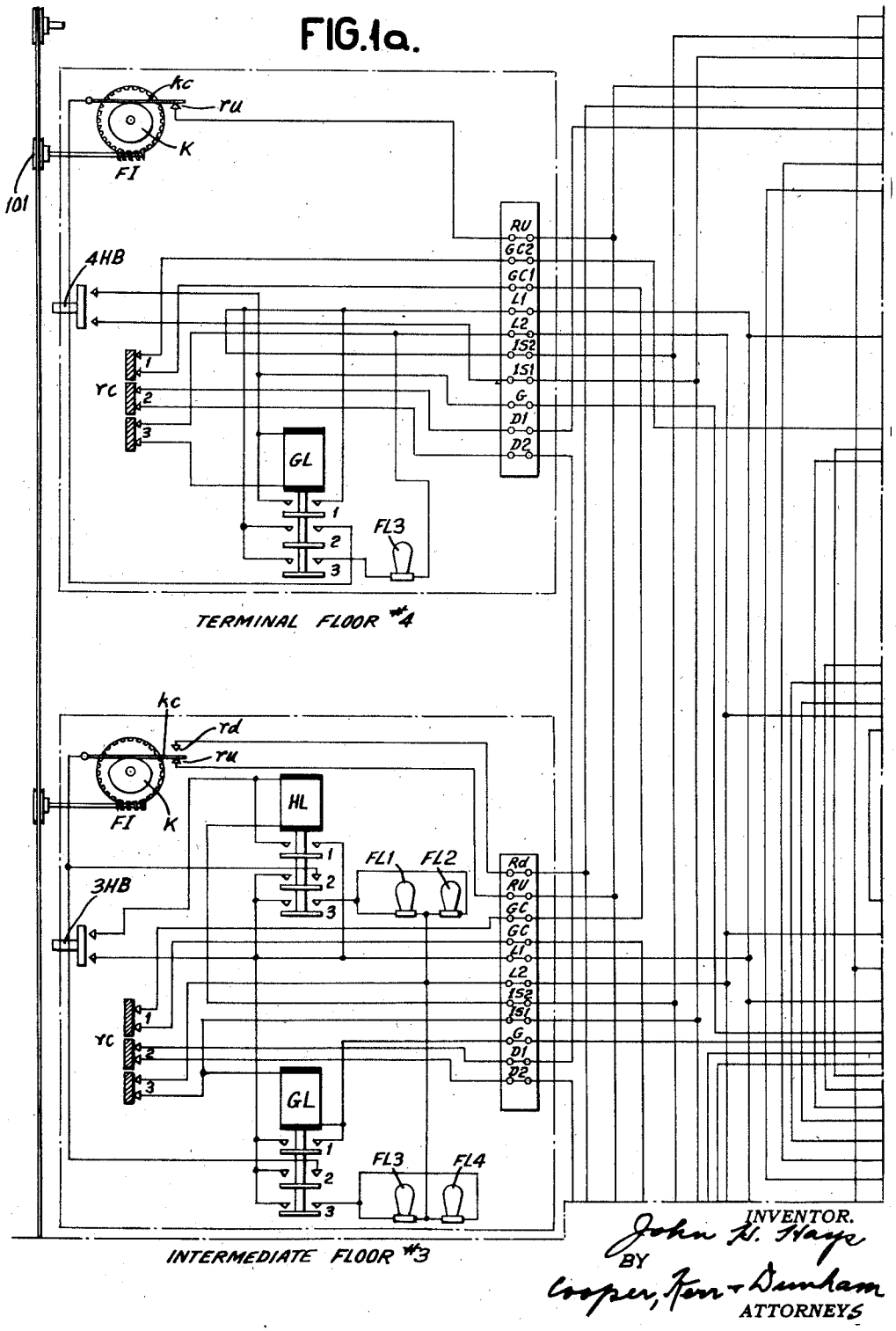
Feb. 11, 1941. J. H. HAYS 2,231,624

ELEVATOR SYSTEM

Filed April 10, 1940 4 Sheets-Sheet 1

FIG. 1a.



