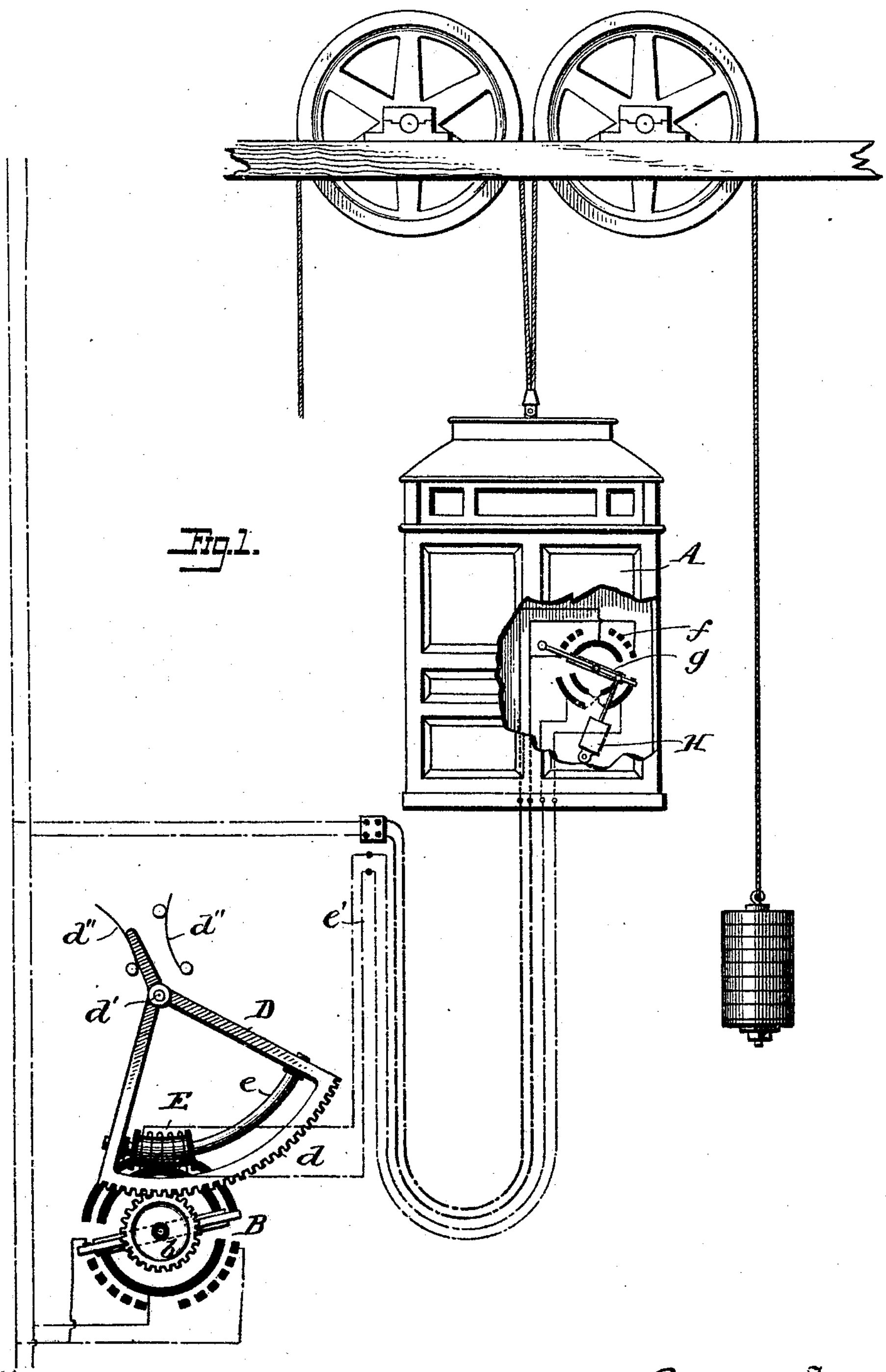
(No Model.) 2 Sheets—Sheet 1.

R. WATSON.

ELECTRIC ELEVATOR.

No. 516,956. Patented Mar. 20, 1894.



Witnesses
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(No Model.)

