Nov. 19, 1940. G. N. CRABBE ET AL 2,222,193

ELEVATOR SYSTEM

Filed Oct. 21, 1939 4 Sheets-Sheet 1

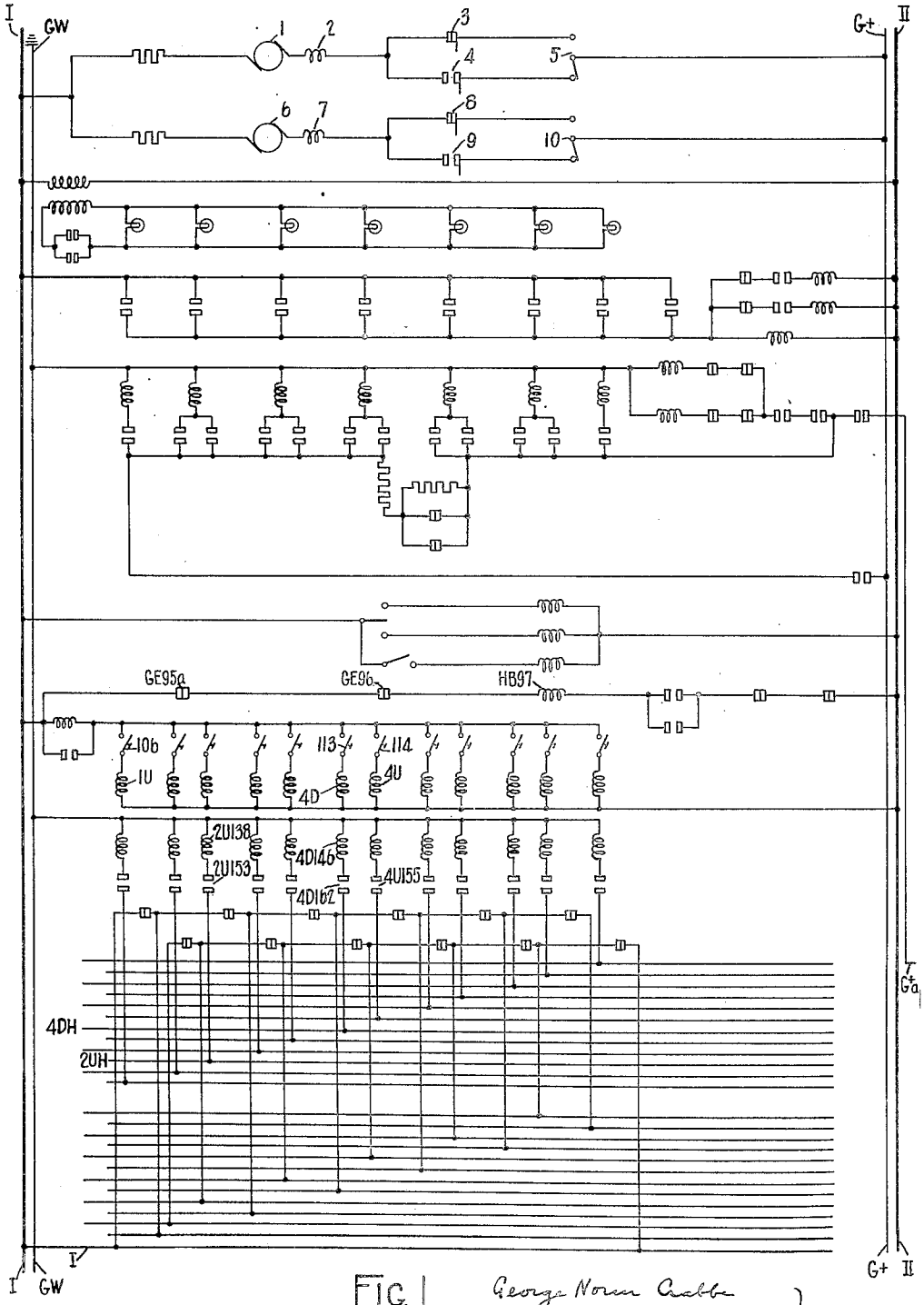


FIG. 1

George Norman Crabbe
Arthur Willard Paulson } INVENTORS
BY Walter C. Bradley ATTORNEY

