

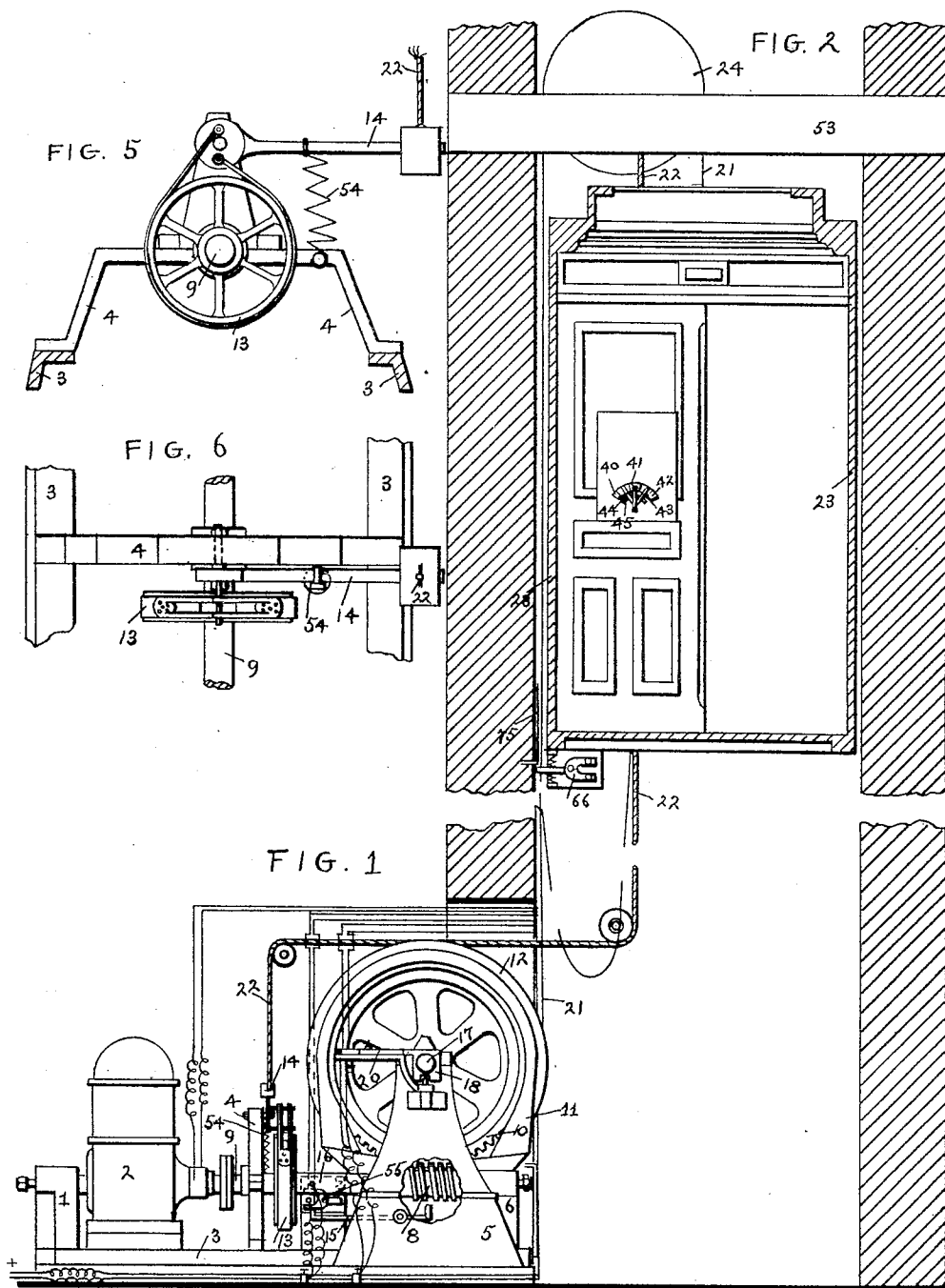
(No Model.)

