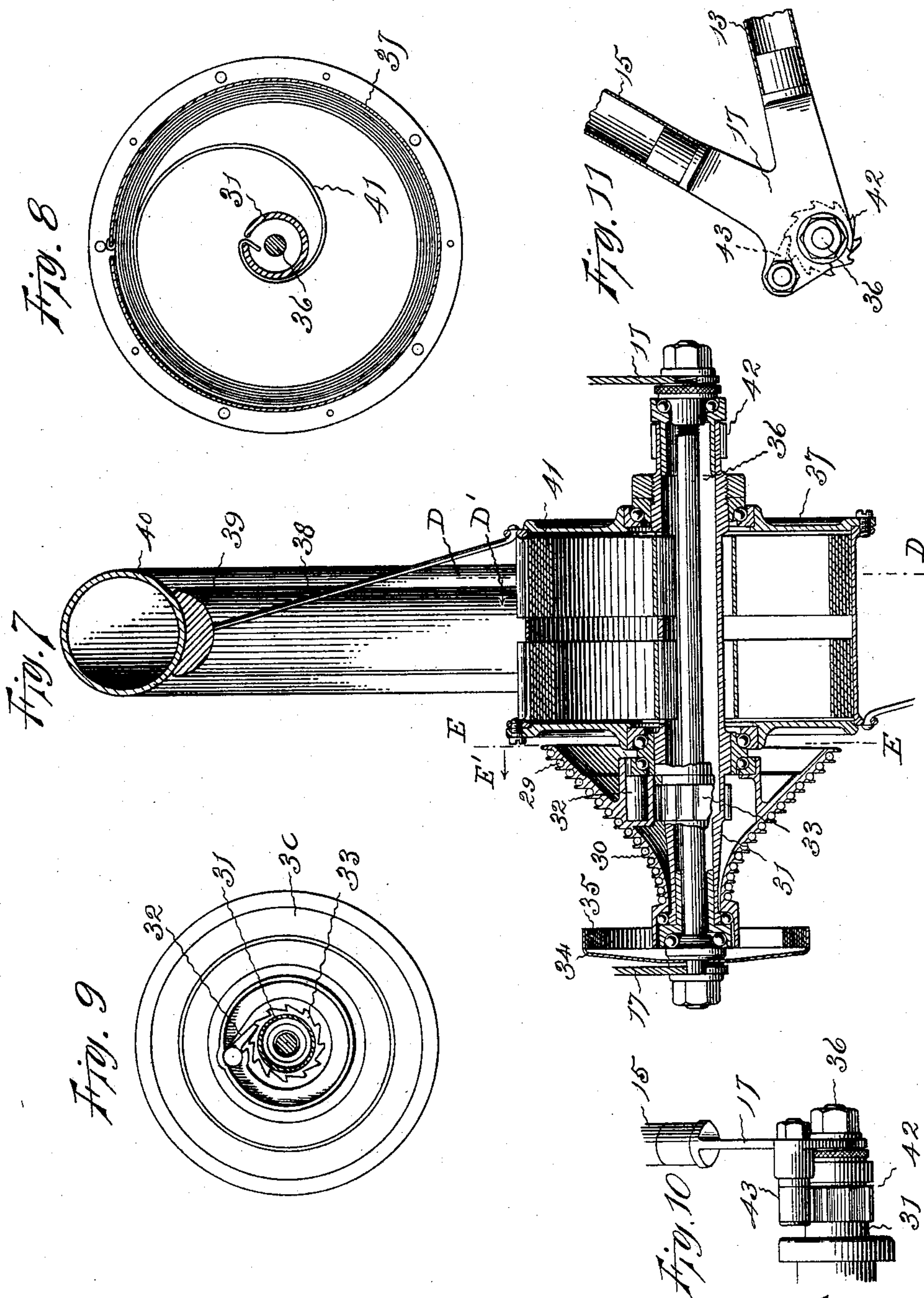
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4 Sheets—Sheet 4



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# UNITED STATES PATENT OFFICE.

JOHN H. BERGSTROM, OF DANBURY, CONNECTICUT.

## BICYCLE.

SPECIFICATION forming part of Letters Patent No. 606,854, dated July 5, 1898.

Application filed April 22, 1897. Serial No. 633,384. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN H. BERGSTROM, a citizen of the United States, residing at Danbury, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Bicycles, of which the following is a specification.

The invention relates to a bicycle so constructed that it may be propelled either by the use of the feet or by the use of the hands, or both together,

The object of the invention is to provide a comparatively simple, inexpensive, durable, and easy-running bicycle of this nature which is so arranged that the rider when mounted can bring into play and utilize many different muscles of the body, legs, and arms, whereby great power can be applied for propelling and high speed easily attained with such a distribution of effort that none of the muscles need be overstrained.