Nov. 19, 1940. G. N. CRABBE ET AL 2,222,193

ELEVATOR SYSTEM

Filed Oct. 21, 1939 4 Sheets-Sheet 2

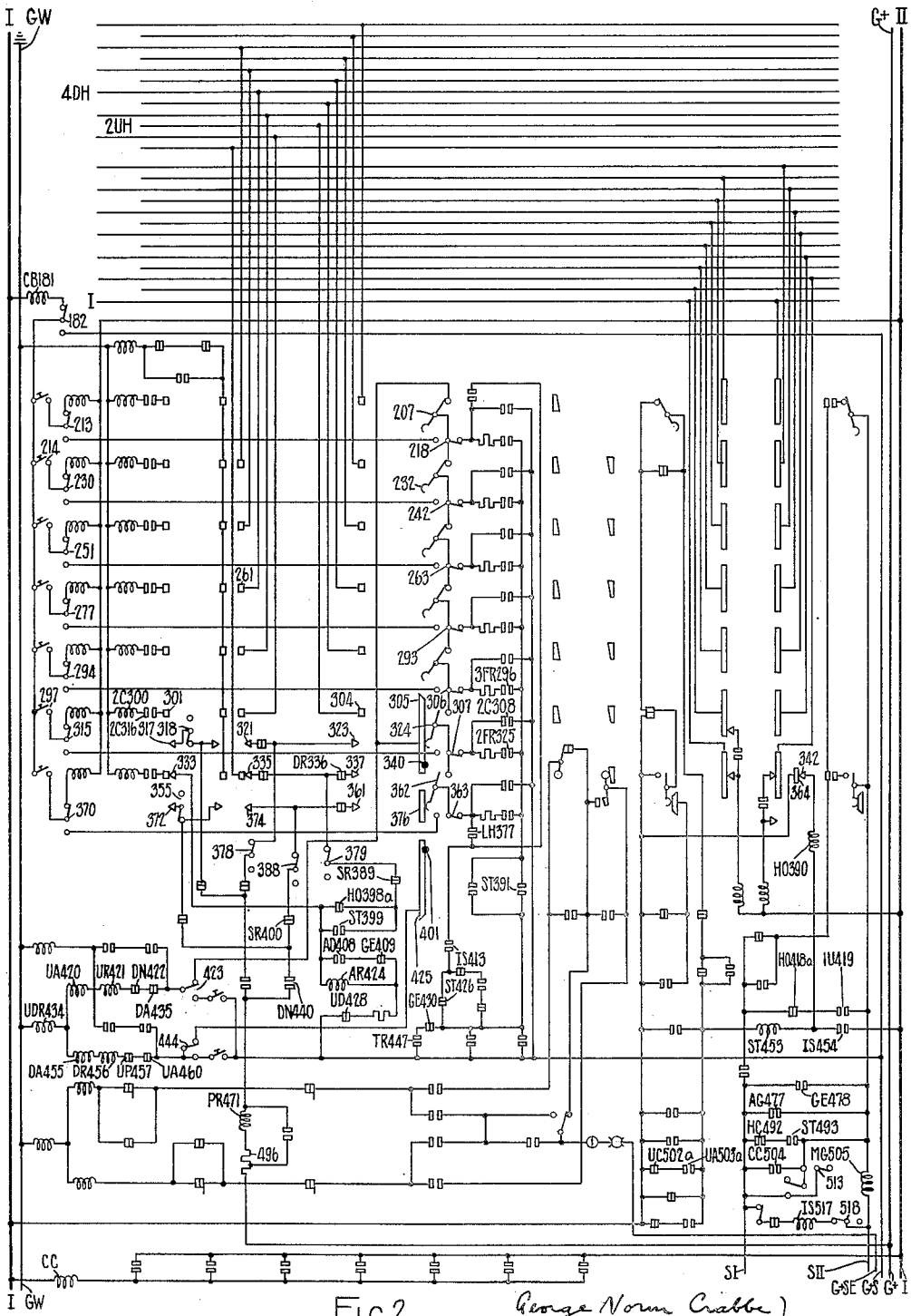


FIG 2

George Norman Crabbe
Arthur Willard Paulson } INVENTORS

BY Matthew C. Brady ATTORNEY

Nov. 19, 1940. G. N. CRABBE ET AL 2,222,193

ELEVATOR SYSTEM

Filed Oct. 21, 1939 4 Sheets-Sheet 3

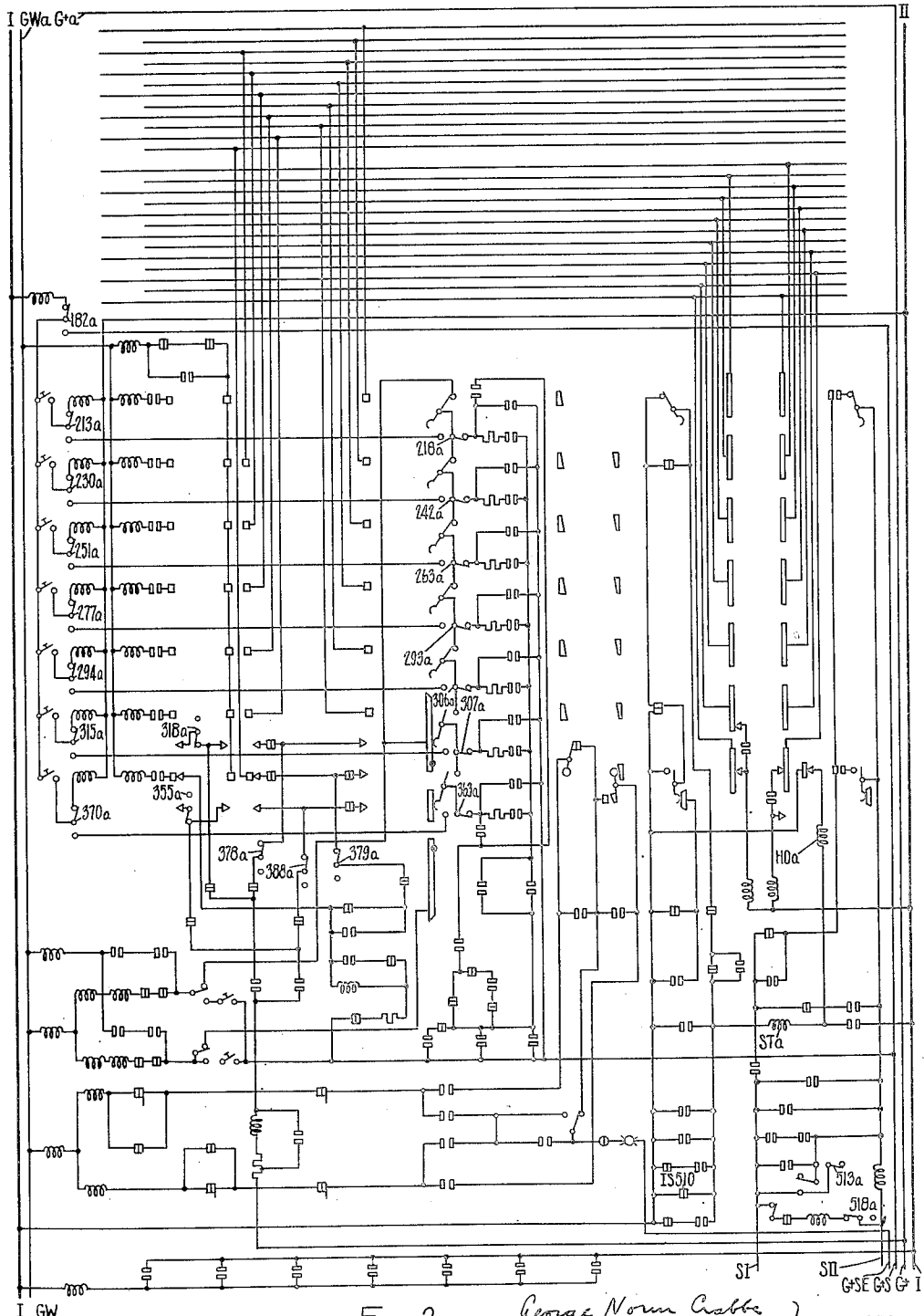


FIG. 2a

George Norman Crabbe
Arthur Willard Pawloon } INVENTORS

BY Walter B. Bradley ATTORNEY

Nov. 19, 1940. G. N. CRABBE ET AL 2,222,193

ELEVATOR SYSTEM

Filed Oct. 21, 1939 4 Sheets-Sheet 4

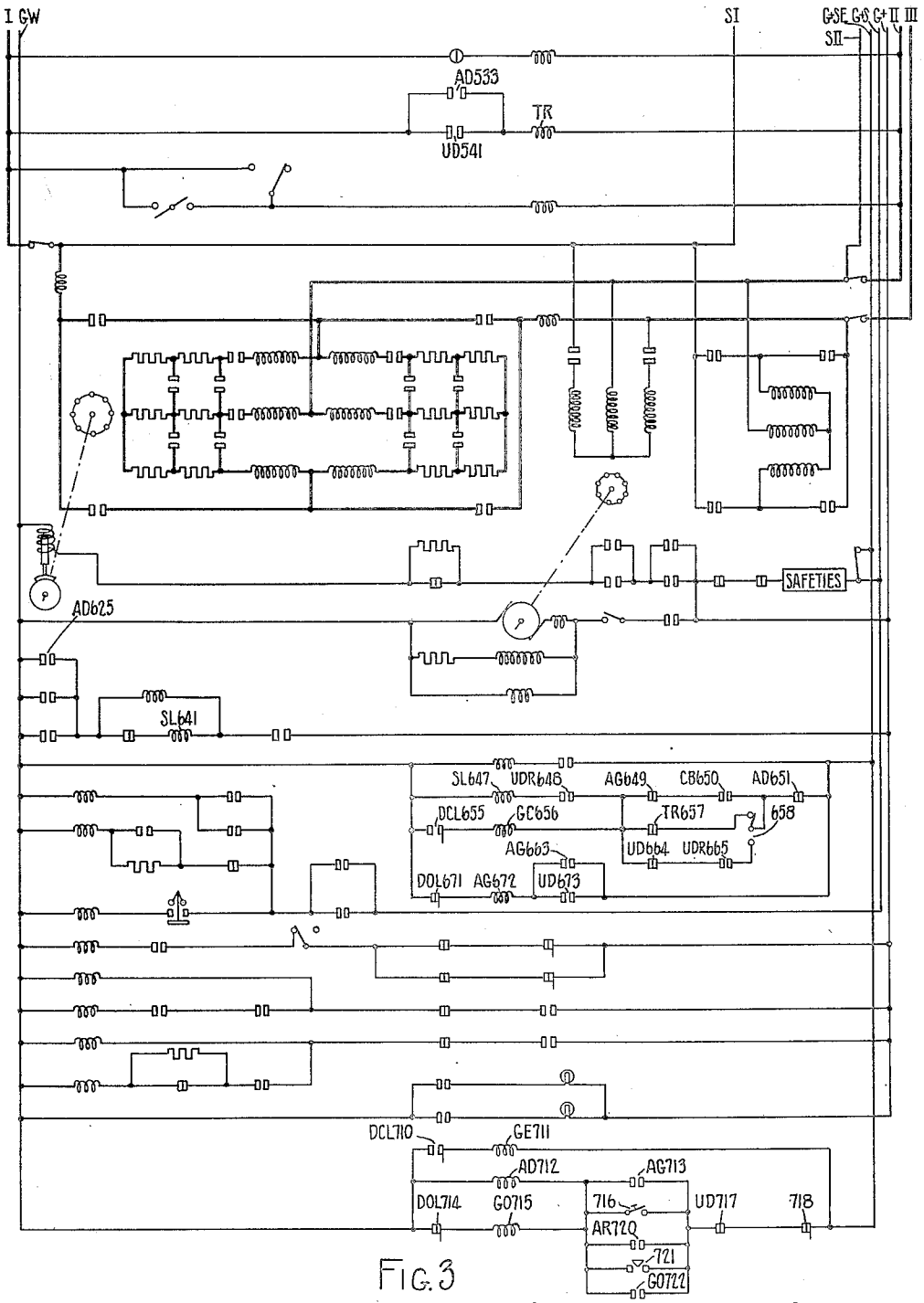


FIG. 3

George Norm Crabbe } INVENTORS
Arthur Willard Pawson }

BY Walter S. Bradley ATTORNEY

Patented Nov. 19, 1940 2,222,193

UNITED STATES PATENT OFFICE

2,222,193

ELEVATOR SYSTEM

George Norm Crabbe, Cresskill, N. J., and Arthur Willard Paulson, Old Greenwich, Conn., assignors to Otis Elevator Company, New York, N. Y., a corporation of New Jersey

Application October 21, 1939, Serial No. 300,506

11 Claims. (Cl. 187—29)

The invention relates to elevator systems.

The invention is directed to elevator systems of the type in which push buttons are provided at the landings for operation by intending passengers to call the car to the landing and in which push buttons are provided in the car for the landings for operation by the passengers to send the car to their destinations and in which the car stops at the floors for which calls are registered in the order of succession of floors. Systems of this character are applicable to various types of installations and are especially suitable for hospitals. In hospitals it oftentimes happens that the use of an elevator is desired for emergency service as, for example, to transport stretchers. It is desirable under such conditions to turn over the car to this use exclusively. The present invention is especially directed to changing over the control of the elevator for emergency service.

The invention is applicable to systems in which a single elevator car is employed or to those having a plurality of interconnected elevators. In the latter case the push buttons at the landings are common to the elevators. The invention will be described as applied to a system having a plurality of elevator cars.

It is the object of the invention to change over a push button control elevator of the type described from normal operation to emergency service operation and to effect such change-over in a simple manner with a minimum of apparatus and alteration in wiring.

One feature of the invention is to effect such change-over by means of a single switch in the elevator car.

Another feature of the invention as applied to a plurality of elevator cars is to effect such change-over of any one of the cars without affecting the operation of the other cars.

Another feature of the invention is to effect such change-over without cancelling previously registered calls so that these calls will be responded to when normal operation is restored, provided in the case of a plurality of elevator cars that the hall calls have not been answered by some other car.

Still another feature of the invention is to cause the car under normal operation to park with the hatchway door closed and also with the car gate closed if provided, but under emergency operating conditions to cause the door and gate to remain open when a stop is made until circuits are established to cause the starting of the car.

Other features and advantages will be apparent from the following description and appended claims.

