(No Model.) 2 Sheets—Sheet 1.

J. D. IHLDER.

SAFETY DEVICE FOR ELECTRIC ELEVATORS.

No. 601,301. Patented Mar. 29, 1898.

Fig. 1.

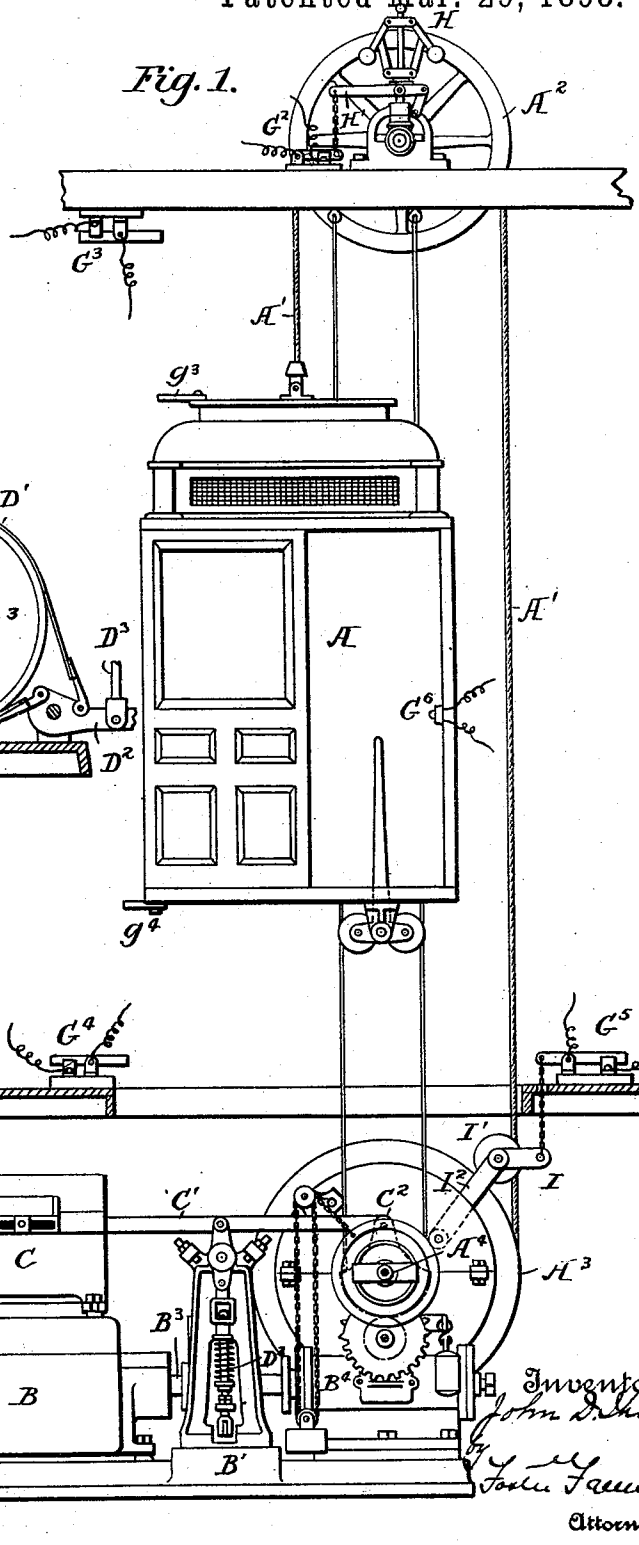

Fig. 3

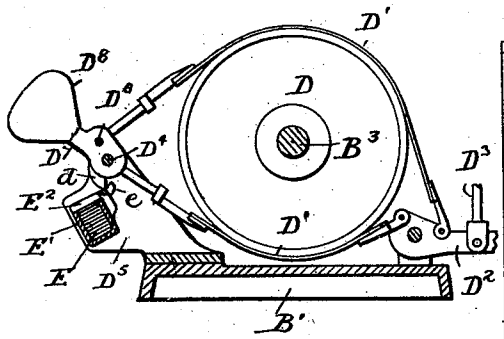

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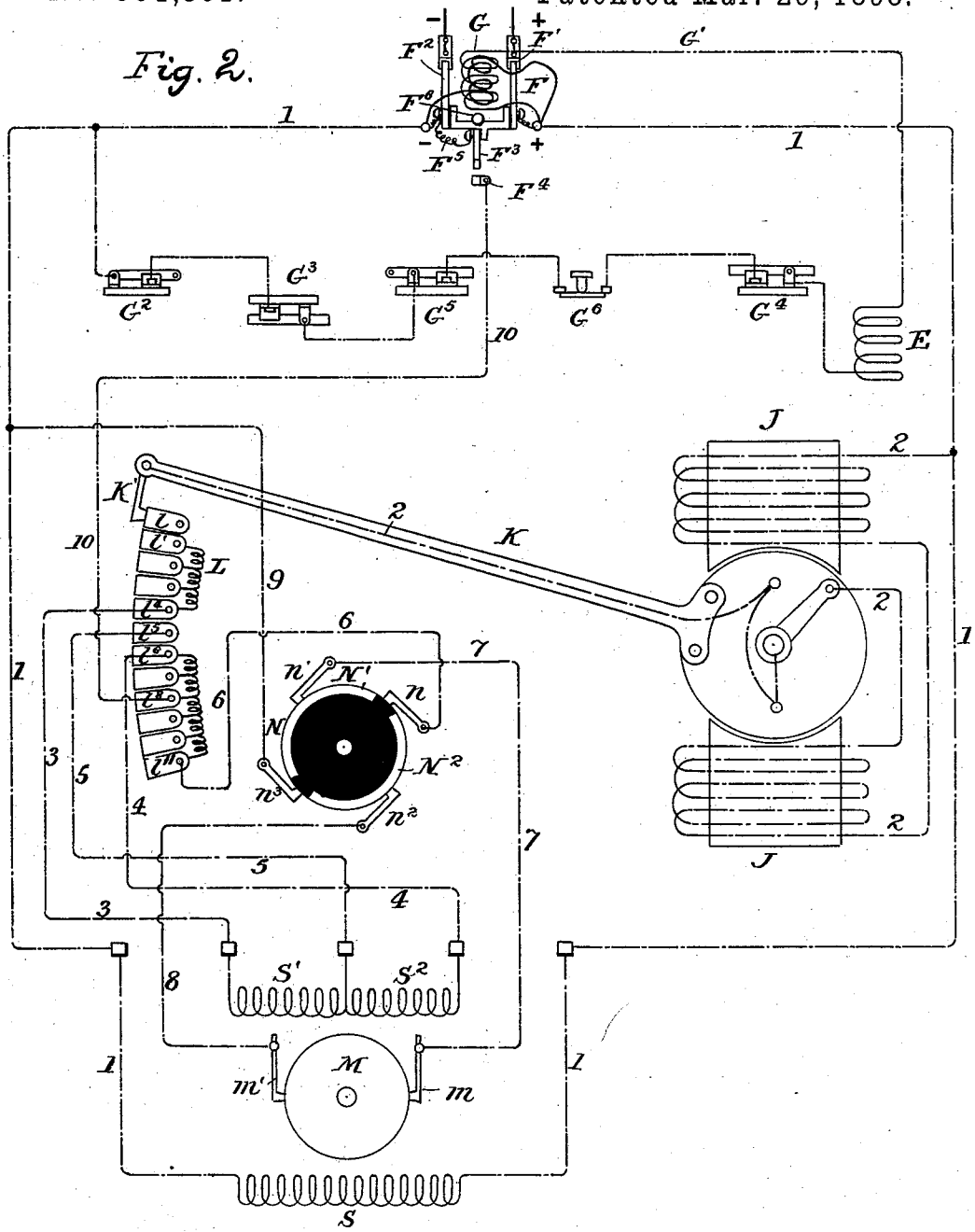
Fig. 2.



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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR ELECTRIC ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 601,301, dated March 29, 1898.

Application filed October 15, 1896. Serial No. 609,008. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. IHLDER, a citizen of the United States, residing in Yonkers, Westchester county, State of New York, have invented certain new and useful Improvements in Safety Devices for Elevators, of which the following is a specification.

My invention relates to safety devices for electric elevators; and it has for its object to provide means to prevent the elevator getting beyond control in case of accident, derangement of apparatus or circuits, &c.; and to these ends it consists in the various features of construction and arrangement of parts operating to stop or control the elevator in the manner substantially as hereinafter more fully set forth.

Referring to the accompanying drawings, Figure 1 is a general view of an electric-elevator apparatus of a well-known type, showing my present improvements. Fig. 2 is a diagrammatic arrangement of circuits which may be employed in connection with the apparatus; and Fig. 3 is a side view, partly in section, of the brake apparatus on an enlarged scale.

