

(No Model.)

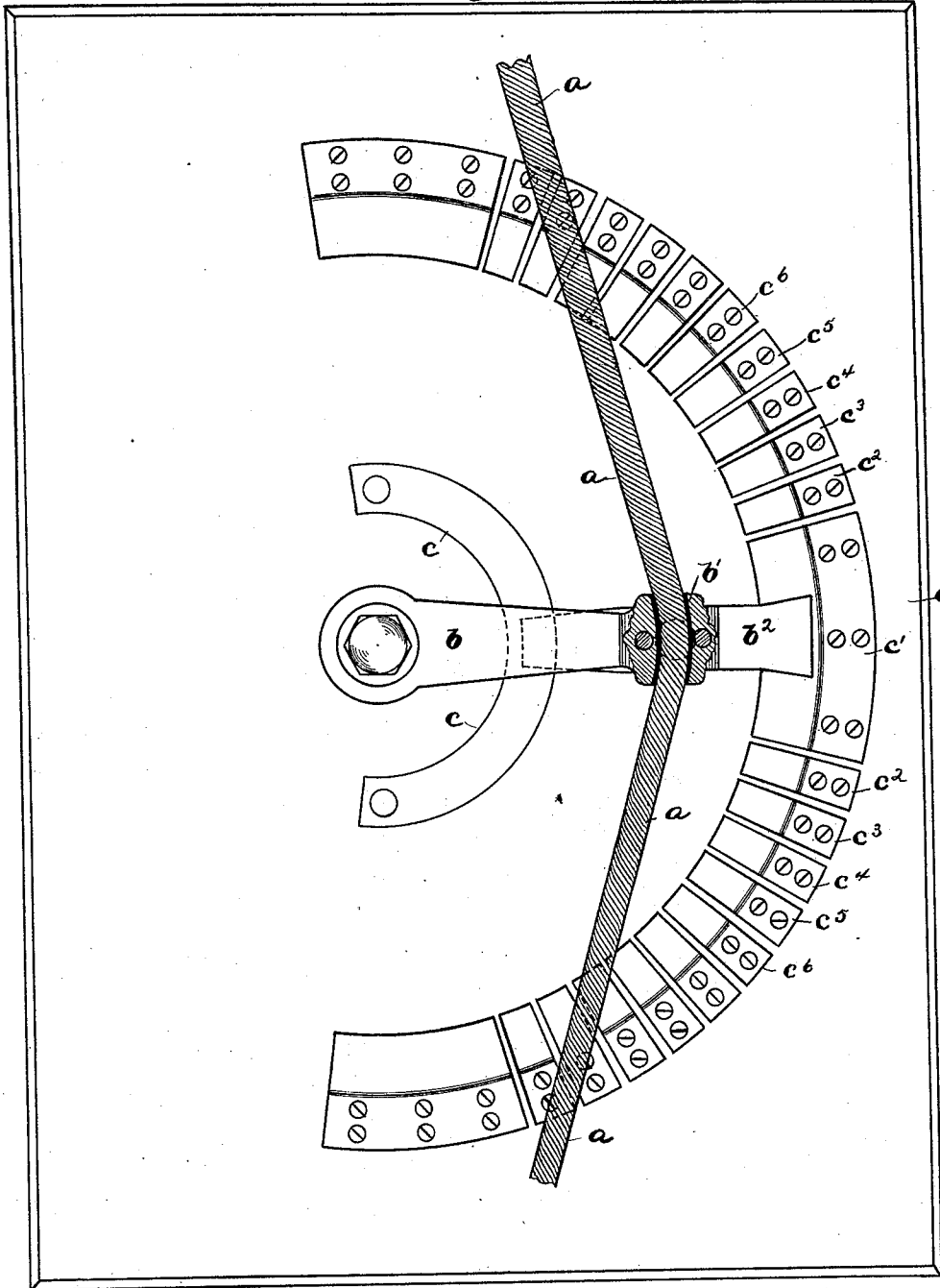
5 Sheets—Sheet 1.

J. J. NATE.
ELECTRIC SWITCH.

No. 487,092.

Patented Nov. 29, 1892.

