(No Model.) 6 Sheets—Sheet 1.

A. NEUBURGER.

ELECTRIC ELEVATOR.

No. 468,253. Patented Feb. 2, 1892.

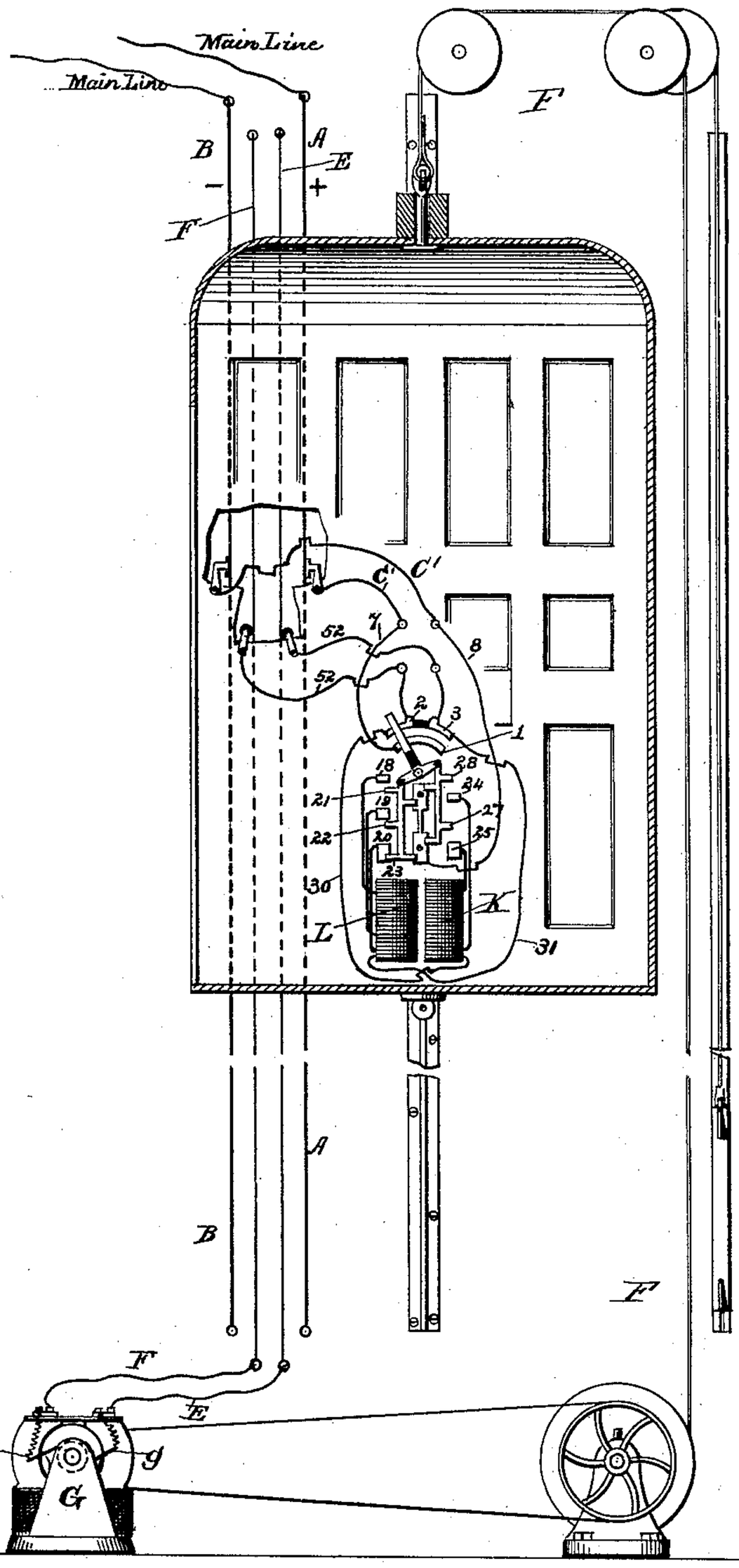

Fig. 1.

Witnesses
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(No Model.) 6 Sheets—Sheet 2.

A. NEUBURGER.

ELECTRIC ELEVATOR.

No. 468,253. Patented Feb. 2, 1892.

Fig. 2.

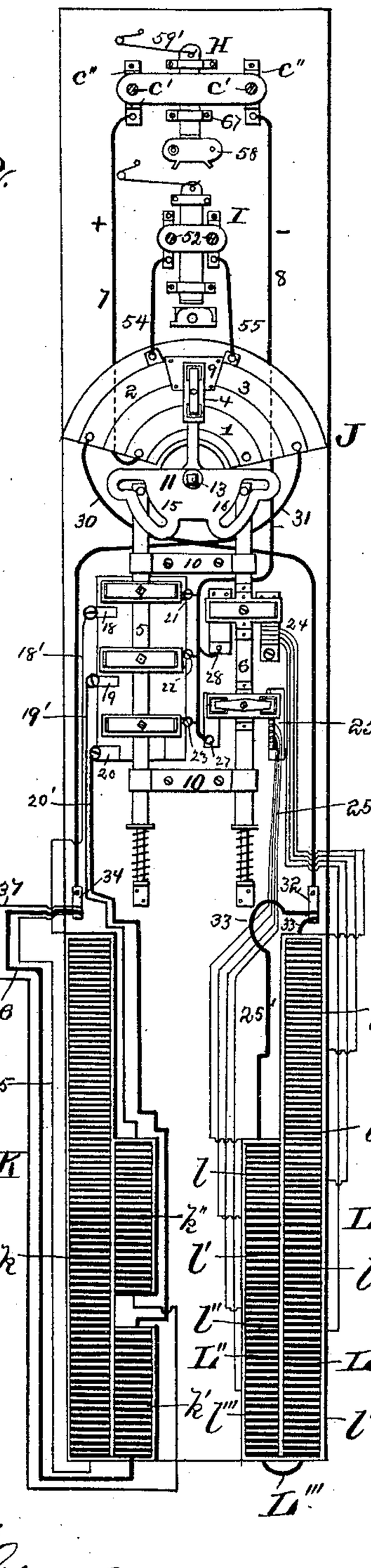
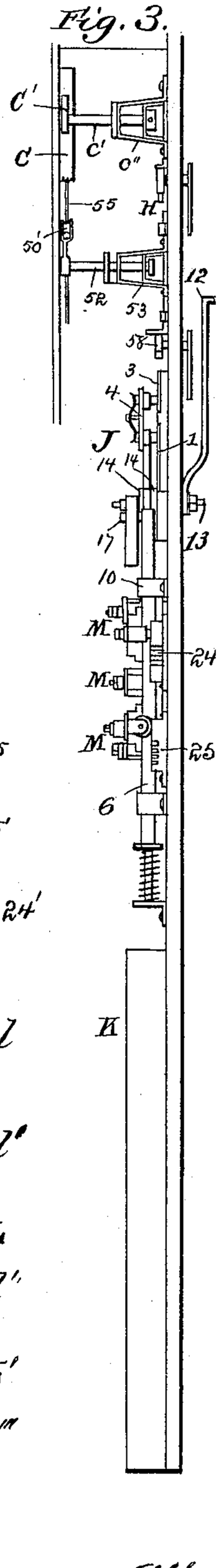


Fig. 3.



Witnesses:
J. B. McGirr.
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(No Model.) 6 Sheets—Sheet 3.

A. NEUBURGER.

ELECTRIC ELEVATOR.

No. 468,253. Patented Feb. 2, 1892.