While my invention is intended to be used and is shown as adapted for use in connection with electric elevators, it is evident that it can be used in other connections and with other devices and that parts of the invention may be used separately or in connection with each other or with other equivalent devices; and while I shall now proceed to describe one form or embodiment of my invention it will be understood that I am not limited thereto, as it can be modified by those skilled in the art to adapt the invention for use in many and various constructions.

In Fig. 1 I have shown sufficient of a typical electric elevator to enable those skilled in the art to understand the same, and while I do not deem it necessary herein to specifically describe the details of construction and operation of the parts it is sufficient to say that A is the elevator-cage, connected to the suspensory rope or ropes A′, passing over a sheave A^2 and around a drum A^3. The electric motor B is mounted upon a suitable base B′, and in the arrangement shown the armature B^2 is mounted on or connected with the shaft B^3, which is provided with a worm within a worm-case B^4, engaging a suitable worm-wheel on the shaft A^4, carrying the drum A^5, and it will be understood that the drum or equivalent winding device is directly operated by the motor to raise or lower the elevator-car. Mounted on the motor is a switch-box C, containing the circuit-reverser and devices for controlling the current of the electric motor and other apparatus, and this is provided with a shipping rod or bar C′, which is connected to a wheel or arm C^2, shown as mounted on the shaft A^4 and controlled in the present instance by the standing ropes through the medium of a lever or other device on the car. The details of this construction need not be herein described, it being sufficient to say that as the standing ropes are moved by the operator the shipper-bar is operated, controlling the electric circuits in a well-known manner to start and stop the car and regulate its speed.

Connected to be operated simultaneously with the standing ropes and shipping mechanism is a brake device, which in the present instance is interposed between the motor and winding-drum and is operated by the shipping-bar C′, it being understood that when the parts are in the position shown in Fig. 1, with the motor at rest, the brake is applied; but when the shipper-bar is moved to start the motor in either direction the brake is released, and when the shipper-bar is moved to stop the motor the brake is again applied both automatically and positively.

While any desired brake apparatus may be used, in Fig. 3 I have illustrated one form embodying certain improvements, which are more particularly set forth and claimed by me in my application, Serial No. 606,561, filed September 21, 1896, and this comprises, briefly stated, a brake-wheel D, mounted on the shaft B^3 and having brake-bands D′, with their free ends connected to a lever D^2, which in turn is connected to a rod D^3, controlled and operated by the shipper-bar C′. The brake-band is divided into two parts, forming practically two bands, one of which is connected to a bearing D^4, mounted in brackets D^5, while the other band is connected to an eccentric bearing D^6, mounted in a rocking bearing D^7, having a weight D^8 and provided

with a lug or projection d. Arranged also in the bracket is an electromagnet E, shown as inclosed in a cup-shaped housing E′ and having a pivoted cover E^2, serving as an armature for the magnet, which cover is provided with a lug e, engaging the lug d on the rocking bearing D^7.

Briefly described, when the parts are in the position shown in Fig. 3 the cover or armature E^2 is attracted by the magnet holding the weight D^8 in its elevated position, and the brake-bands may be operated by the lever D^2 in the usual way. When, however, the strength of the current passing through the magnet E falls below a predetermined amount, the armature or cover E^2 is released and the lugs e d permit the weight D^8 to fall, automatically applying the upper brake-band D′ and stopping the car. When the brake-lever D^2 is operated by the rod D^3 in the usual way, the weighted bearing is again brought to its normal position (shown in Fig. 3) and the lugs d e engage to hold it there so long as the current through the magnet is of proper strength. It will be seen that this arrangement constitutes a safety-magnet brake device in addition to the ordinary brakes used in elevators.

I arrange in the electric circuit of the elevator apparatus an automatic potential switch F, which controls the electric circuit of the elevator apparatus. The potential switch I prefer to use is more fully described and claimed in my Patent No. 594,879, granted December 7, 1897, and need not be set forth in detail herein, it being sufficient to say that it consists of a double-pole brake-switch having blades F′ F^2, controlling the circuit from the feeding-wires + and −, and an additional blade F^3, adapted to engage an independent circuit, the terminal of which is indicated at F^4, and in the present instance this blade F^3 is connected to the blade F^2 or the circuit thereof by suitable means, as a conductor F^5.

