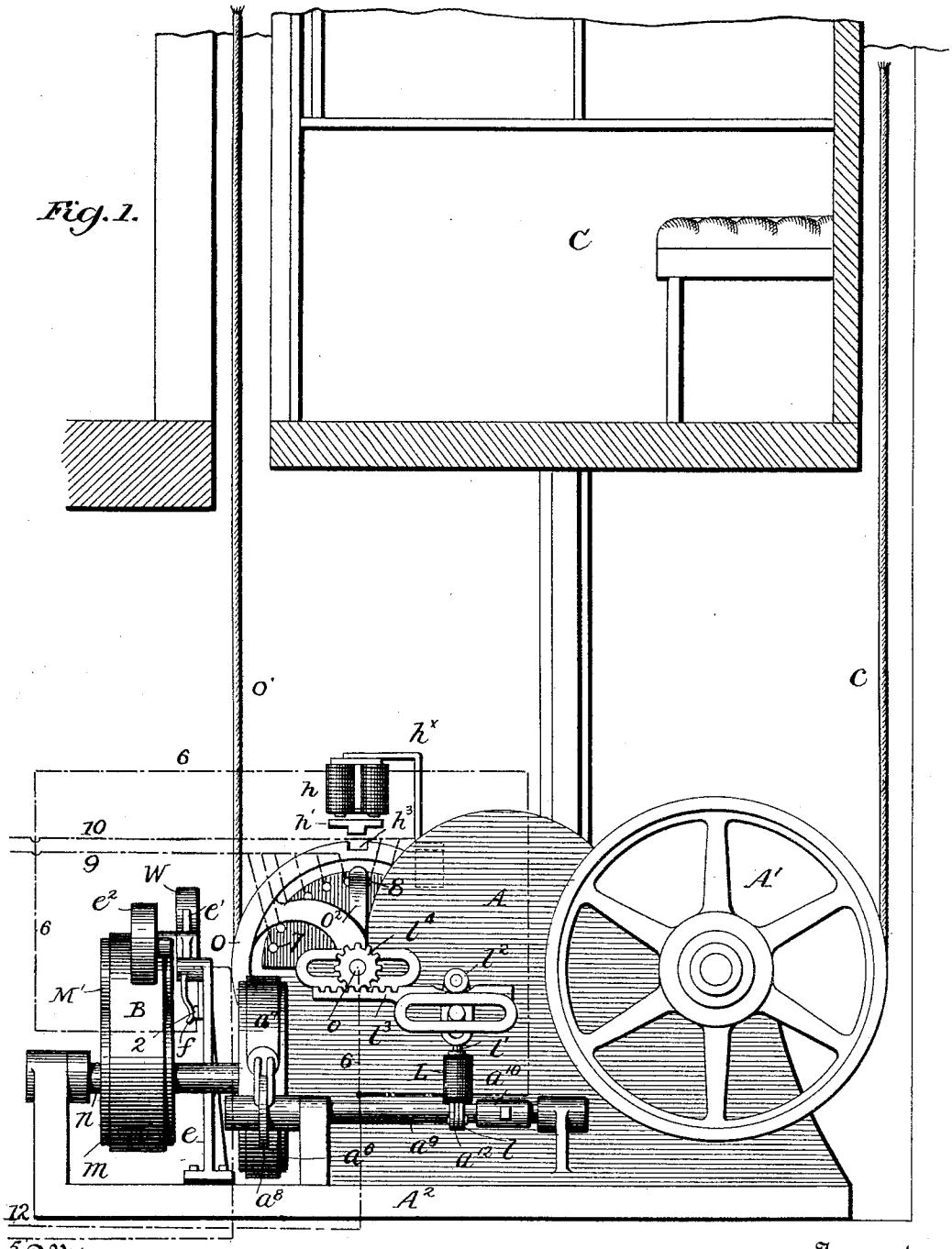
(No Model.) 3 Sheets—Sheet 1.

F. B. PERKINS

ELECTRIC ELEVATOR.

