No. 770,873. PATENTED SEPT. 27, 1904.

H. STAHL.

CONTROLLING DEVICE FOR ELECTRICAL LIFTS OR HOISTING MECHANISMS.

APPLICATION FILED JULY 11, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

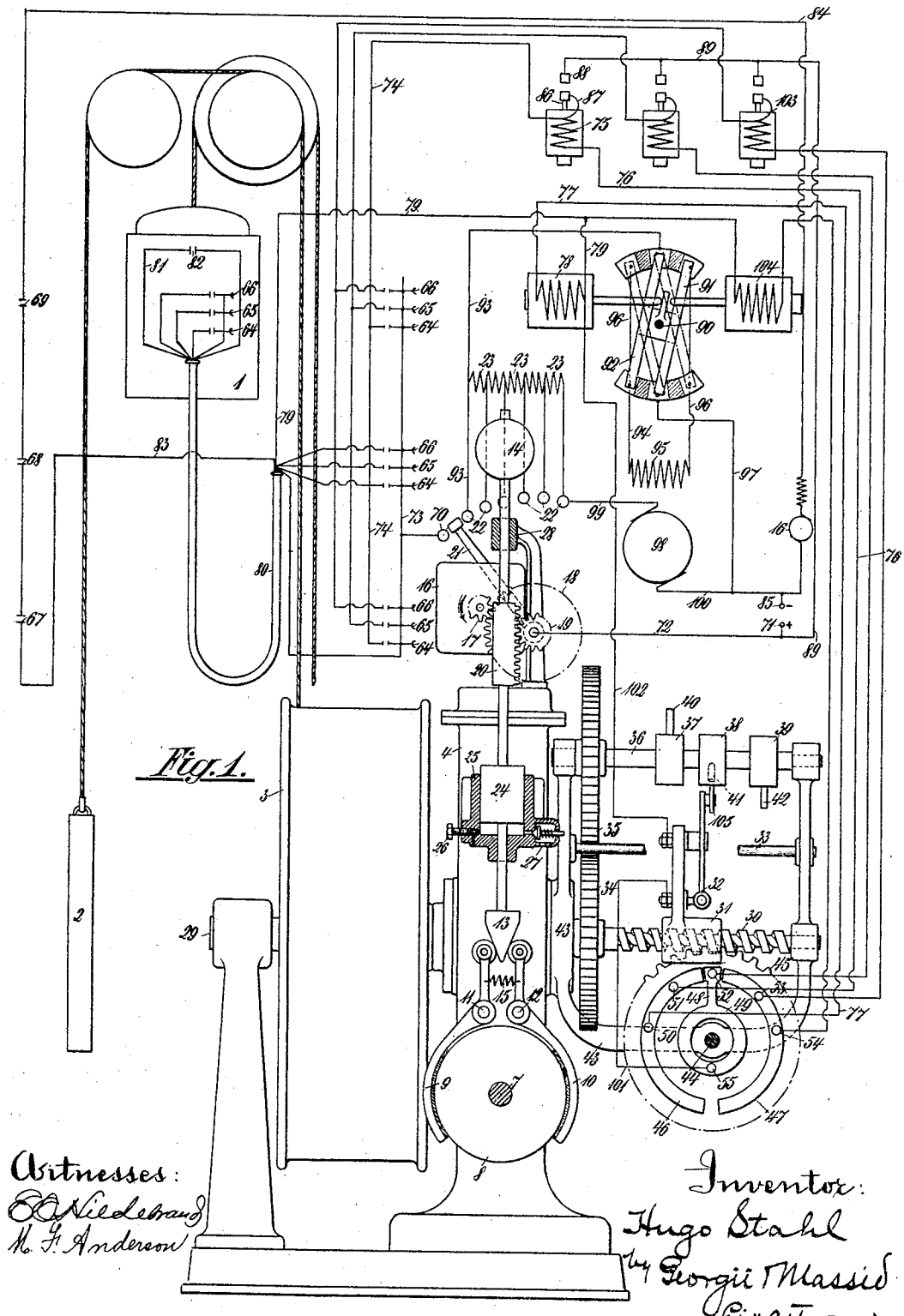

Fig. 1.

Witnesses:
O. A. Liedebrand
M. F. Anderson

Inventor:
Hugo Stahl
by Georgii Massid
his attorney

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

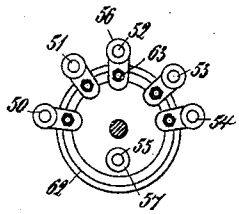

Fig. 2.

Witnesses:
O. A. Hildebrand
M. F. Anderson

Inventor:
Hugo Stahl.
by Georgii Massie
his attorneys

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UNITED STATES PATENT OFFICE.

HUGO STAHL, OF STUTTGART, GERMANY.