The switch is controlled by a magnet G, the coils of which are included in the main circuit, so that as long as the potential of the current in the main line is in satisfactory condition the switch remains closed; but on a fall of potential to a predetermined limit the switch is automatically operated to break the main-line circuit and close the independent circuit through the blade F^3 and contact F^4. The switch may also be manually operated, as by the handle F^6.

In the present arrangement the independent circuit controlled by the switch F^3 controls a circuit around the armature of the motor, which preferably includes a part of the normal starting resistances or some other additional resistance, so that the armature will run upon a closed electric circuit, which will tend to arrest the armature and stop the motor whenever the independent circuit is closed.

The magnet G of the potential switch F in the present instance is wound with a high-resistance shunt-wire connected to the main line and including the safety-brake-magnet coils E, and the relations of this shunt to the main line are such that under normal conditions of current the brake-magnet E will be sufficiently energized to hold the parts in their normal position, (indicated in Fig. 3;) but when the potential of the main circuit falls below a predetermined amount not only will the potential switch operate to break the main circuit, but the brake-magnet will release the weight D^8 of the brake apparatus, which will automatically apply the brake to instantly stop the motor. At the same time, as an additional element of safety, the potential switch will close the independent circuit, short-circuiting the armature of the motor, thus providing an additional means of stopping the motor and electrically arresting the movement of the car.

The shunt-circuit of the magnet G is arranged to include a number of safety devices, the operation of any one of which either manually or automatically will break the circuit of the safety-magnet E or reduce the potential therein, so as to release the weight and cause the brake to be applied to stop the car. Thus, referring to Fig. 1, H represents a governor device attached to and operated by the shaft of the sheave A^2, and this operates a lever H′, so as to move the switch G^2 to break the circuit G′ of the magnet G and of the brake-magnet E when the car is traveling beyond the normal or predetermined rate of speed. The operation of this governor need not be described, as it is well understood, the balls being arranged so that when they fly outward far enough and preferably before they will accomplish their usual purpose, which is to operate the mechanical safety devices on the car or in the well to mechanically stop the elevator, (which devices, however, are not shown herein,) the switch G^2 will be operated, as before described. Also connected in the circuit G′ are switches G^3 G^4, which are arranged at the top and bottom of the well in such a position as to be operated by the car when it reaches the extreme limits of its movement in either direction. Thus in Fig. 1 I have shown a projection g^3 on the top of the car, adapted to engage the switch-lever G^3, and a projection g^4 on the bottom of the car, adapted to engage the switch-lever G^4, to break the circuit, so that if perchance the movements of the car are not under proper control when it reaches the extreme limits of its travel in either direction the safety brake-magnet E will operate to release the weight and apply the brake to stop the car, and the potential switch will break the main-line circuit. Also connected in the circuit G′ is a switch G^5, connected to be operated by the slack-cable device I, Fig. 1, which in this instance consists of a pulley or wheel I′, mounted in pivoted arms above the drum A^3 and bearing against the ropes or cables A′ in such a position that normally the switch G^5

is closed; but when for any cause the cables or ropes become slackened the wheel or pulley I′ will fall sufficiently to operate the switch-lever G^5 to break the circuit of the magnets E and G, thus opening the potential switch and applying the brakes to stop the car. Also arranged upon the car is a switch device G^6, shown in the present instance in the form of a push-button connected in the circuit G′, and it will be readily understood that when in case of emergency the button is operated the circuit of the brake-magnet is broken or the potential thereof so reduced that the brake is automatically applied to stop the car and the supply-circuit is broken.

In order that the arrangement of circuits may be more clearly understood, I have indicated in the diagram Fig. 2 one simple arrangement of circuits for operating the motor and controlling the safety devices, and while this is a satisfactory arrangement in many cases it will be understood that it is only given as a typical form and may be varied to suit the requirements of any particular case. To briefly describe such circuits: From the blade F′ of the potential switch F extends a conductor 1, including the shunt field-magnet coils S of the electric motor, and thence leading to the blade F^2 of the potential switch. Branching from the conductor 1 is a conductor 2, which in the present instance passes around the field-magnets J of an electromagnetic dash-pot or regulator for the lever K, controlling the resistance L of the armature-circuit of the motor in a well-known way. The conductor 2 leads through the arm of the lever K to the brush K′, normally bearing on one of the contacts l of the resistance device L. Connected to one of the contacts, as l^4, is a conductor 3, leading to one end of the series field-magnet coils S′ S^2 of the motor, the other end of the coils being connected by conductor 4 to one of the contact-plates, as l^6. Connected to another contact-plate, as l^5, is the conductor 5, leading to an intermediate portion of the series field-magnet coils S′ S^2, so that the series field-magnet coils may be eliminated from the circuit in sections, or the current may be reversed or otherwise arranged to suit the requirements of any particular case. Connected to the contact-plate l^{11} is a conductor 6, leading to the brush n of the circuit-reverser N, which is shown as a disk having two conducting-plates N′ N^2. Leading from the brush n' is a conductor 7, connected to the brush m of the armature of the motor M, and from the brush m' is a conductor 8, leading to the brush n^2 of the circuit-reverser, and from the brush n^3 is a conductor 9, leading to the minus side of the main conductor 1 and thence to line.

