

July 31, 1934.

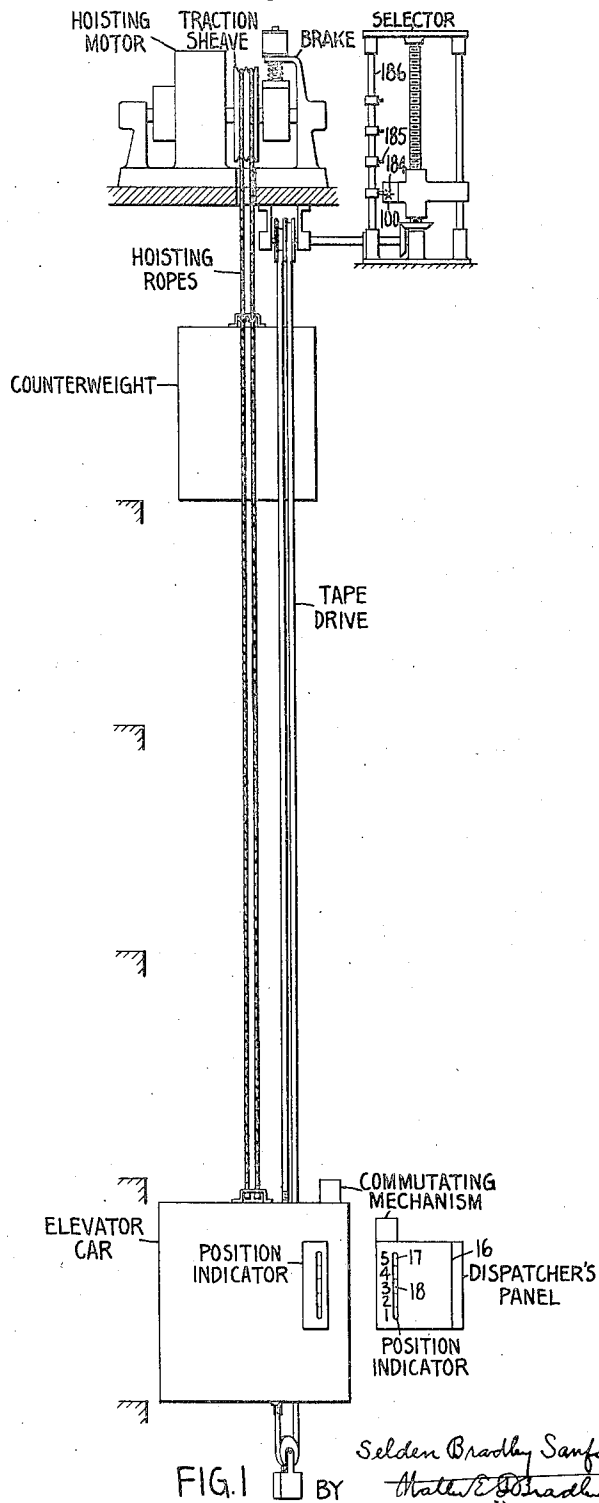
S. B. SANFORD

1,968,427

ELEVATOR SIGNAL SYSTEM AND SWITCHING MECHANISM

Filed July 30, 1932

4 Sheets-Sheet 1



Selden Bradley Sanford INVENTOR
BY *Math E. Brady* ATTORNEY

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S. B. SANFORD

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ELEVATOR SIGNAL SYSTEM AND SWITCHING MECHANISM

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4 Sheets-Sheet 2

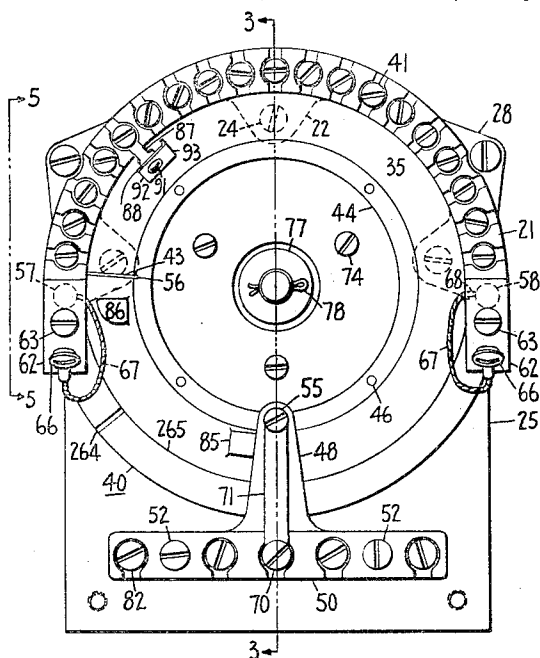


FIG. 2

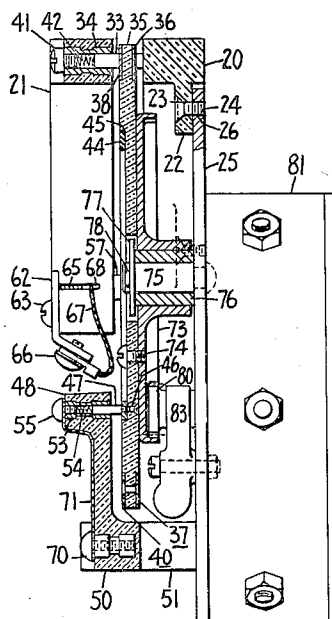


FIG. 3

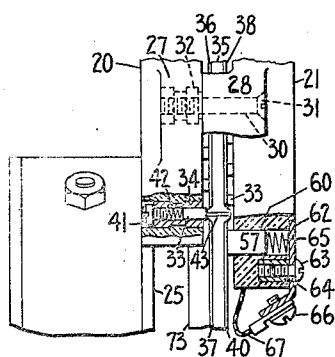


FIG. 5

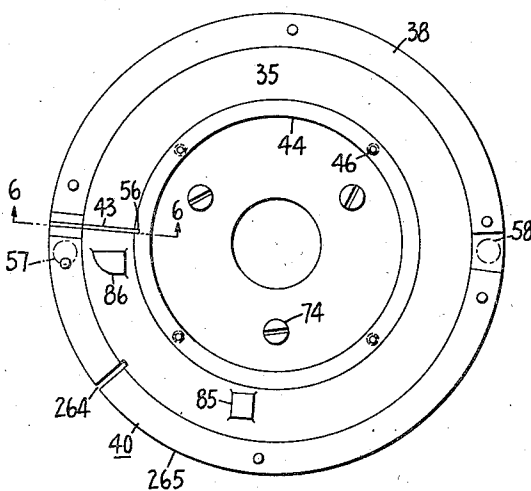


FIG. 4

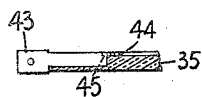


FIG. 6

Selden Bradley Sanford INVENTOR
BY *Matthew C. Bradley* ATTORNEY

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S. B. SANFORD

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ELEVATOR SIGNAL SYSTEM AND SWITCHING MECHANISM

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4 Sheets-Sheet 3

