

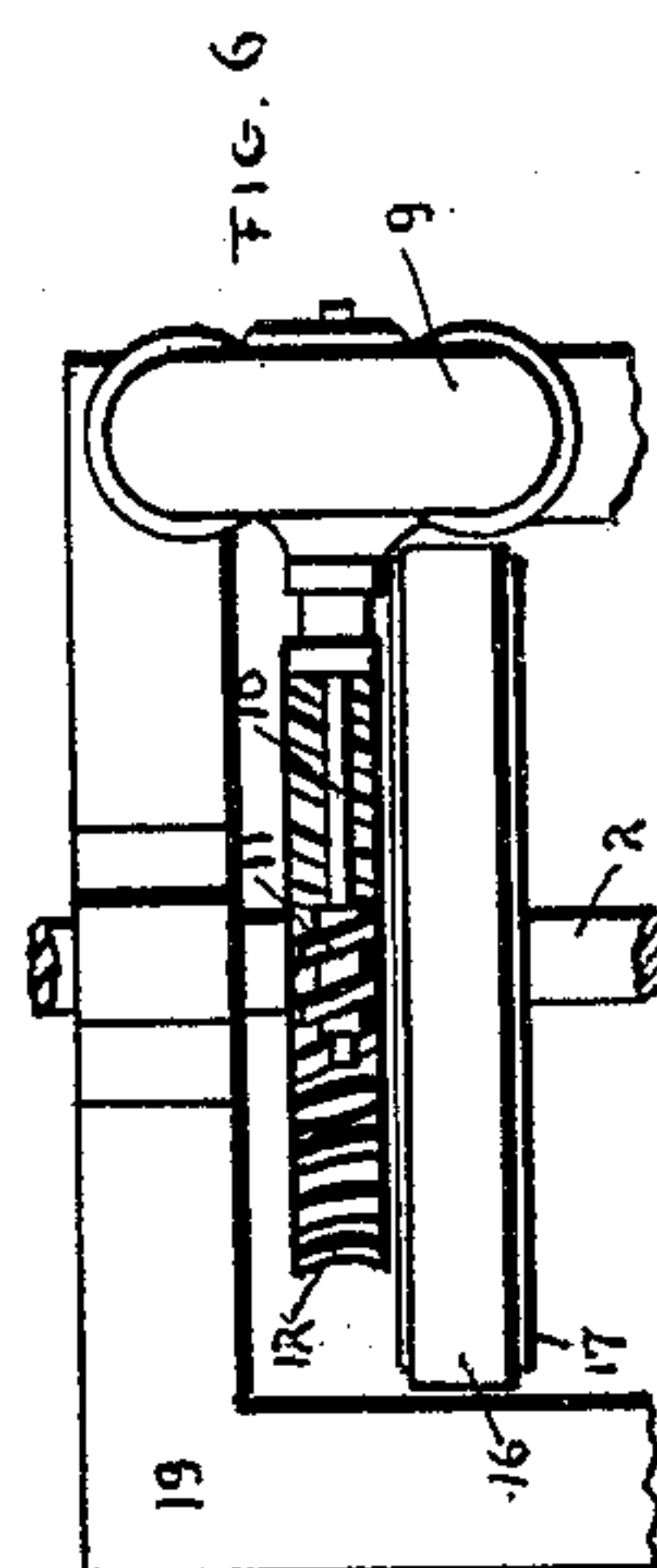