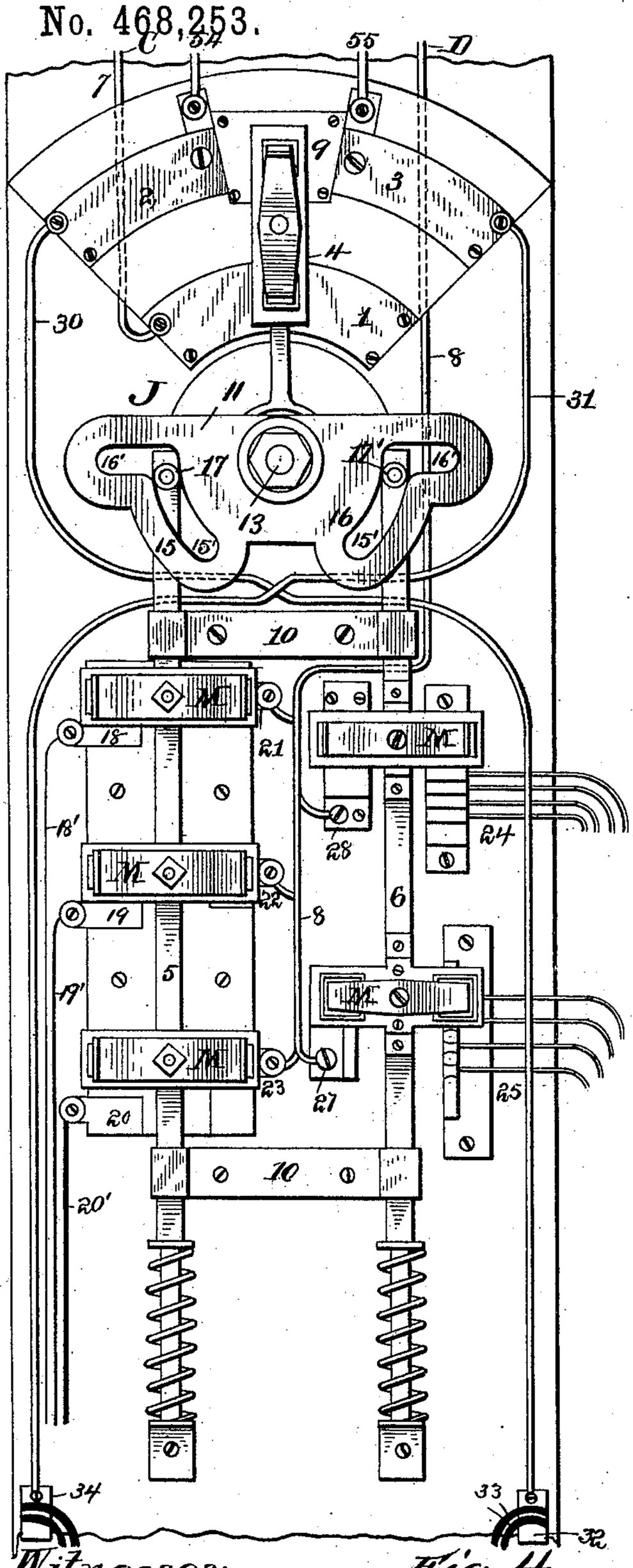


Fig. 4.

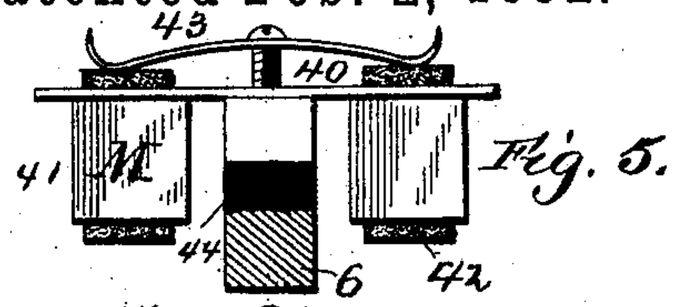


Fig. 5.

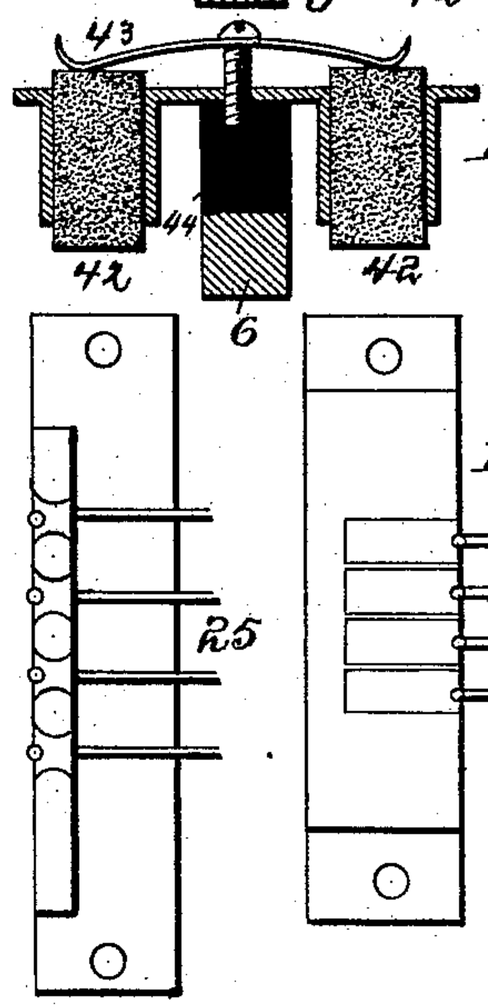


Fig. 6.

Fig. 9.

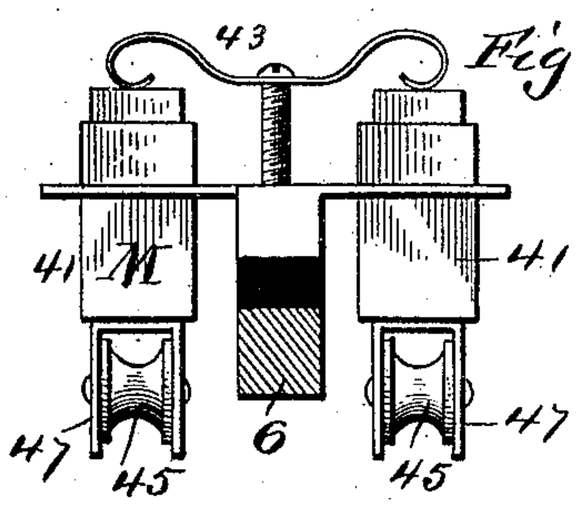
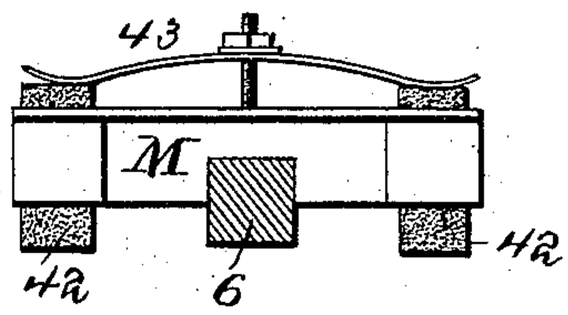


Fig. 7.

Fig. 8.



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(No Model.) 6 Sheets—Sheet 4.

A. NEUBURGER.

ELECTRIC ELEVATOR.

No. 468,253. Patented Feb. 2, 1892.

Fig. 10.