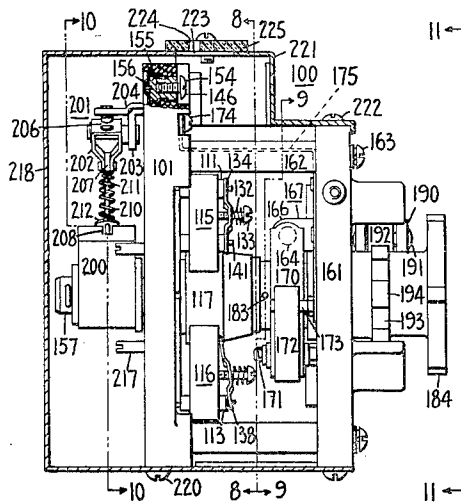


FIG. 7

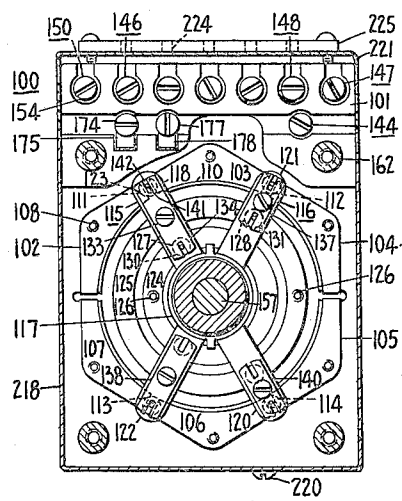


FIG. 8

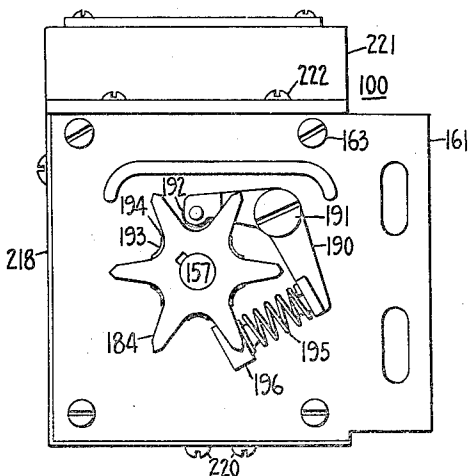


FIG. 11

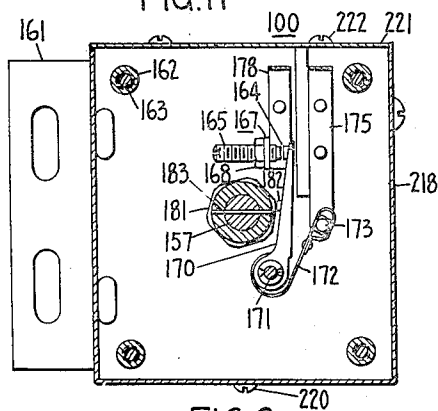


FIG.9

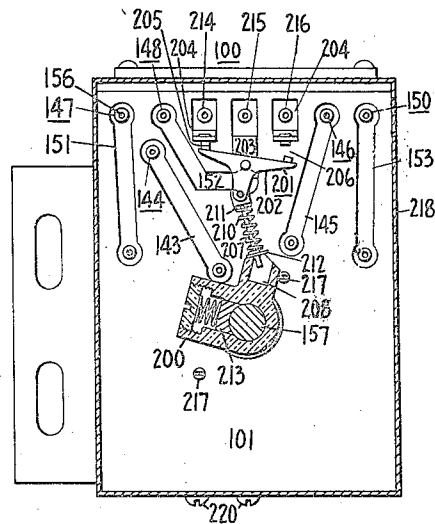


FIG. 10

Selden Bradley Sanford INVENTOR
BY Walter E. Bradley ATTORNEY

July 31, 1934.

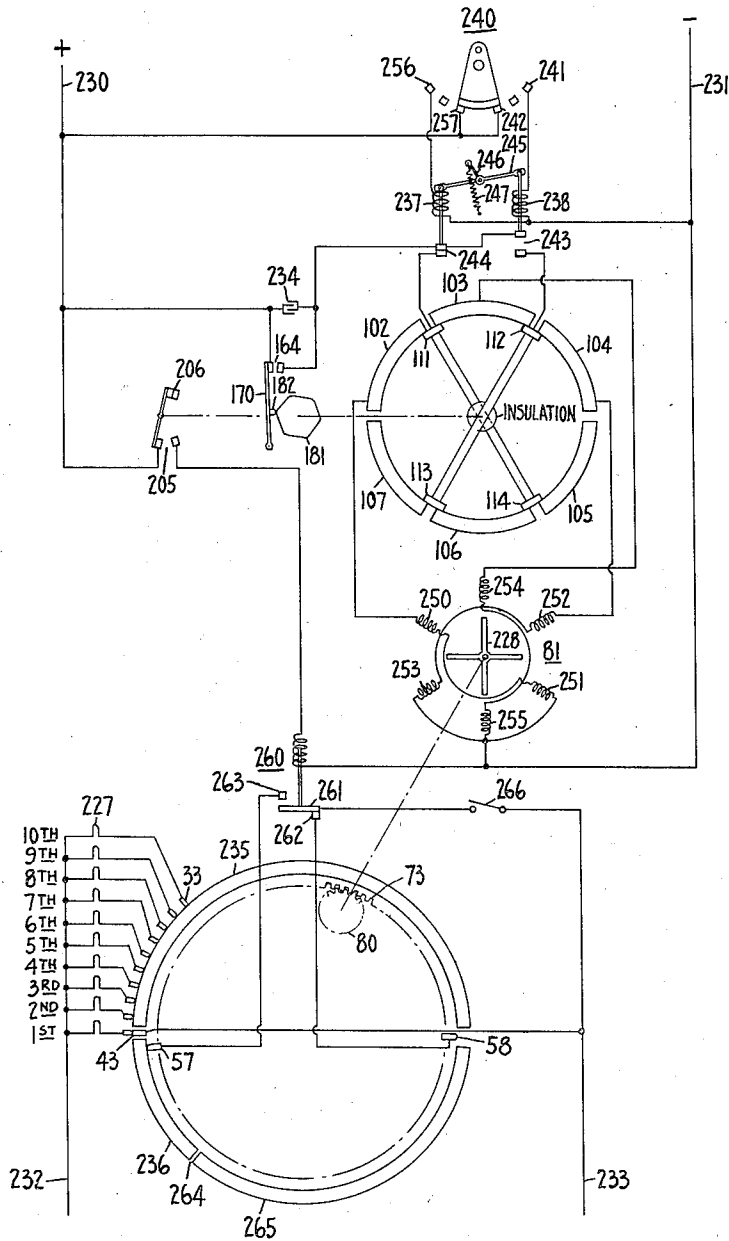
S. B. SANFORD

1,968,427

ELEVATOR SIGNAL SYSTEM AND SWITCHING MECHANISM

Filed July 30, 1932

4 Sheets-Sheet 4



Selden Bradley Sanford INVENTOR
BY *Walter E. Bradley* ATTORNEY

UNITED STATES PATENT OFFICE

1,968,427

ELEVATOR SIGNAL SYSTEM AND SWITCH-
ING MECHANISMSelden Bradley Sanford, Yonkers, N. Y., assignor
to Otis Elevator Company, New York, N. Y., a
corporation of New Jersey

Application July 30, 1932, Serial No. 626,303

2 Claims. (Cl. 177-336)

The present invention relates both to signalling systems for elevator installations and to switching mechanisms for use in such systems and in control systems for the elevator car.

