(No Model.) 2 Sheets—Sheet 1.

N. P. OTIS & R. C. SMITH.

SAFETY DEVICE FOR ELECTRIC ELEVATORS.

No. 458,977. Patented Sept. 1, 1891.

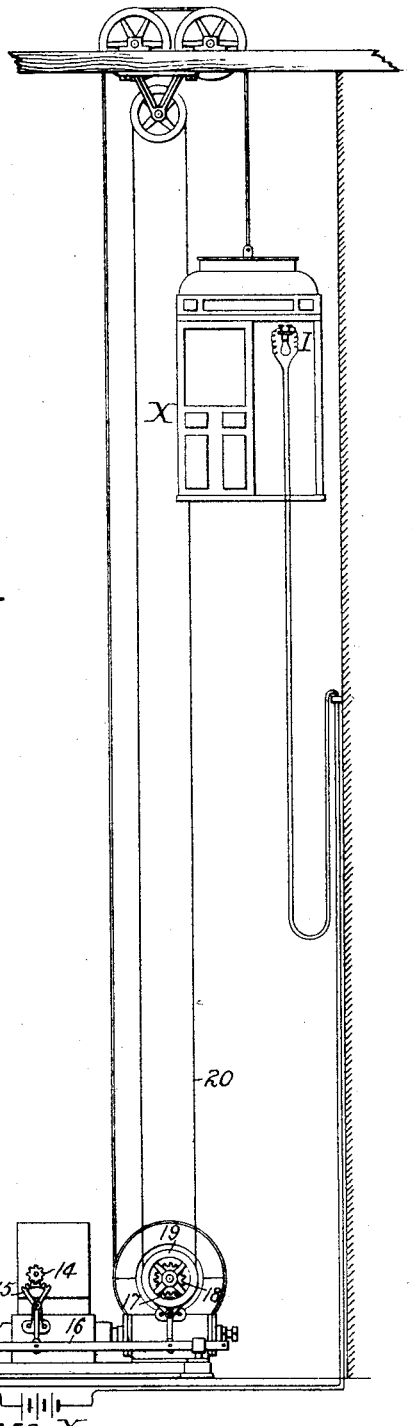


Fig. 1.

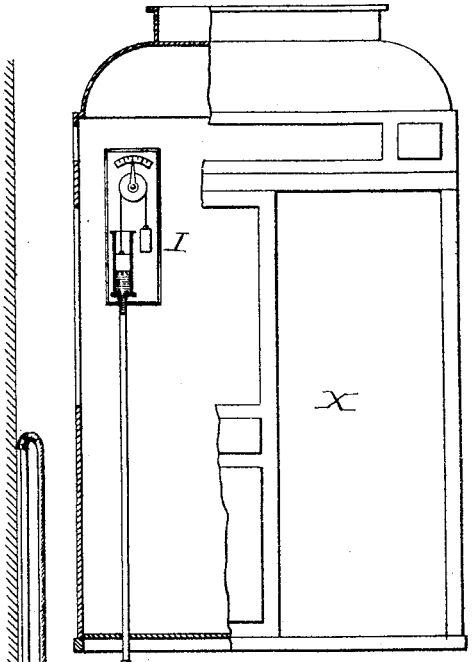
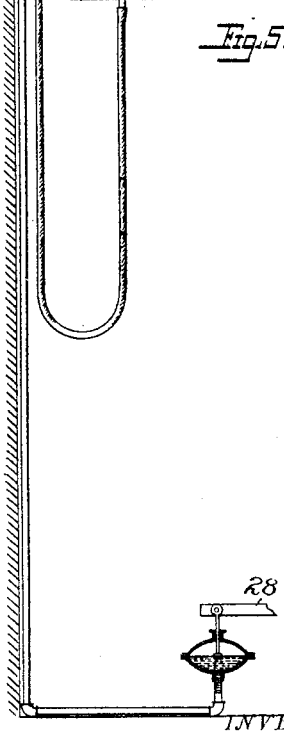


Fig. 5.



WITNESSES
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(No Model.) 2 Sheets—Sheet 2.

