No. 859,163. PATENTED JULY 2, 1907

P. WRIGHT.

CONTROLLING AND BRAKING DEVICE FOR ELECTRIC ELEVATORS.

APPLICATION FILED JAN. 19, 1905.

2 SHEETS—SHEET 1.

Fig. 1a.

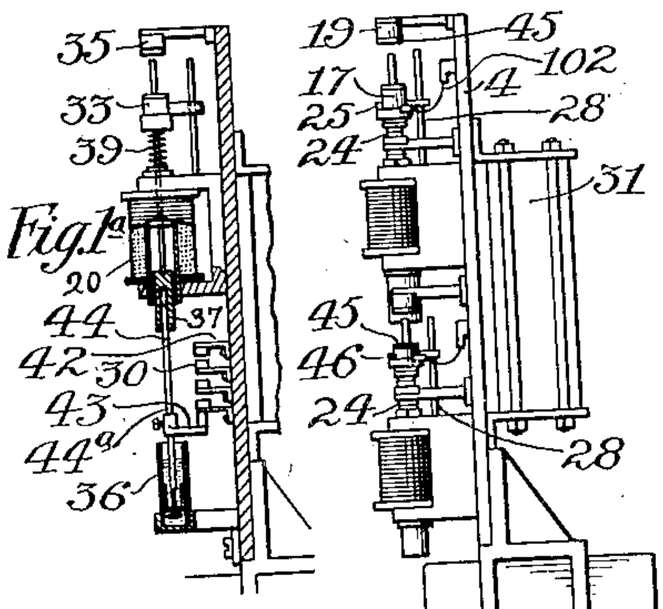


Fig. 1.