5 Of the switching mechanisms to which the invention relates one form is of the type having a plurality of stationary contacts, one for each of the various floors served by the car, and movable contacting means, for engaging said stationary contacts, moved with respect to said contacts
10 in accordance with the movement of the car with respect to the floors for which the contacts are provided. Such switching mechanisms are known by various terms in the elevator industry, such as selectors, floor controllers and commutators.

15 It is desirable that such switching mechanism be as compact as possible. However, a considerable number of present day buildings have such a large number of floors requiring stationary contacts on the switching mechanism as to tend to defeat the attainment of this desirability.

20 One feature of the invention is the provision of such a switching mechanism in which alternate stationary contacts are arranged in staggered relation.

25 Another feature of the invention is the provision of switching mechanism having movable contacting means effective on two sides and having every other one of the stationary contacts contacting with one of said sides and the other stationary contacts contacting with the other one of said sides.

30 The signalling system to which the invention especially relates is one for indicating the position of an elevator car in its hatchway.

35 Position indicators are useful at the dispatcher's station and also on the elevator cars themselves. It is of advantage to dispatchers to know the direction of travel of the cars as well as their positions and it is usual, in present day elevator practice, to provide suitable direction indicating means for each elevator car at the dispatcher's station.

45 Position indicators utilizing electric lamps for indicating the positions of the cars have been found very suitable for present day practice. In an indicator of this type, it is usual to provide a lamp for each floor relative to which indication is made as to the position of the car and each lamp is lighted when the car is opposite the floor for which the lamp is provided. By causing the lamps for floors in a direction from the car opposite to the direction of car travel to be lighted
50 as well as the lamp which indicates the position

of the car, an indicator is provided from which the progress and direction of travel of the car can be obtained at a glance. The invention relates in part to position indicator systems of this type.

55 A third feature of the invention resides in the provision of a system for indicating both the progress and direction of travel of the car which is of simple form and in which the switching mechanism for controlling the operation of the indicator is of simple construction and positive in operation.

60 Another feature of the invention lies in changing the operation of such system so as to cause the indicator to register only the position of the elevator car.

65 The switching mechanism for controlling the operation of the indicator is of the type previously referred to, that is, it provides a stationary contact for each floor for which an indicating lamp is provided and movable contacting means for engaging the stationary contacts. Although this switching mechanism may be operated in various ways, it will be described as controlled from a remote point. More particularly, the mechanism will be described as operated by an impulse motor controlled by a contactor device from the elevator penthouse. This motor is provided with a plurality of field coils energizable in a certain sequence to cause rotative movement of the armature of the motor to take place, the armature in turn moving the movable contacting means of the switching mechanism. Such arrangement minimizes the number of wires to the switching mechanism from the point of remote control, which is highly desirable.

70 Another form of switching mechanism to which the invention relates is the contactor device for causing current impulses to be supplied from the remote control point to the impulse motor field coils and a fifth feature of the invention resides in the provision of such a contactor device in which the field coils to which current impulses are to be supplied are selected by contacting means slidably movable over stationary contacts and in which the supply of the current impulses is controlled by switching means having abutting contacts. Although particularly applicable for such control, the contactor device is useful for other purposes.

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

80 The invention will be described as applied to a position indicator system for elevators.

In the drawings:—

Figure 1 is a simplified schematic representation of an elevator installation in which the elevator car is arranged to serve five floors, illustrating a system in which an indicator is provided at the dispatcher's station for indicating both the position and direction of travel of the car and an indicator is provided in the car which may indicate only the position of the car or both its position and direction of travel;

Figure 2 is a front view of mechanism actuated in accordance with movement of the elevator car for use in such system;

Figure 3 is a side view of the same, with the commutating mechanism shown in section along the line 3—3 of Figure 2;

Figure 4 is a detail of the movable contacting elements of such switching mechanism and the mounting of the same;

Figure 5 is a fragmental view, taken along the line 5—5 of Figure 2, illustrating the construction and arrangement of the stationary contacts of the switching mechanism and their relation to the movable contacting elements, parts being shown in section;

Figure 6 is a detail, taken along the line 6—6 of Figure 4, illustrating the mounting of the movable contact strip of the switching mechanism;

Figure 7 is a side view of the contactor device suitable for controlling the operation of the impulse motor, a portion of the cover of the device being removed;

Figure 8 is a view in section taken along the line 8—8 of Figure 7;

Figure 9 is a view in section taken along the line 9—9 of Figure 7;

Figure 10 is a view of one end of the mechanism illustrated in Figure 7;

Figure 11 is a view of the other end of the mechanism, taken along the line 11—11 of Figure 7; and

Figure 12 is a wiring diagram of impulse motor control circuits and indicator circuits for a ten floor installation.

Referring to Figure 1, the elevator car is raised and lowered by means of a hoisting motor. This motor drives a traction sheave over which pass the hoisting ropes for the car and counterweight. An electromagnetic brake is provided for the motor.

A position indicator for the car is provided on the dispatcher's panel. The operation of the indicator is controlled by impulse motor driven commutating mechanism at the dispatcher's panel. The impulse motor, in turn, is controlled from a remote point by a contactor device actuated in accordance with car movement. This device is illustrated as arranged in the machine room at the top of the hatchway on a selector comprising a travelling nut or crosshead driven by a vertical screw. This screw is caused to rotate by tapes, one attached to the top and the other to the bottom of the car. These tapes are wound on overhead sheaves in a manner similar to the winding of measuring tapes, one being wound oppositely with respect to the other. These sheaves drive the vertical screw through bevel gears, the driving being effected by the unwinding of one of the tapes as movement of the car takes place, the other tape being wound up during the driving operation. The contactor device carried by the crosshead is arranged to be operated by pins arranged on a vertically extending member of the selector. Each operation of the contactor device causes an impulse of current to be sup-

plied to the impulse motor, causing an operation of the commutating mechanism to take place. A similar position indicator may be provided in the car together with commutating mechanism therefor controlled by the contactor device. This will be explained later in more detail.

The indicator arranged on the dispatcher's panel for indicating both the progress and direction of travel of the car is illustrated as comprising a casing 16 in the cover of which is an elongated sheet 17 of frosted glass. This glass is the visual medium for indicating the position and direction of travel of the car. The lamps for illuminating the glass are arranged in pockets 18 in back of the glass. With this arrangement, the successive lighting of the lamps appears through the frosted glass as a column of light which increases in length as the car moves in each direction in the hatchway. The pockets 18 cause the advancing end of the column of light to be sharply defined. Numerals for indicating the floors may be arranged on the panel to one side of the glass and in horizontal alignment with the pockets, as illustrated.