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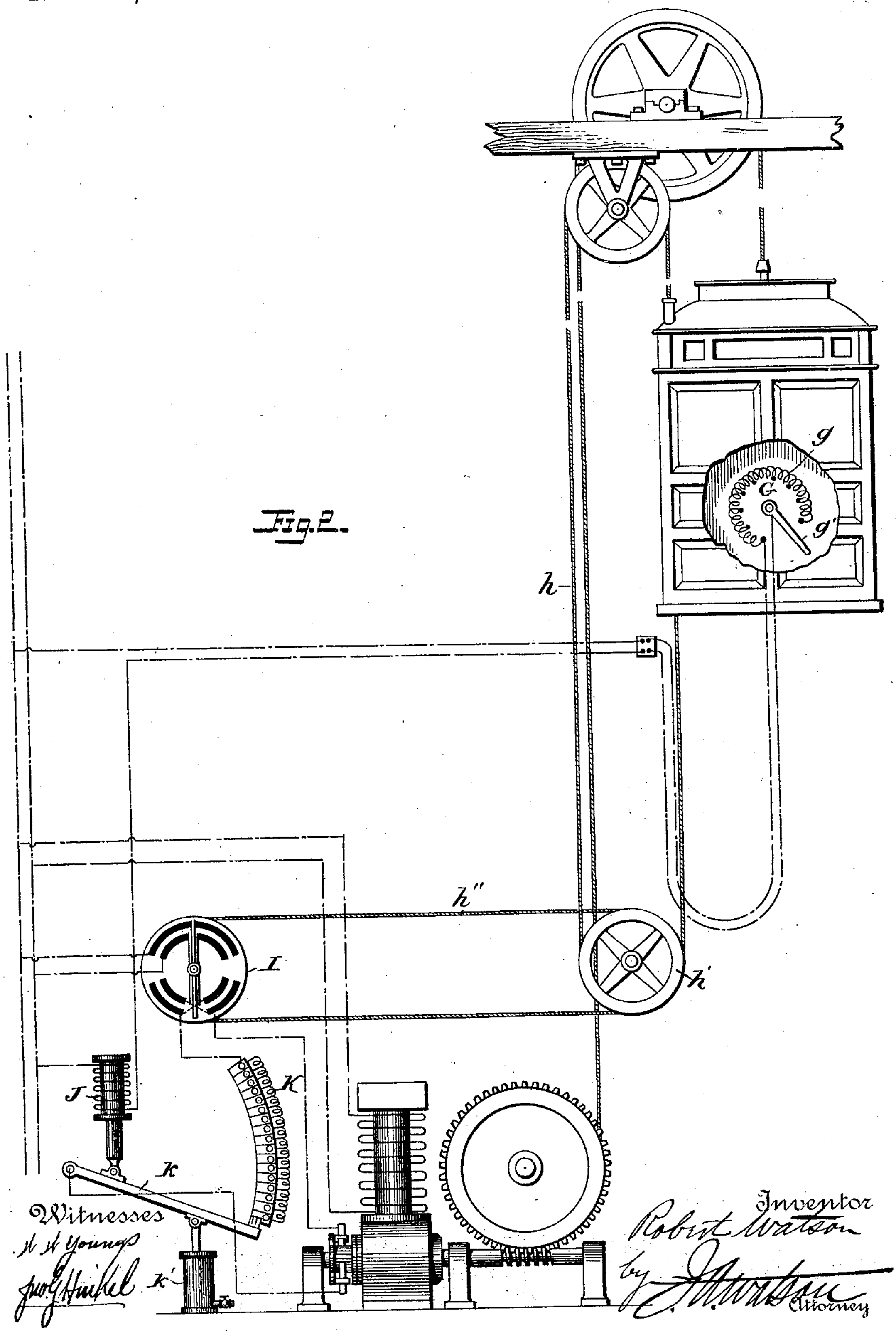
Fig. 2.



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UNITED STATES PATENT OFFICE.

ROBERT WATSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 516,956, dated March 20, 1894.

Application filed November 13, 1893. Serial No. 490,751. (No model.)

To all whom it may concern:

Be it known that I, ROBERT WATSON, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electric Elevators, of which the following is a specification.

