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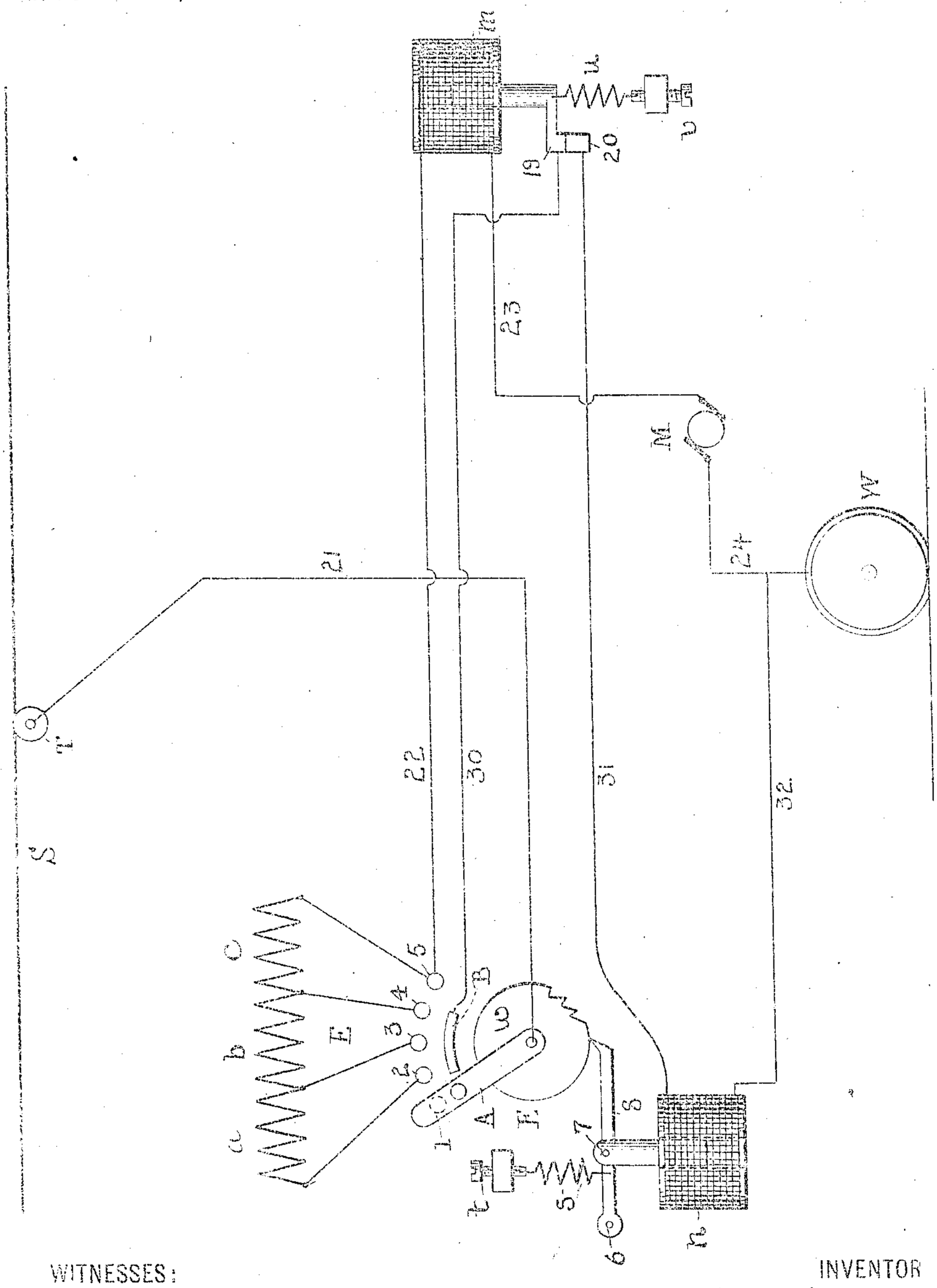
R. HUTCHISON.

CONTROLLING SWITCH FOR ELECTRIC MOTORS.

(Application filed Dec. 9, 1898.)

(No Model.)



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CONTROLLING-SWITCH FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 622,230, dated April 4, 1899.

Application filed December 9, 1893. Serial No. 698,693. (No model)

To all whom it may concern:

Be it known that I, REESE HUTCHISON, a citizen of the United States, and a resident of Mobile, in the county of Mobile and State of Alabama, have invented certain new and useful Improvements in Controlling-Switches for Electric Motors, of which the following is a specification.

My invention is especially useful in the electric propulsion of wheeled vehicles.

The object of my invention is to automatically control the switch employed to vary the strength of current in the motor-circuit and to prevent a careless or ignorant operator from injuring the motor by introducing excessive strengths of current or abruptly varying the current.

My improvement differs from any automatic locking device for similar purposes heretofore known or described in that it normally holds the switch locked, so that it cannot be changed from one contact position to another unless the predetermined safe strength of current is present. I thus obviate the possibility of turning the switch to any desired point as by the expedient of first opening the circuit at the trolley connection, moving the switch, and then closing at the trolley.

I provide a toothed ratchet fixed on the movable portion of the switch and a pivoted dog normally engaging a tooth of the ratchet. An electromagnet controls the dog. This magnet is in a normally open circuit. The circuit has two break-points, one operated by a relay adjusted to respond to a predetermined strength of current located in the main circuit. The second break-point is closed by the movement of the motor-switch during a part of its excursion and while it is desirable to maintain the automatic control.

The accompanying drawing illustrates my invention.

S is a supply-circuit connected with a source of electricity.

T is a trolley or collecting device connecting the motor-circuit on a moving vehicle with the supply S.