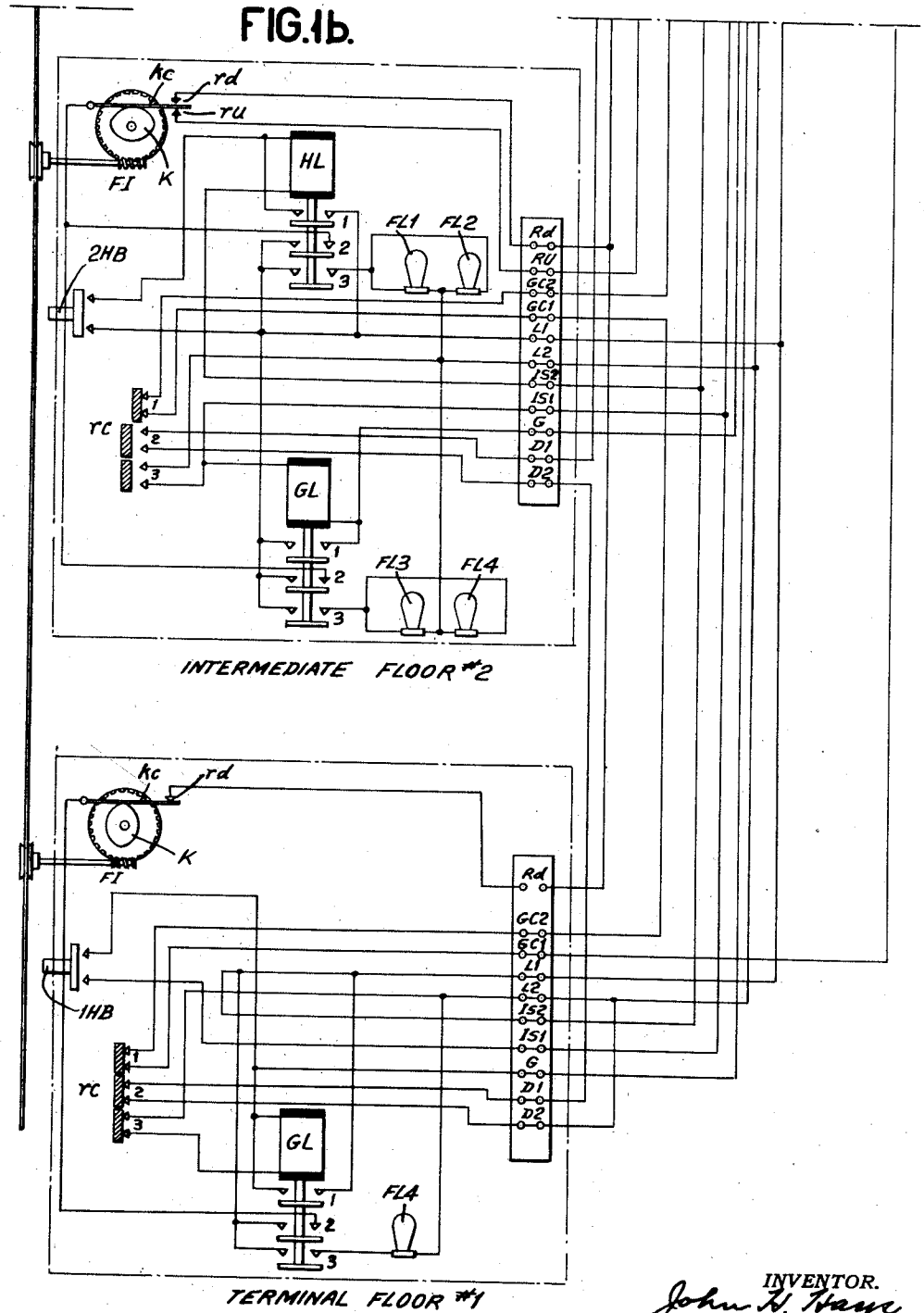
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ELEVATOR SYSTEM

Filed April 10, 1940 4 Sheets-Sheet 2

FIG. 1b.



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ELEVATOR SYSTEM

Filed April 10, 1940 4 Sheets-Sheet 3

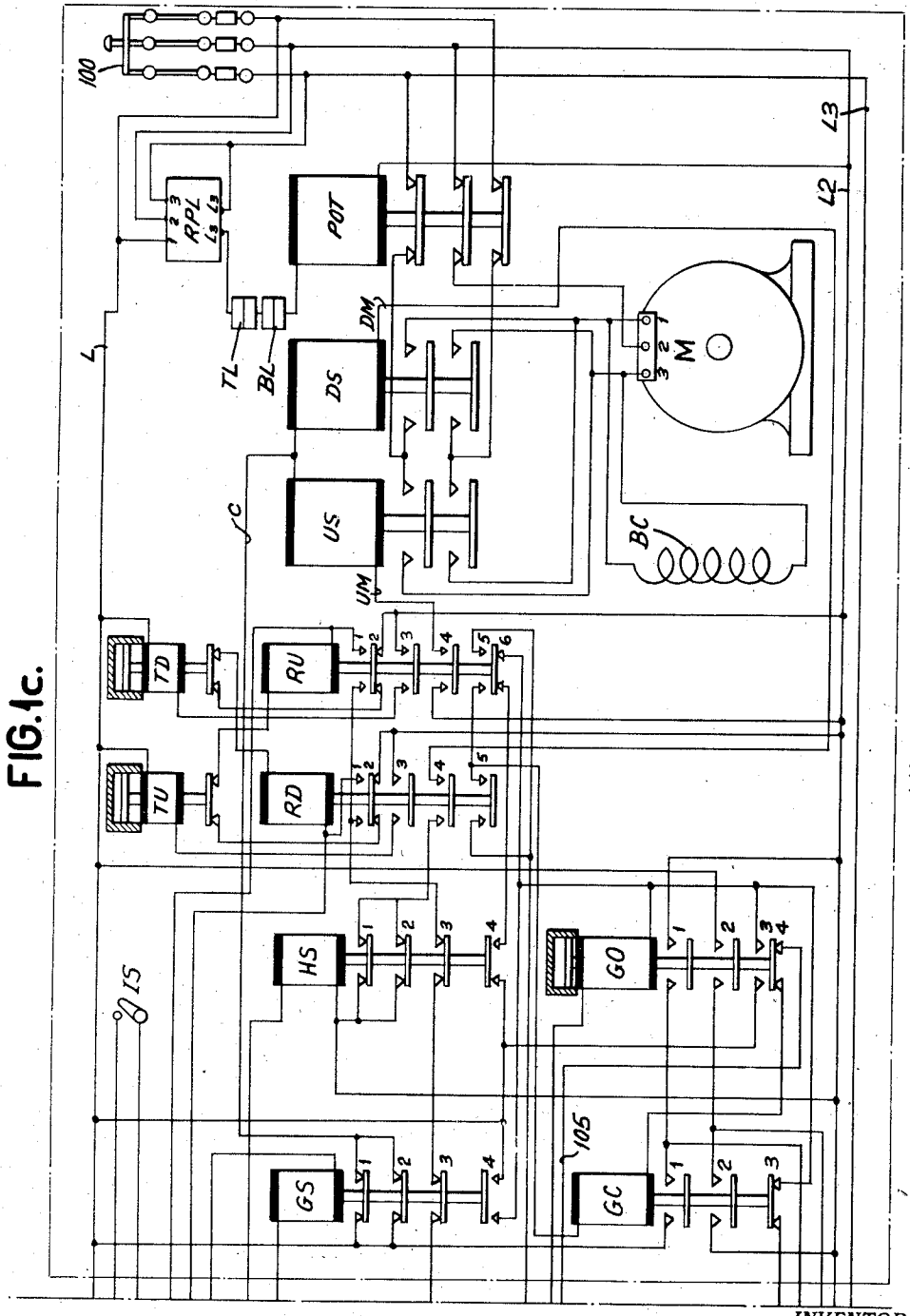


FIG. 1c.