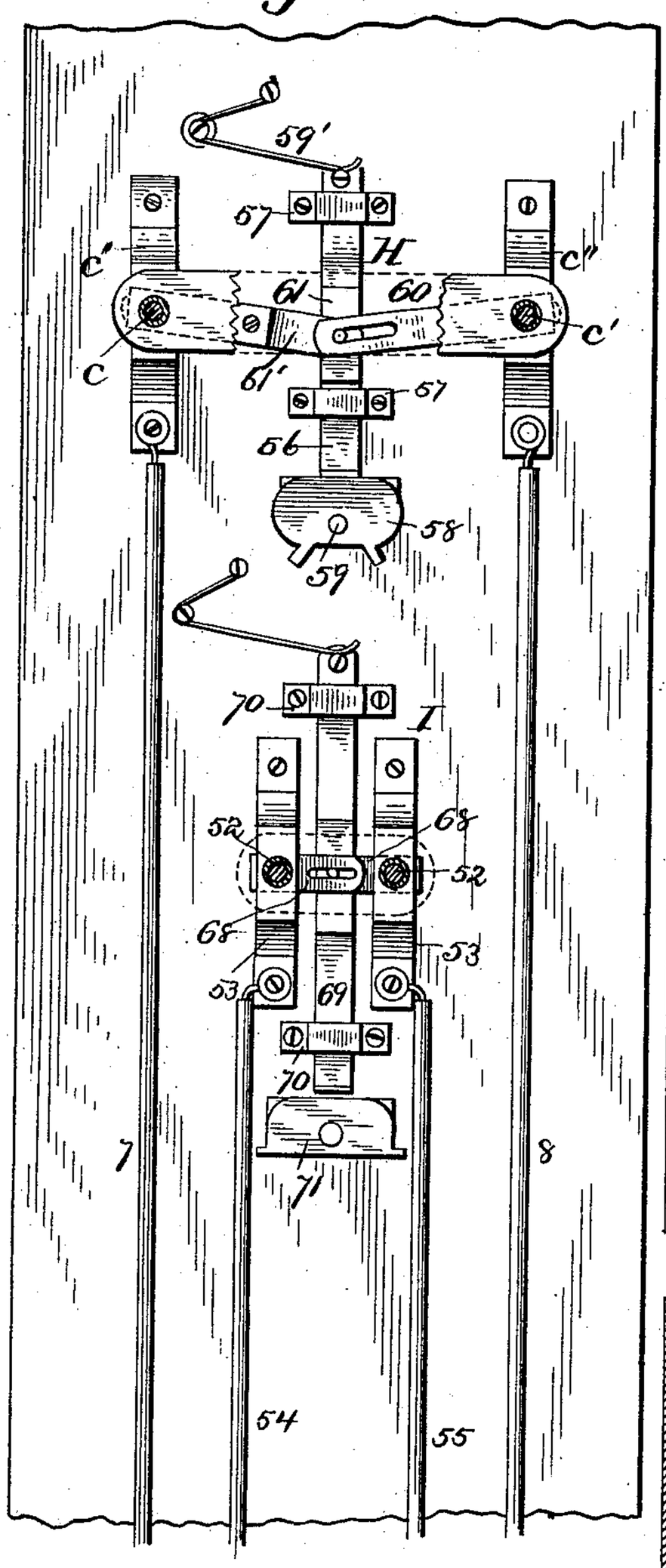
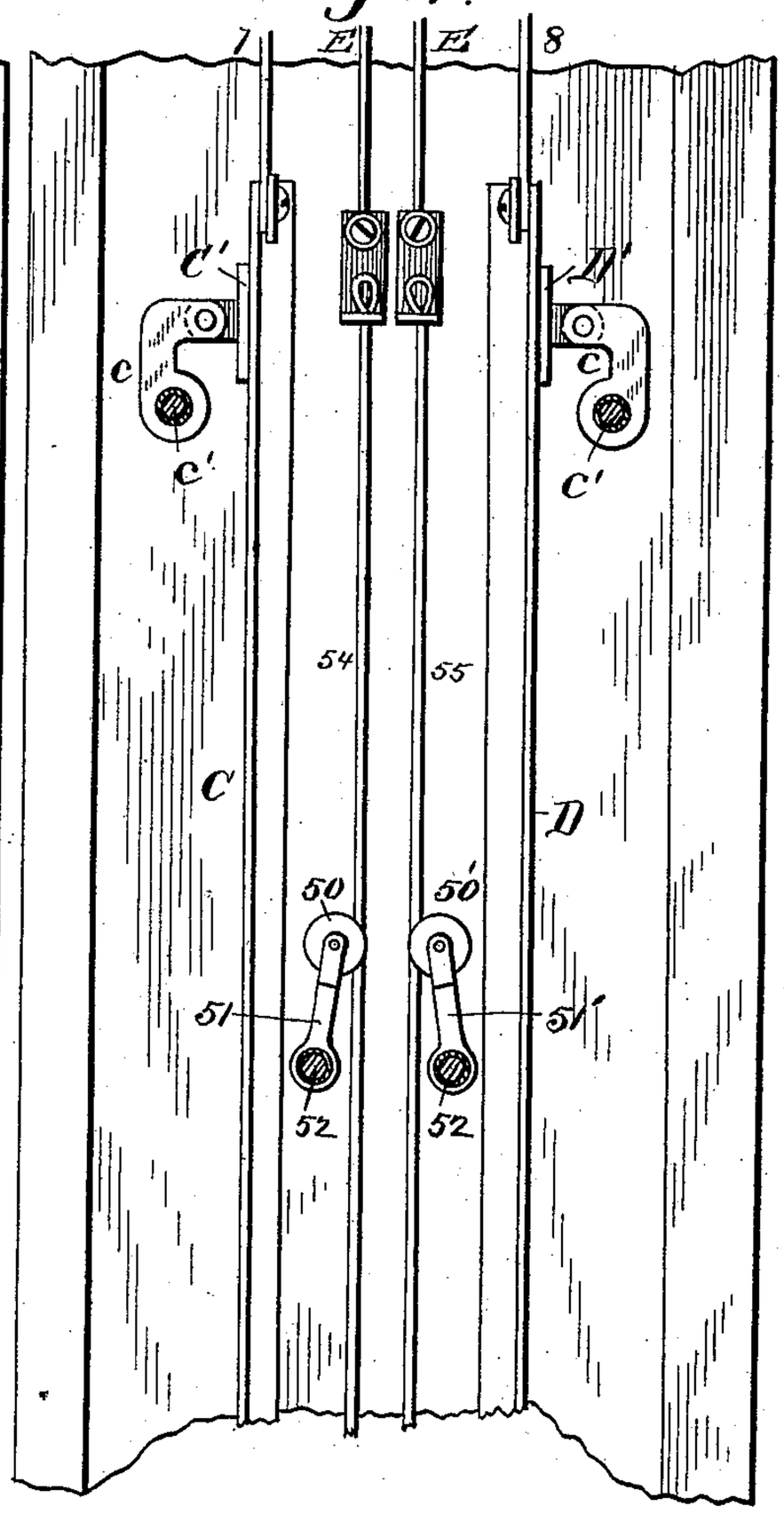


Fig. 11.



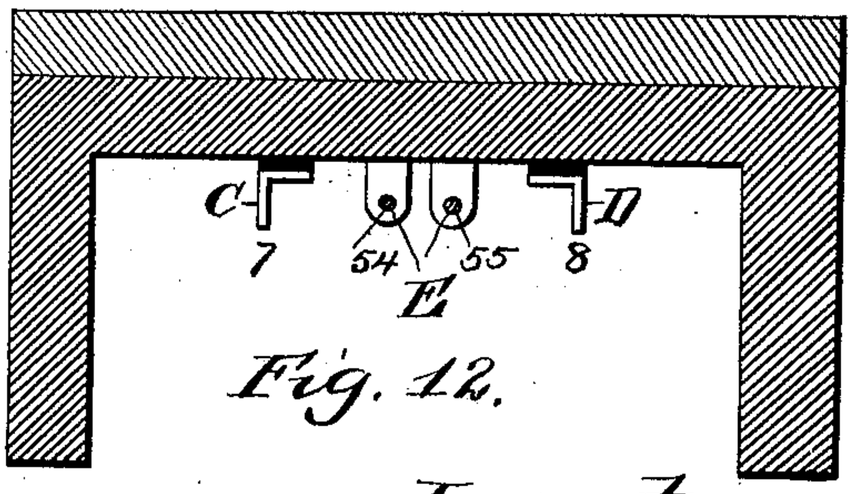


Fig. 12.

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(No Model.) 6 Sheets—Sheet 5.

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ELECTRIC ELEVATOR.

No. 468,253. Patented Feb. 2, 1892.

Fig. 15.

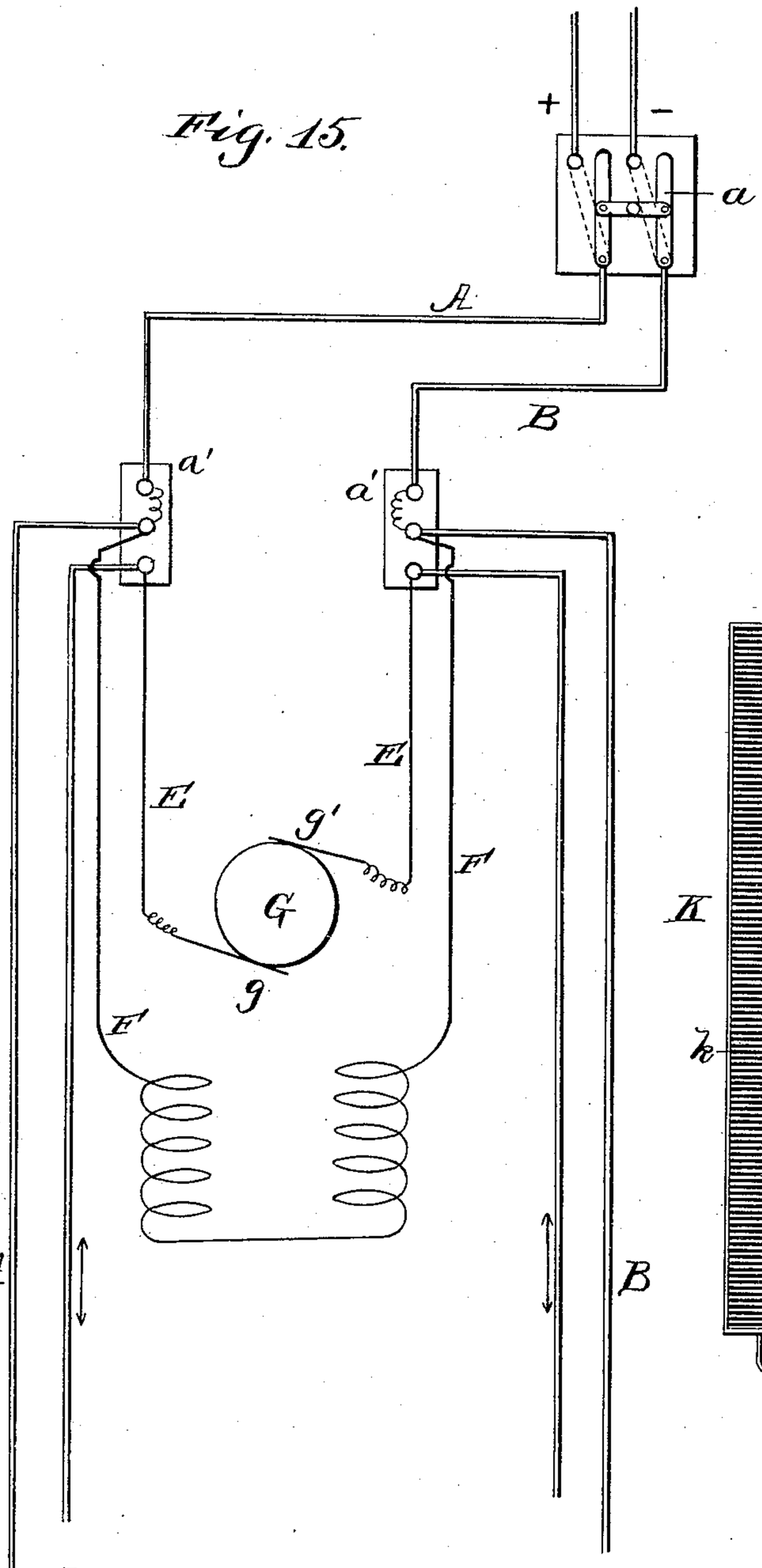


Fig. 13.

