

No. 665,681.

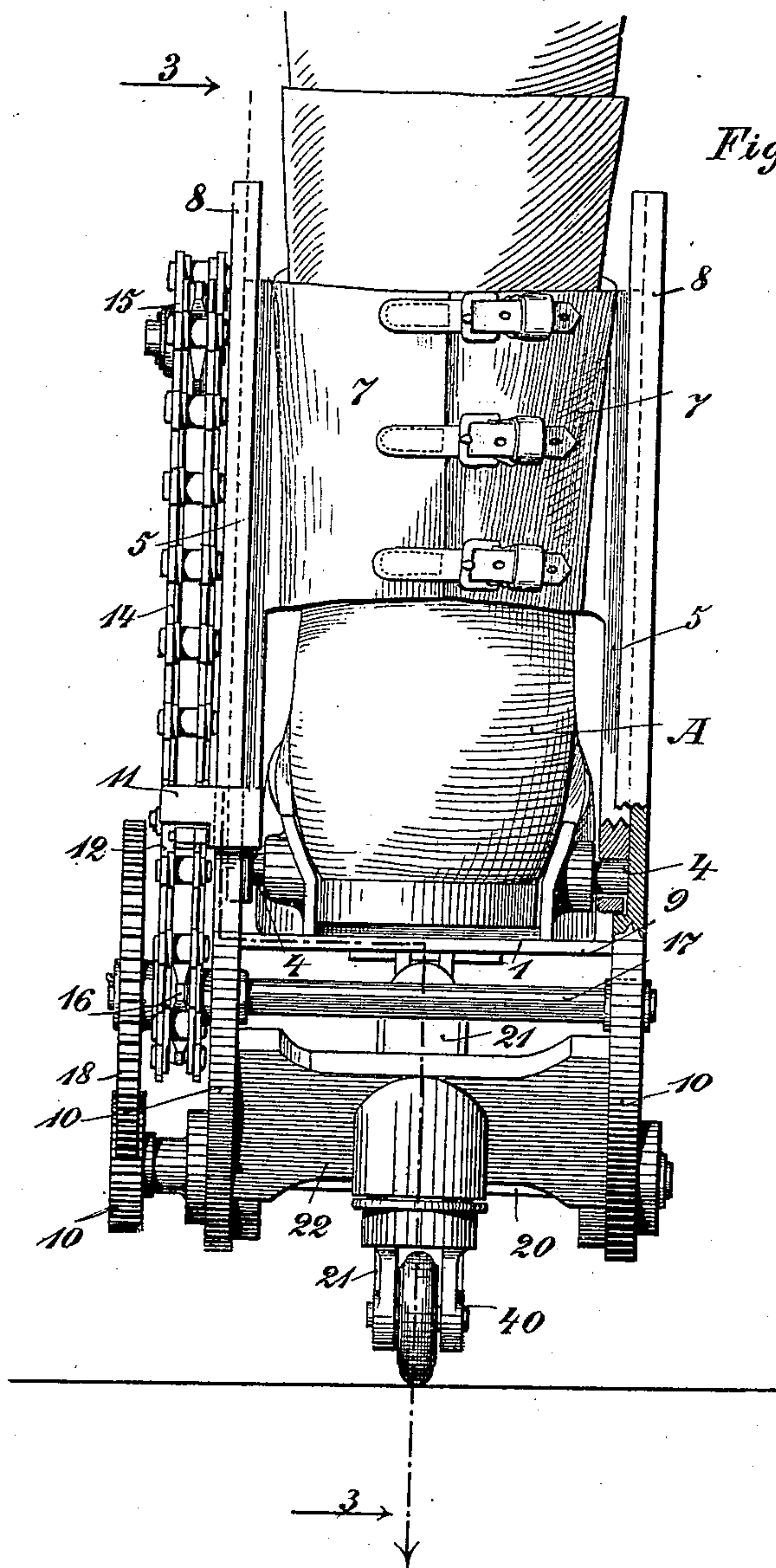
Patented Jan. 8, 1901.

H. HEINRICH.
FOOT CYCLE.

(Application filed Feb. 6, 1900.)

(No Model.)