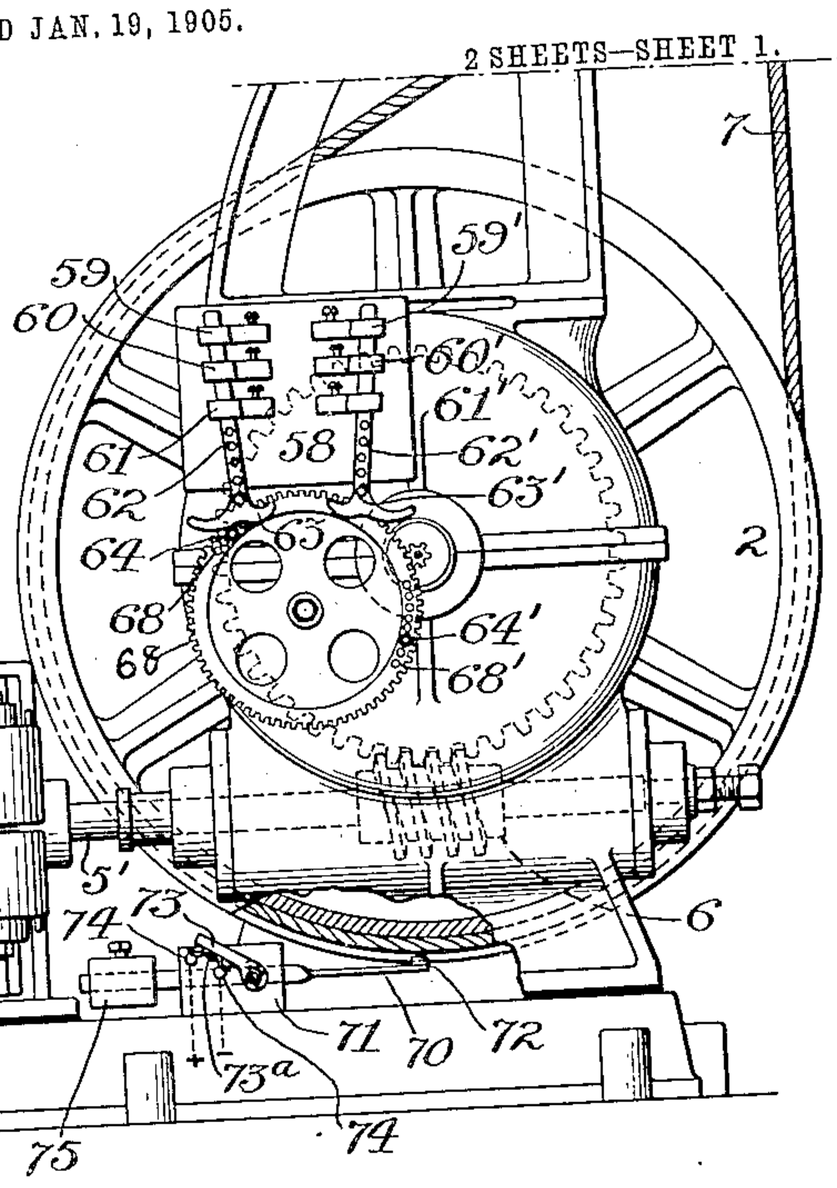


Fig. 2.

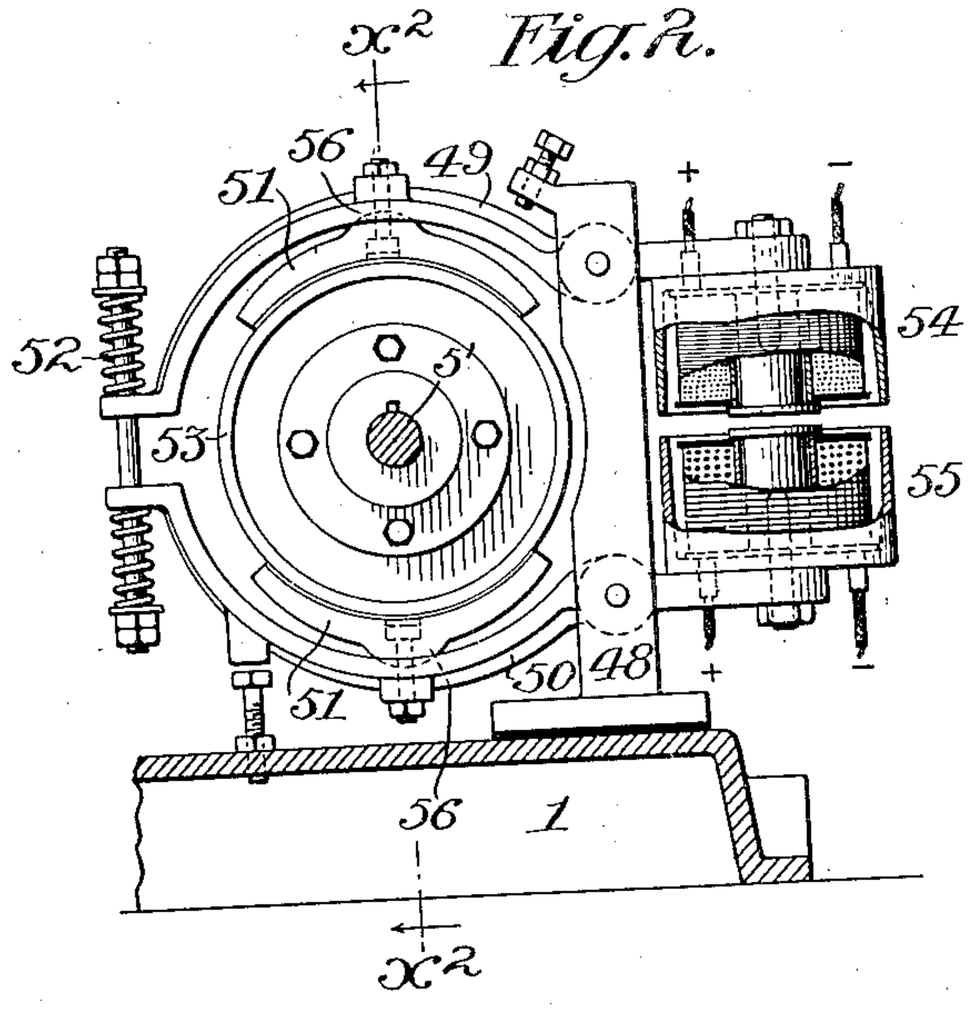
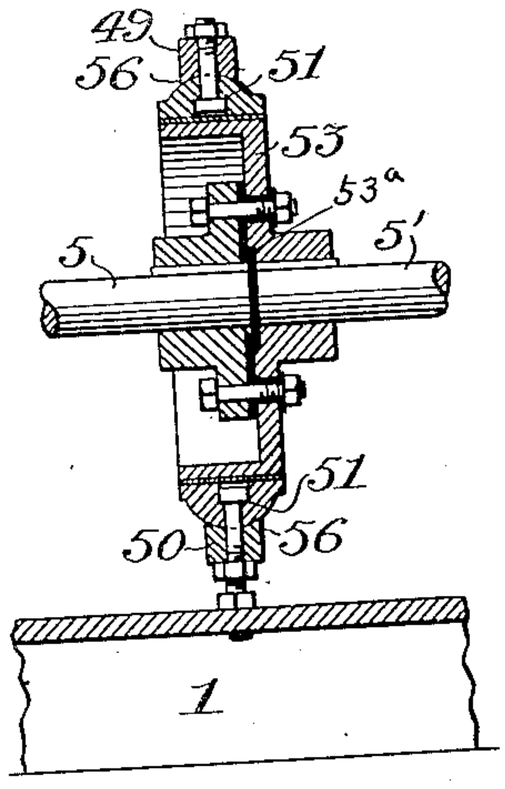