The invention resides in a machine having two or more wheels of common construction, a frame formed of tubes or rods of suitable strength supported upon the wheels by any ordinary ball or other desired antifriction bearings, a seat attached to the frame for the support of the rider, pedals connected with a slide that is movably supported by the frame, handles connected with a rod that is loosely held by the frame, and a flexible connection between the handles, the pedal-slide, and the driving-wheel, as more particularly herein-after described, and pointed out in the claims.

Of the accompanying drawings, Figure 1 shows a side elevation of a bicycle which embodies the invention. Fig. 2 shows an enlarged side view of a portion of the frame, pedals and pedal-slide, handles and handle-rod, and the connections between them. Fig. 3 shows a transverse section taken on the plane indicated by the broken line A A of Fig. 2, looking in the direction of the arrow A'. Fig. 4 shows a transverse section taken on the same plane, looking in the direction indicated by the arrow A<sup>2</sup>. Fig. 5 is a section on the plane indicated by the broken line B B of Fig. 2, looking in the direction of the arrow B'. Fig. 6 is a view of the forward end of the pedal-slide, looking from the direction indicated by the arrow C. Fig. 7 shows an

enlarged sectional view of a portion of the driving-wheel and its connections. Fig. 8 is a section of the spring-barrel of the driving-wheel on the plane indicated by the broken line D D of Fig. 7, looking in the direction of the arrow D'. Fig. 9 is a view of the inside of the cord-pulley, with parts cut in section, the view being taken on the plane indicated by the line E E and looking in the direction of the arrow E'. Fig. 10 is a detail rear view of a portion of the frame, showing the ratchet and pawl that prevent the driving-wheel sleeve from rotating backward under the impulse of the driving-spring. Fig. 11 is a side view of these latter parts, and Fig. 12 is a detailed sectional view of a portion of the handle-rod and handle-bar.

The wheels of the bicycle of the drawings are of common construction and are provided with the usual pneumatic tires. The hub of the forward wheel 11 has ordinary antifriction-bearings for supporting the axle at the end of the fork 2, that is connected with the steering-head 3. The upper end of the steering-head is provided with a yoke 4, and pivoted between the ends of the yoke is a sleeve 5, Figs. 1, 2, and 3. This sleeve near each end bears a pair of rolls 6, and freely sliding through the sleeve between the rolls is a rod 7, that at its rear end is connected with a handle-bar 8, which is fitted with any ordinary handles 9. The handle-rod 7 is preferably made hollow and is oblong in cross-section, so that it will not rotate between the rolls 6, on which it freely runs as it is reciprocated through the oscillating sleeve 5. This construction forms a sliding knuckle-joint between the handles and the steering-head—that is, the handles are free to move forward and backward toward and from the steering-head and also to be oscillated vertically, but they cannot be rotated independently of the steering-head, so that they may be utilized for moving the head and turning the steering-wheel.

The head-tube 10 of the frame is supported by the stem of the steering-head on any ordinary antifriction-bearings. From the head-tube 10, extending rearwardly, is a tube 11, a tube 12, and a pair of tubes 13, the tube 11 terminating in a bracket 14, that is connected



with and supports a pair of tubes 15, the tube 12 terminating in a bracket 16, that is connected with and supports another part of the tubes 15, and the tubes 13 terminating in the driving-wheel-axle brackets 17, which support the rear ends of the tubes 15, Figs. 1, 2, and 4.

The tubes 15 are near together where they are connected with the bracket 16, which also supports the saddle 18, and from this point they diverge in both directions, downward to form the rear fork and upward to the bracket 14. The front ends of the tubes 13 diverge as they extend forward from the tube 10, so as to support the forward ends of the tubes 15, with which they are connected some distance in advance of the steering-head, and they also diverge from the tube 10 as they extend rearward to the driving-wheel axle.

The pedal-slide is supported by and moves freely upon the frame-tubes 15. The pedal-slide tubes 19, near each end, are connected by cross-heads 20, that bear rolls 21, which are arranged to run upon flattened upper and lower inner surfaces of the tubes 15. The tubes 19 are some larger in diameter than the tubes 15, which they surround, so they do not make contact therewith, and they are slitted for some distance back from their front ends in order that these ends may be reciprocated beyond the point where the front ends of the tubes 13 are connected with the front ends of the tubes 15, Figs. 2, 5, and 6.

The pedal-bars 22 are adjustably connected with the tubes 19 by bolts and clamp-sleeves, and attached to these bars are pedals having treads 23, toe-straps 24, and foot-rests 25. The pedal-bars are also connected with the tubes 19 by tie-rods 26, Figs. 2 and 4. The cross-head 20, that connects the front ends of the tubes 19, is provided with a pulley 27, which pulley of course moves back and forth as the pedal-slide is reciprocated, and supported by the frame near the steering-head is a pulley 28, Figs. 2 and 3.

