

(No Model.)

3 Sheets—Sheet 1.

F. E. HERDMAN.

AUTOMATICALLY CONTROLLING ELECTRIC MOTORS.

No. 548,830.

Patented Oct. 29, 1895.

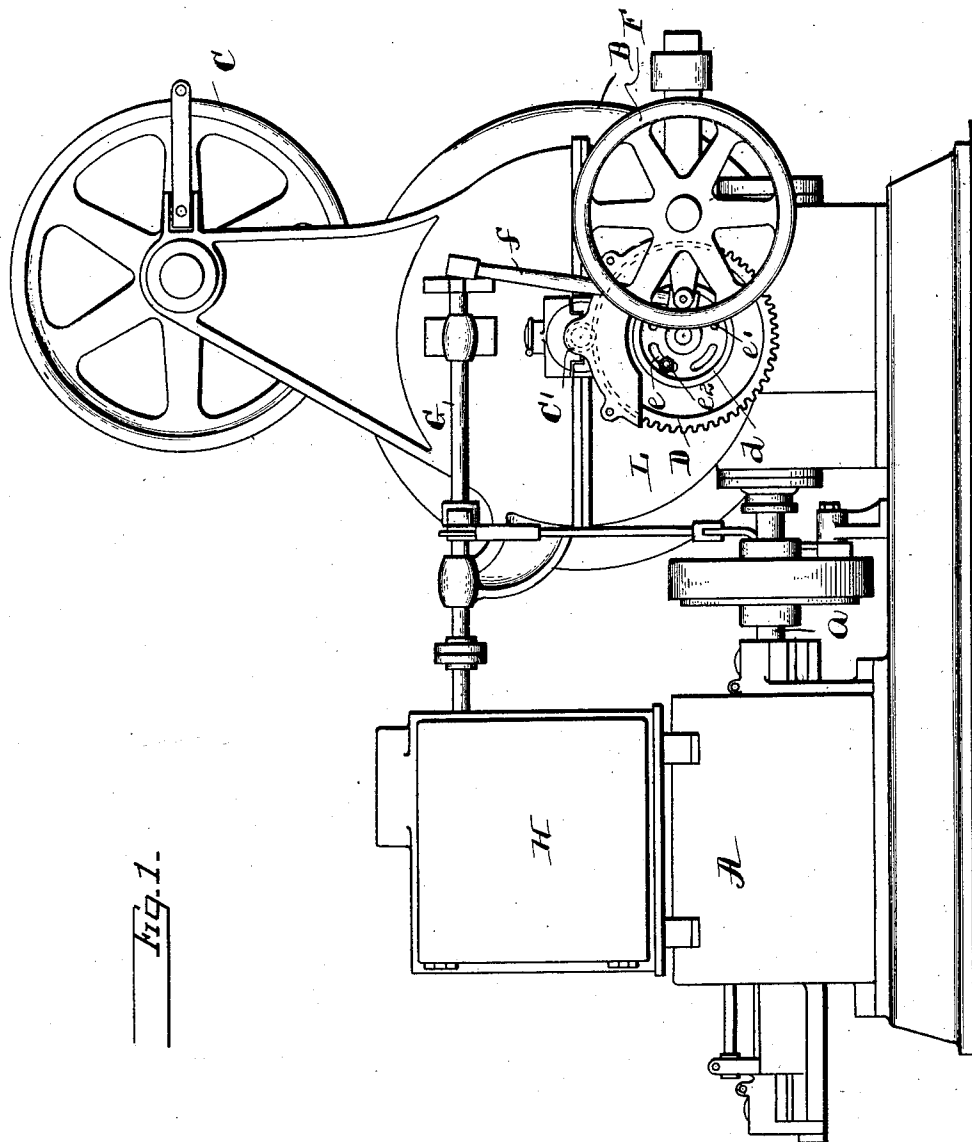


Fig. 1.

Witnesses.