4 Sheets—Sheet 1.

J. E. BYRNE.
ELECTRIC ELEVATOR.

No. 461,493.

Patented Oct. 20, 1891.



WITNESSES:

M. S. Parker,
Arthur H. Tabor

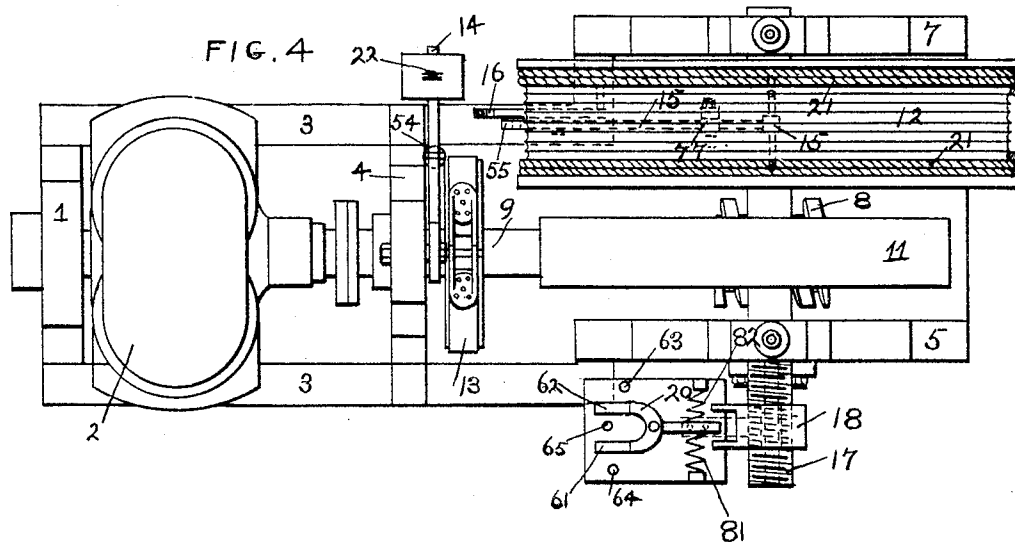
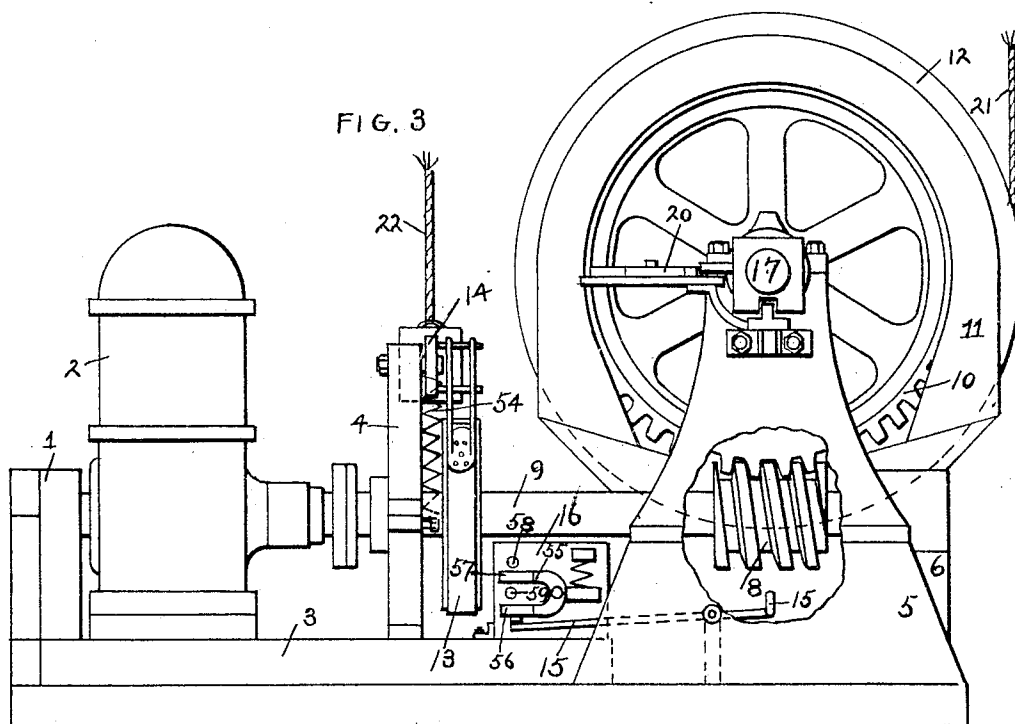
INVENTOR