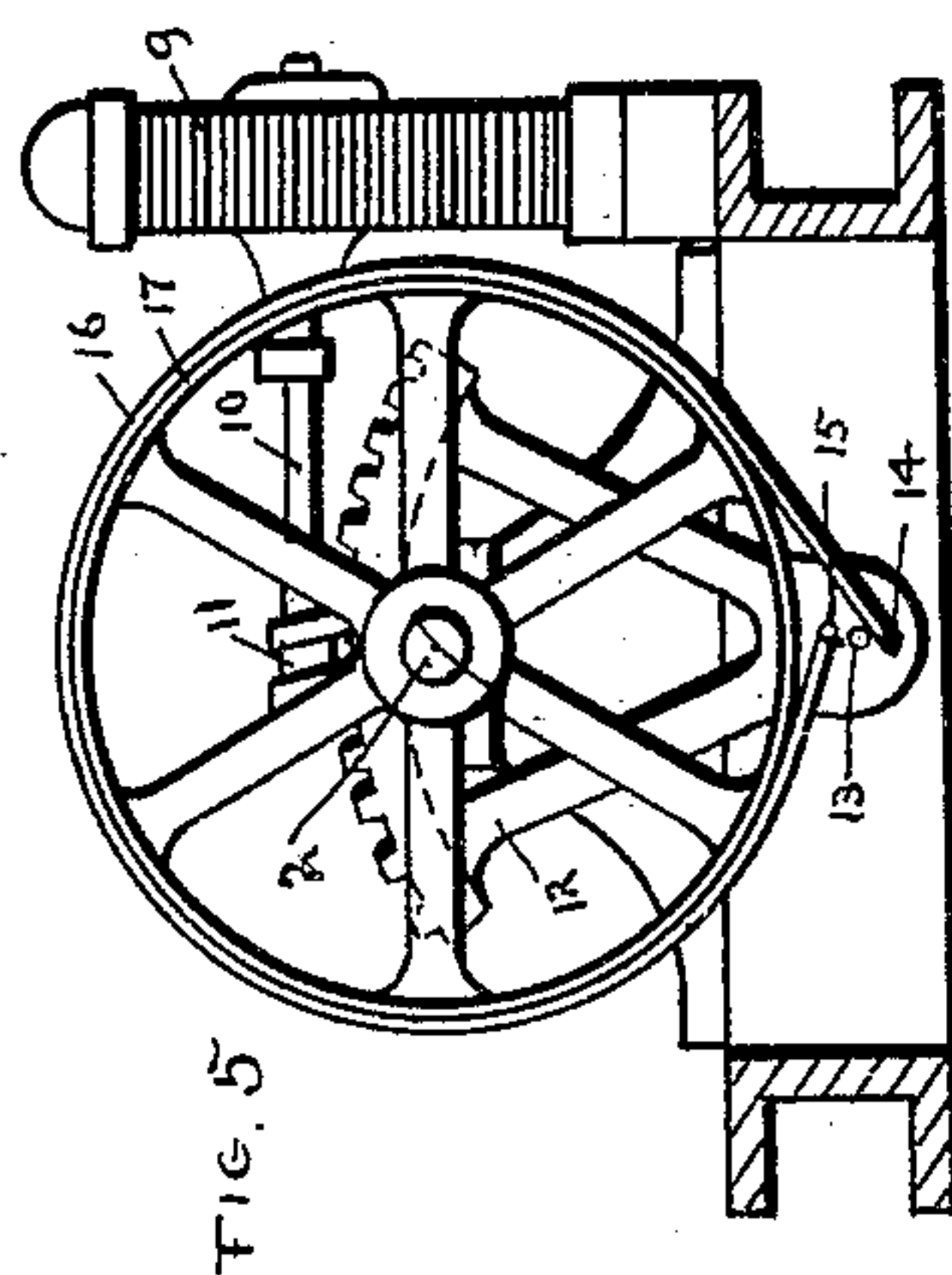
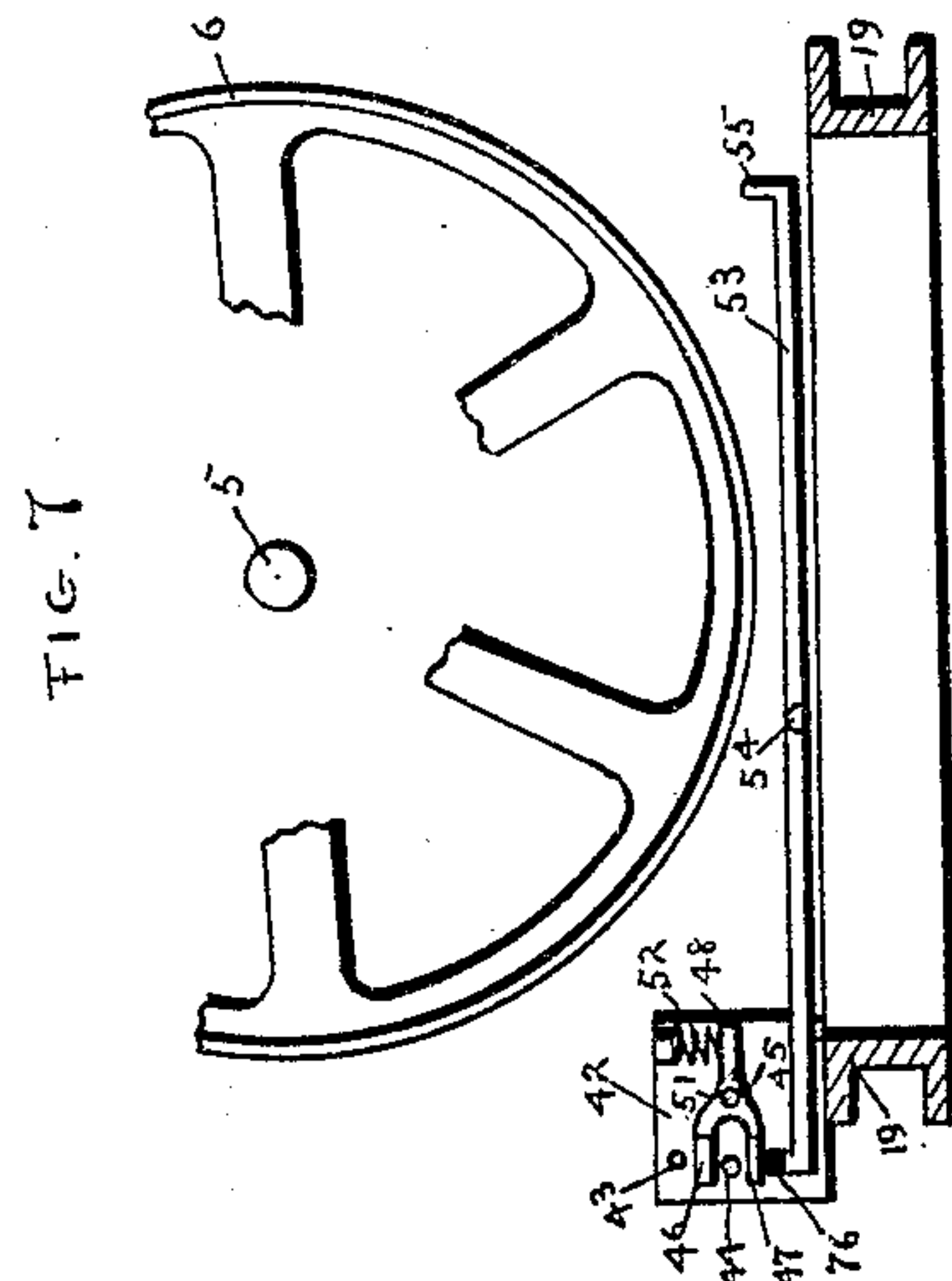
