(No Model.)

W. D. LUTZ.

ELECTRIC ELEVATOR.

No. 520,794. Patented June 5, 1894.

Fig. 1.

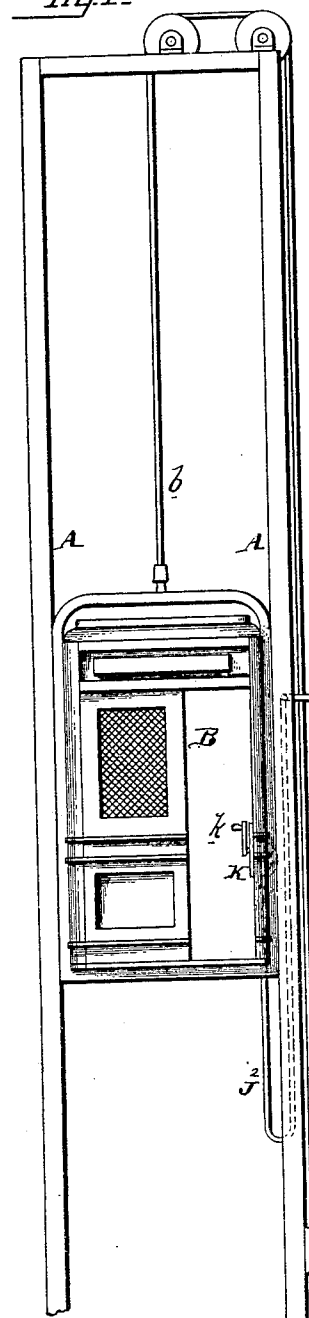


Fig. 2.

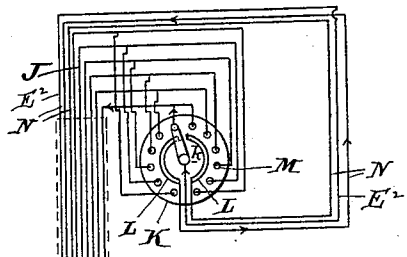


Fig. 3.

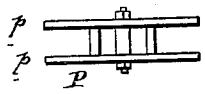
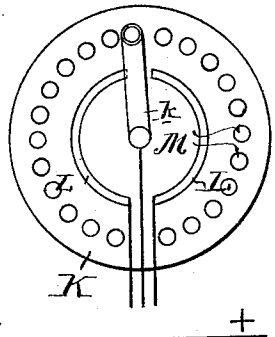


Fig. 4.



Witnesses:

Jesse B. Keller.

H. C. Mothenrell.

Inventor.

Wm. D. Lutz

By

Attorney.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM D. LUTZ, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 520,794, dated June 5, 1894.

Application filed March 10, 1894. Serial No. 503,086. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM D. LUTZ, of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Electric Elevators, of which the following is a specification.

My improvements have reference to electric controlling devices for elevators, &c., and consist of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof.

More particularly my invention comprehends certain features or improvements in the controlling mechanism for varying the speed of movement of the cage under the action of an electric motor, and permits the said control to be had from the moving car or cage.

In carrying out my invention I employ the following instrumentalities combined so as to co-operate and produce the advantageous results hereinafter specified. The car is provided with a hand controller formed of any suitable construction of switch devices adapted to the purpose, the movement of which is designed to vary the speed of movement of the cage, and also its direction of travel, that is to say, up or down. The cage is moved by any suitable hoisting device such as a cable and drum operated by an electric motor. The electric motor has its speed directly controlled by a rheostat and the said rheostat has its resistance cut in or out of circuit by means of a suitable series of solenoids and a movable core actuated thereby. The solenoids are controlled by means of electric circuits leading from the supply conductor to the cage, thence through the switch back to the solenoids, and thence to the return conductor, the said solenoids being so combined with the switch on the cage that they can be separately and successively energized so as to cause a definite travel or movement of the core and with it the switch contact of the rheostat. The rheostat switch may also be employed to interrupt the motor circuit. In addition to the foregoing device I may employ an electrically actuated switch for reversing the current in the armature of the motor, the said reversing device also being controlled by the switch upon the cage. The construction is such that when the lever is moved in one direction over the switch board the reversing switch is operated to make the motor run in one direction, and when the switch lever is moved in the opposite direction over the switch board, the said reversing switch controls the motor to make it run in the reverse direction.

By my improvements, a single hand operated switch controls all the necessary movements of the cage and insures accurate respondence in the power device and the means to control the same.

