

(No Model.)

2 Sheets—Sheet 1.

J. E. BYRNE.
ELEVATING MACHINE.

No. 404,893.

Patented June 11, 1889.

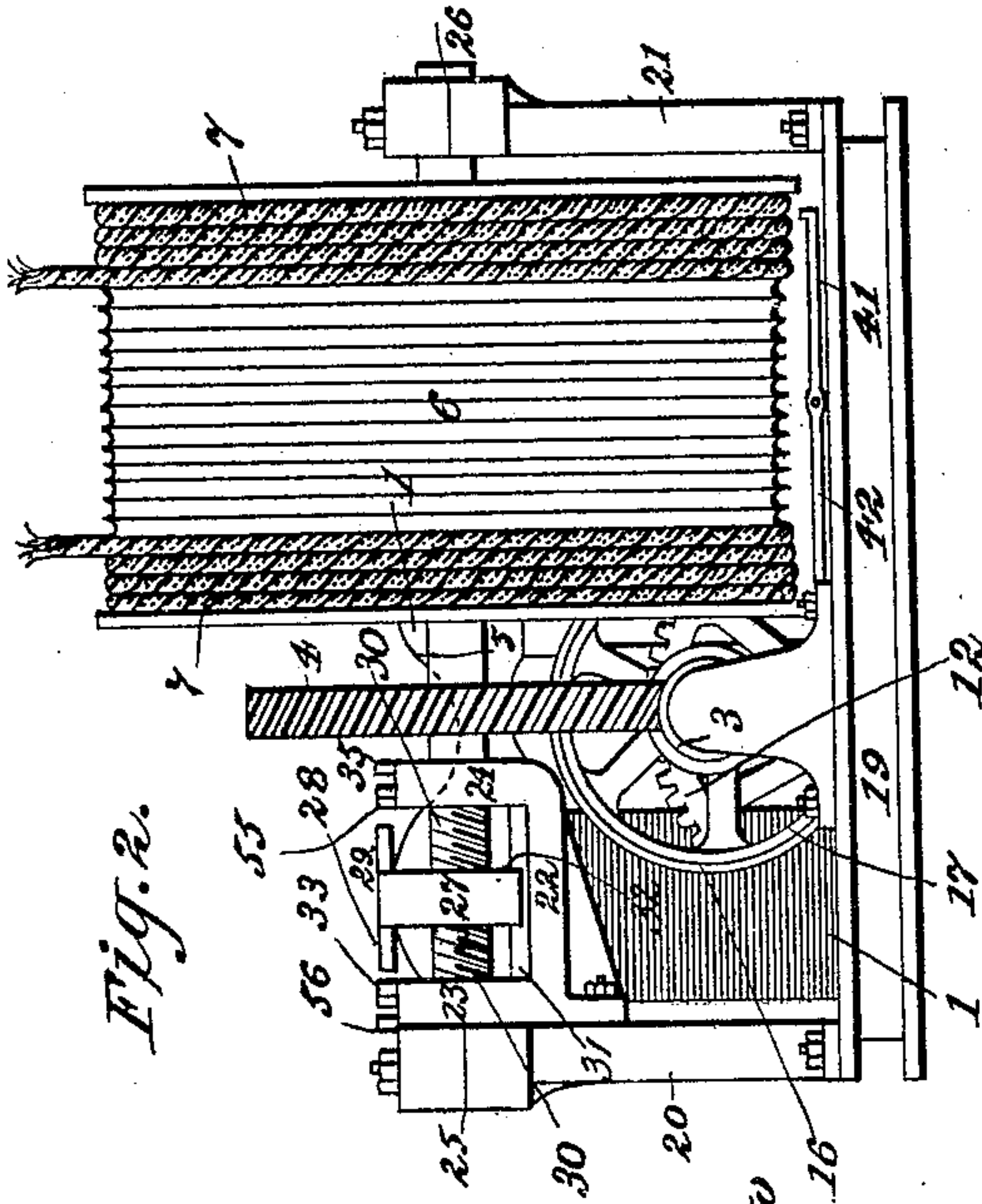


Fig. 2.