CONTROLLING DEVICE FOR ELECTRICAL LIFTS OR HOISTING MECHANISMS.

SPECIFICATION forming part of Letters Patent No. 770,873, dated September 27, 1904.

Application filed July 11, 1903. Serial No. 165,174. (No model.)

To all whom it may concern:

Be it known that I, HUGO STAHL, a subject of the King of Würtemberg, residing at Stuttgart, in the Kingdom of Würtemberg, German Empire, have invented certain new and useful Improvements in Controlling Devices for Electrical Lifts or Hoisting Mechanisms, of which the following is a specification.

The present invention relates to a press-button controlling apparatus for electric elevators; and it consists of the combination of an auxiliary electric motor with braking device for the purpose of slowly switching on the current and of an apparatus combined with the hoisting mechanism for automatically switching off the current and stopping the car, said apparatus having the advantage over prior constructions known to me of combining small dimensions with a sharp and quick interruption of the auxiliary current.

In the drawings, Figure 1 is a diagram showing the general arrangement of the operating and controlling apparatus and of the electric connections. Fig. 2 is a side view of the operating and controlling apparatus, and Fig. 3 represents the contacts of the stopping apparatus.

In the drawings, 1 is the elevator, 2 the counterweight, and 3 the drum on which the suspension-ropes are wound. The drum 3 is driven by a worm-wheel 5, Fig. 2, provided in the casing 4, said worm-wheel being rotated by the worm-shaft 7, coupled direct to the main motor 6. (Shown in Fig. 2.) On the shaft 7 is mounted the brake-disk 8, which at the same time forms the coupling for the motor. The brake may be of any desired construction—as, for example, that shown in the drawings, and consisting of two blocks 9 10, which turn about the bolts 11 12 and are pressed against the disk 8 by the wedge 13 when the latter is depressed by the weight 14. As long as the car is moving and the wedge is raised the blocks 9 10 are kept out of contact with the disk 8 by the spring 15.

The weight 14 is raised by the auxiliary motor 16, which also switches out the starting resistances in a known manner. When an electric current passes through the auxiliary motor, the latter will turn in the direction of the arrow, Fig. 1, and raise the toothed rack 20 through the agency of the spur-wheels 17 18 19, so that the brake-blocks 9 10 will be moved from the disk 8 by the spring 15. At the same time the contact-lever 21, attached to but insulated from the axis of the spur-wheels 18 19, will be moved over the contact-pieces 22 and will thus successively switch out the starting resistances 23. In order to enable this movement to be effected sufficiently slowly, gearing of high purchase or a slowly-rotating and therefore very expensive auxiliary motor have heretofore been necessary. This drawback is avoided in the present construction by connecting the toothed rack 20 with the piston 24 of an air-brake or dash-pot 25, which is provided with an air-admission screw 26, adapted to regulate the speed in switching on the current, and an outlet-valve 27. The rotation of the motor is thus retarded by the air-brake, so that the starting resistances are gradually switched out. When the last stage of the resistance has been switched out, the auxiliary motor is stopped in any suitable manner, as by the rack 20 striking against the guide 28. The motor remains stationary, although fed with current, and accordingly exerts a torque. This motor is wound as a series motor and, as explained below, is switched in series with all the controlling apparatus. It is of such dimensions that it can stand the controlling-current without being unduly heated. The elevator is stopped by the current of the auxiliary motor being cut off by a switch, described below, as soon as the elevator-car arrives at the desired story or landing. At the same time the auxiliary motor ceases to exert a torque, and under the influence of the weight 14 the whole device sinks, the resistances being quickly switched in, and finally the main current interrupted and the brake put on. This movement, contrary to the switching on of the current, takes place quickly, because the valve 27 allows the air to escape without resistance.

Before describing the electric connections the stopping apparatus must be considered, which, like the other devices, is illustrated as employed for three stories. The drum and

worm-wheel shaft 29 is extended to form a screw-spindle 30, on which fits a nut 31, carrying the switch 32 and prevented from rotating by two guide-rods 33. Above the nut 31 is provided a shaft 36, which is driven by the spur-wheels 34 35 and carries tappet-disks consisting of the rings 37 38 39, each furnished with a pin 40, 41, or 42. The standard 43, connected with the bearing of the worm-wheel shaft or fastened to the case 4, forms the bearing for the shafts 36 and 30, supports the guides 33, and carries at the same time a stud 44, on which turns a worm-wheel 45, engaging with the shaft 30. In order to allow the nut 31 to move through the whole of its stroke, it is cut out at the bottom, as shown in Fig. 2. On the worm-wheel 45 are fixed the insulated contact-rails 46 47, which are separated by narrow spaces from the intermediate piece 48, connected to the contact-ring 49. The contacts 50, 51, 52, 53, 54, and 55 (only indicated in Fig. 1) are represented in detail in Figs. 2 and 3. In these figures the contacts 52 55 move in guides 56 57, of insulating material. By means of bolts 58 59, fixed by screws, the contacts are pressed against the rails 46 47 through the agency of springs 60 61. The guides are screwed on a disk 62, which is fixed on the stud 44. For the purpose of enabling the contacts to be adjusted according to desire the guides are fixed by screws 63, which slide in a dovetail groove. In Fig. 1 the disk 62 is omitted, being shown in detail in Fig. 3.