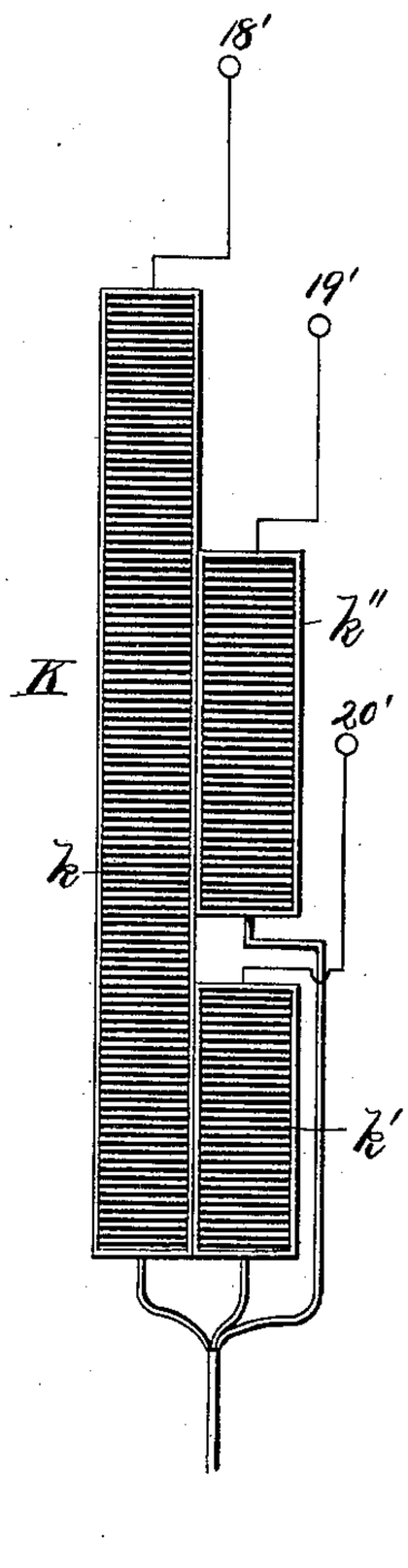
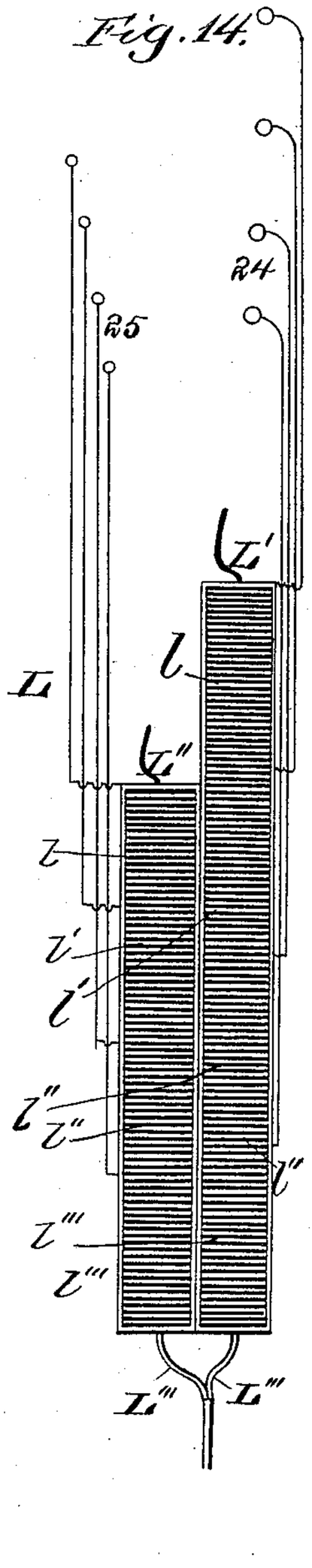


Fig. 14.



Witnesses:
J. B. McGirr.
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(No Model.) 6 Sheets—Sheet 6.

A. NEUBURGER.

ELECTRIC ELEVATOR.

No. 468,253. Patented Feb. 2, 1892.

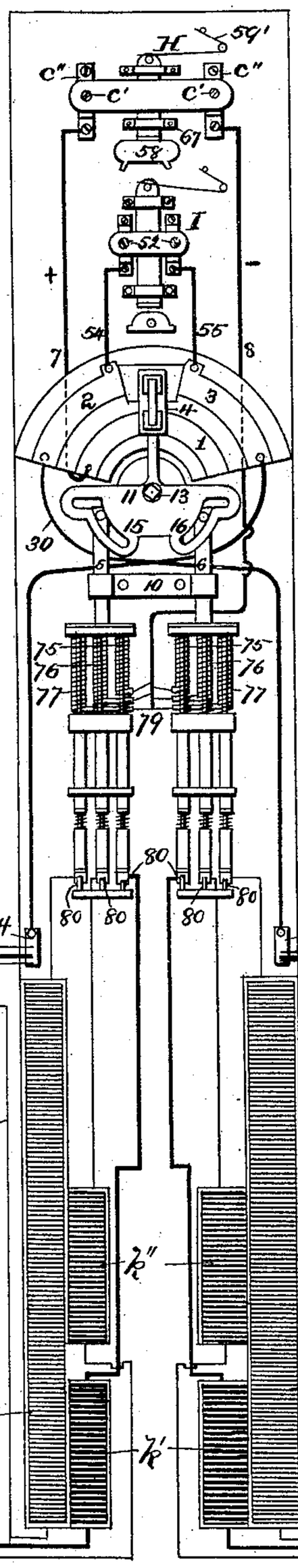

Fig. 16.

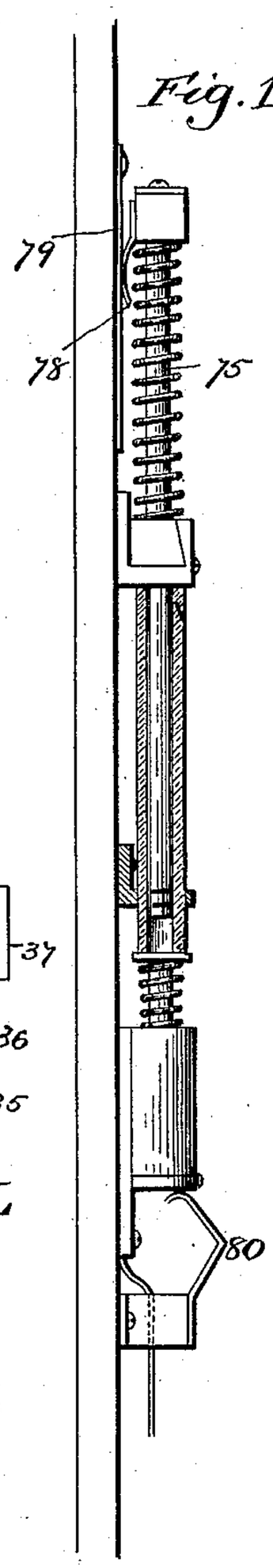

Fig. 17.

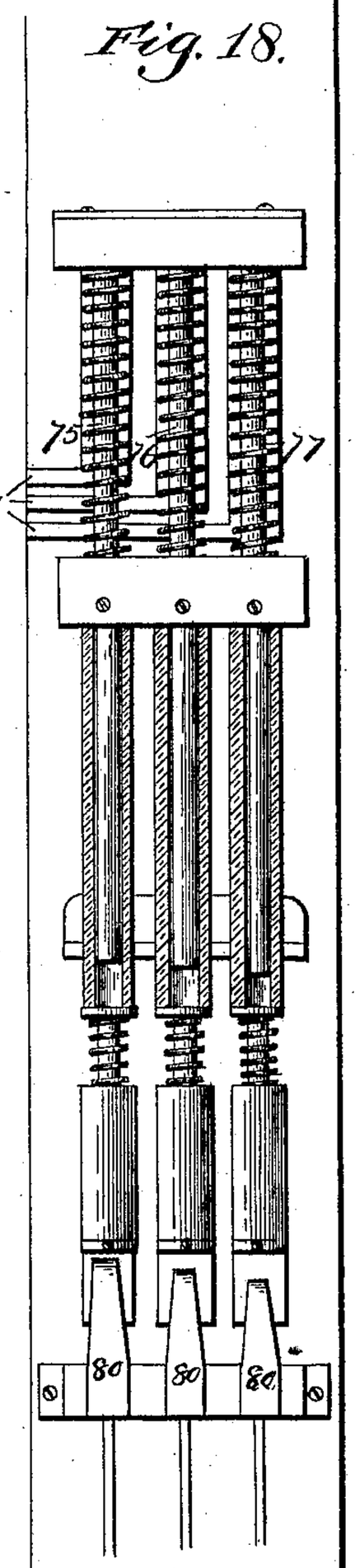

Fig. 18.

Witnesses:
J. B. McGinn.
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Inventor:
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UNITED STATES PATENT OFFICE.

ALBERT NEUBURGER, OF KANSAS CITY, MISSOURI.

ELECTRIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 468,253, dated February 2, 1892.

Application filed July 31, 1891. Serial No. 401,309. (No model.)