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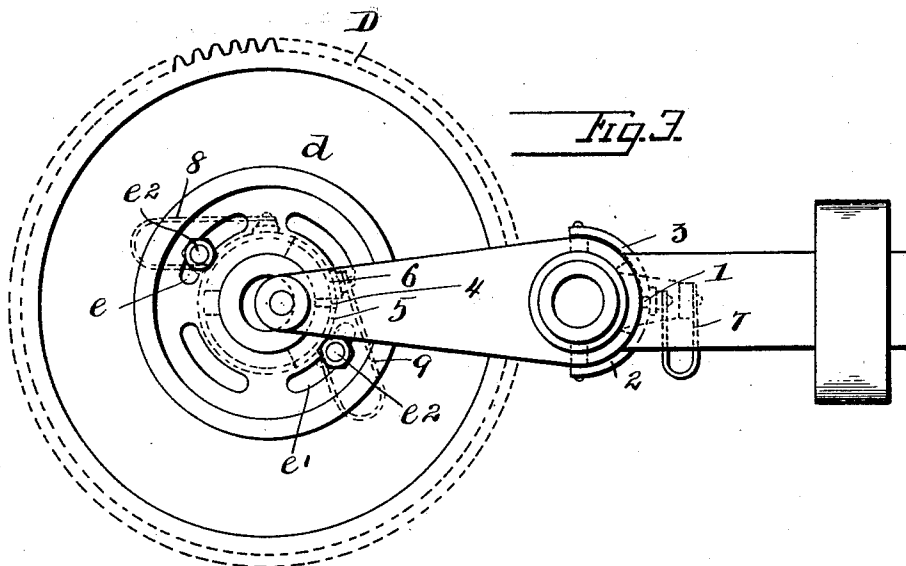
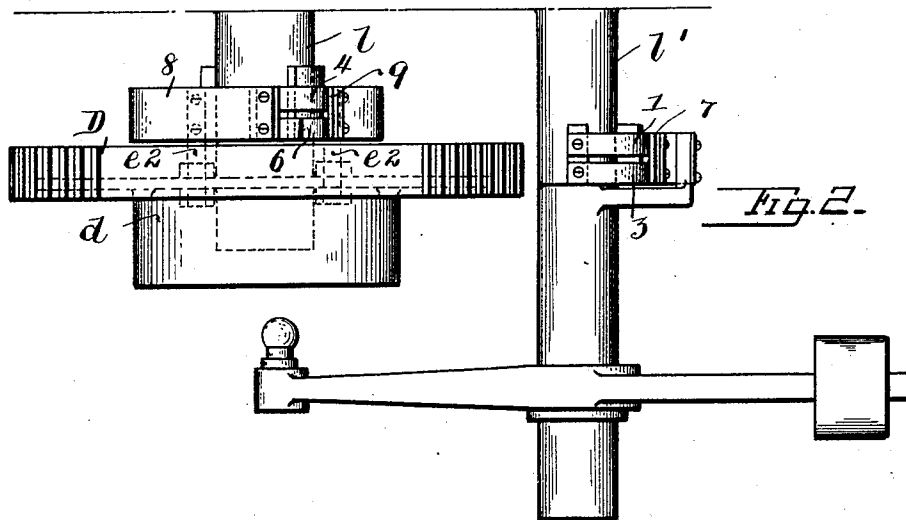
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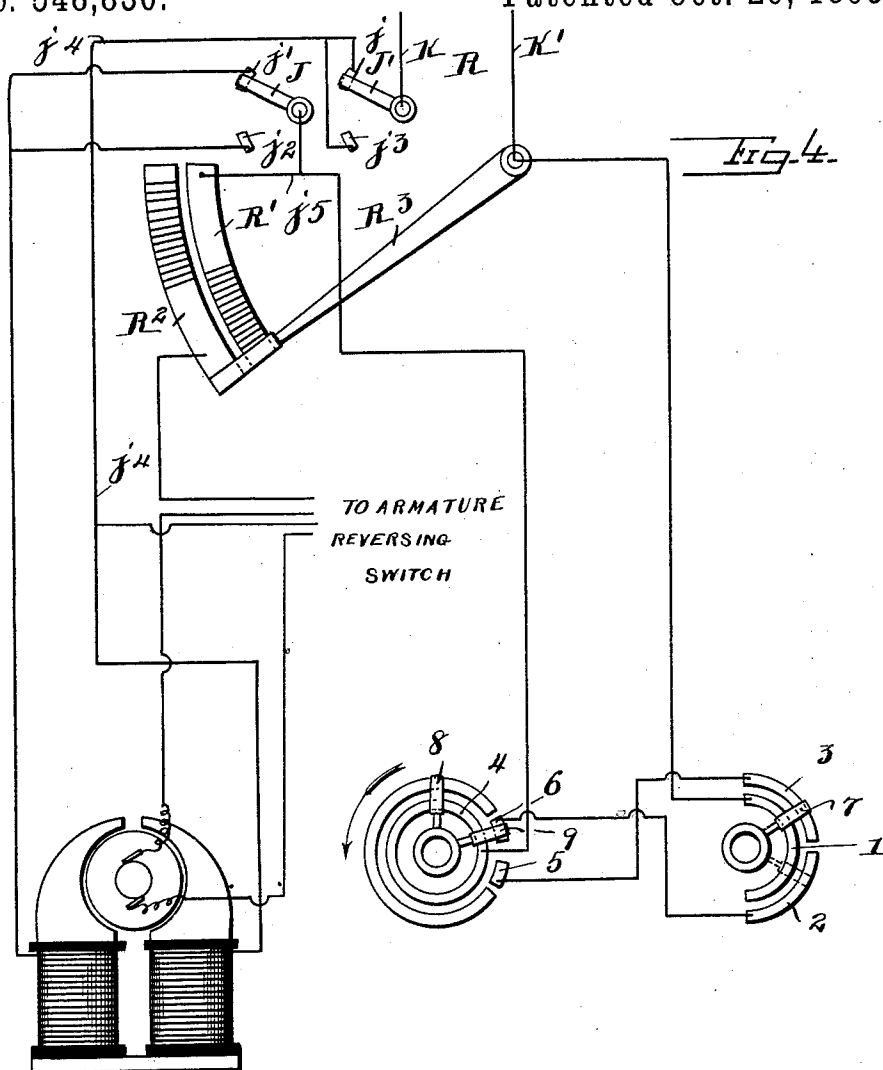
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AUTOMATICALLY CONTROLLING ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 548,830, dated October 29, 1895.