5 Sheets—Sheet 1.



Witnesses:
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H P Hammond

Inventor:
Heinrich Heinrich
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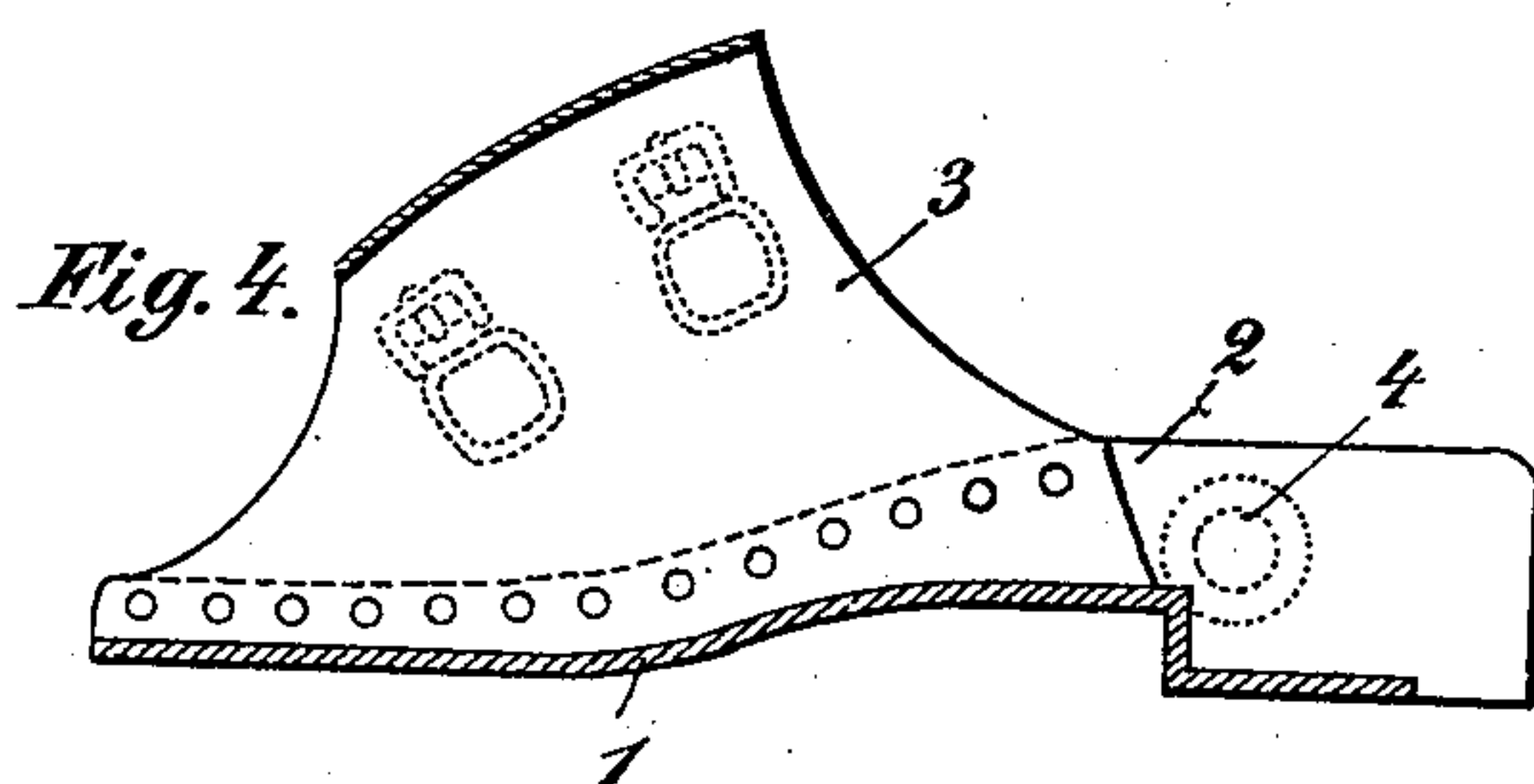
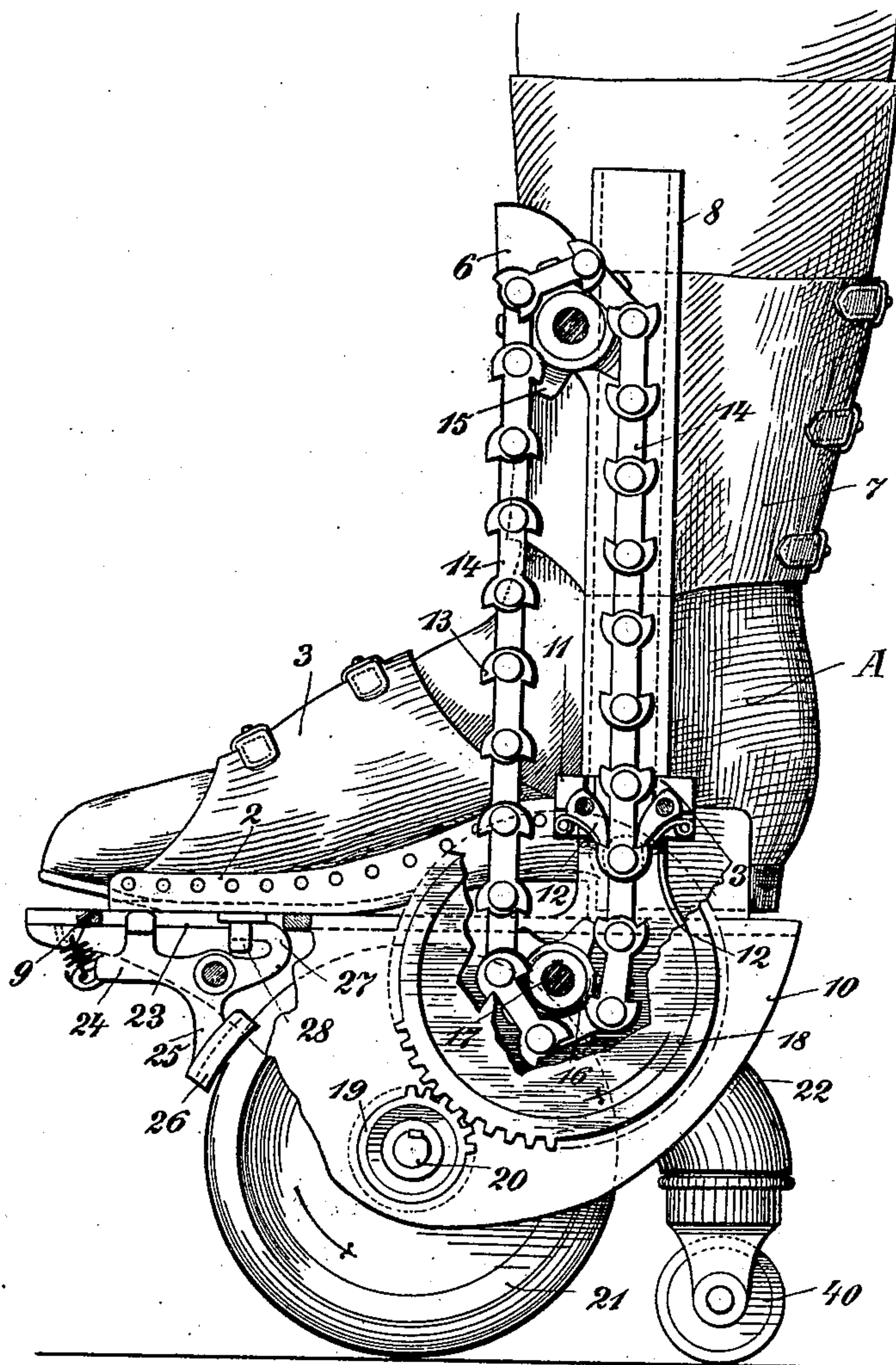