Fig. 1



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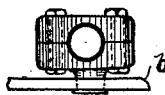


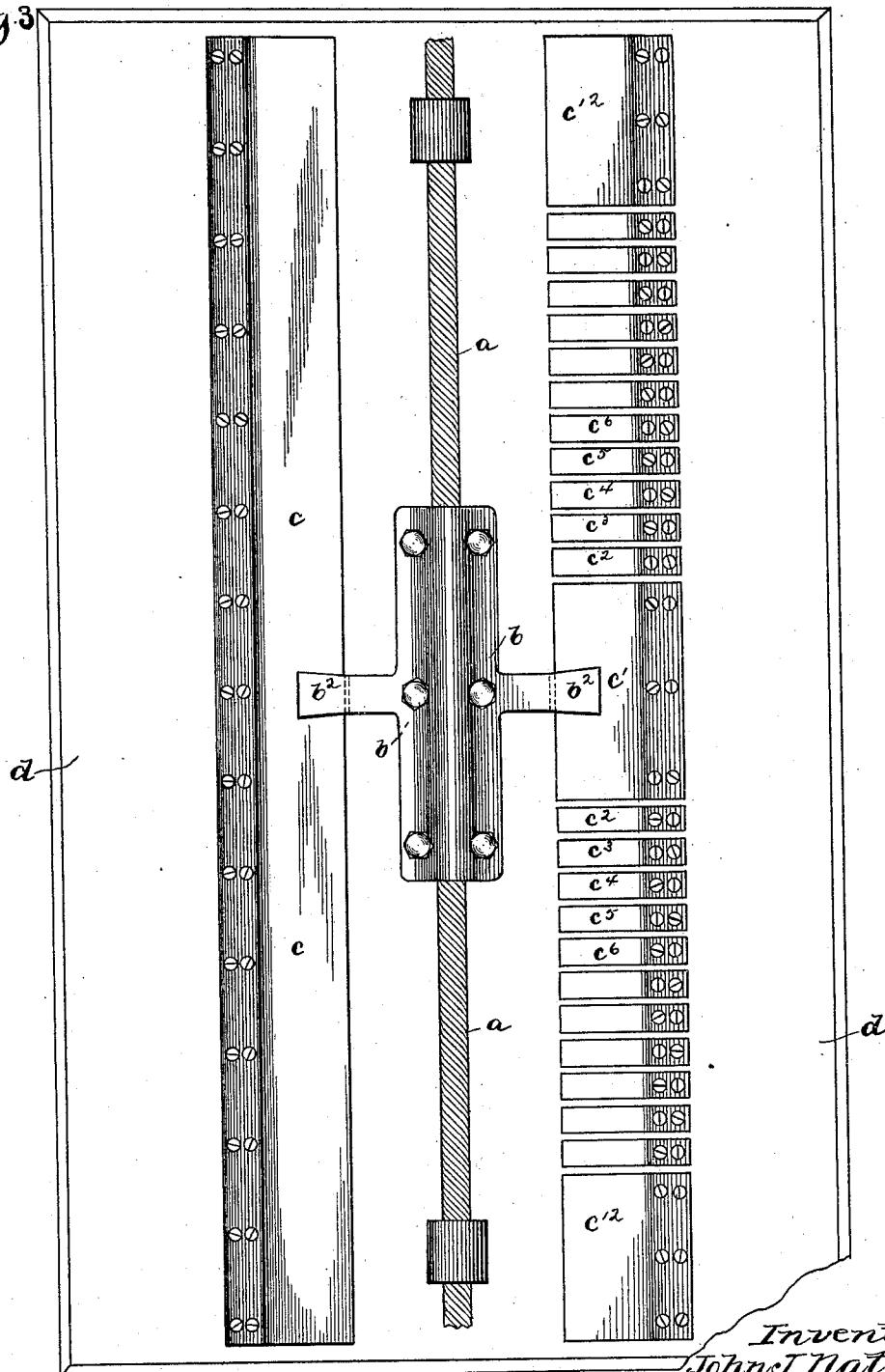
Fig. 2
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Fig 3