Application filed June 29, 1895. Serial No. 554,420. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. HERDMAN, a citizen of the United States, residing at Winnetka, county of Cook, and State of Illinois, have invented a new and useful Improvement in Automatically Controlling Electric Motors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

I will first describe my invention as illustrated in the drawings, and then point out the invention in the claims.

In the drawings, Figure 1 is a side elevation of the device and the operating mechanism. Fig. 2 is a plan view of the device. Fig. 3 is a side elevation of the same. Fig. 4 is a diagrammatic view showing my invention.

A is an electric motor; *a*, the shaft of the same. The shaft *a* is in gearing with and driving the winding-drum B of an elevating apparatus. C is a guide-wheel for the lifting-cable. Upon the shaft of the winding-drum is a gear C', which meshes with a gear D. Connected with a hub *d* of wheel D are the brushes 8 and 9, said brushes being connected in the following manner: The hub is provided with slots *e* and *e'*, and the brushes are secured to the hub by set-screws *e*², which are secured in said slots. To the hub *l* of the casing L, carrying the shaft on which the wheel D moves, is attached a contact 4 and short contacts 5 and 6, the brush 8 being adapted to make contact with contacts 4 and 5 and brush 9 with contacts 4 and 6.

F is the operating-sheave, connected in the ordinary manner by cables with the car. *f* is a connecting-rod connected at one end to said sheave F and connected at the other end to the operating-bar G, which is connected to the switch mechanism in the box H, Fig. 1. Connected to the hub *l'* of the casing is a contact 1 and also contacts 2 and 3. To the hub of crank *f* is connected a brush 7, which is adapted in its movement to wipe on contact 1 and contact 2 or 3.

R is the rheostat in the circuit to the field and armature of the motor, in which R' are the field-resistances, R² the armature-resistances, and R³ the resistance-arm for control-

ling the resistances in the armature and field circuit.