My invention may be used for other purposes than the controlling of elevators. Broadly considered, it may be employed for any purpose where a distant rheostat is to be operated to control the running of an electric motor, or wherever it is desired to start, stop, reverse or vary speed of any apparatus at a distance from operator.

My invention will be better understood by reference to the accompanying drawings, in which—

Figure 1 is an elevation of an electrically actuated elevator showing my improvements applied thereto. Fig. 2 is a diagrammatic view illustrating the various electric devices and circuits on a larger scale. Fig. 3 is a plan view of the reversing switch levers; and Fig. 4 is an enlarged view of the switch device on the cage.

A are the guides of the elevator.

B is the cage, *b* the lifting or elevating cable, and C the drum upon which it is wound or unwound in the act of raising or lowering the cage as is customary in elevators in general use. The drum C is rotated by worm wheel gearing or other suitable well known contrivances by an electric motor D which is shown as a series wound motor, that is to say, the armature is in series with the field. I do not confine myself to any particular construction of the motor.

E is the supply conductor leading from a source of electrical energy of any character, and successively includes the field magnets of the motor, part of the reversing switch P, the armature of the motor, another part of the reversing switch P, and the rheostat F, and finally discharges into the return conductor circuit E'. The rheostat F consists of a series of contact plates between all but the

two lowermost of which are interposed resistances *f*. The lowermost plate is the cut out for the motor. Arranged transversely to the contact plates F is a longitudinal contact strip *h* and pressing upon this strip and upon the transverse contact strips F is a movable contact H of any suitable construction. The contact H is moved by a short core *i* operating in a series of solenoids I arranged one above the other. A switch K arranged on the cage B is connected by suitable circuits with the several solenoids so that the said solenoids may be energized successively or in pairs, or successively cut out of circuit by the same switch. The construction is furthermore one in which a portion of the solenoids less than the whole may be successively energized and the last one or pair energized alone maintained in circuit during the movement of the cage. If the lowermost solenoid be energized as is shown in Fig. 2 the circuit is closed and a portion of the resistances are cut out. If the next solenoid be energized, the core will pass from the first solenoid to the second solenoid, and the next series of resistance will be cut out, and so on. The cutting out of the resistance *f* is attained in a gradual manner by having several contact strips F to each solenoid, and the said resistances in being cut out reduce the resistance to the flow of current through the motor D, and consequently permits an increase in its power to suit the load or speed desired.

If desired the contacts on the switch K in the cage may be so arranged and combined with the movable part that two adjacent solenoids I are maintained in circuit as above mentioned in which case the core *i* will assume a position intermediate of the two solenoids energized with the result of giving a greater range of speed regulation.

To prevent the core *i* and the contact block H rising too rapidly, a retarding device may be employed, which device is shown as a piston *g* working in a cylinder G into which the air may be slowly admitted below the piston. This device insures a steady action of the regulator. A valve W in the piston permits the core *i* and its contact to fall rapidly as it allows the air under the piston to readily escape.

Referring to the switch K in the cage, it is made of a disk or board of suitable insulating material provided with two series of contacts M arranged in a circle or curve, one series being from the right of a vertical line through the switch center, and the other to the left of said vertical line, but the corresponding contacts of each set are electrically connected together and to the same circuit leading to the solenoids.

k is a switch lever. If the said switch lever is moved to the left as indicated in Fig. 2 so as to rest upon the first contact block M the current will pass from the supply conductor E through the conductor E^2 as indicated by arrows and be delivered to the lever *k*, and passes thence to the first contact block of the switch K, then by one of the wires J through the flexible cable J^2 to the lowermost solenoid I, and thence to the return conductor E′. The solenoids should be wound with sufficient resistance to prevent injury by the passage of too much current. If the lever K were moved to the second contact on the switch, the second solenoid would be energized, and the core *i* would be drawn into it and remain there, and so on. If the switch lever K were suddenly moved around over a number of the contacts the action would be so quick that the core *i* could not respond, and the solenoid in which the core was located would be cut out of circuit before the core would rise to the next solenoid, and consequently the core would drop back, throwing in the full resistance and then breaking the circuit preventing the destruction of the fuse or injury to the motor which might otherwise occur from too sudden cutting out of the resistance *f*, that is to say, before the motor had attained its speed to generate sufficient counter electro motive force to check the excessive flow of current from the line.

It is preferable to make the contacts M close together as shown in Fig. 4 in which case the movement of the switch lever *k* will first energize the lower solenoid *i*, then energize both lower solenoids in parallel, then cut out the lowermost solenoid, then energize the second and third solenoids in parallel, and so on, causing the gradual decrease of the resistance in the motor circuit as before explained.