No. 570,410 Patented Oct. 27, 1896.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

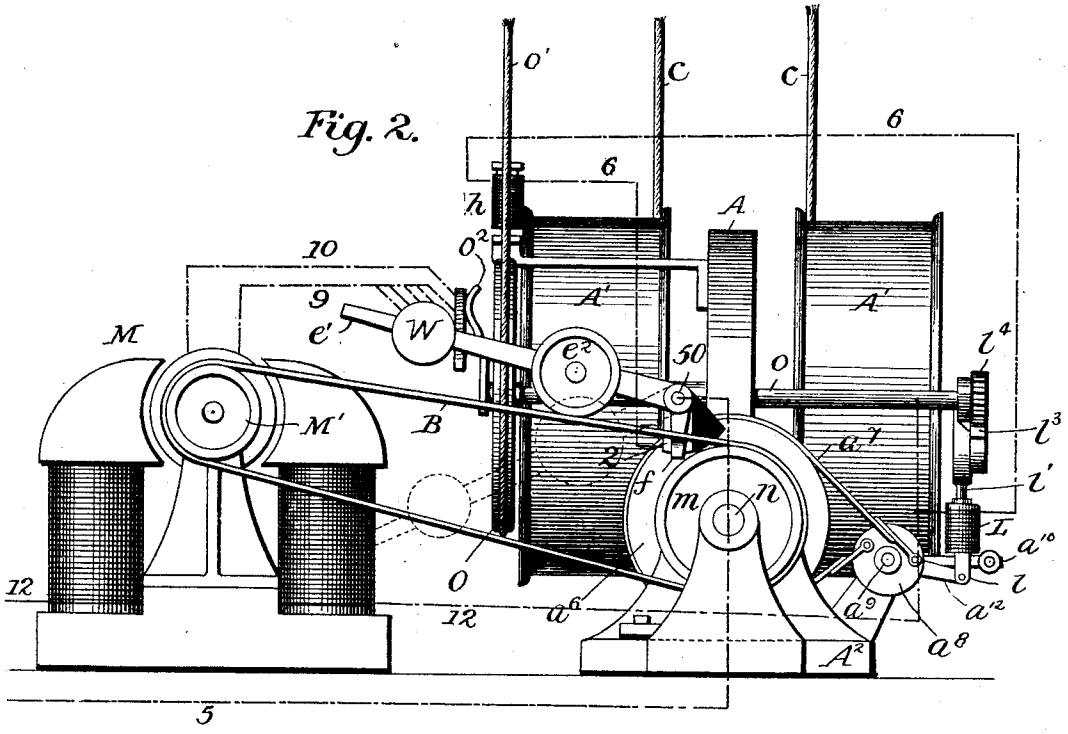


Fig. 3.

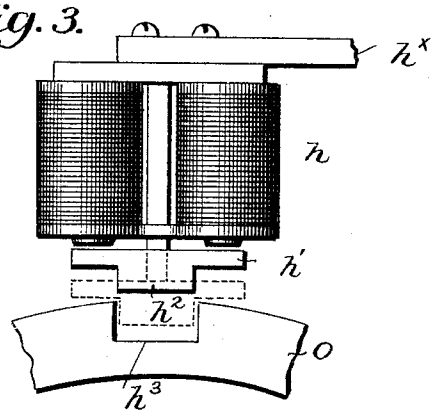
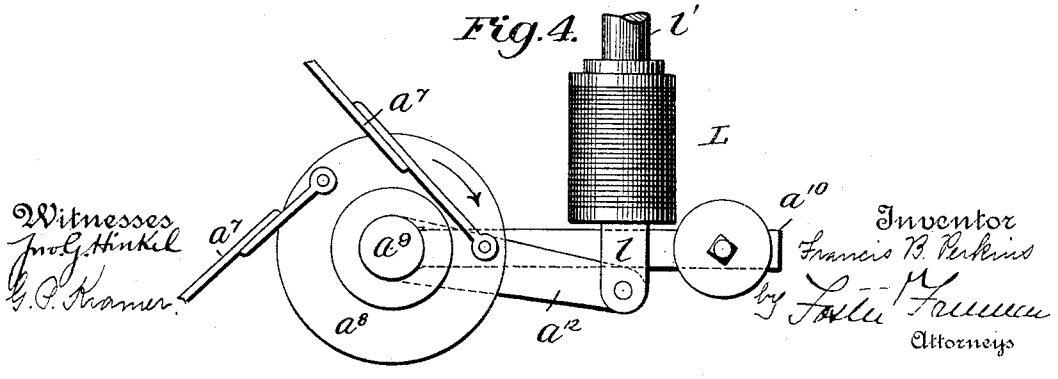


Fig. 4.



