(No Model.)

F. B. COREY.

ELECTRICALLY OPERATED ELEVATOR.

No. 551,757. Patented Dec. 24, 1895.

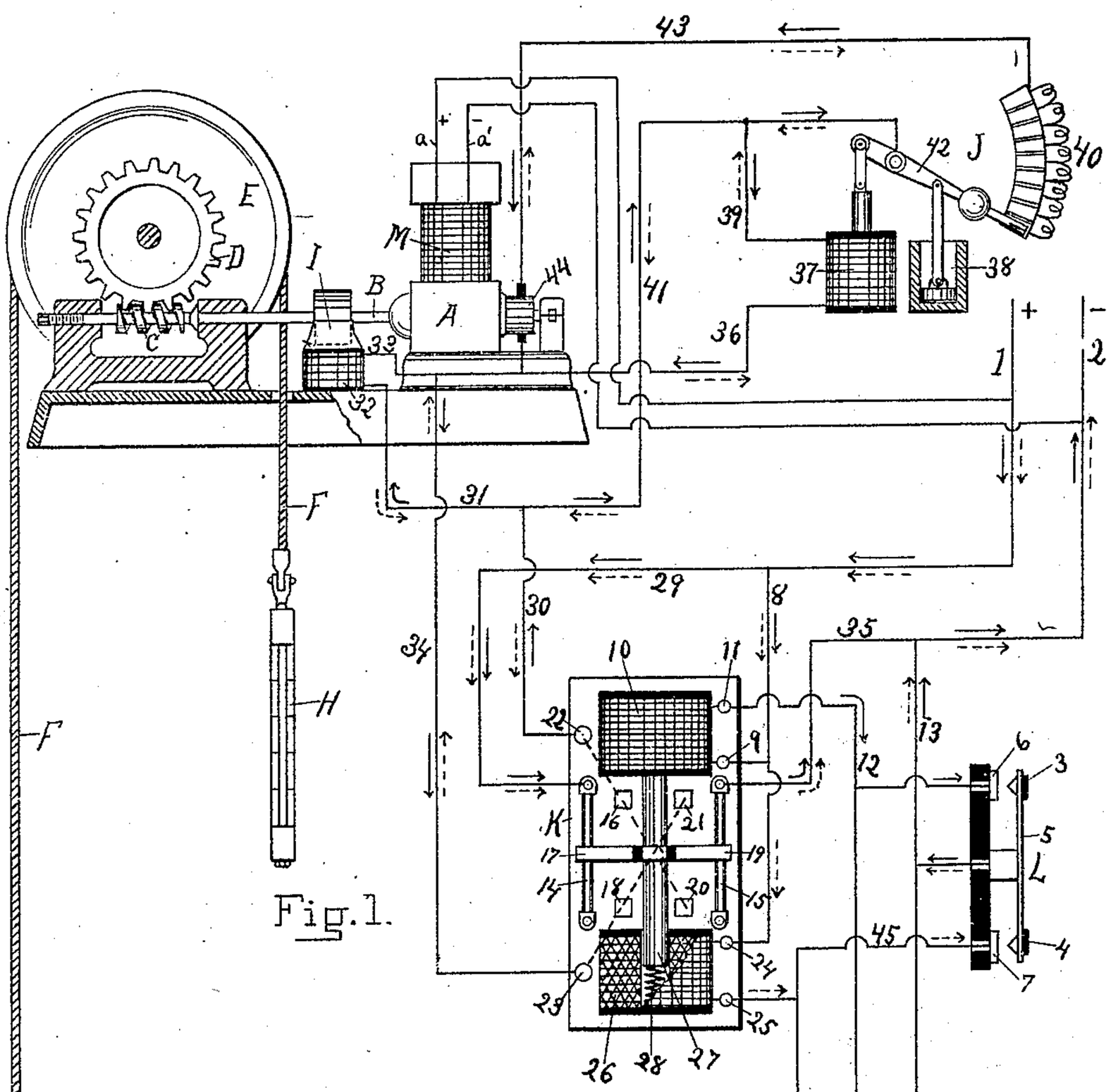


Fig. 1.