The handle-bar 8 is rotatably held by the end of the handle-rod 7, and connected with and wound about the handle-bar is the end of a cord 29, that extends therefrom along a groove in the under part of the rod 7, around the pulley 27, and over the pulley 28 to a cord-pulley 30, connected with the driving-wheel, Figs. 1, 4, and 12.

The cord-pulley is preferably made in the form of a hollow cone with grooves on its outer face, and the cord is wound about the pulley and lies in the grooves with its end attached to that part of the pulley which is the largest in diameter. Balls are located in the interior, between shoulders on this cord-pulley and shoulders formed on a sleeve 31, in order that the cord-pulley may be rotated with but little friction. Carried by the cord-pulley in the interior is a pawl 32, and on the sleeve 31, in position to be engaged by this pawl, there are ratchet-teeth 33. In a shell 34, connected with the frame, is a spring 35,

one end of which is secured to the shell, while the other end is secured to a part of the cord-pulley.

When the cord 29 is pulled so as to unwind and rotate the cord-pulley forward, the pawl engages with the ratchet-teeth and drives the sleeve forward. This movement of the cord-pulley winds up the spring 35, so that when the cord is slackened the tension of this spring will rotate the pulley in a reverse direction and wind up the cord, the pawl when the pulley is moving in this direction traveling freely over the teeth of the ratchet, Figs. 7 and 9.

The sleeve 31 is at each end provided with suitable ball-caps, and between these and ball-cones on the axle 36 balls are located to insure the free rotation of the sleeve. The axle is connected with the brackets 17 at the ends of the frame-tubes in any common manner, and the ball-cones are adjustable along the axle, so that wear can be taken up and the parts can be readily disassembled and assembled when desired, Fig. 7.

Mounted upon the balls, so as to rotate freely independently of the sleeve 31, is the hub 37 of the driving-wheel. Spokes 38 extend from this hub in the usual manner to the ordinary rim 39, that is provided with a common tire 40. In the hub is located a driving-spring 41. The spring shown is made in two similar sections, and the inner ends of the sections are connected with the sleeve 31, while the outer ends are connected with the walls of the hub.

Formed on the sleeve near one end are ratchet-teeth 42, and secured to the frame so as to engage with these teeth is a pawl 43, Figs. 7, 10, and 11.

When the cord is pulled so as to unwind and rotate the cord-pulley forward, the pulley-pawl, through the ratchet-teeth, rotates the sleeve forward, and this, through the medium of the spring, drives the wheel forward. The pull of the cord rotates these parts all forward in such manner that the tendency of the pull of the cord is to drive the wheel forward; but if the wheel does not move forward as rapidly as the pulley and sleeve rotate the energy is stored up in the spring, and this tends to drive the wheel forward while the cord is being rewound upon the pulley. The pawl 43 of the frame that engages with the ratchet-teeth 42 prevents the sleeve from rotating backward while the cord is being rewound.

With a machine constructed in this manner a rider supported by the seat, with his feet on the pedals and his hands grasping the handles, can drive the machine by only working his arms or by only working his legs, or by working both together. When the handles are pushed forward, if the pedals remain stationary, the slackness of the cord resulting from this movement of the handles is taken up by the winding of the cord upon the cord-pulley under the influence of the spring, as



described, and the pulling of the handles backward toward the rider draws the cord taut and causes it to unwind and drive the cord-pulley and wheel forward. The drawing of the pedals backward, if the handles remain stationary, slackens the cord, for the pulley on the end of the pedal-slide over which the cord passes is moved backward, and this allows the cord to be wound upon the cord-pulley, and the pushing of the pedals forward moves the pulley on the pedal-slide forward, and this draws the cord taut and causes it to unwind and drive the cord-pulley and wheel forward. If the handles are pulled backward and the pedals are pushed forward at the same time, of course the cord is drawn by the handles and is also drawn by the movement forward of the pulley on the pedal-slide about which the cord passes. When both are moved together, the power of the pull of the arms and the power of the straightening out of the legs is transmitted through the cord to the driving-wheel. When operated in this way, great force can be expended for driving the wheel and high speed obtained. The cord-pulley is made cone-shaped, so that the leverage of the cord upon the pulley becomes greater as the cord unwinds and the driving-spring becomes more tense. The handles are free to be moved vertically, and they slide freely between the rolls in the sleeve that connects the bar with the steering-head; but of course proper oscillation of the handles side-wise will steer the machine in the desired direction.