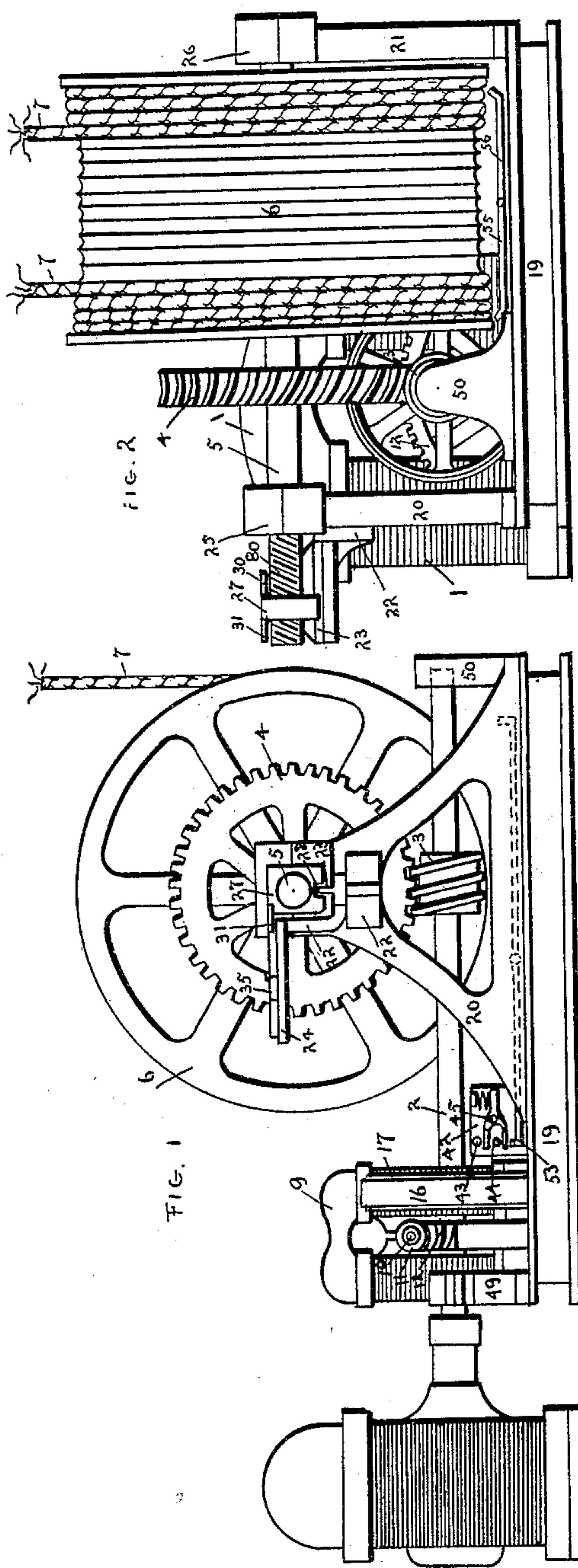
(No Model.)