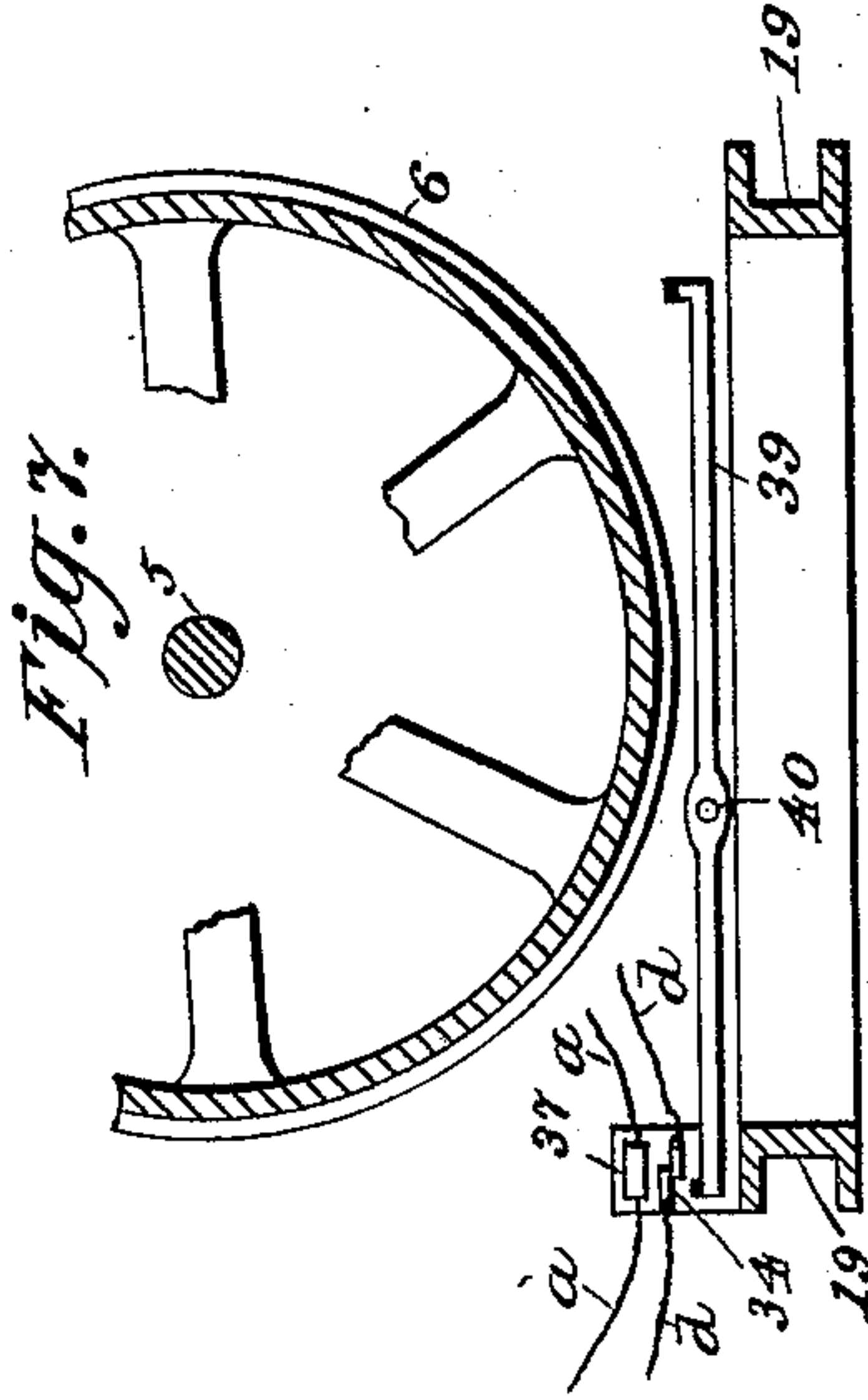


Fig. 7.