To all whom it may concern:

Be it known that I, ALBERT NEUBURGER, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Electric Elevators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to electric elevators wherein the energy of an electric current is utilized to raise or lower and stop or start a passenger-car or weighted platform at the will of the attendant stationed in the car.

The nature of the present invention consists in the combination, with a main-line and a motor circuit, of a switch mechanism carried by the car and arranged to close the two circuits in a manner to admit more or less of the electric current into the motor-circuit, and thereby enable the attendant in the car to control the speed of the car or platform, to reverse the direction of movement of the car or platform, and to start or stop the same. The mechanism is so constructed and arranged that at the starting of the car it can be moved slowly and afterward the speed of the car increased by admitting to the motor-circuit the full strength or approximately the full strength of the current from the main line, and the car can be stopped by gradually slackening its speed until it comes to a full stop by moving the switch mechanism to gradually diminish the strength of the current in the motor-circuit.

The invention further relates to the combination of devices and peculiar construction and arrangement of parts whereby simplicity and durability of construction is attained, efficiency in operation secured, as well as full control of the car by the attendant stationed therein.

In the accompanying drawings hereto annexed I have illustrated the circuits, one form of hoisting mechanism, and the general arrangement of parts, as well as the detailed construction of several forms of cut-outs; but I do not limit myself to the particular hoisting mechanism shown in Fig. 1, as any preferred or known form of hoisting mechanism may be used.

Figure 1 is a diagrammatic view illustrating the several circuits, reversing-switch mechanism, and the hoisting mechanism. Fig. 2 is an elevation, showing the preferred forms of the main and motor circuits, switch mechanism, the rheostats, and the cam-switch or cut-outs for the make-and-break of main and motor circuits. Fig. 3 is an edge view of the mechanism shown by Fig. 2. Fig. 4 is an enlarged front elevation of the switch mechanism shown by Figs. 2 and 3. Figs. 5, 6, 7, and 8 are detail views of the several contact-shoes, one or more of which may be used in the switch mechanism. Fig. 9 is a detail view of the contacts for the contact-shoes. Fig. 10 is an enlarged side elevation of the cam-switch contacts for the make-and-break main and motor circuits. Fig. 11 is an enlarged side elevation of the collecting-brush wheels or shoes for the main circuit and the same for the motor-circuit, capable of making rigid contacts with the vertically-suspended contact-strips. Fig. 12 is a transverse section of Fig. 11. Figs. 13 and 14 are details of rheostats of varying resistances for use in connection with the different kinds of contact-shoes. Fig. 15 is a diagram of the main-line and motor circuits, showing the main-line switch for cutting off the current from the elevator system. Fig. 16 is a view of a modified form of switch mechanism in which I employ a series of spring-backed rods and sliding contacts in lieu of the traveling shoes for closing the branches of the divided circuit. Fig. 17 is a detail view, partly in side elevation and in section, on an enlarged scale, of part of the mechanism shown by Fig. 16; and Fig. 18 is a detail view, in front elevation and partly in section, of the devices shown in Figs. 16 and 17.

Like numerals and letters of reference denote corresponding parts in all the figures of the drawings.

In my improved system for electric elevators I utilize the energy of an electric current generated at a central station for lighting or power purposes, and the positive and negative circuit-wires A B of the main line are led from the street into the basement or other

part of the building where the elevator is erected, a suitable switch *a* being used, as indicated in Fig. 15, for turning the current off from the central station and admitting it to the conductors within the building. These conductors of the main line are ordinary copper conductors with good insulating-covering and are connected to fuse-blocks *a'* in the well-known way, and said conductors are then led to vertically-strung bare-metal contact-strips C D, which are suitably fastened in the hatchway in which the elevator-car is adapted to move, said contact-strips being electrically connected with the main-line conductors and forming a continuation of the main-line wires and a part of the circuit for the current in the main line. These vertical contact-strips C D are suitably protected or insulated within the hatchway, and against these bare-metal contact-strips C D are positively forced or pressed the collecting-brush wheels or shoes C' D' which collect the current supplied to the contact-strips by the main-line conductors and which serve, in connection with the switch mechanism and the rheostats, hereinafter described, to transmit the energy of the current to the motor-armature-circuit conductors E E, which are connected to the commutator-brushes *g g'* of the electric motor G, situated in the building in which the elevator is erected.

F is the hoisting mechanism, which is illustrated conventionally in Fig. 1 and arranged in the usual way to be operated by the motor to raise or lower the car. I employ a motor having shunt-wound field-coils utilizing a current of constant potential, and by connecting the conductors E E of the motor-circuit to the commutator-brushes and employing in the main-line and motor circuit a reversing-switch mechanism, through which the current must pass from the main-line to the motor circuit, I am enabled to send the current in either direction through the armature of the motor, and thus reverse the direction of rotation of the armature to operate the hoisting mechanism for the purpose of raising or lowering the car or platform, and at the same time the speed of the elevator-car can be controlled by the attendant within the same and the car can be stopped and started at any point in the hatchway by simply manipulating the lever of the switch mechanism.

Referring now more particularly to Figs. 2 to 9, inclusive, of the drawings, H designates a mechanically-operative cam-switch or cut-out, through which the current from the main line passes to the reversing-switch mechanism. I is a similar mechanically-operative cam-switch or cut-out provided in the motor-circuit, and J designates the switch mechanism, which consists, essentially, of the single continuous contact-plate 1, the divided contact-plate 2 3, the movable arm 4, the reciprocating parallel bars 5 6, each carrying a series of contact-shoes, means actuated by the movement of the swinging arm 4 to cause the shoes of one bar 5 or 6 to successively make the fixed contacts, the rheostats, and suitable connections between the several parts.

The collecting-brushes C' D' are suitably pivoted to crank-arms *c*, which are fixed to rocking posts *c'*, mounted so as to turn in metallic brackets or standards *c''*, and to the brackets or standards are electrically connected the wires 7 and 8, forming a part of the main line, the wire 7 being the positive conductor to receive through the bare-metal contact-strip C, the shoe C', the post, and the bracket the current from the conductor A, while the wire 8 is the negative conductor and forms a continuation of the wire B and the negative bare-metal strips D as the current passes through the wire 8, the bracket *c''*, to which the wire 8 is fastened, the post, the shoe D', and the bare-metal strip D. The positive wire 7 leads and is electrically connected to the single continuous plate 1, where the wire 7 terminates.

The sections 2 3 of the divided contact-plate are insulated from each other by a suitable insulating material 9, placed between the approximate ends of the sections of said plate, and said divided plate is out of electrical contact with the single continuous plate 1, said single plate and the divided plate being arc-shaped or of segmental form and arranged concentric with each other, so that the movable arm 4 of the switch can make contact with either member 2 or 3 of the divided plate and with the single continuous plate in order to close the circuit through the main-line and the motor circuit when said movable arm is turned to either side of its normal upright position, in which position it bears on the insulation 9 and the single contact-plate 1.

The vertical bars 5 6 are arranged parallel with each other and at a suitable distance apart, and these parts are preferably polygonal in form and fitted so as to slide or move longitudinally in corresponding fixed guides 10 on the car platform. The bars are adapted or arranged to be moved separately and independently of each other. Thus when one bar is shifted or moved the other bar remains at rest, and vice versa, which is accomplished by means of the cam-slotted plate 11, actuated by the shaft or hub of the operating-lever 12, which also moves the swinging arm 4 of the switch simultaneously with the adjustment of one or the other of the vertical bars or carriers.

The operating-lever 12 is arranged within the car or on the platform in convenient reach of the attendant, and said lever is rigid with a transverse rock-shaft 13, which is suitably journaled or mounted on the car, said shaft preferably extending through the car. On this shaft or hub of the operating-lever the movable switch-arm 4 is rigidly secured; but it is insulated from the shaft or hub to avoid short-circuiting of the current; and on opposite sides of the movable switch-arm I

place insulating-washers 14, which insulate said arm 4 from the adjacent metallic parts of the switch mechanism. This rocking shaft or hub also carries the cam-slotted plate 11, which is rigidly fastened or secured to said hub or shaft so as to turn the switch, and which plate is insulated from the movable arm by one of the washers 14.

In plate 11 I provide two slots 15 16, one on one side of the pivot of the plate and the other on the opposite side of said pivot, and each slot has a segmental end 15′, which is concentric with the pivot or shaft 12, and an angular end 16′, which is radial to the pivot or shaft, said slots 15 16 in the plate being reversely placed in relation to each other.

