No. 698,827. Patented Apr. 29, 1902.

F. K. FASSETT.

CONTROLLER FOR ELEVATORS.

(Application filed Sept. 9, 1901.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

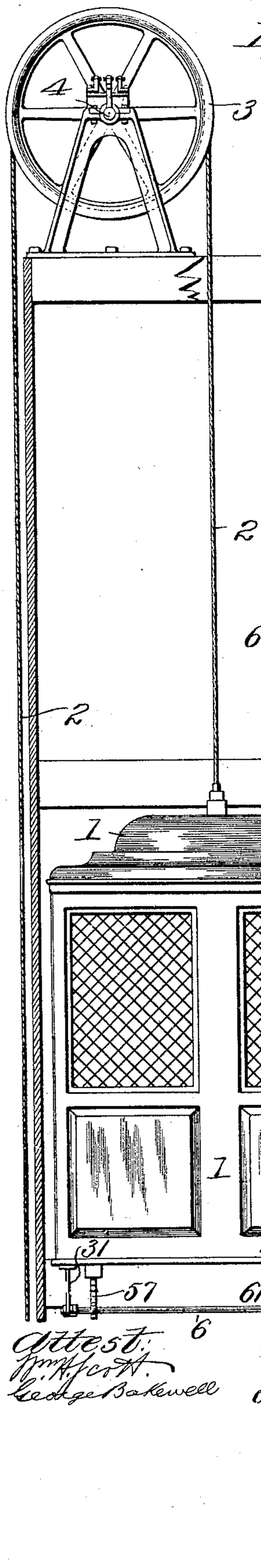
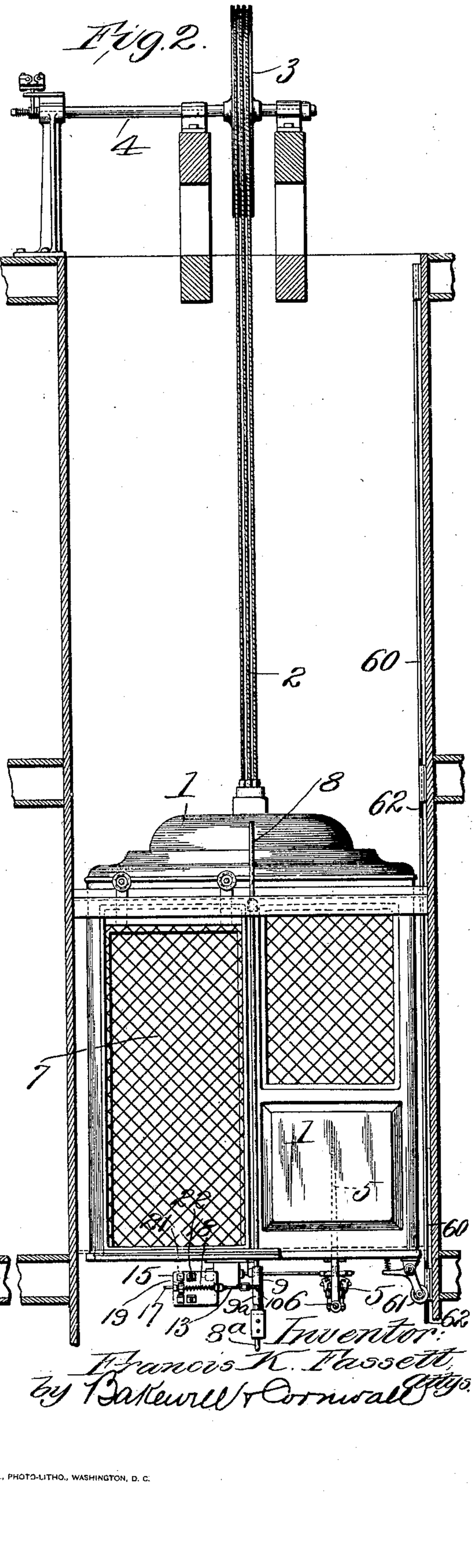


Fig. 2.



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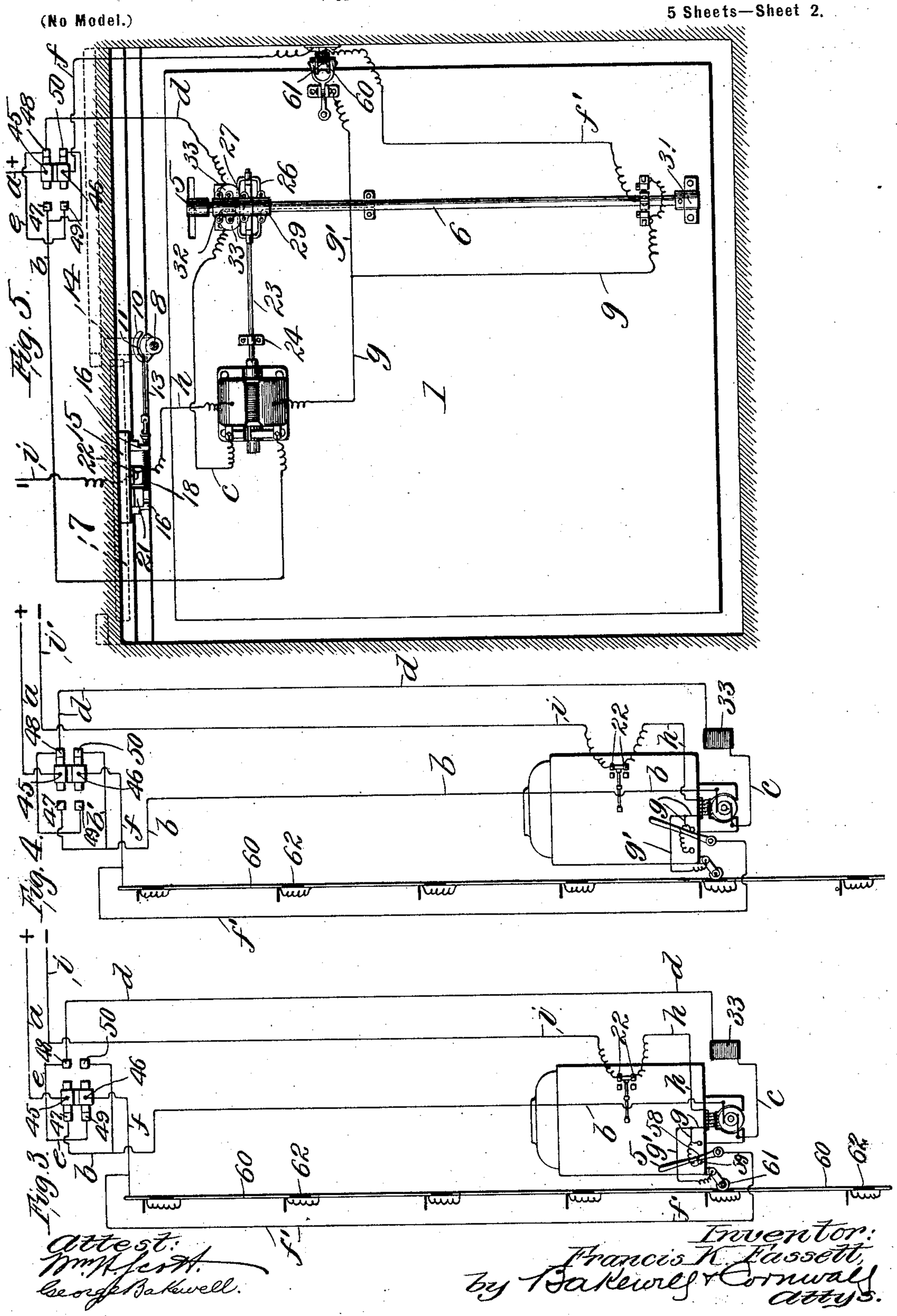
(No Model.) 5 Sheets—Sheet 2.



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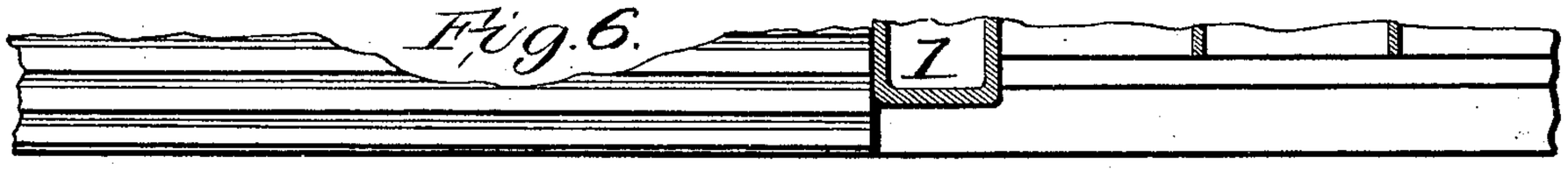
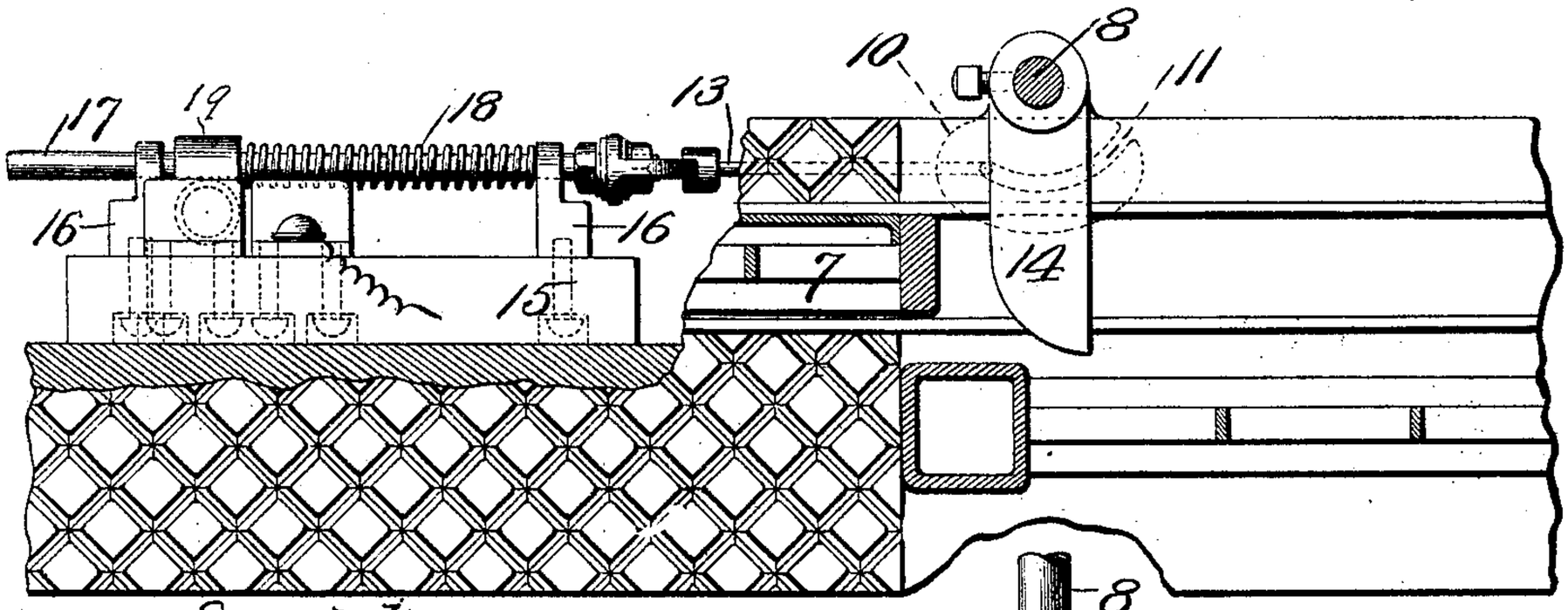
(No Model.) 5 Sheets—Sheet 3.