The contacts 51 52 53 and the rings 37 38 39 are so adjusted with regard to each other that when the elevator-car arrives at the middle story the pin 41 of the disk 38 strikes against the adjacent roller 105, and thus opens the switch 32. Further, the contact 52 bears against the sufficiently-broad intermediate piece 48 without touching the rails 46 47. When the elevator-car arrives at the first story, the same relative position is occupied by the pin 40 and contact 51, and at the top story by the pin 42 and contact 53. By opening the switch 32, as shown by the description of the connections given below, the auxiliary current is interrupted and the machine stopped. Owing to the relatively great speed of rotation of the pins 40 41 42, which can be increased by choosing suitable spur-wheels 34 35, the switch 32 is very quickly and precisely opened.

The manner of closing and opening the circuit of the auxiliary current will be evident from the following description of the entire electric connections.

64 65 66 are the press-buttons, 67 68 69 the door-contacts, in each story. Corresponding press-buttons and a door-contact 82 are provided on the elevator-car. The operation during the movement of the elevator-car is as follows: Supposing the car to be stopping at the middle story (which case is shown in the drawings) and that in one of the stories the press-button 64 of the bottom landing be pushed in. At this moment the contact-lever 21 is stationary on the contact 70. On pressing the button 64 the electric current passes from the pole 71 through the conductor 72, lever 21, contact 70, conductor 73, press-button 64, conductor 74, magnet 75, conductor 76, contact 51, rail 46, contact 50, conductor 77, magnet 78 of the reversing-switch, conductor 79, cable 80, hanging from the elevator-car, conductor 81, door-contact 82 of the elevator-car, then again through the cable to the conductor 83, door-contacts 67 68 69, conductor 84 to the auxiliary motor 16, whose winding is diagrammatically shown in conductor 84, and then to the pole 85. This current caused the auxiliary motor 16 to at once rotate in the direction of the arrow, so that the lever 21 begins to move and leaves the contact 70, thus interrupting the circuit just described. At the same time, however, the magnet 75 attracted the core 86, which is connected by a movable wire 87 to the magnet-coil and on striking against the contact 88 closes a circuit parallel to the one described above. The current of this circuit passes from the + pole 71 through conductor 89, contact 88, magnet 75, conductor 76, &c., exactly like the described circuit. This parallel circuit remains closed until interrupted at some point. As a consequence the lever 21 will continue to rotate, so that the pressing-in of any of the buttons would provisionally be of no effect, because the conductor 73 is interrupted at 70. Supposing that the car was previously rising, then the reversing-switch magnets 78 will have attracted its core immediately the button is pressed and brought the insulated contact-springs 91 92, turning about the bolt 90, from the dotted position into that shown in full lines. As soon, therefore, as the auxiliary motor has continued its motion, which is retarded by the dash-pot, to such a point that the lever 21 bears against the first contact-point 22 of the starting resistances 23 the electric current passes from + pole 71 through the conductor 72, lever 21, conductor 93, contact-spring 92, conductor 94 to the exciter 95 of the main motor and then through the conductor 96, contact-spring 91, conductor 97 to the — pole 85, conductor 99, armature 98, and conductor 100 to the — pole 85. The elevator-car therefore begins to descend, while the auxiliary motor moves the lever 21 over all the contacts 22, and after switching out all the resistances is stopped by the rack 20 striking against the guide 28. While the car is descending, the nut 31 is moved to the left, and finally the intermediate piece 48 will begin to come into contact with the contact 51, because it spans the intermediate space. A part of the current passes through the intermediate piece 48, ring 49, contact 55, the movable conductor 101, switch 32, conductor 102, conductor

79, the door-contacts, as above described, to the — pole. Finally, the contact 51 will leave the rail 46 and remain in the middle of the intermediate piece 48, so that the entire controlling-current will pass through the switch 32. The elevator-car now arrives at the landing at which it is to stop, and at this instant the pin 40 must strike against the switch-roller 105 and open the switch. Owing to the interruption of the current the core of the floor-magnet 75 falls at once, and when the switch is again immediately closed the circuit stills remains broken at 88. As soon as the circuit is broken the torque exerted by the auxiliary motor ceases, the weight 14 sinks, and after successively switching in the resistances cuts off the current at the contact 22 and presses the block 9 10 against the brake-disk 8. The lever 21 again bears against the contact 70, so that by pressing a button a new passage of the car can be brought about.

