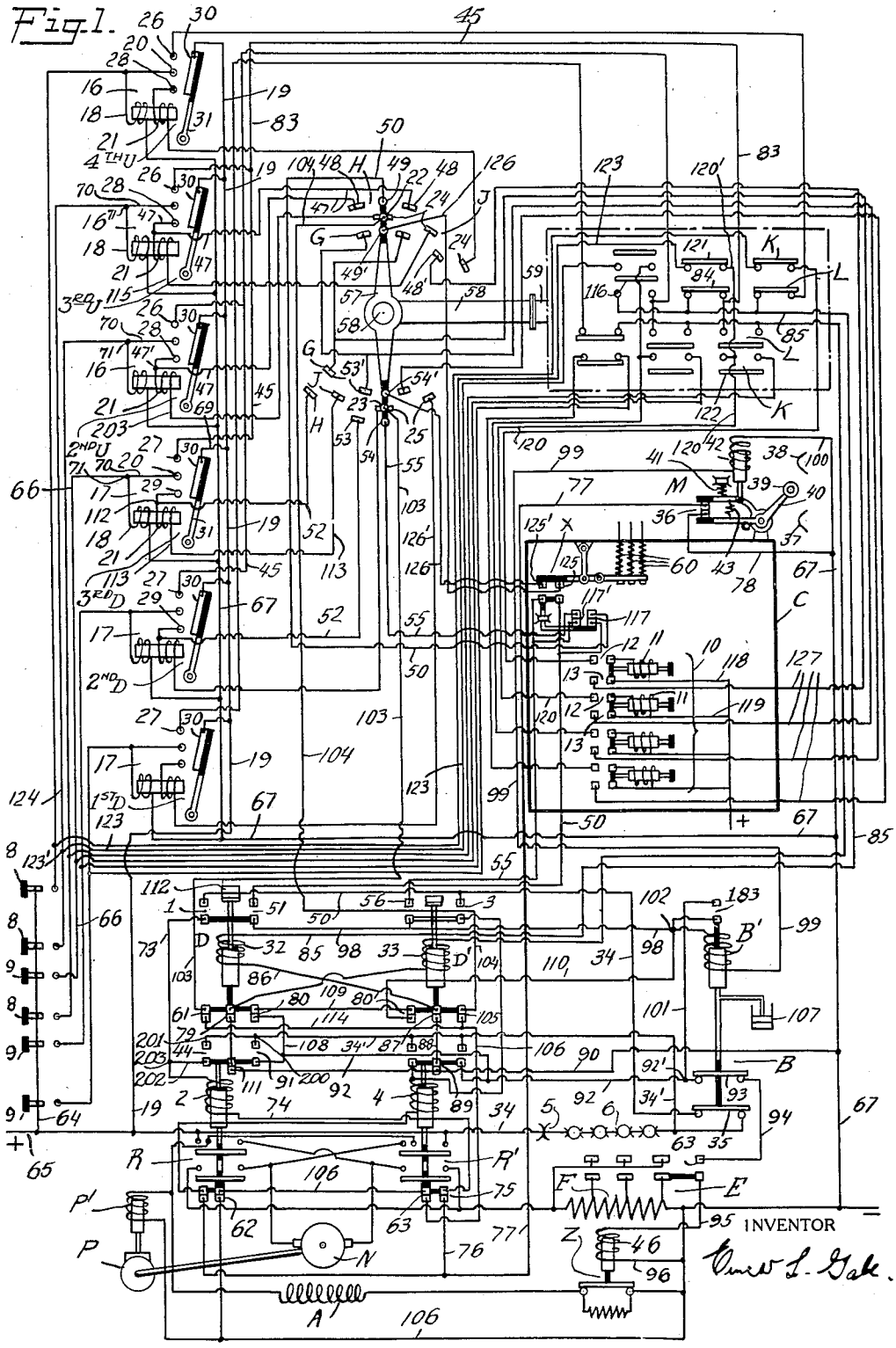
Oct. 30, 1934. E. L. GALE 1,978,670

PUSH BUTTON CONTROL SYSTEM FOR ELEVATORS

Filed March 29, 1929 3 Sheets-Sheet 1

Fig. 1.

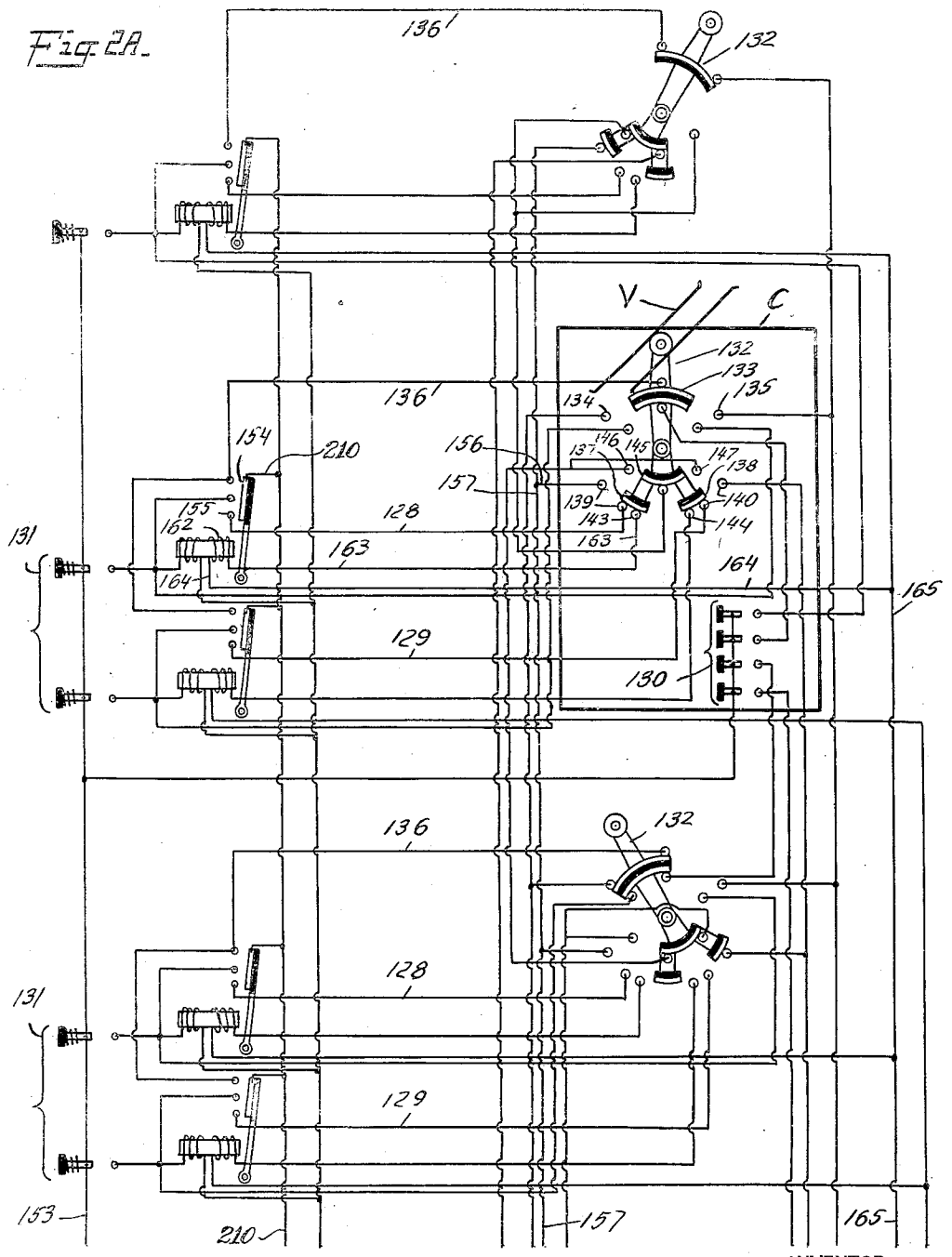


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PUSH BUTTON CONTROL SYSTEM FOR ELEVATORS

Filed March 29, 1929 3 Sheets-Sheet 2

Fig. 2A.