James Edwin Byrne

4 Sheets—Sheet 2.

No. 461,493.

Patented Oct. 20, 1891.



WITNESSES:

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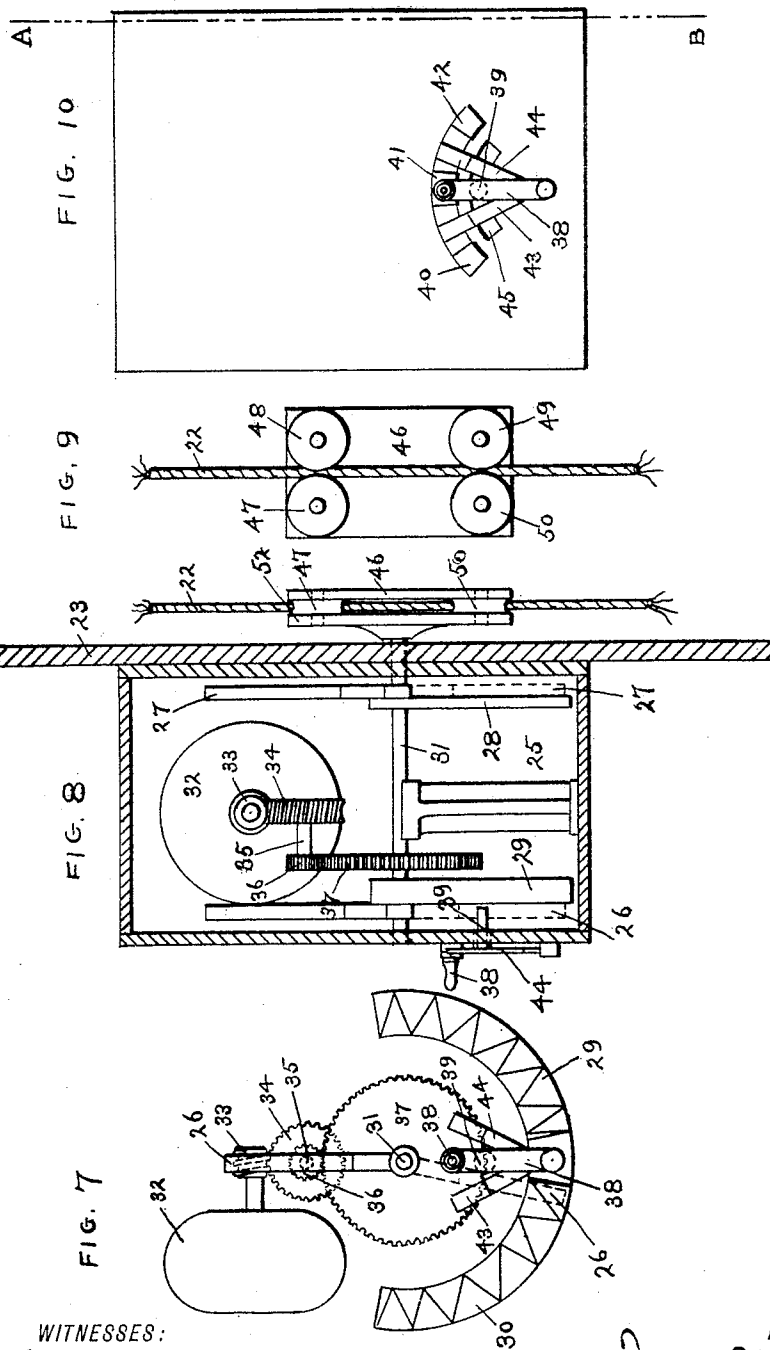
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J. E. BYRNE.
ELECTRIC ELEVATOR.