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ELEVATOR SYSTEM

Filed April 10, 1940 4 Sheets-Sheet 4

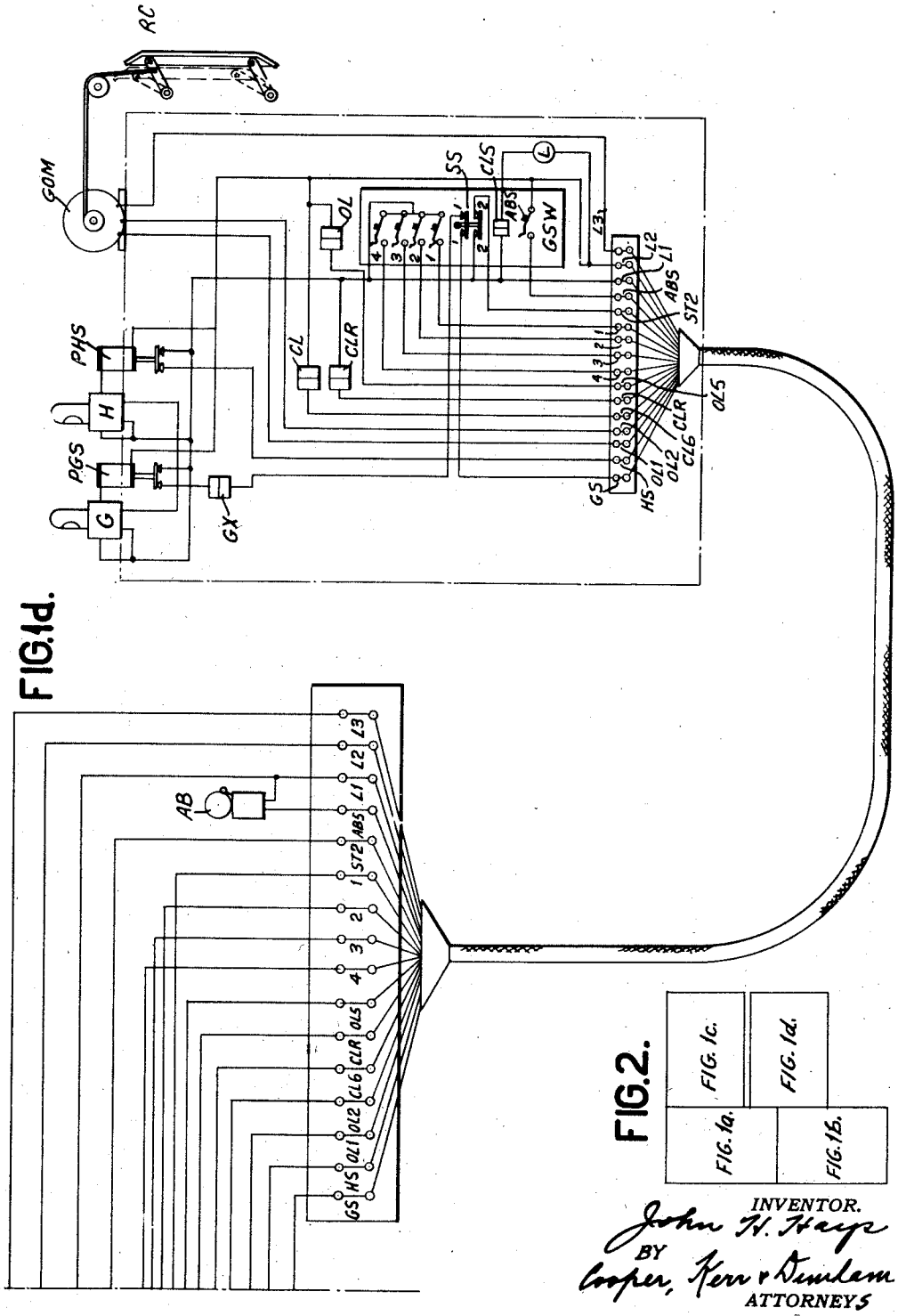


FIG. 1d.

FIG. 2.

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2,231,624

ELEVATOR SYSTEM

John H. Hays, Montclair, N. J.

Application April 10, 1940, Serial No. 328,798

10 Claims. (Cl. 187—29)

At the present time elevator systems are in use wherein cars are provided with gang switches with buttons for each floor and wherein hall buttons are provided for hall calls. The hall button systems are of two types, either single button systems wherein there is a single button at each floor to call the car to the floor or two button systems wherein there is an up button and a down button in the hall at each floor. With both of these systems it has been found desirable ti have the car operate in an automatic and collective manner, that is to say, if several passengers enter the car at say the first floor and register calls for say the fourth and second floors, the car upon closure of the gate, etc., will proceed automatically to the second floor and thereafter proceed automatically to the fourth floor. That is to say the car will stop at the floors in sequence irrespective of the sequence in which the calls were registered in the car. These systems also include the further feature of controlling the car so that it proceeds to the higher floors automatically irrespective of intermediate floor calls being registered from the hall buttons. That is to say, if after the passengers in the car had pushed the gang switch buttons and if a passenger at the third floor pressed the hall button the car would not stop at the third floor on the up motion but would proceed to stop for the car registered calls on the up motion and thereafter return to the third floor and stop there. Such previous systems also had the further feature that if a floor call was registered from a higher level floor than any car registered call, the car would automatically proceed from the last car registered call floor level to the higher hall registered floor level to pick up the passenger at that higher floor before proceeding on the down motion. Such previous systems furthermore on down motion were fully collective, that is to say, the car stops in succession at the relatively lower and lower floor levels for calls registered both within the car and without the car. This operation on the down motion is what might be termed "fully collective operation" whereas on the up motion the operation is selectively collective.

