W. J. WIGMORE AND O. H. FIDDES.

ELECTROMAGNETIC ELEVATOR DOOR LOCK.

APPLICATION FILED APR. 2, 1919.

1,344,430. **Patented June 22, 1920.**

2 SHEETS—SHEET 1.

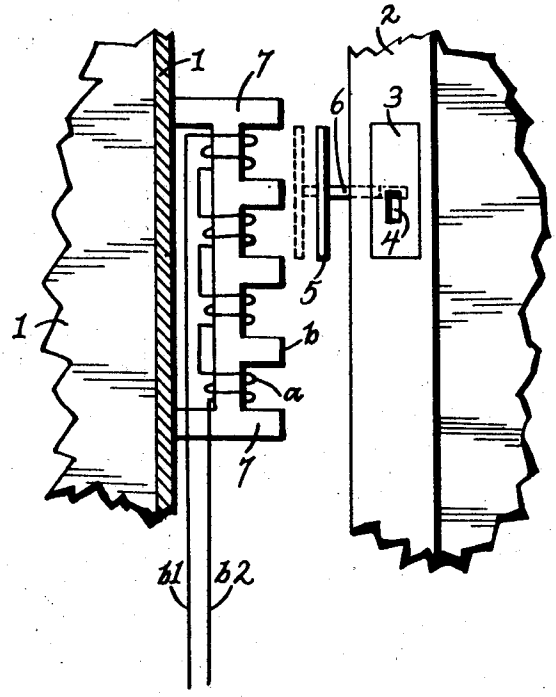

Fig. 1

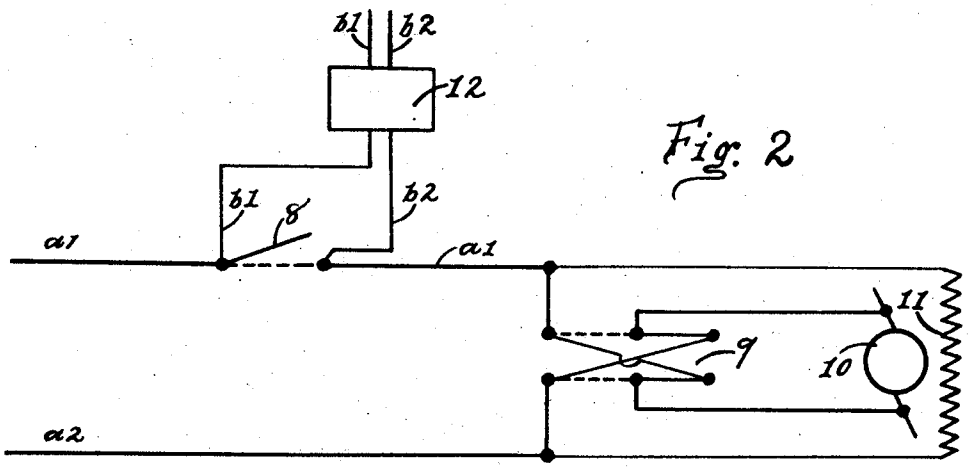

Fig. 2

WITNESSES

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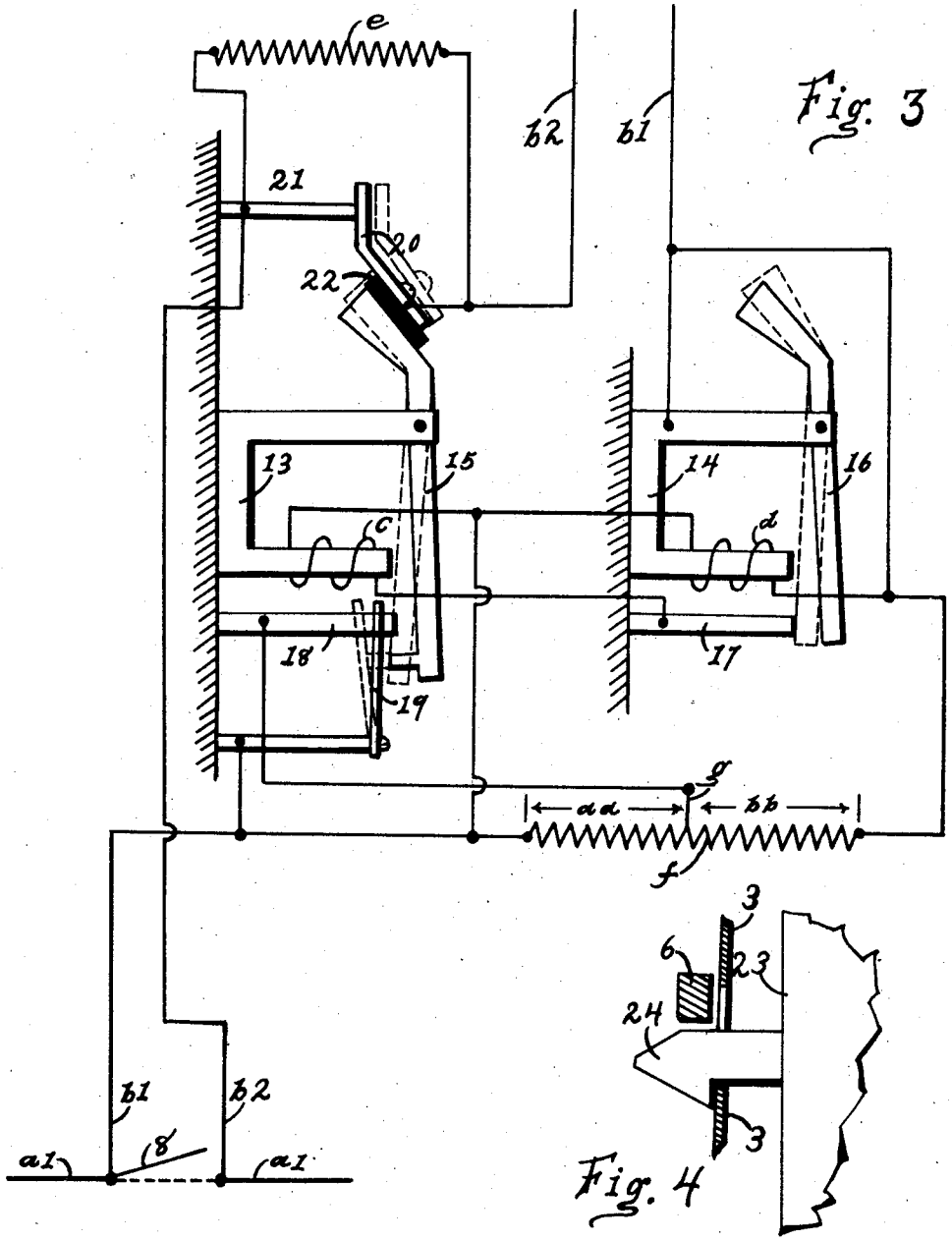

Fig. 3

Fig. 4

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UNITED STATES PATENT OFFICE.

WILLIAM J. WIGMORE, OF OAKLAND, AND OSCAR H. FIDDES, OF SAN FRANCISCO, CALIFORNIA.

ELECTROMAGNETIC ELEVATOR-DOOR LOCK.

1,344,430. Specification of Letters Patent. Patented June 22, 1920.

Application filed April 2, 1919. Serial No. 287,090.

To all whom it may concern:

Be it known that we, WILLIAM J. WIGMORE and OSCAR H. FIDDES, citizens of the United States, residing, the said WILLIAM J. WIGMORE, in the city of Oakland, county of Alameda, and State of California, and the said OSCAR H. FIDDES, in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Electromagnetic Elevator-Door Locks; and we do hereby declare the following to be a full, clear, and exact description of the preferred embodiment of this invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Our present invention relates to novel electro-magnetic means of effectually manipulating elevator door locks, and particularly door locks adapted to hatchway-doors of full automatic elevators. Heretofore the latch locking mechanism of the door locks of full automatic elevators have been actuated by an actuator such as cams, levers, rollers, etc., carried by the elevator car, said actuator mechanically manipulating said latch locking mechanism of the hatchway-door locks by coming in direct contact with same in its travel up or down the hatchway.