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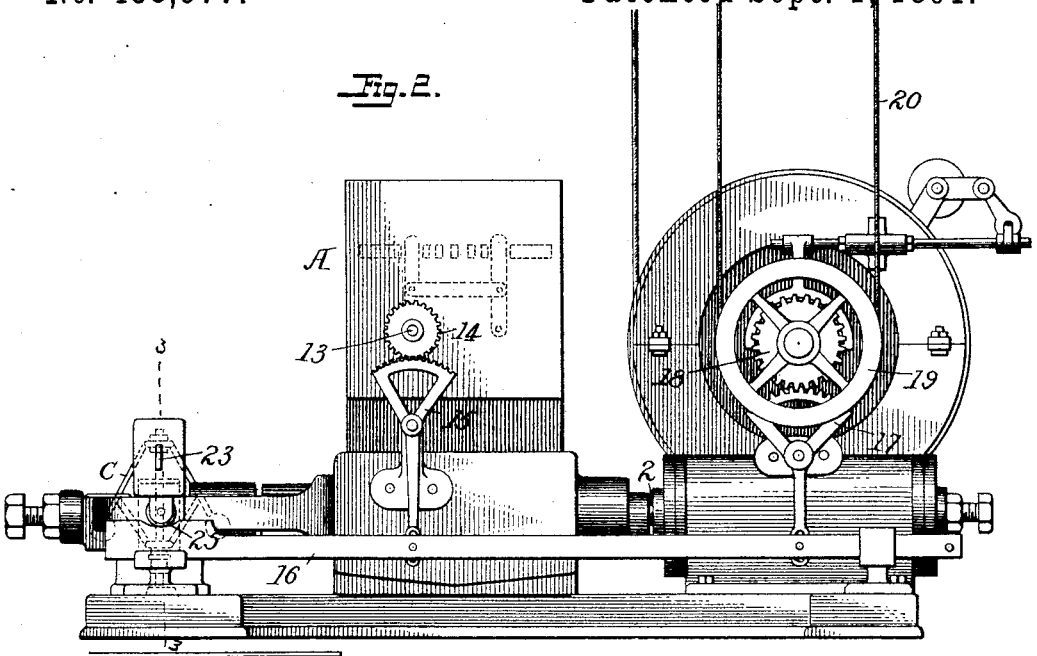
Fig. 2.



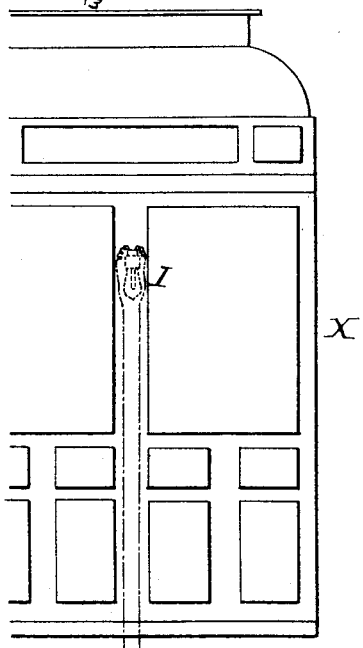


Fig. 4.

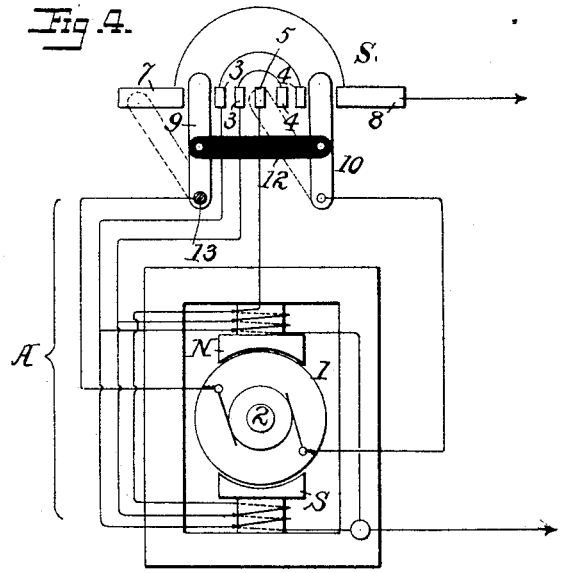
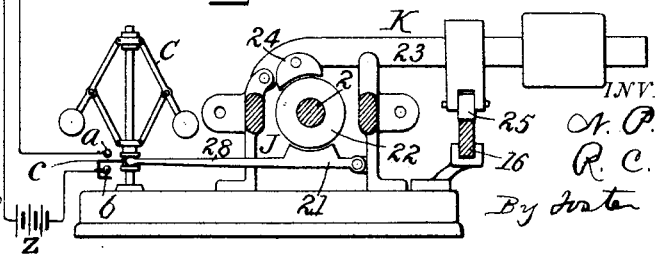


Fig. 3.



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UNITED STATES PATENT OFFICE.

NORTON P. OTIS AND RUDOLPH C. SMITH, OF YONKERS, NEW YORK, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE NATIONAL COMPANY, OF ILLINOIS.

SAFETY DEVICE FOR ELECTRIC ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 458,977, dated September 1, 1891.

Application filed December 31, 1890. Serial No. 376,382. (No model.)