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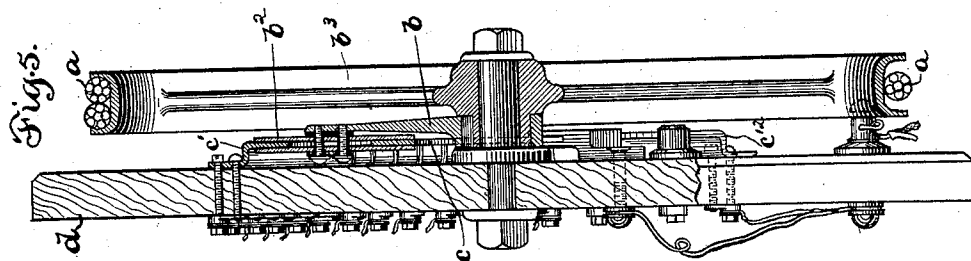
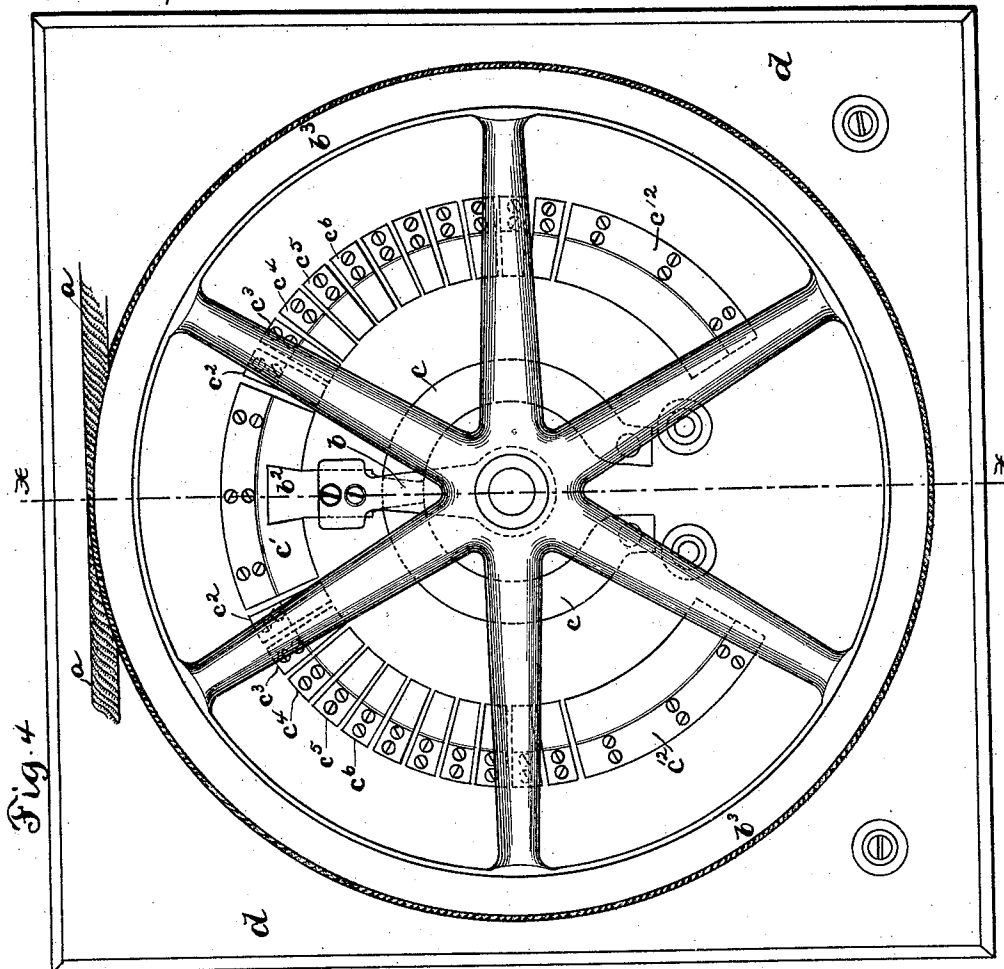
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ELECTRIC SWITCH.

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Patented Nov. 29, 1892.