Fig. 6.





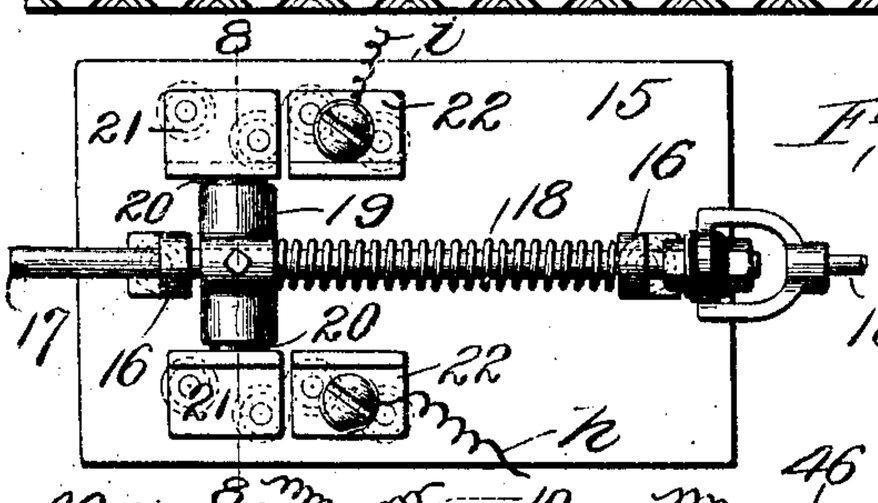


Fig. 7.

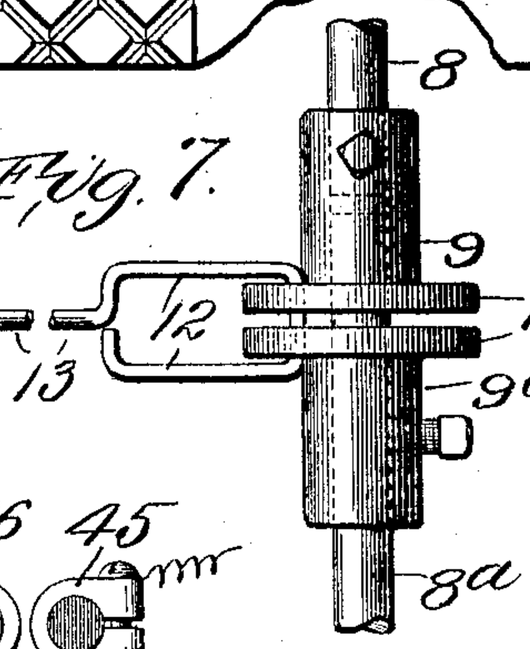
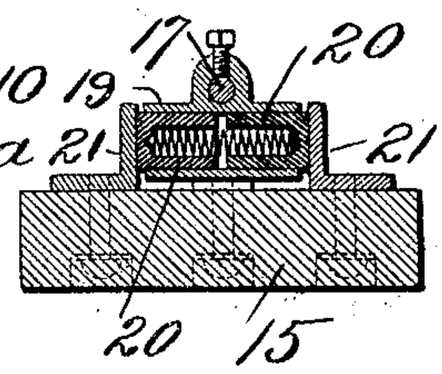


Fig. 8.



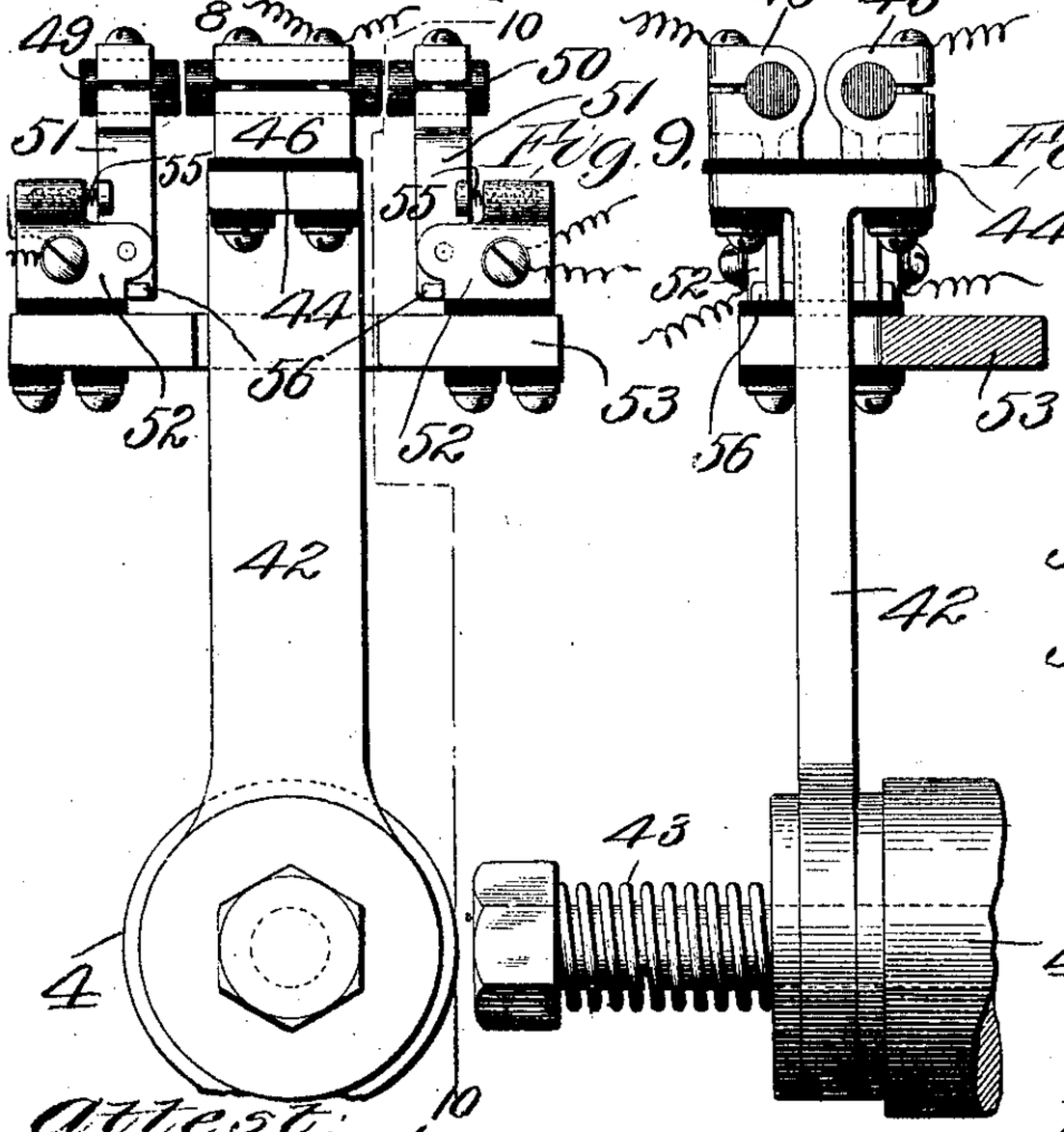
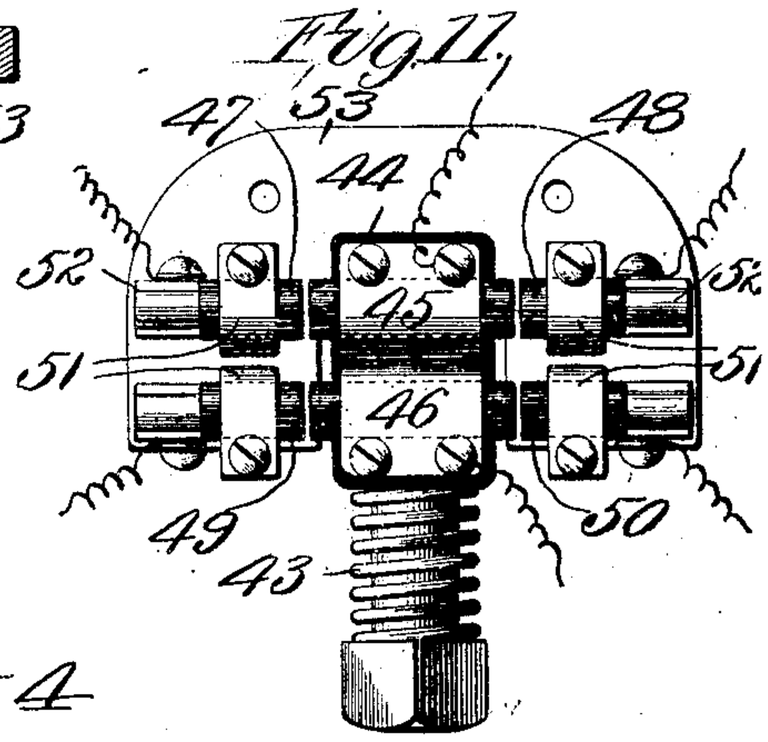


Fig. 9.

Fig. 10.

Fig. 11.