INVENTOR

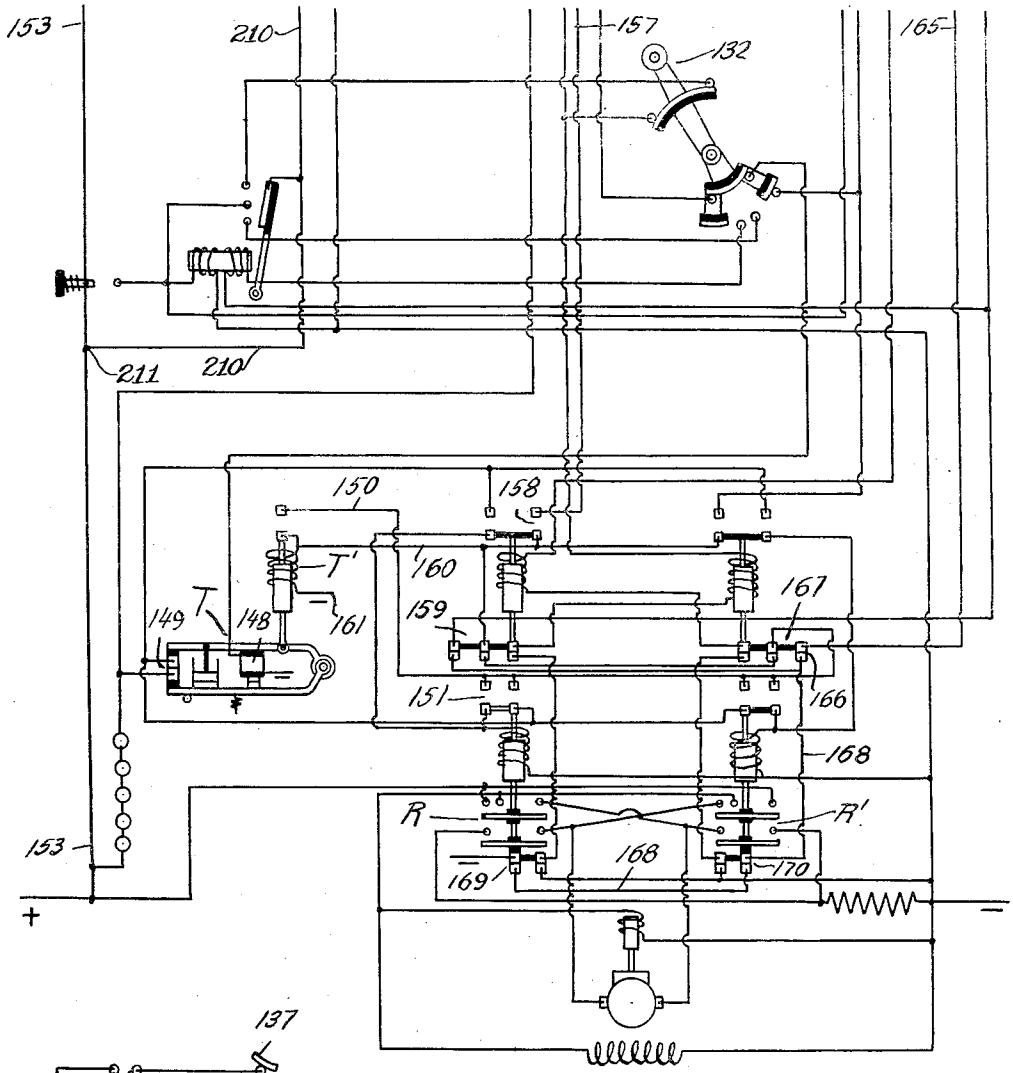
Ernest L. Gale.

Oct. 30, 1934. E. L. GALE 1,978,670

PUSH BUTTON CONTROL SYSTEM FOR ELEVATORS

Filed March 29, 1929 3 Sheets-Sheet 3

Fig. 2B.



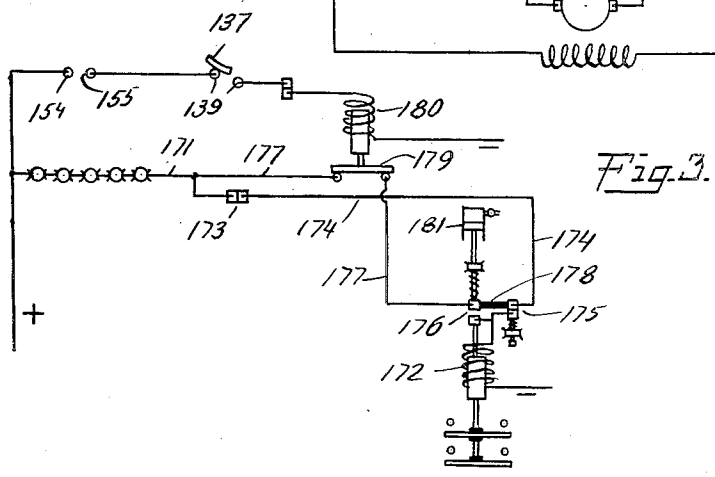


Fig. 3.

INVENTOR

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Patented Oct. 30, 1934

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UNITED STATES PATENT OFFICE

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PUSH BUTTON CONTROL SYSTEM FOR ELEVATORS

Ernest L. Gale, Yonkers, N. Y., assignor, by mesne assignments, to The Gurney Elevator Co., Honesdale, Pa., a corporation of Pennsylvania

Application March 29, 1929, Serial No. 350,963

16 Claims. (Cl. 187—29)

This invention relates to a push button control system for elevators.

The objects of the invention reside in various provisions summarized as follows:—

First, a push-button control system having combined dispatch and intercepting functions and arranged for multi-speed and single speed elevators, the control means, i. e. push-buttons and their associated floor-relay switches, being operable collectively, or in other words, at any time regardless of the position of the car and the direction of car movement and effective to intercept the car by effecting its slow-down and stop, at the landings successively in their natural order regardless of the sequence in which the push-buttons are actuated, the car for any one direction of movement completing its trip to a farthest landing for which a push-button is actuated before reversal of car movement is normally effective.

Second, a push-button control system for multi-speed, and single speed, elevators comprising for each of a plurality of landings, "up" and "down" push-buttons located at the landings and only a single push-button for each landing, located on the car, having combined dispatch and intercepting functions, and actuable at any time to register their calls regardless of car position and the direction of movement of the car, when actuated.

Third, a time-limit switch to control duration of car stops, effective at the expiration of a predetermined period of time, provided the car gate and the hoistway doors are closed but regardless as to whether they are opened during the stopping period, to continue movement of the car in the same direction as when intercepted, or in a reverse direction as when the car has completed its trip in response to a farthest actuated push-button.

Fourth, a load controlled device effective when the car is substantially fully loaded, to render intercepting circuits non-responsive to actuated hall push-buttons, (the latter however effective at the same time to register their calls), and the car responding only to actuated car buttons for landings intermediate car position and the ultimate point of dispatch which latter may be the ground floor or some other pre-determined landing.

Fifth, a push-button control system arranged so that any actuated "up" push-button, or any farthest-up actuated "down" push-button if for a landing above that for which a farthest-up "up" button is actuated, if actuated while the car is moving downwardly from its landing, will after the car completes its downward trip in response to any actuated button farthest-down, condition the system for reverse car movement so that the act of closing the car gate and the hoistway door at such farthest-down landing, or the operation of the time-limit switch, will initiate movement of the car upwardly. During movement of the car upwardly, only "up" push-buttons at intermediate landings are effective to intercept the car and it is automatically slowed-down and stopped at the landing farthest-up for which a push-button is actuated regardless as to whether such push-button is an "up" or a "down" push-button.

Sixth, a push-button control system arranged so that any actuated "down" push-button, or any farthest-down actuated "up" push-button if for a landing below that for which a farthest-down "down" push-button is actuated, if actuated during movement of the car upwardly away from its landing, will, after the car completes its upward trip in response to any actuated push-button farthest-up, condition the system for reverse car movement so that the act of closing the car gate, and the hoistway door at such farthest-up landing, or the operation of the time-limit switch, will initiate movement of the car downwardly. During such downward movement of the car, only "down" push-buttons at the intermediate landings are effective to intercept it and it is automatically slowed-down and stopped at the landings farthest-down for which a push button is actuated regardless as to whether such push-button is an "up" or "down" push-button.

Seventh, car starting circuits constructed and arranged to insure the get-away of the car after each stop, even though the coast of the car when making a stop is not sufficient to move the car actuated stopping elements, out of co-operative relation which condition renders said stopping elements responsive as in case for example, a late comer at the landing stopped at, presses the button thereat just as the door and car gate are closed and before the car has moved sufficiently to disengage said co-operating stopping elements.

Briefly stated a system of control as herein provided having "up" and "down" push-buttons located at each intermediate landing, and a single button on the car for each landing, is arranged so that according to one mode of operation thereof a hall passenger needs only to momentarily actuate a hall push-button once which corresponds to direction in which it is desired to travel and assuming the car is not being used, such initiating-button regardless as to whether it is an

"up" or "down" button will initiate movement of the car toward its landing from a position above or below the latter. Either the "up" or "down" push-button will stop movement of the car which it initiates on first approach of the car from either direction conditional on the assumption that none of the push-buttons for a landing or landings beyond and toward which the car is moving are actuated, and prior to car arrival at the landing corresponding to said initiating push-button. However, if car movement and the push-button which initiates it, correspond as to direction, such push-button will stop the car at its landing on first approach thereto unconditionally. If car movement and the push-button which initiates it do not correspond as to direction, such push-button is ineffective to stop movement of the car at its landing on first approach thereto if during said movement a push-button at a landing or landings beyond and toward which the car is moving is actuated, however said initiating push-button by the single actuation thereof conditions the system so that when the car completes its trip in response to the farthest actuated button for the landing beyond, direction is established for reverse movement of the car and the act of closing the car gate and the hoistway door, or the operation of the time-limit switch initiates movement of the car in a reverse direction to return it to the landing corresponding to the initiating push-button, and the latter is effective automatically to cause slow-down and stop of the car during its return movement.