No. 461,493.

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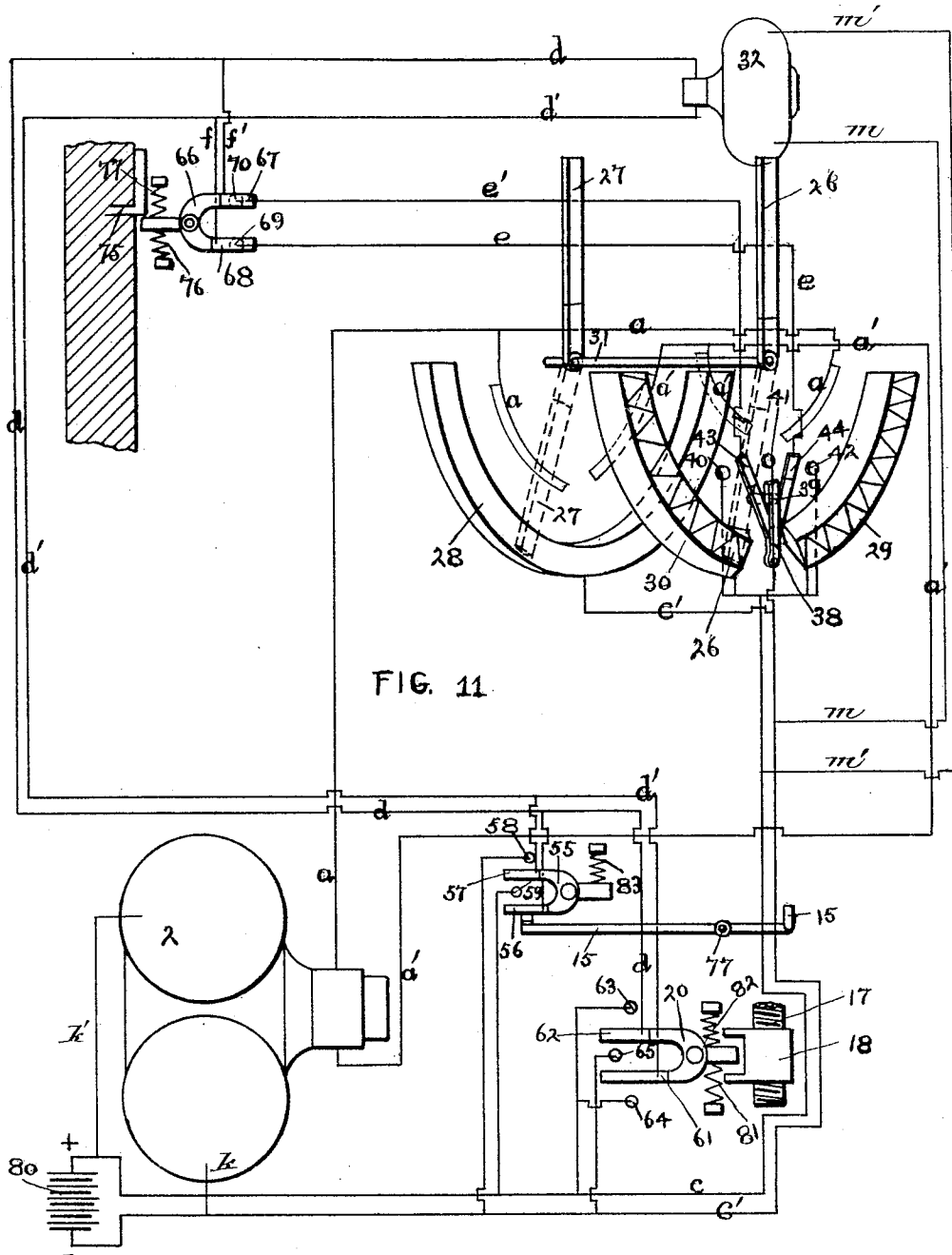
(No Model.)

