(No Model.) 2 Sheets—Sheet 1.

A. M. COYLE.

ELECTRIC SWITCH.

No. 493,485. Patented Mar. 14, 1893.

FIG. I.

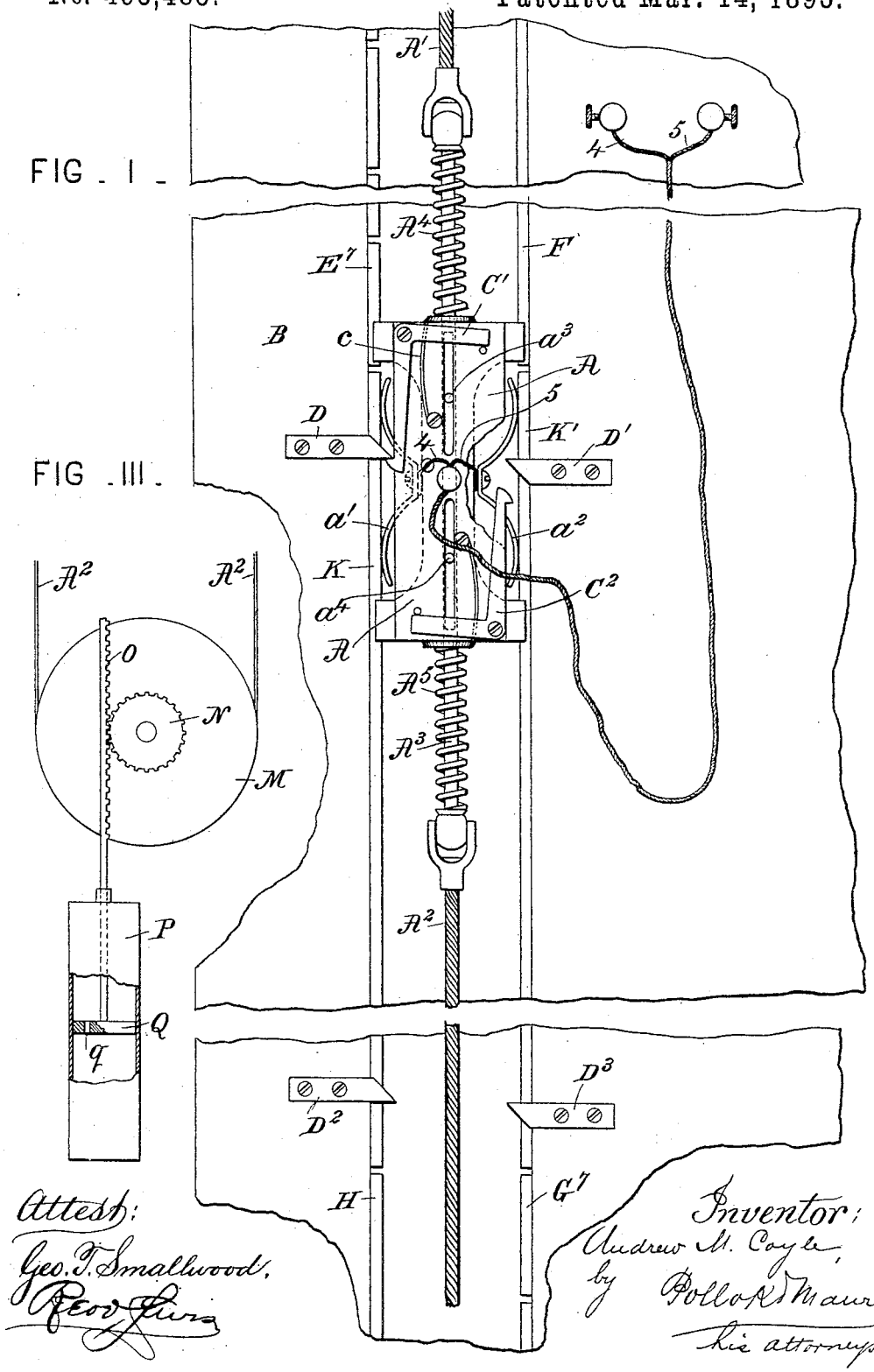

FIG. III.

Attest:
Geo. T. Smallwood.
Peo. Lins

Inventor:
Andrew M. Coyle,
by Pollok & Mauro,
his attorneys.

(No Model.)