Referring now to Fig. 4, J and J' are the switch-brushes for the field-circuit, and *j* *j'* and *j*² *j*³ the contacts for the field-circuit. K and K' are the wires leading from the source of current-supply. The ordinary wiring to the field is as follows: The circuit passes from K to switch J' through either contact *j* or *j*³, (dependent upon the position of switch J'), to wire *j*⁴, to the field of the motor. From there it passes to contact *j'* or *j*², (dependent upon the position of switch J,) through switch J to field-resistances R', to resistance arm R³, to wire K'. One portion of R' is directly connected with wire *j*⁵, so that when the arm R³ is in that position the current passes directly to the field. Initially the arm rests on that portion of R', but when the motor is in full operation its position is as shown in Fig. 4, in which case the resistances are cut out of the armature-circuit and resistances are in the field-circuit. From wire *j*⁵ a wire runs to contact 4, wires connect contacts 6 and 2 and 5 and 3, respectively, and wire K' is connected directly to contact I. The position of the brush 7 is determined by the movement of the operating-bar G. Thus in one direction of movement of the operating-bar it makes connection with contacts 1 and 3 and in the other direction with contacts 1 and 2.

The movement of the operating-bar in one direction causes the motor to revolve in one direction and the movement in the other direction causes the motor to revolve in the other direction. Thus in the motor's revolution in one direction the brush 7 is in contact with contacts 1 and 3 and in its revolution in the other direction with contacts 1 and 2.

The contacts 5 and 6 are of short length, and the revolution of wheels C' and D are such that the drum B makes the desired number of revolutions (sufficient to allow the elevator to raise its full height or descend to the lowest point) in one revolution of wheel D, and the brushes 8 and 9 are so set that in the movement of drum B in one direction brush 8 makes contact with contact 5 (and contact 4) and in the other direction brush 9 makes con-

tact with contact 6 (and contact 4) at the desired point of travel of the elevator. As may be seen, there is a main field-circuit, which includes the resistance-arm R^3 and resistances R' and a shunt field-circuit around the arm R^3 and resistances R' . This shunt field-circuit is controlled by the brush 7 and brushes 8 and 9. When the motor is started, the bar G is moved from the center, which causes the brush 7 to make connection with contact 1 and either contact 3 or 2, dependent upon the direction the bar is moved. The movement of the bar operates switch-brushes J and J' and sets the motor in revolution and the current is admitted to the field through arm R^3 , which moves so as to throw resistances in the field, and when the motor is at full speed the arm is in the position shown in Fig. 4. The motor in its revolution revolves the winding-drum. If we suppose the movement of the bar G has made brush 7 connect with contacts 1 and 3 and the drum revolves in a direction to cause the brushes 8 and 9 to revolve in the direction of the arrow, Fig. 4, as soon as brush 8 makes contact with contact 5 the shunt-circuit to the field is closed and the field receives current independent of resistances R' and the strength of the field is increased. When the bar G is moved in the other direction, brush 7 is moved off of contact 3 and onto contact 2 and in consequence breaking the shunt-circuit to the field, the motor revolves in the opposite direction, and the brushes 8 and 9 move in a direction opposite to the arrow, Fig. 4, and when brush 9 makes contact with contact 6 the shunt-circuit around the resistances R' to the field is again closed. By this arrangement I can, by the adjustment of the position of brushes 8 and 9 at any desired point of the travel of the elevator in either direction, increase the strength of the field and thus lessen the speed of the elevator. This arrangement enables the speed to be reduced without changing or affecting the operating mechanism.

In a previous patent granted to me, No. 506,911, dated October 17, 1893, there is shown, described, and claimed automatic devices moved by the winding-drum and adapted at predetermined points to affect the operating mechanism and bring it to its central position. With this arrangement, if the operator should stop the car after the automatic devices have commenced to operate and before he has reached the final stop, it is difficult for the operator to throw current on the machine to continue the travel in that direction, so that if he wishes to continue to the end of the travel the operator would have to reverse and return to a position before the automatic devices begin to act, when he could throw on the current to run to the end of the travel. The space for the action of the automatic devices being according to the speed of the machine, from six to ten feet, this distance is

so great that at times the operator is called upon to stop the car within that space. While I do not intend to discard these automatic devices, the construction hereinbefore described is intended to be used with these automatic devices, they being adjusted to act within a short distance of the end of the travel of the car—say within two or three feet—and the devices described being placed to act at some distance before these automatic devices, to bring the motor to a slow speed independent of the operating mechanism, thereby within this limit, enabling the operator, in case the car should be stopped, to again throw on the current and proceed in the same direction until the automatic devices acted.