My invention relates to electric elevators, and it consists more particularly in an improvement in the switching devices of such elevators and in means for controlling the movement of the elevator from the car.

In operating electric elevators as at present constructed, it is customary at starting to close the armature circuit through a series of resistances and then to cut out the resistances gradually until the motor is running with full current in the armature. It is further customary in some types of elevators, to cut out the resistances by automatic means, such, for instance, as a solenoid having its movement regulated by a dash-pot or other governor. Such devices of this kind as hitherto constructed have not been entirely satisfactory in operation for the reason that they have been arranged to give the car its maximum speed until the current is shut off, the ordinary brake devices being relied upon altogether for stopping the car. At moderate or high speeds, and with varying loads, it is difficult and almost impossible to stop the car even with the landing, as the inertia to be overcome by the brake varies with the load and the direction in which the car is moving.

The object of my invention is to provide means whereby the rapidity of the movement of the car in electric elevators may be controlled at all times by the operator from the car, and to provide more particularly for slowing down the movement of the car in approaching a landing, so that there may be a gradual decrease of speed without any jerking or sudden stoppage, thus permitting the car to be stopped with precision at the landings.

A further object of the invention is to provide, in combination with the above, convenient devices upon the car for reversing the motor.

In connection with my invention the usual brake devices may be employed, but they need not to be brought into action until the speed of the car has been slowed down.

In the accompanying drawings, which form a part of my specification, Figure 1 is a diagrammatic representation of an elevator supplied with controlling devices according to my invention, and Fig. 2 is a similar view showing the invention applied to one of the existing forms of elevators.

My invention consists primarily in devices for controlling the strength or direction of the armature current, or both, and, in consequence, the speed and direction of the motor, by means of electrical devices upon the car. In a more limited form it consists in a solenoid for cutting in and out resistance in the armature circuit, and reversing said circuit, in combination with devices upon the car for controlling the solenoid.

Referring particularly to Fig. 1 of the drawings, A indicates the car of an elevator, and B represents the reversing switch of an electric motor which is connected to operate the car. As the motor and winding drum form no part of my present invention, I have not deemed it necessary to illustrate them. The switch B may be of any approved form, its functions being first, to determine the direction of the current through the armature, secondly to close the circuit through a rheostat in the armature circuit, and thirdly, to gradually cut out the resistance from the armature circuit.

As shown in Fig. 1, the switch B is operated by a gear wheel b, which, in turn, is in mesh with a segmental rack d upon a frame D which is mounted upon a fixed pivot d'. The frame D is preferably of non-magnetic material, and upon it is mounted a curved polarized magnet e concentric with the rack d.

E indicates a fixed solenoid, of which the magnet e forms a core.

The frame D is normally maintained in a central position by means of springs d'' or equivalent devices. It will be evident that the frame D may be moved more or less in either direction from its central position according to the direction and strength of the current used to energize the solenoid. It will also be evident that instead of the particular form and arrangement of the frame D, solenoid and magnet, other equivalent arrangements may be used. For instance, the magnet e might be fixed at its ends to the main frame and the solenoid connected to the movable frame D. Also in lieu of the polarized magnet, an electro-magnet might be used, in which case the end in view might be accomplished by reversing and controlling the circuit of the magnet or the circuit of the solenoid, or both. The solenoid circuit e' is carried up to the car by flexible conductors suspended in the elevator well, in the usual manner.

Located in the car, and in circuit with the solenoid, is a pole-changer and rheostat F, which, for convenience, I have shown combined in the manner in which they are used in an ordinary reversing switch. The resistances of the rheostat are indicated by f, and the contact lever by g. In order to prevent the resistances f from being cut out too rapidly by the operator, a dashpot H may be connected to the contact lever, if desired.

The operation of the devices thus far described is as follows: If it be desired to start the elevator car upward, the operating lever g is moved in one direction, to the left, for instance, the effect of which is to close the solenoid circuit through the resistances f, and at the same time to direct the current so that the reversing switch will be moved in the proper direction. To increase the speed of the motor and car, the resistances f are gradually cut out of the solenoid circuit, thus gradually strengthening the solenoid circuit and operating the switch B. It will be evident that the strength of the solenoid and the position of the switch B may be controlled by the lever g, and, indirectly, the speed of the elevator car. When it is desired to stop the car it is slowed down by moving the lever g in the reverse direction and gradually cutting in the resistances f. The operator on the car is thus enabled to regulate the speed and to make easy and gradual stops and starts.