3 Sheets—Sheet 1.

J. E. BYRNE.
ELECTRIC ELEVATING MACHINE.

No. 404,895.

Patented June 11, 1889.



WITNESSES:

Frank C. Watts
Charles H. Rayer

INVENTOR

James Edwin Byrne

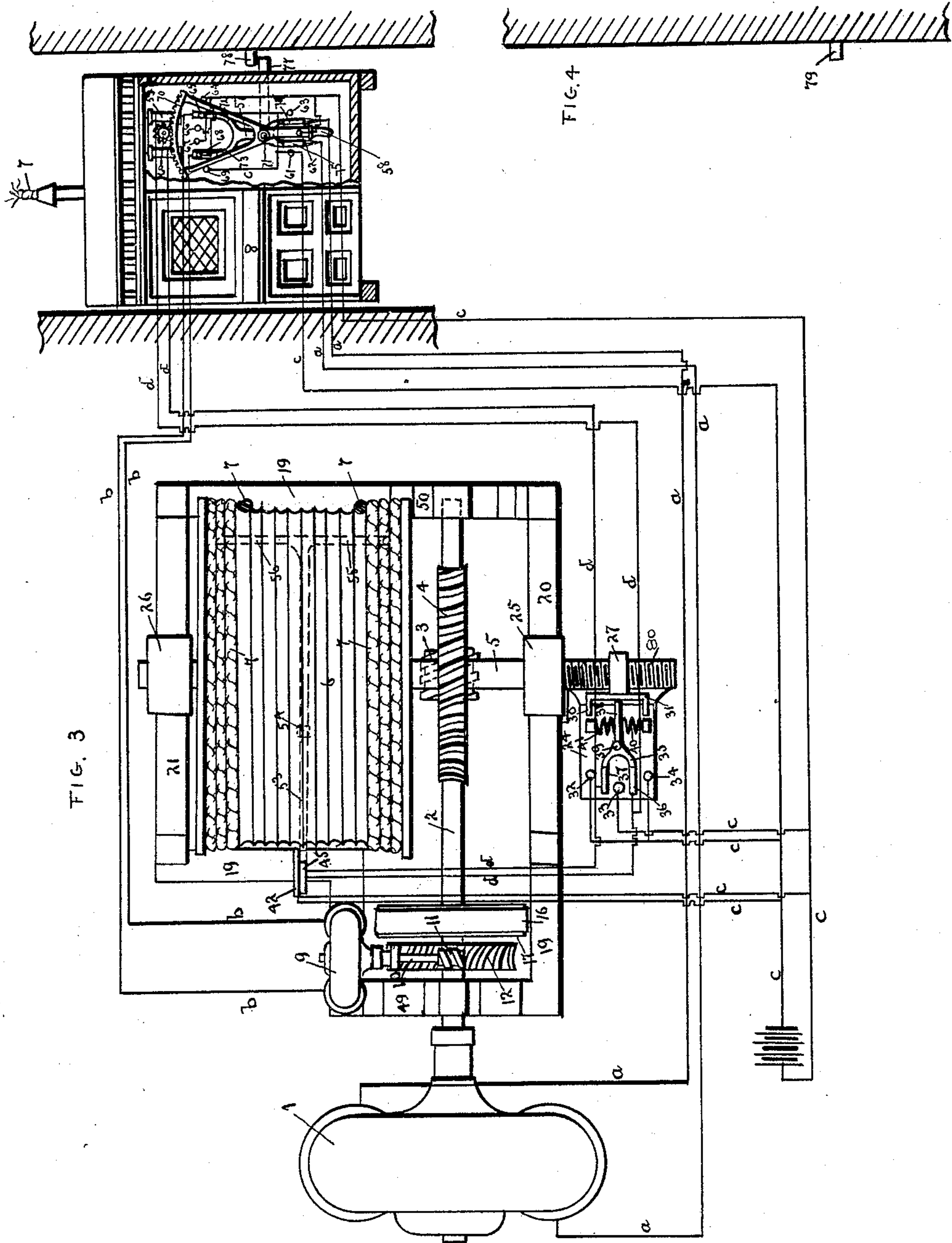
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3 Sheets—Sheet 2.