Reference may now be had to Figures 2 to 6 inclusive, which illustrate the details of motor operated commutating mechanism of preferred construction. This mechanism comprises the commutator proper and the driving mechanism therefor. The commutator has two sets of stationary contacts, one set being above the other. The contacts of each set are arranged in a semi-circle and radially disposed relative to the center. The contacts of the lower set are mounted in a segment 20 and the contacts of the upper set are mounted in a similar segment 21, the segments being of insulating material. For convenience of further description, these segments will hereinafter be referred to as commutator bases.

The lower commutator base 20 is formed with inwardly extending lugs 22. Each of these lugs is provided with a countersunk aperture 23. Screws 24 secure base 20 to a mounting plate 25, these screws extending through apertures 23 into threaded apertures 26 in the mounting plate. Commutator base 20 is also formed with outwardly extending lugs 27. Similar lugs 28 are formed on upper commutator base 21. Lugs 28 are provided with countersunk apertures 30. Screws 31 secure the upper and lower commutator bases together, these screws extending through apertures 30 into threaded bushings 32 moulded into lugs 27. The lugs 27 and 28 are positioned and dimensioned so as to space the upper commutator base from the lower one.

Each of the stationary contacts comprises a brush 33, for example of silver and graphite, slidably arranged within a bushing 34. These bushings are moulded into the commutator bases. A stationary contact is provided for each floor. The stationary contacts mounted on the lower commutator base are for odd numbered floors, while those mounted on the upper commutator base are for even numbered floors. The bushings 34 in each base are equally spaced angularly. The relative positions of the bushings in the upper and lower bases are such as to stagger the stationary contacts of one set with respect to those of the other, as may be seen from Figure 5. Nineteen stationary contacts are illustrated for the upper commutator base and twenty stationary contacts on the lower base. The contacts on each base are spaced nine degrees apart with those of the upper base half way between those of the lower base. Thus, thirty-nine stationary con-

tacts are provided, rendering the commutating mechanism suitable for position indicator systems for up to thirty-nine floor indications.

The brushes engage contacting segments for controlling the circuits for the position indicator lamps. The contacting segments are carried by a disc 35 of insulating material mounted for rotation about the center of the semi-circle formed by the stationary contacts. The brushes of the lower set of stationary contacts engage contacting segments 36 and 37 arranged on the bottom of disc 35 and concentric therewith. The brushes of the upper set of stationary contacts engage contacting segments 38 and 40 arranged on the top of disc 35 and concentric therewith. The commutator bases are spaced by lugs 27 and 28 sufficiently to permit the disc to extend between them with ample clearance. The contacting segments are of a radius commensurate with that of the semi-circle formed by the stationary contacts so as to place the segments in contact with the brushes.

The bushings for the brushes of the stationary contacts are threaded at their outer ends to receive terminal screws 41. The brushes are pressed into engagement with the contacting segments by springs 42 arranged within the bushings between the terminal screws and spring seats formed on the brushes. The contacting segments for the two sets of stationary contacts are oppositely disposed on the contact disc 35 and oppositely disposed segments extend slightly less than one hundred and eighty degrees around the periphery of the disc, the disc being formed with arcuate depressions to receive the segments, these depressions being of the same dimensions as the segments so as to present a flush surface.

A contact strip 43 is moulded into the contact disc between adjoining ends of the contacting segments. This strip also contacts with the brushes of the stationary contacts. The portion of the contact strip between the contacting segments extends beyond the sides of the disc. The disc is sloped outwardly on each side from the contacting segments to the contact strip as illustrated. The purpose of this arrangement will be explained later.

A contacting ring 44 is also mounted on disc 35. This ring is concentric with the contacting segments but is of less diameter. The ring is positioned in the depression 45 formed in the disc and is secured to the disc in any suitable manner as by screws 46. A stationary brush 47 contacts with ring 44. This brush is mounted in an arm 48 of a terminal board 50. This board is formed with bosses 51 through which screws 52 extend to secure the board to mounting plate 25. These bosses raise the board to permit arm 48 to extend over disc 35. The arm is provided with a bushing 53 into which brush 47 slidably extends. The brush is pressed into engagement with ring 44 by a spring 54 arranged between the brush and a screw 55 threaded into the outer end of the bushing. The contact strip 43 extends into a slot 56 formed in ring 44 wherein it is secured, as by brazing. The ring 44 and brush 47 form a current feed for the contact strip.

The contacting segments are fed by brushes 57 and 58 slidably mounted in apertures 60 in the upper commutator base. These apertures are arranged in the ends of the base and are slightly more than one hundred and eighty degrees apart. A brush connector 62 is secured over each aperture as by screw 63 threaded into a bushing 64 moulded into the base. The brushes are pressed

into engagement with the contacting segments 38 and 40 by springs 65 arranged between the brushes and brush connectors.

Terminal screws 66 are provided in the ends of the brush connectors for connecting brushes 57 and 58 in the system. The brushes are connected to the terminal screws by stranded cable 67 secured to the brushes and extending through slots 68 in the upper commutator base. Brushes 33 are connected in the system by their terminal screws 41. Brush 47 is connected in the system by a terminal screw 70 on the terminal board, this screw being connected to screw 55 by a conducting strip 71.

The disc 35 is driven by the impulse motor by reduction gearing. This gearing comprises an inner toothed gear 73 to which disc 35 is secured as by screws 74. This gear is rotatably mounted on a stub shaft 75 secured to mounting plate 25, the gear being provided with a bushing 76 into which the stub shaft extends. The gear is retained on the bushing by means of a washer 77 and cotter pin 78. A pinion 80 drives gear 73, this pinion being secured to the end of the armature shaft of the impulse motor 81. This shaft extends through plate 25 which forms the top of the housing for the impulse motor.

The details of the impulse motor are not illustrated. However, an arrangement comprising six wound field poles and a four pole unwound armature is suitable. Such arrangement is illustrated in the wiring diagram in Figure 12 to which reference will be had later. The field coils are connected to terminals 82 on terminal board 50.

It is preferred to provide braking mechanism to produce a frictional drag on the armature shaft. Such braking mechanism is indicated in Figure 3 as 83.

As will be explained later, the impulse motor armature is rotated in steps. The amount of reduction provided by the reduction gearing is such that each step of armature movement causes four and one-half degrees of rotative movement of the disc. The mechanism is set so that when the car is positioned at a floor, contact strip 43 is in engagement with the brush of the stationary contact for that floor. Thus, each step of rotative movement of disc 35 causes the contact strip to move into engagement with the brush of the next stationary contact. The direction of movement of the disc is the same as that of the armature of the impulse motor.