To all whom it may concern:

Be it known that we, NORTON P. OTIS and RUDOLPH C. SMITH, citizens of the United States, residing at Yonkers, in the State of New York, have invented certain new and useful Improvements in Safety-Guards for Elevators, of which the following is a specification.

The object of our invention is to provide means whereby the operator in the cage of an elevator may be notified of any change of the operation of the engine and to provide safeguards whereby to prevent a series electromotor from using an unnecessary amount of current beyond that required for the work which it is required to do; and to these ends we provide the cage with an indicator, with means for operating it upon an undue change in the speed of the engine, and in the case of an electrical engine we provide means whereby the operator in the cage can control the operating extent of the field-magnet, and whereby friction is automatically applied to prevent any undue increase of motion of the engine.

In the accompanying drawings, Figure 1 is an elevation showing a passenger-elevator and engine embodying our improvements; Fig. 2, an enlarged side elevation of the engine; Fig. 3, a transverse sectional view on the line 3 3, Fig. 2, showing the car; Fig. 4, a diagrammatic illustration of the motor-controlling switch and circuits; Fig. 5, a motor showing a modified form of indicator.

The motor A may be of any of the well-known types, with an armature 1 upon a shaft 2 and revolving between the poles of the field-magnets N S, the multiple coils of which connect with one section of the main line and lead to terminals or contact-plates 3 3 4 4 5, arranged between contact-plates 7 and 8, in connection with the other section of the main line.

The reversing-switch S consists of two arms 9 10, each pivoted at the lower end and swinging at the upper end over the contacts or terminals between the central terminal 5 and the side terminal 7 or 8, the two arms being connected to swing together by a non conducting or insulating coupler-bar 12. These arms are connected as hereinafter described and illustrated, and with any suitable means for shifting them.

The arm 9 is electrically connected with one of the armature-brushes and the arm 10 with the other brush of the armature, and the terminals of the field-magnet coils are properly looped together—for instance, as in Fig. 4—to secure a correct action in diminishing the motive force of the motor and in reversing the current and direction of rotation of the armature. Thus when the parts are in the position shown in full lines, Fig. 4, the line is open. No current can pass to the motor, and the latter is at rest.

When the parts are shifted to the position shown in dotted lines, Fig. 4, the arm 10 is upon the terminal 5 and the arm 9 on the terminal 7 to complete the circuit in such manner as to secure the maximum strength of the field and the highest electro-motive force of which the machine is capable. If the switch is thrown to the right instead of to the left to bring the arm 9 onto the terminal 5, the same result will be attained; but the armature will be reversed in its direction of motion. If the power developed is greater than is required, the effective operation of the machine is reduced by shifting the arms of the switch S onto one or the other of the terminals 3 3 or 4 4, cutting out a portion of the field-coils.

In order to adapt the use of the motor and its regulating-switch device for service in an elevator apparatus, we combine with the switch, constructed as described or in any other manner to secure the same result, appliances whereby the said switch may be shifted to one side or the other and set at any intermediate point at either side by the act of the operator or attendant in the cage. One construction of appliances is illustrated in the drawings and will now be described. The arm 9 is secured to a short pivotal shaft 13, rocking in suitable bearings and carrying a pinion 14, which gears with the teeth of the sector-lever 15, pivoted between its ends and slotted to receive the pin upon the sliding

shifter-bar 16. A second sector-lever 17 is also slotted to receive a pin from the shifter-bar and gears with a pinion 18 upon a sleeve attached to a pulley 19, round which passes a hand-rope 20, extending through the car X of the elevator. It will be seen that by means of the appliances described the attendant in the elevator-cage by moving the hand-rope 20 upward or downward and to any desired extent may shift the switch to one side or the other or set it at any intermediate point, and thereby he can control the working power of the engine, proportioning it to the load to be lifted or lowered.

In order to avoid the necessity of constant observation of the running of the engine and of mistakes from the ignorance or carelessness of the operator, we combine with the cage an indicator I and with the engine a governor C, which controls the current or other force operating the indicator. The indicator may be of any suitable character, as an alarm operated by an electric current or otherwise, a visual signal in the form of an electric lamp, as shown in Fig. 3, or a pointer operated by a weight and piston propelled by variations in a fluid column, as shown in Fig. 5. The governor may be constructed in any suitable manner so as to vary the current or the fluid column or other signal-actuating means, an ordinary ball-governor being shown driven from the engine and shifting a circuit-closer *c*, so as to make contact with the two terminals *a* and *b* when the speed of the engine becomes excessive, and to thereby complete a circuit including a battery Z and a signal in the car. By means of a governor and signal device the operator is warned upon any undue increase in the speed of the motor, so that he can thereupon shift the switch to reduce the power of the engine; but in order to prevent accidents from any negligence of the indications of the signal we combine with the engine a brake device J, whereby sufficient mechanical resistance is applied to the moving part of the engine by the action of the governor to prevent excessive speed if the operator fails to shift the switch and cut out the field-coils. One construction for effecting this result is shown as consisting of a brake-lever 28, carrying a brake-shoe 21, which is brought against a brake-wheel 22 upon the shaft 2 by the action of the governor C when the speed of the engine is such as to throw out the governor-balls beyond their normal limit. As shown, the circuit-closer *c* is carried by the brake-lever 28 and is so arranged as to close the circuit including the indicator I before the brake is applied, so that the operator in the cage is warned before the speed of the engine reaches its maximum limit.