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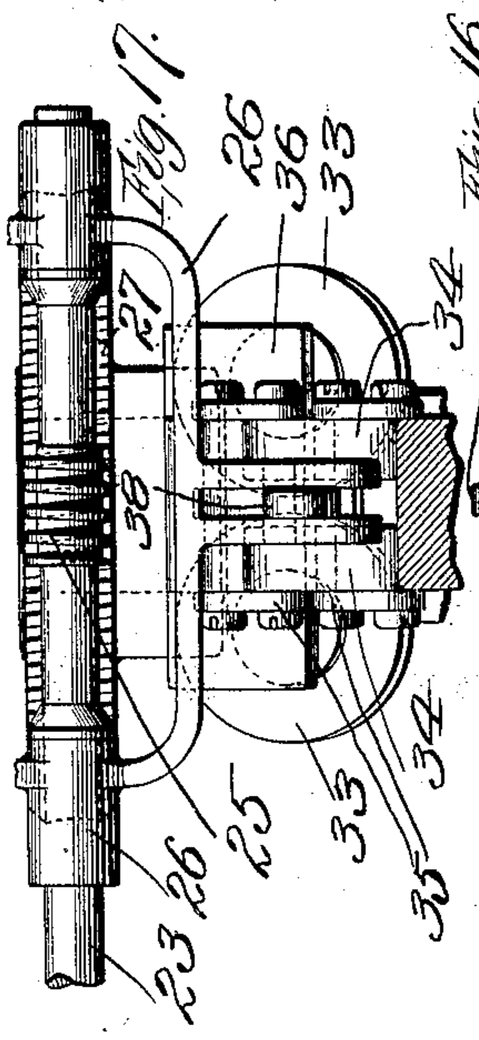
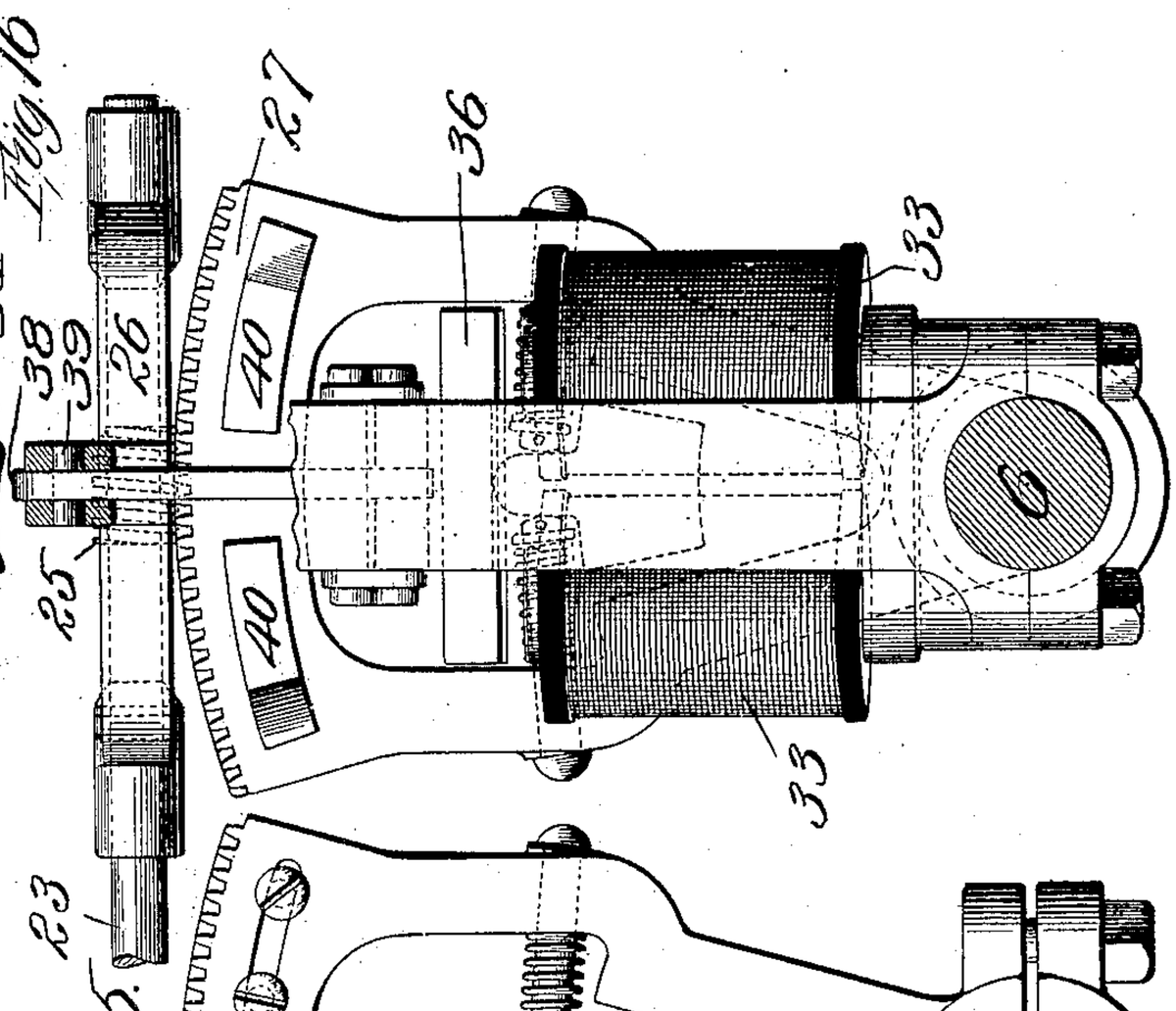
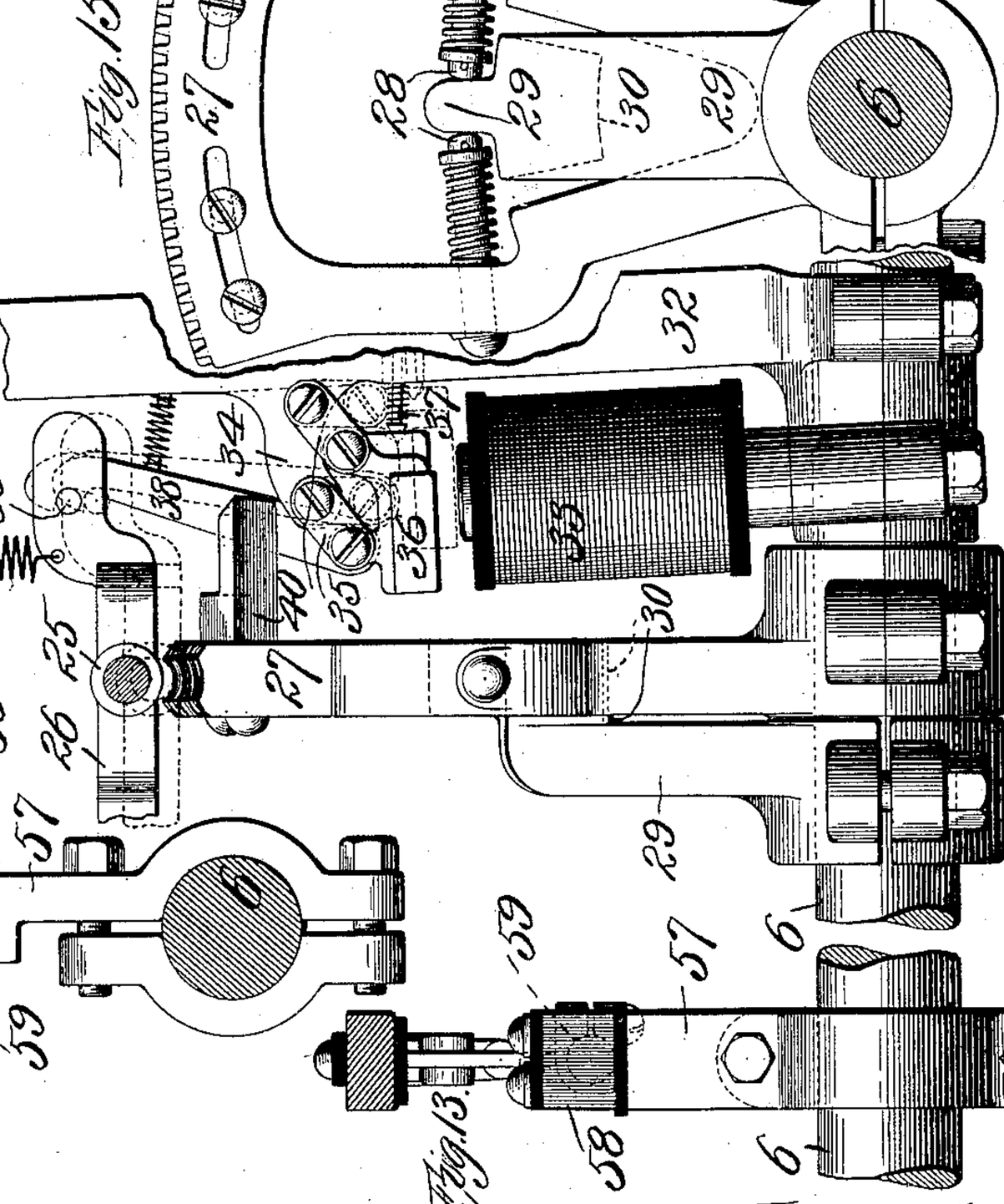
CONTROLLER FOR ELEVATORS.

(Application filed Sept. 9, 1901.)

(No Model.) 5 Sheets—Sheet 4.







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No. 698,827. Patented Apr. 29, 1902.

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CONTROLLER FOR ELEVATORS.

(Application filed Sept. 9, 1901.)

(No Model.) 5 Sheets—Sheet 5.

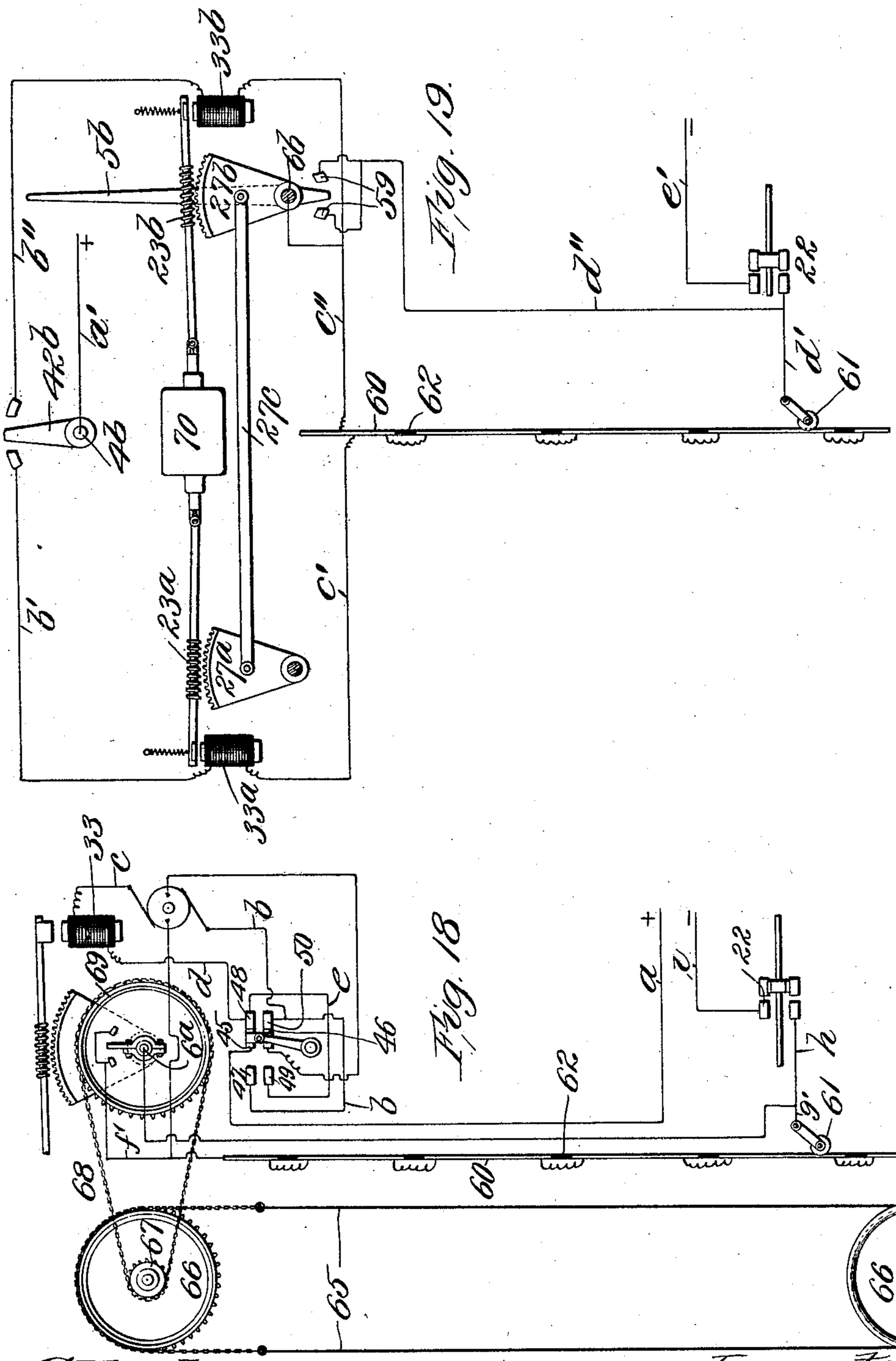

Fig. 18

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UNITED STATES PATENT OFFICE.

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CONTROLLER FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 698,827, dated April 29, 1902.