Fig. 3.



Witnesses:-
Frank L. A. Graham.
A. P. Knight

Inventor;
Parvin Wright.
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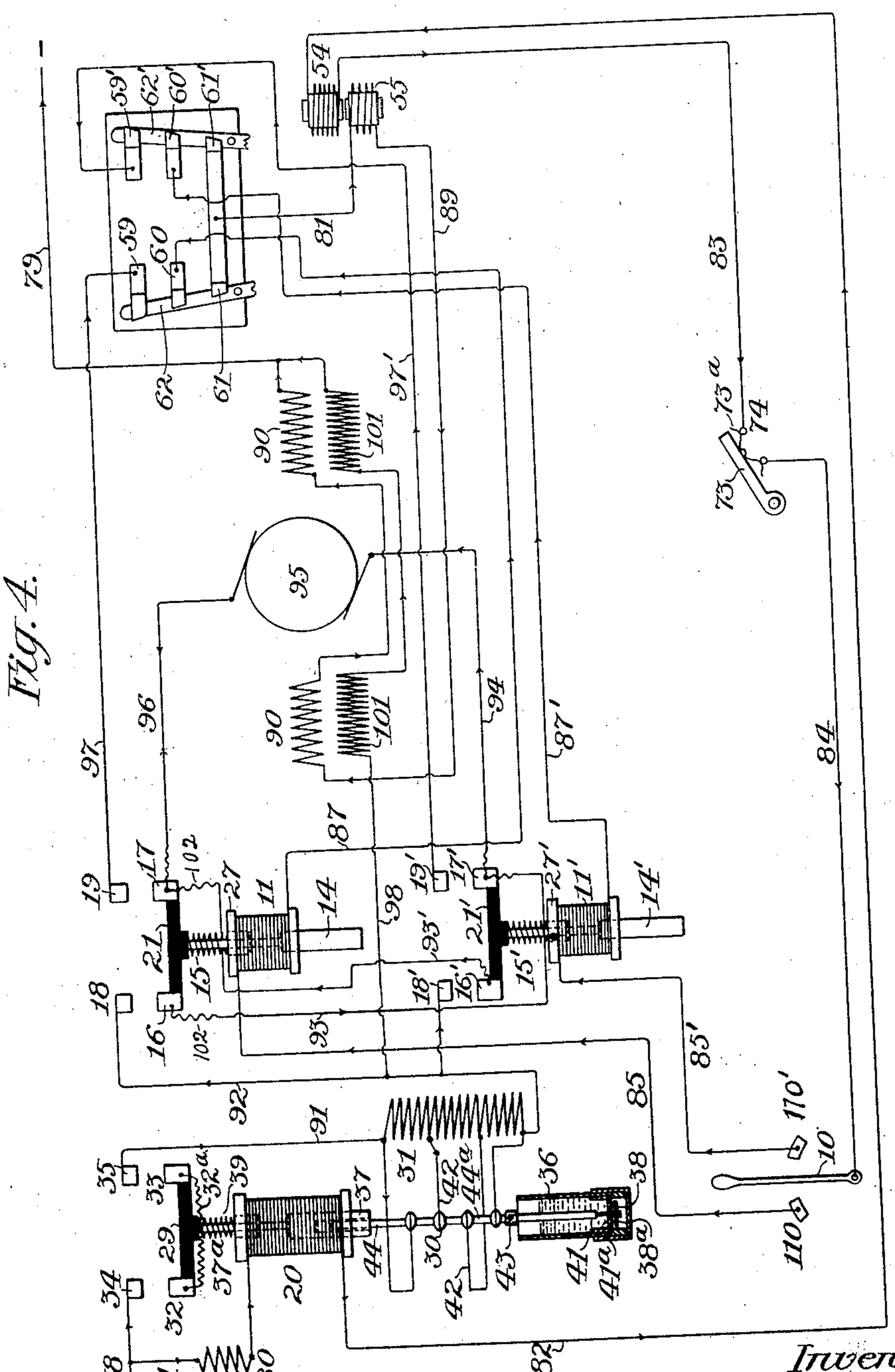
2 SHEETS—SHEET 2.

