(No Model.) 5 Sheets—Sheet 1.

F. E. HERDMAN.

ELECTRIC ELEVATOR.

No. 492,160. Patented Feb. 21, 1893.

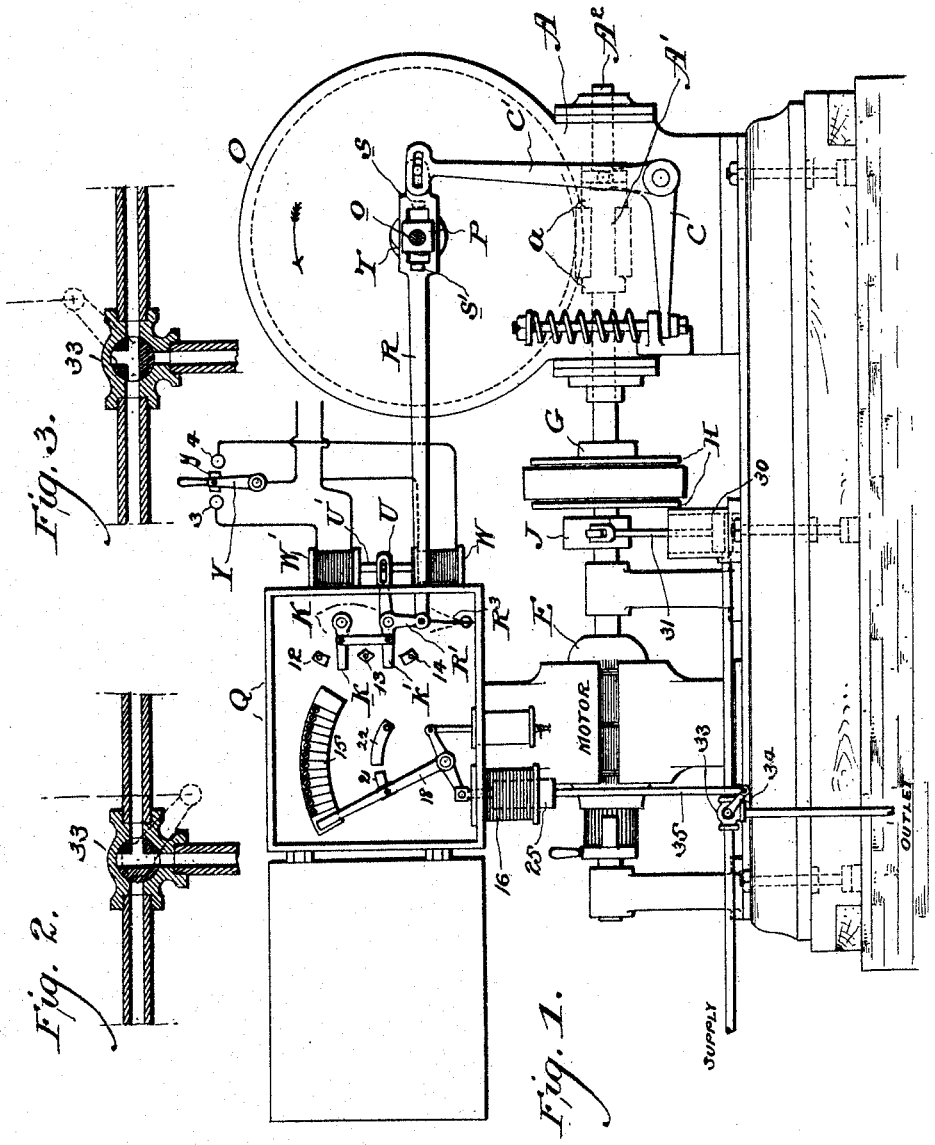


Fig. 3.

Fig. 2.

Fig. 1.

WITNESSES:
David S. Williams.
Frank A. Brosee

INVENTOR:
Frank E. Herdman
by his atty
G. F. Hendricks

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 2.

F. E. HERDMAN.

ELECTRIC ELEVATOR.

No. 492,160. Patented Feb. 21, 1893.

Fig. 4.