Application filed September 9, 1901. Serial No. 74,813. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS K. FASSETT, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Controllers for Elevators, of which the following is a full, clear, and exact description, 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, forming part of this specification, in which—

Figure 1 is a sectional view through an elevator-shaft, showing the cage in side elevation and my improved mechanism in position thereon. Fig. 2 is a similar view showing the cage in front elevation and my improved mechanism thereon. Fig. 3 is a diagrammatic view of the system of wiring. Fig. 4 is a similar view. Fig. 5 shows a bottom plan view of the cage with my improved mechanism in position thereon, showing the system of wiring. Fig. 6 is a horizontal sectional view showing details of the door-operated switch. Fig. 7 is a side elevational view of the door-operated switch. Fig. 8 is a sectional view on line 8 8, Fig. 7. Fig. 9 is a side elevational view of the pole-changing switch arranged on the shaft of the sheave over which the hauling-ropes pass at the upper portion of the building. Fig. 10 is a sectional view on line 10 10, Fig. 9. Fig. 11 is a top plan view of the pole-changing switch. Fig. 12 is an end elevational view of the switch arranged upon the shaft upon which the operating lever or handle is mounted. Fig. 13 is a side elevational view of the same. Fig. 14 is a side elevational view of the mechanism mounted upon the shaft of the operating-lever reversing the rocking-shaft. Fig. 15 is an end elevational view of one of the elements of said mechanism. Fig. 16 is an end elevational view of said mechanism. Fig. 17 is a top plan view of said mechanism. Fig. 18 is a diagrammatic view of a modified form of my invention, and Fig. 19 is a diagrammatic view of another modified form of my invention.

This invention relates to a controller for elevators, being designed particularly, though not exclusively, for use in connection with passenger-elevators.

The object of this invention is to prevent the cage from moving any considerable distance from the floor at which it is arrested while the door is open, although the operator is permitted to manipulate the lever, wheel, or handle, as the case may be, to start the elevator at less than full speed; but in no instance is it possible for the operator to throw and hold the controller to either extreme position in leaving the floor unless the door is closed.

Heretofore devices have been made for locking the controlling lever, wheel, or handle against movement when the elevator was at a floor, said devices being actuated by the door and being effective when the door was opened. When the door was closed, the lever, wheel, or handle was released and could then be manipulated. It is obvious that by the use of such constructions considerable time is lost, because the closing of the door is a condition precedent to the manipulation of the said controlling devices.

My present invention contemplates a movement of the controlling devices, which will enable the cage to travel a short distance above or below the floor, notwithstanding the fact that the door may be open; but when the cage reaches a predetermined limit the controlling devices are automatically reversed if the door is still open and the cage returned toward the level of the floor which it had attempted to leave.

In elevators where the doors are controlled by the operator and no means are provided for locking the controlling device on the elevator-cage or for coöperating with said controlling device, so as to prevent the departure of the elevator from a floor, accidents frequently occur. Passengers attempt to enter or leave the car when the door is open or while the door is being either opened or closed and after the operator has moved the controlling device to start the cage away from a particular floor.

In mechanically-operated doors persons are sometimes caught by the door in its closing movement and held so that they can neither get into the elevator or onto the floor. Consequently injuries of a serious nature are apt to be inflicted.

My present invention is designed to be applied to existing forms of controlling devices; and it consists, generally stated, in means coacting with said controlling device to reverse the movement thereof in the event that the operator attempts to leave a floor while the door is still open. A limited uninterrupted travel of the cage is permitted—say from twelve to eighteen inches above or below the floor; but this travel is insufficient to cause the elevator to inflict any injury to a person attempting to get into or out of the cage. When the door is closed, the mechanism which coacts with the controlling device is inoperative, and therefore said controlling device may be operated as usual.

In addition to the above the invention consists in providing a motor which is only energized and effective when the door is open for coöperating with the controlling lever, wheel, or hand-rope in such manner that any movement thereof tending to cause the cage to travel beyond the prescribed limits will be reversed by the motor and the cage restored to the floor it attempted to leave. This motor is ineffective while the cage is within the prescribed limits of travel above and below the floor; but the instant the cage passes beyond said limits the motor is effectively engaged with the controlling mechanism of the car to reverse the same, and consequently changes the direction of travel of the cage, tending to restore said cage to the floor which it had attempted to leave.

Another feature of the invention is the provision of a pole-changing switch, where direct currents are employed, for changing the direction of rotation of the armature-shaft of the motor at every change of direction of travel of the cage.

Another feature of the invention resides in the provision of a magnet in the motor-circuit for effectively engaging the motor with the controlling device on the cage whenever the motor is energized. I will state, however, that a solenoid may be employed in lieu of a magnet for accomplishing the above.

Another feature of the invention resides in the novel means employed for automatically disconnecting the armature-shaft from the controlling mechanism in the elevator-cage when the parts reach a certain position, which may be designated as their "limit of travel," notwithstanding the fact that the motor is still energized and running, and, finally, the other features of invention reside in the construction, arrangement, and combination of the several parts, all as will hereinafter be described, and afterward pointed out in the claims.

The cage and its operating mechanism.—In the drawings, 1 indicates the elevator cage or car; 2, the hauling ropes or cables; 3, the sheave for the hauling ropes or cables, said sheave being located at the top of the shaft in the upper part of the building and being mounted upon a shaft 4, which shaft is journaled in suitable bearings, as is well understood.

General controlling mechanism.—5 indicates the controller or lever, which is manipulated by the operator in the car for starting and stopping the car. This lever is mounted upon a shaft 6, which it rocks, said shaft carrying operating mechanism for controlling the power mechanism of the elevator.

I have not deemed it necessary in this application to illustrate any of the operating mechanism except as above mentioned, nor the controlling devices therefor whereby the cage is caused to ascend, descend, or be arrested at the will of the operator by the manipulation of the lever 5, as such form no part of this invention. I will say, however, that my present invention is applicable to elevators in general irrespective of their power mechanism; also, that while I have shown a rocking lever 5 it is obvious that there are other forms of devices manipulated by the operator for managing the controlling mechanism which could be used in conjunction with my invention.

The elevator-doors.—7 indicates a door suspended, as usual, by rollers upon a track. There is usually one of these doors at each floor or landing of a building for controlling an opening to the elevator-shaft. These doors may be manually or mechanically operated.

Door-switch-operating mechanism.—8 indicates what may be termed a "switch-actuator," and this is here shown as a rod or shaft which is arranged in juxtaposition to the path of movement of all of the doors 7. This rod is preferably located in the elevator-shaft and may be continuous from top to bottom of the building; but in high buildings I prefer to make said rod in sections, employing a coupling between the contiguous ends thereof, such as shown in Fig. 7. This coupling consists of a sleeve or collar 9, fixed to the lower end of the upper suspended section, said upper section being hung in an appropriate manner, so that it is permitted to partially rotate. This sleeve receives into the lower portion of its bore the upper end of the next-adjacent section 8^a of the rod, thereby centering said section 8^a. Section 8^a may have a stepped bearing, but is permitted to partially rotate independently of the upper section of the rod 8. The upper end of the section 8^a carries a sleeve or collar 9^a, fixed thereto. Both sleeves or collars 9 and 9^a are provided with flanges 10, which flanges are formed with registering concentric slots 11. (See Fig. 6.) An eye or loop of a switch-operating rod 13 is received in these slots 11. For the purpose of this description we will assume that there are but two sections of the rod 8 in the building and that when the upper of said sections is rocked its attached flanged collar will be moved to the right (see Fig. 6) and the switch-operating rod 13 will be moved to the right, the loop 12 riding idly through the slot 11 of the collar-flange of the stationary section. In this man-

ner if there were six floors in a building the upper section of the rod would be common to the three upper floors, while the lower section of the rod would be common to the three lower floors, and when any door in the three upper floors is operated the upper section of the rod will be manipulated in a manner now about to be described, and when any door in the three lower sections is manipulated the lower section of the rod will be operated. In the path of movement of all of the elevator-doors in the building are projections 14, (see Fig. 6,) which projections are secured to the sections of the rod 8, so that when any elevator-door of the building is open or partially open the projections 14 will be displaced and the section of rod 8, to which said projection is connected, rocked. As before stated, the sections of rod 8 for the purpose of saving friction, and thus reducing the power necessary to operate the switch connected to the rod 13, are independently movable; but it will be observed from the above that when either section of the rod is rocked by the opening movement of a door the switch connected to the rod 13 will be operated. In this manner but one switch is necessary for all of the doors, and this switch will be operated when any of the doors are open.

Door-switch.—The switch referred to, as shown in Figs. 6, 7, and 8, is preferably mounted upon an insulation-base 15, secured to some suitable support in the elevator-shaft. Perforated lugs 16 are arranged upon the base for supporting a sliding rod 17, said rod being attached, through the medium of an appropriate insulation-joint, to the rod 13. 18 indicates a spring on rod 17, bearing at one end against one of the perforated lugs 16 and at its other end against a cross-head 19, fixed to the rod 17. This cross-head 19, as shown in Fig. 8, carries spring-pressed plungers 20, which are pressed outwardly and into contact with what might be termed "blind terminals" 21 when the switch is in its normal and inoperative positions, as shown in Fig. 7. However, when any door is open and either section of rod 8 rocked the rod 13 and its connected rod 17 are moved, and the spring-pressed contacts 20 engage electric terminals 22 in their paths, the spring-pressed contacts completing an electric circuit through said terminals. Thus whenever any elevator-door is open the circuit referred to is closed or completed, and when all of the doors are closed the spring 18 restores the sections of rod 8 to normal position and also moves the cross-head 19 to the left, breaking the electric circuit.

Direct-current motor.—The electric circuit referred to we will assume for the purpose of this present description is derived from a direct-current generator and energizes a motor preferably mounted under the floor of the elevator-car, which motor coöperates with the controlling devices to prevent the cage or car from moving away from a floor at which it is arrested for any considerable distance. This motor being in the circuit controlled by the door-switch will only be available when the door-switch completes the circuit, and this is dependent upon the opening of any of the elevator-doors in the building. When all of the doors are closed, the circuit is broken and the motor is idle.

The motor shown in Figs. 1 to 5, inclusive, consists of the usual field-magnets, armature, commutator, brushes, &c., said armature being mounted upon a shaft which is extended outwardly a considerable distance, being journaled in a suitable bracket 24, depending from the floor of the cage or car. (See Fig. 5.)

