W. D. BALDWIN & F. C. FURLOW.

CONTROLLING APPARATUS FOR PLUNGER BRAKES.

APPLICATION FILED APR. 16, 1908.

981,909.

Patented Jan. 17, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

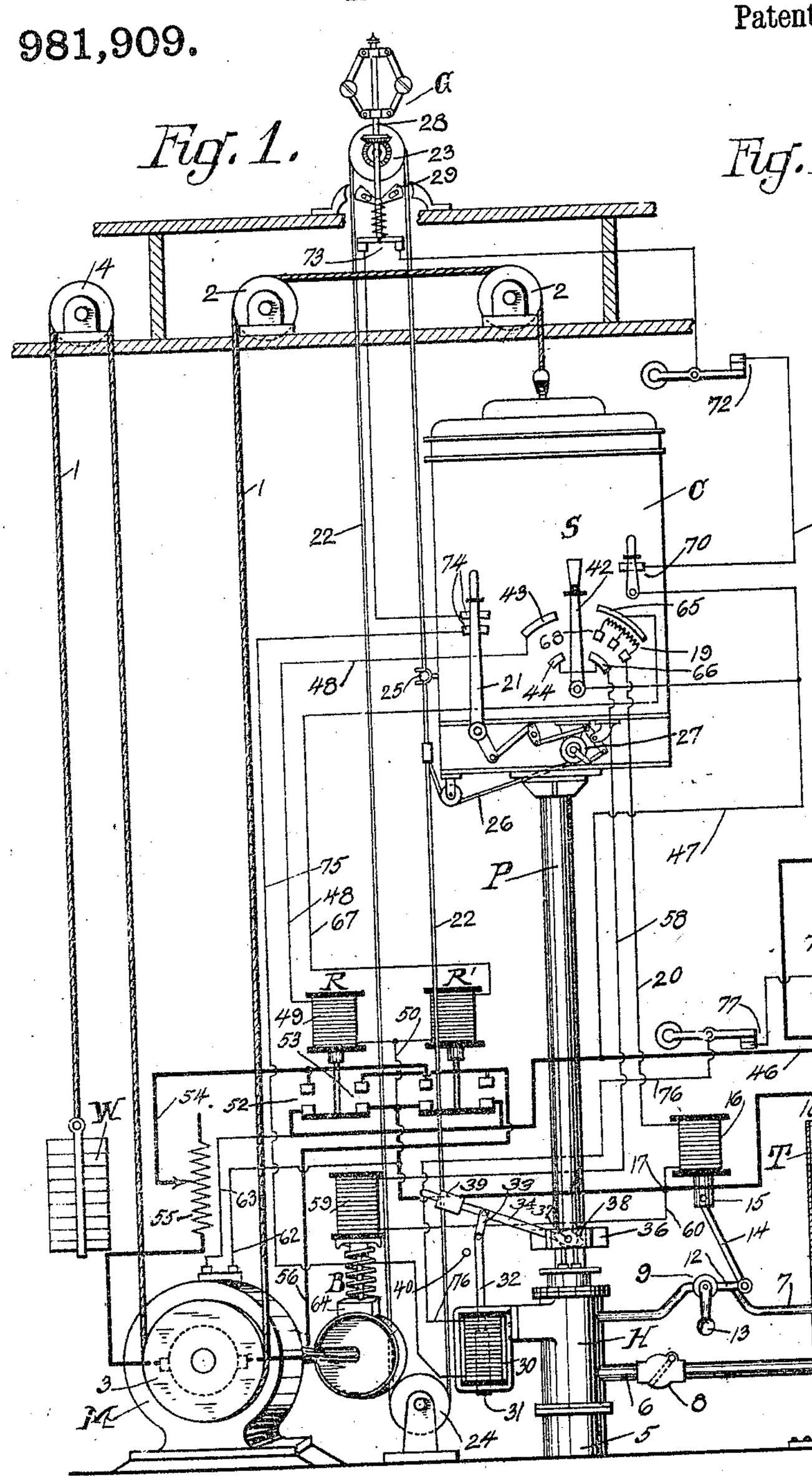


Fig. 1a.