M is an electric motor, and W a car-wheel propelled by the motor, through which wheel the return-circuit is completed.

E is a multiple-contact motor-controlling switch, of which the well-known multiple-series car-controller is an amplified specimen or type. It employs a series of sections of artificial resistance *a b c*, connected, respectively, to a series of fixed contacts 2, 3, 4, and 5, while 1 is a dead or open contact. The movable contact of the switch is represented by the radial arm A, making contact, successively, with the fixed contacts 1 to 5. Circuit normally passes from S via T 21 22 23 to the motor M, 24, and W to the return-circuit. The strength of current in motor M is determined by the amount of artificial resistance in circuit and the counter electromotive force of the motor, which varies with its speed of rotation, as is well known.

I provide an automatic locking device normally locking and holding the switch at rest during intervals of no current and also during the flow of an excess of current, the switch being freed by a controlling electromagnet during the establishment of a predetermined intermediate safe strength of current only. A form of this locking device is shown.

w is a toothed ratchet-wheel fixed to the movable contact A of the switch E. A dog 8 is pivoted at 6. A spring *s*, having its force regulated by an adjusting-screw *t*, holds the dog 8 normally in contact or engagement with a tooth of the ratchet *w*.

n is an electromagnetic device in the form of a solenoid, with its core pivoted to dog 8 at 7. When *n* is energized, dog 8 is drawn out of engagement with wheel *w*. The coils of magnet *n* are in a shunt or branch circuit 30 31 32, in which circuit are two separate break-points controlled by the movable contact A of switch E and by an electromagnet *m*. On switch E there is a fixed contact B, arc-shaped and in extent equal to the extent of the points 2, 3, and 4 of the switch. This limits the unlocking operation of the device to the conditions existing when the switch is in danger of harmful use, for no harm can be done while A is on point 1 and circuit is open or when A is on point 5, and the only possible change would result in a reduction of current strength in the motor-circuit. The coils of magnet *m* are in the motor-circuit and, as shown, are located between the switch and the motor-coils. The core or armature of *m* is retracted by a spring *n*, having its force regulated by the adjust-

ing-screw *v*, so as to close the contact-points 19 20 during the existence of a predetermined safe strength of current, but to be overcome and permit of opening said contact-points during any greater flow or any excess of current strength beyond the predetermined amount. It will thus be seen that with an interval of no current magnet *n* is of course deënergized and dog 8 locks the ratchet. With an excess of current the circuit of magnet *n* is open at 19 20, and with a predetermined intermediate strength of current magnet *m* permits the spring *u* to close points 19 20, while current is present and available to operate magnet *n*.

The operation is as follows: Switch-arm A is upon point 1. No current flows in the motor-circuit to operate magnets *m* or *n*. Points 19 20 are closed by spring *u* and the dog 8 engages the surface of the wheel *w*. Arm A is now moved to point 2. Dog 8 locks it against further movement by engaging with the first tooth of wheel *w*. An excess of current flows in the motor-circuit. Magnet *m* draws in its core. The points 19 20 are separated. Magnet *n* can get no current, although the circuit 30 is connected to the circuit 21 by the arm A resting on B. As motor M speeds up its counter electromotive force decreases the current in the motor-circuit to the predetermined safe point, and the spring *u* closes points 19 20 against the force of magnet *m*. The circuit 30 31 32 is closed at both points. Magnet *n* draws in its core and separates dog 8 from wheel *w*. Arm A is now free to be moved to point 3, where the same action last described takes place, and the same thing occurs upon moving the arm to point 4. When the arm is moved to point 5, circuit of magnet *n* is broken between A and B, and the unlocking device is out of action. The dog 8 rides on the periphery of wheel *w*. On the reverse movement of arm A current is constantly decreased.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of an electric motor, an electric circuit, a motor-switch for varying the current strength in said circuit and means for normally locking and automatically controlling the movement of said switch.

2. The combination of an electric motor, a suitable circuit, a switch for varying the strength of current in the motor-coils, an automatic lock for said switch and an electromagnetic device to control said lock, said electromagnetic device being connected with the motor-circuit and so adjusted that upon the establishment of a predetermined strength of current the switch is released, substantially as described.

3. The combination of an electric motor, a suitable circuit therefor, a multiple-contact motor-switch for varying the strength of current in the motor-coils, an automatic lock, normally holding the switch at rest, and an electromagnetic device connected with the motor-circuit operating to release the switch upon the establishment of a predetermined strength of current only.

4. The combination with an electric motor, a circuit therefor, a multiple-contact switch to vary the strength of current in the motor, a lock to normally hold the switch in any contact position, and a magnet to operate said lock located in a branch of the motor-circuit responsive to a predetermined strength of current in said circuit.

5. The combination with an electric motor, a circuit therefor, a multiple-contact switch to vary the strength of current in the motor-coils, a lock arranged to normally engage and hold said switch, a magnet to disengage said lock located in a branch of the motor-circuit, and a magnet located in the motor-circuit operating break-points in said branch circuit.

6. The combination with an electric motor, a circuit therefor, a multiple-contact switch to vary the current strength in the motor-coils, a lock arranged to normally engage and hold said switch, a magnet to disengage said lock having its coils in a branch of the motor-circuit, a magnet operating break-points in said branch circuit having its coils in the motor-circuit and break-points in said branch circuit operated by the switch, substantially as described.

7. The combination with an electric motor, a circuit therefor, a multiple-contact switch to vary the current strength in said circuit, a lock arranged to normally engage and hold said switch, a magnet to control said lock having its coils in a branch circuit and a break-point in said branch controlled by said switch, substantially as described.

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Witnesses:
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