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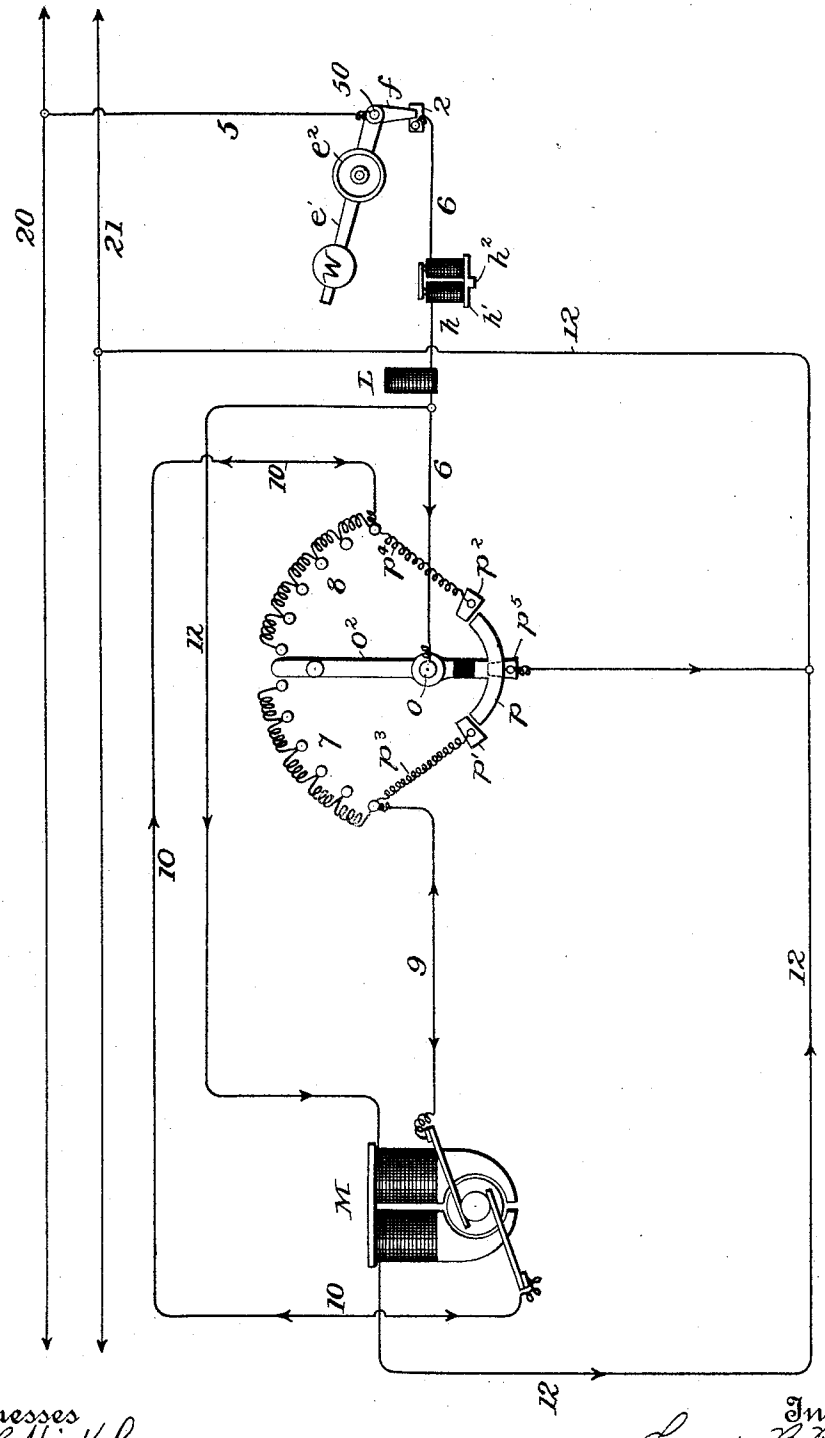

Fig. 5.

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UNITED STATES PATENT OFFICE.

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ELECTRIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 570,410, dated October 27, 1896.

Application filed September 7, 1895. Serial No. 561,862. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS B. PERKINS, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electric Elevators, of which the following is a specification.

This invention relates to electric elevators; and it has for its object to provide such apparatus with safety devices; and it consists in the various features of construction and arrangement as are hereinafter more particularly pointed out.

Referring to the accompanying drawings, wherein is shown one embodiment of an elevator apparatus having the improvements connected therewith, Figure 1 represents in side elevation an elevator mechanism, elevator-well, and portion of a car in section. Fig. 2 is a left-hand side elevation of the operating mechanism shown in Fig. 1. Fig. 3 is an enlarged detail of the locking device for the starting and stopping mechanism. Fig. 4 is an enlarged detail showing the electrically-controlled brake mechanism, and Fig. 5 is a diagram showing the arrangement of circuits.