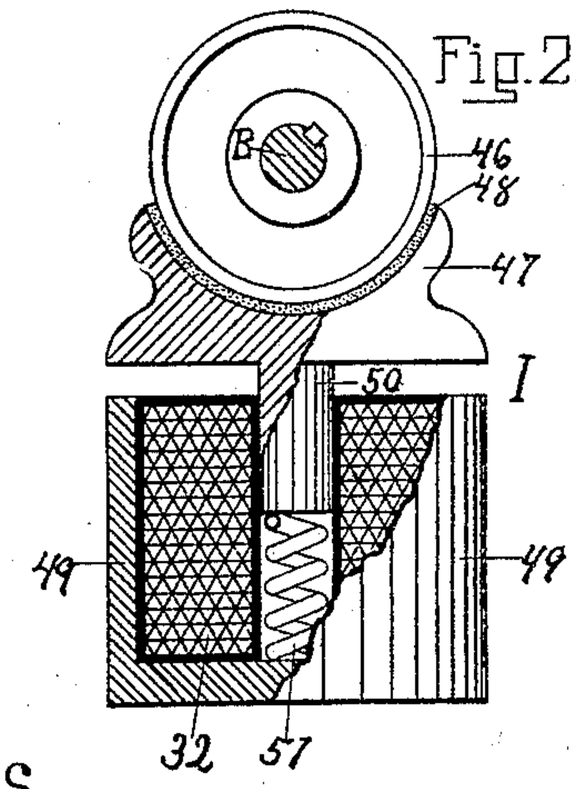
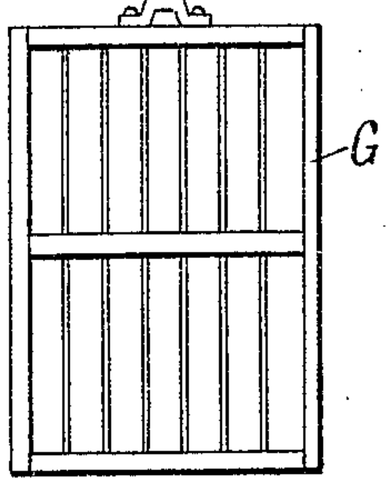
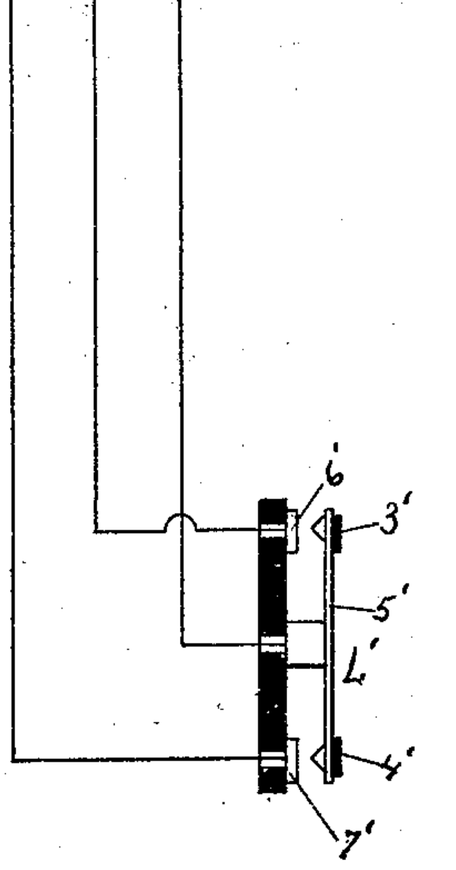


Fig. 2.





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ELECTRICALLY-OPERATED ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 551,757, dated December 24, 1895.

Application filed May 13, 1895. Serial No. 549,075. (No model.)

To all whom it may concern:

Be it known that I, FRED BRAINARD COREY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Electrically-Operated Elevators, of which the following is a specification.

My invention relates to electrically-operated elevators, and especially to such elevators as may be controlled by switches or push-buttons on the car or at the floors between which the car is to run.

The objects of this invention are to provide simple means whereby the movement of the elevator may be perfectly controlled from several points, either within or without the car, by means of simple switches or push-buttons, and to secure this control in a safe and reliable manner.

The invention is applicable to all types of electric hoists, elevators, dumb-waiters and similar machines operated by shunt-wound motors on constant-potential circuits.