Fig. 4.



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UNITED STATES PATENT OFFICE.

PARVIN WRIGHT, OF LOS ANGELES, CALIFORNIA.

CONTROLLING AND BRAKING DEVICE FOR ELECTRIC ELEVATORS.

No. 859,163. Specification of Letters Patent. Patented July 2, 1907.

Application filed January 19, 1906. Serial No. 241,743.

To all whom it may concern:

Be it known that I, PARVIN WRIGHT, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented certain new and useful Improvements in Controlling and Braking Devices for Electric Elevators, of which the following is a specification.

This invention relates to means for controlling the operation of electric elevators and particularly means for automatically arresting the movement of the elevator when it reaches the upper or lower limits of travel, and means for automatically arresting the movement of the elevator on occurrence of a slack cable due to the car or cage sticking in the shaft.

The accompanying drawings illustrate the invention:

Figure 1 is a side elevation of the elevator operating apparatus. Fig. 1ª is a vertical section of the rheostatic controlling device. Fig. 2 is a side elevation of the brake in section. Fig. 3 is a vertical section on line X^2—X^2 in Fig. 2. Fig. 4 is a diagram of a circuit showing the various controlling, operating and braking devices.

1 designates a suitable base or frame on which are mounted the cable winding drum 2, the electric motor 3 and the electromagnetic controlling devices mounted on a case or board 4. The cable drum 2 is operated from the shaft 5 of the motor 3 in any suitable manner, for example by worm gearing indicated at 6, and the cable 7 passes over and around said drum and under the guide sheave in the usual manner.

9 designates a brake device operating on the drum shaft 5′, said brake device operating automatically to arrest the movement of the elevator when the motor is not in operation.