To maintain electrical connection between the rheostat, which may be arranged adjacent to the motor D as shown in Fig. 1, and the switch K in the cage B, I arrange the circuits J, E^2, and also the circuits N of the current reversing switch (the latter to be hereinafter described) as a flexible cable J^2, one end of which is connected with a switch K and the other end with the guideways A at an intermediate position. From the guideways the conductors pass by a suitable cable J′ for proper distribution.

The armature circuit of the electric motor D is provided with a current reversing switch P of any suitable construction, the said switch being operated by electro magnetic devices R, R′. The current reverser is composed of two pivoted levers *p* adapted to control eight contacts, but any other type of reversing switch may be employed, that shown being simply intended as a graphical illustration of such a device. In this manner the current reversing switch will be closed when the motor circuit is open and just before the rheostat operating devices come into operation. One terminal of each of the electro magnets R, R′, is connected with the return circuit E′, and the other terminals are respectively connected with two circuits N passing up through the flexible cable J^2 and terminating in two curved contacts L, L on the switch K in the cage. These contacts L are so arranged that

the lever *k* of the switch K when passing to the contacts M will insure the closing of the circuit through the contact L and corresponding electro magnet. As shown in Fig. 2 the current which passes into the switch lever *k* divides, part passing to the solenoids I of the rheostat and part passing to the circuit N leading to the electro magnet R, which being energized causes the switch P to be thrown into position to cause the motor to elevate the cage B. The proportion of these parts should be such that the reversing switch is operated before the circuit is closed through the rheostat, that is to say, the lever *k* should be positively on one contact L before coming into connection with the contacts M, as is clearly shown in Fig. 4.

If the switch lever *k* be thrown to the right from a vertical line the electro magnet R′ will be energized and the reversing switch also thrown into opposite direction to cause the motor to be rotated in a manner to lower the cage, while the movement of the said lever over the contacts M will control the speed of movement. It will be understood that it is not essential that the electro magnets R or R′ should be maintained in electrical circuit after once being thrown and therefore the curved contacts L might be of short length so that the first movement of the lever *k* will energize the particular electro magnet and then cut it out of circuit, the switch P remaining in its position assumed by friction or any other suitable mechanical device well known in the arts.

My invention is especially adapted to elevators but may be used to control any power device at a distance from the operators.

I do not confine myself to the minor details of construction as they may be modified in various ways without departing from the principles of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an electric elevator, the combination of the moving cage, power devices to move the cage, an electric motor to operate the power devices, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a movable contact adapted to be successively actuated by the said solenoids and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch carried upon the cage consisting of a movable part and a series of contacts, and electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch on the cage, whereby the movement of the switch may control the energizing of any particular solenoid or pair of solenoids desired and thereby control the speed of the motor.

2. In an electric elevator, the combination of the moving cage, power devices to move the cage, an electric motor to operate the power devices, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a movable contact adapted to be successively actuated by the said solenoids and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch carried upon the cage consisting of a movable part and a series of contacts, electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch on the cage, whereby the movement of the switch may energize any particular solenoid or solenoids desired and thereby control the speed of the motor, a reversing switch for the electric motor, electro magnetic devices for operating said reversing switch, electric circuits leading from said reversing switch to the moving cage, and switch devices on the cage for controlling the said circuits for the purpose of operating the electro magnetic switch to make the motor run in one direction or the other.

3. In an electric elevator, the combination of the moving cage, power devices to move the cage, an electric motor to operate the power devices, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a movable contact adapted to be successively actuated by the said solenoids and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch carried upon the cage consisting of a movable part and a series of contacts, electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch on the cage, whereby the movement of the switch may energize any particular solenoid or solenoids desired and thereby control the speed of the motor, a reversing switch for the electric motor, electro magnetic devices for operating said reversing switch, electric circuits leading from said reversing switch to the moving cage, a switch device movable in common with the switch device on the cage which controls the energizing of the solenoids for controlling the said reversing switch circuits for the purpose of operating the electro magnetic switch to make the motor run in one direction or the other.

4. In an electric elevator, the combination of the moving cage, power devices to move the cage an electric motor to operate the power devices, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a movable contact adapted to be successively actuated by the said solenoids and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch carried upon the cage consisting of a movable part and a series of contacts, electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch on the cage, whereby the movement of the switch may control

the energizing of any particular solenoid or pair of solenoids desired and thereby control the speed of the motor, and a circuit interrupter controlled by the movable contact to cut out the motor after the resistances are all in circuit.