It will be evident that an electric brake or other form of brake may be substituted for that shown, and that other forms of speed-governors may be employed.

In order to rapidly arrest the momentum of the machine when the main circuit is broken to stop the machine, we make use of a second brake device K, consisting of a weighted lever 23, carrying a shoe 24, adapted to be brought against the brake-wheel 22, and the lever K is provided with a roller or other bearing 25, resting upon the shifter-bar 16, which is notched, as shown in Fig. 2, so as to allow the lever 23 to descend and apply the brake-shoe to the friction-wheel as the switch is brought to its central position. When the shifter-bar is moved to either side, the inclines or inclined sides of the notch lift the brake-lever and remove the shoe from the wheel.

It will be evident that some of the features described may be used separately with other kinds of engines than that shown and described.

Without limiting ourselves to the precise construction and arrangement of parts shown, we claim—

1. The combination, in an elevator, of a traveling cage or platform, a stationary series electromotor having the various field-magnet coils connected to the separate terminals, terminals for the main circuit, a switch arranged to break or shift the circuits to arrest, reverse, and vary the power of the engine, and appliances between the switch and the cage whereby the operator can shift the switch to arrest, reverse, and vary the speed of the engine and cage, substantially as set forth.

2. The combination, with the cage and a series electromotor having sectional field-magnet coils, a series of terminals connected with the sections of said field-magnet coils, and terminals arranged upon opposite sides of said series of terminals, of a switch provided with two arms connected to move together over said terminals, and appliances between the switch and the cage for operating the switch from the cage, substantially as described.

3. The combination, with an elevator and electromotor for operating the same, of a governor or speed device operated by the motor and an indicator in the cage controlled by the governor to indicate to the operator any undue change in the speed of the engine, substantially as set forth.

4. The combination, with the cage, operating-engine and controlling devices therefor, and means for operating the same from within the cage, of a speed device or governor driven from the engine, and an indicator within the cage and means for operating the same from the governor, substantially as and for the purpose set forth.

5. The combination of an elevator-cage, operating-engine, speed device operated therefrom, an electric circuit including an indicator in the cage, and circuit-closer connected to be operated by the speed device, substantially as set forth.

6. The combination, with the cage of an elevator and with the motor therefor, of a

speed device driven from the motor, an indicator controlled thereby, and a friction-brake connected with the speed device to apply a frictional resistance to the motion of the parts when the speed of the motor becomes excessive, substantially as set forth.

7. The combination, with an elevator-cage, electromotor, and switch, and connections whereby to stop, reverse, and vary the speed of the motor, of a friction-brake, an automatic speed device connected to be operated from the motor and to operate the brake, and a secondary brake device connected to be controlled from the cage substantially as set forth.

8. The combination, in an elevator, of the cage, an electromotor, a switch device arranged to regulate the extent of the field-coils required in the circuit and to break and reverse the circuits, connections between the switch device and the cage, and an automatic speed device operated by the motor for preventing the excessive speed of the latter, substantially as described.

9. The combination, with the engine and shifter-bar, of a brake and inclines on the shifter-bar arranged to lift the brake when the bar is moved from its mid-position in either direction, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

NORTON P. OTIS.
RUDOLPH C. SMITH.

Witnesses:
HENRY L. BRANT,
SAMUEL BURGER.

Correction in Letters Patent No. 458,977.

It is hereby certified that Letters Patent No. 458,977, granted September 1, 1891, upon the application of Norton P. Otis and Rudolph C. Smith, of Yonkers, New York, for an improvement in "Safety Dĕvices for Electric Elevators," were erroneously issued to the National Company, of Illinois, as sole owner of the said invention; that said Letters Patent should have been issued to said *Norton P. Otis and the National Company, jointly*, said National Company being assignee of the interest of said Rudolph C. Smith only, as shown by the record of assignments in this office; and that said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 15th day of September, A. D. 1891.

[SEAL]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

W. E. SIMONDS,
Commissioner of Patents.