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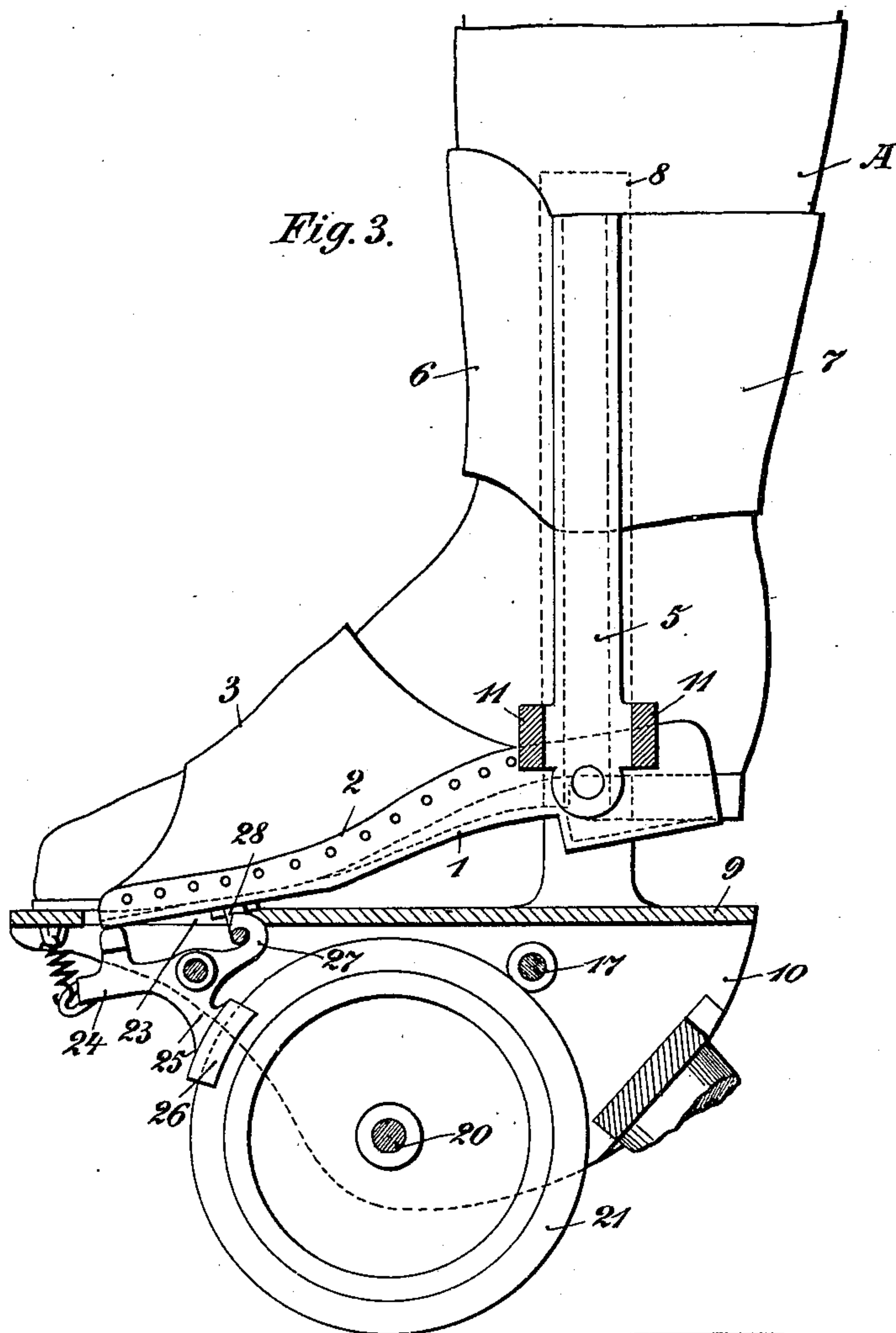
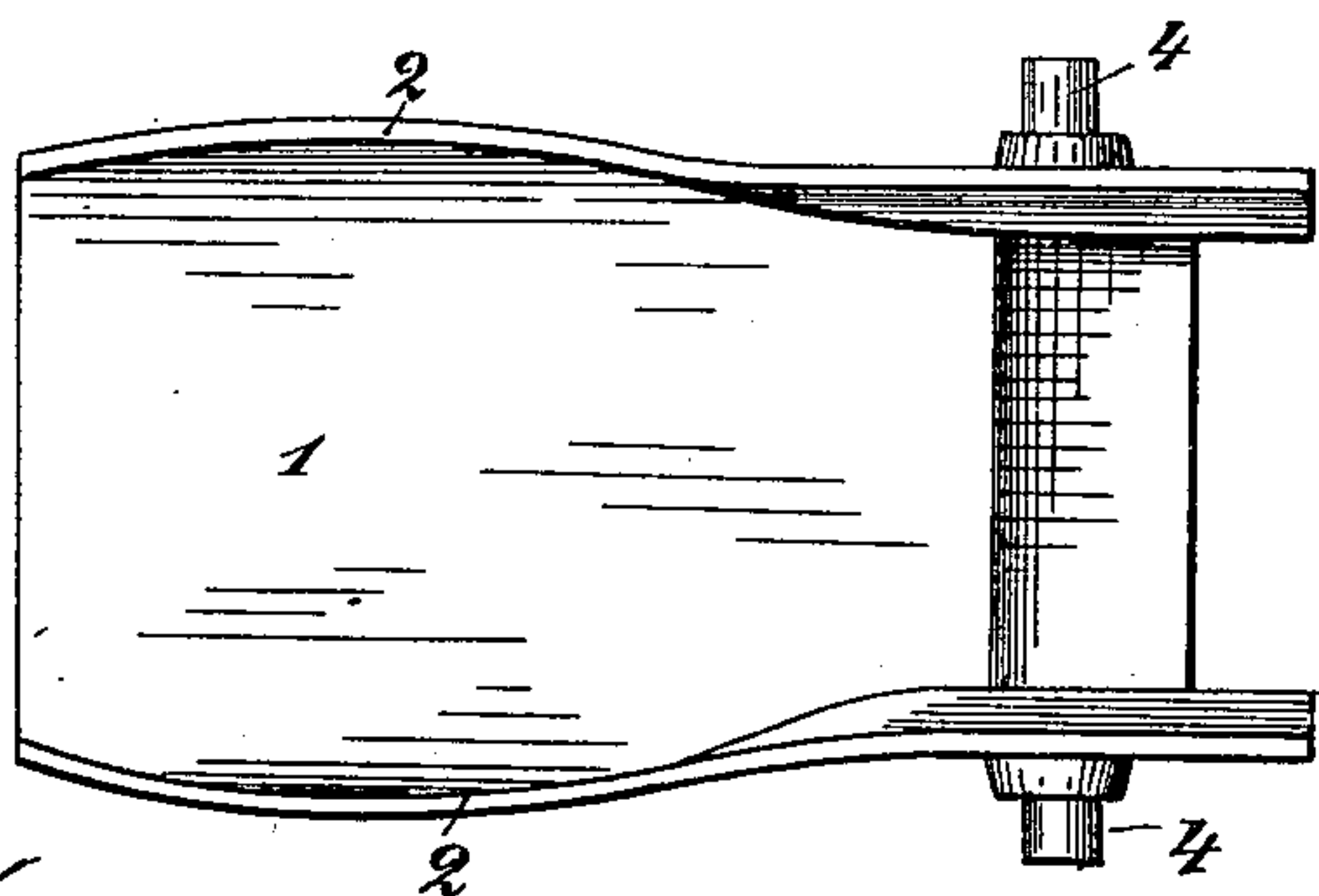