4 Sheets—Sheet 4.

J. E. BYRNE.
ELECTRIC ELEVATOR.

No. 461,493.

Patented Oct. 20, 1891.



WITNESSES:
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UNITED STATES PATENT OFFICE.

JAMES EDWIN BYRNE, OF BOSTON, MASSACHUSETTS.

ELECTRIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 461,493, dated October 20, 1891.

Application filed December 2, 1890. Serial No. 373,392. (No model.)

To all whom it may concern:

Be it known that I, JAMES EDWIN BYRNE, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Electric Elevators, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to improvements in electric elevating machinery in which a rotating drum taking its motion from either a reversible electric motor or two electric motors (one for going ahead and one for backing) through a train of mechanism operates in connection with cables, which being attached to a suitable car give it upward or downward motion, electric automatic top and bottom and intermediate or slack-cable safety-stops on the elevating-machine operating in conjunction therewith; and the objects of my improvements are, first, to provide a means by which the main motor-switch of an electric elevator can be placed in an elevator-car in a neat and handy form and be operated with constant velocity, thus cutting out the motor resistances with regularity and uniformity; second, to provide a means whereby this motion can be controlled by a small auxiliary operating-switch, which switch is in turn automatically controlled independent of the operator to limit its action; third, to provide a means by which the main motor-switch can be automatically operated by the top and bottom and intermediate automatic stop-switches on the machine independent of the auxiliary operating-switch or the operator; fourth, to provide a means whereby a mechanical brake on the machine can be operated in conjunction with the main motor-switch, and also serve as a check to overcome the inertia of motion in the auxiliary car-motor when the current is cut off from it. 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 the winding-drum, brake-rope leading up from brake-lever, and wires leading from motor, automatics, and battery to switch in car. Fig. 2, Sheet 1, is a side elevation of the elevator-car and overhead work, showing switch-box in car and auxiliary operating-switch and contacts on the outside of

the box. Fig. 3, Sheet 2, is an enlarged view of Fig. 1, Sheet 1, showing in detail the locations of the automatic switches on the machine and the mechanism for operating the same. Fig. 4, Sheet 2, is a top view of Fig. 3, Sheet 2. Fig. 5, Sheet 1, is an end view of the brake mechanism with brake-rope attached. Fig. 6, Sheet 1, is a top view of Fig. 5, Sheet 1. Fig. 7, Sheet 3, is an end view of the main switch and mechanism for operating same, with covering-box removed. Fig. 8, Sheet 3, is a sectional elevation on A B of Fig. 10, Sheet 3. Fig. 9, Sheet 3, is a front elevation of the device for operating the brake through the brake-rope. Fig. 10, Sheet 3, is an enlarged view of the switch-box, auxiliary switch, and contacts. Fig. 11, Sheet 4, is a diagram of the electric wires and their connections.

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

The winding-drum 12 is driven by the reversible electric motor 2 through a train of gearing consisting of worm 8, worm-shaft 9, and worm-wheel 10, the whole being supported by beds 1, 3, 5, 6, and 7. The motion of the drum 12 gives motion to the elevator-car 23 through the rope 21 and overhead-wheel 24. The main motor-switch 25 consists of the shaft 31, with the two arms 26 and 27 fastened to and working with it, the contact 28, and the rheostat-contacts 29 and 30.

Motion is given to the switch-shaft 31 by means of the auxiliary motor 32 through a train of mechanism, which in this case consists of worm 33, worm-wheel 34, shaft 35, pinion 36, and gear 37. The auxiliary motor-switch consists of contact-points 40, 41, and 42, arms 43 and 44, and handle 38. To the back of the handle 38 is affixed the pin 39, which when struck by the arm 26 swinging in either direction causes contact to be broken at the auxiliary motor-switch, thus automatically cutting off this motor.