Hand-lever-reversing mechanism.—This armature-shaft is provided with a worm 25, (see Figs. 14 to 17, inclusive,) said shaft at this point being mounted in a frame 26, pivotally supported at one end in a bracket (not shown) depending from the floor of the car. The free end of this pivoted frame carries the shaft 23, and when said frame is depressed, as shown by dotted lines in Fig. 14, shaft 23 is deflected, so that the worm 25 is thrown into mesh with a segmental gear 27, mounted upon the rock-shaft 6. If desired, universal couplings may be used in the length of shaft 23; but in view of the fact that the deflection of said shaft from a straight line is so slight it is possible for the frame 26 to be depressed to cause engagement between the worm 25 and the segmental gear without binding or interfering with the rotation of said armature-shaft. The segmental gear 27 referred to is loosely mounted on shaft 6 and carries two spring-pressed plungers 28, which coöperate with an arm 29, fixed upon the shaft 6. Thus the segmental gear may yield in either direction to a slight extent, the opposing plungers tending to center the same at all times with respect to the fixed arm 29. This fixed arm 29 carries a projection 30 in the path of movement of the segmental gear, so that after said segmental gear is moved a short distance independently of the shaft 6 it becomes engaged with said shaft through the instrumentality of said projection 30 on said fixed arm, and a continued movement of the segmental gear will positively drive the shaft 6 in the same direction. The shaft 6 is mounted in suitable bearings 31 and 32, suspended from the floor of the car, the bearing 32 supporting magnets 33. This journal-bracket 32 is also provided with an arm 34, upon which are pivoted links 35, said links carrying an armature 36, which is designed to be attracted by the magnets 33. A spring-pressed plunger 37 cooperates with the armature for the purpose of holding the same in an elevated position above the magnets. A hook 38 is mounted upon the armature 36 for engaging a pin or projection 39 on the depressible frame 26. 40 are cam-blocks adjustably mounted on the segmental gear 27, whose working faces cooperate with the hook 38 for disengaging the same from the frame 26 when the shaft 6 is.

being driven through the segmental gear. The frame 26 is normally held in an elevated position by a spring 41. By reason of the construction above described the segmental gear has a slight yielding movement independently of said shaft 6, which causes the segmental gear when driven to be circumferentially displaced with respect to the fixed arm 29, said segmental gear traveling in advance of said fixed arm, such advanced or abnormal position of the segmental gear being equivalent to the distance of its independent idle movement before it becomes engaged with the fixed arm. This condition prevails when the segmental gear is driven in either direction, and the purpose of this is to advance the rearmost cam-block, so that said cam-block will when the shaft 6 is operated through the segmental gear release the frame 26 before reaching the limit of its movement; but in a normal position of the segmental gear when it is central with respect to the fixed arm neither of the cam-blocks referred to will coöperate with the releasing-hook of the frame 26 before the shaft reaches its limit of movement in either direction.

The importance of the circumferential displacement of the segmental gear when the shaft 6 is being actuated therethrough will be developed later on.

Operation of the reversing mechanism.—The operation of the above-described reversing mechanism is as follows: For the purpose of explanation we will say that the controlling-lever 5, mounted upon shaft 6, when in a vertical or central position causes the car, through the instrumentality of the controlling mechanism actuated thereby, to come to a position of rest, that when said lever and its shaft 6 are rocked, say, to the right the car is caused to ascend, and that when the lever and said shaft 6 are rocked, say, to the left the car is caused to descend. Through the fixed arm 29 on shaft 6 the segmental gear 27 is moved to the right or to the left or occupies a vertical position, as the case may be, similar in all respects to the hand-lever 5, and in this rocking movement of the segmental gear neither cam-block will engage the hook 38, because the limit of movement will be reached before the cam-blocks or either of them can coöperate with the hook so as to disengage it from the frame 26. When the car is brought to a position of rest at a landing and the hand-lever 5 and the segmental gear are in a vertical position, the opening of the elevator-door at the landing will complete the electric circuit so far as the door-switch is concerned. However, said circuit will not be available to the motor, nor will it energize the magnets 33 until certain conditions, not yet mentioned, are established. We will assume for the purpose of explaining the operation of the mechanism shown in Figs. 14 to 17, inclusive, that the magnets 33 are energized and that the motor is running. The energized magnets 33 will attract the armature 36, causing it move to the position shown in dotted lines in Fig. 14, and through the hook 38 the frame 26 will be displaced, so as throw the rotating worm on the armature-shaft of the motor into mesh with the segmental gear 27. The segmental gear 27 will first be circumferentially displaced and will cause one of the plungers 28 to yield until the segmental gear becomes positively engaged with the fixed arm by striking the projection 30 thereof. Under these conditions the continued rotation of the motor will cause the shaft 6 to be rocked and its carried lever 5 to be moved, so that the controlling-valves will be thrown in one direction or the other to tend to restore the elevator to its landing. If by the above the shaft 6 is thrown to such an extent as to operate its connected controlling device so as to cause the cage to be arrested in its movement and said movement reversed, it follows that the cage in the absence of the operator will simply move up and down slowly for a short distance. However, as it is usually the practice to have an attendant upon the car at all times the attendant in the event of the operation of the reversing mechanism just described can manipulate the operating mechanism or lever 5 to properly control the car only after the reversing mechanism has completed its movement and the motor disengaged from the shaft 6. I have before stated that the segmental gear is circumferentially displaced with respect to the fixed arm 29, so that the rearmost cam-block is advanced. Consequently in this abnormal position the rearmost cam-block will before the segmental gear reaches the limit of its movement engage the hook 38 and release the frame 26, so that the motor is disengaged from the shaft 6. As soon as this release is effected the segmental gear again centers itself with respect to the arm 29, and in the ordinary operation of shaft 6 neither cam-block will hit the hook 38 to disengage it from the frame 26. An appropriate spring 38^a is arranged behind the hook 38, so that notwithstanding the fact that the magnets 33 are energized and hold the hook in a lowered position said hook will be in readiness when the armature is permitted to rise to again engage the frame 26.

We have presupposed in the above statement that the elevator, while brought to a proper position of rest opposite its landing, is, through leakage of its valves or from other causes not attributable directly to any movement of the lever 5 by the operator, moving away from the landing either up or down, as the case may be, and that this travel up or down has established a condition wherein the motor is energized and caused to rotate, and the magnets 33 are also placed in circuit. The power of the motor under these conditions is directed to move the shaft 6 in such direction that the cage will be arrested in its travel away from its landing and caused to return toward the landing. The limit of this travel

of the car when the elevator-door is open, away from its landing, may be fixed arbitrarily. I have found that from twelve to eighteen inches is preferable.

Pole-changer.—As we are now dealing with a direct-current circuit and as we have mentioned an opposite movement being imparted to the shaft 6 from the motor, it will be necessary in the proper operation of the device to send the current through the armature in opposite directions, so that the motor will rotate in different directions to suit the conditions demanded.

In Figs. 1, 2, 9, 10, and 11 I have shown a pole-changing device which is operated from the shaft 4, upon which the sheave 3 is mounted. This pole-changer consists of an arm 42, mounted upon the end of the shaft 4 and held in position against the end of said shaft by a spring 43, whereby when the shaft 4 rotates in either direction it will carry the arm 42 with it, by reason of the friction resulting from the pressure of spring 43, until the arm 42 is arrested. The shaft 4 will then continue to rotate; but the arm 42 will be held stationary.

Arm 42 carries an insulation-block 44 on its upper end, upon which are two binding-posts 45 and 46, said binding-posts carrying electric contacts which project on each side thereof and coöperate with stationary contacts 47, 48, 49, and 50, mounted in pivoted arms 51. These arms 51 are pivoted to the binding-posts in the form of blocks 52, properly insulated from a support 53, said arms being pressed inwardly by springs 55 and arrested in their innermost position by lugs 56.

The sheave 3 is fixed to the shaft 4, and consequently any movement of the elevator cage or car will cause said shaft 4 to rotate in one direction or the other, and this rotation in either direction will cause the electric contacts on the arm 42 to complete the circuit through the fixed terminals at either side thereof. The idle play of the arm 42 in moving between these fixed terminals is comparatively short—say one-fourth of an inch—so that the slightest movement of the cage upward or downward will cause the circuit to be completed through the pole-changers, the circuit going through the armature in one direction or the other, depending upon the direction of movement of the elevator-cage. With this slight movement of the arm 42 it is improbable that said arm will for any length of time occupy a position between the fixed terminals, so that the motor-circuit is broken. When the cage is ascending, the circuit, as controlled by this pole-changing device, is such that if the motor-shaft is operated under these conditions and imparts motion to the shaft 6 such motion will be in such a direction as to cause said shaft 6 to rotate to the left, so that the controlling mechanism will be operated to arrest the upward movement of the cage. Likewise if the cage were descending the motor-circuit as controlled by the pole-changer would be such that if the motor were energized and engaged with shaft 6 it would move said shaft to the right, operating the elevator-controlling mechanism so as to cause the cage to ascend.

Lever-switch.—Referring to Figs. 1, 12, and 13, it will be observed that the shaft 6 has fixed to it an arm 57, said arm carrying an insulated binding-post 58 at its upper end, which coöperates between two yielding terminals 59. These terminals 59 are mounted in spring-pressed pivoted arms, similar in all respects to terminals 47, 48, 49, and 50. This contact 58 is designed to engage one or the other terminal 59 when the lever 5 is at either extreme position for the purpose of completing the circuit through the motor independently of the position of the traveling contact carried by the elevator-car. In other words, if the car is at a landing and the traveling contact, to be hereinafter described, is inoperative the operator may, when the door is open, throw the lever 5 to the full limit of its movement in either direction; but the motor, through this lever-switch, will tend to restore the hand-lever.

Traveling contact.—60 indicates a bar, wire, or strip of metal arranged in the elevator-shaft and forming a track for and coöperating with a moving contact, preferably in the form of a wheel 61, carried by the car. This strip 60 is interrupted at points by dead sections 62, said dead sections properly supporting the wheel, but breaking the electric contact between the strip 60 and the wheel. These dead sections in the strip are bridged by wires, so that the strip above and below the dead sections is alive. These dead sections in the strip 60 occur at such places as to be opposite the wheel or trolley 61 when the car is in proper position at a landing. However, when the car moves up or down from the landing and the door is open electrical connection is established between the strip and trolley and the circuit completed through the motor and other devices hereinbefore referred to. Said track and traveling contact thus are, in effect, a switch in the electric circuit.

General operation.—Referring now to Figs. 3 and 4, we will assume that *a* is the inlead-wire from a source of direct-current supply and that wire *i* is the return-wire. Wire *a* is connected to the binding-post 45 on the end of the arm 42, and in Fig. 3 we will assume that the elevator has descended from some point above to its proper position at a landing, in which event the trolley 61 is on a dead-section in strip 60. We will also assume that the door is open and that the door-switch has completed the circuit through the terminals 22. Under these conditions the circuit will be as follows: Entering wire *a* the current passes through contact-point 45 to terminal 47, through wire *b* down to the upper commutator-brush, through the armature and out through the lower commutator-brush, through wire *c* to magnets 33. From

magnets 33 the current passes to wire *d* up to the terminal 48 and through wire *e* to terminal 49 to binding-post 46. From binding-post 46 the current passes through wire *f* to strip 60 and through wire *f'* to contact-point 58 of the lever-switch. If the trolley 61 is on a dead section and the lever 5 occupies a central position, the circuit will thus be broken. We will assume, however, that the operator throws the lever 5 over to the left of the limit of movement and causes the contact 58 to strike the terminal 59 in its path. The circuit will now be completed by said terminal through wire *g*, through the field-magnet coil of the motor, wire *h*, the door-switch, and wire *i*, said wire *i* being the return-wire. We will suppose now that instead of completing the circuit through the lever-switch the operator moves the lever-switch 5 to a limited extent without making contact between 58 and 59 and attempts to leave the landing without closing the door. The limited movement of the lever 5 will not complete the circuit through the lever-switch; but the traveling contact 61, depending upon the length of the dead section in the strip 60, will pass from said dead section onto one of the live sections of said strip and complete the circuit through the strip 60, trolley 61, wire *g'*, field-coil, wire *h*, &c. Of course if the door is closed the door-switch will open the circuit, so that none of the devices before referred to will be electrically operated. As before described, the pole-changer directs the current through the motor in such manner that when the arm 42 is in one position the current drives the motor in one direction, causing the reversing mechanism to operate the shaft 6 in such manner as to move the controlling devices and reverse the direction of travel of the car. The reversing mechanism is designed to operate the controlling mechanism of the car in a contrary direction at all times, so that the movement of the car is reversed, the pole-changer simultaneously reversing the armature-circuit.