Fig. 5.



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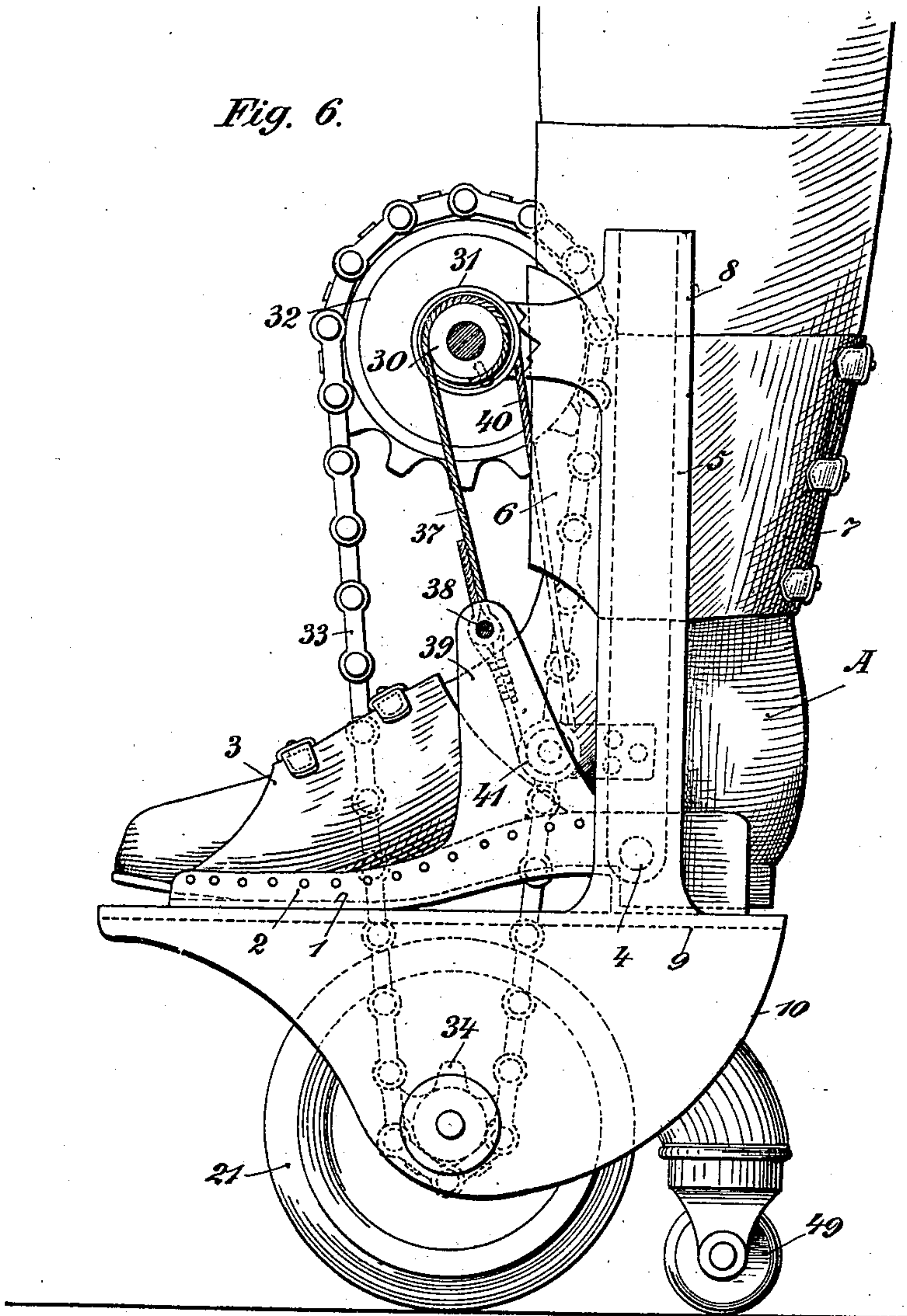
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(No Model.)

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Fig. 6.



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(Application filed Feb. 6, 1900.)

(No Model.)

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Fig. 7.