In the slot 15 works a friction-roller 17, which is loosely journaled on a fixed pin on the upper end of the reciprocating bar 5, and a similar friction-roller 17′ on the upper end of the bar 6 works in the slot 16 of the cam-slotted plate 11. As the lever 12 is turned to cause the movable arm to make the section 2 of the divided contact-plate the plate 11 is turned with the shaft, so that the friction-roller 17′ rides idly in the concentric part 15′ of the slot 16 to allow the bar 6 to remain at rest, while at the same movement of the plate 11 the friction-roller 17 rides in the radial end 16′ of the slot 15 and causes the bar or carrier 5 to become depressed, whereby the one bar or carrier is moved downward and the other bar remains at rest. When the lever is turned back to its initial position to cause the swinging arm to bear on the insulation 9 between the divided sections of the upper contact-plate, the bar 5 is elevated by the roller 17 riding in the radial part of the slot 15 in the plate, while the bar 6 remains at rest, as its roller simply rides in the concentric part of the slot 16. When, however, the lever is turned to the reverse position to adjust the movable arm 4 to make the section 3 of the upper contact-plate, the roller 17′ rides in the radial end 16′ of the cam-slot 16, so as to depress the bar 6, while the bar 5 remains stationary, because its roller 17 rides in the concentric end of the slot 15, and when the lever is returned to its initial normal position to bring the movable arm 4 onto the insulation 9 the bar 6 is raised by the roller 17′ riding in the cam-slot and the bar 5 still remains at rest. It is thus seen that the bars or carriers 5 6 are operated independently of each other and that one is at rest while the other is in operation.

Along each side of each vertically-movable bar or carrier I provide a series of fixed contact-plates, the positive contacts 18, 19, and 20 for the shoes of the bar 5 being on the left of said bar, while the negative contacts 21 22 23 are on the right of the bar 5, and the positive contacts 24 for the shoes of the bar or carrier 6 are on the right thereof, while the negative contacts 27 28 for the shoes of the carrier or bar 6 are on the left side thereof. (See Fig. 4.) In connection with these series of contacts I employ two rheostats K L, Figs. 2, 3, 14, and 15. The rheostat K, Fig. 13, is designed for use in connection with the contacts and shoes of the carrier 5, while the rheostat L is designed for use in connection with the other bar 6. Each rheostat is divided or made up of a series of sections of different resistances. Thus the rheostat K has a section or part *k* of high resistance, another section *k′* of low resistance, and a third section *k″* of a resistance between that of the high and low resistance. The rheostat L is divided into sections L′ L″, each of which has parts *l l′ l″ l‴* of different resistances. From the first positive contact 18 of the lower bar or carrier 5 a wire 18′ leads to the section *k* of high resistance of the rheostat K; from the second contact 19 of said carrier 5 a wire 19′ leads to the intermediate-resistance section *k″* of the rheostat K, and from the lower contact 20 of said carrier 5 a wire 20′ leads to the low-resistance section *k′* of the rheostat.

The contacts 24 25 for the bar or carrier 6 are differently constructed, arranged, and connected to the rheostat L from the contacts for the shoes of the bar 5. Thus each contact is divided or split up into a series of pieces, each suitably insulated from the other, the parts of the upper or first contact 24 being connected by the wires 24′ with the sections *l l′ l″ l‴* of the member L′ of the rheostat L, while the divided parts of the lower contact 25 are connected by the wires 25′ with the sections *l l′ l″ l‴* of the member L″ of the rheostat L, said members L′ L″, forming the rheostat L, being connected at the lower part by the wires L‴. The negative wire 8 of the main line is led beneath the contact-plates 1, 2, and 3 in rear of the bar 6, and thence between the two bars 5 6 and the negative contacts 21, 22, and 23 of the carrier 5 and the negative contacts 27 28 of the carrier 6, said negative contacts being suitably connected to the negative wire 8, as shown more clearly in Fig. 4.

To the section 2 of the divided contact-plate is connected a positive conductor 30, and a similar conductor 31 is connected to the section 3 of said divided contact-plate, said positive conductors 30 31 being in common or electrical connection and preferably crossing each other below the contact-plates. The conductor 30 is connected at its lower end to a plate 32, from which lead wires 33 to the members L′ L″ of the rheostat L, which member L′ is connected at the bottom by the wires L‴ to the bottom of the other member L″ of said rheostat. The positive conductor 31 is connected at its lower end to a plate 34, and from this plate 34 lead three wires 35, 36, and 37, the first-named wire 35 leading from the plate 34 to the bottom of the high-resistance section *k* of the rheostat K, the second wire leading from said plate 34 to the low-resistance section *k′* of the rheostat K, and

the wire 37 leading from the plate to the intermediate-resistance section *k''* of said rheostat.

Although the positive contacts 24 25 of the carrier 6 are different in construction as compared with the contacts 18, 19, and 20 of the other carrier 5 and the connection of said positive contacts 24 25 with the rheostat L is different from the connection of the positive contacts 18, 19, and 20 with the rheostat K, yet I do not wish it to be understood that I necessarily employ such particular construction and connection of the contacts and rheostats. In fact, I prefer to make the contacts for each bar or carrier similar in construction and connect them to the rheostats in a similar manner—that is to say, I prefer in practice to make the contacts for the bar 5 similar to the contacts for the bar 6 or to make the contacts for the bar 6 similar to the contacts for the bar 5, the different contacts being herein shown and described to make it clear that I do not restrict myself to the precise construction disclosed as an embodiment of my invention.

Each bar or carrier has a series of shoes for making the negative and positive contacts provided therefor, and in the drawings I have illustrated several different forms of shoes, either of which may be used at pleasure on the bars or carriers. One embodiment or form of the shoe M is shown in the detail views, Figs. 5 and 6, which shoe consists of a bridge-plate 40, having sockets 41, carbon blocks or contacts 42, fitted in said sockets and projecting beyond both ends of the same, and a spring 43, which is rigidly secured to the bridge-plate, the ends of said spring bearing on the carbon blocks and being in electrical connection therewith. The shoe M is placed on the bar or carrier transversely to the length thereof, so that its carbon blocks can make the pair of positive and negative contacts, and between the bridge-plate 40 of the shoe and metallic bar or carrier is placed a suitable insulation 44, which insulates the sockets of said bridge-plate, as well as the plate itself, from contact with the bar or carrier. The shoe can be suitably fastened to the bar or carrier to move therewith—as, for instance, the insulating-block can be cemented on the bar or carrier and the bridge-plate fastened to the block by the screw that holds the spring in place, said screw being out of electrical contact with the bar or carrier. This form of shoe with the long blocks of carbon is especially adapted for use in connection with the flat contact-plates shown in the left of Fig. 4; but I may use the raised or elevated contact-blocks 24, as in Fig. 3, in which case I use the shorter carbon blocks shown in Fig. 8 and change the proportions of the bridge-plate and sockets accordingly. Again, for the form of divided contacts 25 shown in Figs. 2, 3, and 4 I may use the form of shoes shown in Fig. 7, each shoe having two rollers 45, loosely journaled in fixed pins in the brackets 47, fitted in the sockets of the bridge-plates and held in position by a spring fastened to the insulating-block between said bridge-plate and the carrier or bar.

It is to be understood that the number of shoes on the bar or carrier is to correspond to the number of pairs of positive and negative contacts. Thus in the left of Fig. 4 I have shown three pairs of contacts and three shoes, while in the right of Fig. 4 but two shoes are shown for the two pairs of contacts, although the positive contacts are divided into the parts or sections to lead the sections of the rheostat L. It is also to be understood that the shoes on each bar are duplicates of the other—that is to say, if the contacts 24 25 and the connection thereof with the rheostat is used for both bars and carriers 5 6 the necessary number of shoes of the form shown in either Figs. 7 or 8 is applied to both bars or carriers, while if the contacts 18 19 20 and 21 22 23 are used for both bars or carriers 5 6 the number of shoes M necessary for the contacts are applied to the bars or carriers. The number of shoes, however, is not material; but a sufficient number should be used on the bars or carriers and they should be so arranged as to successively (not simultaneously) make the several contacts, and thus permit the current from the positive conductors 30 or 31 to successively flow through the sections of the proper rheostat, and thereby gradually admit the current from the motor-armature circuit through the rheostat in said circuit, which is thus explained: The circuit across from the negative to the positive shoe-contacts is normally open, as the bars or carriers when raised to their initial positions by the cam-slotted plate raise the shoes so that they do not touch the plates sufficiently to close the circuit, and the main-line and motor circuits are broken or opened at the movable switch-arm, which rests or bears at one end on the insulating-block 9. Now when the lever is turned slowly the shaft or hub thereof operates the movable switch-arm and the cam-slotted plate at one time, as follows: If the switch-arm is turned to make the section 2 of the divided contact-plate, the circuit in the main line and the motor-circuit is closed and the bar 6 and its shoes remain at rest, while the bar 5 and its shoes are lowered sufficiently for the first shoe to make the contacts 18 21, thus completing the circuit through the rheostat K from the positive conductor 7 to the negative conductor 8, as the circuit from the armature-wires of the motor-circuit then passes from the plate 1 across the switch-arm 4 to the section 2 of the divided plate, then through the wire 54, Fig. 2, leading from the plate 2 to the conductor E, and thus through the armature of the motor-circuit back by the other conductor E of the motor-circuit to the wire 55, Fig. 2, thence to the section 3 of the divided contact-plate, then through the wire 31, the wire 35, the high-resistance section *k* of

the rheostat K, the wire 18′, the first contact-plate 18, the first shoe M across to the negative contact 21, and then through the negative conductor 8 out of the main line. As the operating-lever is further depressed and the cam-slotted plate turned therewith the carrier or bar 5 continues its descent and breaks the contact at 18 21 by the first shoe M clearing the same; but before this contact is wholly broken the second shoe makes the contacts 19 22, and the current then passes through the medium resistance *k″* of the rheostat and across the second shoe to the negative conductor, thereby admitting a current of higher strength to pass through the motor-circuit, and as the lever is further turned the second shoe breaks the contacts 19 21, while the third shoe makes the contacts 20 23 and the current passes through the low resistance of the rheostat, and thus the strength of current is still further increased in the motor-circuit. Thus the strength of the current is gradually increased until the maximum effect is produced in the motor-circuit, thereby enabling the attendant in the car to start it slowly and to gradually increase the speed of the motor-armature and the speed of the car and it is obvious that the car can be gradually slowed down and stopped easily by simply reversing the lever to successively deliver the current through the different resistances of the rheostat and the shoes of the series on the movable carrier or bar.