Our invention has for its object to simplify the manipulation of the latch locking mechanism and eliminate the numerous well known undesirable features that are prevalent in the present type of elevator hatchway-door locks mechanically manipulated by an actuator carried by the elevator-car, thus, the liability of certain parts thereof getting out of line, wearing at the points of contact, undesirable noise due to the parts coming in contact, etc. We have therefore been led to devise an electro-magnetic actuator for the door lock mechanism, wherein the said lock mechanism is responsive to the magnetic lines of force emanating from an electro-magnet carried by the elevator-car, said electro-magnet effectually manipulating said door lock mechanism without coming in contact with same, or said door lock actuating mechanism being required to be in perfect line with the line of travel of said electro-magnetic actuator carried by the car; thus, the principal undesirable features which are prevalent in the present type of elevator hatchway-door locks now commonly in use for elevators, to wit, the mechanical manipulation of the latch locking mechanism, and the liability of the said actuating mechanism to get out of order, is eliminated.

A further object is to provide a device of the above description in which the latch locking mechanism thereof will not be required to be in mechanically correct line with the line of travel of the actuator carried by the elevator-car.

A still further object is to provide an elevator hatchway door lock, wherein certain elements of the mechanism thereof, consists of material of high magnetic permeance and wherein said magnetical elements and the operation thereof being responsive to magnetic lines of force emanating from an electro-magnetic actuator carried by an elevator-car.

A still further object is to provide an elevator hatchway door lock, wherein certain elements of the latch locking mechanism thereof, consists of magnetic material, and wherein said magnetical elements and the operation thereof are responsive to magnetic lines of force emanating from an electro-magnet.

A still further object is to provide an electro-magnetic actuator of the above description whereby the core thereof will be magnetized to its full magnetic density when first thrown in circuit and then after a given time a reduction in the number of magnetic lines of force of same is effected.

A still further object is to provide a time limit device that will automatically vary the magnetic density of the said electro-magnetic actuator when same is in operation.

A still further object is to provide a device of the above description, whereby the magnetic actuator for the door lock mechanism will exert a uniform magnetic pull on said lock mechanism, regardless of the position of said lock mechanism within the range of said magnetic actuator.

Other objects of the invention will appear hereinafter, the novel combination of elements being designated in the claims appended hereto.

With these ends in view our invention consists in the details of construction and com-

bination of elements hereinafter set forth, and then specifically described by the claims. Its construction and operation will be described in detail, referring by numerals and letters to the accompanying drawings forming a part of this specification, and in which similar numerals and letters of reference designate corresponding parts in all figures.

A preferred embodiment of our invention is illustrated in the accompanying two sheets of drawings, wherein—

Referring to the several figures of the drawings:—Figure 1, is a broken fragmentary schematical view of an elevator car and elevator hatchway-door casing with our electro-magnetic door lock attached thereto. Fig. 2, is a diagrammatic view of an electric elevator motor circuit with our device connected to same. Fig. 3, is a schematical view of the controlling apparatus designated by the numeral 12 in Fig. 2, consisting of parts 13—22. Fig. 4, is an enlarged broken fragmentary front elevation of an elevator door with a latch attached thereto.

Referring to the drawings, the numeral 1 is used to designate the side-walls of an ordinary elevator car with a multi-polar electro-magnet 7 attached thereto. An elevator hatchway door casing 2 is shown with a door lock 3 mortised in same, said lock 3 containing a latch aperture 4 in the jamb thereof. The pole tips of the magnet 7 are indicated by the letter *b*, and the winding thereof by the letter *a*. Line wires a^1 and a^2 connect to a source of E. M. F. and supply current to the electric motor designated by the numerals 10 and 11, the shunt field indicated as 11 and the armature as 10; said motor having in circuit with same a potential or line switch 8 and a reversing or direction switch 9. Feed wires b^1 and b^2, connect the windings *a* of the electro-magnet 7 and the controlling device designated by the numeral 12 of Fig. 2 in circuit, the ends thereof of said wires b^1 and b^2 supplying current to magnet windings *a* through controlling device 12, from line wires a^1 and a^2 by connecting across the terminals of line switch 8. Numerals 13 and 14 show cores of electro-magnets, the same having pivoted armatures that swing as shown by the dotted lines. The letters *c* and *d* designate the energizing windings for the magnet cores 13 and 14, and the letters *e* and *f* noninductive resistances. Contacts 17, 18, 19, 20, and 21 open and close circuits for the various magnet coils and resistances shown in Fig. 3. A broken fragmentary section of an elevator door is shown at 23 with a latch 24 attached to same.