It is preferred to provide correcting mechanism to insure that the commutating mechanism is maintained in step with the elevator car. The correcting mechanism comprises a pair of stops 85 and 86 on the outer side of disc 35, arm 48 of the terminal board and a stop device secured to the upper commutator base. The stop device comprises a bracket 87 secured by the terminal screw on top of the stationary contact on the upper commutator base for the upper terminal floor, in case of an even number of floors, and on top of the stationary contact on the upper commutator base next above the one on the lower commutator base in case of an odd number of floors. An adjustable stopping member 88 is secured to the bracket. Stop 85 cooperates with arm 48 at the lower terminal floor and stop 86 cooperates with stopping member 88 at the upper terminal floor. If the disc gets behind during up car travel, it will be ahead of the car upon reversal and during succeeding down car travel,

and the correction is made at the lower terminal. If the disc gets behind the car during down car travel, it will be ahead of the car upon reversal and during the succeeding up car travel, and the correction is made at the upper terminal. The stopping member 88 has an aperture to receive screw 91 which secures the member to the bracket. The distance of this aperture from one end 92 of the stopping member is such that with this end facing stop 86, correction is made at the floor corresponding to the stationary contact to which the bracket is secured. The distance of the other end 93 of the stopping member from the aperture is such that with this end facing stop 86, correction is made at the next lower floor. Thus, the member is secured to the bracket so that its end 92 faces stop 86 in case of an even number of floors and so that its end 93 faces the stop in case of an odd number of floors. The correcting mechanism is illustrated in Figure 2 as set for a ten floor installation to correspond with the number of floors illustrated in the control system to be described later.

The impulses from a source of current to the impulse motor to operate the commutating mechanism are transmitted through a contactor device 100. The details of a preferred form of contactor device are illustrated in Figures 7 to 11 inclusive. The device comprises a contact base 101 of insulating material to which are secured six stationary contact segments 102, 103, 104, 105, 106 and 107 arranged in a circle. The segments are secured to the base as by screws 108 and are held in position by means of a rim 110 formed on the base. These segments are engaged by brushes 111, 112, 113 and 114. These brushes are carried by two metallic brush holders 115 and 116 mounted for rotation about the center of the circle formed by the segments. The brush holders are carried by a moulded hub 117 of insulating material to which they are secured in the moulding process. The brush holders cross each other at an angle of sixty degrees and are separated by the insulating material. Each brush holder comprises two arms extending oppositely from the hub, the arms of holder 115 being designated 118 and 120 and those of holder 116 being designated 121 and 122. Apertures 123 are provided in the ends of the arms to slidably support the brushes.

A pair of feed rings 124 and 125 are also mounted on the contact base. These rings are concentric with respect to the circle formed by the contact segments, ring 125 being of less diameter than the segments and ring 124 being of less diameter than ring 125, the dimensions being such as to space the rings from each other and from the contact segments. The rings are secured to the base in any suitable manner as by screws 126. Brush holder arm 118 which carries brush 111 also carries an additional brush 127 for cooperating with the inner ring 124 while brush holder arm 121 which carries brush 112 also carries an additional brush 128 for cooperating with outer ring 125. Properly positioned apertures 130 and 131 are provided in the arms to slidably receive these additional brushes.

Brushes 111 and 127 are pressed into engagement with the contact segments and contact ring 124 respectively by a spring 132 arranged on a screw 133 secured to arm 118. This spring is arranged between the head of the screw and a holding plate 134 arranged on the screw and spanning the brushes. Brushes 112 and 128 are pressed into engagement with the contact segments and ring 125 in a similar manner. The holding plate

137 spanning these brushes is shorter than plate 134 owing to the less distance from ring 125 to the segments. Brushes 113 and 114 are pressed into engagement with the contact segments in a similar manner. Although additional apertures are provided in brush holder arms 120 and 122 which support brushes 113 and 114, this is for manufacturing purposes and no additional brushes are provided in these apertures. Thus, one end of each of the holding plates 138 and 140 for brushes 113 and 114 rests against the arm. Each of the brushes is formed with a pin 141 on the outer end thereof. These pins extend into slots 142 in the holding plates to maintain the plates in proper position.

A conductor strap 143 connects inner ring 124 to a terminal 144 on the contact base. A similar conductor strap 145 connects the outer ring 125 with another terminal 146 on the contact base. Conductor strap 143 is secured to feed ring 124 by one of the mounting screws 126 for that ring and conductor strap 145 is secured to feed ring 125 by one of the mounting screws 126 for that ring. The contact rings 124 and 125 and brushes 127 and 128 serve as current feeds for brushes 111 and 114 and brushes 112 and 113 respectively. Brush 127 feeds brushes 111 and 114 through the brush holder 115 and brush 128 feeds brushes 112 and 113 through brush holder 116. The three lower contact segments 105, 106 and 107 are not connected in the system and serve principally to support brushes 111, 112, 113 and 114. The three upper contact segments 102, 103 and 104 are individually connected to terminals 147, 148 and 150 on the contact base by conductor straps 151, 152 and 153. These conductor straps are secured to the contact segments by mounting screws 108. Each of the terminals to which the straps are secured comprises a terminal screw 154 threaded into an insert 155 moulded into the contact base. Each insert is formed with a reduced portion 156 which extends into an aperture formed in the end of the conductor strap and is peened over to secure the conductor strap to the terminal.

The brush holder hub 117 is mounted on a shaft 157 extending through a bearing provided in contact base 101 and concentric with the circle formed by the contact segments. This shaft also extends through a bearing provided in a bracket plate 161 secured to the contact base. Four distance pieces 162 are moulded into the contact base at opposite corners thereof. The other ends of these distance pieces are threaded to receive screws 163 for securing the bracket plate to the contact base.

The stationary contact of a cam operated switch 164 is mounted on bracket plate 161 on the side thereof facing the contact base. The stationary contact comprises a tungsten-tipped contact screw 165 adjustably mounted on the arm 166 of a bracket 167 secured to the bracket plate. A nut 168 serves to lock the contact screw in adjusted position. The movable contact for engaging the stationary contact is also tungsten-tipped and is carried by an arm 170 pivotally mounted on a stud 171 secured to the bracket plate. The movable contact is biased toward the stationary contact by means of a spring 172 connected to the contact arm, passing around stud 171 and secured at the other end around a stud 173 secured to the bracket plate. The movable contact is connected to a terminal 174 on contact base 101 by means of a conductor strap 175. This strap is secured at one end to spring stud 173 and at the other end to the terminal by the terminal screw. The sta-

tionary contact is connected to a terminal 177 on contact base 101 in a similar manner by a conductor strap 178. This strap is secured at one end to bracket 167 and at the other end to the terminal by the terminal screw.

The operating cam 181 for the switch is mounted on shaft 157. Cam 181 is hexagonal in form and engages with an operating member 182 of insulating material provided on the switch arm 170. This cam is preferably secured to brush holder 117 in the moulding process. Shaft 157 drives both the cam and the brush holders, the driving relation being obtained by a pin 183 extending through aligned apertures formed in the cam and the shaft.

Rotative movement is imparted to shaft 157 to effect the operation of switch 164 and movement of brushes 111, 112, 113 and 114 over the contact segments by means of a star wheel 184 keyed on the outer end of the shaft. The contactor device, as previously stated, is mounted on the crosshead of car actuated mechanism. The stationary pins for operating the contactor device are shown in Figure 1 where they are designated 185. They are arranged on vertically extending member 186 of the car actuated mechanism in position to engage the points of the star wheel 184 as movement of the crosshead takes place. The number of pins is one less than the number of operative positions assumed by contact strip 43 on disc 35. Thus, for the five floor installation illustrated in Figure 1, only four pins are provided. The pins are positioned to cause operation of the star wheel at desired points in the travel of the car. The star wheel, upon engaging each pin during travel of the car, is moved thereby, as continued movement of the car takes place, to cause sixty degrees of rotative movement of shaft 157.