When the switch mechanism is operated to cause its switch-arm to make the section 2 of the divided contact, the current is sent through the armature of the motor in one direction to cause the motor and hoisting mechanism to move the car in one direction; but to reverse the motion of the car or platform I shift the switch to send a current in the reverse direction to rotate the armature of the motor in the reverse direction and the hoisting mechanism. This is effected by moving the lever to cause the switch-arm to make the section 3 of the divided contact-plate, thus lowering the carrier or bar 6 and its shoes, while the carrier 5 and its shoes are at rest. As the carrier 6 is lowered its shoes successively make contact with the divisions of the positive contact-plates 24 25 and with the negative contact-plates 28 27 to successively admit the current through the high, intermediate, and low resistances of the rheostat L, and thereby gradually increase the strength of the current in the motor-circuit until the motor is driven at the desired rate of speed, and by reversing the operating-lever the strength of the current can be gradually diminished until it is cut off and the car stopped. The wires of the motor-circuit E E are vertically suspended in the hatchway and are parallel to the bare-metal contact-strips C D and similarly exposed, so that good electrical contact can be made therewith by the rollers 50 50′, which are loosely journaled on pins fixed in the bifurcated ends of the movable arms 51 51′, which arms are rigidly secured to the rocking posts 52, suitably journaled in fixed brackets 53. From these brackets lead wires 54 55, forming a part of the motor-circuit, being the positive and negative wires which lead from the sections 2 3 of the divided contact-plate. The wires F of the motor-circuit are connected to the field-coils of the motor G and to the main-line conductors A B at the fuse-blocks in the manner indicated in Fig. 15; but the motor-circuit wires E E are not directly connected to the main-line conductors, as they lead to the conductors 54 55, which terminate at the sections 2 3 of the divided contact-plate, so that the motor-circuit is normally opened at the reversing-switch mechanism J. The motor-circuit and the main line are broken or opened when the switch-arm is in its normal vertical position to contact with the insulating-block 9; but when the switch-arm 4 is shifted by its lever to make contact with the section 2 of the divided contact-plate the motor-circuit is closed and the current from the main-line conductors A 7 passes through the plate 1, across the movable switch-arm 4, through the section 2 of the divided plate, through the moving contact 50 and the wire 54 to the conductor E of the armature-circuit, and thus through the armature of the motor back through the other conductor E of the armature-circuit to the other moving contact 50′ to the wire 55, thence to the plate-section 3, the conductor 31, the sections of the rheostat K, thence through the wires 18′, 19′, or 20′ to the contacts 18, 19, or 20, across the proper shoes M of the carrier 5 to the negative contacts, and thence out through the negative wire 8 to the negative conductor B of the main line, the passage of the current in the manner described operating to rotate the armature in one direction By shifting or reversing the switch mechanism to cause its movable arm 4 to make the section 3 of the divided contact-plate, the direction of rotation of the armature can be reversed, as the current of electric energy from the main-line conductors A 7 will then pass from the plate 1 across the movable switch-arm 4 to the section 3 of the plate, then through the moving contact 50′ and the conductor 55 to one wire E of the armature-circuit, thus rotating the armature of the motor, and then back through the other conductor E of the armature-circuit to the moving contact 50 and the wire 54, then through the section 2 of the divided plate, the conductor 30, the proper sections of the rheostat L, the shoes M of the carrier 6, thence to the negative conductor 8 and out to the main-line conductor B, as before. It will be seen that when the main-line and motor-armature circuits are closed the proper rheostat K or L is included in the main line, and as the switch mechanism is slowly manipulated or adjusted by the attendant the current passes successively through the different branches of the divided circuit and the dif-

ferent resistances of the rheostat included in such branches, which branches of one circuit, embracing the sections of the rheostat L, are formed by the wires 24′ and 25′, the conductors 30 and the conductor 8, and the several contacts and shoes, while the branches of the other divided circuit, embracing the sections of the rheostats K, are formed by the wires 18′ 19′ 20′, the conductor 31, the negative conductor 8, the respective contacts for the branches of the divided circuit and to which said wires are connected, and the shoes for making said contacts. The wire 30 is connected by branch wires to the several sections of the rheostat L, and the members L′ L″ of said rheostat are suitably connected in the manner indicated in Figs. 2 and 14, said rheostat L being in the circuit formed by the wire 30, and the branches of the divided circuits formed by the wires 24′ 25′ to permit, in connection with the switch mechanism, the current to be sent in one direction, and the wire 31 is similarly connected by branch wires to the several sections of the rheostat K to bring the latter into the main line, which is completed through the wire 31, the rheostat, and the several branches of the divided circuit formed by the wires 18′ 19′ 20′, their contacts, and the shoes, thus providing in connection with the switch mechanism, for sending the current in the reverse direction.

The mechanical cam-switch or cut-out H for controlling the current in the main line consists of an endwise-movable bar or slide 56, which is guided in suitable ways 57, a cam 58, carried by a shaft 59, having an operating-handle, and connections between the slide and the rocking posts, which carry the collecting-brush wheels or shoes C′ D′. These rocking posts *c c′* have the links 60 rigidly secured to them, and the inner ends of the links are slotted and connected by a pin to the slide 56, the links and the posts which carry the brushes being insulated from the slide 56 by an insulating-block 61, suitably fastened on the slide and interposed between said slide and the inner ends of the links, and said links 60 being insulated from each other by an insulating piece or block 61′, which is rigidly fastened to one of the links, (to the left-hand link, as shown in Fig. 10,) said insulating-piece 61′ forming a part of the left-hand link and lapping the slide and the right-hand link as shown, whereby the current is prevented from becoming short-circuited across the links 60 60 and the slide 56. By turning the handle to throw the cam so that it raises the slide the links turn the posts, which force the collecting-brushes out of contact with the bare-metal contact-strips C D, thus breaking the main-line circuit should the current be passing through the same; but the slide is normally lowered by the action of a spring 59′, and the collecting-brush wheels or shoes have good electrical engagement with the fixed bare-metal contact-strips vertically.

The mechanical cam-switch cut-out I, suspended in the hatchway for the motor-circuit, is similar to the cut-out for the main line; but it is operated independently of said cut-out H. This cut-out I consists of the links 68, rigidly secured to the rocking posts 52, the insulated slide 69, guided in two ways 70 and having the links connected thereto, an operating-cam 71, provided with a handle, and a spring, all combined so that by the simple movement of the cam the arms 51 51′ will be adjusted out of engagement with the motor-circuit wires E F by the movement of the slide, the links, and the rocking posts.

The operation of my invention will be understood by those skilled in the art from the foregoing description, but may be briefly summarized as follows: To start the car or platform, it is only necessary for the attendant in the car to turn the operating-lever slowly, thereby turning the swinging switch-arm to make one of the sections of the divided contact, one end of said switch-arm thus bearing on the plate 1 and a section of the divided plate, thereby completing the circuit in the main line and closing the motor-circuit, and at the same time the cam-slotted plate moves one of the carriers or bars to cause the shoes thereof to successively make contact with the pairs of positive and negative contacts, thus shunting the current from the main line through the different resistances of the proper rheostat, the other carrier-bar and rheostat remaining inert. The armature of the motor will thus be rotated in one direction to raise or lower the car, the speed of which is under the immediate control of the attendant, and by turning the switch mechanism back to its initial position the speed of the motor will be decreased gradually and the car stopped easily without the sudden jerking accompanying the use of ordinary passenger-elevator cars. By reversing the switch to make the other section of the divided contact-plate and bringing the other carrier, its shoes, and rheostat into service a reverse current of electric energy will be sent through the armature of the motor to rotate said armature in the reverse direction, and thus change the direction of travel of the car or platform, the speed of the motor and the car being also under the control of the attendant in this case, the same as before. The attendant can cut the switch mechanism out of the main-line or the motor circuit at will, which is desirable in case the machine becomes disarranged, and it will thus be seen that the whole mechanism is under the immediate and direct control of the attendant in the car.