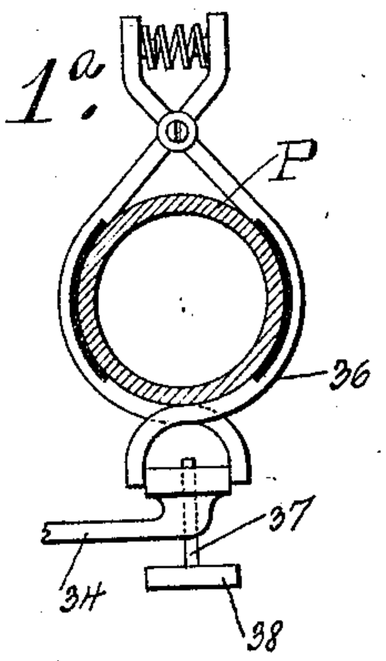
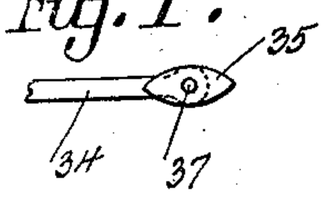


Fig. 1b.



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2 SHEETS—SHEET 2.

Fig. 3.

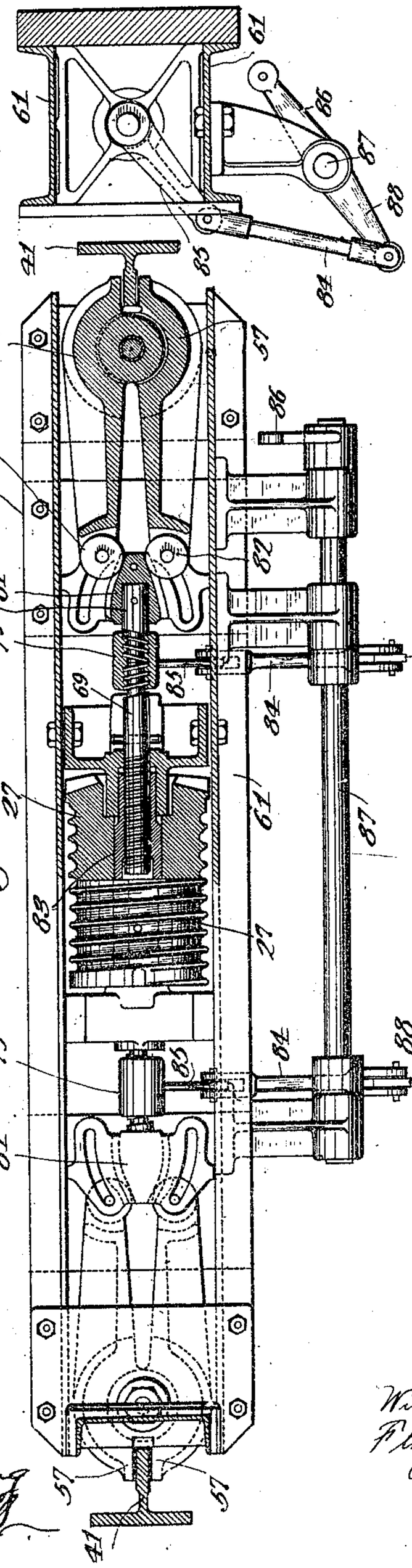

Fig. 2.

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UNITED STATES PATENT OFFICE.

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CONTROLLING APPARATUS FOR PLUNGER-BRAKES.

981,909. Specification of Letters Patent. Patented Jan. 17, 1911.

Application filed April 16, 1908. Serial No. 427,547.

To all whom it may concern:

Be it known that we, WILLIAM D. BALDWIN and FLOYD C. FURLOW, citizens of the United States, residing, respectively, in New York city, in the county of New York and State of New York, and Montclair, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Controlling Apparatus for Plunger-Brakes, of which the following is a specification.

The present invention relates to brake mechanism adapted for use with elevators, and has for an object the provision of an electro-magnetic brake in conjunction with a plunger connected to the elevator car when said car is operated by means other than fluid pressure applied to the lower end of the plunger.

Another object of the invention is to provide such a brake in connection with various other car controlling and safety appliances, and to provide means for automatically operating said brake whenever any of said appliances are operated.

Other objects of the invention will appear hereinafter, the novel combinations of elements being set forth in the appended claims.

Referring to the drawings, Figure 1 is a general view of an elevator system embodying our invention; Figs. 1ª and 1ᵇ are detail views of the plunger brake; Fig. 2 is an enlarged detail view of the emergency brake mechanism at the bottom of the elevator car; and Fig. 3 is an end view of the same.