The brake is operated in conjunction with the switch as follows: The brake-rope 22 passes through the device composed of the two pieces of metal 46 and 52, which are fastened to the switch-shaft 31, and have between them on shafts the pulleys 47, 48, 49, and 50, and then continues on and is fastened to the overhead beams 53. Any motion of the shaft

31 turns the device 46 and shortens the brake-rope by twisting it, thereby raising the brake-lever and operating the brake. All of the switches are constructed with bodies of insulating material and the ends of the arms of conducting material. When the machine is at rest, the positions of the switch-arms 26 and 27 are as indicated by solid lines in the various figures.

The operation of the machine is as follows: The motors 2 and 32 are illustrated in the drawings as having constant fields and are wound throughout for constant potential, their field-wires being of proper resistance and connected directly to the main circuit by the wires *k k'* and *m m'*, respectively, and they are so constructed as to have their direction of motion reversed by the reversal of the direction of motion of the current through the armature. Any other practicable type of reversible motor may be substituted, however, by the proper changes in the wiring connections. The operator in the car moves the auxiliary switch 38 to the left, making the contacts 40 and 43 and 41 and 44, and leaves it there. Motion being now given to the auxiliary motor 32 through the wire *c*, contact 40, arm 43, wire *e'*, contact 70, arm 67, wire *f'*, wire *d*, auxiliary motor 32, wire *d'*, wire *f*, arm 68, contact 69, wire *e*, arm 44, contact 41, wire *c'*, and generator 80, the switch-shaft 31 is operated through the train of mechanism 33, 34, 35, 36, and 37. This causes the arms 26 and 27 to move in a direction opposite to that of the motion of the hands of a watch and make the contacts 26 and 30 and 27 and 28, thus giving motion to the main driving-motor 2 through the train *c*, rheostat 30 26 *a'*, motor 2, *a*, 27, 28, *c'*, and 80. The device 46 being attached to the shaft 31 is also revolved, thereby bending the brake-rope 22, lifting the brake-lever 14 and taking the brake off. As the arm 26 approaches the end of its travel, it strikes the pin 39 and breaks the auxiliary switch-contacts. The inertia of the moving motor 32 where the current is cut off is overcome by means of the spring 54 on the brake-lever, which causes the device 46 to turn harder the farther it turns. To stop the machine, the operator moves the auxiliary switch 38 to the right, making the contacts 41 and 43 and 42 and 44, thus giving motion to the auxiliary motor 32 in the opposite direction to that previously obtained through the train *c* 42, 44, *e*, 69, 68, *f*, *d'*, auxiliary motor 32, *d*, 67, 70, *e'*, 43, 41, *c'*, and 80. The auxiliary motor in turn gives motion through the train 33, 34, 35, 36, and 37 to the shaft 31 and the switch-arms 26 and 27 in the direction of the motion of the hands of a watch. If he desires to stop the machine when the arms 26 and 27 are free of contacts, he breaks the contacts 41 and 43 and 42 and 44 he has just made with the auxiliary switch, and the motions of the motor 32 and the main switch are consequently stopped. If, however, he desires to reverse the motion of the motor 2 and the elevator-

car instead of stopping, he does not touch the auxiliary switch, but allows the motion of the arms 26 and 27 in the direction of the motion of the hands of a watch to continue until the contacts 26 and 29 and 27 and 28 are made. The direction of motion of the motor 2 is now reversed through the train *c*, 29, 26, *a*, motor 2, *a'*, 27, 28, *c'*, and 80. The arm 26 as it travels on comes in contact with the pin 39 and forces the auxiliary switch free of contacts, thus stopping the motor 32 and consequently the motion of the switch-arms 26 and 27. The above is the ordinary every-day operation of the elevator.