Previous systems of this general class have included a mechanically driven floor selecting switch which was positively driven from one of the moving parts of the elevator equipment. This mechanism had to be definitely maintained in synchronism and in proper timing with the car position to insure reliability of operation, level stops, etc. In particular the said mechanism was utilized to actually stop the car at the different floor levels. It also functioned to select the calls.

The present invention has for its objects the provision of an improvement and simplification of elevator systems of the foregoing type to the general end that all car stopping operations and car selecting operations are provided for by mechanism which has no mechanical connections with the elevator operating mechanism. In lieu of an electromechanical system a more completely purely electrical system is provided.

According to the present invention floor indicating devices are provided which are mechanically driven in time with the car. These devices, however, are only utilized for controlling car starting operations and for determining direction of car movement. It is not required therefore that these devices be maintained in accurate synchronism with the car. The devices which control selection of destination and the devices which control stopping are purely electrical in their operation. More particularly, certain relays are provided and control of floor selection and car stopping is effected photo-electrically by means of photocell devices on the car and lamp devices in the shaftway. The lamp devices are controlled conjointly from the hall buttons and from the car and the photocell devices in cooperation with the lamp devices which are effective to both select the floor stops and actually cause stopping at the floor levels.

Accordingly, the present invention has for its further object the provision of improved and simplified means for selecting the destination of the car; improved and simplified control means for controlling the stopping of the car either on the up motion or down motion; improved relay control devices for elevator systems of the automatic collective and selective collective type; improved and simplified photocell and light controls for elevator systems of the foregoing types.

A further object of the present invention resides in the provision of novel electrical and photo-electrical controls for selecting floors at which stops are to be made and for initiating stopping at such selected floors.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawings which show by way of illustration a preferred embodiment and the principle thereof and what I now consider to be the best mode in which I have contemplated applying that principle. Other embodiments of the in-

vention employing the same or equivalent principle may be used and structural changes made as desired by those skilled in the art without departing from the present invention and within the spirit of the appended claims.

In the drawings:

Figures 1*a*, 1*b*, 1*c* and 1*d* taken together and arranged as shown in Fig. 2 show complete elevator systems;

Fig. 2 shows diagrammatically the way the various figures (Fig. 1*a* to Fig. 1*d*) are to be disposed to afford the complete wiring diagram.

Referring to Fig. 1*c*, 100 designates a conventional main line switch. RPL is the customary reverse phase relay. TL and BL are the conventional top limit switch and bottom limit switch. POT is the customary potential switch. US and DS are the customary up-motion and down-motion switches. M is the elevator motor and BC the customary braking coil. These parts are all of conventional construction and need no further description.

It may be mentioned that a common line C extends to both the up-motion switch US and the down-motion switch DS and an up-motion circuit UM extends to US and a down-motion circuit DM extends to the down-motion switch DS.

The foregoing parts comprise the main control board of a standard elevator.

Referring again to the motor room equipment, the control board includes relay switches as follows: GS, HS, RD, RU, TU and TD. The general purpose of these relays may be explained as follows: GS when de-energized, stops the car movement. Relay HS when de-energized, is adapted to stop the car on the down motion and it is also adapted to stop the car on the up motion of the car provided no call is registered from a higher floor. RD when energized is adapted to start the car on a down motion. RU when energized, is adapted to start the car on the up motion. TU is a relay adapted when energized to give preference to all up motion calls which may be registered immediately after car movement pertaining to previously registered up motion calls. Thus TU relay when energized locks out relay RU and leaves RD free to respond to additional down motion calls. Relay TD is adapted when energized to lock out relay RD and thus gives preference to up motion calls. TU and TD are time delayed relays being provided with dash pots so arranged as to give preference to new calls which require the car to continue in its last direction of travel. Such preference is given only for a short time period.

A single pole inspection switch IS is provided on the main control panel in the motor room for disconnecting the hall buttons when the elevator equipment is being inspected and repaired.

Figs. 1*a* and 1*b* of the drawings, show the shaft-way equipment of the system. In the shaft-way there is suitable dial driving mechanism generally designated 101. This may comprise a cable and pulley drive which extends from the main operating mechanism of the elevator down through the shaft-way, to the various floors. At each floor there is a floor indicator mechanism of conventional form generally designated FI. This may be driven by a worm gear from the dial drive mechanism 101. Each floor indicator at each floor in addition to being provided with the usual indicator mechanism includes a cam designated K. When a car is adjacent to a floor, cam K will assume such a position that a contact operating member KC will be in intermediate or neutral position, see the showing for intermediate floor #2. On the other hand if a car is below a particular floor, see intermediate floor #3, the cam K will shift to such a position that the contact operating member KC will assume this lower position as shown. If the car is above a floor station, see terminal floor #1, the cam K will shift member KC to the upper position. For the intermediate floors contact member KC is adapted to establish contact when in upper position with an *rd* contact, and when in lower position such member is adapted to establish contact with an *ru* contact.

It will be noted that at the top terminal floor #4 there is only an *ru* contact, whereas, for the bottom terminal floor #1 there is only an *rd* contact.

At each floor there is a hall button which is designated 1HB, 2HB, etc., which button when depressed, is adapted to energize the hall light relay designated HL, one of which is provided for each intermediate floor.