I do not intend to limit my invention for use with any particular character or construction of automatic devices which control the operative mechanism, those spoken of heretofore in this specification as being described in Patent No. 506,911 being used here merely as an example or type of a class.

Having now fully described my improvement, what I claim, and desire to protect by Letters Patent, is—

1. The combination with an electric motor and a source of current supply, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, a switch device controlled by the motor in said last mentioned circuit.

2. The combination with an electric motor and a source of current supply, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, an adjustable switch device controlled by the motor in said last mentioned circuit.

3. The combination with an electric motor and a source of current supply, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, switch devices controlled by the motor in said last mentioned circuit, said switch devices being oppositely acted on in the movement of the motor in either direction at said switch.

4. The combination with an electric motor and a source of current supply, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, adjustable switch devices, controlled by the motor, said switch devices being oppositely acted on in the movement of the motor in either direction at the switch.

5. The combination with an electric motor, a source of current supply, and operating mechanism for said motor, of an electric circuit from the source of current supply to the

field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, switch devices in said last mentioned circuit, one controlled by the operating mechanism and the other by the motor.

6. The combination with an electric motor, a source of current supply and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, switch devices in said last mentioned circuit, one controlled by the operating mechanism and the other by the motor, the switch device controlled by the motor being adjustable.

7. The combination with an electric motor, a source of current supply and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, switch device controlled by the operating mechanism in said last mentioned circuit, and switch devices controlled by the motor in said last mentioned circuit, the electrical connections being such that when the said operating mechanism switch is moved in one direction it co-acts with one of the motor controlled switches, and in the other direction coacting with the other motor controlled switch, said motor controlled switches being oppositely acted on in the movement of the motor, in either direction.

8. The combination with an electric motor, a source of current supply and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, switch device controlled by the operating mechanism in said last mentioned circuit and switch devices controlled by the motor in said last mentioned circuit, the electrical connections being such that when the said operating mechanism switch is moved in one direction it co-acts with one of the motor controlled switches, and in the other direction co-acting with the other motor controlled switch, said motor controlled switches being acted on oppositely in either direction of movement of the motor, said motor controlled switches being adjustable.

9. In an elevating apparatus, the combination with an electric motor and a source of current supply, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, a lifting cable drum, a wheel given a rotation relative to the rotation of the drum, a switch device upon said last mentioned circuit operated by said wheel.

10. In an elevating apparatus, the combination with an electric motor and a source of

current supply, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, a lifting cable drum, a wheel given a rotation relative to the rotation of the drum, a switch device operated by said wheel upon said last mentioned circuit, the switch device being adjustable.

11. In an elevating apparatus, the combination with an electric motor and a source of current supply, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, a lifting cable drum, a wheel given a rotation relative to the rotation of the drum, switch devices operated by said drum upon said last mentioned circuit, said switch devices being acted on oppositely in either direction of movement of the wheel.

12. In an elevating apparatus, the combination with an electric motor, a source of current supply, and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, a lifting cable drum, a wheel given a rotation relative to the rotation of the drum, a switch device controlled by the operating mechanism, in said last mentioned circuit, and a switch device, operated by said wheel, in said last mentioned circuit.

13. In an elevating apparatus, the combination with an electric motor, a source of current supply, and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, a lifting cable drum, a wheel given a rotation relative to the rotation of the drum, switch device in said last mentioned circuit controlled by the operating mechanism, switch devices in said last mentioned circuit operated by said wheel, said last mentioned switch devices being oppositely operated on in either direction of revolution of the wheel, the operating mechanism switch device when moved in one direction coacting with one of said wheel switch devices and in the other direction, with the other wheel switch device.

14. In an elevating apparatus, the combination with an electric motor, a source of current supply, and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, a lifting cable drum, a wheel given a rotation relative to the rotation of the drum, a switch device, operated by the controlling mechanism, in said last mentioned circuit, and a switch device operated by said

wheel, said wheel switch device being adjustable.