J. E. BYRNE.
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WITNESSES:

Frank C. Watts.
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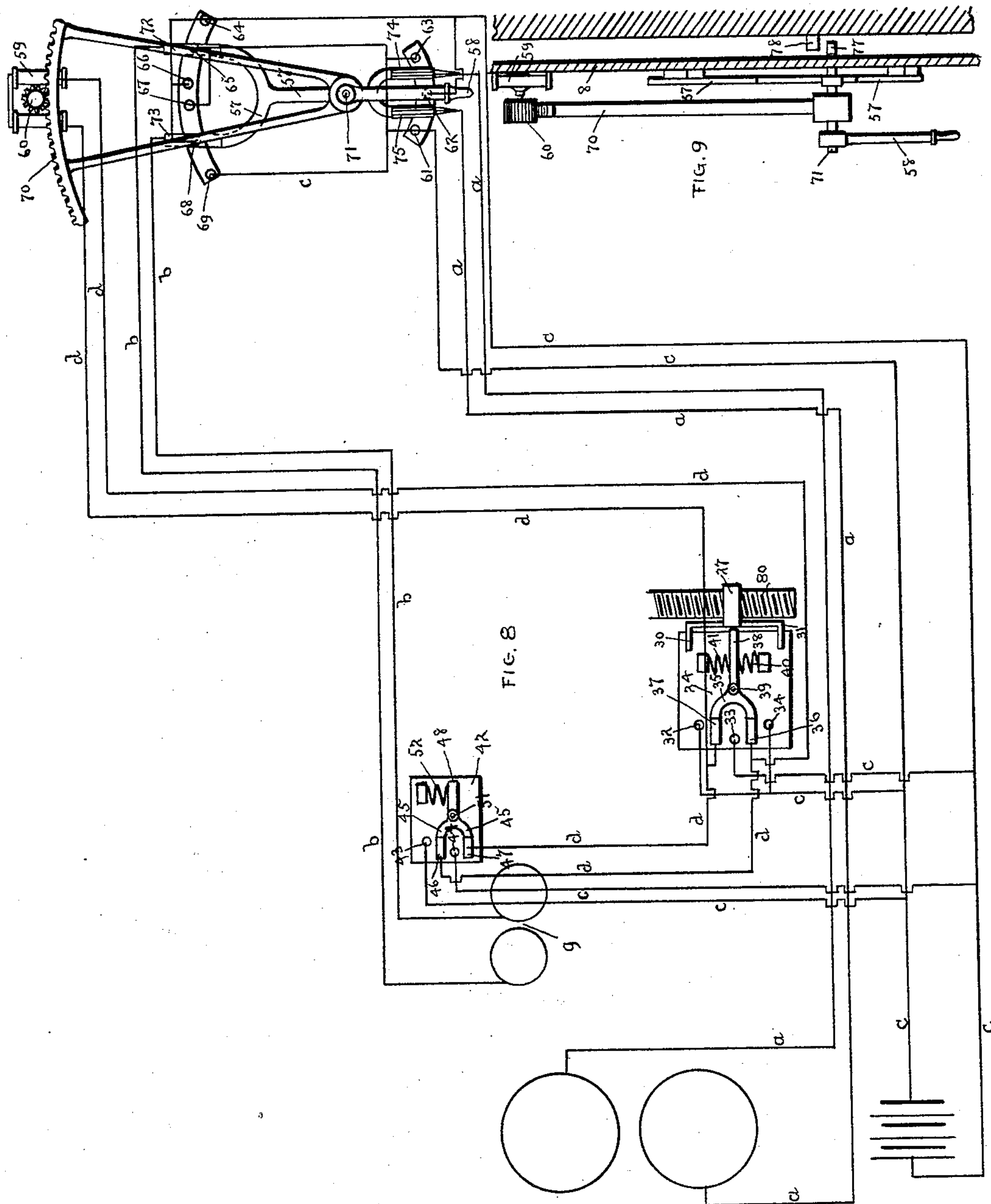
INVENTOR