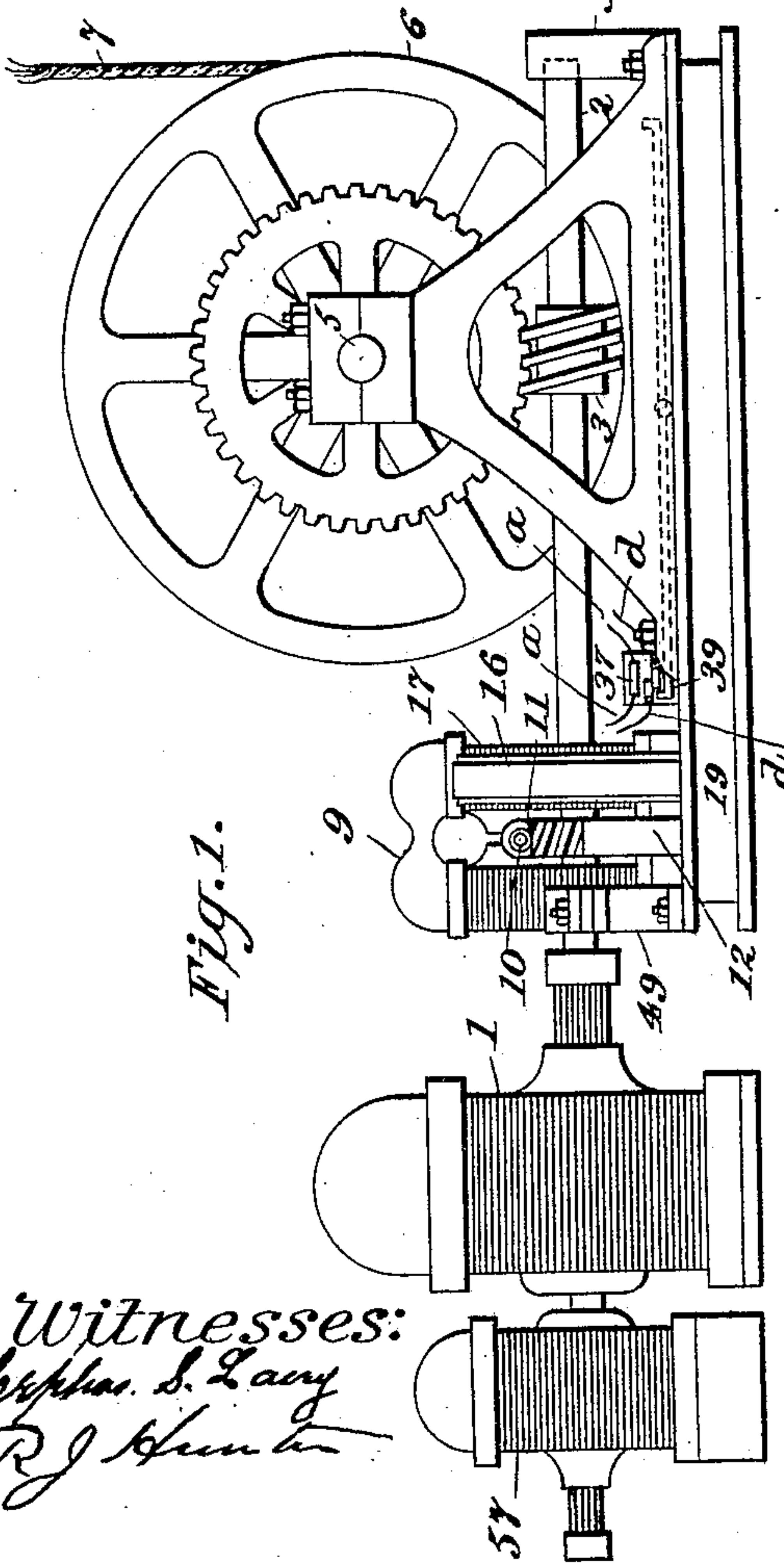


Fig. 1.