15. In an elevating apparatus, the combination with an electric motor, a source of current supply, and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance device, a lifting cable drum, a wheel given a rotation relative to the rotation of the drum, a switch device controlled by the operating mechanism, in said last mentioned circuit, and switch devices on said last mentioned circuit operated by said wheel, said switches being oppositely acted on by the wheel in its revolution in either direction, said wheel switch devices being adjustable.

16. In an elevating apparatus, the combination with an electric motor, a source of current supply, and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a lifting cable drum, a wheel given a rotation relative to the rotation of the drum, brushes as 8 and 9 moving with said wheel contact as 4, and contacts as 5 and 6, brush 8 being adapted in the movement of the wheel in one direction to connect contacts 4 and 5, and brush 9 in the movement of the wheel in the other direction to connect contacts 4 and 6, a brush as 7, a contact as 1 and contacts as 2 and 3, the brush 7 being adapted to be operated by the operating mechanism, and adapted in its movement in one direction to connect contacts 1 and 3 and in the other direction contacts 1 and 2, electrical connection between contacts 3 and 5, and electrical connection between contacts 2 and 6, electrical connection between the source of current supply and the field independent of the resistance device said circuit including contacts 1 and 4.

17. In an elevating apparatus, the combination with an electric motor, a source of current supply, and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a lifting cable drum, a wheel given a rotation relative to the rotation of the drum, adjustable brushes 8 and 9 moving with said wheel contact as 4, and contacts as 5 and 6, brush 8 being adapted in the movement of the wheel in one direction to connect contacts 4 and 5, and brush 9 in the movement of the wheel in the other direction to connect contacts 4 and 6, a brush as 7, a contact as 1 and contacts as 2 and 3, the brush 7 being adapted to be operated by the operating mechanism, and adapted in its movement in one direction to connect contacts 1 and 3, and in the other direction contacts 1 and 2, electrical connection between contacts 3 and 5, and electrical connection between contacts 2 and 6, electrical connection

between the source of current supply and the field independent of the resistance device said circuit including contacts 1 and 4.

18. The combination with an electric motor and a source of current supply, of a device controlled by the motor and adapted after a predetermined number of revolutions of the motor, to change the relation to each other of the strength of current passing to the armature and field independent of the operating mechanism.

19. The combination with an electric motor and a source of current supply, of a device controlled by the motor and adapted after a predetermined number of revolutions of the motor, to increase the strength of current passing to the field of the motor independent of the operating mechanism.

20. In an elevating apparatus the combination with an electric motor and a source of current supply, of mechanism adapted at a predetermined point or points in the movement of the elevating apparatus to change the relation to each other of the strength of current passing to the armature and field independent of the operating mechanism.

21. In an elevating apparatus the combination with an electric motor and a source of current supply of mechanism adapted at a predetermined point or points in the movement of the elevating apparatus to increase the strength of current passing to the field of the motor independent of the operating mechanism.

22. In an elevating apparatus the combination with an electric motor, a source of current supply and operating mechanism for said motor, of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance, a switch device in said last mentioned circuit and mechanism adapted in the movement of the elevating apparatus to operate said switch device and close the circuit to the field independent of the resistance.

23. In an elevating apparatus the combination with an electric motor, a source of current supply and operating mechanism for said motor of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance, switch devices in said last mentioned circuit, one controlled by the operating mechanism and mechanism adapted to operate the other in the movement of the elevating apparatus.

24. In an elevating apparatus the combination with an electric motor, a source of current supply and operating mechanism for said motor of an electric circuit from the source of current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance, a switch device in said last mentioned circuit and mechanism adapted at a predetermined point

or points in the movement of the elevating apparatus to operate said switch device and close the circuit to the field independent of the resistance.

- 5 25. In an elevating apparatus the combination with an electric motor, a source of current supply and operating mechanism for said motor of an electric circuit from the source of
10 current supply to the field of the motor, a resistance device in said circuit, a circuit to the field independent of the resistance, switch de-

vices in said last mentioned circuit, one controlled by the operating mechanism and mechanism adapted to operate the other at a predetermined point or points in the movement of 15 the elevating apparatus.

In testimony of which invention I have hereunto set my hand.

FRANK E. HERDMAN.

Witnesses:

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C. D. HOYT.