The motor 3 may be of any usual or suitable type, but is preferably compound wound. Said motor is controlled, to start and stop the elevator, by means of a controller or reversing switch in the elevator cab, said controller switch, indicated at 10 in Fig. 4, being a double throw or two-way switch, acting through the controlling circuits on the electromagnetic controlling means. Said electromagnetic means comprises electromagnetic switch operating devices 11, 11′, preferably solenoids, adapted to respond respectively to the reverse operations of the controller switch aforesaid, to close the motor circuit for revolution in one or the other direction,—the device 11 controlling the upward movement of the elevator and the device 11′ controlling the downward movement thereof. The electromagnetic controlling means further comprises an electromagnetic device 20, preferably a solenoid, for the starting main and rheostatic switch devices, to establish and control or regulate the current to the motor so as to prevent excessive flow of current in starting and to give an easy starting movement.

The electromagnetic reverse controllers are substantially duplicates of each other, the "up" controller comprising a solenoid 11, a core 14 therefor, connected by its stem or rod 15 to switch bar 21, of insulating material, carrying contacts 16, 17, adapted, when the bar is raised, to engage fixed contacts 18, 19 connected in the motor circuit. The "down" controller similarly comprises a solenoid 11′ a core 14′, a stem 15′, a switch bar 21′, of insulating material carrying contacts 16′, 17′, thereon adapted to engage fixed contacts 18′, 19′, also connected to the motor circuit.

24, 24′ designate buffer springs surrounding stems 15, 15′ and engaging between arms 25 on bars 21, 21′ and core members 27, 27′ fixed in the upper ends of the solenoids, these springs serving to give an easy cushion stop to the switch as it drops. Arms 25 also engage and slide on guide rods 28 to hold the switch bars 21, 21′ in alinement with the fixed contacts.

The starting rheostat device comprises a solenoid 20 operating a main switch 29, and also operating rheostat contacts 30, said rheostat contacts being preferably a series of resiliently supported contacts respectively connected to resistance sections 31, and said contacts being movable to bring two or more of them into electric connection to short circuit one, two or more sections of the resistance.

The main switch may consist of a bar carrying contacts 33, 33 adapted to engage, when raised, with fixed contacts 34, 35 on the board 4. Contacts 32, 33 are electrically connected by connection 32ª. Said main switch bar is operated and carried by the stem or rod 37ª of a core 37 for solenoid 20, and a buffer spring 39 is desirably provided, similar to the buffer spring 24.

Each of the rheostat contacts 30 may consist of a metal block carried by a leaf spring or spring arm 42, which normally hold the contacts in extended or separate position, but which will yield to allow the contacts to be pressed together. Such operation of the contacts is effected by an arm 43 extending from the stem or rod 44ª on the core 44 of the solenoid 20. The two cores 37 and 44 are preferably concentric, the core 44 telescoping within the core 37. This movement of the contacts is arrested and retarded by suitable retarding means, preferably a dash pot 36 whose piston 41 is perforated as at 41ª, a dasher plate 38 on the rod 44ª being also perforated with perforations 38ª smaller than the perforations 41ª. Normally, piston 41 rests at the bottom of the dash pot and when the rod 44ª starts to rise it will move freely a small distance until the plate 38 starts the piston and moves up with it. All of the contacts of the switches 21 and 21′, main switch 27 and rheostat contact means 25 are desirably provided with carbon terminals 45 which may be supported in suitable sockets or holders 46.

The brake device, (Figs. 1, 2 and 3) comprises a

standard 48 on base 1, levers 49, 50 pivoted on said standard and carrying the brake shoes 51, spring means 52 engaging said levers to press the shoes on a wheel 53 on drum shaft 5′, and electromagnets 54, 55 mounted on the respective levers 49, 50 in position to mutually attract each other when either or both are energized as hereinafter set forth, such attraction causing the shoe-carrying arms of levers 49, 50 to be moved further apart and releasing the braking grip of the shoes on wheel 53, according to the strength of the magnet energization. Magnet 54 is connected in the controlling circuit and magnet 55 in the motor shunt circuit. Brake shoes 51 are preferably mounted on levers 49, 50 by a ball and socket bearing 56. 53ª designates an insulating partition between the motor and cable drum shafts.