The elevator car C is adapted to be lifted and lowered by means of an electric motor M connected to the car by ropes or cables 1 secured to the top of the car, passing over the overhead sheaves 2, to the drive sheave 3 on the motor shaft, the overhead sheave 4, and to the counter-balance weight W. The motor, which is here shown as a direct current motor, is operated by current from the positive and negative mains (designated + and −, respectively) connected to any suitable source of current supply. The current is supplied to the motor through the electro-magnetic reversing switches R and R′ controlled by the manual operating switch S in the car. An electro-magnetic brake B of a well known construction may be applied to the motor. In conjunction with the electric motor we use a hydraulic retarding device for limiting the speed of the elevator car as it is being lowered. This device, which is substantially like that shown in a co-pending application made by W. D. Baldwin, Serial No. 330,113, filed August 11, 1906, elevator control, comprises a plunger P connected to the bottom of the car, and movable within the cylinder 5 which is filled with fluid. The cylinder 5 is connected to a tank T by means of the pipes 6 and 7, a check valve 8 being placed in the pipe 6 and a controlling valve 9 in the pipe 7. The tank T containing fluid is depended upon to maintain the cylinder 5 filled with fluid for all positions of the plunger. A float F may be provided for automatically operating a valve to admit fluid from the supply pipe 10 into the tank T, or the tank may be filled at any time by opening the spigot 11. Attached to the valve 9 is a bell-crank lever 12, one arm of which carries a weight 13, and the other arm of which is pivoted to the link 14. The upper end of the link 14 is pivoted to a core 15 movable within the solenoid 16 which is connected to the negative side of the potential switch A by wires 17 and 18, and to the variable resistance 19 of the car switch by means of the wire 20.

Attached to the bottom of the car is an emergency brake or car safety device which embodies the principles set forth in Patents No. 376,374 and No. 665,225 issued to A. C. Ellithorpe and G. John, respectively. This apparatus is shown in Figs. 2 and 3 and comprises a metal frame-work 61 provided at either end with a pair of pivoted gripping jaws 57, 57 which are adapted under certain conditions to forcibly engage co-acting guide rails 41 to retard or stop the car. 27 designates a safety drum which is rigidly mounted upon a sleeve 83 adapted to rotate in suitable fixed bearings secured to the frame 61. Right and left screw threaded rods such as 69 are screwed into the sleeve which is internally screw threaded to correspond thereto. The opposite ends of each of the rods 69 are also right and left screw-threaded respectively with threads of comparatively high pitch as shown, and these threaded ends butt against the ends of other screw-threaded rods 80 which are provided with threads of the same pitch but arranged in reverse order. The adjacent right and left screw threaded ends of the rods 69 and

80 are embraced by nuts 79, 79, which are internally screw-threaded to correspond, and which are connected by levers 85 and 88 and links 84 to a rod 87. A lever 86 is secured to this rod 87, and is connected by suitable links and levers to the hand operating lever 21 (Fig. 1) in the car. Upon one end of each rod 80 is fastened a wedge 81 which is in contact with anti-friction rollers 82, 82, carried upon the ends of the levers which are integral with the gripping jaws 57. When the parts of the safety device are in the position shown in Fig 2, which is their normal position, the gripping jaws are not in contact with the co-acting guide rails 41.

The operation of the safety device may be effected by rotating the safety drum 27 or by rotating the nuts 79, 79, either operation causing the wedges to move outwardly and thus force apart the rollers 82, 82, thereby applying the gripping jaws to the guide rails with great pressure. The rotation of the nuts 79, 79 is effected from the car by means of the hand lever 21 to apply or release the gripping jaws whenever desired, while the operation of the safety device by means of the safety drum 27, is effected automatically whenever the car exceeds a predetermined speed. For this purpose, a speed governor G is used, which is operated by a running cable 22 extending around the governor sheave 23 and an idler sheave 24 at the bottom of the elevator shaft (Fig. 1), said cable being yieldingly connected to the car at 25. A cable 26 is connected at one end to the governor cable 22, and has its opposite end wound about the safety drum 27 and secured thereto. When the speed of the car exceeds a certain predetermined limit, the governor balls fly apart sufficiently to raise a rod 28 and with it the clamping jaws 29, which latter operate to clamp the cable 22 and prevent it from moving with the car. This causes the cable 26 to be unwound from the safety drum 27, the rotation of which forces the screw threaded rods 69 to move outwardly to apply the gripping jaws to the guide rails thereby retarding or stopping the car.