2 Sheets—Sheet 2.

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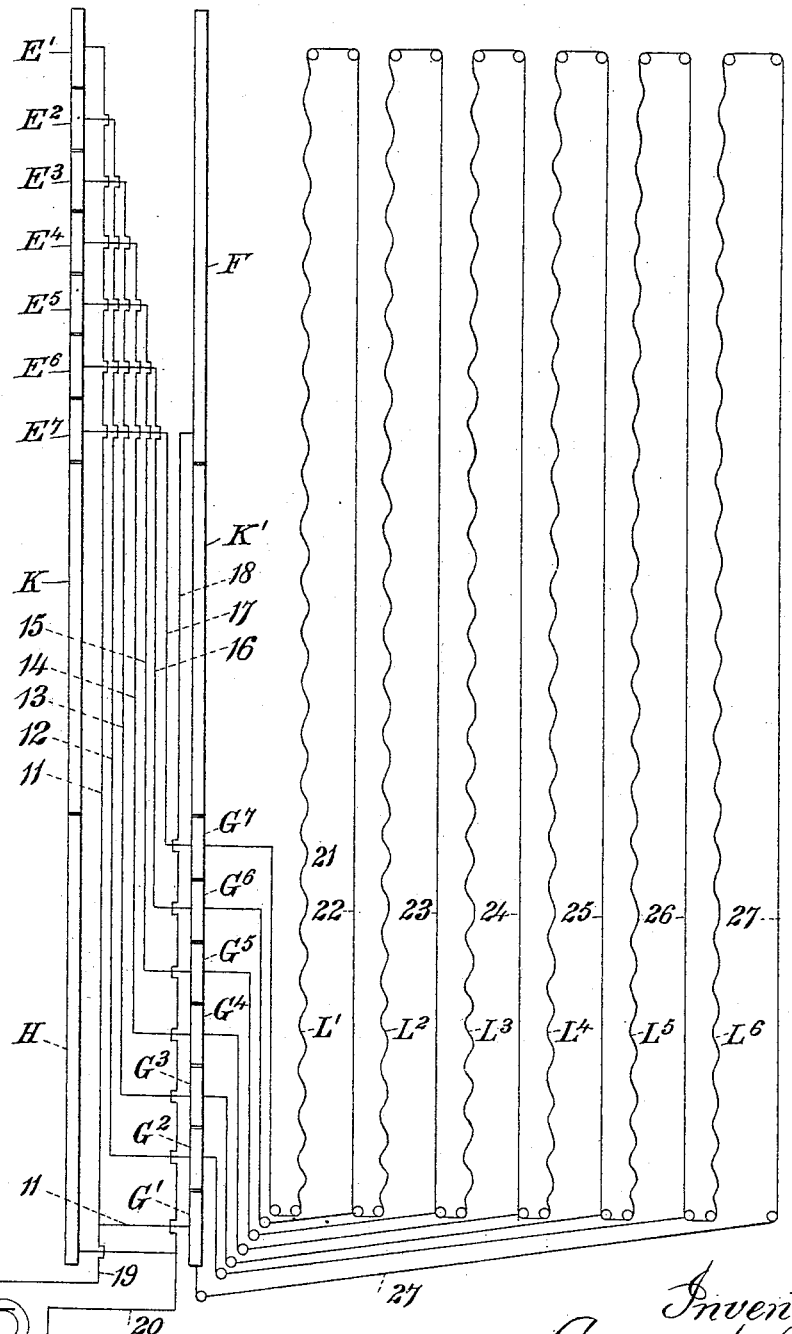
FIG. 2.



Attest: Geo. T. Smallwood. Chas. Lewis.

Inventor: Andrew M. Coyle. by Pollok & Mauro. his attorneys

UNITED STATES PATENT OFFICE.

ANDREW M. COYLE, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE STANDARD SCREW ELEVATOR MANUFACTURING COMPANY, OF SAME PLACE.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 493,485, dated March 14, 1893.

Application filed March 3, 1892. Serial No. 423,600. (No model.)

To all whom it may concern:

Be it known that I, ANDREW M. COYLE, residing at Baltimore, Maryland, have invented a new and useful Improvement in Electric Switches, which improvement is fully set forth in the following specification.

The present invention relates to electrical switch mechanism designed for making, breaking and reversing the connections of an electro-motor with its supply circuit. The apparatus is particularly contrived for use in connection with electrically driven elevator systems, in which the movable part of the switch is actuated by a pull cord from the car of the elevator.