In elevator apparatus it is common to provide an electric motor and to connect this electric motor with the elevating engine or apparatus by means of a belt, and it is evident that if from any cause this belt should become displaced or should break serious injury is likely to result.

One of the objects of this invention is to provide means whereby if the belt should be displaced or break the circuit of the motor and elevator mechanism will be cut out. In carrying out this feature of the invention there is a lever or arm which is supported in its normal position by the belt connecting the motor with the elevator-operating mechanism, which lever or arm is arranged to control the circuit of the motor in such a manner that if the belt should be displaced or broken the lever or arm would fall by gravity or otherwise to its abnormal position and operate the switch or cut-out.

Referring to the drawings, the electric motor M is of any usual or desired type and construction and has a driving-pulley M′, connected by a driving-belt B with a pulley *m*, fast on the driving-shaft *n* of any usual elevator-operating mechanism which is provided with a suitable starting and stopping mechanism, and the said driving-shaft is herein represented as constituting the worm-shaft, which drives a pair of worm-wheels placed within the casing A and which rotate drums A′, on which are wound the lifting-ropes *c*, connected to move the elevator-car C.

Mounted on a suitable support *e*, erected on and insulated from the base A^2 of the elevator-operating mechanism, is a lever or arm *e′*, pivoted at the point 50 and preferably provided with a pulley or roll e^2, which rests upon the belt B and sustains the lever or arm in its elevated or normal position, and the said lever or arm may be further extended beyond the pulley e^2 to sustain a weight W, or it may be acted upon by an equivalent device, as a spring or otherwise, to increase the pressure of the pulley upon the belt. This lever or arm is arranged to control the motor-circuit, and in the present instance the end of the arm *e′* adjacent to the pivot 50 carries a movable contact *f*, which bears upon a contact 2 when the arm *e′* is held in its elevated position, and when, through the breaking or displacement of the belt or otherwise, the arm is depressed or falls into the position indicated in dotted lines in Fig. 2, the contact *f* passes off from the contact 2, breaking the electric circuit and cutting out the motor. This electric contact may be arranged anywhere in the electric circuit, and in the illustration this contact 2 is arranged in the circuit near the feed or main conducting wires, as indicated in Fig. 5.

In the apparatus shown there is a shipper-wheel O, operated by a shipper-rope *o′* and mounted on a shaft *o* and operated in the usual way from the elevator-car. This shaft *o* is provided with a movable contact-lever o^2, which in the normal or stationary condition of the apparatus is in the position shown in Fig. 1, but when the shipper-rope is moved this contact-lever wipes over a series of contacts 7 or 8 containing varying resistances, and breaks the current through the armature of the motor in one or the other direction to

cause the motor to rotate in the desired direction to raise or lower the elevator-car. These circuits are best indicated in Fig. 5, wherein 20 and 21 represent the positive and negative feed or main-line wires for supplying current to the motor. The movable contact-lever o^2 is provided with an insulated contact arm or brush p, which coöperates with three contacts or terminals $p' p^2 p^5$, with the latter of which it is in constant engagement. The contact or terminal p^5 is in electrical connection with the conductor 12, leading to the main-line wire 21. The terminal or contact p' is connected by a wire p^3 with the conductor 9, leading to one of the brushes of the armature, and the terminal p^2 is connected by a wire p^4 with the conductor 10, which connects with the other brush of the motor. The conductor 5 leads from the main line 20 to the pivot-point 50 of the arm or lever e', the arm f of which normally connects the pivot-point 50 with the contact 2. From this contact extends a conductor 6, connecting with the contact-lever o^2. Extending from the conductor 6 is a conductor 12, including the field-magnet coils of the motor M and connected to the feed or main line 21.