The present invention differs more essentially from my co-pending application Serial Number 236,740, filed November 30, 1927, by the provision of intercepting circuits which are of the type normally open at both the floor-selector mechanism and the push-button controlled floor-relay contactors, said floor-selector mechanism having a mode of operation to momentarily close-circuit their associated switch mechanism to effect the intercepting operation, whereas in said co-pending application both the intercepting circuits, the floor-selector mechanism and the floor-relays are of an entirely different construction and arrangement and have a different mode of operation involving the use of a normally closed series circuit controlled by the floor-selectors together with normally closed shunts controlled by the push-button controlled floor-relays.

In the accompanying drawings, Fig. 1 illustrates in a more or less diagrammatic manner, a push-button control system of the intercepting type arranged for a multi-speed elevator having for each of a plurality of landings "up" and "down" push-buttons at the landings and a single button for each landing located on the car and the car actuated floor-selector mechanism being of a remote type.

Figs. 2A and 2B illustrate diagrammatically a push-button control system of the intercepting type arranged for a single speed elevator having for each of a pluraltiy of landings "up" and "down" push-buttons at the landings and only a single button for each landing located on the car, the car actuated mechanism being of a type located in the hoistway to be actuated directly by the car.

Fig. 3 illustrates diagrammatically a certain portion of a push-button control system of the intercepting type in modified form.

Referring now more particularly to Fig. 1 it comprises an elevator car C adapted for operation by a hoisting motor N through the intermediary of any well known type of gearing or roping (not shown). So far as the present invention is concerned, the hoisting motor may be of any well known type adapted for multi-speed regulation such for example, as may be obtained by operating it by a Ward-Leonard system or what is commonly known in the art as a variable voltage system, or a multi-voltage system, or a rheostat method of control which involves varying the strength of a shunt field winding A of the hoisting motor, through control of a resistor, the latter method being illustrated herein. Any method for obtaining speed regulation involves the use of a fast and slow speed switch designated Z. Other elements which comprise the system are as follows: an electro-magnetically operable speed-change switch B; an accelerating switch E to control a sectional starting resistance F for the motor N; electro-magnetically operable reversing switches R, R' to control the hoisting motor to move the car upwardly and downwardly respectively; up and down direction switches D, D' respectively, the former having contactors 1 to control an energizing circuit for a winding 2 of the "up" reversing switch, and the latter D' having contactors 3 to control an energizing circuit for a winding 4 of the "down" reversing switch. Car gate contactors and, hoistway door contactors are designated respectively 5, and 6.

The system comprises further, "up" and "down" hall push-buttons 8 and 9 respectively for each intermediate landing and one push-button for each end landing. The car is provided with only a single set of push buttons 10, one for each landing. In the present instance the car-buttons are of the self-holding type, that is they are maintained in actuated or set position by the provision of a self-holding winding 11. Each car push-button is provided with two pairs of contactors 12 and 13, the former to control a car starting circuit through the intermediary of the direction switches, and the latter to control an intercepting circuit in conjunction with a car actuated remote control mechanism of the normally open-circuited type designated G. The intercepting circuits controlled by the controller G and contactors 13 are rendered operative only when the car is loaded to maximum capacity as determined by a load controlled switch X and for which condition an additional remote controller H of the normally open-circuited type which ordinarily is operated in response to both car and hall push-buttons to intercept the car so long as car load is not of maximum value, is rendered non-responsive to either car or hall buttons, but the controller G is rendered operative and is responsive only to car buttons. Hence when the car is loaded to maximum capacity it will not respond to actuated hall-buttons to take on passengers, but will respond to "actuated" car buttons to let car passengers off.

Up and down floor-relay switches 16 and 17 respectively for each of the intermediate landings and one for each end landing, each comprises a winding 18 energizable at any time by momentary actuation of its associated push-button. These switches are maintained in actuated position electrically, or in other words are made self-holding by providing for each winding a self-holding circuit 19 which feeds same by way of self-holding contactors 20. Each floor-relay switch also comprises an additional winding 21 which is wound so that its magnetic action opposes that of its associated winding 18 to pro-

duce a de-magnetizing or neutralizing effect which causes the floor-relay switch to return to a normal position by the action of gravity or a spring not shown. Since the only opening or break in the energizing circuit for any floor-relay winding 18 is at its associated push-button, means in effect that any of the push-buttons are actuable at any time singly or collectively regardless of the position of the car and the direction of car movement, to energize their associated floor-relay windings 18. The demagnetizing windings form two sets, those associated with "up" floor-relays forming one set and those associated with "down" floor-relays forming a second set, each set being rendered effective independently in accordance with direction of car movement as controlled by the direction switches. Energizing circuits for the de-magnetizing windings are controlled through the intermediary of a remote control mechanism J comprising "up" and "down" contactors 22, 23 respectively, actuable in accordance with car movement to co-operate with "up" and "down" fixed contactors 24 and 25 respectively for each intermediate landing, in the circuit of associated de-magnetizing windings, said contact mechanism as will be seen being of the normally open-circuited type.

With the arrangement thus far described it will be seen that the self-holding winding and circuit for each floor-relay switch functions to maintain same in actuated position until the car responds thereto by stopping at its landing, and this in effect means that any button is required to be actuated only once to effect response of the car thereto regardless of the position of the car and the direction of movement of the car, when actuated. The energizing circuits for the de-magnetizing windings are such that for movement of the car upwardly only "up" de-magnetizing windings are momentarily energized to effect return of their associated floor-relays to normal position only if and when the car stops at their landings. When such upward car movement to the farthest point of dispatch is under control of a "down" floor-relay switch such down floor-relay will effect automatic slow-down and stop of the car and will be returned to normal position or if both floor-relays at such farthest-up landings are actuated, both will be returned to normal position. For movement of the car downwardly only "down" de-magnetizing windings are momentarily energized to effect return of their associated floor-relays to normal position only if and when the car stops at their landings. When such downward movement of the car to a farthest point of dispatch is under control of an "up" floor-relay switch, such "up" floor-relay switch will effect automatic slow-down and stop of the car, and will be returned to normal position, or if both floor-relays at such farthest-up landings are actuated both will be returned to normal position.

Actuation of any car button at any time regardless of car position and the direction of car movement effects energization of one or the other of the "up" or "down" floor-relay switch windings for the landing corresponding to such actuated button, depending on the position of the car relative to said landing for which a button is actuated, as determined by a usual type of remote control mechanism designated K which directs current supply to said "up" or "down" floor-relay switch winding for any landing, from contactors 12 of an actuated car button corresponding thereto.

Each "up" and "down" floor-relay switch for each intermediate landing is provided respectively with "up" and "down" car start contactors 26 and 27, which together with "up" and "down" slow-down and de-magnetizing contactors 28 and 29 respectively and also the self-holding contactors 20 are fed from a common contactor 30 carried by each floor-relay switch arm 31. The "up" and "down" contactors 26 and 27 operate in conjunction with a remote controller L of a well known type and a well known mode of operation, to control dispatch operation or in other words, to initiate movement of the car in response to the car-buttons and the hall-buttons, through control of circuits for the windings 32 and 33 of the "up" and "down" direction switches. The latter switches are closable one at a time to close their top contactors 1 or 3 to control energizing circuits for the "up" or "down" reversing switch windings 2 and 4, and also to render "up" or "down" de-magnetizing circuits effective in accordance with direction of movement of the car by means of back-contactors 105 on the "down" direction switch which when the car is moving upwardly render the "up" de-magnetizing circuits effective, and back-contactors 61 on the "up" direction switch which when the car is moving downwardly render the "down" de-magnetizing circuits effective. Contactors 51 and 56 of said direction switches control the "up" and "down" intercepting common wires 50 and 55 respectively so that "up" intercepting circuits are effective when movement of the car is upwardly, and "down" intercepting circuits are effective when movement of the car is downwardly. An initial energizing circuit 34 for a reversing switch winding is subject to the hoistway door, car gate and stop switch contactors, also to contactors 35 of the speed change switch B, and contactors 36 of a stop switch M on the car. The single stop switch M controls all stops and is of a type adapted for actuation by "up" and "down" stop cams 37 and 38 positioned in the hoistway all in one and the same vertical plane for co-action with a stop switch roller 39 carried by a retractive switch arm or lever 40. When the car is moving at its high speed rate the switch is maintained in retracted position mechanically as by a spring 41. with its contactors 36 closed so that the roller will not strike cams at the floors not stopped at, and when slow-down is effected the switch as a whole is rocked by means of an electro-responsive device 42 with the contactors 36 at the same time maintained closed as by a light spring 43, so that the roller is in a position to engage the stop cam when the stopping point is reached and by such engagement open the contactors 36 to open a self-holding circuit for a reversing switch winding controlled by top contactors 44 of the reversing switches thus to effect automatic stop of the car.

The "up" and "down" car start contactors 26 and 27 for any one landing, are connected in parallel by a wire 45 which connects the "up" and "down" contactors in parallel of the remote controller L, for the landing corresponding thereto. Such parallel connection of the "up" and "down" car start contactors renders either the "up" or "down" button for each landing below car position effective through the intermediary of the remote controller L to energize the "down" direction switch to initiate movement of the car downwardly, and to render either the "up" or "down" button for each landing above car position effective through the intermediary of the remote controller L to energize the "up" direction switch to initiate movement of the car upwardly.