The operation of the top and bottom automatics is as follows: Suppose the switch-arms 26 and 27 in mid-position, as shown by solid lines in Fig. 11, Sheet 4, and the elevator at rest. Move the auxiliary switch 38 to the right, making contacts 41 and 43 and 42 and 44. Motion will now be given motor 32 through the train *c*, 42, 44, *e*, 69, 68, *f*, *d'*, auxiliary motor 32, *d*, 67, 70, *e'*, 43, 41, *c'*, and 80, and consequently to the arms 26 and 27 through the train 33, 34, 35, 36, 37, and 31 in a direction of the hands of a watch, making contacts 27 and 28 and 26 and 29. Motion is now given to motor 2 through the train *c*, rheostat 29, 26, *a*, motor 2, *a'*, 27, 28, *c'*, and 80, and the elevator-car will either ascend or descend, as the case may be. Upon reaching the top or bottom landing the switch 66 strikes a projecting tappet 75 at either of these landings and connection is broken at contact-points 69 and 70, thus cutting out the auxiliary operating-switch, and consequently taking entire control of the machine out of the hands of the operator in the car. At the same instant the traveling nut 18 strikes the switch 20 and the contacts 62 and 63 and 61 and 65 are made, the motor 32 is started through the train *c*, 63, 62, *d*, motor 32, *d'*, 61, 65, *c'*, and 80, the arms 26 and 27 are operated in the direction opposite to that of the hands of a watch through the train 33, 34, 35, 36, 37, and 31, and the motor 2, and consequently the elevator-car, reversed. In a similar manner if the contacts 62 and 65 and 61 and 64 had been made, the motor 32 would have been started through the train *c*, 64, 61, *d'*, motor 32, *d*, 62, 65, *c'*, and 80, the arms 26 and 27 operated in the direction of the hands of a watch through the train 33, 34, 35, 36, 37, and 31, and the motor 2, and consequently the elevator-car, reversed. As soon as the car leaves the top or bottom landing the spring 76 or 77 operates, contacts 68 and 69 and 67 and 70 are made, and the control of the main switch again placed in the hands of the operator in the car.

The springs 81 and 82 serve to keep the switch 20 in a central position when released by the traveling nut 18.

To show the operation of the slack-cable automatic switch, move the auxiliary switch 38 to the right. This will cause the auxiliary motor to operate through the train *c*, 42, 44, *e*, 69, 68, *d'*, motor 32, *d*, 67, 70, *e'*, 43, 41, *c'*, and 80.

The main switch will make the contacts 26 and 29 and 27 and 28, and motion will be given to motor 2 through the train *c*, rheostat 29, 26, *a*, motor 2, *a'*, 27, 28, *c'*, and 80. We will suppose the direction of this motion of motor 2 to be such as to cause the elevator-car to descend until it meets an obstruction in the hoistway, thereby holding the car suspended while the hoisting-ropes unwind from the machine-drum 12. The slack hoisting-rope dropping under the drum 12 falls on the end of the lever 15, which lever tipping around fulcrum 77 operates switch 55, making contacts 56 and 59 and 57 and 58, and operating the motor 32 through the train *c*, 59, 56, *d*, motor 32, *d'*, 57, 58, *c'*, and 80. Motor 32 in turn operates the arms 26 and 27 through the train 33, 34, 35, 36, 37, and 31, and contacts 26 and 30 and 27 and 28 are made, thus reversing the direction of motion of the motor 2, and consequently that of the elevator-car, through the train *c*, 30, 26, *a'*, motor 2, *a*, 27, 28, *c'*, and 80. As the rope is now again wound on the drum 12 the rocking lever 15 tips back to its original position, as shown in Figs. 3 and 4, Sheet 2, and the switch 55 is pulled back to its original position by means of the spring 83, thus breaking the connections 56 and 59 and 57 and 58. I am aware that in Letters Patent No. 404,893, granted to me June 11, 1889, I have claimed the combination of two electric motors or a reversible motor and a winding drum connected through a train of mechanism, the motors being in electrical connection with a switch apparatus in the car, and electrical automatic switches operated by a traveling nut and rocking lever; and in Letters Patent No. 404,895, granted to me June 11, 1889, I have claimed the combination of a reversible electric motor and a switch, both in the car and connected through a train of mechanism, the motor being controlled by automatic top and bottom and intermediate switches, but not independent of the operator on the car. I therefore do not claim either of these specifically.