It is desirable to provide means for locking the shipper-wheel of the starting and stopping mechanism to prevent its being moved when from any cause the current of the electric motor is in an abnormal condition, as, for instance, by the displacement or breaking of the belt or otherwise, and another feature of the invention relates to the construction and arrangement of this locking device. In carrying out this feature of invention an electromagnet or solenoid h, supported on a suitable bracket $h^\times$, is placed in the conductor 6 of the motor-circuit, and the armature h' carries a detent h^2, adapted to engage a notch or recess h^3 in the periphery of the shipper-wheel O. When the magnet or solenoid h is properly energized, the armature h' is attracted and held in its normal position (shown in Fig. 1) and the shipper-wheel can be operated in the usual way, but when, through the failure of a proper current passing through the solenoid it is weakened or de-energized, the armature h' drops and the detent h^2 enters the notch or recess h^3 in the hand-wheel, when the latter is lifted into its mid-position, as represented in dotted lines in Fig. 3, and the hand-wheel is thus prevented from being moved until the magnet or solenoid h is properly energized and the armature thereof attracted and the detent lifted clear from the notch.

The brake mechanism which controls the operation of the elevator mechanism is also regulated or controlled by an electromagnet or solenoid placed in the motor-circuit, so that when the circuit is weakened or interrupted in any way, as by the movement of the lever or arm e' or otherwise, the brake mechanism will immediately act to stop the elevator, and, as herein represented, the brake mechanism consists, essentially, of a disk a^6, fast on the main shaft n and embraced by a strap a^7, having its end secured to a disk or wheel a^8, mounted on a shaft a^9, having its bearings in brackets or supports on the bed A^2. Mounted on the shaft a^9 is a weighted lever a^{10}, which normally tends to rotate the shaft a^9 and disk a^8 in the direction of the arrow thereon and to thus draw the belt or strap a^7 tightly about the disk or wheel a^6 to act as a brake and prevent the disk or wheel and the worm-shaft connected therewith from being rotated.

To release the brake and permit the rotation of the worm-shaft it is necessary to lift the weighted lever a^{10}, rotate the disk a^8 in the opposite direction, and thus slacken the strap a^7 about the disk or wheel, and to do this the shaft a^9, as herein represented, is provided with an arm a^{12}, extending at the same side of the shaft as the weighted lever a^{10}, and connected to the outer end of this arm a^{12} is the outer end of an armature or core l of the electromagnet or solenoid L. This electromagnet or solenoid is connected in the circuit of the motor and is secured to the end of a rod l', fitted at its upper end with a roll or stud l^2, normally resting in a depression in the cam-surface of the horizontally-movable rack l^3, in mesh with and actuated by a pinion l^4, fast on the shipper-wheel shaft o. As the shipper-wheel is turned in one or the other direction to cause the elevator mechanism to raise or lower the elevator-car C, the pinion l^4 will move the rack l^3 horizontally to lift the roll or stud l^2 and its rod l', and if the solenoid L, carried by the said rod, is properly energized, the armature or core l thereof will be drawn up with the solenoid and lift the weighted lever a^{10} to slacken the strap a^7 about the disk a^6 and permit the elevator mechanism to be set into operation. If, however, the motor-circuit should be weakened or interrupted, the solenoid will not be energized, in which case, even if the rod l' be lifted by the starting and stopping mechanism, as described, the solenoid will not draw after it the armature l on the arm a^{12}, but will leave the armature and weighted lever in their normal position with the brake set, so that so long as the motor-circuit is weakened or interrupted it will be impossible to start the elevator mechanism by the starting and stopping mechanism even if it be unlocked, because of the impossibility of releasing the brake when the solenoid is not sufficiently energized; but immediately upon the restoration of the motor-circuit to its normal condition the solenoid will be energized, attracting the armature l, so that it will move with the rod l' as a single piece or member, permitting the brake mechanism to be retracted or controlled by the starting and stopping mechanism.

When the brake mechanism is in operation, with the brake released, it is evident that if the motor-circuit should be weakened or in-

terrupted, either by the dropping of the lever e' or otherwise, the solenoid will be deënergized to a sufficient extent to release or drop its armature, and the weighted lever a^{10} will apply the brake and stop the machine; or, if the current should be weakened or interrupted while the machine is at rest, it will be impossible to start the machine so long as the circuit remains in its weakened or broken condition, owing to the impossibility of lifting the armature l and weighted lever a^{10}.

The operation of the device will be readily understood and it will be seen that if the attendant, by means of the shipper-rope or other suitable mechanism, moves the shipper-wheel O and its shaft o and brings the lever o^2 into engagement with one or the other series of contacts, as, for instance, the resistance-contact 7, the motor will be operated to cause the elevator to ascend and the armature-circuit of the motor is completed and the circuit of electricity from the main line will follow the following circuit: from the main-line wire 20 through the wire 5 to the point 50 of the lever e', the movable contact f, fast contact 2, conductor 6, in which are located the magnets or solenoids h and L, thence to the contact-lever o^2, through the resistance-coils and contacts 7, to the conductor 9, through the brushes and armature of the motor, and thence to the line-wire 21, through conductors 10, wire p^4, contacts $p^3\,p\,p^5$, and conductor 12. At the same time the field-circuit of the motor is completed and may be traced from the wire 20, through the wire 5, contacts f and 2, conductors 6 and 12, the electromagnet-coils of the motor, and the conductor 12 to the line-wire 21.