The invention will be described as applied to a system in which both an up hall button and a down hall button are provided at each intermediate floor. To obtain the car for emergency service operation in such a system, both the up and the down hall buttons on the floor where the car is required for emergency service are pressed in order to obtain a car in the minimum possible time. When a car stops at the floor, it is entered and the emergency change-over switch is thrown to emergency position. This effects a change in circuits so as to prevent control of the car by means of the push buttons through their respective floor relays, rendering the car subject to the control of the car buttons directly. The car button for the floor to which it is desired to have the car go is then pressed. The button is held pressed and the car proceeds directly to the floor for which the car button is provided and automatically stops, whereupon the button may be released.

Elevator systems of the type to which the invention is directed are subject to considerable variation. For convenience the invention will be described as applied to the system of the patent to Waters et al., No. 2,100,176, granted November 23, 1937, but it will be understood that it is also applicable to other arrangements. An embodiment of the invention has been illustrated as applied to the control system of Figures 5, 6, 6*a* and 7 of the above patent which is for two elevators, except that certain changes have been made to provide for power operation of both the car gate and hatchway doors, whereas in the Waters et al. patent the circuits are arranged for power operation of the car gate and manual operation of the hatchway doors.

In the drawings:

Figure 1 is a simplified wiring diagram of a portion of the control system for both elevators, corresponding to Figure 5 of said Waters et al. patent;

Figure 2 is a simplified wiring diagram of a portion of the control circuits for one elevator, corresponding to Figure 6 of said Waters et al. patent;

Figure 2*a* is a simplified wiring diagram of the same portion of the control circuits for the other elevator, corresponding to Figure 6*a* of said Waters et al. patent; and

Figure 3 is a simplified wiring diagram of additional control circuits and power circuits for one

elevator, corresponding to Figure 7 of the Waters et al. patent.

Referring to the drawings, the numerals employed in designating the various elements of the wiring diagrams are arranged in sequence, the lowest number appearing in the upper left hand corner of Figure 1, with the succeeding numbers following in numerical sequence from left to right downwardly of the sheet of drawings. Circuits of Figures 2 and 2*a* are joined to those of Figure 1 by means of bus bars. The numbers are continued in Figure 2 and are arranged in the same sequence. The circuits of Figure 2 are continued in Figure 3 as indicated by the continuance of wires I, GW, SI, SII, etc. from the bottom of the sheet of Figure 2 to the top of the sheet of Figure 3. The numbers continue in Figure 3 in the same sequence. Wherever referred to, the switches and mechanisms corresponding to those of the Waters et al. patent are designated by the same reference characters. The switches and other control apparatus of elevator No. 2 are designated by the same reference characters as are employed for the corresponding parts of elevator No. 1, with the exception that the letter *a* is affixed to each designating character for elevator No. 2 as a means of differentiation.

I and II are two of the supply mains of a three-phase alternating current supply. GW is the negative supply wire from elevator No. 1 supply generator. The positive wire from this generator is for convenience divided into several branches designated G+, G+S and G+SE. Wire G+*a* is from the elevator No. 2 supply generator. The service switches for changing over from normal to emergency operation are preferably key operated switches and are designated **5** and **10** for elevators Nos. 1 and 2 respectively. Each of these switches has two operative positions, one for normal operation and one for emergency operation. They are illustrated in normal operation positions. Each switch acts through a change-over switch motor to control a multiple double throw switch having sufficient blades to effect the desired circuit changes. These motors are illustrated as series motors having armature **1** and field winding **2** in the case of elevator No. 1 and armature **6** and field winding **7** in the case of elevator No. 2. The change-over switch motor for elevator No. 1 operates double throw switches **182, 213, 218, 230, 242, 251, 263, 277, 293, 294, 306, 307, 315, 318, 355, 363, 370, 378, 379, 388, 513** and **518**, shown in Figure 2, and switch **658** of Figure 3. The change-over switch motor for elevator No. 2 operates correponding switches, shown in Figure 2*a*. Each of these motors also operates limit switches to control its own circuit, these switches being designated **3** and **4** for elevator No. 1 and **8** and **9** for elevator No. 2.

With the double throw change-over switches in the positions illustrated, except for the changes before mentioned the circuits are in accordance with those of the corresponding figures of the aforementioned Waters et al. patent and the operation of the car in response to the push buttons therein described will be obtained. That is, considering a single car for the moment, it starts in response to the pushing of any button, either car or hall button, for any floor other than the floor at which the car is positioned. The direction of travel is determined by the position of the car with respect to the floor corresponding to the button pressed. Once the car is started in a certain direction, additional circuits may be established by car and hall buttons to maintain that direction of travel. Stops are made in the natural order of floors regardless of the order in which the buttons are pressed. Car buttons cause the stopping of the car regardless of whether it is travelling in the up or down direction. As regards hall buttons, during up car travel stops are made in response to all operated up hall buttons and also in response to an operated down hall button provided no up hall buttons remain unresponded to for floors above the floor corresponding to this button. Similarly, during down car travel stops are made in response to all operated down hall buttons and also in response to an operated up hall button provided no down hall buttons remain unresponded to for floors below the floor corresponding to this button. The car is started automatically in the same direction after each stop so long as push buttons for floors beyond remain to be responded to. Should push buttons also be operated for floors in a direction opposite to that in which the car is travelling, the car is reversed after completing its travel in the first direction to answer these other calls.

Considering both cars, one or the other of the cars, which is termed the wild car, continues to answer the hall calls that are registered so long as these calls are ahead of the car. Registration of a hall call behind the wild car causes the starting of the other car, termed the home station car. Each car responds to its own car calls so that the home station car may also be started in operation by a passenger entering the car and registering a car call for his destination. In either case, the latter car upon starting in operation also becomes a wild car answering its own car calls and assisting the other car in answering the hall calls that are registered. When both cars are in operation, one of them is automatically returned to the home station under certain conditions of operation which are set forth in detail in the Waters et al. patent.

As above pointed out, certain changes have been made in the control system of the aforementioned Waters et al. patent to provide for power operation of both the car gate and hatchway doors. Control mechanism for this purpose is applicable to various types of door and gate operators, for example that disclosed in the patent to Norton et al., No. 1,950,150, granted March 6, 1934. The circuits are arranged so that the door and gate are parked closed during normal operation. Thus, considering single car operation for the moment, with its door and gate in closed position the car is started immediately in response to the pressing of a car button in that car or a hall button. In starting, contacts UD717 separate, and contacts UD673 engage. The engagement of the latter contacts completes the circuit for coil AG672 of the auxiliary door and gate relay. Relay AG engages contacts AG663 to establish a self-holding circuit. It also engages contacts AG713 to prepare a circuit for coil GO715 of the door and gate open relay and coil AD712 of the second auxiliary door and gate relay AD, this circuit being open at contacts UD717.