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

1. The combination, in an elevating-machine, of an auxiliary electric motor and a main switch connected through a train of mechanism, an auxiliary operating-switch carrying a pin which engages with the main-switch arms, a battery, and suitable electric connections between the motor and auxiliary switch and battery, all substantially as set forth.

2. The combination, in an elevating-machine, of an auxiliary electric motor and a main switch connected through a train of mechanism, an auxiliary operating-switch, a top and bottom automatic switch, a battery, and suitable electric connections between the battery, switches, and motor, all substantially as set forth.

3. The combination, in an elevating-ma-

chine, of an auxiliary electric motor and a main switch connected through a train of mechanism, an auxiliary operating-switch, a top and bottom automatic switch, a traveling nut which engages with the top and bottom automatic switch, a battery, and suitable electric connections between the battery, switches, and motor, all substantially as set forth.

4. The combination, in an elevating-machine, of an auxiliary electric motor and a main switch connected through a train of mechanism, an auxiliary operating-switch, an intermediate (or slack-cable) automatic switch, a battery, and suitable electric connections between the battery, switches, and motor, all substantially as set forth.

5. The combination, in an elevating-machine, of an auxiliary electric motor and a main switch connected through a train of mechanism, an auxiliary operating-switch, an intermediate (or slack-cable) automatic switch, a rocking lever which engages with the intermediate (or slack-cable) switch, a battery, and suitable electric connections between the battery, switches, and motor, all substantially as set forth.

6. The combination, in an elevating-machine, of an auxiliary electric motor and a main machine-motor switch connected through a train of mechanism, an auxiliary operating-switch, a top and bottom automatic switch, a traveling nut which engages with the top and bottom automatic switch, an intermediate (or slack-cable) automatic switch on the machine, a rocking lever which engages with an intermediate (or slack-cable) switch, a battery, and suitable electric connections between the battery, switches, and motor, all substantially as set forth.

7. The combination, in an elevating-machine, of an auxiliary electric motor and a main machine-motor switch connected through a train of mechanism, an auxiliary operating-switch, a top and bottom automatic switch, a traveling nut which engages with the top and bottom automatic switch, a switch on the car which engages with stops at the top and bottom landings for the purpose of making and breaking the connections between the auxiliary operating-switch and the auxiliary motor at periods when it is desired that the main motor-switch shall be controlled by the top and bottom automatic switch, a battery, and suitable electric connections between the battery and motor, all substantially as set forth.

8. The combination, in an elevating-machine, of an auxiliary electric motor and a machine-motor switch connected through a train of mechanism, an auxiliary operating-switch, a device operating in conjunction with the main-switch arms for the purpose of operating the brake on the machine by bending or twisting the brake-rope, a brake-rope, a brake, a spring to increase the resistance of operating the brake-lever, a battery, and suitable connections between the battery,

switches, and motor, all substantially as set forth.

9. The combination, in an elevating-machine, of an auxiliary electric motor and a machine-motor switch connected through a train of mechanism, an auxiliary operating-switch, a top and bottom automatic switch on the machine, a traveling nut which engages with the top and bottom automatic switch, a switch on the car which engages with stops at the top and bottom landings for the purpose of making and breaking the connections between the auxiliary operating-switch and the auxiliary motor at periods when it is desired that the main motor-switch shall be controlled by the top and bottom automatic switch on the machine, an intermediate (or slack-cable) switch, a rocking lever which

engages with an intermediate (or slack cable) switch, a device operating in conjunction with the main-switch arms for the purpose of operating the brake on the machine by bending or twisting the brake-rope, a brake-rope, a brake, a spring to increase the resistance of operating the brake-lever, a main machine-motor, a battery, and suitable connections between the battery, switches, and motors, all substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 24th day of November, A. D. 1890.

JAMES EDWIN BYRNE.

Witnesses:

ARTHUR H. TABER,
W. I. BARKER.