The parts of the contactor device are set so that with the car stopped at any floor, cam 181 is in position to cause switch 164 to be open and brushes 111, 112, 113 and 114 are in position to span adjacent contact segments. The parts of the contactor device have been illustrated in Figures 8 and 9 for this condition, brush 111 spanning segments 102 and 103 and brush 112 spanning segments 103 and 104. As will be seen from later description, feed ring 124 is "alive" during up car travel and "dead" during down car travel, and feed ring 125 is "alive" during down car travel and "dead" during up car travel. Thus, of the contacting brushes, only brushes 111 and 114 are effective during up car travel and only brushes 112 and 113 are effective during down car travel.

Assume that the elevator car is started in the up direction. As this takes place, a point is reached at which a point of the star wheel engages one of the pins 185. This causes counterclockwise rotative movement of shaft 157 as viewed in Figure 11 and clockwise movement of the shaft as viewed in Figure 9. This rotates the brush holders, disengaging brush 111 from contact segment 103 and moving it into full engagement with contact segment 102. Thereafter, cam 181 permits the closing of switch 164. Upon continued rotative movement of the star wheel, cam 181 opens switch 164 and thereafter brush 111 is moved into position spanning contact segments 102 and 107. At the same time brush 114 moves into position spanning contact segments 105 and 104. This occurs at the end of the sixty degree step of rotative movement of the star wheel. Upon the engagement of the next pin by the star wheel, brushes 111 and 114 are disengaged from contact segments 102 and 105 respectively and are

moved into full engagement with segments 107 and 104 respectively. Segment 107 is not connected in the system but segment 104 is connected. Thus brush 114 becomes effective instead of brush 111. Thereafter switch 164 is closed and opened by its cam and finally brush 114 is brought to rest spanning segments 104 and 103. Similar operations take place upon each further sixty degree step of rotative movement of the star wheel, namely, the moving of the brushes into full engagement with the next succeeding contact segments, the closing and opening of switch 164 by cam 181 and the movement of the brushes into partial engagement with the next succeeding contact segments as the end of the step of rotative movement occurs. Brush 114 is effective for the next two steps and then brush 111 becomes effective again.

A similar operation takes place during down car travel. Shaft 157 is rotated in the reverse direction and brushes 112 and 113 are alternately effective for each succeeding three steps of rotative movement.

It is to be noted that with the above arrangement, switch 164 closes after the brushes have been moved into full engagement with the next succeeding contact segments and opens prior to the brushes leaving the contact segments. From a consideration of the circuits in which these elements are employed, to be described later, it will be seen that switch 164 serves as a master switch.

Positioning mechanism is provided for causing shaft 157 to assume definite positive positions upon each step of rotative movement. This mechanism comprises a lever 190 pivotally mounted on a pin 191 secured to bracket plate 161. This lever is provided with a roller 192 for cooperating with depressions 193 formed in a rim 194 on the star wheel 184. Spring 195 arranged between one arm of the lever and a stop 196 on the bracket plate biases the lever in a direction to move the roller into a depression. This mechanism not only assures correct positioning of shaft 157 but also assists in effecting the latter portion of each step of rotative movement of the star wheel.

On the other end of shaft 157 and beyond contact base 101 is mounted an operating member 200 for switching mechanism, designated as a whole as 201. This mechanism comprises a metallic switch lever 202, pivoted on a bracket 203 secured to the contact base. This lever is provided with contacts for engaging stationary contacts mounted on contact holders 204 secured to the contact base. These cooperating contacts form switches, designated 205 and 206. A toggle link 207 is pivotally secured to lever 202 and extends into an opening 208 formed in operating member 200. A compression spring 210 surrounds the toggle link. At one end this spring presses against a shoulder 211 on the toggle link and at the other end it presses against the operating member through the intermediary of a washer 212. The operating member is provided with a block 213 which is spring pressed against shaft 157 to provide a frictional drive for the member. Terminals 214, 215 and 216 are provided on contact base 101 for this switching mechanism.

Counterclockwise movement of shaft 157, as viewed in Figure 11, causes counterclockwise movement of operating member 200. This causes the toggle link 207 to be gradually displaced until a point is finally reached where the lever 202 is forced to its other position with a snap action, causing the opening of switch 205 and the closing

of switch 206. Similar action takes place upon reverse rotative movement of shaft 157, as a result of which movement switch 206 is opened and switch 205 is closed. Stops 217 are provided for
 5 operating member 200 to permit continued rotative movement of shaft 157 without further effect upon the switching mechanism.

The contactor device is provided with a suitable casing 218 which is secured to contact base 101 and bracket plate 161 by screws 220. This casing, together with bracket plate 161 forms an enclosure for operating parts of the contactor device. The casing is provided with a removable cover 221 secured to the bracket plate by screws
 10 222. This cover is provided with an opening 223 for the conductors leading to and from the contactor device, these conductors extending through apertures 224 in a terminal cover 225 secured to cover 221 and covering opening 223.

Reference may now be had to Figure 12 which illustrates, in simplified form, the circuits for the impulse motor and position indicator circuits for a ten floor elevator installation. Two sources of current are shown, one for the impulse motor in
 25 which the feed wires are designated 230 and 231, and the other for the position indicator lamps, the latter source being of a lower voltage than the first. The feed wires of the low voltage source are designated 232 and 233. The field coils and armature of the impulse motor are shown diagrammatically in this figure. A four pole armature 228 and six field coils are illustrated. Oppositely disposed field coils are connected in series relation. These opposed coils are oppositely
 30 wound so as to produce magnetic poles of opposite polarity. A condenser 234 is connected across master switch 164 of the contactor device to prevent arcing.

Oppositely disposed contacting segments 36, 38 and 37, 40 of the commutator are shown in the diagram as single segments, the up segments 36, 38 being designated 235 and the down segments 37, 40 being designated 236. Only the brushes 33 of the commutator stationary contacts are
 45 illustrated and only those which are connected in a ten floor installation. Of the contact device brushes 111, 114 and 112, 113, only one pair is "alive" during each direction of car travel. As previously pointed out, brushes 111, 114 are effective during up car travel, and brushes 112, 113 are effective during down car travel. In the system illustrated, the effectiveness of the brushes is controlled by electromagnetic switches 237 and 238, illustrated as controlled by the control switch
 50 240 in the elevator car. This control switch is effective to cause the starting of the car through the intermediary of suitable switches and mechanisms, not shown. It is to be understood that the car may be controlled in any manner, including control by push buttons, a control switch in the car for controlling the starting of the car being illustrated for convenience. It is also to be understood that the effectiveness of the brushes may be controlled in various ways and any arrangement which is suitable for the particular manner
 55 in which the elevator car is controlled may be employed.