The parts of this machine are comparatively simple to construct, and they can be assembled in such manner that there will be but little friction when running. When it is desired to take the feet from the pedals, they may be placed on the supports connected with the pedals. As the handle-bar is held rotarily connected with the handle-rod, the cord can be wound or unwound for shortening or lengthening to enable the use of different windings of the cord on the pulley in order to increase or diminish the leverage exerted on the driving-spring, according to the condition of the rider or the road on which he is traveling.

I claim as my invention—

1. In combination in a velocipede, wheels, a frame supported by the wheels, handles loosely connected with the frame and adapted to be given a free reciprocation, pedals loosely connected with the frame and adapted to be given a free reciprocation, and a continuous flexible connection between the handles, the pedals and the driving-wheel, substantially as specified.

2. In combination in a velocipede, wheels, a frame supported by the wheels, handles loosely connected with the rotatable steering-head and adapted to be given a free reciprocation, a driving-spring connected with the driving-wheel, a sleeve connected with the driving-spring, a ratchet-and-pawl connec-

tion between the sleeve and the frame, a cord-pulley, a ratchet-and-pawl connection between the cord-pulley and the sleeve, a spring connection between the cord-pulley and the frame, and a flexible connection between the handles and the cord-pulley, substantially as specified.

3. In combination in a velocipede, wheels, a frame supported by the wheels, pedals loosely connected with and adapted to be given a free reciprocation along the frame-tubes, a driving-spring connected with the driving-wheel, a sleeve connected with the driving-spring, a ratchet-and-pawl connection between the sleeve and the frame, a cord-pulley, a ratchet-and-pawl connection between the cord-pulley and the sleeve, a spring connection between the cord-pulley and the frame, and a flexible connection between the pedals and the cord-pulley, substantially as specified.

4. In combination in a velocipede, wheels, a frame supported by the wheels, handles loosely connected with the frame and adapted to be given a free reciprocation, pedals loosely connected with the frame and adapted to be given a free reciprocation, a spring driving mechanism connected with the driving-wheel, and a continuous flexible connection between the handles, the pedals and the driving-spring for placing the spring under driving torsion, substantially as specified.

5. In combination in a velocipede, wheels, a frame supported by the wheels, handles having a free reciprocation, a sleeve loosely supporting the handles and pivotally connected with the steering-head, reciprocating pedals, and a continuous flexible connection between the handles the pedals and the driving-wheel, substantially as specified.

6. In combination in a velocipede, wheels, a frame supported by the wheels, handles connected with the frame and adapted to be given a free oscillation and reciprocation, pedals loosely connected with the frame and adapted to be given a free reciprocation, and a flexible connection attached to the handles and attached to the driving-wheel and loosely passing around a portion attached to a part connected with the pedals, substantially as specified.

7. In combination in a velocipede, wheels, a frame supported by the wheels, handles rotarily connected with a handle-rod, said handle-rod having a free reciprocation and an oscillation, pedals loosely connected with the frame and adapted to be given a free reciprocation, and a flexible connection attached to the handles and to the driving-wheel and loosely passing around a portion attached to a part connected with the pedals, substantially as specified.

8. In combination in a velocipede, wheels, a frame supported by the wheels, handles connected with the frame and adapted to be given a free reciprocation, a pedal-slide having wheels which run upon portions of the frame-tubes, pedals connected with the pedal-



slide, and a continuous flexible connection attached to the handles and attached to the driving-wheel and loosely passing around a part attached to the pedal-slide, substantially as specified.

9. In combination in a velocipede, wheels, a frame supported by the wheels, handles loosely connected with the frame and adapted to be given a free reciprocation, pedals connected with the frame and adapted to be given a free reciprocation, a cone cord-pulley adjacent to the driving-wheel, a continuous flexible connection between the handles, pedals and cord-pulley, a spring for rotating the cord-pulley in one direction, a pawl connected with the cord-pulley, a ratchet borne by a sleeve and adapted to be engaged by the pawl, a hub, and a spring located within the hub with its inner end connected with the sleeve and its outer end connected with the hub, substantially as specified.

10. In combination in a velocipede, wheels, a frame supported by the wheels, handles

loosely connected with the frame and adapted to be given a free reciprocation, pedals loosely connected with the frame and adapted to be given a free reciprocation, a cord-pulley rotatably mounted adjacent to the driving-wheel, a flexible connection between the handles, the pedals and the cord-pulley, a spring for turning the cord-pulley in one direction, a pawl borne by the cord-pulley, a sleeve rotatably mounted upon the axle of the driving-wheel and bearing a ratchet that is adapted to be engaged by the cord-pulley pawl and a ratchet that is adapted to be engaged by a pawl connected with the frame, a hub rotatably mounted upon the sleeve, and a spring located within the hub with its inner end connected with the sleeve and its outer end connected with the hub, substantially as specified.

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