James Edwin Byrne

3 Sheets—Sheet 3.

No. 404,895.

Patented June 11, 1889.



WITNESSES:

Frank C. Watts.
Charles H. Ray.

INVENTOR

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UNITED STATES PATENT OFFICE.

JAMES EDWIN BYRNE, OF BROOKLYN, NEW YORK.

ELECTRIC ELEVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 404,895, dated June 11, 1889.

Application filed January 5, 1889. Serial No. 295,553. (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 Improvements in 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 arrangements 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; 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, Sheet 1, is a side elevation of the machine with hoisting-cables wound on and leading up from winding-drum. Fig. 2, Sheet 1, is an end elevation of the machine with hoisting-cables wound on and leading up from

winding-drum. Fig. 3, Sheet 2, 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, Sheet 2, is a section of one side of the bottom of the elevator-shaft, showing safety-stop attached. Fig. 5, Sheet 1, is an enlarged view in side elevation of the brake and mechanism with electric motor for operating same, the rest of the machine being broken away. Fig. 6, Sheet 1, 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, Sheet 1, is a side elevation of the intermediate stop mechanism and the winding-drum and machine-base, the two latter being with parts broken away. Fig. 8, Sheet 3, is a diagram of the electric wires and their connections detached from the machine and in connection with an enlarged view, in front elevation, of the car-switch and the auxiliary electric motor used in operating the car-switch automatically. Fig. 9, Sheet 3, is an enlarged view, in side elevation, of the car-switch attached to the side of the car, and a section of one side of the hoistway with safety-stop attached.

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 motor 1, being secured to the worm-shaft 2, gives 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 or unwinding the hoisting-cables 7 and hoisting or lowering the elevator-car 8. The electric brake-motor 9, giving motion directly to 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. To the standard 20 is attached the bracket 22, carrying the feather 23 and the flat face 24. On the portion of the drum-shaft extending beyond the bearing 25 a thread 80 is cut, along which travels a nut 27, carrying insulated arms 30 and 31, and which is prevented from turning by means of the feather 23 and a slot 28 let into the nut 27.