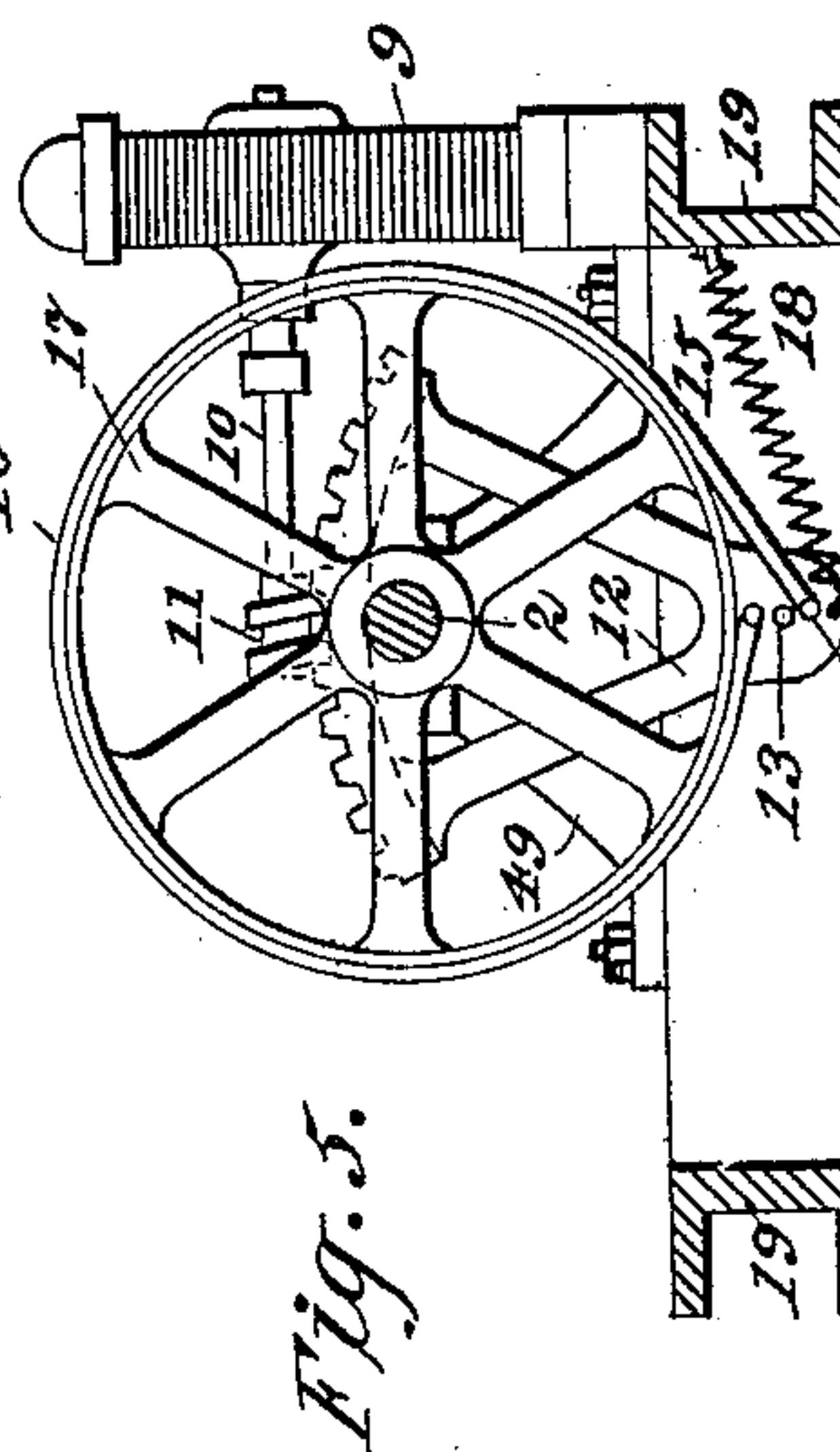


Fig. 5.