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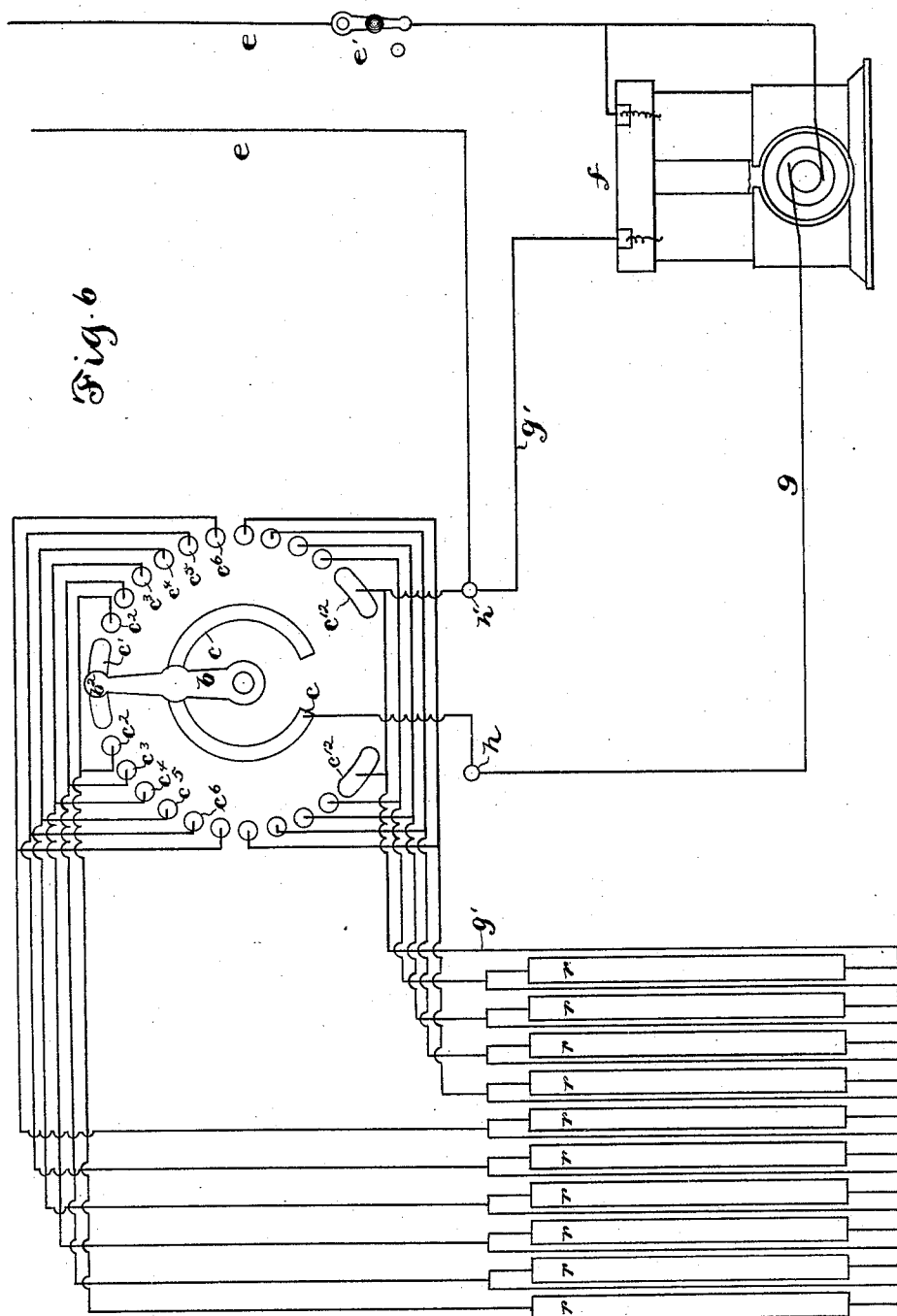
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J. J. NATE.
ELECTRIC SWITCH.

No. 487,092.

Patented Nov. 29, 1892.