The switch consists of a movable part or slide carrying spring contacts or brushes, adapted to make contact with a series of terminal plates, to which are connected resistances in such manner that, as the switch is moved from its neutral position in either direction, it first makes contact between the main line and the motor through all the resistances, and as it progresses cuts out the resistances *seriatim*.

It frequently happens in operating switches from the pull cord of an elevator, that the sliding contact or brush is left in such position as to produce an arc, which results in the burning out of the brushes. To avoid this I provide a retarding or stop mechanism which arrests the switch just before making the contact to switch in the motor; during which arrest the pulling of the cord compresses a spring until the latter accumulates sufficient force to overcome the opposition of the stop, and when this occurs the switch is impelled with a quick movement past the dividing line. This mechanism may be of various sorts, and the preferred construction will be hereafter described in detail.

The apparatus as a whole is specially contrived with a view to preventing injury to the motor by abruptly throwing the current into the armature coils while the motor is at rest, or by a sudden reversal of its connections with the main circuit to reverse the direction of travel of the car, elevator attendants being accustomed to make quick movements of their controlling device. This object is effected first by the arrangement of the resistances as above indicated, secondly by the action of the retarding mechanism, thirdly by giving to the sliding switch a long path of movement, so that the circuit changes effected thereby are made deliberately; and finally by a dash-pot arranged in connection with one of the sheaves over which the pull cord passes.

In the accompanying drawings which form part of this specification, Figure I represents in front elevation a simple form of switch mechanism constructed in accordance with the invention, Fig. II, a diagram illustrating the electrical connections and circuits; and Fig. III is a detail view showing the arrangement of the dash pot.

A represents the slide or movable part of the switch or circuit changer. It is suitably mounted and supported in a case or frame B, so that by means of pull cords A' A^2 it can be moved in either direction. The slide has on each side, and insulated from each other, a bent spring contact or brush a' a^2. These slide over, making electrical contact with, a series of fixed contacts, as hereinafter described. The direct conductor 4 and return conductor 5 of the main supply circuit are connected with the brushes a' and a^2 respectively. The actuating cords A' A^2 are connected respectively to opposite ends of a rod A^3 passing loosely through the body of the slide, and around the rod A^3 at top and bottom are helical springs A^4 A^5, so that the motion of the rod in either direction with respect to the slide is resisted by one of these springs. On the face of the slide are two bell-crank levers C' C^2, each terminating in a hook or tooth at one end, which hook is pressed by a light spring c beyond the body of the slide. These levers constitute catches which when engaged by one of the stops D D' D^2 D^3 will check and arrest the slide. When this occurs, the slide will remain stationary while a continued pull on the cord A' or A^2 will draw rod A^3 lengthwise of the slide gradually compressing the spring A^4 or A^5 as the case may be. Rod A^3 has two cross pins a^3 a^4 which project through slots in the face of the slide, and when the rod A^3 is drawn far enough in one direction or the other, one of these pins will strike the tail of lever C or C^2, withdraw the tooth thereof, and thus permit the slide to

advance. As soon as the catch is withdrawn, the energy of the compressed spring will throw the slide forward for a considerable distance, and these catches and stops being properly arranged, it is obvious that the slide cannot under any circumstances come to rest at such points as would cause the current to form an arc.

The stops D D′ and D^2 D^3 are arranged in pairs as shown, and are curved on one side so that they engage the tooth of the adjacent catch, when the slide is moving in one direction, and simply push the catch back against the pressure of spring *c*, when the slide moves in the other direction.

The contact plates before referred to, and the electrical connections thereof, will be best explained by reference to Fig. II. On the right of the slideway beginning at the top are seven separate plates E′ to E^7 inclusive, and opposite these is a single strip F, whose length equals the combined lengths of the opposite series of plates. At the lower end of the slideway are seven plates G′ to G^7 inclusive, corresponding to the series E′ &c., but placed on the left of the slideway. Opposite these is a long strip H, corresponding to strip F. Plate E′ is connected by wire 11, with the corresponding plate G′. E^2 is similarly connected by wire 12 with G^2, and so on throughout the series. The long strip F is connected by wire 18 with strip H. From wire 11 a wire 19 leads to one pole of the motor I, and from wire 18 a wire 20 leads to the other pole of the motor. Between the upper and lower series of strips or plates, are the strips K K′ which have no electrical connections. Consequently when the brushes connected with the slide are in contact with these strips, the motor will be disconnected. The short plates are the terminals of the resistances L L^2 &c. of which six are shown; but obviously the number of resistances, and consequently the number of terminal plates, could be increased or diminished as may be desirable for the object in view.