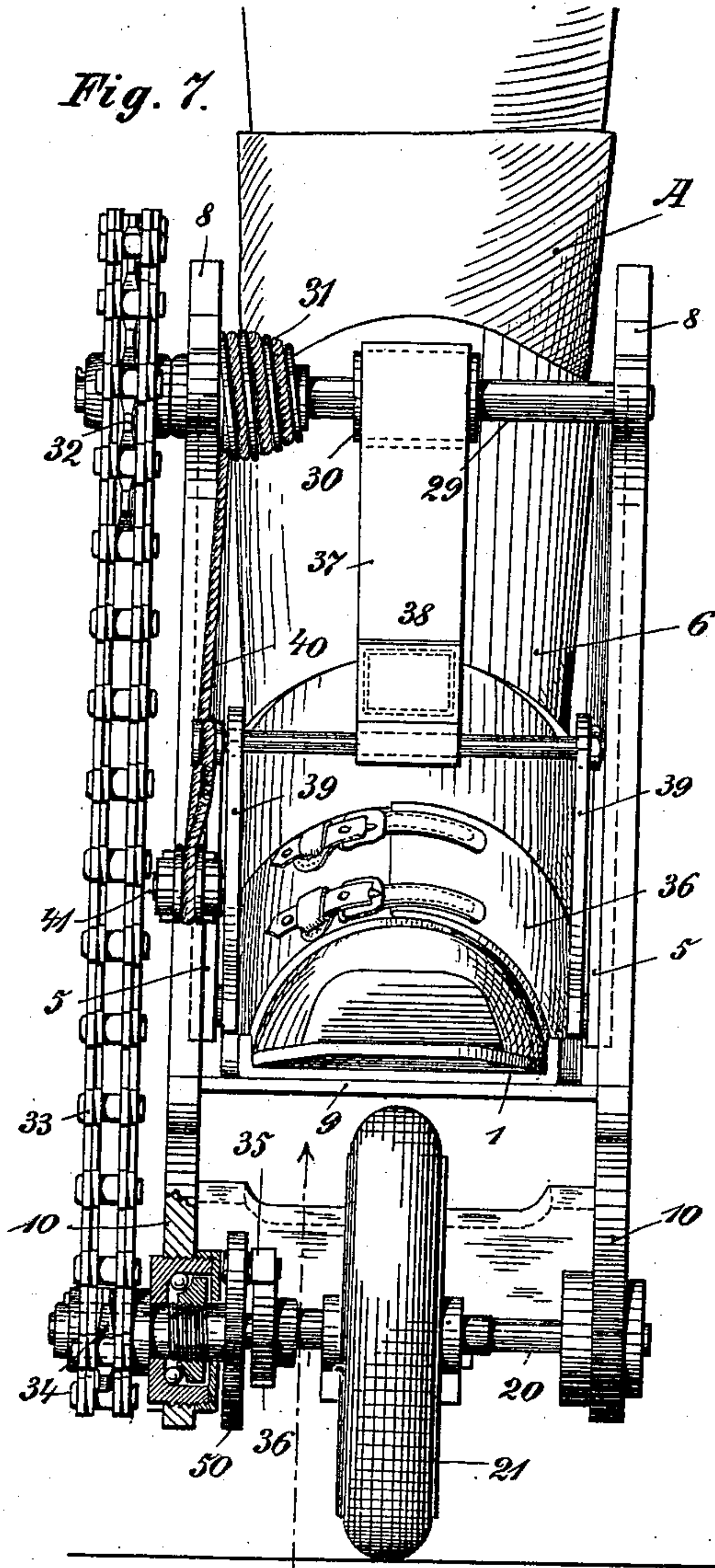
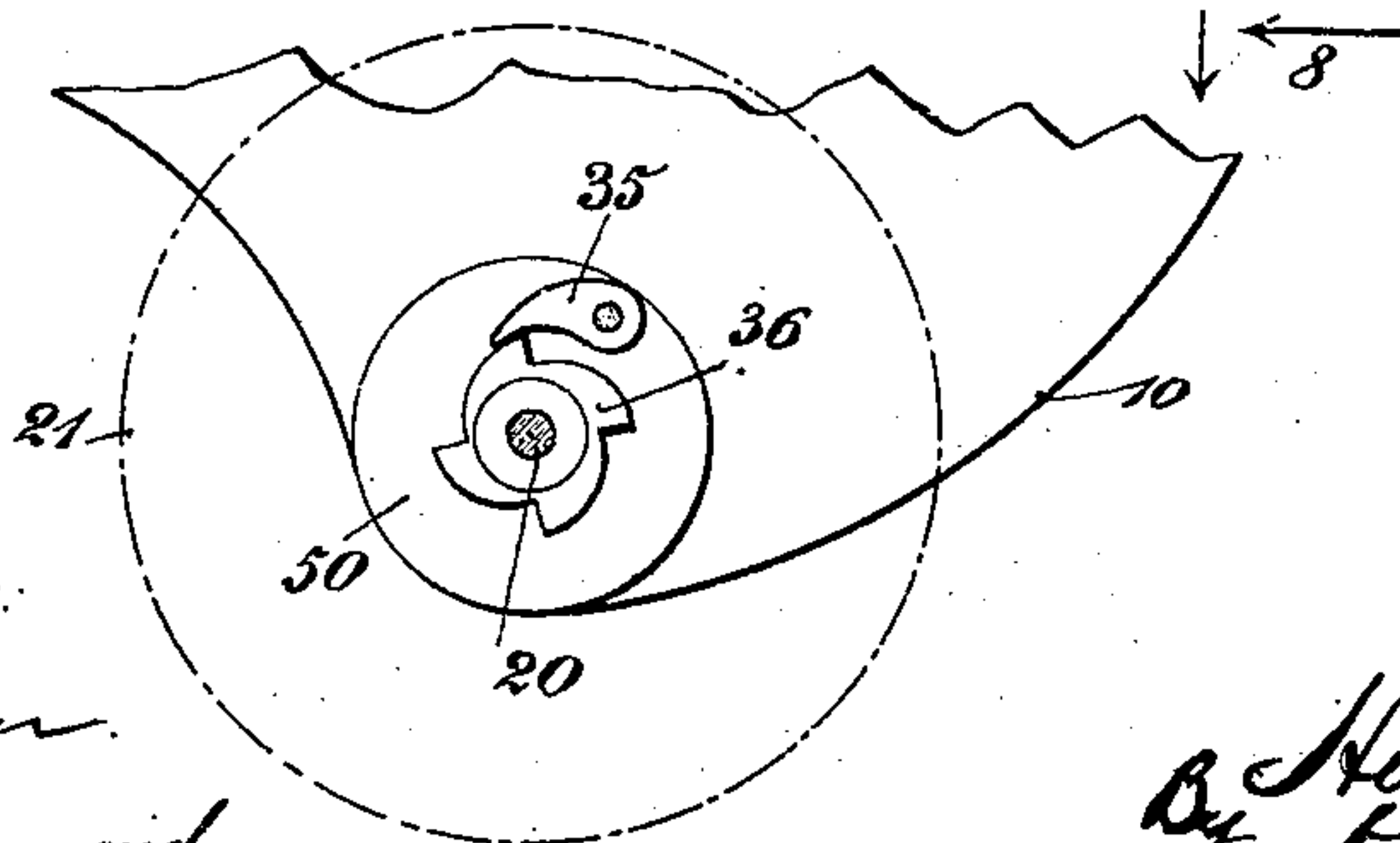