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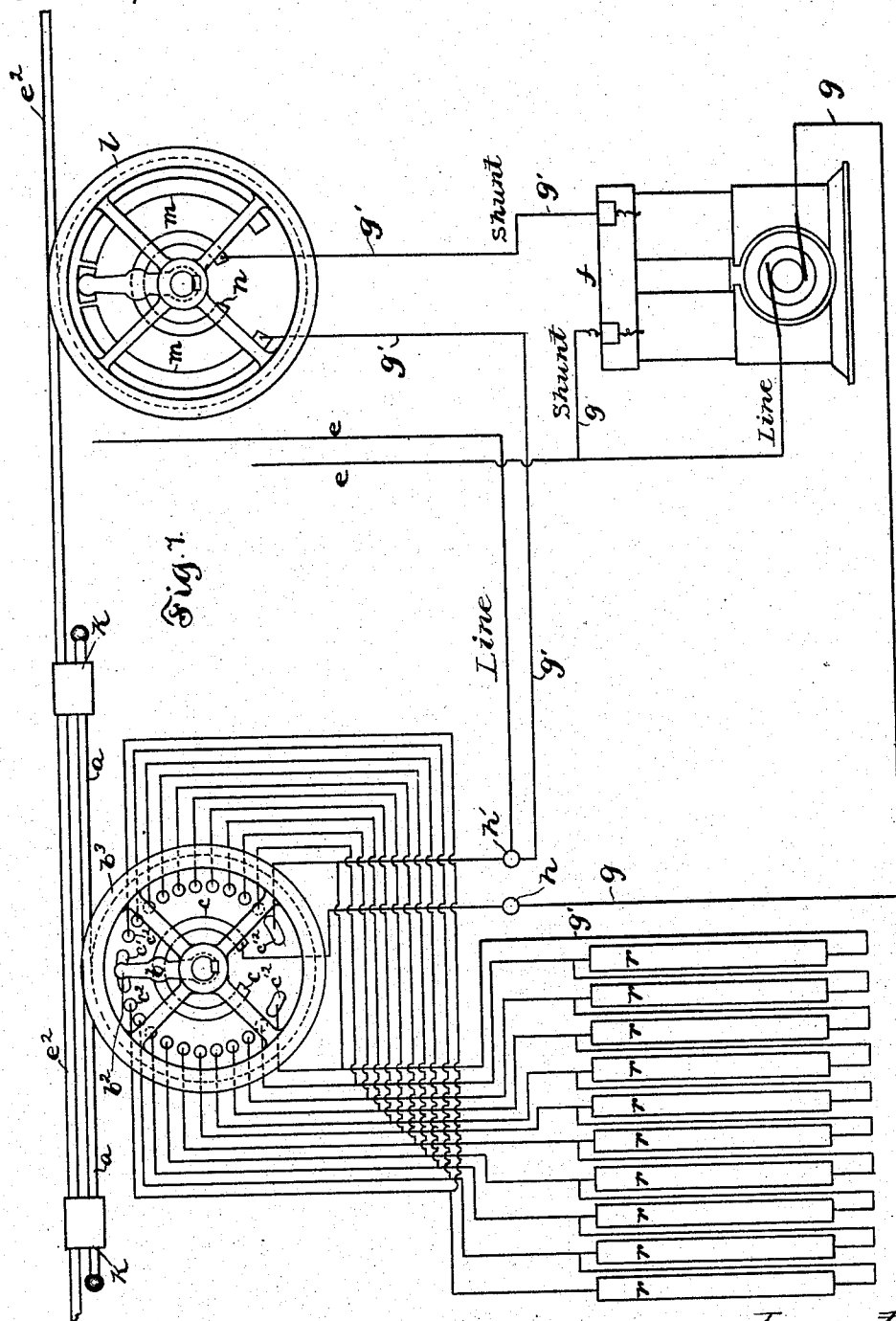
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J. J. NATE.
ELECTRIC SWITCH.

No. 487,092.

Patented Nov. 29, 1892.



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UNITED STATES PATENT OFFICE.

JOHN J. NATE, OF CHICAGO, ILLINOIS.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 487,092, dated November 29, 1892.

Application filed March 29, 1892. Serial No. 426,946. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. NATE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have
5 invented a certain new and useful Improvement in Electric Switches, (Case No. 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of
10 this specification.

My invention relates to switches and rheostats for use with elevators which are operated by electric motors.

It has for its object the adaptation of the
15 hand-rope now in common use to the purposes of switching into and out of circuit the motor which operates the elevator.

A further object is the provision of means for closing the circuit through the field of the motor before closing the circuit of the armature thereof, thus saving the time which is required to charge the field-magnets.

A still further object is to facilitate the use of belt-elevators to swiftly-moving elevators.

25 My invention consists of a switch or switches of special design, working in connection with a resistance-box, means for connecting same to the hand-rope, and the circuits by which this apparatus is adapted to be connected in
30 circuit with the motor.

The accompanying drawings will serve to illustrate my invention.

Figure 1 is a top view of the switch of my invention. Fig. 2 represents a detail of the
35 clamp to which the cord is attached. Fig. 3 shows an alternative device which may be used, in which the contact-points are arranged in a straight line instead of in a segment of a circle. Fig. 4 shows a switch of different
40 construction for the same purpose. Fig. 5 shows a sectional elevation of the switch shown in Fig. 4, viewed from line *x x*. Fig. 6 shows the diagram of the circuits which I employ in connection with the apparatus of my
45 invention. Fig. 7 shows a diagram of circuits which I employ in connection with the apparatus of my invention for switching in the field-circuit in advance of the operating-circuit.

50 It is obvious that switches similar to those I have shown in Figs. 1 and 3 may be employed to answer the same purpose as the

switch I have shown diagrammatically in Fig. 7.

Similar letters of reference refer to similar 55 parts throughout the different views.