This arrangement in effect provides means whereby a hall-passenger needs to press a hall button only once corresponding to direction in which it is desired to travel and if the car is not in use, such button, regardless as to whether it is an "up" or "down" button will originate movement of the car toward its landing from a position above or below same and effect automatic slow-down and stop of the car thereat on first approach of the car thereto, such slow-down operation however on first approach of the car being conditional if the initiating button and the direction of car movement do not correspond as to direction. When the car is moving upwardly, the normally closed speed-change switch B in the circuit of the winding 46 of the slow-down switch Z and also in the initial energizing circuit for the reversing switch windings is responsive to actuated "up" buttons through the intermediary of "up" intercepting slow-down circuit 47 for each intermediate landing, as controlled by "up" slow-down contactors 28 of a floor-relay switch together with a contactor 48 and common contactor 49 of the remote controller H. The contactor 49 connects with a common wire 50 which feeds the winding B' of switch B by way of contactors 51 of the "up" direction switch.

When the car is moving downwardly response of the switch B is effective through the intermediary of a "down" intercepting or slow-down circuit 52 for each intermediate landing as controlled by "down" slow-down contactors 29 of its associated floor-relay switch together with its associated contactor 53 and common contactor 54 of the remote controller H. The contactor 54 connects with a common wire 55 which feeds the winding B' by way of contactors 56 of the "down" direction switch.

When movement of the car upwardly to a farthest-up landing for which a button is actuated is under control of a "down" button, automatic slow-down of the car at such landing is effected by opening of the "up" direction switch so that with both direction switches opened, their back-contactors 80 and 80' in series are closed to complete an energizing circuit for the winding B' of the slow-down switch B. Likewise the "down" direction switch opens when the car reaches a farthest-down landing for which a button is actuated and if movement of the car to such farthest down landing is under control of an "up" button said back-contactors effect automatic slow-down.

The common contactors 49 and 54 to control "up" and "down" intercepting circuits in response to car and hall-buttons, also common contactors 49' and 54' which co-operate respectively with "up" and "down" contactors 48' and 53' to control intercepting circuits responsive only to car buttons, together with common contactors 22 and 23 to control demagnetizing circuits, are carried by arms 57 rotatable by a shaft 58 which may be coupled with a shaft 59 of the remote controller L actuable in accordance with the movement of the car either directly or indirectly through the intermediary of any of the well known types of drive (not shown).

A switch X on the car is responsive to the load so that when the latter is of a pre-determined or maximum value corresponding to full car load, the car suspension springs 60 yield sufficiently to cause actuation of the switch X. Actuation of switch X will in effect render the car non-responsive to actuated hall-buttons by forming an open-circuit in both intercepting common wires 50 and 55 at the contactors 117 and 117'. Said hall-buttons however at the same time remain effective to energize their associated floor-relay switch windings thus the hall-buttons remain effective to register calls. The switch X by closing contactors 125 and 125' thereby renders the controller G effective and the speed change switch B is thus rendered responsive only to the car buttons.

Coming now to the operation of the parts. A hall passenger needs only to actuate momentarily either the "up" or "down" landing button according to the direction in which it is desired to travel. Assume for example that the car is not already in use and is at rest at the first landing, and a first passenger to press a button is at the third landing and said passenger desiring to go down accordingly presses the "down" button at said landing. By momentary actuation of said button an energizing circuit is completed for the winding 18 of the third landing "down" relay switch 17, causing operation of the latter so that the contactor 30 engages contactors 27, 20 and 29. Such closed floor-relay switch causes energization of the "up" direction switch winding 32 by completing its circuit at the contactors 27 and 30 the contactors 20 and 30, complete a self-holding energizing circuit for the floor-relay switch winding 18. "Down" slow-down and "down" de-magnetizing circuits are closed at contactors 29 and 30 said two circuits branching in parallel from the latter contactors, but such circuits are inoperative at the present time. The "up" direction switch closes its contactors 1 to complete an initial energizing circuit for the winding 2 of the "up" reversing switch by way of contactors 35 of the normally closed switch B, to cause closure of the reversing switch to direct current to a winding P' of an electro-mechanical brake P to effect release of the brake, and direct current to the hoisting motor N to effect movement of the car upwardly. The accelerating magnet operates in a well-known manner to accelerate the motor and when its last arm operates it closes contactors 63 to complete an energizing circuit for the winding 46 of the fast and slow speed switch Z to effect operation of the car at its fast speed rate. It will be observed here that the "down" intercepting circuit will be open at the remote control "down" contactors 53 and 54 and also at the "down" direction switch contactors 56; also at this time the "down" de-magnetizing circuit for the third landing is open at the "down" remote control contactors 25 and 23 also at the "up" direction switch back-contactors 61 and also at the back-contactors 62 of the "up" reversing switch which latter contactors are in series with the back-contactors 63 of the "down" reversing switch which in effect means that a de-magnetizing circuit for any particular landing is not completed unless and until the car stops thereat which is evidenced by both reversing switches being open to close said back-contactors 62 and 63 and then a circuit is completed only for the de-magnetizing winding for the floor-relay which corresponds to direction of car movement.

A circuit for the winding 18 of the third landing "down" floor-relay switch as completed by actuation of its associated "down" button 9 is as follows; from a common feed wire 64 connecting with a plus main 65, third landing "down" button, wire 66, and through winding 18 to the minus main by wire 67.

A self-holding circuit for said winding 18 is as follows; from a wire 19 connecting with the plus main, wire 69, contactors 30 and 20, wire 70 which

forms a junction at 71 with wire 66, through winding 18, and to minus main by wire 67.

A circuit for the winding 32 of the "up" direction switch is as follows:—wire 19, wire 69, contactors 30 and 27 of third landing floor-relay switch, wire 45 which connects the contactors 26 and 27 of both the "up" and "down" floor-relay switches respectively, for the third landing, in parallel, wire 45, to third landing "up" contactors 84 of the remote controller L, to common "up" wire 85 which feeds the "up" direction switch winding 32, wire 86, back-contactors 87 of the "down" direction switch, wire 88, back-contactors 89 of "down" reversing switch and thence by wires 90 and 67 to minus main.

A circuit for the winding 46 of the fast and slow speed switch Z is as follows:—from plus main 65 to wires 34, 34', auxiliary contactors 91 on "up" reversing switch, wire 92, contactors 93 of the speed change switch B, wire 94, contactors 63 controlled by last arm of accelerating magnet E, wire 95, winding 46, and by wire 96 to minus main.

A circuit for the winding 2 of the "up" reversing switch may be traced as follows:—from plus main to contactors 1 of the "up" direction switch by way of a wire 34 including the hoistway door and car gate contactors and normally closed contactors 35 of switch B, through contactors 1 to wire 73, winding 2 to wire 74, back contactors 75 of "down" reversing switch, wires 76 and 77, normally closed contactors 36 of stop switch M and thence through wire 78 to wire 67 leading to minus line.

The "up" direction switch by closing, opens its back-contactors 61, 79 and 80. The contactors 61 by opening render the "down" de-magnetizing circuits inoperative and the "up" de-magnetizing circuits are rendered operative by reason of the back-contactors 105 of the "down" direction switch being closed. The contactors 79 open the circuit for the winding 33 of the "down" direction switch, and in such manner said switch is rendered inoperative and cannot close so long as the "up" direction switch is closed and the latter switch will remain closed until the car reaches the farthest-up landing for which an "up" button is actuated because the floor-relay corresponding to the latter provides a farthest-up feed for the winding of the "up" direction switch. Because of the fact that the "down" and "up" feed contactors 26 and 27 for a landing are connected in parallel, means that a farthest-up actuated "down" button if for a landing above the one for which a farthest-up "up" button is actuated will provide a farthest-up feed for said "up" direction switch winding to maintain its switch closed. Said direction switch by opening will effect automatic slow-down and will condition the system to effect stop of the car at the third landing under present conditions as assumed.

We now have the car moving upwardly at its fast speed rate to the third landing under control of the "down" button thereat, with the "down" intercepting and de-magnetizing circuits rendered inoperative and the "up" intercepting and de-magnetizing circuits rendered operative. Hence even though the movement of the car to a farthest point of dispatch is under control of a "down" push button or floor-relay switch, the car will not respond to any actuated "down" buttons for landings intermediate car position and said farthest point, but will however respond to actuated "up" buttons for such intermediate landings, by slowing-down and stopping thereat successively in their natural order regardless of the order in which the buttons are actuated. Let us assume now that the second landing "up" button is actuated prior to the car reaching the second landing "up" slow-down point or before the contactor 49 engages the second landing slow-down contactor 48. Actuation of said button at such time results in intercepting the car by slowing it down and effecting its stop at the second landing on first upward approach thereto. However if said "up" button is actuated subsequently to the car passing said slow-down point, it will by the single actuation thereof and if it is the farthest-down actuated button, condition the system to bring the car downwardly after completion of its upward trip to a farthest-up landing for which a button is actuated, and effect automatic slow-down and stop of the car at the second landing on said downward trip of the car. On the other hand if said "up" button is not the farthest down actuated button (which means that a button at a landing below is also actuated), the car will not respond to it on its said trip downwardly, but said "up" button by the above mentioned single actuation thereof will condition the system to initiate movement of the car upwardly when it completes its trip to the farthest-down point of dispatch, and automatically effect its slow-down and stop on what will be its second upward approach to said second landing.