For the purpose of explaining the circuit connections, let it be supposed that the operator has drawn the slide upward from the intermediate or neutral position, until its brush a' makes contact with plate E^7, its opposite brush a^2 being in contact with plate F. In this position the circuit may be traced from main wire 4, to brush a', plate E^7, wire 17 plate G^7, wire 21, resistance L′, wire 22, resistance L^2, and so on through the whole series of resistances and their connecting wires to plate G′. Thence the circuit proceeds by wires 11 and 19 to the motor I, returning by wire 20, wire 18, strip or plate F, brush a^2 of slide A and return conductor 5. Consequently at the first motion of slide A to start the motor the current passes through the whole series of resistances, and by following the circuit connections, as shown on the drawings, it will be clearly seen that as the slide continues its upward movement the resistances are cut out, one by one, until the brush a' rests on terminal plate E′, which directly connects with the motor, shutting out all the resistances. Conversely, if the slide be moved downward from the neutral position, it will at first connect the motor in circuit through all the resistances; but in this case the connection of the motor with the supply-circuit will be reversed, for the reason that the resistance terminal plates G′ G^2 &c. are on the opposite side of the slideway from the corresponding plates E′ E^2 &c.

The retarding stops D′ D^2 are placed near the line of separation between the neutral strips K K′ and the upper series of terminal plates, while the stops D^2 D^3 are placed near the line of separation between these neutral strips and the lower terminal plates. They act, as already explained, so that in whatever direction the slide is moved, it is checked as it approaches these lines of separation, and held while energy is being stored up in one of the springs A^4 or A^5 sufficient to carry the brushes or contacts entirely over the line of separation, and prevent their coming to rest in such proximity to the plates E^7 F or G^7 H as would cause the formation of an arc.

It will be observed that, when the motor is running at full speed in one direction, to cause its reverse movement at full speed the slide must travel from one end of the slideway to the other; and moreover that in this movement it will be twice arrested by the retarding devices. These provisions are found to act efficiently as a means to prevent damage to the motor by abrupt reversal of its circuit connections. This result is further insured by the arrangement shown in Fig. III, in which M represents one of the sleeves under which the pull-cord A^3 passes on its way to the slide A. On the axis of this sleeve is a pinion N which engages a toothed rack O formed in the piston rod of the dash pot P, the piston Q has a small aperture *q* through which the fluid (liquid or air) passes as the piston moves up and down. This arrangement prevents any sudden movement being given to the slide.

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

1. In combination with an electric motor, switch mechanism for making, breaking and reversing the circuit connections thereof, such mechanism comprising a slideway having on one side contact plates connected through resistances with one pole of the motor and opposite these a single plate connected with the other pole, a second series of plates electrically connected with said resistances but arranged on the opposite side of the slideway from the first series, a complementary single contact plate opposite the second series, and a slide carrying brushes adapted to make contact with said plates, said brushes being connected respectively with the direct and return wire of the supply-circuit, substantially as described.

2. An electric switch mechanism comprising in combination, a slide carrying brushes connected respectively with the two conductors of the supply or main circuit, a slideway in which said slide is adapted to move, a series of resistances, a series of terminal plates in said slideway with which said resistances are electrically connected, a second series of terminal plates arranged in said slideway on the side opposite to the first and connected each with one of the first series, the two series being separated by a space of greater length than said slide, so that as said slide is moved from its intermediate position in either direction it completes the main circuit first through all the resistances and cuts these out one by one as it approaches the extremity of its path, substantially as described.

3. In an electric switch mechanism, the combination with an electric circuit, of a movable part or slide carrying contact springs or brushes, and fixed contact plates for completing said circuit through said springs or brushes, a stop or detent in the path of said slide, a catch carried by the latter and engaged by said stop when the slide approaches the end of one of said plates, a spring through which the power to move said slide is applied, and means for disengaging said catch from said stop when said spring is compressed to a certain degree, substantially as described.

4. In an electric switch mechanism the combination of the slide carrying brushes for making contact with fixed terminal plates, a cord for drawing said slide in either direction, springs through which the pull of said cord is transmitted to said slide, stops on opposite sides of said slideway and adjacent to the ends of said contact plates, catches, one on each side of said slide and adapted to be engaged by said stops, and pins acting to disengage said catches and release the slide, so that the latter receives an impulse from the energy stored in one of the springs during the period of arrest, substantially as described.

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

ANDREW M. COYLE.

Witnesses:
NELSON HISS,
CHARLES W. FOWLER.