Fig. 8.



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UNITED STATES PATENT OFFICE.

HEINRICH HEINRICH, OF DARMSTADT, GERMANY.

FOOT-CYCLE.

SPECIFICATION forming part of Letters Patent No. 665,681, dated January 8, 1901.

Application filed February 6, 1900. Serial No. 4,268. (No model.)

To all whom it may concern:

Be it known that I, HEINRICH HEINRICH, student of electricity, a subject of the Grand Duke of Hesse-Darmstadt, residing at 75 So-

5 derstrasse, Darmstadt, in the Grand Duchy of Hesse-Darmstadt and Empire of Germany, have invented certain new and useful Improvements in Foot-Cycles, of which the following is a full, clear, and exact description.
10 The foot-cycle forming the subject of the present invention is adapted to be attached under the person's foot with its driving-wheel as nearly as possible directly under the middle of the foot, the springs for raising the foot
15 usually found in such contrivances being omitted, the movements of the foot or leg being left altogether to the control of the person, and the support being thus steady and solid even when the person is at rest. This
20 arrangement of the driving-wheel under the middle point of pressure of the wearer's foot enables the person to move in smaller circles than the usual constructions.

In the accompanying drawings, Figure 1 is a
25 rear view of one form, showing the left leg of a person equipped with the contrivance from the outside. Fig. 2 is an outside view. Fig. 3 is a vertical section through the apparatus along the line 3 3 in Fig. 1. Figs. 4 and 5 are
30 a longitudinal section and a top view of the foot-plate on which the foot rests. Figs. 6 and 7 are a side and front view of a second form of the apparatus. Fig. 8 shows a component part of Figs. 6 and 7, which is more
35 particularly described below.

It has already been stated that an apparatus is attached to each foot, as shown in Figs. 1 and 2 or Figs. 6 and 7, and it is sufficient, therefore, to describe one apparatus particularly in
40 its effect and construction, since the two are similar, and the only difference is that they come into operation alternately in accordance with the up-and-down movement of each foot. Each apparatus is operated in such a way that
45 when the one foot is in its lowest position, as shown in Figs. 1 and 2 and 6 and 7, the other foot is moved upward and then brought down with force, and by this means the apparatus attached to it brings about the motion of the
50 wearer. At every downward movement of, for instance, the right foot the left foot can be raised or it can be kept in its lowest po-

sition until the descending foot has attained its lowest position. In the same way the right foot can act while the left is at rest. The
55 adjacent sides—viz., the inner side of the apparatus—can be connected by simple means in such a way that the feet remain in the same vertical plane until a strong forward or backward movement breaks the connection com-
60 pletely, so that the wearer may with one foot in the roadway with the other step easily upon the curb of the pavement even when it is a high one. The object of this is to enable the
65 wearer in case of necessity to leave the street and gain the pavement with ease and rapidity. Such simple easily-disconnected lateral connections can be constructed in various
ways; but as they constitute no essential necessary part of the present apparatus they are
70 not separately shown.

In the drawings, A is in Figs. 1 to 3 the left foot and in Figs. 7 and 6 the right foot. The foot rests on a plate 1, to the side of which two
75 leather flaps 3 are firmly attached, which firmly clasp the foot, as shown in Figs. 2 and 3, and hold it down firmly on the plate 1. This plate is connected, by means of two lateral pins 4, with two vertically-sliding rods 5,
80 transmitting power, but still movable, which rods are fixedly connected above by a plate 6 and have also leather flaps 7, which, along with the plate 6, which is of metal padded on
its inside, serve to connect the rods 5 with the leg and to grip the latter firmly. The two
85 rods 5 can move up and down vertically in the guides 8, which are immovably attached to the under frame of the contrivance, which consists of a horizontal bed-plate 9 and bearing-plate 10, or the guides may be in one piece
90 with the same. Each leg is fitted with one of these contrivances, as shown in Figs. 1 and 2, and the two contrivances work alternately as propellers in such a way that the one always runs free while the other is at work.
95 The alternate movements take place at intervals corresponding approximately to those usual in operating the pedals of a bicycle. The rods 5 run in the guides 8 in such a way
100 that the leg may easily be lifted without the rest of the constructive parts 8, 9, and 10 being lifted. These, on the other hand, always remain on the ground through their own weight.