Going back to the assumption first made, viz.; that the button is actuated prior to the car passing the "up" slow-down point, under such circumstance when the movement of the car brings the contactor 49 into engagement with the second landing contactor 48, an energizing circuit for the winding B' of switch B is momentarily completed, and said switch B operates to effect automatic slow-down by opening the circuit of the fast and slow speed switch winding 46. Said switch B at the same time opens at its contactors 35 the initial energizing circuit of the "up" reversing switch winding 2 so that the reversing switch is now maintained closed under control of the contactors 36 of stop switch M. When the switch B operates, it closes at contactors 183 a self holding circuit for its winding B', said circuit being controlled by the reversing switch contactors 91 so that in effect the switch B, although initially opened by engagement of contactors 49 and 48, is thereafter maintained open until stop is effected as by opening the reversing switch.

In such manner when slow-down is effected, the control of the "up" reversing switch is transferred from the switch B, exclusively to the stop switch M controlling the self-holding circuit for the winding 2 of said reversing switch. The energizing circuit for the winding of switch B includes the winding 42 of stop switch M. Hence the winding 42 is energized when slow-down is effected and is de-energized as by opening the above noted self-holding circuit. The winding 42 being energized moves the stop switch M into position to co-operate with the stop cam and when the car reaches a point near the second landing, the stop switch engages the stop cam to effect opening of contactors 36 thereby to open the self-holding circuit for the "up" reversing switch to effect stop of the car.

The intercepting circuit as completed momentarily to energize the winding B' when contactor 49 engages contactor 48 corresponding to the second landing is as follows:—from wire 19 through closed "up" floor-relay switch contactors

30 and 28 for second landing, wire 47, second landing contactor 48 to common contactor 49, wire 50 which includes contacts 117 of the load adjusted switch X, contactors 51, wire 98, winding B', wire 99, winding 42 and to the minus main by wires 100 and 67.

The self-holding circuit for windings B' and 42 is as follows:—from a plus wire 65, wire 34, wire 34', contactors 91, wire 92 to junction 92', wire 101, contactors 183 to a junction 102 with wire 98, through windings B' and 42 in series, and to the minus main as heretofore traced.

A self-holding circuit for the winding 2 of the "up" reversing switch may be traced as follows:—branching from wire 34' at junction 200, wire 201, contacts 44, junction 203 with wire 73, winding 2 to wire 74, back-contactors 75, wires 76 and 77, contactors 36 of stop switch M and thence to wire 67 leading to minus line by way of wire 78.

With the car now at rest substantially at a level with the landing, "up" and "down" contactors 22 and 23 respectively in the "up" and "down" de-magnetizing circuits are in engagement with their respective fixed contactors 24 and 25 respectively which correspond to the second landing. The "down" de-magnetizing circuits are inoperative at this time due to the "up" direction switch forming an opening at its back-contactors 61 in a common wire 103 which connects with the common contactor 23. However with the "up" common wire 104 closed at back-contactors 105 of the "down" direction switch and both reversing switches now open to close their back-contactors 62 and 63, and with the contactors 22 and 24 in engagement, an energizing circuit is completed for the de-magnetizing winding 21 of the second landing "up" floor-relay switch and the magnetic effect of said winding neutralizes the magnetic effect of the winding 18 which results in opening said floor-relay switch, so that the latter is again conditioned for actuation in response to its associated button. The completed circuit for the de-magnetizing winding 21 may be traced as follows:—branching from the second landing "up" floor relay switch wire 47, at a junction 47', winding 21, wire 203, contactors 24 and 22, common wire 104, back-contactors 105 of "down" direction switch, and thence to the minus main by way of wire 106 which includes the back-contactors 63 and 62 in series of the "down" and "up" reversing switches.

We now have the car at rest at the second landing and assuming the car gate and the hoistway door after having been opened are again closed, the initial energizing circuit for the "up" reversing switch winding is thus conditioned so that when the switch B which is in the form of a time-limit switch to control duration of car stop closes, the car will thus automatically be caused to continue its movement upwardly to the third landing under control of the "down" button thereat. The provision of a dash-pot 107 on switch B, causes the latter when its winding is de-energized by opening of the "up" reversing switch, to be retarded in its movement to close its contactors 35 to complete the initial energizing circuit for the "up" reversing switch winding. In such manner the switch B is caused to function as a time-limit switch to limit the duration of each car stop to give a passenger a reasonable period of time to open the car gate and hoistway door, etc. Hence at the expiration of the time period, if the car gate and hoistway doors are closed, and regardless as to whether either had been opened during the stopping period said switch will close to continue movement of the car in the original direction in which it was travelling when intercepted.

At this point it will be mentioned that if a passenger whom we will term a late comer should actuate the button at the second landing with the hoistway door and the car gate closed and just after the switch B closes to effect closing of "up" reversing switch to start the car, but before car movement has disengaged the contactors 22 and 24, the start of the car will not be interfered with, and the floor-relay switch corresponding to the button pressed will remain in actuated position and will not be re-set or returned to normal position at such time even though the contactors 22 and 24 are in engagement, because the de-magnetizing common wire 104 is opened at the back-contactors 62 of the "up" reversing switch when it closes to start the car.

Assuming that the switch B is now closed the car will move upwardly to the third landing under control of the "down" button or "down" floor-relay switch corresponding thereto, such landing being the farthest-up for which a button is actuated. Under such circumstance, or in other words, when the farthest actuated button and the movement of the car do not correspond as to direction, the automatic slow-down will be effected by the opening of whichever direction switch is closed which agency is relied upon as under the present condition in the absence of the necessary closure of the "up" intercepting circuit at the third landing "up" floor-relay switch contactors 30 and 28. Hence when the car in moving upwardly toward the third landing, reaches the slow-down point as determined by the adjustment of the remote direction controller L, the contactors 84 are open-circuited. In such manner the farthest-up feed for the winding 32 of the "up" direction-switch is opened and said switch will open, and close its back-contactors 61, 79 and 80. The opening of said switch will effect automatic slow-down by reason of its back-contactors 80 together with the back-contactors 80' of the "down" direction switch being in series to complete an energizing circuit for the winding B' of the speed change switch B and at the same time the stop switch M is conditioned to effect car stop through control of the self-holding circuit for the reversing switch winding, which circuit maintains the reversing switch closed when its initial energizing circuit is opened as in this case at the contactors 35 and also at the contactors 1.

When said "up" direction switch opens, the energizing circuit which is completed for the winding B' is as follows:—wires 34, 34', contactors 91 of "up" reversing switch, wire 108, back-contactors 80, wire 109, back-contactors 80', wire 110 to junction 102 and so on through windings B' and 42 in a manner as heretofore traced. The switch B operates to close its contactors 183 to close the self-holding circuit heretofore traced subject to the "up" reversing switch contactors 91 so that the winding B is de-energized when said switch is opened through the engagement of the stop switch M with the stop cam.

The car having reached the farthest-up point of dispatch, and the "up" direction switch being open, results ultimately in closure of the "down" direction switch, provided of course that any of the "up" or "down" floor-relays corresponding to landings below the car are closed. However, the winding 33 of the "down" direction switch cannot be energized until the "up" reversing switch opens, to close its back contactors 111 in the circuit of

said winding. Furthermore the provision of a dash-pot 112 on each of the direction switches will cause each to have a slow or retarded movement when its winding is energized to close its top contactors. In effect the time period so introduced permits the back-contactor 61 and 105 and the back-contactors 62 and 63, all to be closed at the same time, as for example, in the present circumstances with the car at the farthest point of dispatch, so that with the car stopped at such point or third landing, and with the contactors 22 and 23 in engagement with their associated contactors 24 and 25 respectively, whichever floor relay switch is closed, or both if such is the case, will be returned to normal position because of the energizing circuits being closed at the various contactors above enumerated for both "up" and "down" de-magnetizing windings for said landing. In the present case only the "down" floor-relay switch for the third landing is in actuated position and it will now be returned to a normal position through the action of its neutralizing winding 21 whose circuit may be traced as follows:— wires 19 and 69, contactors 30 and 29, winding 21 of the third landing "down" floor-relay, wire 113, contactor 25 corresponding to the third landing, contactor 23, common wire 103, back contactors 61 of "up" direction switch, wire 114 to a junction with the wire 106 which connects with the minus main and includes the back-contactors 63 and 62 in series, of the reversing switches. It is obvious of course that if when the car reached the third landing, the "up" floor-relay switch is in actuated position, it would also be returned to normal position through energization of its neutralizing winding by way of its contactors 30, 28, winding 21, wire 115, contactor 24, corresponding to the third landing, contactor 22, wire 104, back-contactors 105 of the "down" direction switch whose operation to close its top contactors is retarded by the dash-pot and the fixed contactor 105 will be spring pressed to follow-up its co-operative movable contactor for a short distance so that the de-magnetizing circuit now being traced will remain completed for a short period of time after the "up" reversing switch has opened at which time the "down" direction switch may be caused to operate but with a retarded movement so that the contactors 105 and back-contactors 62 and 63 will both be closed at the same time and the circuit will continue by way of wire 106 including said contactors 62 and 63 in series, to the minus main.