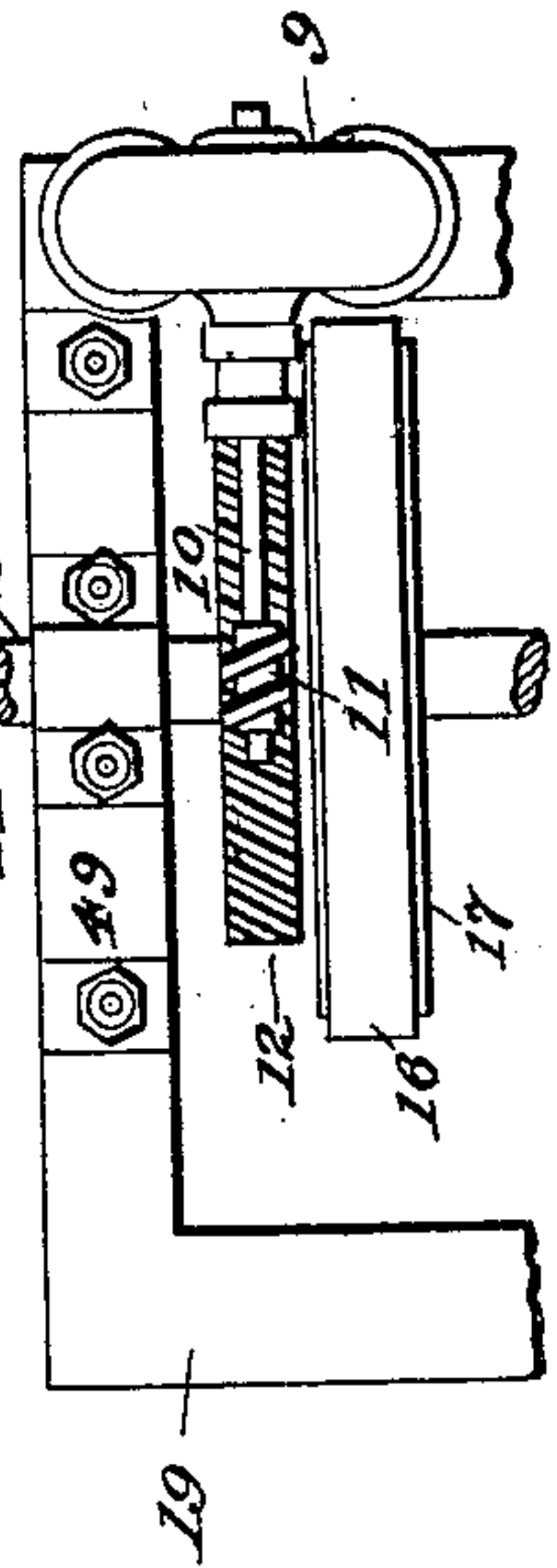


Fig. 6.

Witnesses:
Charles S. Lacy
R. J. Hunter

Inventor:
James Edwin Byrne

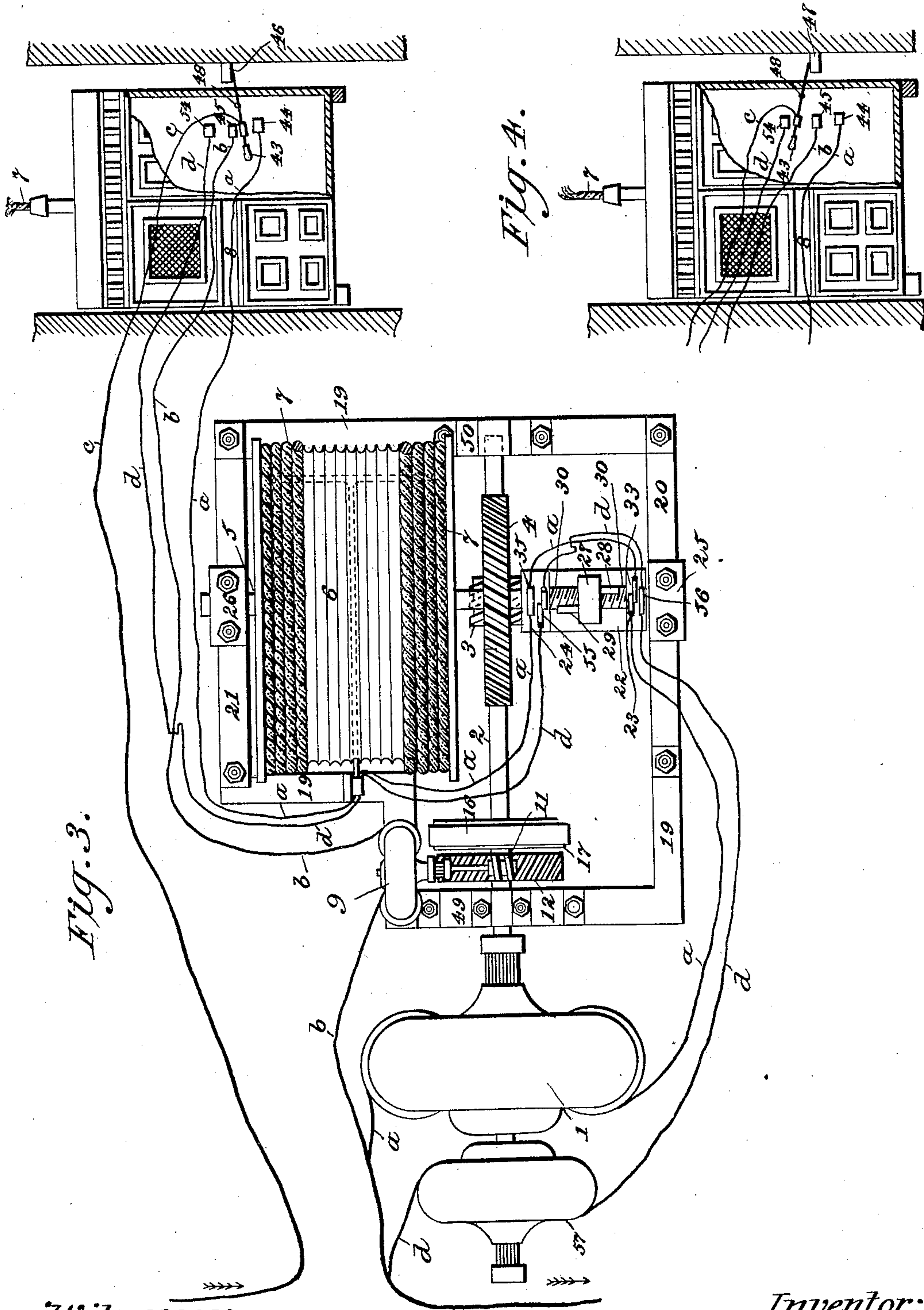
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UNITED STATES PATENT OFFICE.