The brake apparatus used in connection with the plunger P comprises a magnet solenoid 30, in this instance connected rigidly to the cylinder head H. Movable within this solenoid is a core or armature 31, to the upper end of which is connected the stem 32. This stem is in turn connected by the link 33 to the brake lever 34 which is rigidly connected to the cam member 35 between the brake shoes or gripping devices 36 in contact with the plunger. The cam 35 is pivoted at 37 to the support 38 mounted on top of the cylinder head H. When the solenoid 30 receives sufficient current, the core 31 will be lifted, and so also the parts connected thereto, so as to release the gripping jaws and permit the plunger to be moved. When the current is cut off the weight of the core 31 will effect the application of the brake, or, if this is not sufficient, the weight 39 may be placed on the outer end of the lever 34. A stop 40 may be placed in proper position to limit the downward movement of the lever 34 and hold the same where the cam 35 will have maximum effect in applying the jaws firmly to the plunger.

In operation, when it is desired to lift the elevator car, the hand lever 42 of the car switch S is moved to the left to bridge the contacts 43 and 44 which closes a circuit through the magnet coil 49 of the reversing switch R, which may be traced as follows: From the positive main through the contacts 45 of the potential switch, wires 46, 47, switch lever 42, contact 43, wire 48, reversing switch coil 49, wires 50 and 18, and contacts 51 to the negative main. The coil 49 now operates to connect the contacts 52 and 53 of the reversing switch R, which completes a circuit through the motor armature as follows: From the positive main, through contacts 45, wire 46, contacts 52, wire 54, variable resistance 55, motor armature, wire 56, contacts 53, wire 18 and contacts 51 to the negative main. The operation of the car switch also closes a circuit through the magnet coil of the brake B, from the positive main, through contacts 45, wires 46, 47, switch lever 42, contact 44, wire 58, coil 59 of the brake magnet, wires 60, 17 and 18, and contacts 51 to the negative main. The brake shoe 64 will therefore be lifted, and the motor permitted to run in a direction to lift the car. The field windings of the motor receive current through the wires 62 and 63 connected respectively to the wires 18 and 46. The check valve 8 permits the water to flow freely into the cylinder 5 as the car rises. When the car switch lever is moved back to central position, the circuits are opened to cut off the supply of current from the motor armature and brake magnet to stop the motor and apply the brake B. To cause the car to descend, the lever 42 is moved to the right to engage the contacts 65 and 66 which are connected respectively to the magnet coil of the reversing switch R′ and the brake magnet coil 59 by the wires 67 and 58. The switch R′ closes a circuit through the motor armature in the reverse direction and causes the motor to run in a direction to lower the car. The weight of the car and its load, however, are usually sufficient to move the car downward without the assistance of the motor, and in order to limit the downward speed of the car the hydraulic retarding device is brought into operation. The check valve 8 which opens toward the cylinder 5 prevents any flow of fluid from the cylinder to the tank T. When the lever 42 is moved to the right it engages a contact

68 and closes a circuit through the magnet solenoid 16 and the resistance 19. This circuit is from the positive main through contacts 45, wires 46, 47, switch lever 42, contact 68, resistance 19, wire 20, coil 16, wires 17, 18, and contacts 51 to the negative main. The core 15 will now be partially lifted and the valve 9 opened to a predetermined degree. The car will therefore be retarded to a corresponding degree in its descent. By further movement of the lever 42 to the right, a section of the resistance 19 is cut out to effect a further upward movement of the core 15 and a greater opening of the valve 9. The car may then descend at a greater speed. The sections of resistance 19 may be of any number to secure the desired refinement of variation of speed of descent of the car, and the valve operating mechanism may be varied as desired, the particular form here set forth being merely by way of illustration. When the switch is moved to cause the car to ascend, the weight 13 automatically closes the valve 9 and fluid is drawn into the cylinder 5 from the tank T through the pipe 6. To allow a quick upward movement of the car, the pipe 6 is made comparatively large.

If desired, the pipe 6 and check valve 8 may be entirely omitted, in which instance electric connection must be made between the left-hand portion of the switch S and the solenoid 16. Then when the switch lever is moved to the left the valve 9 will be opened wide at once to allow free downward movement of the car. Preferably, however, the pipe 6 with the check valve 8 is included in the retarding system to insure the cylinder 5 being filled with liquid at all times, even in case of failure of the valve-operating mechanism to act.

The electro-magnetic brake for the plunger P is brought into operation in case of an emergency, or whenever any of the safety appliances are operated, as the same circuit controls said brake and the various safety appliances. This circuit is from the positive main through the contacts 45, wires 46, 47, the car safety switch 70, wire 71, upper stop limit switch 72, governor switch 73, contacts 74, and emergency brake lever 21, wire 75, brake magnet coil 30, wire 76, lower limit switch 77, magnet coil 78 of the potential switch A, and to the negative main.