The limit switches (Fig. 1) are mounted on an insulating board 58 adjacent to the cable drum, the upper limit switch comprising a series of contacts 59, 60, 61, and a pivoted switch lever 62 to engage simultaneously therewith, and the lower limit switch comprising corresponding members 59′, 60′, 61′, 62′. Levers 62 and 62′ have toes 63, 63′ extending in the path of pins 64, 64′ carried by gear wheel 65, which is engaged by a pinion 66 fast on the cable drum shaft 5′. Pins 64, 64′ are circumferentially adjustable on wheel 65, said pins, for example, being mounted in any one of two series of holes 68, 68′ on said wheel. When the elevator approaches or reaches the upper end of the elevator shaft, pin 64 will engage toe 63 to open switch lever 62, and when the elevator is at or near its lowermost position, the pin 64′ similarly opens switch 62′, these switches being connected to open the respective circuits controlling the motor circuit for downward and upward operation respectively.

The slack cable circuit controller (see Fig. 1) consists of a lever 70 pivoted on a support 71, so that the cross arm or bar 72 on the end of said lever extends under the several rounds or layers of the cable in the drum, and a contact spring bridge 73ª on an arm 73, rigidly connected to lever 70 and engaging fixed contacts 74 to normally close the controlling circuit, a counterweight 75 on lever 70 tending to hold the circuit closed, but yielding on the springing out of the cable due to the slackening thereof, so as to cause the circuit to be broken.

The electric connections lead from the line or supply circuit wires indicated at 78, 89 as follows:—From line wire 78, through a wire 81 including a resistance wire 80, to starting and main switch solenoid 20, thence by wire 82 to brake coil 54, wire 83 to contacts 74, 73ª, wire 84 to switch 10. From one of the contacts 110 of the switch by wire 85 to coil 11, from which wire 87 leads to contact 60 of the "up" limit switch and from contact 61 thereof wire 81 leads to brake coil 55, connected by wire 89 to series field coil 90 of the motor which is connected to wire 79. Main switch contact 34 is connected to line wire 78 and contact 35 is connected by wire 91 with the series of resistance sections 31 from which wire 92 leads to reversing switch contact 18. From contact 16, wire 93 leads to contact 17′ of switch 21′ and wire 94 leads therefrom to one side of the motor armature 95. Wire 96 leads from the other side of the armature to contact 17 of switch 21. From corresponding contact 19, wire 97 leads to contact 59 of the "up" limit switch. A connection leads from wire 91 by wire 98 to one end of shunt field coil 101 of the motor connected at the other end to line wire 79. Wire 92 is also connected to switch contact 18′ of the other reversing switch and the connections of said switch are completed by wires 93′, 97′ in such manner as to lead the current in a reverse direction through the motor armature. The connections to moving contacts 16, 17, 16′, 17′ may be made by flexible conductors 102. The reverse controlling-circuit is completed by wires 85′, 87′, in obvious manner.