JAMES EDWIN BYRNE, OF BROOKLYN, NEW YORK.

ELEVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 404,893, dated June 11, 1889.

Application filed August 10, 1888. Serial No. 282,477. (No model.)

To all whom it may concern:

Be it known that I, JAMES EDWIN BYRNE, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Electric Elevating-Machines, of which the following is a specification.

My invention relates to improvements in elevating machinery in which a rotating drum operates in connection with cables, which, being attached to a suitable car, gives it upward or downward motion, automatic top and bottom and intermediate safety-stops operating in conjunction therewith; and the objects of my improvement are, first, to substitute electric motive power for those now in use; second, to substitute in place of the present safety mechanical arrangements on the machine for automatically reversing the motion of the elevator-car at the top or bottom of the hoistway, or at an intermediate point if the car should meet an obstruction in its descent, thereby causing the car to stop in the hoistway and the hoisting-cables to unwind from the drum, and commonly known, respectively, as "automatic top and bottom stops" and "automatic intermediate stop," automatic stops that operate in connection with electric circuits; third, to provide a form of machine that can be operated in a simple manner by means of electric circuits and a switch in the car; fourth, to substitute for the mechanical arrangement for operating the brake an electrical device which is operated from the switch in the car; fifth, to provide a means of automatically reversing the position of the switch at the top and bottom of the hoistway, thereby reversing the motion of the car and preventing accident, thus forming additional top and bottom automatic stops; and, sixth, to substitute for the present elevator-machines with winding-drums one more simple and efficient and especially adapted for passenger-service. I attain these objects by mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the machine with hoisting-cables wound on and leading up from winding-drum. Fig. 2 is an end elevation of the machine with hoisting-cables wound on and leading up from winding-drum.

Fig. 3 is a top view of the machine with hoisting-cables wound on and leading up from winding-drum in connection with a side elevation of the top of the elevator-shaft with parts broken away, and the elevator-car with parts broken away, showing the switch in connection with automatic mechanism for reversing it. This figure also shows a diagram of the electric-circuit connections between the car-switch, the automatics, and the electric motors, together with their make and break contacts. Fig. 4 is a side elevation of the bottom of the elevator-shaft with parts broken away, showing the car with parts broken away, and the switch in connection with automatic mechanism for reversing it. Fig. 5 is an enlarged view, in side elevation, of the brake and mechanism with electric motor for operating the same, the rest of the machine being broken away. Fig. 6 is an enlarged view, in plan, of the brake and mechanism, with electric motor for operating the same, the rest of the machine being broken away. Fig. 7 is a side elevation of the intermediate stop mechanism and the winding-drum and machine-base, the two latter being with parts broken away.

Similar figures and letters refer to similar parts throughout the several views.

The base 19 and the standards 20, 21, 49, and 50 form the bed of the machine. The electric hoisting-motor 1 and the backing-motor 57 being secured to the worm-shaft 2, give motion in either direction directly to the worm-shaft 2, which has fastened on it the worm 3, meshing into the worm-wheel 4, which is fastened to the drum-shaft 5, with bearings 25 and 26, in standards 20 and 21, which drum-shaft has fastened to it the hoisting-drum 6 and causes the hoisting-drum 6 to revolve, thereby winding the hoisting-cables 7 and hoisting the elevator-car 8. The electric brake-motor 9, giving motion directly to the brake-worm shaft 10, which has fastened on it the brake-worm 11, meshing into the swinging worm-segment 12, which is pivoted at point 13, and has attached to it at points 14 and 15 the brake-strap 16, causes the brake-strap 16 to grip the brake-wheel 17, whereupon the brake-wheel 17, being attached to the hoisting-worm shaft 2, stops the motion of