The invention might be operated without the dashpot H, but in such case the operator, if careless, might, by cutting out the resistances too quickly, throw the full current on to the armature before the motor had gained sufficient headway and thereby burn out the armature or do other damage. It is therefore desirable to include the dashpot or some equivalent device for safety.

In Fig. 2 the reversing switch I is operated from the car in the usual manner by a hand-rope h which runs over the sheave h', the switch being connected to the sheave h' by a second rope h''. In the arrangement shown, the solenoid J is employed simply to cut in or out resistances in the armature circuit. The core of the solenoid, which in this instance need not be polarized, is connected to a contact lever k which is arranged to cut out more or less resistance from the rheostat K as the solenoid is energized more, or less. The resistance is normally in the armature circuit, the resistance bar being drawn down by gravity or a spring. A dash-pot k' may be used to regulate the movement of the resistance bar in cutting out the resistance. The solenoid circuit is carried to the elevator car, as previously described, and connected to a rheostat G in the car. The rheostat consists of a series of resistances g and a hand-lever g', by which the attendant may cut in or out the resistances and break the circuit when necessary.

From the description of the operation of Fig. 1, it will be obvious that the modification shown in Fig. 2 operates in a manner substantially similar, excepting that the attendant in the car uses the ordinary rope for reversing instead of operating the reversing and regulating devices by a single lever, as shown in Fig. 1. To start the car upward, the rope is pulled down and the reversing switch operated to start the motor in the proper direction. As the solenoid is inactive, the motor will start slowly, its armature taking current through the entire rheostat K. In order to increase the speed of the motor, the attendant then operates the solenoid slowly by cutting out the resistances g gradually. To stop the car the resistances g are gradually cut in, thus weakening the solenoid and cutting resistances into the armature circuit. This slows the car down in approaching a landing, and it is finally stopped by means of the hand-rope in the usual manner.

While I have shown the solenoid as connected in a separate branch from the main, I do not wish to limit myself to any particular arrangement of circuits, as, for the purposes of my invention the solenoid might be included in a shunt to the armature circuit, or in any other arrangement of circuit which it may be convenient to use. Therefore, without limiting myself to the precise construction and arrangement of parts shown and described,

I claim—

1. In an electric elevator the combination with the motor of an electrically controlled device for cutting in and out resistance in the armature circuit, a circuit extending to the car for controlling said device, and a rheostat in the car for varying the resistance in the latter circuit, whereby the speed of the car may be regulated, substantially as described.

2. In an electric elevator the combination with the motor, a rheostat in the armature circuit thereof, and a solenoid connected to operate said rheostat, of a circuit for the solenoid, said circuit extending to the car, a rheostat in the car included in the solenoid circuit, and an operating device for the rheostat in the solenoid circuit, whereby the speed of the car may be regulated, substantially as described.

3. In an electric elevator the combination with the motor, a reversing switch and rheostat for the armature circuit of said motor, and an electrically controlled device for operating said switch and rheostat, of a circuit for said device extending to the car, a reversing switch

and rheostat located in the car and included in said latter circuit, and an operating device in the car for said switch and rheostat, substantially as described.

4. In an electric elevator the combination with the motor, a reversing switch and rheostat for the armature circuit of said motor, and a solenoid arranged to operate said switch and rheostat, of a circuit for said solenoid extending to the car, a reversing switch and rheostat located in the car, and included in the solenoid circuit, and an operating device in the car for said switch and solenoid, substantially as described.

5. In an electric elevator, the combination with the motor, a reversing switch for said motor, and a solenoid for operating the reversing switch, of a solenoid circuit extending to the car, a reversing switch mounted upon the car and included in said solenoid circuit, and an operating device for said switch, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT WATSON.

Witnesses:

RALPH W. LEE,

HARRY C. BIRGE.