5. The combination of a moving cage, power devices to elevate or lower the cage, an electric motor to operate the power devices, electric circuits for supplying current to the motor, an electro magnetic switch for reversing the motor consisting of a movable part operated by two electro magnets, separate circuits running from each of the electro magnets to the moving cage and terminating in contacts thereon, a movable switch on the cage electrically connected with the source of electric supply and adapted to be moved into contact with either of the terminals of the electro magnets to energize one or the other for the purpose of making the motor run in one or the other direction, a rheostat to control the current flowing through the motor, and electrically actuated devices independent of the reversing switch and controlled from the cage to positively operate the rheostat to vary its resistance, at will.

6. In an electric elevator, the combination of the moving cage, power devices to move the cage, an electric motor to operate the power devices, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a switch adapted to be successively actuated by the said solenoids and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch carried upon the cage consisting of a movable part and a series of contacts, electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch on the cage, whereby the movement of the switch may energize any particular solenoid or solenoids desired and thereby control the speed of the motor, and suitable retarding devices to prevent the resistance of the rheostat being too suddenly cut out.

7. In an electric elevator, the combination of the moving cage, power devices to move the cage, an electric motor to operate the power devices, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a switch adapted to be successively actuated by the said solenoids and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch carried upon the cage consisting of a movable part and a series of contacts, electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch on the cage whereby the movement of the switch may energize any particular solenoid or solenoids desired and thereby control the speed of the motor, suitable retarding devices to prevent the resistance of the rheostat being too suddenly cut out, a reversing switch for the electric motor, electro magnetic devices for operating said reversing switch, electric circuits leading from said reversing switch to the moving cage, and switch devices on the cage for controlling the said circuits for the purpose of operating the electro magnet reversing switch to make the motor run in one direction or the other.

8. The combination of power devices, a controlling device therefor, a series of solenoids, a core connected with the controlling devices adapted to be successively actuated by the said solenoids and held in any position within them, a distant electric switch consisting of a movable part and a series of contacts, and electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch, whereby the switch may control the energizing of any particular solenoid or solenoids desired.

9. The combination of an electric motor, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a movable contact adapted to be successively actuated by the said solenoids and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch consisting of a movable part and a series of contacts, and electric circuits between the several contacts of the switch and the respective solenoids controlled by the movable part of the switch, whereby the movement of the movable part of the switch may control the energizing of any particular solenoid or solenoids desired and thereby control the speed of the motor.

10. The combination of an electric motor, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a movable contact adapted to be successively actuated by the said solenoids and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch consisting of a movable part and a series of contacts, electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch whereby the movement of the movable part of the switch may energize any particular solenoid or solenoids desired and thereby control the speed of the motor, a reversing switch for the electric motor, electro magnetic devices for operating said reversing switch, electric circuits leading from said electro magnetic devices to the switch devices for controlling the said circuits for the purpose of operating the electro magnetic switch to make the motor run in one direction or the other.

11. The combination of an electric motor, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a movable contact adapted to be successively actuated by the said solenoids

and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch consisting of a movable part and a series of contacts, electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch whereby the movement of the movable part of the switch may control the energizing of any particular solenoid or solenoids desired and thereby control the speed of the motor, and a circuit interrupter controlled by the movable contact to cut out the motor after the resistances are all in circuit.

12. The combination of an electric motor, a rheostat to control the current delivered to the electric motor, a series of solenoids, a core combined with a movable contact adapted to be successively actuated by the said solenoids and held in any position for the purpose of cutting in or out any amount of the resistance of the rheostat desired, an electric switch consisting of a movable part and a series of contacts, electric circuits between the several contacts and the respective solenoids controlled by the movable part of the switch whereby the movement of the movable part of the switch may energize any particular solenoid or solenoids desired and thereby control the speed of the motor, a reversing switch for the electric motor, electro magnetic devices for operating said reversing switch, electric circuits leading from said electro magnetic devices, switch devices for controlling the said circuits for the purpose of operating the electro magnetic switch to make the motor run in one direction or the other, and a circuit interrupter controlled by the movable contact to cut out the motor after the resistances are all in circuit.

In testimony of which invention I have hereunto set my hand.

W. D. LUTZ.

Witnesses:
R. M. HUNTER,
ERNEST HOWARD HUNTER.