The operation is as follows:—Normally or when the elevator is at rest, the circuits are open, controller circuit being open at switch 29 as well as switch 21, 21′, both upper and lower limit switches 62, 62′ will normally be closed, as will also slack cable switch 73, leaving the controlling circuit in condition to respond to the operation of the elevator-cab switch 10. All of the electromagnetic controlling devices will be de-energized and the motor will be inoperative but the brake will be in action due to de-energization of the releasing magnets thereof so that elevator-cab will be held in fixed position. To start the elevator up, the switch 10 is thrown over to contact 110, thus establishing the "up" controlling circuit as follows:—From line wire 78, through wire 81, resistance 80, solenoid 20, wire 82, brake coil 54, wire 83, slack cable switch contacts 74, 73, wire 84, switch 10, contact 110, wire 85, "up" solenoid 11, wire 87, contact 60 of the "up" limit switch, switch blade 62, contact 61, bar 88, brake coil 55, wire 89, series field coil 90 of the motor to the other side of the line at 79. The current flowing in this circuit will energize the solenoid 20, drawing up the core 37 and closing switch 29, and the coil of the reversing solenoid 11 will draw up its core 14, closing the switch 21. The closure of these two switches 29 and 21 establishes the motor circuit as follows:—From wire 78 to contact 34, thence by contacts 32, 33 of switch 29 to contact 35, wire 91, resistance 31, wire 92, contacts 18, 16 of switch 21, wires 93, 94, armature 95, wire 96, contacts 17, 19 of the switch 21, wire 97, contact 59, blade 62, and contact 61 of the "up" limit switch, wire 81, brake coil 55, wire 89, series field coil 90 to the other side of the line at 79. The current flowing in this circuit energizes and sets in operation the motor, the entire resistance 31 being at first included in this circuit, but is gradually cut out by the elevation of the internal core 44 of solenoid 20, the lowermost contact 25 being first brought against the second contact, and on further movement, the second contact being raised to engage the third, and so on,—each closure being adjacent contacts cutting out one section of resistance, its movement being retarded by the dash pot means 36, 38, 41, so as to give a gradual acceleration to the motor and prevent undue flow of current therein in starting. The field magnet of the motor is energized by the series field coil 90 in the circuit above traced, and also by shunt field coil 101, the circuit of which is traced as follows:—From line wire 78 as above to wire 91, thence by resistance 31 and wires 92, 98 to shunt field coil 101 of the motor, and thence to the other side 79 of the line. It

will be noted that the controlling circuit at this time energizes brake magnet 54, while the motor circuit energizes brake magnet 55 so that the mutual attraction of these magnets will fully release the brake. The motor will then propel the elevator upwardly until the controller switch 10 is moved to open position as shown in Fig. 4, thereby breaking the controller circuit and de-energizing solenoid 20 allowing the switch 29 to fall in open position. This will break the line connection to the motor, and the circuit of both brake releasing magnets will be broken, so that the brake will be set. If the operator should neglect to move the controlling switch when the car reaches either limit of its travel, the corresponding limit switch will be operated to break both the motor circuit and the controlling circuit and will stop the operation of the motor and deënergize the brake releasing magnet, thus setting the brake. On occurrence of a slack cable, the controlling circuit will be broken at 73, 74, and the motor will be deënergized and braked in the same manner as by opening the controlling switch 10.

What I claim is:—

1. In an electric elevator system, the combination with an electric motor, and cable mechanism driven thereby, reversely operating motor circuits, two limit switches included in the respective motor operating circuits, operating means for said limit switches connected to be operated by the cable mechanism to open one of the limit switches when the elevator reaches its limit of movement in either direction, a brake for the cable mechanism, means acting to set the brake, and a magnet for releasing said brake, connected in both of the operating circuits, to allow the brake to set on operation of either limit switch.

2. In an electric elevator system, the combination with an electric motor and cable mechanism driven thereby, of limit switches, reversely operating motor circuits controlled by the respective limit switches and operating means for said limit switches connected to be operated by the cable mechanism, to open one of the limit switches when the elevator reaches its limit of movement in either direction, said operating means comprising a gearing connected to the cable mechanism, and pins carried by and adjustable on said gearing and engaging the respective switches.

3. In an electric elevator system, the combination with an electric motor and a cable mechanism driven thereby, of motor operating circuits for reverse operation of the motor, switches in said operating circuits, controlling circuits including electromagnetic means controlling said switches, limit switches connected in the motor circuit and in the controlling circuit, means for operating said limit switches, a brake for the cable mechanism and a plurality of electromagnetic means acting to release said brake and connected respectively in the motor circuit and in the controlling circuit.

In testimony whereof, I have hereunto set my hand at Los Angeles California this 27th day of December 1904.

PARVIN WRIGHT.

In presence of—
A. P. KNIGHT,
JULIA TOWNSEND.