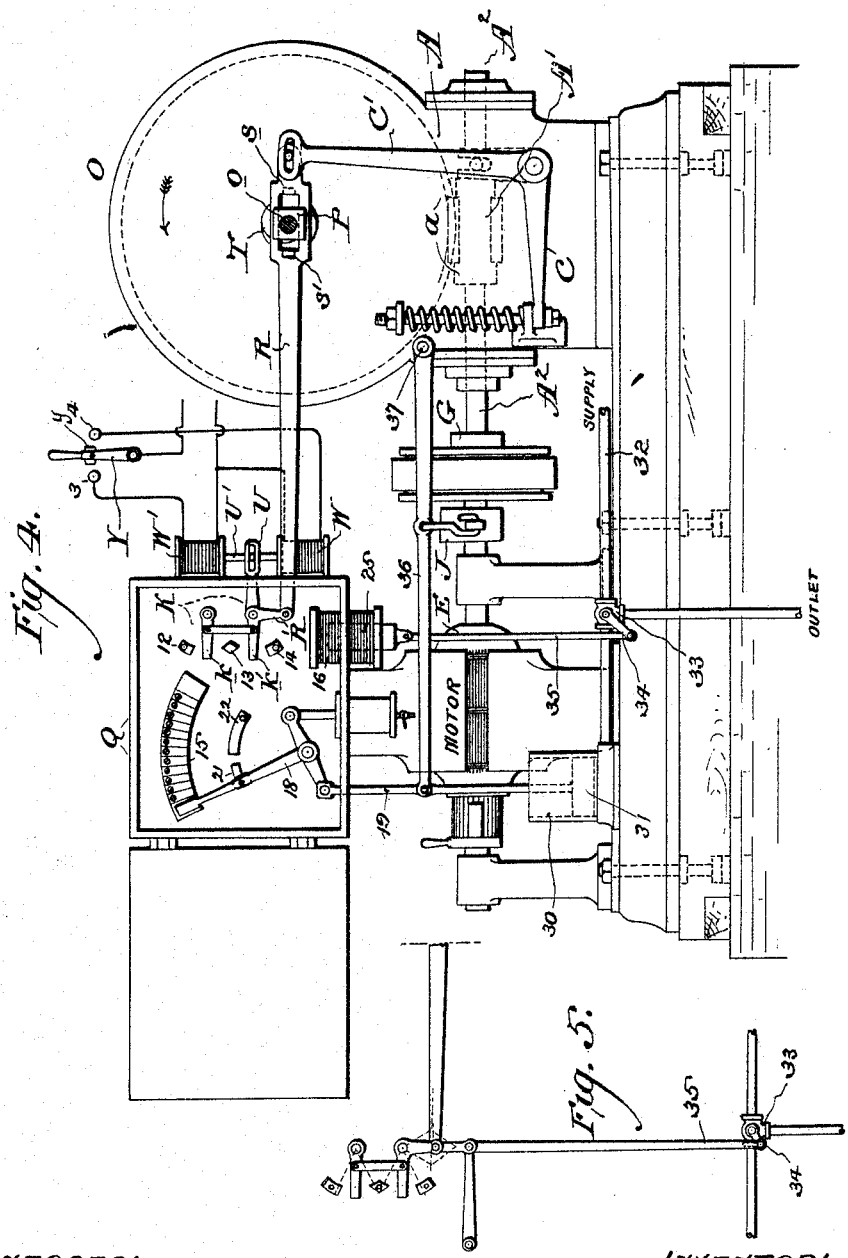


Fig. 5.