Although a push-button which does not correspond to direction of car movement, brings the car to a farthest point of dispatch and effects automatic slow-down and stop by operation of a direction switch, the latter switch will not effect such result in response to actuated buttons which do not correspond to direction of car movement at the landings intermediate said farthest point of dispatch and car position, because of the fact that the direction switch which has the car under control, remains closed uninterruptedly until said farthest point is reached regardless of the number of intermediate stops so that in effect, the car will respond only to buttons at said intermediate landings, which correspond to direction of car movement, and through the agency of their associated intercepting wires.

The car is now at rest at the third landing and after a lapse of time as determined by the adjustment of the dash pot associated with switch B, the latter will close. Hence if all hoistway doors and the car gate are closed movement of the car in a reverse or downward direction will be initiated by any actuated floor-relay switch or switches for landings below car position regardless of whether such actuated relay switches are "up" or "down" switches, but if none of such switches are in actuated position the car will remain at the third landing or farthest-up point of dispatch. Assume now that during the previously described movement of the car upwardly under control of the third landing "down" button, the second landing "up" button had been actuated subsequently to the car passing the second landing "up" slow-down point. Said button having been actuated too late to intercept the car on its "up" trip will however cause it to stop on its next "down" trip if the first landing button is not pressed some time after the car has left its landing for the previous upward trip and before the car reaches the second landing "down" slow-down point on its downward trip. We will assume now that said second landing "up" button through its control of the "down" direction switch initiates movement of the car downwardly. Let us assume further that the first landing button is actuated before the car reaches the second landing "down" slow-down or intercepting point, that is before the remote control L operates its second landing-contactors 116 to open the "down" direction switch to effect automatic slow-down. Under such condition the first landing floor-relay switch will close and its contactors 30 and 27 will provide a feed for the winding of the "down" direction switch winding 33 so that in effect the "down" direction switch will not open to effect automatic slow-down and stop at the second landing in response to the actuated "up" button at said landing, and the car will continue on downwardly and will be automatically slowed-down near the first landing through control of the switch B by opening of the "down" direction switch. Stop of the car is effected by operation of the stop switch M. With the car stopped at the first landing the circuit for the de-magnetizing winding 21 for the first landing floor-relay switch is conditioned by the remote controller J at its "down" contactors 23 and 25 to cause return of the first landing floor-relay switch to normal position.

Under present assumed conditions, the second landing "up" floor-relay switch is closed so that the car having now completed its trip to the farthest-down point of dispatch, will, provided all hoistway doors and the car gate are closed, and at the expiration of the time period as controlled by the switch B, through the action of its associated dash-pot 107 and by the closure of the latter, be caused to move upwardly through closure of the "up" direction switch in response to the second landing actuated floor-relay switch. The car will be automatically slowed-down at said second landing through the control of the switch B by the second landing "up" intercepting circuit 47 etc., and will be stopped automatically by actuation of the stop switch M.

It is obvious of course that if during the heretofore described movement of the car downwardly from the third landing under control of the first landing button, the second landing "down" button is actuated prior to the car passing the second landing "down" slow-down point, such "down" button will intercept the car by causing it to slow-down as it approaches the second landing, through control of the switch B by the second landing "down" intercepting circuit 52 and its associated contactors 54, 53, etc.

The stop of the car at said landing is effected by the stop switch M, and the second landing "down" floor-relay switch is returned to normal position but the "up" actuated floor-relay switch will remain undisturbed and will bring the car back to its landing and stop it thereat when it completes its trip to the first landing.

A completed "down" intercepting circuit for the winding B' as controlled in response to the actuated "down" floor-relay switch for the second landing is as follows: wire 19, contactors 30 and 29 of the second landing floor-relay switch, wire 52, contactors 53 and 54 of the remote controller H, wire 55 which includes contactors 117' of the load controlled switch X, contactors 56 of the "down" direction switch, wire 98, winding B', wire 99, winding 42, to minus line by way of wires 100 and 67.

It will be obvious of course that intercepting wires 47 and 52 together with associated contactors 48 and 53 are not required for the two end landings because of the fact that when the car is brought to either of said points, the automatic slow-down of the car is effected by the opening of whichever direction switch has brought the car to said points in a manner as has been heretofore described.

Any actuated car button for the landings intermediate the two end landings, will effect energization of either the "up" or "down" floor relay switch winding for the landing corresponding thereto. The remote controller K serves as a telltale for the position of the car so that for any position thereof say at or between any intermediate landing, the controller K will direct current to "up" relay windings for all landings above car position whose coresponding car buttons have been actuated, and it will direct current to "down" relay windings for all landings below car position whose corresponding car buttons have been actuated. By such an arrangement any car button by only a single actuation will in effect register its call by effecting closure of one or the other of the floor-relay switches for the landing corresponding thereto regardless of the position of the car and the direction of movement of the car when actuated. The manner in which the single set of car buttons through the agency of the remote controller K function selectively to effect actuation of the floor-relay switches, one at a time for any one landing for which a car button is pressed and according to the direction in which it is desired to travel, having been described, it is sufficient to say further that the response of the car to such actuated floor-relay switches, is the same as has been described as when the floor-relays are actuated by the hall-buttons.

Any car button which is actuated is maintained in such position by its holding coil 11. Assume the car is at the second landing and a passenger getting on same presses the car button corresponding to the third landing the car already having been dispatched by a hall-button to the fourth landing. Under such circumstances the now closed third landing car button contactors 12 complete an energizing circuit for the winding 18 of the "up" third landing floor-relay switch as follows, from a wire 118 connecting with the plus main, wire 119, winding 11 and contactors 12 of the third landing car button, wire 120 to wire 120' which connects in parallel the "up" contactors 121 now closed and "down" contactors 122 now open, of the remote controller K, through "up" contactors 121, to wire 123, to junction 123' with wire 124 which is fed also from the "up" hall-button at the third landing, and extends to the winding 18 of the "up" floor-relay switch for the third landing. The circuit just traced constitutes a self-holding circuit for the third landing car button to maintain its contactors closed until the car responds thereto. Said self-holding circuit for the car button winding 11 is opened substantially at the time when the car stops at the landing corresponding thereto, by opening of the contactors 121 and substantially at the same time the corresponding closed floor-relay switch is opened in a manner as hereinbefore described through energization of its demagnetizing winding.

From the description thus far given it will be seen that the car buttons as well as the hall buttons through their control of the floor-relay switches will in effect function to initiate car movement and also to intercept the car. So long as the car load is not sufficient to open-circuit the contactors 117 and 117' of the load controlled switch, the car will be intercepted through the agency of the circuits controlled by the floor-relay switches and the controller H in a manner as hereinbefore pointed out, in response to both the hall and car buttons. However, when car load is a maximum the contactors 117 and 117' of the load switch are opened to render the car non-responsive to the hall push-buttons on its trip downwardly or upwardly by rendering the controller H inoperative as effected by open-circuiting the "down" and "up" intercepting common wires 55 and 50 by opening them at the contactors 117, 117' thus depriving the speed-change switch winding B' of a feed from such source. However, the other set of intercepting circuits 127 is rendered effective at this time by closure of the "up" and "down" common wires 126 and 126' at the contactors 125, 125' of the load switch. Said circuits 127 are responsive only to the car buttons, they being fed from their contactors 13, so that the latter in conjunction with the remote controller G provide a control means subject only to the car buttons to intercept the car at any landings for which car buttons are actuated while at the same time the car will be non-responsive to actuated hall push-buttons in-so-far as their intercepting operations are concerned, so long as the contactors 117 and 117' remain open-circuited. However any of the floor-relay switches can be actuated at this time by actuation of their associated hall-buttons, and by the car buttons also since through their agency the initiation of car movement in one direction or the other and the maintenance of directions of such movement by the direction switches is controlled, but the car in travelling to the farthest point of dispatch will stop at intermediate points only in response to actuated car buttons. With the present arrangement a car passenger needs only to actuate a car button only once to effect response thereto even though the button so actuated does not correspond to a landing toward which movement of the car is directed at the time said button is actuated which condition may arise for example, if, when the car stops at a landing in response to an actuated car button to let a passenger off, another passenger waiting for the car at said landing should occupy same and actuate such a car button. Such car button if for an intermediate landing will effect closure of the "up" or "down" floor-relay switch for the corresponding landing, and when the car completes its trip to the farthest-point to which it was

already dispatched at the time such button was operated, said button will initiate movement of the car in a reverse direction and stop it at the landing corresponding thereto during the trip in said reverse direction.

The present system of intercepting and dispatch circuits can be used without the use of the load controlled stop switch and in such case, the present system will be materially simplified by the reduction of elements because in such case, the remote controller G and its associated circuits 127, also the self-holding type of car push-button can be eliminated. Hence in place of the self-holding type of buttons in the car, the usual standard type such as illustrated for the halls can be employed, and each provided with only the single contactors 12 to control their associated circuits 120 by means of which the floor-relay switches are actuated from said car buttons in a manner as controlled by the remote controller K.