On the bracket-face 24 are located the machine top and bottom automatic stop contact-points 32, 33, and 34 and the double-polarity switch 35, having arms 36, 37, and 38, the switch 35 being pivoted at the point 39 and kept in mid-position by means of the springs 40 and 41. The insulated arms 30 and 31, carried by the traveling nut 27, are so arranged as to engage with the switch-arm 38 when the nut 27 is at the ends of its travel, and thereby, in a manner to be hereinafter explained, cause the motion of the elevator-car to be reversed whenever it attempts to pass the upper or lower limits of its travel, and thus prevent accident when from any cause the operator in the car should forget to operate the car-switch. On a plate 42, fastened to the machine-bed 19, are located the intermediate automatic stop contact-points 43 and 44 and the switch 45, having arms 46, 47, and 48, the switch 45 being pivoted at the point 51, and kept in mid-position by means of the spring 52. The switch 45 is so arranged as to be struck by an insulated tip 76 on the end of lever 53, which lever 53 is fulcrumed at point 54, and has arms 55 and 56 extending along the bottom of the drum 6, and thereby, in a manner to be hereinafter explained, cause the downward motion of the elevator-car to be reversed, and 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 55 and 56, causes the lever 53 to tip.

In the elevator-car 8 are arranged the contact-points 61, 62, 63, 64, 65, 66, 67, 68, and 69, (in electrical connection with the electric motors,) and the switch 57, which may be operated either by hand, by means of the handle 58, or the small auxiliary electric motor 59, the motor 59 having on its armature-shaft a pinion 60, which gears into the toothed segment 70, the toothed segment 70, the switch 57, and the handle 58 all being on the same shaft 71. The multiple switch 57 has four contact-arms 72, 73, 74, and 75.

All the switches are made with bodies of non-conducting material and arms of conducting material.

The operation of the machine is as follows: The battery-wire *c* is connected with the intermediate stop contact-points 43 and 44, the top and bottom stop contact-points 32, 33, and 34, and the car-switch contact-points 61, 62, 63, 64, 65, 66, 67, 68, and 69. The machine-motor 1 wire *a* is connected with the car-switch arms 74 and 75, the arms 74 and 75 being composed of metallic strips of different electrical resistances insulated from each other and each strip joined to wire *a*. The outer strips of each arm possess the highest electrical resistance and the center ones the least, the object being that when only partial contact of the arms 74 and 75 is made with the contact-points 61, 62, and 63 the amount of current admitted to the machine-motor 1 is limited by the resistance of the outer strips, and consequently full speed not attained. When, however, full contact is made between the arms 74 and 75 and the contact-points 61, 62, and 63, the full current is admitted to the motor 1 and the corresponding speed attained. The velocity of the motor, and consequently of the elevator-car, is thus controlled in the car. The brake-motor wire *b* is connected to the switch-arms 72 and 73. The auxiliary car-switch motor 59 is connected to the top and bottom automatic switch-arms 36 and 37 and to the intermediate automatic switch-arms 46 and 47. With the car-switch in the mid-position, as shown in the diagram, Sheet 3, Fig. 8, all the circuits are open except the brake-motor circuit *b*, the car-switch arms 72 and 73 being in contact, respectively, with the battery contact-points 65 and 68. The motor 1 is consequently at rest and the brake on. The switch-handle 58 being now moved to the right, contact is made between the battery-wires *c* and the motor-wires *a* at the contact-points 62 and 63 and the machine started to hoist the elevator-car. At the same time the brake-motor connection with the battery is broken at the contact-points 65 and 68 and made again at the contact-points 66 and 69, thereby reversing the direction of the current to the brake-motor 9 and taking the brake off. The elevator-car now ascending has reached its upper limit and attempts to pass it, when the insulated arm 30 on nut 27 strikes the switch-arm 38, thereby making connection between the auxiliary car-switch motor 59 and the battery, through the switch-arms 36 and 37 and contact-points 32 and 33, thus giving motion to the motor 59 and altering the position of the car-switch until arms 74 and 75 make contact with contact-points 62 and 61, respectively, thereby reversing the direction of the current to the motor 1 and cause the elevator-car to descend. At the same time the connections between the brake-motor wires *b* and the battery-wires *c* are broken at contact-points 66 and 69 and made again at points 64 and 67, the direction of current to the brake-motor being the same and the brake remaining off. The descending car now meets