the said hoisting-worm shaft 2 when the electric hoisting-motor 1 is not in operation. The spring 18, being attached to the machine-base 19 and to the swinging worm-segment 12, draws back the segment 12 when the brake-motor 9 is not in operation, thereby slackening the brake-strap 16. To the standard 20 is attached the ribbed bracket 22, through the perforated arms 23 and 24 of which passes the drum-shaft 2 to its bearing 25. On the portion of the drum-shaft 2 included between the arms 23 and 24 is cut a screw-thread 30, and along which travels a nut 27, carrying insulated arms 28 and 29, the traveling nut 27 being prevented from turning by means of a feather 31 on the bracket 22, which slides through a slot 32, let into the nut 27. On the bracket-arms 23 and 24 are located the machine top and bottom automatic stop contact-points 33, 35, 55, and 56, so arranged and at such a distance apart that spring contact-point 33 will be struck by the insulated arm 28, and thereby, in a manner to be hereinafter explained, cause the elevator-car to be automatically reversed only after the elevator-car has passed its upper landing, and thus prevent its wrecking itself in the top of the hoistway, if from any cause it should not be controlled in the usual manner by the car-operator, and contact-point 55 will be struck by the insulated arm 29, and thereby, in a manner to be hereinafter explained, alter the direction of motion of the elevator-car, and thus prevent its wrecking itself in the bottom of the hoistway, if from any cause the operator should fail to stop it.

On the machine-base 19 are located the intermediate automatic stop contact-points 37 and 34, so arranged as to be struck by the end of the lever 39, which lever 39 is fulcrumed at point 40 and has arms 41 and 42 extending along the bottom of the drum 6, and thereby, in a manner to be hereinafter explained, cause the elevator-car to be reversed, and thereby prevent accident when from any cause the downward progress of the elevator-car is impeded by an obstruction while the machine is in motion, thereby causing the cables 7 to unwind from the drum, the weight of which, falling on the arms 41 and 42, causes the lever 39 to operate.

The operation of the machine is as follows: The battery-wire *c* is connected with the switch 43 in the car, the hoisting-machine motor 1, wire *a*, is connected with the contact-point 44 in the car, the lowering-machine motor 57, wire *d*, is connected with the contact-point 54 in the car, and the brake-motor 9, wire *b*, is connected with the car contact-point 45. Electrical contact being made in the car between wires *c* and *a* by means of the switch 43 and contact-point 44, the motor 1 is started and the machine is set in operation to hoist the car 8. Contact now being broken between wires *a* and *c* by means of switch 43 and made between wires *b* and *c* by means of switch 43, the motor is first stopped, and then the brake-

motor 9 being set in operation the brake acts instantly to overcome any existing inertia of the machine and car. Contact now being broken between wires *b* and *c* by means of switch 43 and then made by means of switch 43 between wires *c* and *d*, the brake is first slackened by action of spring 18, and then motor 57 starts, reversing the motion of the worm-shaft 2 and lowering the car 8. Well-known forms of motors, with suitable tangential brushes that will admit of this reversal of the direction of motion of worm-shaft 2, are to be used.

For the purpose of showing the operation of the automatics, we will now suppose the car at the top landing and the brake on and breaking contact at contact-point 45 by means of the switch 43, thus throwing off the brake, and, making contact between switch 43 and contact-point 54, cause the car to descend until an obstruction is accidentally met with in the hoistway, thus preventing the car from descending any farther and causing the ropes to unwind from the drum 6. The ropes, now falling by their own weight on the lever-arms 41 and 42, cause the lever 39 to operate and break contact in circuit *d* at contact-point 34 and instantly make contact at contact-point 37 between wires *c* and *a* through a portion of the wire *d*, thereby causing the machine-motor 1 to start, and thus prevent the ropes from unwinding farther, and at the same time by the agitation of the car attract the car-operator's attention to the state of affairs. The obstruction being now removed, the car descends to the lower landing, where the operator neglects to stop it and the car attempts to go farther. As the car travels on a short distance farther, the insulated arm 29 comes in contact with the contact-point 55, breaking the circuit *d* and making connection between the wires *a* and *c* through a portion of the wire *d* and starting the machine-motor 1. The car-operator now making connection between wires *a* and *c*, by means of the car-switch 43 and the contact-point 44, the car is started upward until, on reaching the top landing, the operator neglects to stop it. The insulated arm 28 on the machine, as the car attempts to ascend farther, breaks the circuit *a* at the spring-contact points 33 and instantly makes contact between the wires *c* and *d* through a portion of the wire *a*, and the motor 57 starts, causing the car to descend until the arm 28 moves away from the spring contact-points 33, and thus allows the circuit *a* to be again closed, the vibration of the car caused by the alternate making and breaking of the circuit calling the attention of the operator.