In Fig. 4 I have shown the pole-changer in the position it occupies, say, when the car is arrested at a floor after moving in an upward direction. Under these conditions the current entering through wire *a* passes through the binding-post 45, wire *d*, magnets 33, and into the armature-windings via the lower commutator-brush. The current passes from the armature through the upper commutator-brush, through wire *b* and wire *b'* to terminal 50, from terminal 50 through the binding-post 46 and wire *f* to strip 60, likewise through wire *f'* to the lever-switch. Should the circuit be completed through the lever-switch or the trolley, it would pass through wires *g* and *g'*, the field-coil of the motor, wire *h*, and through the door-switch to the return-wire *i*.

From the above the following salient points should be noted: First, the movement of the car either up or down effects, through the pole-changer, a reversal in the direction of rotation of the motor; second, the motor always operates to drive the controlling mechanism of the car in a direction tending to reverse the same and cause the car to travel in a contrary direction; third, that the circuit is controlled by (*a*) the pole-changer, (*b*) the door-switch, (*c*) the lever-switch, and (*d*) the moving contact or trolley; fourth, that (*a*) the pole-changer is never intended to be in an inoperative position, but should at all times contact with one or the other set of coöperating terminals; fifth, that (*b*) the door-switch absolutely controls the circuit, the opening of the door closing the circuit, rendering the electrical devices available for operation, while the closing of the door breaks the circuit, rendering all of the electrical devices inoperative; sixth, that (*c*) the lever-switch is only available when the door is open and serves to prevent the operator from starting the car away from a landing at full speed; seventh, (*d*) the traveling contact or trolley determines the distance of movement of the car away from a landing when the door is open, either up or down, and operates when a car passes the prescribed limit to check its movement whether or not the operating-lever 5 has been operated; eighth, that none of the devices above described interfere in any way with the normal running conditions of an elevator. The operator in approaching a landing may bring his car to a position of rest, open the door, and let passengers in or out, as usual, and may start the car slowly (not at full speed) away from the landing before the door is fully closed, the car traveling to the end of the dead section, which when passed if the door is not closed will cause the controlling mechanism set in motion by the operator to be reversed, the reversal resulting in checking the car and causing the car to travel toward the landing it has left. This reversal is beyond the control of the operator, compelling him to first close the door, to break the circuit, and render the electrical devices inoperative before he can proceed.

It will also be noted that the above-described construction in addition to not interfering with the usual conditions surrounding the running of elevators in service is of such character that it can be applied to elevators at present in service. Consequently no special provision need be made in the manufacture and erection of elevators for this device.

Hand-rope controlling device.—In Fig. 18 I have shown my invention for use in connection with a manually-operated hand-rope, said rope being used for controlling the power which operates the elevator in lieu of the operating-lever before referred to. In this construction the door-operating lever 5 is designed to be operated in substantially the same way as hereinbefore described; but the other parts of the mechanism may be located at the top or at the bottom of the shaft, as desired, instead of being arranged on the car, as previously described.

The hand-rope or "tiller-rope," as it is usually called, is indicated at 65, said rope passing over sheaves or sprockets 66, as is usual. In order to reduce the movement, a pinion 67 is mounted upon one of the shafts of the sheaves 66, over which pinion passes a chain or cable 68 for driving a sheave or sprocket 69, mounted upon the end of a rock-shaft 6^a, this rock-shaft corresponding in all respects to the shaft 6, upon which the hand-lever 5 (shown in Figs. 1 and 2) is arranged.

With the above-mentioned alterations the device operates in the same way as described with reference to the diagrammatic views illustrated in Figs. 3 and 4, and therefore it is deemed unnecessary to repeat that description here. Of course the trolley 61 is mounted on the car, as previously described.

Constantly-running motor.—In Fig. 19 I have shown a modified form of my invention, wherein the motor is designed to run constantly instead of being energized at different periods of time and under certain conditions, as hereinbefore described. In this modification of my invention 70 indicates the motor, whose armature-shafts are provided with worms 23^a and 23^b, each held away from the segmental gears 27^a and 27^b by mechanism such as before described. Magnets 33^a and 33^b effect the engagement of the worms with their respective segmental gears. The segmental gears are connected together by a link 27^c, so that when either of said gears is driven the shaft 6^b will be rocked. 5^b is the hand-lever on the car for rocking the shaft 6^b and actuating the controlling devices for moving the car. 42^b is a switch mounted upon the shaft 4^b for sending the current in one direction or the other, depending upon the direction of movement of the elevator. This switch-arm 42^b corresponds in all respects to the switch-arm 42, before described, with the exception that it carries a single contact-point for coöperating with opposite terminals instead of a pair of terminals on each side. The lever-switch, the door-switch, and the trolley devices are the same as before described. The operation of this switch is as follows: The current, either alternating or direct, causes the motor 70 to constantly rotate, and when the switch 42^b is in contact, say, with the terminal at the left the circuit is completed through the inlead-wire a', wire b', magnet 33^a, wire c', strip 60, and if the trolley is on one of the live sections of said strip, through the trolley to the door-switch via wire d' and out through the return-wire e'. If the lever-switch is operated to its full limit of movement in either direction, (in the event that the trolley is on one of the dead sections,) the circuit will be completed through wire c'' and either of the terminals 59, through wire d'' to the door-switch and out through the return-wire e' When this circuit is completed, either by the trolley or by the lever-switch, the magnet 33^a is energized, the worm 23^a is thrown into mesh with the segmental gear 27^a, and through the link 27^c shaft 6^b is driven in a direction to operate the controlling devices and reverse the movement of the car. Should the switch-arm 42^b be on the terminal at the right, the circuit will be completed through wire b'', magnet 33^b, and wire c'', strip 60, through the trolley, and to the door-switch and out through the return-wire, causing the magnet 33^b to be energized, if the trolley is on a live section, so as to engage the worm 23^b with the segmental gear 27^b and rock the shaft 6^b in a reverse direction to reverse the movement of the car, or if the trolley is on a dead section and the operating-handle 5^b is manipulated to its extreme limit the circuit will be completed and the same result accomplished. These worms, while rotating in the same direction, are oppositely pitched, so as to move the shaft 6^b in different directions, depending upon the movement of the car, the throw of the shaft 6^b in all instances being such as to actuate the controlling devices to arrest the car by throwing said controlling devices in a reverse direction and cause the car to travel in a reverse direction. This constantly-running motor is preferably mounted under the bottom of the car, although it is obvious that it could, as indicated in Fig. 18, coöperate with a hand-rope and be arranged in the top or bottom of the shaft.

From the above it will be noted that the principal purpose of the motor is to drive an element which actuates or controls the power mechanism of the elevator in such manner that the power mechanism is caused to arrest the travel of the car, tending, if an excess movement is imparted to the valve of like member of said power mechanism, to reverse the direction of travel of the car, and therefore in the use of the term "controller for said power mechanism" or some like term in the following claims I wish to be understood as including in such term all elements in the train of connection between the manually-operable device on the car and the valve, switch, or other form of controlling device which regulates and controls the power which causes the elevator to ascend or descend, which elements are capable of being operated by the motor for automatically changing the position of said controlling devices; further, that the motor employed may be a constantly-running motor and the devices coöperating therewith may be set in motion by the establishment of certain conditions to cause the engagement between the motor and the controlling devices, or the motor may be normally idle and in constant engagement with the controlling mechanism, and that devices may be employed for energizing the motor under certain conditions.

I am aware that many minor changes in the construction, arrangement, and combination of the several parts of my invention can be made and substituted for those herein

shown and described without in the least departing from the nature and principle of my invention.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an apparatus of the character described, the combination with a plurality of doors, of an electric circuit controlled by each individual door, said circuit being closed upon the opening of a door, a motor in said circuit, and controlling devices for the elevator with which said motor coöperates; substantially as described.

2. In an apparatus of the character indicated, the combination with an elevator-car, power mechanism therefor having a controller, and a door, of an electric circuit controlled by said door, a motor in said circuit, and means whereby said motor controls said controller; substantially as described.

3. In an apparatus of the character described, the combination with controlling mechanism for the car, of a motor normally out of operative connection with said controlling mechanism, and devices for effectively engaging said motor with said controlling mechanism for reversing the same; substantially as described.

4. The combination with controlling mechanism of an elevator-car, of a motor for driving said mechanism to bring the car to a condition of rest, and means for disengaging said motor from said mechanism when the car is brought to rest; substantially as described.

5. The combination with controlling devices of an elevator-car, of a motor, devices for causing said motor to reversely drive said controlling mechanism, and a switch in the motor-circuit which is operated by the elevator-door; substantially as described.

6. The combination with controlling mechanism which is free and operable when the car is at a landing and the door open, of means for restoring said mechanism should the actuating devices be thrown to start the car away from the floor before the door is closed; substantially as described.

7. In an apparatus of the character described, a car, controlling mechanism therefor, a manually-operable device for actuating said controlling mechanism, a motor independent of the car-moving mechanism, and means for engaging the motor with the controlling mechanism when the car moves away from a landing and the door is open; substantially as described.

8. The combination with a car and its controlling mechanism, of a door, an electric circuit controlled by said door, a motor designed to coöperate with said controlling mechanism and reverse the same when the car leaves a landing and the door is open, and means for engaging the motor with said controlling mechanism; substantially as described.

9. The combination with the controlling mechanism of an elevator-car, of a motor for driving the same, a pole-changer in the motor-circuit, and means for throwing said pole-changer into pole-changing position whenever the car changes its direction of travel; substantially as described.

10. The combination with the controlling mechanism of an elevator-car, of a motor for driving the same, a door-switch in the motor-circuit, and a switch for completing the circuit whenever the actuating devices of the controlling mechanism are moved to their full limit; substantially as described.

11. The combination with an elevator-car, power mechanism therefor, and a door, of means for permitting only a limited movement of said car away from the landing while said door is open; substantially as described.

12. The combination with an elevator-car, power mechanism therefor, and a door, of means for permitting only a relatively slow limited movement of said car away from the landing while said door is open; substantially as described.

13. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of means for permitting only a limited movement of said controller while said door is open; substantially as described.

14. The combination with an elevator-car, power mechanism therefor, and a door, of means for automatically arresting the movement of said car should it travel a limited distance while said door is open; substantially as described.

15. The combination with an elevator-car, power mechanism therefor, and a door, of means for automatically reversing the movement of said car should it travel a limited distance while the said door is open; substantially as described.

16. The combination with an elevator-car, power mechanism therefor, and a door, of means whereby the car is placed under the control of the operator while it is at a landing adjacent said door and for a limited distance beyond said landing, and means for automatically arresting the travel of said car should it travel beyond said limited distance while the door is open; substantially as described.

17. The combination with an elevator-car, and power mechanism therefor, of a controller for said power mechanism, a door, and means for automatically operating said controller, said means being rendered inoperative while the door is closed but operative when the door is open; substantially as described.

18. The combination with an elevator-car, and power mechanism therefor, of a controller for said power mechanism, a door, and means for automatically operating said controller, said means being rendered inoperative while the door is closed and also inoperative to stop the travel of the car while the door is open and the car is within a limited distance of its landing, but said means being rendered op-

erative while the door is open and after the car has traveled said limited distance; substantially as described.

19. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a motor, and means for causing said motor to automatically control said controller at desired intervals of travel of the car; substantially as described.

20. The combination with an elevator-car, power mechanism therefor, and a door, of a motor, and means for causing said motor to control said car while the door is open; substantially as described.

21. The combination with an elevator-car, power mechanism therefor, and a door, of a motor, and means for causing said motor to arrest the movement of said car should it travel beyond a limited distance while said door is open; substantially as described.