an obstruction—such as a projection into the hoistway—which causes it to stop, the machine, however, still being in motion and unwinding the hoisting-ropes. The slack ropes
 5 fall onto the arms 55 and 56 of the rocking lever 53, and, causing it to tip, the insulated tip 76 strikes the switch 45, and connection is made between the battery-wires *c* and the auxiliary switch-motor 59 wires *d* at the
 10 points 43 and 44, thus causing the motor 59 to operate and reverse the switch and cause the elevator-car to ascend. The obstruction being removed and the car started downward,
 15 by placing the switch in the third position cited, the car finally reaches its lower limit and attempts to pass it, whereupon the insulated arm 31 on the nut 27 strikes the switch-arm 38, and connection is made between
 20 the battery-wires *c* and the auxiliary switch-motor 59 wires at contact-points 33 and 34, and the car-switch is reversed and the elevator-car started upward until brought to a stop by again placing the car-switch in the position
 25 shown in Fig. 8, Sheet 3, by means of the handle 58.

As an additional set of automatic top and bottom stops, the shaft 71 is extended through the side of the elevator-car and a lever 77 attached to it, so as to come in contact with the
 30 projection 78 when the elevator car attempts to pass its upper limit, and thereby reverse the position of the switch and alter the direction of motion of the car. In the same manner, when the car attempts to pass its
 35 lower limit, the lever 77 comes in contact with the stop 79, and the switch is again reversed and the direction of the motion of the car altered.

I am aware that prior to my invention winding-drums driven by worm and gear, band-brakes, electric motors, and mechanically-operated top and bottom automatic stops have been made and applied in connection with elevating machinery, and that in my appli-
 40 cation for a patent for an improvement in elevating-machines filed August 10, 1888, Serial No. 282,477, I have claimed the combination of two separate electric motors on the same shaft, and a winding-drum, a band-
 45 brake operated by an electric motor, a rocking lever operating an electric switch, and a traveling nut with insulated arms operating an electric switch. I therefore do not claim either of these specifically, but desire to
 50 broaden some of my former claims by embracing as much of them as is necessary in my present new combinations.

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

1. The combination, in an elevating-machine, of an electric motor and a winding-drum connected by a train of mechanism, a

reversible switch in the elevator-car, top and bottom and intermediate automatic stop-
 65 switches on the machine, a battery, and suitable electric connections between the machine-motor, car-switch, automatic switches, and battery, all substantially as set forth.

2. The combination, in an elevating-machine, of an electric motor and a winding-drum connected by a train of mechanism, a reversible switch in the elevator-car, top and bottom and intermediate automatic stop-
 70 switches, springs to keep the automatic switches in mid-position, a traveling nut carrying arms which engage with the top and bottom switch-arm, a rocking lever which engages with the intermediate automatic switch,
 75 a battery, and suitable electric connections between the machine-motor, car-switch, automatic switches, and battery, all substantially as set forth.

3. The combination, in an elevating-machine, of a reversible electric motor and a
 85 brake connected through a train of mechanism, a switch in the elevator-car, contact-points, and a battery, the switch, motor, contact-points, and battery having suitable electric connections, all substantially as set forth.

4. The combination, in an elevating-machine, of a reversible electric motor and a switch, both in the elevator-car, connected through a train of mechanism, top and bottom and intermediate automatic stop-switches
 95 on the machine and contact-points in the car, and a battery, the switches, battery, and contact-points having suitable electric connections, all substantially as described.

5. The combination, in an elevating-machine, of a reversible electric motor and a winding-drum connected through a train of mechanism, a reversible electric motor and a band-brake connected through a train of mechanism, a reversible electric motor and a
 100 switch in the elevator-car connected through a train of mechanism, top and bottom and intermediate stop-switches on the machine, a traveling nut carrying insulated arms which engage with the top and bottom automatic
 105 stop-switch, a rocking lever which operates in connection with the intermediate stop-switch, a lever which engages with projecting tappets on the sides of the elevator-hoistway, suitable contact-points, and a battery, the
 110 electric motors, switches, and contact-points having suitable electric connections, all substantially as described.

Signed at Brooklyn, in the county of Kings and State of New York, this 3d day of January, A. D. 1889.

JAMES EDWIN BYRNE.

Witnesses:

FRANK C. WATTS,
 CHARLES H. RAYE.