As an additional set of automatic top and bottom stops, the switch 43 is fulcrumed at point 48 and extends through the side of the car, so as to come in contact with the projection 46, attached to one of the sides of the top of the hoistway, and when the car attempts to ascend beyond the upper landing to shift

it and cause the contact between the wires *c* and *a* at contact-point 44 to be broken and contact to be made between wires *c* and *d* at contact-point 54, thus reversing the motion of the car. In the same manner, when the car attempts to go below the bottom landing the switch-arm strikes the projection 47, which causes the switch to break contact between wires *c* and *d* at contact-point 54 and make contact between wires *a* and *c* at contact-point 44, and thus reverse the motion of the car.

I am aware that prior to my invention winding-drums driven by worm and gear band and brakes, electric motors with belt-connections, and mechanically operated top and bottom automatic stops have been made and applied in connection with elevator-machinery, and that electric motors have been used for driving-pumps for hydraulic elevators. I therefore do not claim either of these specifically.

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in an elevating-machine, of a winding-drum and two electric motors, (one for hoisting and the other for lowering,) connected through a train of mechanism, consisting of a worm-shaft, a worm, a worm-wheel, and a drum-shaft, all substantially as set forth.

2. The combination, in an elevating-machine, of a winding-drum and two electric motors, (one for hoisting and the other for lowering,) connected through a train of mechanism, consisting of a worm-shaft, a worm, a worm-wheel, and a drum-shaft, the motors being in electrical connection with contact-points in the elevator-car, all substantially as set forth.

3. The combination, in an elevating-machine, of a band-brake having a slackening-spring and an electric motor, the band-brake and the motor being mechanically connected through a worm-shaft, a worm, a worm-wheel segment swinging about its shaft and fastened to the brake-band at two points, the slackening-spring being attached to segment at some point below its shaft and at some point without said segment, the motor being in electrical connection with a contact-point in the elevator-car, all substantially as set forth.

4. In an elevating-machine, the combination of a bracket having arms carrying electrical contact-points, the said electrical contact-points carried by the bracket-arms, a feather which prevents a traveling nut turning, a traveling nut carrying insulated arms which en-

gage with the electrical contact-points carried by said bracket-arm, hoisting and lowering motors, contact-points in elevator-car, and a battery, the electrical contact-points carried by said bracket-arms being in the electrical circuit connecting the elevating-machine hoisting and lowering motors, the contact-points in elevator-car, and the battery, all substantially as set forth.

5. In an elevating-machine, the combination of a rocking lever having arms at one end upon which the hoisting-ropes fall when they unwind from the winding-drum, and at the other end an arm with an insulated tip, hoisting and lowering motors, contact-points with which the insulated tip on the end of the said rocking lever engages, contact-points in the elevator-car, and a battery, the contact-points with which the insulated tip on the end of the said rocking lever engages being in the electrical circuit connecting the hoisting and lowering motors, contact-points on the bracket-arms, contact-points in the elevator-car, and battery, all substantially as set forth.

6. The combination of two electric motors fastened to the same shaft, one for hoisting and the other for lowering, and a drum winding the hoisting-cables of an elevator-car connected through a train of mechanism, the motors being in electrical connection with a contact-point in the elevator-car, a brake operated by an auxiliary electric motor connected through a train of mechanism, the auxiliary motor being in electrical connection with a contact-point in the elevator-car, a nut traveling on the winding-drum shaft and carrying insulated arms which engage at the ends of the travel of the nut with contact-points mounted on the arms of a bracket which carries a feather for preventing the said nut from turning, said contact-points being in the electric circuit connecting the machine-motors with the contact-points in the car, a rocking lever which makes and breaks contact between the battery-wire and the machine-motor wires, and a switch connected with the battery-wire and extending through the side of the elevator-car and engaging with stops at the top and bottom of the elevator-hoistway, thereby altering the position of the switch in the car, all substantially as set forth.

Signed at Brooklyn, in the county of Kings and State of New York, this 6th day of August, A. D. 1888.

JAMES EDWIN BYRNE.

Witnesses:

ROCKWELL J. HUNTER,
CEPHAS S. LACEY.