If it is desired that the elevator should descend, the operator turns the switch-lever o^2 into contact with the resistances 8, bringing the brush or contact p into engagement with the contact p', thus completing the armature-circuit through the conductor 10, brushes and armature of the motor, the conductor 9, wire p^3, contacts $p'\,p\,p^5$, and the wire 12 to main-line wire 21.

The field-circuit is the same as that described before, and the motor operates in the opposite direction to that produced when the circuits are as first described.

It will thus be seen that if the belt B breaks or becomes deranged the circuit of the motor is broken and the elevator mechanism is immediately stopped by the brake mechanism and the shipper mechanism is locked as soon as it reaches its mid-position, so that it cannot be operated until the circuit is again complete and in working order; and if from the breaking of the belt or otherwise the current is weakened or the circuit broken the magnets or solenoids h L will release their armatures and stop and lock the elevator mechanism, irrespective of the extent of the movement of the arm e'. If the motor M is automatic in its action—that is, when it is so constructed as to regulate the current according to the load it is required to operate—if in such case the belt should be displaced or become broken, the load will be suddenly removed and the automatic regulation of the motor will immediately operate to reduce the current employed to such a point as is necessary to drive the motor alone, the current, however, being thus so weakened that the solenoid L will release its armature and apply the brake to stop the mechanism, and in this case the lever e' may be dispensed with.

This invention is not limited to the particular construction and arrangement shown, as the principles thereof may be embodied in other constructions by those skilled in the art and parts of the invention may be used separately or in connection with other inventions.

What I claim is—

1. The combination with a motor, an elevator mechanism actuated thereby, a starting and stopping mechanism, and a brake mechanism for said elevator mechanism, of an electrically-controlled connection in circuit with said motor and connecting said brake mechanism with said starting and stopping mechanism, and an electrically-controlled locking device to lock said starting and stopping mechanism, substantially as described.

2. The combination with a motor, an elevator mechanism actuated thereby, and a starting and stopping mechanism, of an electrically-controlled locking device for said starting and stopping mechanism in circuit with said motor, substantially as described.

3. The combination with a motor, an elevator mechanism actuated thereby, and a starting and stopping mechanism therefor, of an electrically-controlled locking device for said starting and stopping mechanism arranged to hold said starting and stopping mechanism in its mid-position when the motor-current is insufficient to operate the elevator mechanism, substantially as described.

4. The combination with a motor, an elevator mechanism actuated thereby, and a starting and stopping mechanism therefor, of a belt connecting the motor and elevator mechanism, an arm supported in its normal position by said belt, a circuit-controller operated by said arm, and an electrically-controlled locking device for the starting and stopping mechanism in circuit with said motor, substantially as described.

5. The combination with a motor, an elevator mechanism actuated thereby, and a shipper-wheel for controlling said mechanism, of a belt connecting the motor and elevator mechanism, an arm supported in its normal position by said belt, a circuit-controller operated by said arm, and a locking device in circuit with said circuit-controller, substantially as described.

6. An elevator mechanism having a shipper-wheel provided with a recess, and a locking mechanism for said shipper-wheel comprising an electromagnet, its armature and detent, substantially as described.

7. An elevator mechanism, having a shipper-wheel provided with a recess, a motor connected with and to operate said mechanism by a belt, combined with an arm supported by said belt, a movable contact controlled by said arm and controlling the motor-circuit, and an electromagnet in said circuit having an armature and detent to engage said shipper-wheel, substantially as described.

8. The combination with a motor, an elevator mechanism actuated thereby, a starting and stopping mechanism therefor, and a brake mechanism for said elevator mechanism, of a belt connecting the motor and elevator mechanism, an arm held in its normal position by said belt, an electrically-controlled locking device for the starting and stopping mechanism in circuit with said motor, and an electrically-controlled brake mechanism also in circuit with said motor, substantially as described.

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

FRANCIS B. PERKINS.

Witnesses:

LOUIS E. G. GREEN,

HENRY C. WILSON.