The control equipment for each floor also comprises a gang light relay GL. This relay is called into operation from the gang switch in the elevator car.

Referring now to the equipment on the car (see Fig. 1*d*), each car is provided with a conventional retiring cam designated RC. This retiring cam is operated by a car gate operating motor GOM. This motor GOM in the usual well known way opens and closes the car gate and raises and lowers the retiring cam. As is customary, the retiring cam is raised and the gate is closed for running position of the car and the car gate is open and the retiring cam lowered when a car is stationary and at a floor. Within the car there is a gang floor switch generally designated GSW. The customary push buttons are provided for each floor, these buttons being adapted to operate contacts designated 1 to 4 inclusive. The car gang switch also includes an emergency stop switch designated SS. The emergency stop button when operated is adapted to open contacts SS1 and SS2. The gang switch also includes a car light switch CLS for turning on a light L in the car. The car gang switch also includes an alarm bell switch ABS.

The car control equipment also includes an open limit switch OL for stopping car gate opening movement when the gate is fully open. A switch CL stops gate movement when the gate is fully closed. A supplemental switch is provided in the car designated CLR, the purpose of which is to reopen the car gate in the event that a hatchway door is opened when the car gate is being closed. The car control equipment also includes a gate contact GX, the purpose of which is to prevent the starting of the car until the car gate is in fully closed position.

Referring again to the shaft-way equipment (Figs. 1*a* and 1*b*), at each floor station there is a shaft-way interlocking switching mechanism generally designated *rc*. Contacts *rc*1 of this interlocking equipment are closed by the hatchway door when the door is in fully closed position. Contacts *rc*2 and *rc*3 on the other hand are normally closed contacts adapted for control by the retiring cam on the car. Such contacts *rc*2 and *rc*3 are open when a car is stationary and at a floor and with a car running such contacts are closed.

In the main control room or motor room there are provided gate closing and gate opening relay

switches generally designated GC and GO (Fig. 1c). With relay GC energized, the gate operating motor GOM (Fig. 1d) is brought into operation to close the car gate. Also when the gate opening relay GO is energized, the gate operating motor is brought into operation to open the car gate. The gate opening relay GO is preferably provided with the usual dash pot device to provide the desired time delay of operation.

Shaft-way lights and photocells on car

Disposed in the shaft-way for each floor station are sets of incandescent lamps as follows: The lamps designated FL1 and FL2 are illuminated under control of the hall buttons. The lamp FL1 is preferably disposed slightly above a floor level station and lamp FL2 is slightly below the floor level station.

At each floor station there are other lamps designated FL3 and FL4. Lamp FL3 is slightly above floor level and FL4 is slightly below the floor level for intermediate floors such as 3 and 2. For the top terminal floor lamp FL3 is slightly below the floor level and for the bottom terminal floor lamp FL4 is slightly above the floor level. It may be here mentioned that lamps FL3 and FL4 are illuminated under control of the gang switch in the car. Lamps FL1 and FL2 for all the various floor stations are disposed in a common vertical plane. Likewise lamps FL3 and FL4 are disposed in another common but different vertical plane.

Referring again to the car equipment (see Fig. 1d) the car is provided with a pair of photocells, one of which is designated G and the other H. Such photocells may be of any desired type and will include the customary amplifier devices and circuits (not shown) which provide for the energization of the sensitive relays PGS and PHS. When the photo-electric cell unit G receives light PGS will be energized and when the photocell unit H receives light PHS will be energized. Photocell unit H is so disposed on the car as to be influenced by the floor lamps FL1, FL2 and photocell unit G is so disposed on the car as to be influenced by the floor lamps FL3 and FL4.

Before describing the system in detail it may be mentioned that each hall button when operated energizes a related relay which may be termed "a hall relay" and also causes illumination of the pair of hall stop lamps in the shaft-way adjacent the floor. Thus if several hall buttons are pushed several hall relays will be energized and several sets of hall stop lamps will be lit. Operation of one or more of the buttons in the car will selectively energize other relays and selectively light one or more pairs of car stop lamps in the shaft-way. These car stop lamps are in a separate set from those illuminated under control of the hall buttons. Suitable controls are provided to start the car upon say the up motion. A photocell carried upon the car scans the car stop lamps which are illuminated under control of the gang switch in the car. When the car reaches a floor at which a car stop lamp is illuminated, the photocell is influenced and a control circuit is established to stop the car at the floor level. The respective lower car stop lamps of the set just mentioned are disposed slightly below the respective floor levels to give enough time for the car to be brought to a level stop at the floor. While the hall button controlled lamps are also scanned upon the up motion, the car is not necessarily stopped at hall registered stops because of certain interlocking controls. Upon the down motion both sets of lamps are scanned by their related photocells on the car and stops are made at all floors where calls are registered by the illuminated lamps of either set. Here again stopping is under photocell and light control and level stops are provided for by placing the various down motion stop lights each slightly above the related floor level.

Every time the car stops at floors, the calls registered for the floor whether from the gang switch in the car or from the hall button, are cancelled. The controls for the elevator operating mechanism include a relay which has parallel circuits through it. If calls are registered for floors above the floor at which the car stands, at least one of the parallel circuits will be maintained to keep the car on the up motion, with possible intermediate stops, until no higher floor calls are registered.

The various car gate operating controls will be subsequently described. These are of conventional construction but are disposed in certain of the controlling circuits.