In carrying out our invention we preferably employ a multi-polar electro-magnet attached to the elevator car, although a plurality of bi-polar electro-magnets will answer the same purpose. The coils of the magnet are wound so as to have a low resistance compared to the voltage of the circuit to which the same are attached, so that when the circuit is closed through them a large rush of current will result, and produce a sufficient number of ampere turns to magnetize the core to the saturation limit. After the core has been energized to the saturation limit for about a second or so, a resistance is inserted in series with the winding of same and of sufficient ohms to cut the current down and reduce the number of magnetic lines or force in said core. An automatic time limit device shown in Fig. 3 cuts in and out the resistance automatically when this device is in operation. An ordinary door lock and latch is used, the same now commonly in use for mechanically operated locks, only that an armature of magnetic material is attached to the rod that actuates the latch locking dog. The said armature being of sufficient volume to carry the necessary lines of force to lower the reluctance of the magnetic field of the magnet, so that the same will be attracted with the necessary pull to operate the lock. We preferably connect the terminals of the time limit device to terminals of the potential switch as shown in Fig. 2, or the same can be connected to any other part of the motor controlling mechanism that will short out or cut out same only when the elevator car is in motion, and cut in only when the car comes to a dead stop. The magnet is attached to the elevator cage, so that when the car is flush with the floor or landing the armature attached to the lock will come in the center of the magnet. The latch locking dog 6 is held in place as shown in Fig. 1 by a spring or by gravity, and is drawn in the direction of the magnet to unlock same as shown by the dotted line in Fig. 1.

The operation of this device will then be as follows: The device being connected as shown in the drawings, and the elevator car started by the closure of the potential switch 8, the circuit connecting the magnet and controlling device is shorted out. It is evident then, that if the device is shorted out the magnet will de deënergized and when the car is passing the locks at the different floors, the same will not respond to the magnet and remain closed. The resistance of the magnet 7 is about 1,000 ohms, the same passing approximately one-quarter of an ampere when straight across the line on 220 volts, and has a resistance of approximately 2,000 ohms passing one-eight of an ampere with the resistance cut in series with same. The coil 7 will be in series with the motor when the potential switch 8 is open, but as the conductance of the motor is so high, the resistance thereof being only a frac-

tion of an ohm, there will be practically no drop of potential across the terminals thereof when same is effecting a closure of the circuit for the coil 7. A current of one-eighth of an ampere passing through a motor with a resistance of only a fraction of an ohm will not produce a sufficient drop of potential across the terminals thereof to keep same in operation when the potential switch 8 is open, therefore the motor will be inoperative when the coil 7 is in operation and in series with said motor. It is obvious that when the potential switch 8 is opened the motor and the elevator car will stop and simultaneously the magnet will be energized, as the circuit connecting thereto will be in series with the armature and fields of the motor, closing a complete circuit to the line. When the car stops at a landing the magnet 7 will be opposite the lock and simultaneous with the closing down of the motor the magnet will be energized, and attract the armature 5 and actuate the latch locking dog 6 unlocking the lock; the elevator door can then be opened. The armature 5 will hold the lock open until the motor is again started and the car in motion. The latch 24 is attached to the door 23, and when said door is closed, the latch will be within the lock 3; said latch locking dog 6 shown by the dotted line in Fig. 1 rides on top of said latch 24 when same is within the lock 3 which locks the door until said latch locking dog 6 is removed.

It is a recognized fact that in full automatic elevators that they do not always stop exactly flush with the landing due to varied loads, stretching of the cables, slipping of the brakes, etc.; it is evident then, that if the car should happen to slide beyond the floor when stopping at a landing in either the up or down direction and only a single pole magnet were employed the armature 5 would be out of range of the magnet 7 and the lock rendered inoperative, therefore we employ an electro-magnet with a plurality of magnetic poles extending for a sufficient distance in line with the travel of said magnet 7 to give the elevator-car a leeway of about six inches in both directions, which in all cases is necessary. It is obvious then that wherever the armature 5 happens to come in relation to the magnet 7 within the range thereof, that a pull will be exerted on same sufficient to effectually and positively manipulate the latch locking mechanism attached thereto. The armature 5 shown in the drawing Fig. 1, is of sufficient area to come within the range of a plurality of said poles, thus the magnetic circuit will close through said armature 5 at all points in its travel within the range of the magnet 7, as the length of said armature 5 is sufficient to come within the range of some of the said poles; with a single magnet such would not be the case, as the armature 5 would deviate from the neutral point of the magnetic lines of force emanating from the magnet, increasing the reluctance, which would reduce the pull on said armature impairing the positiveness of the latch locking mechanism. Only a slight increase in the reluctance would result in varying the pull on the armature 5, resulting in effecting the uncertainty of the operativeness of the latch locking mechanism and rendering the device noncommercial.