The car is started in the up direction by moving control switch 240 counterclockwise. This
 70 bridges contact 241 with feed contact 242, completing a circuit for the coil of electromagnetic switch 238. This switch operates to separate its contacts 243 in the feed circuit for down brushes 112 and 113. The corresponding contacts 244 of electromagnetic switch 237 are closed so that up

brushes 111 and 114 are effective for up car travel.

It is preferred to maintain each of switches 237 and 238, once operated, in operated condition until control switch 240 is moved into position to reverse the direction of car travel. Any suitable arrangement may be employed for this purpose.
 80 In the arrangement illustrated, the switches are connected by a pivoted cross bar 245 having an arm 246 to which a spring 247 is connected in such manner as to maintain either switch, once
 85 operated, in operated condition and the other switch in position with its contacts in engagement. Bar 245 also serves as a mechanical interlock in this arrangement.

Assume further that up brushes 111 and 114 are in the position illustrated at the time that the control switch is moved into position to start the car in the up direction. The first step of rotative movement of the star wheel as the car travels upwardly moves brushes 111 and 114 into full engagement with contact segments 102 and 105 respectively, and causes master switch 164 to be closed. This connects impulse motor field coils 250 and 251 across feed conductors 230 and 231 through contact segment 102. Energization of these coils attracts the nearest armature poles with the result that the armature is moved thirty degrees in a clockwise direction. The circuit for coils 250 and 251 is broken upon the subsequent opening of master switch 164 by cam 181. Upon
 90 the next step of rotative movement of the star wheel, brush 114 is moved into full engagement with contact segment 104 and master switch 164 is closed, completing the circuit for field coils 252 and 253. This causes another thirty degree step of clockwise rotative movement of the impulse motor armature. The circuit for these field coils is thereafter broken by the opening of master switch 164. The next step of rotative movement of the star wheel moves brush 114 into full engagement with contact segment 103 and causes master switch 164 to be closed. This completes the circuit for field coils 254 and 255 of the impulse motor, causing another step of clockwise rotative movement of the impulse motor armature. The circuit for these field coils is subsequently broken by the opening of master switch 164. This operation is repeated upon continued steps of rotative movement of the star wheel, brush 114 moving into full engagement with contact segment 102 on the next step and on the succeeding step brush 111 moving into full engagement with contact segment 104 to become effective.
 95 100 105 110 115 120 125

The operation is similar during downward movement of the elevator car. The car is started in the down direction by moving control switch 240 clockwise. This bridges contact 256 and feed contact 257, completing the circuit for the coil of electromagnetic switch 237. This causes the separation of contacts 244 and the reengagement of contacts 243. Thus, down brushes 112 and 113 are rendered effective for down car travel. Assume that the brushes are in the position illustrated at the time that reversal of car movement is effected. As a result of the last step of rotative movement for up car travel, armature 223 of the impulse motor is caused to be in the position illustrated. The first step of rotative movement of the star wheel in the reverse direction moves brush 112 into full engagement with contact segment 104 and brush 113 into full engagement with contact segment 107. Thus, the subsequent closing of master switch 164 completes a circuit for field coils 252 and 253 through contact segment
 130 135 140 145 150

104. This causes the armature to rotate thirty degrees in a counterclockwise direction, the direction of rotative movement of the armature for down car travel being the reverse of that for up car travel. Similar operation takes place upon each succeeding step of rotative movement of the star wheel during down car travel, brush 113 being effective for the next three steps of rotative movement and then brush 112 becoming again effective. With the above described arrangement, all the makes and breaks for the impulse motor field coils are effected by master switch 164. Thus, the single condenser 234 is effective to eliminate arcing.

Rotative movement of the impulse motor armature as the impulses of current are supplied to the field coils causes rotative movement of the contact disc to effect the lighting of the lamps 227 of the position indicator. Assume that the car is positioned at the lower terminal. Under such conditions, contact strip 43 is in engagement with the brush 33 of the stationary contact for the first floor, the floor numbers being indicated to the left of the lamps. Contact strip 43 is connected directly to feed wire 233 of the low voltage source, while the position indicator lamp for the first floor is connected to the other feed wire 232 of the source. Thus, a circuit is completed for the position indicator lamp 227 for the first floor. The brushes for the other stationary contacts are in engagement with contact segment 235. The up feed brush 57 is in engagement with its contact segment 236 but no circuit is completed as a result of this engagement at this time, owing to the fact that segment 236 is not in engagement with any of brushes 33. The down feed brush 58 is disengaged from its contact segment 235 with the car at the lower terminal. Under the conditions assumed, toggle switch 206 is closed and toggle switch 205 is open as a result of the previous downward movement of the elevator car. Switch 205 controls the circuit for the actuating coil of an electromagnetic switch 260, this coil being deenergized when switch 205 is open. The parts of the position indicator system are illustrated in their proper positions for the assumed conditions of operation.

Upon the car being started in the up direction, a point in car travel is reached which causes the operation of the star wheel of the contactor device. The resultant movement of shaft 157 causes the opening of toggle switch 206 and the closing of toggle switch 205. This completes the circuit for the coil of switch 260. Switch 260, upon operation, moves contact 261 from its position in engagement with contact 262 into engagement with contact 263. This renders down feed brush 58 "dead" and up feed brush 57 "alive". The field coils of the impulse motor are energized to cause one step of clockwise rotative movement of the impulse motor armature. This in turn causes one step of clockwise rotative movement of contact segments 235 and 236 and contact strip 43. Thus, contact segment 236 engages brush 33 of the stationary contact for the first floor and contact strip 43 engages the brush of the stationary contact for the second floor. The contact strip thus completes the circuit for the second floor position indicator lamp, causing this lamp to be lighted. Contact segment 236, being "alive" as a result of its feed brush being "alive", maintains the position indicator lamp for the first floor lighted, the movement of segment 236 by the impulse motor being sufficiently

rapid to prevent any noticeable dimming of the lamp as a result of the momentary breaking of its circuit.

Contact strip 43 is moved into successive engagement with the brushes of the stationary contacts for the floors above the second floor upon each succeeding step of rotative movement of the impulse motor armature as the car moves up the hatchway. As a result, the position indicator lamps for these floors are lighted in succession with previously lighted position indicator lamps maintained lighted by way of contact segment 236.

As the car arrives at the upper terminal floor, contact strip 43 completes the circuit for the position indicator lamp for that floor. The circuits for the lamps for the other floors, however, are broken. Contact segment 236 is separated into two parts, as by saw cut 264, at such point that part 265, which contacts with brushes 33, is moved into position disengaging up feed brush 57 as strip 43 moves into engagement with the stationary contact for the upper terminal floor. As a result, the circuits for the position indicator lamps for the first floor to the ninth floor inclusive are broken and only the position indicator lamp for the tenth floor is lighted. In the construction illustrated in Figure 4, the cut 264 extends through both contacting segments 37 and 40.