When a call is picked up under conditions where no other calls remain to be responded to, the circuit for the coil of motor generator starting relay MG is maintained after the floor relay is reset by contacts AG477. As the car comes to a stop at the floor, contacts UD717 engage, completing a circuit for the coil of relays AD and GO through door zone limit switch 718, closed when the car is within a certain zone on each

side of the floor. Relay AD closes contacts AD533 to reestablish the circuit for the coil of the time relay TR. Relay GO causes the operation of the door operating motor to open the car gate and hatchway door. As the door and gate start to open, door close limit switch DCL710 closes, completing the circuit for coil GE711 of generator relay GE. This relay engages contacts GE478 in the circuit for coil MG505. When the door and gate reach open position, door open limit switches DOL671 and DOL714 open, deenergizing the coils of relays AG and GO. Relay GO effects deenergization of the door operating motor, bringing the door and gate to a stop. Relay AG separates contacts AG713, deenergizing relay AD, which in turn separates contacts AD533 to deenergize the time relay. Contacts GE478 maintain motor generator starting relay MG operated to keep the motor generator set in operation after the separation of contacts AG477. At the expiration of the time interval of time relay TR, contacts TR657 engage, completing a circuit through contacts AD651, throw-over switch 658, and door close limit switch DCL655, for coil GC656 of door and gate close relay. This causes operation of the door operating motor to close the door and gate. When the door and gate reach closed position, limit switch DCL655 opens to cause the deenergization of the door and gate operating motor to bring the door and gate to a stop. At the same time door close limit switch DCL710 opens to deenergize the coil of generator relay GE, which opens contacts GE478 to deenergize coil MG505 of the motor generator starting relay, causing the motor generator set to be shut down. Thus with no further calls to be responded to, the car parks at the floor at which the stop is made, with the door and gate closed.

If other calls are in registration at the time the door and gate reach closed position, the motor generator set does not shut down, coil MG505 being maintained energized through contacts HC492 or CC504. The car therefore continues in operation to respond to further calls as set forth in said Waters et al. patent, the circuit for operating coil SL647 of the slow down switch being completed through contacts UDR648 and TR657, throw-over switch 658 and contacts AD651.

The closing of the hatchway door and car gate may be interrupted by pressing door open button 716 in the car or by the closing of safety shoe switch 721 on the edge of the door, as by the door striking a person attempting to enter the car. This causes operation of relay AD to separate contacts AD651, breaking the circuit for the coil of door and gate close relay GC and also operation of door and gate open relay GO to cause the reopening of the door and gate. Also, relay AD engages contacts AD625 to energize the restoring coil SL641 of the slow down switch, if this switch has already operated.

The closing of the door and gate may also be arrested by the pressing of a hall button at the floor at which the car is standing. The pressing of this button also causes the opening of the door and gate after they have reached closed position, provided no calls remain to be responded to, so that the car is parked at that floor. Assume, for example, that the car is standing at the fourth floor and that the fourth floor down hall button 113 is pressed to cause the operation of the down fourth floor relay 4D. This relay engages contacts 4D162, completing a circuit for the coil of relay AR through the restoring coil 4D146 of the floor relay, bus bar 4DH, contact 261, brush 335, throw-over switch 379, contacts SR389, contacts ST399, coil AR424, and contacts UD428. Relay AR engages contacts AR720, completing a circuit for the coil of relay GO to cause the opening of the door and gate. It also causes the operation of relay AD, which engages contacts AD533 to reenergize the coil of the time relay TR to reestablish the time interval and also engages contacts AD408 in a shunt circuit for the coil of relay AR. As the door and gate start to open, door close limit switch DCL710 closes to cause the operation of generator relay GE, which engages contacts GE409, completing the shunt circuit for the coil of relay AR, increasing the current flow in the circuit for restoring coil 4D146 of the down fourth floor relay sufficiently to cause this relay to be reset. This also causes relay AR to drop out but the circuits for relays AD and GO are maintained through contacts GO722. Also, relay GE separates contacts GE96 in the circuit for coil HB97 of hall button relay, these contacts and contacts GE95*a* replacing those on relays AR and AR*a* in this circuit in the Waters et al. patent. If other calls are in registration and switch UD has operated to effect the separation of contacts UD428 and UD717 at the time the hall button at the floor is pressed, the circuits for the coils of relays AR, AD and GO cannot be established, so that the car starts and the call remains registered.

Now considering both cars with one of them parked at the home station with the door and gate closed, should an intending passenger desire to be carried from the home station to some floor above, he obtains the car by pressing the first floor hall button 106. This causes operation of the first floor relay 1U to engage contacts 1U419. With the car parked at the home station, its starting relay ST is not operated. Also, when a car is at the home station, the home station relay HO for that car is operated, the circuit extending through floor controller brush 342 and first floor contact 364, coil HO390, and contacts IS454 of the in-service relay. With the other car, say car No. 2, away from the home station, its home station relay HOa is not operated, therefore the contacts HO418*a* of car No. 2 are in engagement so that the engagement of contacts 1U419 completes a circuit for coil MG505 to cause the starting of the motor generator set for car No. 1 at the home station. Similarly, contacts HO398*a* are in engagement, by-passing contacts ST399 so that the operation of the first floor relay completes a circuit for the coil of auxiliary reset relay AR, causing the opening of the car gate and first floor hatchway door as previously described.

Contacts GE430 of the generator relay allow a passenger who enters a car upon the last stop in any given direction to have the preference as to selecting the direction in which the car starts up to the time that the door and gate are fully closed, even though the time interval of the time relay TR may have expired during that time. The pressing of the car button causes the energization of coil CB181 of car button relay CB. This relay engages contacts CB650 in the circuit for the coils of gate close relay GC and slow down switch SL to effect immediate energization of these coils without waiting on the time interval. Contacts AG649 prevent this operation until the gate and door have reached fully open position, thereby preventing a person already in the car

taking the car away by holding his finger on a car button.