22. The combination with an elevator-car, power mechanism therefor, and a door, of a motor, and means for causing said motor to arrest the movement of said car should it travel for a limited distance while the door is open, but be inoperative with respect to said controlling action upon said car while the door is closed and while the car is in said limited distance and the door is open; substantially as described.

23. The combination with an elevator-car, power mechanism therefor, and a door, of a motor, and means for causing said motor to control the speed of the car while the door is open and to arrest the travel of the car should it move beyond a limited distance while the door is open; substantially as described.

24. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a motor, and means for causing said motor to reverse the said controller should the car travel beyond a limited distance while the door is open; substantially as described.

25. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a motor, and means for causing said motor to limit the effective setting of said controller while the door is open and to cause said motor to reverse said controller should the car travel beyond a limited distance while the door is open; substantially as described.

26. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for automatically returning said controller to a position to produce only a limited speed should said controller be moved beyond said position; substantially as described.

27. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a motor, and means for causing said motor to return said controller to a position to effect only a limited speed should said controller be moved beyond said position while the door is open; substantially as described.

28. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of means for permitting full control of said controller by the operator while the door is closed but only limited control of said controller by the operator while the door is open; substantially as described.

29. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, means for energizing said motor, and means for operatively connecting said motor with said controller to cause said controller to operate the power mechanism in a direction tending to bring the car to rest; substantially as described.

30. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, means for periodically energizing said motor, and means for operatively connecting said motor with said controller to cause said controller to operate the power mechanism in a direction tending to bring the car to rest; substantially as described.

31. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a motor, means for energizing said motor, gearing between said motor and said controller, and means for connecting and disconnecting said gearing; substantially as described.

32. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a motor, a worm driven by said motor, a segmental gear operatively connected to said controller, and means for connecting and disconnecting said worm and gear with relation to each other; substantially as described.

33. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a controller-shaft, a gear thereon, a motor, a shaft driven thereby, a gear upon said motor-driven shaft adapted to operatively engage said gear upon said controller-shaft, means for normally supporting said gears out of operative engagement, and means for throwing said gears into operative engagement; substantially as described.

34. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mech-

anism in a direction tending to bring the car to rest, said means including a controller-shaft, a gear thereon, a motor, a shaft driven thereby, a gear upon said motor-driven shaft adapted to operatively engage said gear upon said controller-shaft, means for yieldingly supporting said gears out of operative engagement, and means for throwing said gears into operative engagement; substantially as described.

35. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a controller-shaft, a gear thereon, an extended power-driven shaft, a gear on said power-driven shaft adapted to operatively engage said gear upon said controller-shaft, and a suitably-supported movable frame in which the free end of said power-driven shaft is journaled; substantially as described.

36. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a controller-shaft, a gear thereon, an extended power-driven shaft, a gear on said power-driven shaft adapted to operatively engage said gear upon said controller-shaft, a suitably-supported movable frame in which the free end of said power-driven shaft is journaled, and a spring normally holding said frame in position to hold said gears out of operative engagement; substantially as described.

37. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a controller-shaft, a gear thereon, a motor, an extended armature-shaft, a gear on said armature-shaft adapted to operatively engage said gear upon said controller-shaft, and a suitably-supported movable frame in which the free end of said armature-shaft is journaled; substantially as described.

38. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a motor, means for automatically throwing said motor and said controller into operative engagement, and means for automatically throwing said motor and said controller out of operative engagement; substantially as described.

39. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a motor, gears connected to said motor and said controller, means for automatically causing operative engagement of said gears, and means for automatically throwing said gears out of operative engagement; substantially as described.

40. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a motor normally out of operative engagement with said controller, means for automatically throwing said motor and controller into operative engagement when the said door is open, and means for throwing said motor and controller out of operative engagement when the door is closed; substantially as described.

41. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a normally deënergized motor, means for operatively connecting said motor and said controller, and means for automatically energizing said motor when the door is open; substantially as described.

42. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a motor normally deënergized and out of operative engagement with said controller, and means for automatically energizing said motor and throwing the same into operative engagement with said controller when said door is open; substantially as described.

43. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a motor normally out of operative connection with said controller, and means for automatically throwing said motor into operative connection with said controller should the travel of the car exceed predetermined limits when the door is open; substantially as described.

44. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a motor, gears connected to said motor and said controller, means for operatively connecting said gears, and means whereby the continued movement of said gears when connected causes the connection between said gears to be broken; substantially as described.

45. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, gearing between said motor and said controller, means for holding said gears in operative connection, means for disconnecting said gears by their continued movement, and means whereby the gear in connection with said controller can at times be moved to an extent corresponding to the full movement of said controller without effecting said disconnection but at other times will, by a movement not greater than said full movement of said

controller, effect said disconnection; substantially as described.

46. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, gearing between said motor and said controller, means for holding said gears in operative connection, said parts being normally so related that movement of the gear in connection with said controller through a distance equal to the full throw of said controller fails to effect said disconnection, and means for altering the relation between said controller and its said gear whereby movement of said gear through a distance not greater than the full throw of said controller effects said disconnection; substantially as described.

47. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a controller-shaft, a motor, a gear operable by said motor, a gear loosely mounted on said controller-shaft, means for holding said gears in operative connection, an arm upon said shaft adapted to be engaged by said gear when the latter is moved, and means upon said controller-gear for breaking said connection in the movement of said gear, said gear having a limited amount of movement independent of said arm; substantially as described.

48. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable thereby, a controller-shaft, a gear loosely mounted thereon and having side members, means for holding said gears in operative connection, means upon said controller-gear for breaking said connection during its movement, and an arm upon said controller-shaft and having a part extending between said side members of the gear, there being play between said side members and said part upon said arm; substantially as described.

49. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable thereby, a controller-shaft, a gear loosely supported upon said shaft, means for holding said gears in operative connection, means upon said gear carried by said shaft for causing said connection to be broken, a stop upon said shaft adapted to be engaged by said gear supported upon said shaft, and means for yieldingly holding said gear out of engagement with said stop; substantially as described.

50. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable thereby, a controller-shaft, a gear loosely supported upon said shaft and having side legs, means for holding said gears in operative connection, means upon said gear supported by said shaft for causing said connection to be broken, a stop upon said shaft and extending between the legs of said gear, plungers engaging opposite sides of said stop and extending respectively through openings in said gear-legs, and springs about said plungers and bearing between their inner ends and said respective gear-legs, whereby said legs are yieldingly held out of engagement with said stop; substantially as described.

51. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, means for operatively connecting said motor and said controller, and means for rendering said motor inoperative with relation to said controller when the latter has been moved a predetermined distance by the action of the former; substantially as described.

52. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, means for operatively connecting said motor and said controller, and means whereby the continued action of said motor serves to render the same inoperative with relation to said controller when said controller has been moved a predetermined distance by the action of said motor; substantially as described.

53. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable by said motor, a gear connected to said controller, means for operatively connecting said gears, and means carried by said controller-gear for causing said gears to be thrown out of connection by the movement of said controller-gear; substantially as described.

54. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable by said motor, a gear connected to said controller, means for operatively connecting said gears, and a cam carried by said controller-gear for causing said gears to be thrown out of connection by the movement of said controller-gear; substantially as described.

55. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable by said motor, a gear connected to said controller, means for operatively connecting said gears, and means adjustably supported by said controller-gear for causing said gears to be thrown out of connection by the movement of said controller-gear; substantially as described.

56. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable by said motor, a gear connected to said controller, means for yieldingly holding said gears out of connection with each other, a member adapted to engage a part connected to one of said gears and bring said gear into connection with said other gear against the action of said yielding means, and means for throwing said member out of position to

effect said connection; substantially as described.

57. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable by said motor, a gear connected to said controller, means for yieldingly holding said gears out of connection with each other, a member adapted to engage a part connected to one of said gears and bring said gear into connection with said other gear against the action of said yielding means, and means for throwing said member out of position to effect said connection by the continued action of said gears; substantially as described.

58. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable by said motor, a gear connected to said controller, means for yieldingly holding said gears out of connection with each other, a member adapted to engage a part connected to one of said gears and bring said gear into connection with said other gear against the action of said yielding means, and a cam carried by said controller-gear and, in the continued movement of said gear, adapted to engage said member and throw the same out of position to effect said connection of said gears; substantially as described.

59. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable by said motor, a gear connected to said controller, means for yieldingly holding said gears out of connection with each other, a hook adapted to engage a part connected to one of said gears and bring said gear into connection with said other gear, and means acting in synchronism with said gears for throwing said hook out of engagement with said gear; substantially as described.

60. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable thereby, a gear connected to said controller, means for holding said gears out of connection with each other, a member having engagement with one of said gears, and means for moving said member for bringing said gears into connection with each other; substantially as described.

61. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a motor, a gear operable thereby, a gear connected to said controller, means for holding said gears out of connection with each other, an armature having connection with one of said gears, and a magnet for moving said armature to connect said gears; substantially as described.

62. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of means for causing said controller to operate the power mechanism in a direction tending to bring the car to rest, said means including a motor, a gear operable thereby, a gear connected to said controller, means for holding said gears out of connection with each other, an armature having connection with one of said gears, a magnet for moving said armature to connect said gears, and means for yieldingly holding said armature from said magnet; substantially as described.

63. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a gear operable thereby, a gear connected to said controller, means for yieldingly holding said motor-gear out of connection with said controller-gear, a magnet, an armature, means for yieldingly holding said armature away from said magnet, a hook movably supported upon said armature and adapted to engage a part connected to said motor-gear, means for yieldingly holding said hook in said engaging position, and a block upon said controller-gear adapted during the movement of said gear to move said hook out of its said engagement; substantially as described.

64. The combination with an elevator-car, a power mechanism for use therewith, a single switch controlling said power mechanism, and a plurality of doors, of means for operating said switch by each of said several doors; substantially as described.

65. The combination with an elevator-car, a power mechanism for use therewith, and a shaft, of connection between said shaft and said power mechanism for controlling the latter by the rocking of the former, and means for operating said shaft by the movement of said door; substantially as described.

66. The combination with an elevator-car, a power mechanism for use therewith, and a shaft, of connection between said shaft and said power mechanism for controlling the latter by the rocking of the former, means for operating said shaft in one direction by the opening of said door, and means for reversely rocking said shaft as said door is closed; substantially as described.

67. The combination with an elevator-car, a power mechanism for use therewith, and a shaft, of connection between said shaft and said power mechanism for controlling the latter by the rocking of the former, a projection upon said shaft in the path of movement of said door whereby said shaft is rocked by the opening movement of said door, and a spring for rocking said shaft in the opposite direction when said door is closed; substantially as described.

68. The combination with an elevator-car, a power mechanism for use therewith, a single switch controlling said power mechanism, a single movable member operatively connected to said switch, and a plurality of doors,

of means for operating said movable member by each of said several doors; substantially as described.

69. In an elevator mechanism or the like, a power mechanism, a switch controlling the same, a plurality of independently-operable switch-actuator sections, means for operating said several sections, and a single means common to said several sections for operating said switch by the movement of any of said several sections; substantially as described.

70. In an elevator mechanism or the like, a power mechanism, a single switch controlling the same, a plurality of independently-operable switch-actuator sections, means for operating said several sections, and a single means common to said several sections for operating said switch by the movement of any of said several sections; substantially as described.

71. In an elevator mechanism or the like, a power mechanism, a switch controlling the same, a plurality of independently-operable switch-actuator sections, and a common connector between said switch and said sections and engaged by parts upon each of said sections, said engaged portion of said connector being movable with relation to one of said sections when engaged and moved by another thereof; substantially as described.