WITNESSES:
David D. Williams
Frank J. Brosser

INVENTOR:
Frank E. Herdman
by his atty
G. H. Harding

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

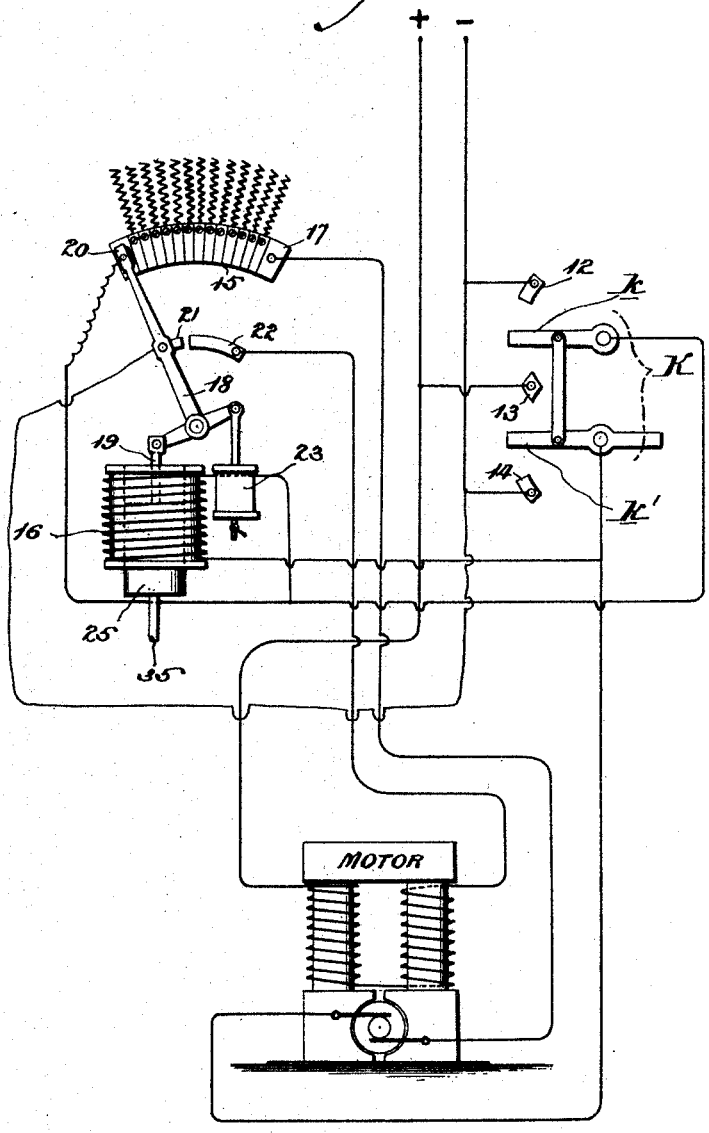
(No Model.) 5 Sheets—Sheet 3.

F. E. HERDMAN.

ELECTRIC ELEVATOR.

No. 492,160. Patented Feb. 21, 1893.

Fig. 6.



WITNESSES:
David S. Williamson
Frank A. Brosseau

INVENTOR:
Frank E. Herdman
by his Atty
G. H. Harding

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

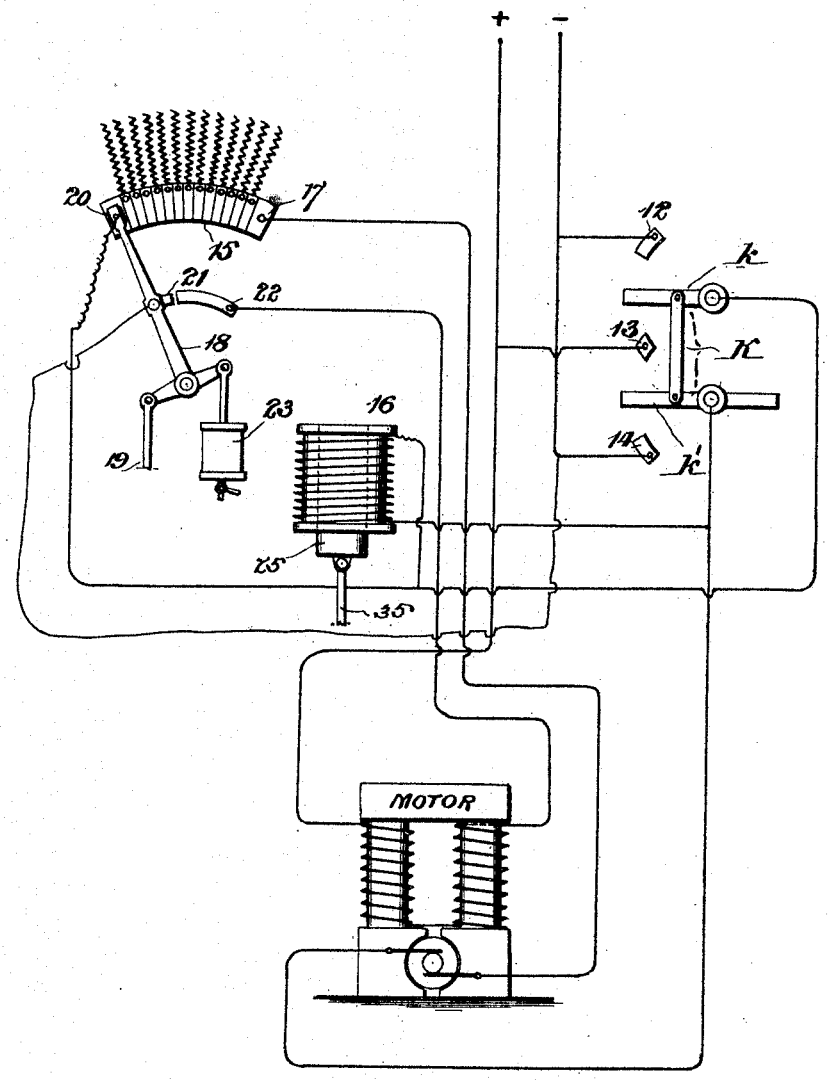
(No Model.) 5 Sheets—Sheet 4.