Assume that a car is desired at the fourth floor for emergency service. Both the down hall button 113 and up hall button 114 at that floor are pressed. This is to insure a car coming to and stopping at that floor in the minimum possible time. The pressing of these buttons causes the operation of the up floor relay 4U and down floor relay 4D for this floor to engage contacts 4U155 and 4D162, rendering the corresponding contacts of the floor controllers for both elevators "alive". Assume that operating conditions are such that elevator No. 2 is at the home station while elevator No. 1 is travelling in the down direction, say passing the fifth floor, at the time these buttons are pressed. Upon the engagement of elevator No. 1 floor controller brush 374 with down fourth floor stationary contact 261, a circuit is completed from wire GW through restoring coil 4D146 and contacts 4D162 of the down fourth floor relay, bus bar 4DH, contact 261, brush 374, throw-over switch 388, contacts SR400, DN440, coil PR471 of the pick up relay, resistance 496, to wire G+. This causes the car to be slowed down and brought to a stop at the fourth floor and the reset of the down fourth floor relay as described in said Waters et al. patent, and the car gate and hatchway door open automatically as the car comes to a stop.

There is a designated attendant on each floor, for example the head nurse on that floor, who is provided with a key for operating the emergency service switches. The attendant enters the car and inserts the key in the emergency service switch 5 and throws this switch from the position illustrated, i. e., normal operating position, to its opposite position, that is, the emergency service position. This completes a circuit for the change-over motor for elevator No. 1 through limit switch contacts 3. This motor upon energization operates to throw the throw-over switches previously enumerated for elevator No. 1 from the normal positions illustrated to their opposite positions for emergency operation. Movement of switch 513 to its emergency operation position connects coil MG505 of the motor generator starting relay directly across supply lines SI and SII to maintain the motor generator set for elevator No. 1 in operation for emergency service. Movement of throw-over switch 518 to its emergency operation position breaks the circuit for coil IS517 of the in service switch. This switch separates contacts IS454 to deenergize starting relay ST. If the starting relay STa for the other car is not already energized, the reengagement of contacts IS510 causes the energization of that starting relay, thereby causing the other car to respond to any hall call that is registered. In other words, one car is caused to answer all hall calls so long as the other car is in emergency service operation. It is believed that this will be understood from the disclosure in the aforementioned Waters et al. patent. Moving throw-over switch 658 to emergency position transfers the circuit for the coils of relays GC and SL from the control of contacts TR657 of the time relay to the control of contacts UD664 of up and down switch UD and contacts UDR665 of up and down relay UDR. Thus, as regards door and gate close relay GC, its coil cannot be energized unless the door and gate are not closed until a direction circuit is established, car button relay CB being cut out of circuit by throw-over switch 182. The throw-over of switch 182 and of the other throw-over switches renders the car in emergency service subject directly to its car buttons alone.

Assume that it is desired to have the car go to the sixth floor. The attendant presses the sixth floor car button 214, which completes a circuit from wire G+S through throw-over switch 182, push button 214, throw-over switches 230 and 242, floor brush direction switches 232 and 207, service inspection switch 423, contacts DA435 and DN422, coils UR421 and UA420 of the up direction relays, and coil UDR 434 of the up and down relay, to wire GW. Operation of relay UDR to engage contacts UDR665 causes the closing of the car gate and hatchway door. When the door and gate reach closed position, the car is started in the up direction, as set forth in said Waters et al. patent.

As the car travels in the up direction it reaches a point where the upper section 395 of the direction cam engages the sixth floor direction switch 232, transferring the direction circuit to the cam. As the car arrives at a predetermined distance from the sixth floor, up roller 340 engages and lifts this direction switch off the cam, breaking the direction circuit through the coils of relays UDR, UA and UR. These relays drop out, causing the car to slow down and stop at the sixth floor. Upon reengagement of contacts UD717, circuits are completed to cause operation of the door operating mechanism to open the car gate and hatchway door. As the car comes to a stop the car button may be released.

The door and gate remain open until the key operated switch is returned to normal position or, if further operation of the car is required under the emergency service condition, until another car button is operated to send the car to some other floor. Assume it is desired to cause the car to travel from the sixth floor to the second floor as a part of the emergency service. This may be done by pressing and holding pressed the second floor car button 207. This completes a circuit from wire G+S to throw-over switch 182, push button 207, throw-over switches 315 and 307, direction switch 324, thence upwardly through the direction switches of the floors above to the lower section 425 of the direction cam, through service inspection switch 444, contacts UA460 and UP457, coils DR456 and DA455 of the down direction relays, and coil UDR434 of the up and down relay, to wire GW. Relay UDR operates to cause the closing of the car gate and the hatchway door and upon the door and gate reaching closed positions, the car is started in the down direction, as set forth in said Waters et al. patent. As the car arrives at a predetermined distance from the second floor, down insulating roller 401 engages the second floor direction switch 324, breaking the circuit for the coils of relays UDR, DA and DR, causing the car to slow down and stop at the second floor and the operation of the door operating mechanism to open the car gate and hatchway door.

The car cannot be intercepted by other car buttons during its trip to the floor to which it is travelling under emergency conditions. This is due to the fact that the brushes 317, 333 and 372 are ineffective. Also, any car calls which have been registered by car buttons are ineffective to control the starting of the car as the direction circuits are disconnected from the car button floor relay contacts and rendered directly responsive to the car buttons. Similarly, the hall buttons are ineffective to control either the starting

or stopping of the car inasmuch as the direction circuits are divorced also from control by the hall button floor relays and as brushes 321, 323, 335, 337, 374 and 361 are ineffective. Thus when control of the car has been obtained for emergency service operation, the car may be dispatched directly to the floor desired without the possibility of its being interrupted during its travel.

If a car call is in registration for the floor at which a stop is made under emergency operating conditions, the floor relay is reset as the door and gate start to open as a result of the short circuit established for the coil of relay AR by contacts AD408 and GE409. The restoring circuit, assuming the car is at the second floor, is through restoring coil 2C300, contacts 2C316, contact 301, brush 333, contacts AD408, contacts GE409 and contacts UD428.