Let it be assumed that the car is standing at floor one with no calls registered. Two passengers enter the car and register calls by pushing the second and fourth buttons on the car switch GSW. The GL relays at floor #2 and #4 are energized. From circuit L1 on the car, circuits are completed through the gang switch buttons 2 and 4, through the cable to the GL relay coils at floors 2 and 4, through the retiring cam operated contacts *rc*3 to line L2. The holding circuit for the GL relays is completed from line L1 at the floor stations, through relay contacts GL1, through the GL coils, through *rc*3 to line L2. Assume the car is at the first floor and below the floors for which the calls were registered, the floor indicator mechanism FI at floors 4 and 2 has permitted the contacts *kc* and *ru* to come in contact with one another at both floors. Energizing of GL completes the RU magnet circuit from L1 at each floor station through GL2, through *kc* and *ru*, through the RU magnet coil (Fig. 1c), through the normally closed contacts of the TU relay, through the normally closed contacts RD2 to wire L2. Energizing the GL relays, also lights, lamps FL3 and FL4 as a circuit is completed from L1, through GL3, through FL3 and FL4 to line L2.

RU on energizing also completes the car gate closing circuit at RU5. RU on energizing also interrupts the car gate opening circuit at relay contacts RU6. The car does not start until the car gate contact GX has been closed by the action of the car gate. When the car gate contacts GX are closed, a circuit is completed to energize GS. This energizing circuit is completed from circuit L1 on the car, through the normally closed contacts of the PGS relay, through the GX car gate contacts, through the SS1 switch contacts, through the cable, through the GS relay coil, through each hatchway door interlock contact at *rc*2 to line L2 at terminal floor one. The RU holding circuit is then actually completed by the GS1 and GS2 contacts which are now closed. When RU is energized, its holding circuit is established from L1 on the car, through the normally closed contacts SS2 of the emergency stop switch, to terminal ST2, through the cable through the GS3 relay contacts, through the HS3 relay contacts, through the RU1 contacts, through the RU relay coil, through the normally closed contacts of the TU relay, through the RD2 relay contacts to line L2. Relay RU on energizing also energizes the preference relay TD by completing a cir-

cuit from L1, through the TD relay coil, through relay contacts RU3 to line L2. Relay RU also energizes the main up motion relay US by completing a circuit from line L1, through relay contacts GS1 and GS2, through the magnet coil US, through the RU4 relay contacts to line L2.

The car is then started on the up motion with calls registered for the second and fourth floors. Assume that with the car so in motion, the hall button HB is pressed at the third floor station. A hall stop call is registered by the completing of a circuit from L1 at the third floor, through the 3HB push button hall switch at such floor, through the HL relay coil, through a circuit to the control board, through the IS inspection switch, back through the retiring cam control contacts *rc*3 to L2. As the car is below the third floor, relay HL at the third floor completes the RU circuit through contacts *kc* and *ru* at the third floor, but this circuit is of no effect at this instant, since RU is already energized. Relay HL, however, lights lamps FL1 and FL2 by completing a circuit from L1 at the third floor, through the HL3 contacts, through lamps FL1 and FL2 at the third floor to L2.

It will now be recalled that two calls are registered from the car, viz. for the second and fourth floors and another call has been registered from the hall at the third floor. Under this condition of car calls and hall calls the car should stop at the second floor and after the passenger has left the car, the car should resume its operation and proceed not to the third floor where there is a hall call registered, but to the fourth floor since the car is on the up motion and the waiting passenger at the third floor is in all probability desirous of descending. The procedure is for the car to go to the second floor and then to the fourth floor and then descend to allow the passenger to enter at the third floor.

As the car arrives level with floor two, the photocell G is brought in line with lamp FL3, which is placed the proper distance below the floor level to provide a level floor stop. The action of the light beam from light FL3 on the photocell G, which is on the car, causes relay PGS to be energized by completing a circuit from L1 on the car, through the photocell G, through relay PGS to line L2. Relay PGS energizing breaks the circuit of stopping relay GS, thereby de-energizing the main up motion relay US by breaking its circuit at GS1 and GS2, thus stopping the car. GS also on de-energizing, opens the holding circuits for relays RU and RD at contacts GS3. However, RU is not de-energized as the energizing circuit for this relay is maintained through the FI mechanisms at the third and fourth floors. This de-energizing of GS initiates gate opening and closing and call cancelling sequence operations as will now be described.

When GS de-energizes, the GS4 contacts reclose. A circuit is completed from L1, through the GS4 contacts, through the GO relay coil, through the OL5 terminal, through the cable, through the OL5 terminal on the car, through the open limit switch OL to line L2 on the car. With GO energized, the relay contacts GO1 and GO2 are closed and current is supplied to the gate opening motor GOM to cause it to rotate in a gate opening direction. The retiring cam on the car is also raised. With GO energized, the normally closed GO4 contacts are open, which locks out the GC relay, thus deferring gate closing operations. The open limit switch OL opens when the gate is fully open and relay GO is de-energized. The retiring cam upon operation with the car at the second floor mechanically unlocks the door and opens the *rc*2 and *rc*3 contacts. The passenger can now leave the car at the second floor. The passenger upon opening the door by hand, opens the *rc*1 contacts. The opening of the *rc*3 contact at the second floor will de-energize the GL relay at the second floor which turns out the FL3 and FL4 lights at the second floor. Opening of contact *rc*2 at the second floor opens the circuit through the gate safety contact GX to eliminate the possibility of the car being started until the retiring cam has returned. The *rc*1 contacts at floor 2 on closing partially complete a gate closing circuit either through the *ru*5 contacts or the *rd*5 contacts.

The call for the second floor stop has now been completed and the call cancelled. It will be recalled that there is a car call for the fourth floor on the up motion and a hall call registered at the third floor which is presumably for a down motion stop.