In circuit with the winding of the magnet 7 is an electro-magnet 14 with a swinging armature 16, the energizing coil of same is shown as *d*. In multiple with the coil *d* is a noninductive resistance *f*, said resistance having a mid-point tap *g;* section *bb* of resistance *f* is permanently connected across coil *d* and forms a derivative circuit with same. The coil *d* has a high resistance inductive winding while section *bb* of resistance *f* has a low resistance noninductive winding. When the circuit of the coil 7 is closed, it is obvious that the high inductance of the coil *d* will not pass the sudden large rush of current which will result from the high conductance of the circuit, and said current will be shunted through the low noninductive resistance, which will retard the action of the armature 16 and cause it to lag behind the energizing of magnet 7. When the armature 16 draws in which is after the magnet 7 is energized it cuts in multiple with coil *d* another coil *c* of a similar magnet 13 by making contact with contact 17 and energizing said coil. When the magnet 13 is energized the armature 15 of same breaks circuit at contacts 20 and 21 cutting in a resistance *e* which is connected across same into the line b^2 and simultaneously breaks circuit at the contacts 18 and 19 which opens mid-point tap *g* of resistance *f* and inserts section *aa* of same in series with section *bb* which decreases the conductance of the noninductive circuit in multiple with coils *d* and *c* which strengthens them sufficiently to positively retain armatures 15 and 16 in place. It is obvious from the foregoing that the noninductive shunt placed in multiple with the magnet winding *d* will retard the action of the armature of same sufficiently to give the magnet 7 full current for a short space of time before the resistance *e* is cut into circuit to weaken same. When the switch 8 is opened the magnet 7 will first take a heavy current to magnetize same to the saturation limit for the purpose of overcoming the inertia of the lock mechanism and to insure a positive opening of same, before the resistance *e* is inserted in circuit to cut down

the current; only a fraction of the current is required to keep the lock open after it is once unlocked.

While we have illustrated and described the preferred construction and arrangements of the various parts, it will be obvious from the foregoing description that the device is susceptible of considerable modification, without departing from the essential features or sacrificing any of the advantages thereof as come within the scope of the claims appended thereto.

Having explained the nature of this invention and fully described construction embodying the several features thereof, what we claim is—

1. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock the mechanism thereof being responsive to the energizing of said electro-magnetic actuator, a means of energizing said electro-magnetic actuator to a given magnetic density and then decreasing said magnetic density of same, and said electro-magnetic-actuator consisting of a plurality of magnetic poles of like and unlike polarity.

2. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock the mechanism thereof being responsive to the energizing of said electro-magnetic actuator, a means of energizing said electro-magnetic actuator to a given magnetic density and then decreasing said magnetic density of same, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, and a means of energizing said electro-magnetic actuator only when said elevator car is at rest.

3. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock the mechanism thereof being responsive to the energizing of said electro-magnetic actuator, a means of energizing said electro-magnetic actuator to a given magnetic density and then decreasing said magnetic density of same, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, and said electro-magnetic actuator provided with a time-limit means for effecting said decrease in magnetic density.

4. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock the mechanism thereof being responsive to the energizing of said electro-magnetic actuator, a means of energizing said electro-magnetic actuator to a given magnetic density and then decreasing said magnetic density of same, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, said electro-magnetic actuator provided with a time-limit means for effecting said decrease in magnetic density, and a means of energizing said electro-magnetic actuator only when said elevator-car is at rest.

5. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock, an armature of magnetic material attached to the mechanism of said lock, the actuation of said lock mechanism being responsive to the magnetic attraction of said armature by said electro-magnetic actuator, and said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity.

6. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock, an armature of magnetic material attached to the mechanism of said lock, the actuation of said lock mechanism being responsive to the magnetic attraction of said armature by said electro-magnetic actuator, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, and a means of energizing said electro-magnetic actuator only when said elevator-car is at rest.

7. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock, an armature of magnetic material attached to the locking mechanism of said lock, the actuation of said lock mechanism being responsive to the magnetic attraction of said armature by said electro-magnetic actuator, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, and said armature of sufficient area to come within the range of a plurality of said magnetic poles of different polarity.

8. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock, an armature of magnetic material attached to the locking mechanism of said lock, the actuation of said lock mechanism being responsive to the magnetic attraction of said armature by said electro-magnetic actuator, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, said armature of sufficient area to come within the range of a plurality of said magnetic poles of different polarity, and a means of energizing said electro-magnetic actuator only when said car is at rest.

9. In a device of the above description, the combination of an electro-magnetic actu-

ator carried by an elevator car, an elevator hatchway-door lock, a latch adapted to enter said lock, said lock containing a latch locking mechanism, an armature of magnetic material attached to said latch locking mechanism, the actuation of said latch locking mechanism being responsive to the attraction of said armature by said electro-magnetic actuator, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, and said armature of sufficient area to come within the range of a plurality of said poles of different polarity.

10. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock, a latch adapted to enter said lock, said lock containing a latch locking mechanism, an armature of magnetic material attached to said latch locking mechanism, the actuation of said latch locking mechanism being responsive to the attraction of said armature by said electro-magnetic actuator, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, said armature of sufficient area to come within the range of a plurality of said magnetic poles of different polarity, and a means of energizing said electro-magnetic actuator only when said elevator-car is at rest.

11. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway door lock, a latch adapted to enter said lock, said lock containing a latch locking mechanism, an armature of magnetic material attached to said latch locking mechanism, the actuation of said latch locking mechanism being responsive to the attraction of said armature by said electro-magnetic actuator, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, said armature of sufficient area to come within the range of a plurality of said magnetic poles of like and unlike polarity, a means of energizing said electro-magnetic actuator to a given magnetic density and then decreasing said magnetic density of same, and a means of energizing said electro-magnetic actuator only when said elevator-car is at rest.

12. In a device of the above description, the combination of an electro-magnetic actuator carried by an elevator-car, an elevator hatchway-door lock, a latch adapted to enter said lock, said lock containing a latch locking mechanism, an armature of magnetic material attached to said latch locking mechanism, the actuation of said latch locking mechanism being responsive to the attraction of said armature by said electro-magnetic actuator, said electro-magnetic actuator consisting of a plurality of magnetic poles of like and unlike polarity, said armature of sufficient area to come within the range of a plurality of said magnetic poles of different polarity, a means of energizing said electro-magnetic actuator to a given magnetic density and then decreasing said magnetic density of same, said electro-magnetic actuator provided with a time-limit means for effecting said decrease in magnetic density, and a means of energizing said electro-magnetic actuator only when said elevator-car is at rest.

13. In a device of the above description, the combination of an electro-magnet carried by an elevator-car, an elevator hatchway-door lock mechanism responsive to the energizing of said electro-magnet, a means of energizing said electro-magnet to a given magnetic density and then decreasing said magnetic density of same, said electro-magnetic provided with a time-limit means for effecting said decrease in magnetic density, and a means of energizing said electro-magnet only when said elevator-car is at rest.

14. In a device of the above description, the combination of an electro-magnet carried by an elevator-car, an elevator hatchway-door lock the mechanism thereof responsive to the energizing of said electro-magnet, and a means of energizing said electro-magnet to a given magnetic density and then decreasing said magnetic density of same.

15. In a device of the above description the combination of an electro-magnet carried by an elevator-car, an elevator hatchway-door lock the mechanism thereof responsive to the energizing of said electro-magnet, a means of energizing said electro-magnet to a given magnetic density and then decreasing said magnetic density of same, and said electro-magnet provided with a time-limit means for effecting said decrease in magnetic density.

In testimony whereof, that we claim the foregoing as our own, we have hereunto affixed our hands to this specification in the presence of two subscribing witnesses, this 27th day of March, 1919.

WILLIAM J. WIGMORE.
OSCAR H. FIDDES.

Witnesses:
S. O. HENNIG,
T. A. GRAY.