If the speed of the car should exceed a predetermined limit, the governor G will operate to lift the rod 28 and open the governor switch 73 before the clamping jaws 29 are brought into operative position. The opening of the switch 73 cuts off current from the coil 30 of the plunger brake and permits it to be applied to the plunger P in the manner above described. The opening of the switch 73 also deënergizes the coil 78 of the potential switch A and permits it to open at the contacts 45 and 51, thus cutting off the supply of current to the motor armature and the brake B. The brake B will therefore be applied to stop the motor and assist the brake for the plunger in bringing the moving parts quickly to rest. If the speed of the car should for any reason exceed that necessary to open the switch 73, the jaws 29 will clamp the cable 22 and effect the application of the emergency car brake. When the manual switch lever 21 is operated to apply the emergency brake, the circuit is opened at the contacts 74 and the result is the same as when the governor opens the switch 73 and operates the clamping jaws 29. The opening of the car safety switch 70 or the upper limit switch 72 or lower limit switch 77 will operate to apply the brake to the plunger P and also effect the opening of circuits for the motor armature and brake magnet 59.

Obviously the controlling circuit for the plunger brake magnet might include other forms of safety appliances than those here shown, the particular forms of such appliances depending largely upon the type of elevator system to which our invention is applied.

Various changes in the details of construction and arrangement of parts other than those herein disclosed might be made by those skilled in the art without departing from the spirit and scope of the invention, and we wish therefore not to be limited to the exact construction shown.

What we claim as new and desire to secure by Letters Patent of the United States is:—

1. In an elevator system, the combination with a car, of means for lifting and lowering the car, a plunger hung from the car, a brake, safety appliances for the car, and means for automatically applying the brake to the plunger when the safety appliances are operated.

2. In an elevator system, the combination with a car, of an electric motor, driving connections between the car and motor, a plunger attached to the car, an electro-magnetic brake for the plunger, a controlling circuit for said brake independent of the operating and controlling circuits of the motor, and means for interrupting said brake circuit at predetermined points in the car travel.

3. In an elevator system, the combination with a car, of a rod or plunger connected thereto, an electro-magnetic brake for the rod or plunger, an electric motor, an electro-magnetic potential switch controlling the supply of current to the motor, a circuit comprising the magnet coils of said brake and switch, and means for controlling said circuit.

4. In an elevator system, the combination with a car, of an electric motor, a motor

controlling switch in the car, a plunger attached to the car, a brake adapted to be applied to the plunger, a brake for the motor and means independent of the motor controlling switch for controlling both of said brakes.

5. In an elevator system, the combination with a car, of hoisting mechanism for the car, a plunger hung from the car, a brake for the plunger, an emergency brake carried by the car, a manual lever in the car for operating the emergency brake, and means controlled by said lever for applying the plunger brake.

6. In an elevator system, the combination with a car, of an electric motor, driving connections between the car and motor, a plunger depending from the car, an electro-magnetic brake, an electro-magnetic potential switch controlling the motor circuits, limit switches, and a circuit in which the limit switches and the coil windings of the potential switch and said brake are included.

7. In an elevator system, the combination with a car, of an electric motor, reversing switches, a manual switch in the car for controlling the reversing switches, a hydraulic retarding device, and means for controlling said retarding device by the movement of the car switch in one direction.

8. In an elevator system, the combination with a car, of an electric motor, reversing switches for the motor circuits, a controlling switch in the car, a plunger suspended from the car, a plunger cylinder, means for supplying fluid to the cylinder, an electro-magnetically operated device for controlling the flow of fluid from the cylinder as the car is lowered, and means for effecting the operation of said device when the car switch is moved in a direction to cause the car to descend.

9. In an elevator, the combination with a car, of a plunger, means independent of the plunger for operating the car, a brake associated with said operating means, an additional brake for said plunger, and means common to both brakes for effecting their application upon excessive speed of the car.

10. In an elevator, the combination with a car, of an electric motor, driving connections between the car and motor, a plunger hung from the car, friction brakes associated with said motor and plunger, a manually operable switch for effecting the application of one of said brakes, and the same automatic means for effecting the application of both of said brakes.

In testimony whereof, we have signed our names to this specification in the presence of two subscribing witnesses.

WILLIAM D. BALDWIN.
FLOYD C. FURLOW.

Witnesses:
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