The hand-rope of the elevator, as is well known, is adapted to shift the driving-belt from a central point, where it is running upon an idle pulley, to either side. On one side 60 the belt is carried to a pulley which drives the apparatus in one direction, on the other side to a pulley which reverses the motion. The arrangement of pulleys by which this is accomplished is well known and may be found 65 illustrated in the *American Mechanical Dictionary* (Knight's) under the head of "Belt-shifter," page 273, and as it constitutes no essential part of my invention I do not consider it necessary to describe it further. The hand-
70 rope by which the belt is shifted from one pulley to either of the others moves vertically up and down or horizontally through a certain range and is attached to one of the levers by which the belt-shifter is actuated.

75 I have found it necessary in adapting an electric motor to the service of operating a belt-driven elevator to provide an electric switch the different contact-points of which connect with the resistances of a rheostat and 80 adjust the different positions of the lever of said switch to conform to the different positions which the hand-rope occupies in starting, stopping, or reversing the motion of the elevator-car. It is obvious that when the belt 85 is running upon the idle-pulley and when the elevator is stopped or just about to be started the greatest amount of resistance should be cut in the circuit of the motor, as at that time the least power is required and the least 90 amount of current consumed. It is further obvious that as the elevator is moved in either direction the most current should be consumed when the most power is required, which is when the belt driving the elevator is shifted 95 to one extremity or the other of its lateral excursion. To accomplish this harmony of relation between the current flowing through the motor and the work required in moving the elevator is what I design by the apparatus shown in Figs. 1, 3, 4, 5, 6, and 7. 100

Referring to Fig. 1, the cord *a* is attached at each extremity to the hand-rope of the elevator. (Not shown.) The switch-lever *b*, to

which is attached the cord a , is adjusted to the range of motion which the hand-rope is required to have in order to shift the belts. It will be readily understood that any motion of the hand-rope shifts the switch-lever b in one direction or the other by means of the engagement between the cord a and the said switch-lever b . The cord a is attached to the lever b by means of a clamp b' , which is pivoted to the lever b . A detail of this clamp is shown in Fig. 2. The lever b carries the contact-spring b^2 , which makes contact with the horseshoe-shaped contact-piece c and also with the contact-points c^1, c^2 , &c., as the lever is swung. The contacts c^2, c^3, c^4 , &c., on opposite sides of the contact-plate c' are connected together, so that in whichever direction the switch-lever b is swung the contact-spring b^2 will practically make the connection between the same circuits when moved the same distance. The contact-point c^1 is a dead-point—that is to say, it is not connected into circuit at all, and therefore when the contact-spring b^2 is upon the contact-spring c' the circuit is open.

For the purpose of making the contact between the contact-spring b^2 and the contact-points c^2, c^3, c^4 , &c., secure I preferably divide the contact-spring b^2 , making thereof a jaw and raising the contact-points sufficiently from the base d of the switch to allow the lower member of the jaw to pass freely between the base of the switch and contact-plate, as shown in Fig. 5. When the arm b^2 is in the position shown in Fig. 1, there is no current flowing in the circuit to the motor, and the position of this arm corresponds to the central position of the belt—that is to say, that position in which the belt runs upon the loose pulley. As the switch-lever is moved in either direction by the motion of the hand-rope this contact-spring b^2 upon the arm b engages successively with the contact-points c^2, c^3, c^4 , &c., which contact-points are connected with the resistances of a rheostat-contact c^2 , including all the resistances of the rheostat contact c^3 , a less number of resistances, and so on to the last contact-point of the series where no resistances of the rheostat is included in the circuit. I preferably make the last contact-plate of the series longer than the others, so as to permit a certain amount of motion on the part of the hand-rope and therefore of the switch-arm. When the switch-arm is carried to the extreme limit, the belt will have been shifted to one or the other of the fixed pulleys and will therefore be tending to the utmost to carry the elevator up or down, as the case may be. In either case the motor should then be receiving its full supply of current, and this is exactly what is accomplished by means of this device. Alternative forms of switches for this purpose are shown in Figs. 3, 4, and 5. In Fig. 3 instead of arranging the contact-points c^2, c^3, c^4, c^5, c^6 , &c., in a circular form I arrange them longitudinally, connecting the contact-plates on each side of the cen-

tral dead-point c' together, the same as in the formerswitch. (Shown in Fig. 1.) The contact-arm b is attached firmly to the hand-rope and slides in a groove and carries the contact-spring b^2 up or down by means of a cord attached to the hand-rope of the elevator. The horseshoe contact-plate of Fig. 1 appears in Fig. 3 as the long strip c , with which the contact-spring b^2 makes contact. It will be readily seen that, the arm b occupying the position shown in Fig. 5, the circuit is open and the belt of the elevator is upon the idle-pulley. As the arm is carried in either direction the circuit is first closed through all the resistance of the rheostat, which resistance is gradually removed as the switch passes to either limit of its excursion, impelled by the hand-rope, until all resistance is cut out and the motor is receiving its full supply of current, at which time the elevator-belt will be upon one or the other of the fixed pulleys and tending to move the elevator up or down.