When the attendant is finished with the car, he turns the key switch back to its normal position. This completes a circuit for elevator No. 1 throw-over switch motor through limit switch 4, closed at the start of the previous change-over. The motor returns the multiple throw-over switches to their positions illustrated and when this is effected limit switch 4 opens to bring the throw-over switch motor to a stop. The return of throw-over switch 658 to its normal position renders the door and gate close relay GC again subject to contacts of time relay TR and the door and gate are automatically returned to closed position. If no car calls are in registration for the car and the other car is not at the home station and no hall calls are in registration behind it, the car is automatically started upon its return to the home station, assumed to be the lower terminal. The home station return circuit is completed upon the expiration of the time interval of relay TR by the engagement of contacts TR447 and is from wire G+S through contacts TR447, GE430, ST426, IS413 (engaged as a result of the energization of coil IS517 through switch 518), contacts LH377, switch 363, and assuming the change back has been effected with the car at the second floor, through switch 362, cam section 425, and through the coils of the down relays as previously traced. This causes the starting of the car in the down direction and the stopping of the car at the lower terminal as set forth in said Waters et al. patent.

If, at the time the car is changed back to normal operation, there is a hall call in registration behind the other car, the car is started away from the floor in a direction toward the floor at which such call behind exists. Assume that the car is at the second floor, that the other car is above the third floor set for upward travel and that an up hall call is registered for the third floor. Thus upon engagement of contacts IS454 upon the change back to normal operation being completed, a circuit is completed through contacts UC502*a* and UA503*a* for coil ST453 of elevator No. 1 starting relay. Thus, upon expiration of the time interval, contacts TR447 engage, which completes a circuit for relays UDR, UA and UR through section 305 of the direction cam, floor relay contacts 3FR296 and contacts ST391. This causes the starting of the car in the up direction.

If a hall call is in registration for the floor at which the change back is made, the waiting passenger may step into the car after the use of the car for emergency service is discontinued. He is given preference for the time interval of relay TR and until the closure of the hatchway door and car gate as to starting the car, so that he may cause the car to start toward the floor which is his destination. The hall call which was in registration for the floor at which the change back was made is reset upon reoperation of the starting relay, the restoring circuit, assuming the car to be at the second floor and an up call for that floor in registration and that the car button pushed is for a floor above, extending through restoring coil 2U138 of floor relay 2U, contacts 2U153 of this relay, bus bar 2UH, floor controller contact 304, brush 337, contacts DR336, change-over switch 379 and contacts SR389, ST399, AD408, GE409 and UD428.

While the invention has been described as applied to the control system of Figures 5, 6, 6*a* and 7 of said Waters et al. patent, it is also applicable to the arrangement illustrated in Figures 8, 9 and 10 of that patent.

In other arrangements involving a plurality of interconnected elevators, response of the cars to the push buttons may vary from that disclosed in said Waters et al. patent. However, application of the invention to such arrangements would be effected in a similar manner, that is, the car placed on emergency service would not respond to registered calls but only directly to car buttons held pressed for the desired floors, the other car or cars responding to hall calls that are registered. Similarly, in an installation of only one elevator, when the car is placed on emergency service, it will not respond to hall calls but only to car buttons held pressed for the desired floors. However, in single car installations, no other car being available to answer hall calls, all such unanswered calls, whether registered before the car was placed on emergency service or during such period, remain registered and are responded to by the car after the change back to normal operation is effected.

The invention has been applied to a system in which both the car gate and hatchway doors are power operated with the gate and door being returned automatically to closed position after a stop has been made under normal operating conditions and remaining in open position until a car button is pressed when operated under emergency conditions. Other arrangements for controlling the operation of the gate and doors may be provided although it is preferred for emergency operation that the gate and door remain in open condition at the floor at which the car is stopped, until a car button is pressed, as with this arrangement the attendant is free to handle the stretcher or perform other duties required by the emergency service.

Various modifications and alterations may be made in both circuits and apparatus of the control systems to which the invention is applied, including those set forth in the aforesaid Waters et al. patent. Different embodiments of the invention may be made. It is therefore intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An elevator system comprising; an elevator car serving a plurality of floors; a plurality of push buttons in the car, one for each of said floors; means responsive to said push buttons for registering calls; mechanism responsive to the calls that are registered by said registering means in response to the operation of such push buttons for causing the starting of the car and the stop-

ping thereof at floors for which such calls are registered; and means for rendering said first named mechanism unresponsive to said registering means but directly responsive to the pressing and holding pressed of any one of said push buttons to cause the car to travel directly to and stop at the floor for which such button is provided.

2. An elevator system comprising; an elevator car serving a plurality of floors; a plurality of push buttons in the car, one for each of said floors; means responsive to said push buttons for registering calls; throw-over switching mechanism; and means responsive when said throw-over switching mechanism is in one operated position to calls that are registered by said registering means for causing the starting of the car and the stopping thereof at floors for which such calls are registered, and when said switching mechanism is in its other operated position directly responsive to the pressing and holding pressed of any one of said push buttons to cause the car to travel directly to and stop at the floor for which such button is provided but unresponsive to any registered calls.

3. An elevator system comprising; an elevator car serving a plurality of floors; car buttons for said floors; hall buttons for said floors; means responsive to the pressing of said buttons for registering calls; throw-over switching mechanism; and means responsive when said throw-over switching mechanism is in one position to calls that are registered by said registering means for causing the starting of the car and stopping thereof at floors for which such calls are registered, and when said throw-over switching mechanism is thrown to the other of its operated positions directly responsive to the pressing and holding pressed of any one of said car buttons to cause the car to travel directly to and stop at the floor for which such car button is provided but unresponsive to any registered calls, said means responding when said throw-over switching mechanism is thrown back to said one position to unanswered calls registered by said registering means.

4. An elevator system comprising; an elevator car serving a plurality of floors; car buttons for such floors; hall buttons for such floors; means responsive to said car buttons and hall buttons for registering calls; mechanism responsive to calls that are registered by said registering means for causing the starting of the car and stopping thereof at the floors for which calls are registered; and means for rendering said first named mechanism unresponsive to said registering means but directly responsive to the pressing and holding pressed of any one of said car buttons to cause the car to travel directly to and stop at the floor for which such car button is provided.

5. An elevator system comprising; an elevator car serving a plurality of floors; a plurality of car buttons, one for each of said floors; an up hall button at each of said floors; a down hall button at each of said floors; a plurality of floor relays, one for each of said push buttons, each floor relay being operated in response to the pressing of the push button for which it is provided; mechanism responsive to said floor relays that are operated for causing the starting of the car and the stopping thereof at the floors for which such relays are provided; and means operable to render said mechanism unresponsive to said floor relays but directly responsive to the pressing and holding pressed of any of said car buttons to cause the car to travel directly to and stop at the floor for which such button is provided.