My invention consists of an electric hoisting or elevator machine driven by a shunt-wound motor, an automatic rheostat in the armature-circuit of said motor, an electrically-operated brake to stop and hold the machine, an electrically-operated switch controlling the armature and brake circuits, push-buttons or contact-switches located at convenient points in the car or at the landings for operating the said main switch, and a system of connecting-circuits such as will secure the desired action of the various apparatus.

In the accompanying drawings, which illustrate the invention, are shown the switches, circuits, and devices embodying my improvements.

Figure 1 is a diagrammatic view of my invention. Fig. 2 is a view, partially in section, of the electric brake and the wheel on which it acts.

In Fig. 1 is shown somewhat conventionally (and partially in section) the elevator-machine, of which A represents the electric motor, which, through the shaft B, the worm C and the worm-gear D, rotates the sheave or drum E, to which is attached by means of the rope or cable F the car or other load G and the counterweight H.

I represents the electric brake by means of which the car or load is held in any desired position when the motor is not in operation and by which the shaft B is released at the instant that current is admitted to the armature-circuit of the motor.

J represents any approved form of automatic rheostat or starting resistance for the protection of the armature of the motor A. The special form of rheostat here shown forms no part of my invention.

K is the main switch by the action of which the motor A is started, stopped and reversed.

L and L′ are push-buttons or contact-switches controlling the action of the main switch K.

The various circuits connecting the apparatus are fully shown.

It is to be understood that as many push-buttons or contact-switches L as is desired may be connected in multiple with those shown, and one of these may be placed upon the car G and connected to the energizing-circuit by means of a flexible cable.

In the drawings the field-wires *a a′* of the motor A are shown connected to the main line 1 2, which is the preferable arrangement when the elevator is to run almost continuously, but not otherwise, as such constant connection would be wasteful of current.

In practice the economy of operation is enhanced by so connecting the field-wires *a a′* to the main switch that the circuit is broken whenever the switch is opened, and it will be found advisable to so place the contact-points that the field-circuit is completed before the armature-circuit and broken after the rupture of the armature-circuit. This arrangement however forms no part of my invention and is therefore omitted from the drawings in order to prevent a further complication of circuits.

In Fig. 2 is shown more in detail the electric brake which appears at I in Fig. 1. My preferred method is to place the elevator machinery at the top of the shaft or elevator-well and to replace the drum heretofore ordinarily used by a sheave or wheel, over which is run a rope or cable to which is attached the car at one end and the counterweight at the other. By so doing the greater part of the rope ordinarily used is saved and at the same time I

can secure all the advantages of overcounterweighting. It is preferable to make the counterweight of such size that its weight shall equal the weight of the car plus the average load to be carried. With this arrangement whenever the load on the car is exactly of this assumed average weight, all the work to be performed by the motor is that of overcoming friction, whether the load is to be raised or lowered, and at other loads the work done is either in hoisting the car and its load or in hoisting the counterweight, according as the load on the car is greater or less than the assumed average load, and the weight thus hoisted is the difference between the actual load and the average assumed.

The construction in detail and the operation of my invention may be together described as follows:

The push-buttons L L′, &c., are in multiple arrangement as shown and located at points from which it is desirable to operate the machine. They are best arranged with the contact devices or buttons of each switch one above the other, the upper one for raising the car or load and the lower one for lowering. The construction of such contact devices L as I propose to use is plainly indicated by the drawings.

The main switch K is arranged as follows: To the insulating-base are attached the metal rods 14 and 15, to which wires may be connected. Sliding upon these rods is a bar 17 19 composed of metal pieces separated by some insulating substance, such as vulcanized fiber or similar insulator. These metallic pieces are adapted to engage in clips 16 21 and 18 20, according as the bar 17 19 is at the upper or lower end of the rods 14 15, respectively. These clips are connected in pairs by joining those diagonally opposite, and each pair is connected to one of the binding-posts 22 23, all of which connections are indicated in the drawings by dotted or broken lines. To the center of the sliding bar 17 19 is attached the iron core 27 of such length as to enter the solenoids 10 and 26, the latter of which is shown partially in section. In the interior of each solenoid is a spring, one of which is shown at 28, which tends to keep the core 27 and the bar 17 19 in the central position as shown.