F. E. HERDMAN.

ELECTRIC ELEVATOR.

No. 492,160. Patented Feb. 21, 1893.

Fig. 7.



WITNESSES:
David S. Williams,
Frank S. Busser

INVENTOR:
Frank E. Herdman
by his atty.
P. Pleading

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 5.

F. E. HERDMAN.

ELECTRIC ELEVATOR.

No. 492,160. Patented Feb. 21, 1893.

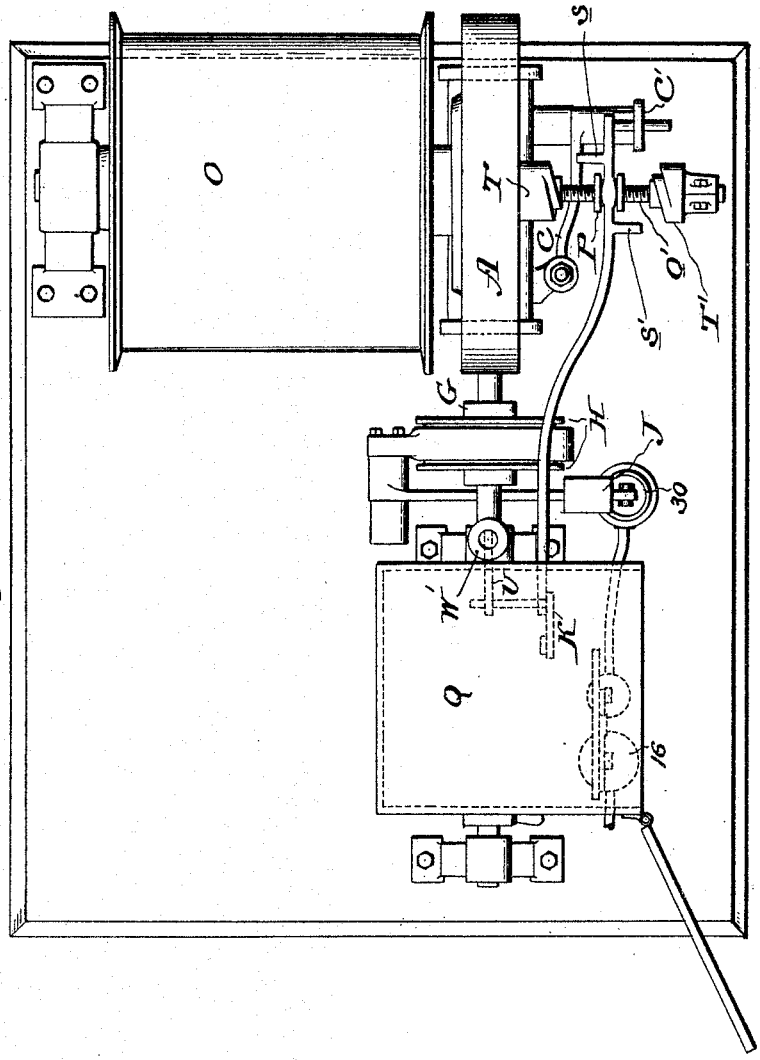


Fig. 8.

WITNESSES:
David S. Williams.
Frank S. Bruser

INVENTOR:
Frank E. Herdman
by his atty
G. G. Harding

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRANK E. HERDMAN, OF INDIANAPOLIS, INDIANA.

ELECTRIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 492,160, dated February 21, 1893.