6. An elevator system comprising; an elevator car serving a plurality of floors; a plurality of car buttons, one for each of said floors; an up hall button a each of said floors; a down hall button at each of said floors; a plurality of floor relays, one for each of said push buttons, each floor relay being operated in response to the pressing of the push button for which it is provided; direction determining mechanism; means responsive to said floor relays that are operated to cause the starting of the car in a direction determined by said direction determining mechanism; mechanism actuated in accordance with car movement responsive to said floor relays that are operated for causing slow down and stopping of the car at the floors for which such relays are provided; and throw-over switching mechanism operable to render said mechanism actuated in accordance with car movement and said starting means unresponsive to said floor relays and to render said starting means and mechanism actuated in accordance with car movement directly responsive to said car buttons to cause by operating a car button and holding it depressed said starting means to start the car in a direction determined by said direction determining mechanism and to continue it in operation to the floor for which such car button is provided without interference from any operated floor relays and to cause said mechanism actuated in accordance with car movement to stop the car as it arrives at the floor for which such car button is being held pressed.

7. An elevator system comprising; an elevator car serving a plurality of floors; a plurality of car button floor relays, one for each of said floors; a car button in the car for each of said relays, said buttons being connected to their respective floor relays to cause operation thereof; an up floor relay for each of said floors; a plurality of up hall buttons, one at each of said floors, said up hall buttons being connected to the corresponding up floor relays to cause operation thereof; a down floor relay for each of said floors; a plurality of down hall buttons, one at each of said floors, said down hall buttons being connected to the corresponding down floor relays to cause operation thereof; direction determining mechanism; direction relays connected to said direction determining mechanism, said floor relays having contacts connected to said direction determining mechanism to cause the starting of the direction relay determined by said direction determining mechanism to cause the starting of the car; mechanism actuated in accordance with car movement for controlling slow down and stopping of the car, said floor relays having additional contacts connected to said mechanism actuated in accordance with car movement to control the stopping of the car at the floors; and throw-over switching mechanism operable to render said mechanism actuated in accordance with car movement ineffective to cause slow down and stopping of the car in response to floor relays, to disconnect all of said floor relays from said direction determining mechanism, and to connect said car buttons directly to said direction determining mechanism to cause the starting of the car by operation of a car button and by holding such button depressed to cause the car to travel directly to the floor for which such button is provided without interference from any operated floor relays, said mechanism actuated in

accordance with car movement being operable as the car arrives at the floor for which such car button is being held pressed to cause the car to slow down and stop at that floor.

8. An elevator system comprising; a plurality of elevator cars; a plurality of floors served by the cars; a plurality of car buttons in each car, one for each of said floors; a floor relay for each of said car buttons operable in response to the pressing of the car button for which it is provided; an up hall button at each of said floors; a down hall button at each of said floors; a floor relay for each of said hall buttons operable in response to the hall button for which it is provided; mechanism for each car responsive to operated car button floor relays for that car and to operated hall button floor relays for causing the starting of that car and the stopping thereof at floors for which such relays are provided; and switching mechanism for each car operable to render the first named mechanism for that car unresponsive to said floor relays but directly responsive to said car buttons for that car without affecting the response of said first named mechanism for any of the other cars to the car button floor relays for the respective ones of such cars or to hall button floor relays.

9. An elevator system comprising; an elevator car; a closure controlling access to and from the car when the car is stopped at a floor; control means for causing the starting and stopping of said car; mechanism for controlling the operation of said closure; throw-over switching mechanism; and means operable when said throw-over switching mechanism is in one operated position to cause the operation of said controlling mechanism to automatically effect the opening of said closure upon a stop being made at said floor and the reclosing of said closure upon the expiration of a predetermined time interval after the closure reaches open position, and operable when said throw-over switching mechanism is in its other operated position to cause the operation of said controlling mechanism to automatically effect the opening of said closure when a stop is made at said floor but to prevent the operation of said controlling mechanism to effect reclosing of said closure except upon operation of said control means to cause the starting of said car.

10. An elevator system comprising; an elevator car serving a plurality of floors, said car having a gate and a hatchway door being provided at each of said floors; a plurality of push buttons, one for each of said floors; means responsive to said push buttons for causing the car to travel to and stop at the floors for which such push buttons are provided; mechanism for controlling the operation of said gate and doors; throw-over switching mechanism; and means operable when said throw-over switching mechanism is in one operated position to cause the operation of said gate and door controlling mechanism to automatically effect the opening of the car gate and hatchway door at the floor at which a stop is made and the reclosing of said gate and door upon the expiration of a predetermined time interval regardless of whether or not any push buttons remain to be responded to, and operable when said throw-over switching mechanism is in its other operated position to cause the operation of said gate and door controlling mechanism to automatically effect the opening of the car gate and hatchway door at the floor at which a stop is made but to prevent the operation of said gate and door controlling mechanism to effect reclosing of said gate and door except in response to the pressing of one of said push buttons.

11. An elevator system comprising; an elevator car serving a plurality of floors, said car having a gate and a hatchway door being provided at each of said floors; mechanism for controlling the operation of said gate and doors; a plurality of push buttons in the car, one for each of said floors; push buttons at said floors; means responsive to said push buttons for registering calls; throw-over switching mechanism; and means operable when said throw-over switching mechanism is in one operated position to cause in response to the calls that are registered by said registering means the starting of the car and the stopping thereof at the floors for which such calls are registered and to cause the operation of said gate and door controlling mechanism to automatically effect the opening of the car gate and hatchway door at the floor at which the stop is made as the car is brought to a stop and the reclosing of said gate and door upon the expiration of a predetermined time interval regardless of whether or not any further calls remain to be responded to, and operable when said throw-over switching mechanism is in its other operated position to prevent starting and stopping of the car in response to registered calls, to prevent the operation of said gate and door controlling mechanism to effect automatic reclosing of the car gate and hatchway door at the floor at which the car is stopped, to cause in direct response to the pressing and holding pressed of any one of said push buttons in the car the operation of said gate and door controlling mechanism to effect closure of said gate and door and the car to travel directly to and stop at the floor for which said push button is provided, and to cause operation of said gate and door controlling mechanism to automatically effect the opening of the car gate and hatchway door at the floor at which the stop is made.

GEORGE NORM CRABBE.
ARTHUR WILLARD PAULSON.