In the construction shown in Figs. 1 and 2

two arms 11 are attached to each rod 5, which encircle horizontally the guides 8 and have a pawl 12 on each of their free ends. When the leg is moved upward, the two pawls 12 jump the teeth 13 of an endless chain 14, which runs over chain-wheels 15 and 16, of which the former, 15, is fixed to revolve freely on the outer guiding-slot 8, Fig. 1, left, while the other is connected so as to transmit power with a large gear-wheel 18 by means of an axle 17, revolving in bearings on the plates 10. In Fig. 2 this wheel 18 is partially broken away to show the wheel 16 more clearly. The toothed wheel 18 works in the smaller wheel 19, which by means of the axle 20 is fixedly coupled with the driving-wheel proper, 21. For the revolving axle and, in fact, for all the revolving parts ball-bearings may be provided. The wheel 21 takes the whole weight of the wearer when, for example, the one leg is extended or nearly extended and the foot rests by means of its plate 1 upon the plate 9 while the other foot is raised.

The trail-wheel 40, suitably attached to the under frame 9 and 10—*e.g.*, by means of a traverse 22—is as a rule little used and is chiefly employed for standing upright when coasting on inclines or steep roads.

It has already been stated that the pawls jump the ascending teeth, but as soon as the foot has attained its highest position and begins to move down the pawls 12 engage the teeth 13 and drive the corresponding driving-wheel by means of the chain 14 and wheels 16, 18, and 19. The driving-wheel revolves on the ground, and thereby moves the whole apparatus and the wearer.

To put the brake on, the toe of one foot or the toes of both feet are made to rest, as shown in Fig. 3, on for forward position of the plate 9. By this means the two front edges of the plate 1 are pressed downward, as shown in Fig. 3, through the openings 23 of the plates 9, whereby by means of the levers 23 24 the two brake-blocks 26 are pressed against the wheels 21. Each lever 24 25 is further provided with a hook 27, which engages an eye 28 of each foot-plate 1 as soon as the foot is brought into the position shown in Fig. 3. It is also possible by this arrangement to raise the apparatus conveniently in stepping to and from a pavement on a higher level.

It is evident that by means of the alternate up and down movements of both feet a continuous forward motion is produced.

In Figs. 6, 7, and 8 a different driving mechanism is shown. Fig. 6 shows the right foot from the inside, and Fig. 7 the same foot from the front. 29 is an axle which rests in the guide 8, so as to revolve easily and with

a pulley or barrel 30. It also supports fixedly a cord-pulley made like a conical screw. On the axle 29 there is situated a large fixed chain-wheel 32, which by means of the chain 33 and the small chain-wheel 34 drives the wheel 21. The small chain-wheel 34 is not fixed, but revolves freely on the axle 20 and is fixedly connected with the pulley 50, which supports a pawl 35, which as soon as the chain moves forward by means of the ratchet-wheel 36 engages the axle 20 and correspondingly the wheel 21. Over the pulley 30 a strap 37 is laid, the lower end of which is connected with the foot-plate 1, so as to transmit power, by means of the transverse bar 38 and the side pieces 39. The upper end of the strap 37 is firmly attached to the pulley 30, so that when the axle 29 is revolved the pulley 30 winds up the strap 37. This winding up takes place whenever the foot is raised and is effected by the cord 40, whose upper end is fixedly connected with the pulley 31, being drawn by the bar 38 downward over a pulley 41 and then again upward. The strap 37 and the cord 40 wind and unwind themselves alternately, and the object of 40 is to insure the regular winding up of the strap 37. The cord-pulley 31 must have the form of a conical screw, because the velocity of the axle 29 would otherwise be proportionately retarded when the strap was wound up on account of the increase of the radius. Therefore the cord-pulley 31 must have an increasing diameter to keep pace with the winding up of the strap 37.

What I claim, and desire to secure by Letters Patent, is—

A foot-cycle comprising a plate adapted to be attached to a foot or shoe of the wearer, a frame pivoted to such plate, a driving-wheel journaled in such frame and driving connections for said wheel connected to and operated by the relative movement of the plate and frame, under the positive action only of the wearer's foot, the said wheel being located substantially directly under the middle bearing-point of the foot, and said driving means comprising an endless chain connected to drive said driving-wheel and supporting-wheels therefor, carried by said frame, and a pawl device connected to aforesaid plate so as to be movable with the foot, and engaging with said chain, substantially as and for the purpose set forth.

In witness whereof I subscribe my signature in presence of two witnesses.

HEINRICH HEINRICH.

Witnesses:

KARL BOHNENSTIEL,
CHRISTIAN HEINRICH.