Application filed March 8, 1892. Serial No. 424,140. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. HERDMAN, a citizen of the United States, residing at Indianapolis, county of Marion, and State of Indiana, have invented a new and useful Improvement in Elevators, 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.

My improvement has especial application to those elevators the power for lifting which is electricity, and to that class of elevators where the electricity is conveyed to the motor through resistances, and has for one of its objects mechanism to cause the brush to travel over the resistances, and has, for another object, mechanism to cause the brake to be automatically put in action when the current is cut off and to be moved out of action when the current is admitted.

In the drawings—Figure 1 is a side elevation, partially in section of operating mechanism. Figs. 2 and 3 are sectional views of the valve in different positions. Fig. 4 is a side elevation partially in section of operating mechanism, with modified form of device. Fig. 5 is a detail view of modified form of operating device. Fig. 6 is an enlarged detail view of switch and electric devices and motor of Fig. 1. Fig. 7 is an enlarged detail view of switch and electric devices and motor of Fig. 4. Fig. 8. is a plan view of Fig. 1.

A is the worm casing containing the worm and worm gear A′.

A^2 is the worm shaft and *a* the yoke.

E is the armature, whose shaft is coupled directly with the worm shaft A^2 by the coupling G, which has its rim extended into the form of a brake-wheel H, on whose surface acts an ordinary friction-brake, held down by a weight J. On the top of the motor is placed the resistance box Q.

K is a snap switch, having brushes *k*, *k*′.

O is the drum, *o* its shaft. On the end of this drum-shaft is a long screw *o*′, shown in plan. On this screw is placed the nut *p*, which is connected in a slot in the connecting rod R, so that said nut cannot revolve, but so that the connecting rod R is adapted to have a motion to-and-fro on the same. On each side of the nut, and fastened to the connecting rod R, are the fingers *s*, *s*′, one on one side and one on the other. The shoulder where the screw connects with the drum-shaft is made in a spiral T, of the same longitudinal pitch as the pitch of the screw, but so that anything riding on it will be carried to the outer surface of the shoulder. To the other end of the screw *o*′ is clamped a nut, with a similar spiral shoulder T′, so that it can be placed at any desired distance from the shoulder T.

The connecting rod R is connected by the lever R′ to the switch K. If the switch is thrown upward, the connecting rod R would necessarily be thrown to the left, which would carry the finger *s* on the inside, to the left. With the switch thrown in this direction, the drum would move in the direction of the arrow, as shown in Fig. 1, which would necessarily cause the revolving of the screw *o*′, and the throwing of the nut P in the direction of the drum-shaft, when the nut carries the connecting rod R in that direction, so that the finger *s* rides on the spiral T, and it is pushed back, moving the connecting rod to the right and throwing the switch to the center and cutting the current off of the elevator, thereby stopping it. If the switch K is thrown in the opposite direction, or downward, the drum moves in the direction opposite to the arrow, and the nut P travels in the direction opposite to that before described, on the screw, and comes in contact with the spiral T′, clamped on the outer end of the screw *o*′. When the finger *s*′ reaches the spiral, it causes the connecting rod to move in the direction opposite to that before described, again bringing the switch to the center, and cutting the current off. This described arrangement forms an automatic stop, so that the elevator is automatically stopped, independently of the operator, at the end of its travel. By the movement of the nut T, clamped on the end of the screw *o*′, either inwardly or outwardly, the travel of the elevator is decreased or increased.

The switch K is controlled from the car in the following manner: The switch K is connected by the slotted arm U with a core U′ common to two electro-magnets W, W′, the switch being held in its central position by