Referring now to the arrangement illustrated in Figs. 2A and 2B, they show essentially somewhat the same system of intercepting circuits, etc., as in Fig. 1, but as embodied in a single speed control system, to control a stop switch T. In the Fig. 2A arrangement however, the normally open-circuited intercepting "up" and "down" stop circuits designated 128 and 129 respectively are controlled through the intermediary of "up" and "down" floor-relay switches in response to car and hall push-buttons 130, and 131 respectively, in conjunction with hoistway type of floor-selector switches 132 located adjacent each landing and actuable in a well known manner by a cam V on the car. Each switch 132 for each intermediate landing comprises the following parts, viz;—a segment 133 to co-operate with "up" and "down" fixed contactors 134, 135 respectively to control the direction switches through the agency of car start circuits 136; segments 137 and 138 to co-operate with contactors 139, 140 respectively to control intercepting circuits 128 and 129 to condition the switch T by energizing an actuating winding therefor T', but not cause its actuation to stop the car, said intercepting circuits being normally open-circuited at their associated contactors 137 and 139 and 138 and 140, for either position of the segments 137 and 138 as set by movement of the car upwardly and downwardly, said intercepting circuits being momentarily closed and again opened by their respective contactors; a feed for an "up" de-magnetizing winding is closed when one of the contactors 139 and an additional contactor 143 are engaged by the segment 137, and a feed for a "down" de-magnetizing winding is closed when one of the contactors 140 and an additional contactor 144 are engaged by the segment 138, an additional segment 145 to co-operate with fixed contactors 146 and 147 in parallel, said contactors for all the landings and for either set position of the segments 145, forming a normally closed series circuit opened momentarily only at the switch which is actuated, and being again closed at said point, to control an energizing circuit for a winding 148 of the switch T. Said winding 148 acts as a holding coil so that the two pivoted arms of the switch T will be rocked as a unit by energization of the winding T' subject to the control of the normally open intercepting circuits, while at the same time the stop switch contactors 149 remain closed. In such manner the stop switch is conditioned by rocking it bodily, so that when the winding 148 is de-energized as by opening of said series circuit at the floor-selector corresponding to the landing to be stopped at, the lower arm of the switch T will drop while at the same time the upper arm will remain in its actuated position and in this manner the contactors 149 are open-circuit to effect stop of the car.

The car in its movements is responsive to the car and hall-buttons in the same manner as has been described in connection with the Fig. 1 arrangement and herein it is thought sufficient to explain only in a general way the mode of operation of a floor-selector switch to effect automatic stop or interception of the car.

For this purpose let us assume that the car in moving upwardly toward the third landing is intercepted by actuation of the "up" button at said landing. The car in approaching to within say two or three feet of the third landing causes the cam to actuate the third landing switch 132, and the initial movement of the latter causes the segment 137 to engage both contactors 139 thus to complete the intercepting circuit to energize the stop switch winding T to cause the latter to rock the stop switch but without opening its contactor due to the holding action of the already energized winding 148. Said switch will be maintained in such rocked position by a holding circuit 150 subject to the control of the reversing switch contactors 151 to be opened when the reversing switch opens. The stop switch is now held in actuated position by the winding T, with the contactors 149 closed, and the car continues its movement to cause segment 137 to disengage one of the contactors 139 to open the intercepting circuit for the winding T; and when the car is within, say an inch or so of the landing, the segment 137 is then caused to engage one of the contactors 139 and the contactor 143 and at the same time the series circuit for the winding 148 is opened at the segment 145 and contactor 146. The winding 148 being de-energized allows the lower arm of switch T to drop and in this manner open-circuit contactors 149 to open the circuit 152 for the "up" reversing switch winding.

When the reversing switch opens, it effects de-energization of the winding T' and the upper arm of the switch T will start its closing movement, such movement however being retarded by a dash-pot to introduce a time-period to limit the duration of car stop. When the contactors 149 again close, the car will be started, provided all the hoistway doors and the car gate are closed, in an original direction as when intercepted.

With the car stopped at the third landing, the segment 137 close-circuits one of the contactors 139 and contactor 143 which results in the de-magnetizing winding for the third landing "up" floor-relay switch being energized to effect return of said switch to normal position.

A completed intercepting circuit for the winding T' may be traced as follows: from a wire 153 connecting with the plus main, wire 210 which forms a junction at 211 with wire 153, contactors 154 and 155 of the third landing "up" floor-relay switch, wire 128, contactor 139, segment 137, to the other contactor 139, wire 156 to a common "up" intercepting wire 157, contactors 158 of "up" direction switch 159, wire 160, winding T' to the minus main by wire 161.

A completed circuit for the de-magnetizing winding 162 of the third landing "up" floor-relay switch may be traced as follows;—the same as just traced up to and including the contactor 139

then to contactor 143 by way of segment 137, wire 163, winding 162, wire 164 to common "up" wire 165, contacts 166 of "down" direction switch 167, and thence to the minus main by way of wire 168 which includes back-contactors 169 and 170 of the "up" and "down" reversing switches R and R' respectively.

With the present arrangement of circuits although a late comer at the third landing can by actuation of the "up" button thereat effect actuation of the "up" floor-relay switch if the "up" reversing switch has just closed to again start the car, such closed floor-relay through any of the circuits controlled thereby, cannot in any way interfere with the get-away or in other words prevent start of the car by opening the circuit of the reversing switch winding at the stop switch contactors 149.

This is so since the foot or so of car movement toward the landing after the conditioning of the switch T as by the closure of contactors 139 and 137 and before final stop is effected, is sufficient to insure the opening of said contactors 137 and 139 so that even if the button is pressed the contactors 149 cannot be opened by such operation since the energizing circuit for the winding T' is open at said contactors 137 and 139. Furthermore, if the car in coming to a stop had over-run the landing due to coasting sufficiently to again complete the series energizing circuit for the winding 148, the effect will be simply to urge the contactors 149 closed so that under such circumstance the start of the car is not interfered with.

Another way to arrange and control the reversing switch circuit so that it cannot be interfered with by a late comer, and which eliminates the use of a stop switch having a mode of operation of the switch T together with its associated series circuit and contactors therefor is illustrated in Fig. 3 by a straight line diagram illustrating only in a general way such elements as are involved in the change. In said arrangement an initial energizing circuit 171 for a reversing switch winding 172 is traced by way of the direction switch contactors 173, wire 174, and normally closed contactors 175 controlled by the reversing switch so that when it closes its main contactors it closes at the same time the contactors 176 in a self-holding circuit 177 for the reversing switch winding, and the contactors 175 through a mechanical connection 178 with one of the contactors 176 are at the same time opened but with a delayed movement due to the action of a dash-pot 181. A stop switch 179 is included in the said self-holding circuit, but not in the initial energizing circuit of the reversing switch winding and the winding 180 of the stop switch is subject to the control of the floor-relay switch contactors 154 and 155 and the intercepting contactors 139 and 137, the latter set of contactors being adjusted in this case to be closed when the car is within a few inches of the landing, instead of a few feet as in the adjustment described in connection with the Fig. 2 arrangement. In this arrangement the intercepting circuit controlled by the contactors 139 and 137 etc. function directly to stop the car through their control of the stop switch 179. Hence with this arrangement, even though the coast of the car is not sufficient to cause the contactors 139 and 137 to be open-circuited, thus leaving the intercepting circuit closed at one point, so that a late comer by pressing a button closes said circuit at the second point, to complete an energizing circuit for the stop switch winding 180 to cause it to open its contactors, such circumstance cannot interfere with start of the car as by way of contactors 175 in the initial energizing circuit for the reversing switch winding because of the provision of the dash-pot to delay the separation of said contactors 175, the lower of said contactors having a short follow-up movement so that the two contactors 175 maintain said initial energizing circuit closed for a short period after the reversing switch is closed, said period being sufficient to insure movement of the car to open said contactors 139 and 137 and in such manner effect closure of the self-holding circuit at the stop switch contactors before the contactors 175 are opened. The opening of said contactors 175 then transfers the control of the reversing switch winding to said stop switch by way of the self-holding circuit 177.

When the reversing switch opens to effect car stop as by operation of the stop switch to open the self-holding circuit of the winding of the reversing switch the upper contactor 175 is thus released and will move to engage its other contactor 175, such movement however being retarded by the action of the dash-pot so that a reasonable time period is introduced to permit passengers to open the gate and door to get on to or off of the car platform before the initial energizing circuit for the reversing switch winding is again reclosed at the contactors 175 to automatically start the car provided the car gate and the hoistway doors are all closed.

What is claimed is:—

1. A control system for an elevator car comprising control means at each of a plurality of landings, control means on the car for each of said landings, circuits common to said control means on the car and at said landings to start the car, additional circuits common to said control means on the car and at said landings to cause only stop of the car, additional circuits to cause only stop of the car controllable only by said control means on the car, and means responsive to load on the car to render said common stop circuits inoperative and render the latter named stop circuits operative.

2. A control system for an elevator car comprising an up and down floor-relay for each of a plurality of landings controllable manually therefrom, a single control means on the car for each of said landings effective to cause actuation of the up or down floor-relay of the landing corresponding thereto one at a time depending on the position of the car at the time it is actuated, means responsive to actuated relays to effect automatic stop only of the car at their landings, means responsive only to control means on the car to effect automatic stop of the car, and means responsive to load on the car to render said first named stopping means ineffective and to render said second named stopping means effective so that the car stops only in response to actuated control means on the car but not to actuated floor-relays.