It may be mentioned that the relay GO is a time delayed relay which is slow to drop out. After a certain time delay, the car gate closing circuit is completed at the GO4 contacts. This circuit is from line L1 at floor one, through the various *rc*1 contacts at the various floors which are in series, through the RU5 contacts now closed, through the GC relay coil, through the GO4 contacts, through the CL6 terminal contacts, through the cable, through the CL6 terminal contacts on the car, through the CL limit switch, to line L2. With relay coil GC energized, relay contacts GC1 and GC2 close, supplying current to the gate opening motor GOM and causing this motor to close the gate. Closing action continues until the CL limit switch opens at which time the gate is fully closed. The action of the gate operating motor raises the retiring cam and re-establishes *rc*2 and *rc*3 at the second floor.

The purposes of the GC3 contacts and the CLR switch will now be explained. Assume that the gate was in the act of closing and that before the retiring cam had mechanically locked the shaft-way door, a passenger at the floor had reopened the shaft-way door. In this event it is desirable to have the car gate reverse its motion and return to fully open position. The action of the awaiting passenger in reopening the shaft-way door would reopen contacts *rc*1 and thus break the circuit to the gate closing relay GC. With GC thus de-energized, the car gate would be stopped in the partly closed position with both the open limit switch OL and the closed limit switch CL closed. The auxiliary closed limit switch CLR would also be closed at this instant and the de-energizing of GC would make the normally closed contacts GC3, thus establishing a circuit from L1 on the car through the CLR switch, through the cable, through the GC3 contacts, through the magnet coil GO, through the open limit switch OL, back to L2 on the car. The car gate would reopen until stopped by the action of the open limit switch OL.

When the gate is fully closed, the GX contact recloses. It will be recalled that with the car stopped at the second floor, relay RU remained energized because of the floor dial switch controls being closed on higher floors. When the car gate contacts GX reclose, an energizing circuit is provided for the GS relay which in turn completes a circuit through the GS1 and GS2 contacts to energize relay US. This heavy duty relay upon energization establishes the operating

circuit to the elevator motor and the car continues on the up motion towards the third floor. As the car arrives level with the third floor at which floor a hall call had been registered, lamp light FL2 at the third floor will have been illuminated, due to the fact that the HL relay at this floor is energized and contacts HL3 closed. With the FL2 light illuminated, photocell H on the car is influenced when the car arrives level with the third floor. With photocell H activated, relay PHS is energized and temporarily breaks the energizing circuit of the hall stop relay HS. Under this condition the temporary de-energizing of HS does not effect operation of the car in this instance as the car is on the up motion with the call registered above the third floor. With HS thus temporarily de-energized, the opening of contacts HS1 and HS2 has no effect upon relay DS since DS at this time is already de-energized. Furthermore, the opening of the holding circuit of relays RD and RU by contacts HS3 has no effect on RU since relay RU is held energized by the fourth floor FI mechanism, contacts *kc* and *ru* being closed at the fourth floor. This circuit for RU may be traced as follows: From L1 at floor station four, through relay contacts GL2 now closed, through the *kc* and *ru* contacts controlled by the FL mechanism at this floor, via a line which extends through relay coil RU, back through the contacts of the TU relay, down through the RD2 contacts to line L2. Furthermore, the establishment of the gate opening circuit at HS4 has no effect as the circuit to the gate opening relay GO is opened at the RU6 contacts. The car therefore proceeds to the fourth floor level at which level it is stopped by the combined action of light FL3 at the fourth floor, photocell G on the car, relay PGS and GS as previously described for the stop at floor two. In this instance, since the fourth floor is assumed to be the top floor and there is no call registered above the top floor, relay RU is reset. RU will be de-energized at this time because there is no floor dial mechanism or energized relays above the fourth floor to hold the RU relay energized. Accordingly, upon the de-energization of GS, the GS3 contacts will open, thus breaking the holding circuit for the RU relay.

The passenger now leaves the car at the fourth floor and the gate operating and gate control circuits operate as before described for the lower second floor. The retiring cam functions in a similar manner and the car is prepared for its return or downward trip.

At this point it may be mentioned that at the terminal floors, viz. the 1st and 4th floors, no HL relays are provided since these are unnecessary at these floors. At the fourth floor there is no light FL4 because the car never goes above the fourth floor level. At terminal floor one, there is no light FL3 because the car never goes below the first floor level.

During the upward motion of the car in passing the third floor level the FI mechanism shifted the position of the *kc* contact member through the neutral position into contact with *rd* at the third floor level. This action of *kc* prepared relay RD for energization at the time when relay RU is de-energized by preparing a circuit from L1 at floor station 3 through the HL2 contacts, through *kc* and *rd*, through the RD magnet coil, through the TD relay, through the RU2 contacts to L2. Accordingly, when RU is finally de-energized, the hall call registered at the third floor causes RD to be energized. With RD thus energized, it makes its holding circuit from L1 on the car, through the SS2 contacts, through the ST2 terminal, through the cable, through the GS3 contacts, through the HS3 contacts, through the RD1 contacts, through the RD magnet coil, through the TD relay, through the RU2 contacts to line L2. With RD energized, it locks out RU by contacts RD2 opening the energizing circuit for the RU relay. Relay RD energizes the TU relay by completing a circuit from L1, through relay TU, through the RD3 contacts now closed to line L2. Relay RD when energized, completes a gate closing circuit at RD5. The gate on closing, closes the GX contacts re-energizing the GS relay which then closes the GS1 and GS2 contacts. At this time the RD relay which is energized has prepared a circuit for the main down motion magnet DS by establishing a circuit from L2, through the HS1 and HS2 contacts, through the RD4 contacts, through the DS magnet coil, the circuit being completed to line L1, through the GS1 and GS2 contacts upon energization of GS, i. e. when the car gate is fully closed. The car is then placed on the down motion and proceeds to the third floor level at which level there was a hall call stop registered. With this hall stop registered, light FL2 is lit at the third floor. When the photocell H is influenced by such light upon the car reaching the third floor level, the photocell causes energization of relay PHS. With PHS thus energized, the circuit to relay HS will be interrupted, de-energizing relay HS, opening contacts HS1 and HS2 and thereby de-energizing the down motion relay DS, thus stopping the car at the third floor level.