the spring R^3. Y is a lever in the car, having a brush *y* connected with it. This lever is in electrical connection with one of the poles of the current supply, and the other pole of the battery is connected by a loop circuit with both of the electro-magnets W and W'. 3 and 4 are two contact points having electrical connection respectively with the magnets W' and W. When the lever is moved in contact with the contact point 3, so that the current passes from the source of current supply through the contact point 3 to the magnet W', said magnet is energized and draws the core upward, drawing with it the connecting arm U and bringing the switch in contact with the contact points 13 and 14. When the lever is moved in the reverse direction, so that it will be in contact with contact point 4, the electro-magnet W is energized, drawing down the arm U and bringing the switch in contact with contact points 12 and 13. 12 and 14 are two contact points in electrical connection with the negative pole of the battery, and 13 is a contact point in electrical connection with the positive pole of the battery. The positive pole of the battery is in direct electrical connection with the field of the motor; the brush *k* is in electrical connection with the solenoid 16 and with the brush 20 on the arm 18. 15 are the resistances; 17 a contact in electrical connection with the armature; 21 a brush on the arm 18, in connection with the negative pole of the battery and 22 a contact in electrical connection with the field of the motor and 23 is a dash pot connected to the arm 18. The brush *k'* is in electrical connection with the armature of the motor and with the solenoid 16. 25 is the solenoid core. 30 is a cylinder having the piston 31. 32 is a supply-pipe for said cylinder. 33 is a valve on said pipe operated by the lever 34. 35 is a rod connected to the lever 34.

In Figs. 1 and 4, the rod 35 is connected to the core 25 of the solenoid 16, and in Fig. 5 the rod 35 is connected to the lever R'; so that, in either case, if the switch be operated, the valve is operated. In the first case, the solenoid is rendered active, which lifts the rod 35, opening the valve; and in the second case, operating the switch itself operates the valve. In either case, operating the valve admits the liquid which moves the piston.

In Fig. 1, the piston is connected directly to the brake-weight, so that when the switch operates, the weight is relieved from the brake, releasing the brake; and when the supply liquid is shut off, the piston falls, bringing the weight again into action and putting on the brake.

In Fig. 4, the piston not only operates the brake, but also operates the lever 18, carrying the brush 20 so that it travels over the resistances 15. In this case the weight is connected to the lever 36, pivoted at 37, which in turn is connected to the rod 19; so that when the piston is rendered active, the brake is released and the arm 18 carried over the resistances. In the case such as is illustrated in Fig. 5, the solenoid may be dispensed with entirely.

I do not intend to limit myself to any specific method of operating the switch, nor to any specific character of switch.

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

1. In combination with an electric motor, an electric motor controlling switch, a brake wheel, a brake upon said wheel, a cylinder, a piston in said cylinder, a supply pipe to said cylinder, a valve on said pipe and intermediate connection between said valve and the switch and intermediate connection between said piston and the brake.

2. In combination with an electric motor, a source of current supply, a resistance interposed between armature of said motor and source of current supply, a lever carrying a brush and adapted to travel over said resistance, an electric motor controlling switch, a cylinder a piston in said cylinder a supply pipe to said cylinder, a valve on said pipe, and intermediate connection between said switch and said valve, and intermediate connection between said piston and the said lever.

3. In combination with an electric motor, a source of current supply, a solenoid, an electric motor controlling switch, electrical connection between said source of current supply and said switch and electrical connection between said switch and said solenoid, a brake wheel, a brake upon said wheel, a cylinder a piston, in said cylinder connection between said piston and said brake, a supply pipe for said cylinder, a valve on said pipe, and connection between said valve and the solenoid core.

4. In combination with an electric motor, a source of current supply, a resistance interposed between said source of current supply and the armature of motor, a lever carrying a brush and adapted to travel over said resistance, a solenoid, an electric motor controlling switch, electric connection between said switch and the solenoid, a cylinder a piston in said cylinder, connection between said piston and said lever, a supply pipe for said cylinder, a valve on said pipe, and connection between said valve and the solenoid core.

5. In combination with an electric motor, a source of current supply, resistances interposed between said motor and the source of current supply, a lever carrying a brush and adapted to travel over said resistance, an electric motor controlling switch, a brake wheel, a brake on said wheel a cylinder, a piston in said cylinder, connection between said piston and brake and between said piston and lever, a supply pipe for said cylinder, a valve on said pipe and connection between said valve and said switch.

6. In combination with an electric motor, a source of current supply, a solenoid, an elec-

tric motor controlling switch, electrical connection between said switch and solenoid, resistances interposed between the source of current supply and the armature of the motor, a lever carrying a brush and adapted to travel over said resistances, a brake wheel, a brake on said wheel, a cylinder, a piston in said cylinder, connection between said piston and said brake, and connection between said piston and said lever, a supply pipe for said cylinder, a valve on said pipe, and connection between said valve and the solenoid core.

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

FRANK E. HERDMAN.

Witnesses:
W. L. ROBINSON,
G. E. SCHMITULAND.