The form of switch shown in Fig. 4 and in section on line $x x$ of Fig. 5 is similar to the form shown in Fig. 1, except that a wheel is substituted for the switch-lever, this wheel having a grooved periphery, about which is wound the cord a , which is attached at either end to the main rope of the elevator. The frictional or other engagement between the cord a and the wheel b serves to swing the contact-spring b^2 , and the operation of this switch will be readily understood from the descriptions already given.

I shall now proceed to describe the arrangement of circuits to which this apparatus is adapted and to show particularly an important feature of my invention, which consists of cutting into circuit the field-magnet of the motor in advance of the main operating-circuit.

Referring to Fig. 6, which shows the rheostat, the switch, and motor diagrammatically in connection with the circuits, $e e$ are the two sides of the main circuit, in which the motor is located. A switch e' is placed in one side of the circuit and adapted to open the same when the circuit is not in use—as, for instance, at night. The motor f , which I prefer to use, is a shunt-wound motor adapted to be used with a current of constant potential. The circuits $g g'$ lead from the motor to the binding-posts $h h'$ of the switch, and thence, respectively, to the horseshoe-shaped contact-plate c and the contact-plates c^{12} . As before stated, corresponding contact-points c^2, c^3, c^4 , &c., on opposite halves of the circular switch are connected together and in turn to the different resistance-coils $r r r r$ of the rheostat, one terminal of the rheostat being connected to the contact-plates c^{12} . It results from this arrangement that the movement of the arm b in either direction over the surface of the switch from the contact-point c' makes contact through the contact-spring b^2 between contact-points c^2, c^3, c^4 , &c., which are connected through the coils of the rheostat with circuit

5 g' and the horseshoe contact-plate c , which is
 connected to the circuit g . The motor is thus
 cut into circuit with more or less resistance,
 the resistance of the rheostat being cut out
 as the switch-arm b passes farther and farther
 from the contact-plate c' . The same arrange-
 10 ment of circuits is shown in Fig. 7, with the
 additional feature of a switch for opening
 and closing the field-circuit of the dynamo
 before the circuit is closed through the arma-
 15 ture. To accomplish this purpose, the cord
 a , passing around the circumference of the
 switch-wheel b^3 , is joined to the main rope e^2
 by means of eyes k k , through which the
 cord passes freely. Knots or the equivalent
 20 thereof serve as stops at the end of the cord
 a to prevent the end passing through the
 eyes. I allow a few inches play of the cord
 a , making it longer than is absolutely re-
 quired to pass over the surface of the cir-
 25 cumference of the wheel b^3 . As a result of
 this there will be a certain amount of lost
 motion between the main rope and the wheel
 b^3 , and it is this which I make use of to op-
 erate a switch to close the circuit through
 the field of the motor before closing armature-
 circuit. As a convenient form of such switch
 I may use a wheel l , as shown in Fig. 7, around
 30 which I pass the main rope itself. This switch,
 however, has only the function above de-
 scribed—namely, to open and close the circuit
 through the field, which is the circuit g' , as
 shown in the diagram. It will be readily seen
 that upon any motion of the main rope after
 35 the elevator has been stopped the wheel l will
 be moved slightly in advance of the wheel b^3 ,
 and any motion of the wheel l will serve to
 close the circuit g' through the contact-points
 m and n . The advantage of this construction
 40 is that it gives the field-magnets an instant's
 time to become charged prior to the closing
 of the circuit upon the motor, thus facilitat-
 ing the operation of the motor.