In Figs. 16, 17, and 18 of the drawings I have illustrated a further modification of the reversing-switch mechanism which may be used in lieu of the reciprocating carrier, shoes, and contact-plates shown in Figs. 2, 3, and 4. In this form of switch mechanism I employ a series of spring-backed rods 75 76 77, operating in suitable guides and of different lengths, a series of sliding contact-plates 78,

movable with said rods, a series of fixed contact-plates 79, on which the movable contacts bear or press, and a series of yielding or spring plates 80, arranged at one end of the reciprocating rods in the path of the same and adapted to come into electrical connection therewith. There are two sets of these rods and contacts provided, one for each end of the cam-slotted plate, similar to the reciprocating carriers and shoes, and the fixed contact-plates and the springs of each set are connected to the conductor 8 and in circuit with the different resistances of the respective rheostats in a similar manner to the carriers and their contacts, as indicated in Fig. 16 of the drawings, in which K K are the rheostats, having their sections of high, low, and intermediate resistance *k*, *k'*, and *k''* connected by the wires 35, 36, and 37 to the spring-contacts 80 80 80. As the cam-slotted plate is operated with the reversing-switch arm, one set of rods remains at rest, while the other set of rods are moved all together, the longest rod first coming in contact with its respective spring-plate, then the next rod, and so on with the last rod, thereby completing the circuit through the fixed and sliding plates, the rods, and the spring-plates and operating to shunt the current through the different resistances of the rheostat, from whence the current passes to the motor to rotate the armature in one direction. When the switch is reversed, the first set of rods remain at rest, while the other set of rods are operated in the manner described to send the current successively through the armature of motor and the other rheostat, and thereby operate the same to reverse the car.

It should have been stated that the switch-arm 4 is provided with two sockets, in which are fitted the carbon blocks, held in place by a spring, one of said blocks being normally in contact with the plate 1, while the other block at the free end of said movable arm is adapted to make the insulating-block 9 or either section 2 or 3 of the divided plate. This movable arm of the reversing-switch mechanism is constructed the same as the shoe M. (Illustrated by Figs. 5 and 6.)

I am aware that changes in the construction and arrangement of devices here shown and described as an embodiment of my invention can be made without departing from the spirit or sacrificing the advantages of my invention, and I therefore reserve the right to make such alterations as fall within the scope of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric elevator, the combination, with a main line embracing the bare-metal conductors in a hoistway, a car, and suitable hoisting mechanism, of a motor-circuit, traveling contacts on the car, which normally bear on the bare-metal conductors, and a reversing-switch mechanism arranged to open and close the main line and motor-circuit and embracing a series of movable contacts arranged to successively close different branches of a divided circuit, in which are included different resistances of a rheostat, substantially as described.

2. In an electric elevator, the combination, with a main line embracing bare-metal conductors in a hoistway, a car, and suitable hoisting mechanism, of a motor-circuit having its conductors connected to the commutator-brushes of a motor therein, and a reversing-switch mechanism having the main-line and motor-circuit conductors connected to its fixed contacts 2 3 and embracing a movable switch-arm, and a series of independent branch circuits which are adapted to be successively closed by movable contacts which operate to vary the strength of the current in the motor-circuit by including different resistances in the branches of the divided circuit, substantially as described.

3. In an electric elevator, the combination, with a main line embracing the conductors or strips in a hoistway, a car, and suitable hoisting mechanism, of a motor-circuit, a reversing-switch mechanism on the car, arranged to open and close the main line and motor-circuit, and an independent mechanical cam-switch or cut-out having traveling contacts arranged to normally contact with the conductors of the main line and adapted to be operated from the car to cut out the reversing-switch mechanism from the main line, substantially as described.

4. In an electric elevator, the combination, with a main line embracing the bare-metal conductors, a car, and suitable hoisting mechanism, of the motor-circuit embracing the conductors in a hoistway, a switch mechanism arranged to deliver the current from the main-line conductors to the motor-circuit, and an independent mechanical cam-switch included in the motor-circuit and having traveling contacts which normally bear on the vertical conductors of the motor-circuit, substantially as described.

5. In an electric elevator, the combination, with a main line, a car, suitable hoisting mechanism, and a motor-circuit, of a rheostat, a series of positive contacts connected by a divided circuit with the rheostat, and a switch mechanism including a series of movable contacts adapted to successively send the current through different sections of high and low resistance of the rheostat, substantially as described.

6. In an electric elevator, the combination, with a main line, a car, and suitable hoisting mechanism, and a motor-circuit, of a rheostat, a divided circuit connected with the sections of high and low resistance of the rheostat, and a switch mechanism operating to successively close the branches of the divided circuit and to admit the current through the different resistances of the rheostat, substantially as described.

7. In an electric elevator, the combination,

with a main line embracing the bare-metal conductors, a car, suitable hoisting mechanism, and the motor-circuit having conductors connected to the commutator-brushes of the motor-armature, of the continuous and divided contact-plates to which the positive conductors of the main line and motor-circuit are connected, a divided circuit embracing the rheostat, and a switch mechanism including a movable contact-arm for the contact-plates, and traveling contacts arranged to successively close the branches of the divided circuit, substantially as described.

8. In an electric elevator, the combination, with a main line, a car, suitable hoisting mechanism, and a motor-circuit, of the divided circuit having a rheostat, with its sections of high and low resistance included in separate branches of said divided circuit, and a switch mechanism operating to close the main line and motor-circuit and to successively close the branches of the divided circuit, while the main line and the motor-circuit are closed, thereby shunting the current successively through the branches of the divided circuit and the sections of high and low resistance of the rheostat, substantially as described.

9. In an electric elevator, the combination, with a car, suitable hoisting mechanism, a main line including the vertically-strung bare-metal conductors, the traveling brushes, the contact-plate 1, and the divided plate having its sections connected with said brushes, of the divided circuit embracing a rheostat, with its sections of high and low resistance included in separate branches of the divided circuit, and a switch mechanism having a moving arm for the contact-plates, and a series of movable contacts arranged to successively close the branches of the divided circuit, substantially as described.

10. In an electric elevator, the combination, with a main line, a car, suitable hoisting mechanism, and a motor-circuit, of the divided circuit having a positive and negative contact in each branch thereof and including a rheostat, with its sections of high and low resistance embraced in separate branches of said divided circuit, and a switch mechanism provided with a movable arm for closing the main line and motor-circuit, and a series of movable contacts which make contact with the positive and negative contacts of the branches of the divided circuit, and thereby successively close the branches of said divided circuit, substantially as described.

11. In an electric elevator, the combination, with a main line, a car, suitable hoisting mechanism, and a motor-circuit, of the divided circuit having each of its branches provided with the two contacts and one of the resistances of a rheostat included therein, and a switch mechanism provided with an arm which closes the main line and motor-circuit, and with a vertically-movable carrier which sustains a series of traveling shoes adapted to successively close the branches of the divided circuit through the contacts thereof, substantially as described.

12. In an electric elevator, the combination, with a main line, a car, suitable hoisting mechanism, and a motor-circuit, of the independent divided circuits, each having its branches embracing the sections of high and low resistance of the rheostat, and a switch mechanism embracing two sets of movable contacts, one set for each divided circuit, said duplicate sets of contacts being connected to a common operating device, and one set of each contacts remaining inactive while the other set of contacts is moved by the operating device to close the branches of the divided circuit, and vice versa, substantially, as described.

13. In an electric elevator, the combination, with a main line, a car, suitable hoisting mechanism, and a motor-circuit, of two independent divided circuits, each embracing a rheostat, a switch-arm adapted to close the main line and motor-circuit and having a cam-slotted plate, the movable carriers connected to said cam-slotted plate, and the traveling contacts movable with said carriers and operating independently of each other to close the circuits, substantially as described.

14. In an electric elevator, the combination, with a main line, a car, suitable hoisting mechanism, and a motor-circuit, of the independent branch circuits, each having a rheostat, in which the sections of high and low resistance thereof are embraced in separate branches of the divided circuit, the single and divided contact-plates included in the main line and the motor-circuit, a switch for said contact-plates, a cam-slotted plate movable with said switch, the independent carriers for the divided circuits and connected to the cam-slotted plate, and the traveling shoes movable with said carriers, the set of shoes and one carrier being operated by the cam-slotted plate to successively close the branches of one divided circuit, while the other carrier and set of shoes remain at rest, substantially as described.

15. The combination, with a main line, a car, suitable hoisting mechanism, and a motor-circuit, of the divided circuits embracing the rheostats, the switch, the cam-slotted plate, the carriers actuated independently by said plate, and the series of traveling shoes carried by said carriers and each having the contact-surfaces held by springs into engagement with the contacts of the divided circuit, substantially as described.

16. In an electric elevator, the combination, with a main line, a car, suitable hoisting mechanism having bare-metal conductors rigidly suspended in the hoistway, the rocking posts, each carrying a brush which contacts with said conductors, and a movable cut-out cam-switch connected to said rocking posts to adjust the posts and throw the brushes out of contact with the aforesaid bare-metal con-

ductors, of a motor-circuit, the shunt-circuit embracing a rheostat, and a switch mechanism, substantially as described.

17. In an electric elevator, the combination, with a main line, a car, and suitable hoisting mechanism, of the motor-circuit having the hatchway-conductors E F and the wires connected to the commutator-brushes of its motor-armature, the rocking posts, each carrying a movable contact, which presses against one of the hatchway-conductors of said motor-circuit, the divided contact-plates to which the hatchway-conductors of the motor-circuit are connected, the manual cam cut-out switch for throwing the movable contacts out of engagement with said conductor, the divided circuit, and a switch, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALBERT NEUBURGER.

Witnesses:
HENRY E. COOPER,
JOSEPH R. EDSON.