The construction of the hoisting-machine is apparent from the drawings, except the brake I, for which I refer to Fig. 2, which is partially in section.

B is the shaft of the electric motor A, to which is attached the brake-wheel 46, which is partially surrounded by the brake-shoe 47, to the face of which is attached a piece 48 of leather or similar substance to give the necessary friction. Projecting from the bottom of the shoe 47 is the preferably-cylindrical piece 50 fitting loosely into the interior of the magnetizing coil or solenoid 32, which is in turn inclosed in the iron case or box 49, thus forming with the piece 47 an iron-clad magnet and its armature, differing from the ordinary iron-clad magnet only in the fact that the core is attached to the armature instead of to the case. Beneath the core 50 is a spring 51 tending to force the shoe 47 against the wheel 46. This spring is best made of steel, so as to help to decrease the reluctance of the magnet. The coil 32 is connected into circuit with the other apparatus, as shown in Fig. 1.

In Fig. 1 the direction of the current in the various circuits is shown by the arrows, those in full lines indicating the direction of the current for upward motion, and those in dotted or broken lines indicating the direction of the current for downward motion. With the apparatus in the position shown, the motor is stationary and no current is flowing in the various circuits. The positive (+) supply-wire 1 and the negative (—) supply-wire 2 are as indicated.

Now suppose that it is desired to raise the car or other load G. This is effected as follows: The button or contact-piece 3 is caused to make contact with its corresponding piece 6 of the switch L. Current will then flow from the positive (+) supply-wire 1 through the conductor 8 to the binding-post 9 of the main switch K and thence through the magnetizing coil or solenoid 10 to the binding-post 11, from which it will flow through the conductor 12 to the contact 6 of the switch L. This contact 6 being now in connection with the contact 3 which is attached to the spring 5, the current will flow through the spring-piece 5 and thence by way of the return-conductor 13 to the negative (—) supply-wire 2. The solenoid 10, becoming energized, will draw the core 27 and the bar 17 19 upward, and thus cause contact between the conducting-pieces 17 and 19 and the clips 16 and 21 respectively. The action of the current in the various circuits will then be as follows: From the positive (+) supply-wire 1 the current will flow through the conductor 29 to the rod 14 of the main switch K. From the rod 14 it will flow through the conducting-piece 17 and the clip 16 to the binding-post 22. From thence it will flow through the conductor 30, and, dividing, one part flows through the conductor 31 to the energizing-coil 32 of the brake I and returns to the main switch K by the conductors 33 34, thus drawing the brake-shoe 47 downward and releasing the shaft B, while the other branch of the current flows through the conductor 41 to the arm 42 of the rheostat J, and thence through the resistance 40 and the conductor 43 to the armature 44 of the motor A, returning to the main switch K by the conductor 34, which is attached to the binding-post 23. This post 23 being connected to the clip 21, the current will flow to the conducting-piece 19 and the rod 15, from which it returns by the conductor 35 to the negative (—) supply-wire 2. The actuating-solenoid 37 of the automatic rheostat J is connected by the conductors 36 and 39 to either side of the main circuit, as shown. The current

flowing through the solenoid will depend upon the resistance of the solenoid and the voltage of the line, and its action will begin immediately when the main switch is closed. When the load G has reached the desired height the button 3 is released and the spring-piece 5 breaks the circuit between itself and the contact 6, thereby de-energizing the coil 10 and allowing the spring in its interior to force the core 27 and the bar 17 19 to its central position, as shown, thus breaking the main circuit and stopping the motor. At the same time current is cut off from the brake-coil 32 and the spring 51 forces the shoe 47 against the brake-wheel 46, firmly holding the shaft B and preventing further revolution of the screw C. In case it is now wished to lower the car or load G I may press the lower button 4 of the switch L and thus energize the lower coil 26 of the main switch K, so completing the circuits of the various parts of the apparatus. The direction of the current in each conductor for this direction of motion is indicated by the arrows in dotted or broken lines, and it will be noticed that the current through the armature 44 of the motor A is now in the opposite direction, causing an opposite rotation of the shaft B and thus causing the sheave or drum E and so the car or load G to travel in the opposite direction, when it may be stopped as desired by releasing the button 4.