It may be now mentioned that since there are no other calls registered, the opening of contacts HS3 on de-energization of HS opens the holding circuit for relay RD which then becomes de-energized. Gate operations and retiring cam operations operate as before described and the passenger at the third floor enters the car and presses the gang switch button in the car for the first floor. With this gang switch button pushed, the GL relay at the first floor will be energized and the operations would then be the same as described for the fourth to third floor, except that in this instance, the car would proceed to the first floor.

However, if the second floor push button 2HB had in the interim been pressed by a waiting passenger, the car would be stopped at that floor by the same action and controls that stopped it at the third floor. After completing the required sequences of operation at the second floor, the car would proceed to the first floor completing its trip.

From the above description and explanation of operations, it will be understood that with this single button system all calls registered from the car are completed as soon as the car reaches the registered floors regardless of the sequence in which the calls were registered in the car and regardless of the direction of travel of the car. Accordingly, the operations of the car which are controlled from the car gang switch are of the so-called fully collective type. It will be further noted that all hall calls are answered in a fully collective manner when the car is on the down motion and that only the uppermost floor call is answered when the car is on the up motion. This operation is what may be termed "selective" on the up motion.

What is claimed is:

1. An elevator control system including a series of hall button switches, a gang button switch in the car, two sets of lamps in a shaft-way, the lamps of one set being selectively illuminated according to the operated hall buttons, the lamps of the other set being selectively illuminated under control of the gang switch in the car, the lamps of both sets at intermediate floor levels comprising lamps above and below a floor level, photocell means carried upon the car and cooperating with related sets of lamps and car operation control relays for controlling car stops determined by hall button calls and car button calls, said car operation control relays being controlled by related photocells when the latter are influenced by light from the related illuminated lamps in the shaft-way.

2. An elevator control system for stopping an elevator car at a selected floor level irrespective of the direction of car movement, comprising a control relay for controlling stopping of car movement, a switch in the car, a pair of lamps in the shaft-way one below and one above a floor level, both of which lamps are illuminated under control of the switch in the car and photocell means carried by the car and influenced by either lamp depending upon the direction of car movement to cause operation of the control relay.

3. An elevator control system for stopping an elevator car at a selected floor level irrespective of the direction of car movement, comprising a control relay for controlling stopping car movement, a hall button, a pair of lamps in the shaft-way one below and the other above the floor level, both of which lamps are illuminated under control of the hall button, photocell means carried by the car and influenced by either lamp depending upon the direction of car movement to cause operation of the control relay.

4. An elevator system including two car stop control relays, means to control the operation of one of said relays comprising a gang button switch in the car, a plurality of lamps in the shaft-way selectively illuminated under control of the gang button switch in the car, photocell means carried by the car and influenced by an illuminated lamp or lamps to control operation of said relay, means to control operation of the other relay comprising another set of lamps in the shaft-way, a plurality of hall buttons for selectively controlling illumination of said lamps, and further photocell means carried by the car for controlling the other relay when influenced by an illuminated lamp or lamps of said other set.

5. An elevator system with a plurality of floor stations, a car movable in a shaft-way past said stations with the usual operating mechanism, and control devices for said operating mechanism including in combination, a plurality of hall button controlled relays one at each intermediate floor station, a set of hall buttons for selectively energizing said relays, a plurality of car controlled relays one at each floor station, a gang switch in the car for selectively controlling energization of said relays, car direction movement selecting means at each floor for determining the direction of car movement to bring the car to each floor, said selecting means determining circuits established by both the car controlled relays and the hall controlled relays, a pair of supplemental relays for controlling the control devices and determining car movement in one direction or the other, said supplemental relays being controlled through the circuits established by the car movement selecting means, the car controlled relays and the hall controlled relays.

6. An elevator system according to claim 5 wherein the car is provided with the usual retiring cam devices and including means controlled by said retiring cam mechanism upon stoppage of a car at a given floor for de-energizing either an energized car controlled relay or hall controlled relay or both at such floor to thereby cancel the call for the floor at which a stop has been made.

7. An elevator system for controlling an elevator operating mechanism, comprising relay means for controlling said operating mechanism, including floor selecting and stopping relays, means for selectively controlling operation of said relay means comprising hall button controlled stop lamps in the shaft-way which are selectively illuminated, car gang switch controlled stop lamps in the shaft-way which are selectively illuminated, photo-cell means carried on the car and brought into action by car movement and by the stop lamps for controlling said floor selecting and stopping relays for selecting floor stops and initiating car stops at selected floors.

8. The invention according to claim 7, wherein both sets of lamps include down motion stop lamps and up motion stop lamps.

9. An elevator system with operating devices and main up motion and down motion switches, a supplemental relay for controlling energization and de-energization of the main up motion switch, means for controlling energization of said supplemental relay including one or more hall relays, a direction selecting switch and stop relay, said stop relay being ineffective to de-energize the supplemental relay if operated for a floor below a floor at which a hall relay is energized.

10. An elevator system with elevator operating mechanism and the usual main up and down switches for controlling it, and including in combination a supplemental up motion control relay, a supplemental down motion controlling relay, a pair of stop motion control relays, one of said latter relays controlling both the main up motion and down switches to interrupt the circuit thereto, the other of stop motion control relays controlling the main down motion switch to interrupt the circuit, said last mentioned pair of stop motion control also controlling de-energizing of the supplemental up and down motion control relays and means for selectively controlling de-energization of the stop motion control relays.

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