72. In an elevator mechanism or the like, a power mechanism, a switch controlling the same, a plurality of independently-operable shaft-sections, flanges upon said shaft-sections and provided with registering concentric slots, and a common connector between said switch and said shaft-sections and having a member entering said slots, whereby in the movement of one of said sections said member is engaged and moved but during said movement of said section said member plays in said slot of another of said sections; substantially as described.

73. In an elevator mechanism or the like, a power mechanism, a switch-actuator, a suitably-supported perforated lug, a sliding rod extending through said lug, a switch member upon said rod, a spring between said switch member and said lug, a connection between said rod and said actuator, and means for moving said actuator against the action of said spring; substantially as described.

74. In an elevator mechanism or the like, a power mechanism, a switch controlling the same and including a movable cross-head carrying contact members, a rod upon which said cross-head is carried, a suitably-supported perforated lug through which said rod is slidable, a spring between said cross-head and said lug, a movable switch-actuator, and connection between said rod and said switch-actuator; substantially as described.

75. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor for operating said controller, and a switch in the circuit of said motor and operable by said controller; substantially as described.

76. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a relatively fixed terminal in said circuit, a controller-shaft, an arm carried thereby, and a terminal carried by said arm and adapted to coöperate with said relatively fixed terminal; substantially as described.

77. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a suitably-supported spring-pressed pivoted arm carrying a terminal of said motor-circuit, and a terminal of said circuit movable by said controller and adapted to contact with said first-mentioned terminal; substantially as described.

78. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, a normally open motor-circuit, and means for completing said circuit by the movement of said controller in either direction; substantially as described.

79. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor, and a motor-circuit including switch members, one of which comprises two electrically-connected terminals while said other switch member comprises a third terminal intermediate said other terminals, one of said switch members being connected to and movable by said controller; substantially as described.

80. The combination with an elevator-car, and power mechanism therefor, of operative mechanism requiring reversal of movement, a motor for said operative mechanism, and means whereby upon reversal of movement of said car said motor is caused to operate to effect reversal of movement of said mechanism; substantially as described.

81. The combination with an elevator-car, and power mechanism therefor, of operative mechanism requiring reversal of movement, a motor for said operative mechanism, and means for reversing the movement of said motor upon reversal of movement of said car; substantially as described.

82. The combination with an elevator-car, and power mechanism therefor, of operative mechanism requiring reversal of movement, a motor for said operative mechanism, and means controlled by the movement of said car for automatically changing the direction of current through said motor; substantially as described.

83. The combination with an elevator-car, and power mechanism therefor, of operative mechanism requiring reversal of movement, a motor for said operative mechanism, a rotatable shaft, connection between said shaft and said car whereby the direction of rotation of the former is determined by the direction

of movement of the latter, and means operated by said shaft for causing said motor to operate to effect reversal of said operative mechanism upon reversal of rotation of said shaft; substantially as described.

84. The combination with an elevator-car, power mechanism therefor, a rotatable shaft, and cables connected to said car and engaging said shaft, of a controller for said power mechanism, and means for causing reversal of said controller upon reversal of rotation of said shaft; substantially as described.

85. The combination with an elevator-car, power mechanism therefor, a rotatable shaft, and cables connected to said car and engaging said shaft, of a controller for said power mechanism, a motor for said controller, and means for causing said motor to operate to reverse said controller upon reversal of rotation of said shaft; substantially as described.

86. The combination with an elevator-car, power mechanism therefor, a rotatable shaft, and cables connected to said car and engaging said shaft, of a controller for said power mechanism, a motor for said controller, and means for causing reversal of movement of said motor upon reversal of rotation of said shaft; substantially as described.

87. The combination with an elevator-car, power mechanism therefor, and an operative mechanism requiring reversal of movement, of a motor for said operative mechanism, two open circuits including said motor, each of said circuits being adapted to direct current through said motor in a different direction, a member adapted to coöperate with the terminals of either of said circuits to complete said circuit, and means for causing contact between said member and the terminals of a different one of said circuits upon reversal of movement of said car; substantially as described.

88. The combination with an elevator-car, power mechanism therefor, and an operative mechanism requiring reversal of movement, of a motor for said operative mechanism, two open circuits including said motor, each of said circuits being adapted to direct current through said motor in a different direction, a member adapted to coöperate with the terminals of either of said circuits to complete said circuit, and means for shifting said member from the terminals of one of said circuits to those of the other thereof upon reversal of movement of said car; substantially as described.

89. The combination with an elevator-car, power mechanism therefor, and an operative mechanism requiring reversal of movement, of a motor for said operative mechanism, two open circuits including said motor, each of said circuits being adapted to direct current through said motor in a different direction, a member having two terminals in connection with a source of electricity, and means whereby upon the reversal of movement of said car the terminals of said member are caused to contact with the terminals of a different circuit from the circuit-terminals with which they were in contact prior to said reversal of movement; substantially as described.

90. The combination with an elevator-car, and power mechanism therefor, of operative mechanism requiring reversal of movement, a motor for said operative mechanism, a rotatable shaft, connection between said car and said shaft whereby said shaft is caused to rotate by the movement of said car, the direction of rotation of said shaft being determined by the direction of movement of said car, and means whereby the direction of current to said motor is controlled by the rotation of said shaft; substantially as described.

91. The combination with an elevator-car, and power mechanism therefor, of operative mechanism requiring reversal of movement, a motor for said operative mechanism, a rotatable shaft, hoisting-cables connected to said car and passing over said shaft, and means whereby the direction of current to said motor is controlled by the rotation of said shaft; substantially as described.

92. The combination with an elevator-car, and power mechanism therefor, of operative mechanism requiring reversal of movement, a motor for said operative mechanism, a rotatable shaft, connection between said shaft and said car whereby the direction of rotation of the former is determined by the direction of movement of the latter, circuits for the motor, which circuits when completed send current through said motor in different directions, terminals for said motor-circuits, and a member adapted to engage either set of said circuit-terminals to complete the respective circuit, one of said elements (said circuit-terminals or said member) being carried by said shaft, and the other said element being in position to be engaged by said shaft-carried element; substantially as described.

93. In an elevator mechanism or the like, a rotatable shaft, means for rotating said shaft in reverse directions, operative mechanism, a motor therefor, an arm yieldingly engaged with said shaft to have its position changed by reversal of movement of said shaft, means for arresting the movement of said arm, and means carried by said arm for controlling the current to said motor; substantially as described.

94. In an elevator mechanism or the like, a rotatable shaft, means for rotating said shaft in reverse directions, operative mechanism, a motor therefor, an arm carrying means for controlling the current to said motor, means for arresting the movement of said arm, and a spring holding said arm in yielding engagement with said shaft whereby the position of said arm is changed by reversal of movement of said shaft; substantially as described.

95. The combination with an elevator-car, and power mechanism therefor, of operative mechanism, and means for causing said mechanism to be energized at periods determined

by the travel of said car; substantially as described.

96. The combination with an elevator-car, power mechanism therefor, and a landing to which said car travels, of an operative mechanism, and means for automatically energizing said mechanism when said car is substantially at said landing; substantially as described.

97. In an elevator mechanism or the like, a car, an interrupted series of contact-sections located along the path of travel of said car, a contact member carried by said car and having means for holding the same upon said contact-sections, an electric circuit including said contact-sections and said contact member, and an operative mechanism in said circuit, whereby said operative mechanism can be energized at intervals controlled by the movement of said car; substantially as described.

98. In an elevator mechanism or the like, a car, a track for a contact member and having live and dead sections, a contact member carried by said car and having means for holding the same upon said track, an electric circuit including said live track-sections and said contact member, and an operative mechanism in said circuit; substantially as described.

99. The combination with an elevator-car, power mechanism therefor, and an operative mechanism whose movement is designed to be reversed, of a motor for said operative mechanism, an electric circuit including said motor, and means for reversing the direction of the current through said motor, substantially as described.

100. The combination with an elevator-car, power mechanism therefor, and an operative mechanism whose movement is designed to be reversed, of a motor for said operative mechanism, an electric circuit including said motor, means for rendering the polarity of the field-magnet constant, and means for reversing the polarity of the armature of said magnet; substantially as described.

101. The combination with an elevator-car, and power mechanism therefor, of an operative mechanism requiring reversal of movement upon reversal of movement of said car, a motor for said operative mechanism, and means for changing the direction of current through said motor at every change of direction of travel of said car; substantially as described.

102. The combination with an elevator-car, power mechanism therefor, and a door, of mechanism for controlling said car, an electric circuit including said mechanism, a switch in said circuit, connections between said door and said switch whereby the latter is operable by the former, and a second switch in said circuit, said second switch being operated by a movement incident to travel of said car; substantially as described.

103. The combination with an elevator-car, power mechanism therefor, and a door, of a controller for said power mechanism, a motor for said controller, an electric circuit including said motor, a switch in said circuit and operable by the movement of said door, said motor-circuit being also controlled by said controller and by the movement of said car; substantially as described.

104. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a track having a dead section, a contact member carried by said car and engaging said track, an electric circuit including said track and contact member, an electric circuit including a switch operable by said controller, and a motor for said controller included in both of said circuits; substantially as described.

105. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a track having a dead section, a contact member carried by said car and engaging said track, said dead section of track being so located that the said contact member engages the same when the car is at a landing, an electric circuit including said track and contact member, an electric circuit including a switch operable by said controller, a motor for said controller in both said circuits, a switch controlling both of said circuits, and connections between said latter-mentioned switch and said door for operating the former by the movement of the latter; substantially as described.

106. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of an electric circuit, a door-switch in said circuit, a motor in said circuit, means for holding said motor and said controller out of operative engagement, and a magnet in said circuit for bringing said motor and said controller into operative engagement; substantially as described.

107. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of an electric circuit, a door-switch in said circuit, a controller-switch in said circuit, a motor in said circuit, means for holding said motor and said controller out of operative engagement, and a magnet in said circuit for bringing said motor and said controller into operative engagement; substantially as described.

108. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a track having a dead section, a contact member carried by said car and engaging said track, said dead section being so located that it is engaged by said contact member when said car is at a landing, an electric circuit including said track and contact member, a controller-switch, an electric circuit including said controller-switch, a motor for said controller and

included in both of said circuits, means for holding said motor out of operative connection with said controller, a magnet in both of said circuits for bringing said motor and said controller into operative connection, and a door-switch in both of said circuits; substantially as described.

109. The combination with an elevator-car, power mechanism therefor, a controller for said power mechanism, and a door, of a track having a dead section, a contact member carried by said car and engaging said track, said dead section being so located that it is engaged by said contact member when said car is at a landing, an electric circuit including said track and contact member, a controller-switch, an electric circuit including said controller-switch, a motor for said controller and included in both of said circuits, means for holding said motor out of operative connection with said controller, a magnet in both of said circuits for bringing said motor and controller into operative connection, a door-switch in both of said circuits, a pole-changer controlling both of said motor-circuits, and means for operating said pole-changer by the movement of said car; substantially as described.

110. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor for operating said controller, and means for rendering said motor operative with relation to said controller upon movement of said controller; substantially as described.

111. The combination with an elevator-car, power mechanism therefor, and a controller for said power mechanism, of a motor for operating said controller, and means for rendering said motor operative with relation to said controller upon movement of said controller, said controller being permitted a limited movement without so rendering the said motor operative; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 6th day of September, 1901.

FRANCIS K. FASSETT.

Witnesses:
GEORGE BAKEWELL,
GALES P. MOORE.