Contrary to prior constructions the reversing-switch remains stationary during the operation of the stopping mechanism, so that the exciting-current of the motor is not interrupted, but the exciting-coil, armature, and starting resistances form a closed circuit, also after the car has stopped. This arrangement has the advantage that the induction-current arising or interrupting the exciting-coil can flow in this circuit, so that injurious high tensions are avoided. If, for example, the press-button 66 of the top floor is pressed in, then the magnet 103 is correspondingly excited and the current passes through the contacts 53 and 54 and the reversing-switch magnet 104, which latter is operated for the upward passage. The nut 31 is moved at the same time to the right. When the car passes through the middle story, the switch 32 will be raised from the pin 41. This will, however, be of no effect, because the current is not passing through the switch and does not pass until the car has nearly arrived at the top story, the intermediate piece 48 then arriving underneath the contact 53. No controlling-current can flow when one of the doors is open.

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

1. Apparatus for controlling electric elevators comprising in combination, a main electric motor to operate the elevator-car in both directions, an auxiliary electric motor, an auxiliary circuit containing said auxiliary electric motor, means to close said auxiliary electric circuit, means to open said auxiliary electric circuit, a main circuit containing said main electric motor, electric resistances, means adapted to be operated by said auxiliary electric motor to switch said resistance in and out said main circuit, a piston adapted to be moved by said auxiliary motor, a cylinder in which said piston tightly moves, an air-admission opening in said cylinder, a screw to regulate the size of said air-admission opening and an air-outlet valve in said cylinder, substantially as, and for the purpose set forth.

2. Apparatus for controlling electric elevators, comprising in combination, a main electric motor to operate the elevator-car, an auxiliary electric motor, an auxiliary circuit containing said auxiliary electric motor, a contact-lever adapted to be moved by said auxiliary electric motor, parallel circuits adapted to be opened and closed by said contact-lever, press-buttons in said parallel circuits, electromagnets in said parallel circuits, a switch operated by each said electromagnets and connected in series with said auxiliary electric motor, means to open said auxiliary electric current, a main circuit containing said main electric motor, electric resistances adapted to be switched in and out of said main circuit by said contact-lever, substantially as, and for the purpose set forth.

3. Apparatus for controlling electric elevators, comprising in combination, a main electric motor adapted to operate said elevator-car, an auxiliary motor, an auxiliary electric circuit containing said auxiliary motor, means adapted to close said auxiliary circuit, a main circuit containing said main electric motor, electric resistances, means adapted to be operated by said auxiliary electric motor to switch said resistances in and out of said main circuit, a screw-shaft, driven by said main electric motor, a nut on said screw-shaft, a switch carried by said nut, means adapted to bring said switch in series with said auxiliary motor shortly before the elevator-car arrives at the desired story, means adapted to break said auxiliary circuit at the desired story, and means operated by said means for switching said resistances in and out of said main circuit to break said main circuit at the desired story, substantially as, and for the purpose set forth.

4. Apparatus for controlling electric elevators, comprising in combination, a main electric motor adapted to operate said elevator-car, an auxiliary motor, an auxiliary electric-motor circuit containing said auxiliary motor, means to close said auxiliary circuit, a main circuit containing said main electric motor, electric resistances, means adapted to be operated by said auxiliary electric motor to switch said resistances in and out of said circuit, a screw-shaft driven by said main electric motor, a nut on said screw-shaft, a switch carried by said nut, a worm-wheel driven by said screw-shaft, contact-rails on said worm-wheel, a contact-pin for each story bearing against said rails and adapted to bring said switch in the auxiliary circuit shortly before the elevator-car arrives at the desired story, and means to open said switch at the desired story, substantially as, and for the purpose set forth.

5. Apparatus for controlling electric elevators, comprising in combination, a main elec-

tric motor adapted to operate said elevator-car, an auxiliary motor, an auxiliary electric circuit containing said auxiliary motor, means to close said auxiliary circuit, a main circuit containing said main electric motor, electric resistances, means adapted to be operated by said auxiliary electric motor to switch said resistances in and out of said main circuit, a screw-shaft driven by said main electric motor, a nut on said screw-shaft, a switch carried by said nut, a spindle, gearing driving said spindle from said screw-shaft, a tappet-disk on said spindle for each story and adapted to open said switch at the desired story, means adapted to bring said switch in series with said auxiliary motor shortly before the elevator-car arrives at the desired story, and means operated by said means to switch said resistances in and out of said main circuit and adapted to break said main circuit at the desired story, substantially as, and for the purpose set forth.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

HUGO STAHL.

Witnesses:
R. STAHL,
ERNST ENTENMANN.