As the switches L L′, &c., are all to be in parallel arrangement with each other, it will be seen that the action of the apparatus is the same from whichever switch the machine is controlled. When the motor A is in operation in either direction and one of the buttons of the system is depressed, if one of the buttons connected with the other side of the switch is depressed there would be no interference with the operation of the motor, the only effect being the charging of both coils of the main switch K and the first coil charged having attracted the iron core toward it. The last coil to be charged has less attractive effect and therefore does not interfere with the action of the first coil charged. The core 27 is made to fit closely into the interior of the coils 10 26, so as to form an air-cushion, thus preventing a rapid movement of the core 27 in either direction. This is necessary for the protection of the motor A in case one button is released while one connected with the other switch-coil is depressed.

Having described the operation of and the results secured by my invention, I declare that what I claim is—

1. In an electric hoisting mechanism, the combination, with a shunt wound motor, of an electro-magnetic switch for controlling the armature current of said motor, two solenoids in multiple arrangement for actuating said switch, a plurality of double push-buttons or contact switches in multiple arrangement, adapted to close either solenoid circuit, the said electro-magnetic switch being arranged to open when the said push-buttons are released, and a system of connecting circuits, substantially as shown and described, for the purposes set forth.

2. In an electric hoisting mechanism, the combination, with a shunt wound motor and a starting rheostat in series with the armature of said motor, of an electro-magnetic switch for controlling the armature current of said motor, two solenoids in multiple arrangement for actuating said switch, an electric brake connected in shunt around the motor armature and rheostat, a plurality of double push-buttons or contact switches in multiple arrangement, adapted to close either solenoid circuit, the said electro-magnetic switch being arranged to open when the said push-buttons are released, and a system of connecting circuits, substantially as shown and described, for the purpose set forth.

3. In an electric hoisting mechanism, the combination with a shunt wound motor, of an electro-magnetic switch for controlling the armature current of said motor, two solenoids in multiple arrangement for actuating said switch, an automatic rheostat in the armature circuit of said motor, an electro-magnetic brake connected in shunt around the motor armature and rheostat, the actuating magnet coil of said rheostat being connected in shunt with the magnetizing coil of said brake, and a plurality of double push-buttons or contact switches in multiple arrangement, adapted to close either solenoid circuit of the main switch, the said electro-magnetic switch being arranged to open when the said push-buttons are released, and a system of connecting circuits, substantially as shown and described, for the purpose set forth.

4. An electro-magnetic brake consisting of an iron box or case inclosing a coil or solenoid, a brake-shoe shaped to form a cover to the said box or case, a projection on the said brake-shoe adapted to form the core of the said solenoid, and a spring in the interior of the said solenoid between the said core and the said iron case or box, substantially as and for the purpose set forth.

5. In an electro-magnetic switch, the combination, with two actuating solenoids, of an iron core having a reciprocatory movement between the said solenoids, two conducting rods parallel to the movement of said core, an insulating bar or piece attached to said core, the said insulating piece carrying two metallic contact-pieces, each of said contact-pieces being in connection with one of the said conducting rods, and conducting clips adapted to engage said contact-pieces, substantially as set forth.

6. In an electro-magnetic switch, the combination, with two actuating solenoids, of an iron core having a reciprocatory movement between the said solenoids, two conducting rods parallel to the movement of said core, an insulating bar or piece attached to said core, the said insulating piece carrying two metallic contact-pieces, each of said contact-pieces

being in connection with one of the said conducting rods, conducting clips adapted to engage said contact pieces, and a spring or springs connected to the said core adapted to bring the said insulating bar or piece to its central position whenever the solenoid circuits are broken, substantially as set forth.

7. In an electro-magnetic switch, the combination, with two actuating solenoids, of an iron core having a reciprocatory movement between the said solenoids, the said core fitting into the said solenoids in such manner as to form an air-cushion to retard its movement, two conducting rods parallel to the movement of said core, an insulating bar or piece attached to said core, the said insulating piece carrying two metallic contact-pieces, each of said contact-pieces being in connection with one of the said conducting rods, conducting clips adapted to engage said contact-pieces, and a spring or springs connected to the said core adapted to bring the said insulating bar or piece to its central position whenever the solenoid circuits are broken, substantially as set forth.

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