3. A control system for an elevator car comprising up and down floor-relays for each of a plurality of landings each having a winding operatively associated therewith, means operable manually from each landing to cause energization of the windings of its associated floor-relays, a single push-button controlled device on the car for each of said landings to cause energization of the winding of its associated up or down floor-relay switch one at a time depending on the position of the car at the time it is actuated,

means responsive to actuation of the car-carried push-buttons for stopping the car independently of actuated floor-relays, and load-responsive means effective to render said last-mentioned means operative to the exclusion of said floor-relays.

4. A control system for an elevator car comprising up and down floor-relays for each of a plurality of landings each having a winding operatively associated therewith, means operable manually from each landing to cause energization of the windings of its associated floor-relays, a single push-button controlled device on the car for each of said landings to cause energization of the winding of its associated up or down floor-relay switch one at a time depending on the position of the car at the time it is actuated and means for holding said push-button devices on the car in actuated position, circuits effective to cause slow-down of the car in response to said floor-relays, additional circuits effective to cause slow-down of the car, responsive only to said push-button controlled devices on the car, and means responsive to load on the car to render said first named slow-down circuits inoperative and to render said second named slow-down circuits operative.

5. A control system for an elevator car comprising up and down floor-relays for each of a plurality of landings each having a winding operatively associated therewith, means operable manually from each landing to cause energization of the windings of its associated floor-relays, a single push-button controlled device on the car for each of said landings to cause energization of the winding of its associated up or down floor-relay switch one at a time depending on the position of the car at the time it is actuated and means for holding said push-button devices on the car in actuated position, stop circuits responsive to said floor-relays, start circuits responsive to said floor-relays, additional stop circuits responsive only to said controls on the car, and means responsive to load on the car to render the stop circuits responsive to said relays inoperative without rendering said windings of the latter non-energizable and to render said additional stop circuits operative.

6. A control system for an elevator car comprising an up and down floor-relay for each of a plurality of landings, a single control means on the car for each of said landings to cause actuation of the up or down floor-relay of the landing corresponding thereto one at a time depending on the position of the car at the time it is actuated, circuits controlled by the floor-relays for each of said landings whereby either relay for any landing causes start of the car toward its landing from either direction, circuits controlled by said relays effective only to cause slow-down of the car, additional circuits responsive only to said control means on the car to cause slow-down of the car, and means responsive to load on the car effective when the load reaches substantially maximum value, to render said slow-down circuits as controlled by the floor-relays ineffective and render said additional slow-down circuits effective.

7. A control system for an elevator car comprising an up and down floor-relay switch for each of a plurality of landings each having a holding winding and each winding energizable from its landing at any time, an additional winding for each floor-relay switch constructed and arranged so that it magnetically opposes the magnetic effect of the holding winding to cause its associated switch to be re-set, circuits for said additional windings normally open and controlled by the car to effect re-setting of the floor-relay switches in accordance with the direction of car movement, a single control means of the hold-in type on the car for each of said landings to cause energization of the winding of the up or down floor relay switch of the landing corresponding thereto one at a time depending on the position of the car at the time it is actuated, circuits controlled by the floor-relays of each of said landings whereby either relay for any landing causes start of the car toward its landing from either direction, circuits responsive to said floor-relay switches effective to cause slow-down of the car at the landings successively in their natural order regardless of the order in which the control means are actuated, additional slow-down circuits responsive only to said control means on the car, and means responsive to load on the car to render ineffective said slow-down circuits controlled by said floor-relay switches, and at the same time render said second named slow-down circuits effective.

8. In combination, the car, a hoisting motor having multi-speed regulation, a fast and slow speed switch having an electro-responsive device operatively associated therewith, a circuit for said electro-responsive device to control same to effect automatic slow-down successively at landings, controlled in common by control means located at said landings and on the car, an additional circuit for said electro-responsive device controlled only by said control means on the car, and means responsive to load on the car to control said two slow-down circuits.

9. In combination, the car, a hoisting motor having multi-speed regulation, a fast and slow speed switch controllable by an electro-responsive device, means controllable in common from each of a plurality of landings and from the car to cause operation of said speed switch to effect automatic slow-down of the car, additional means controllable only from the car, said common means being normally effective and said additional means ineffective, and means responsive to load on the car to render said common means ineffective and to render said additional means effective.

10. A control system for an elevator car comprising control means for each of a plurality of landings, a normally closed stop switch to control stops at all landings, electro-responsive means to move said stop switch from an inoperative position to an operative position, circuits for said electro-responsive means to energize the electro-responsive means to actuate said stop switch controllable from the car, circuits for said electro-responsive means controllable from said landings, each circuit partially closed by its associated control means, a fixed contactor in each of said circuits, and a contactor common to all of said fixed contactors, movable by the car successively to engage said fixed contactors to complete their circuits, means to energize said electro-responsive means to move the stop switch to and maintain said switch in actuated position independently of said circuits, means controllable by car movement to cause momentary opening of said switch to effect stop of the car, the opening of said stop switch being effective to de-energize the electro-responsive means associated therewith to allow the switch to move to normal inoperative position, and time controlled means for effecting re-

start of the car a predetermined time thereafter.

11. A control system for an elevator car comprising a single stop switch to effect automatic stop at all landings, said switch normally closed and movable from one position to another position and remaining closed at the same time, electro-responsive means to move said switch to said other position, control means for each of a plurality of landings, circuits for said electro-responsive means, one for each of said landings, partially closed by its associated control means, contact mechanism to complete said circuits comprising a fixed contactor for each of said landings, a contactor common to all of said contactors movable in accordance with movement of the car successively to engage same, said common contactor opening each of said circuits prior to actuation of said stop switch to stop the car, means to maintain said stop switch in said other position independently of said circuits, and means to cause actuation of said stop switch to effect stop of the car.

12. A control system for an elevator car comprising control means for each of a plurality of landings, a reversing switch having an operating winding, a timed relay switch in an initial energizing circuit for said winding, a self-holding circuit for said winding, a stop switch having an operating winding effective to actuate said stop switch to open said self-holding circuit, normally open-circuited floor-selector contactors effective jointly with said control means to control said timed relay and stop switch, and a self-holding circuit for the operating windings of said timed relay and stop switch, said self-holding circuit controllable to be opened by said reversing switch when it opens.

13. A control system for an elevator car comprising control means for each of a plurality of landings, a reversing switch having an operating winding, circuits, one for each of said landings, each partially closed by its associated control means, contact mechanism to complete said circuits comprising a fixed contactor for each of a plurality of landings, a contactor common to all of said fixed contactors, movable in accordance with movement of the car successively to engage said contactors, a stop switch in the circuit of said operating winding for the reversing switch, said stop switch normally closed and movable from an inoperative position to another position and remaining closed at the same time, electro-responsive means for so moving the stop switch, a time switch, an operating winding for said time switch, said winding controllable by said circuits, and effective when energized to render said electro-responsive means operative to move said stop switch to said other position in wihch it may be opened, a circuit to maintain said winding of the said time switch energized independently of the first named circuits, and means to cause opening of said switch to effect stop of the car and de-energization of the time switch winding, the circuit controlled by said time switch including means for said circuit for independently energizing the winding of said switch including means for conditioning the control circuits for restart of the car a predetermined length of time after the car has stopped.

14. A control system for an elevator car comprising a slow-down switch, electro-responsive means to actuate said switch, selectively controlled circuits operable jointly with car controlled circuits effective to energize said electro-responsive device to cause it to actuate said switch to cause automatic slow-down, a stop switch constructed and arranged to be moved from one position to another position and remaining closed at the same time, means controlled by said slow-down means to move said switch from one to the other position, and means effective with said switch in said other position to actuate it to effect stop of the car at the landings, and means controllable from the car and from the landings to start the car.

15. A control system for an elevator car comprising a timed switch to control a car starting circuit and effective to cause slow-down, an electro-responsive device to actuate said switch, selectively controlled circuits operable jointly with car controlled circuits, each of said circuits being normally open at two points and completed momentarily by car movement, effective to energize said electro-responsive device to cause actuation of said switch to cause automatic slow-down of the car, a stop switch constructed and arranged to be moved from one position to another position and remaining closed at the same time, said first named switch when so actuated transferring control of the car to said stop switch, and completing an energizing circuit for its electro-responsive device so that the latter maintains it in actuated position independently of said selectively controlled circuits, and means effective only with said stop switch in said other position to actuate it to effect automatic stop of the car at landings.

16. A control system for an elevator car comprising up and down floor relays for each of a plurality of landings, each of said relays being effective to control car movement and each having a winding operatively associated therewith and effective when energized to maintain the relay in actuated position, means operable manually from each landing to cause energization of the windings of its associated floor relay, a single push button controlled device on the car for each of said landings to cause energization of the winding of its associated up or down floor relay switch one at a time depending upon the position of the car at the time it is actuated, whereby to concurrently control car movement from the several landings and from the car, means responsive to the load in the car for rendering said landing relays ineffective to control car movement while maintaining the effectiveness of the push button devices on the car, means for holding said push button devices on the car in actuated position, and car control means for effecting release of said push button devices.

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