The operation of this device need not be fully set forth, as it is understood that the circuit-reverser N is connected to be operated by the shipping-rod C′ to control the circuit to start and stop the motor.

The independent circuit controlled by the blade F^3 and contact F^4 comprises a conductor 10, in this instance leading to a contact l^8 of the resistance device L, and when the circuit is closed it can be traced through the conductor 10, the contact l^8, through a portion of the resistance L to the contact l^{11}, thence by the conductor 6, brush n, and if the circuit-reverser N is in the proper position to the plate N′, brush n', conductor 7, through the armature-brushes m m', conductor 8, plate N^2, brush n^3, conductor 9, and back through conductor F^5 to the blade F^3, and it will thus be seen that when the working circuits of the electric motor are broken by the operation of the potential switch the armature of the motor is immediately short-circuited through the resistance, so that it will operate to electrically stop the motor and the car. It will thus be seen that by this construction and arrangement of parts I provide safety devices which operate automatically or manually, or both, so that upon the falling of the potential of the current the safety-magnet brake device will be operated to stop the car, and in addition thereto the armature of the motor will be short-circuited to electrically stop the car, and one or both of them, acting separately or in conjunction, will certainly produce the desired results in the quickest practical time. Not only will this happen when the potential switch is operated automatically, but when it is operated manually by means of the handle, or otherwise, connected therewith. Not only will the safety-magnet brake be operated when the main circuit is broken by the potential switch, but by properly proportioning the shunt-circuit G′ the safety brake-magnet E may be operated to automatically apply the brake, even before the potential falls sufficiently to operate the potential switch F. Further than that, by connecting in the circuit of the safety brake-magnet the various switches adapted to be manually or automatically operated by the governor, the slack-rope device, or other appliance the operation of the elevator and its motor may be rendered practically safe under any emergency, whether the breaking or derangement of the parts of the apparatus, the failure of the current, or the failure of the operator to properly control the motor and car. All these devices are exceedingly simple in construction and in operation and tend to effect one of the most essential requisites of an electric elevator, and that is the element of safety.

What I claim is—

1. In an electric elevator, the combination with the car and motor therefor, of a potential switch arranged in the circuit of the motor, and a shunt-circuit including the magnet of the potential switch and the magnet of the safety brake device, substantially as described.

2. In an electric elevator, the combination with the car and motor therefor, of a potential switch arranged in the circuit of the mo-

tor, a shunt-circuit including the magnet of the potential switch and of the safety brake device, and an independent circuit including the armature of the motor and controlled by the potential switch, substantially as described.

3. In an electric elevator, the combination with the car and motor therefor, of a safety-magnet brake device, a circuit including the magnet thereof, a switch included in said circuit, and a governor controlled by the moving car and controlling said switch, substantially as described.

4. In an electric elevator, the combination with the car and motor therefor, of a safety-magnet brake device, a circuit including the magnet thereof, a switch included in said circuit, and a slack-rope device connected to said switch, substantially as described.

5. In an electric elevator, the combination with the car and motor therefor, of a potential switch controlling the circuits, an independent circuit controlled by said switch and including the armature of the motor, a shunt-circuit including the safety brake-magnet, and switches included in the circuit of said safety brake-magnet arranged to be operated to break the circuit of said magnet, substantially as described.

6. In an electric elevator, the combination with the car and motor therefor, of a potential switch arranged in the circuit of the motor, an independent circuit controlled by the potential switch and including the armature of the motor, a shunt-circuit including the magnet of the potential switch and the magnet of the safety brake device, and a switch in the circuit of the safety brake device, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN D. HILDER.

Witnesses:
JAMES S. FITCH,
O. B. WARING.