It will be readily understood that any one
 45 of the alternative forms of switches which I
 have represented may be used in combination
 with another switch of the same kind or with
 another switch of any of the other modes of
 construction suggested to accomplish the pur-
 50 pose of closing the field-coil circuit before the
 operating circuit is closed. The dead-point
 c' , upon which the switch-contact rests when
 the elevator-belt is running upon the idle-pul-
 55 ley, is made of considerable length to permit
 the closing of the field-circuit switch before
 the contact-spring b^2 passes off from the dead-
 point c' . The lengthening of the open contact-
 plate c' may serve to permit the closing of the
 field-magnet circuit without the addition of
 60 the lost motion between the cord a and the
 handle, if desired. If desired, the circuit may
 be left closed through the motor-field at all
 times, thus leaving the motor in constant readi-
 ness for operation. A further advantage of
 65 charging the field-magnet before the circuit is
 closed through the armature is that it avoids
 the sparking at the commutator-brushes. The

rheostat may be placed in one case with the
 switch or it may be mounted separately, as
 preferred. To avoid destructive effects of
 70 sparking at the points of contact between the
 contact-plates c^2 c^3 c^4 , &c., and the contact-
 spring b^2 , I make use of carbon contact-points.

Hitherto belt-driven elevators have not
 been adapted to use for swift passenger serv-
 75 ice because of the sudden strain to which the
 belts are subjected in starting the elevator-
 car at the requisite speed. By the use of my
 device the belt may always be driven at full
 speed and the load put upon it as fast as the
 80 belt can carry it, or the speed of the belt and
 the power transmitted thereby may be grad-
 ually increased and the strain of sudden start-
 ing at full speed obviated.

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

1. The combination, with a main circuit and
 an electric motor, of a rheostat in circuit with
 the armature of said motor, said rheostat be-
 90 ing provided with duplex contact-points ar-
 ranged symmetrically upon either side of the
 dead-point, a contact-arm connected with the
 hand-rope of an elevator and adapted to trav-
 erse said contact-points, a switch in circuit
 95 with the field of said motor and connected
 with said hand-rope, said switch being adapted
 to close the circuit through the field-coils of
 said motor before said contact-arm is moved
 from said dead-point, whereby as the hand-
 100 rope is moved in either direction circuit is
 closed through the field-coils in advance of
 the circuit through the armature and an in-
 creasing current is sent through the arma-
 ture, substantially as described.

2. The combination, with the hand-rope of
 an elevator, of a switch adapted to close the
 circuit through the field-coils of an electric
 motor when moved in either direction, a rheo-
 110 stat in circuit with the armature of said mo-
 tor, said rheostat being provided with duplex
 contact-points arranged symmetrically upon
 either side of a dead-point, a contact-arm
 adapted to traverse said contact-points and
 connected with said hand-rope to permit of
 115 lost motion, whereby when said hand-rope is
 moved in either direction the circuit through
 the field-coils may be closed in advance of the
 circuit through the armature and an increas-
 ing current sent through the armature, sub-
 120 stantially as described.

3. The combination, with the hand-rope of
 an elevator, of a switch adapted to close the
 circuit through the field-coils of an electric
 motor when moved in either direction, a rheo-
 125 stat in circuit with the armature of said mo-
 tor, said rheostat being provided with duplex
 contact-points arranged symmetrically upon
 either side of a dead-point, a contact-arm
 adapted to traverse said contact-points, said
 130 contact-arm being connected with a rope pass-
 ing by its ends through eyes attached to said
 hand-rope, said rope being provided with en-
 largements upon its ends, said enlargements

- when said rope is drawn taut being at a greater distance apart than are said eyes, so that the rope passing through said eyes may not partake of the motion of the hand-rope until it shall have moved through a certain distance, whereby circuit may be closed through the field-coils in advance of the armature and an increasing current sent through the armature, substantially as described.
4. The combination, with the hand-rope of an elevator, of a switch attached to a wheel, around which said hand-rope passes, said switch being adapted to close circuit through the field-coils of an electric motor when said hand-rope is moved in either direction, a rheostat in circuit with the armature of said motor, said rheostat being provided with duplex contact-points arranged symmetrically upon

either side of a dead-point, a contact-arm adapted to traverse said contact-points and attached to a wheel encircled by a rope passing by its ends through eyes carried upon said hand-rope, said ends being provided with enlargements which when pulled taut are at a greater distance apart than are said eyes, whereby when said hand-rope is moved in either direction circuit will be closed through the field-coils in advance of the armature and an increasing current sent through the armature, substantially as described.

In witness whereof I hereunto subscribe my name this 19th day of March, A. D. 1892.

JOHN J. NATE.

Witnesses:

GEORGE McMAHON,
GEORGE L. CRAGG.