The operation is similar during down car travel. Upon reverse rotative movement of shaft 157 as the car moves from the tenth to the ninth floor, toggle switch 205 is opened and toggle switch 206 is closed. The opening of switch 205 deenergizes the coil of electromagnetic switch 260, resulting in the separation of contact 261 from contact 263 and its engagement with contact 262. This renders up feed brush 57 "dead" and down feed brush 58 "alive". Contact strip 43 is shifted into engagement with the brush of the stationary contact for the ninth floor as a result of the movement of the brushes of the contactor device and the closing of master switch 164, causing this lamp to be lighted. Also, contact segment 235 is moved into engagement with the brush of the stationary contact for the tenth floor. This segment, being in engagement with down feed brush 58, maintains the position indicator lamp for the tenth floor lighted. Thereafter, the successive position indicator lamps are lighted as the car moves from floor to floor down the hatchway and the lamps for floors which the car has passed are maintained lighted through contact segment 235.

As the car arrives at the lower terminal floor, contact strip 43 moves into engagement with the brush for the first floor stationary contact, completing the circuit for the position indicator lamp for that floor. Contact segment 235 disengages down feed brush 58, breaking the circuit for the lamps for the other floors. Thus, only the position indicator lamp for the first floor is lighted.

In case the direction of car movement is reversed at some intermediate point, the column of light is reversed so as to indicate the opposite direction of car travel. Assume, for example, that the car has been travelling in the up direction and is stopped at the fifth floor. Under such conditions, the lamps for from the first to the fifth floor are lighted, showing that the direction of car travel is up and that the car has reached the fifth floor. Assume further that the car is started from the fifth floor in the down

direction. The first step of rotative movement of the star wheel opens toggle switch 205 to deenergize switch 260. Thus contact 261 disengages contact 263, rendering up feed brush 57 "dead", and engages contact 261, rendering down feed brush 58 "alive". As a result, the circuit to the position indicator lamps for from the first to the third floor, fed through contact segment 236, is broken and the circuit to the lamps for from the fifth to the tenth floor, fed by contact segment 235, is completed. The fifth floor lamp is fed by segment 235 due to the rotative movement of the contact disc as a result of the movement of the star wheel. The circuit for the lamp for the fourth floor is completed by contact strip 43, moved into engagement with the brush of the stationary contact for the fourth floor as a result of the movement of the star wheel.

Owing to the fact that contact strip 43 extends out beyond disc 35 and the fact that the disc slopes outwardly from the contact segments to the strip, the brushes 33 cannot connect the strip to the contact segments as rotative movement of the disc takes place. This prevents lighting all the lamps for floors above the car during up car travel and for floors below the car during down car travel as each step of rotative movement takes place.

Although the position indicator system described is for only ten floors, it is to be understood that the mechanism is applicable to any number of floors. The commutating mechanism has thirty-nine stationary contacts, thus taking care of installations in which up to and including thirty-nine different indications of the position of the car are desired. In case more indications are desired, the mechanism is arranged to provide more stationary contacts. However, the mechanism illustrated is satisfactory in most instances as the majority of present day elevator installations do not require more than thirty-nine indications for each elevator car.

In office buildings having dispatchers' stations, there is a group of elevator cars under the dispatcher's control. The position indicator systems of all the cars may be arranged in the same manner. Also, the position indicators for all the cars may be arranged in the same casing so as to provide a compact unit. The extra space left on the dispatcher's panel illustrated in Figure 1 is for the position indicators for the additional elevators of the group. Thus, with these advancing columns of lights, the positions and directions of travel of the various cars can be told at a glance.

The position indicators themselves may be arranged to display the position and direction of travel of the car other than by advancing columns of light. For example, each position indicator lamp may be arranged behind a separate jewel. In such arrangement, the position and direction of travel of the cars is evidenced by the successive illumination of the jewels, with only the jewels for the terminal floors illuminated when the cars are at the terminal floors.

The position indicator system may be arranged so that its operation may be changed, from giving the position of the car and its direction of travel by a column of light to giving only the position of the car, by lighting the position indicator lamps individually in accordance with the position of the car. This change in operation may be effected in various ways, and in the arrangement illustrated it may be done very simply by opening a manually operable switch 266 arranged in the feed circuit

to contact 261 of switch 260. The opening of switch 266 prevents either of the feed brushes 57 and 58 being rendered "alive" so that contact segments 235 and 236 are ineffective to maintain lighted the position indicator lamps for floors which the car has passed in its movement up and down the hatchway. Under such conditions, the circuits for the position indicator lamps are completed individually by the contact strip 43 so that only one lamp is lighted at a time.

Although the position indicator has been illustrated and described as arranged at the dispatcher's station, it may be arranged at other points including on the elevator car. Also, several indicators may be provided for the car and arranged at different points. In such case, the commutating mechanisms at the various receiving stations are controlled in parallel by the same contactor device. It may be preferred, in case of a position indicator arranged on the car, to illuminate the position indicator lamps individually, in which event the feed brushes 57 and 58 of the commutating mechanism on the car need not be connected in the system.

The above described arrangement reduces the number of wires from the remote control point to the receiving station. With switch 260 on the dispatcher's panel, seven wires from the control station to the dispatcher's panel are sufficient. With the switch 260 at the control station, eight wires from the control station to the dispatcher's indicator are sufficient.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is 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. In combination; an elevator car; a plurality of floors served by said car; a source of current; a plurality of lamps, one for each of said floors, connected to one side of said source; a plurality of stationary contacts, one for each of said floors, each stationary contact being connected to the lamp for the floor for which the contact is provided; a movable contact for engaging said stationary contacts one at a time, said movable contact being connected to the other side of said source so as to successively and individually complete the circuits for said lamps and thus cause them to be successively and individually illuminated as it is moved in either direction into successive engagement with said stationary contacts; means controlled by movement of the elevator car for moving said movable contact from one stationary contact to the next as the car moves from the floor for which said one contact is provided to the floor for which said next contact is provided during each direction of car travel; means for connecting said stationary contacts disengaged by said movable contact during each direction of car travel to the other side of said source immediately after such disengagement occurs so as to maintain said lamps illuminated and for disconnecting such lamps as the car arrives at a terminal one of said floors, whereby only the lamp for that terminal floor is illuminated while the car is at that floor; and means for rendering said maintaining means ineffective at will.

2. In combination; an elevator car; a plurality of floors served by said car; a plurality of lamps, 150

one for each of said floors, arranged in single file formation; a source of current for said lamps; wiring connecting one terminal of each of said lamps to one side of said source; a plurality of stationary contacts, one for each of said floors, said contacts being arranged circularly; wiring connecting each stationary contact to the other terminal of the lamp for the floor for which the contact is provided; a pair of contact segments for contacting with said stationary contacts, said segments being arranged for rotative movement about the center of the circle of the stationary contacts; a contact strip between adjacent ends of said segments for contacting with said stationary contacts; means actuated in accordance with car movement for rotating said contacting segments and strip in one direction during up car travel and in the other direction during down car travel, each of said stationary contacts being positioned to be engaged by said contact strip as the car moves to the floor for which the stationary contact is provided from an adjacent floor and the distance between said adjacent ends of said contact segments being such that said segments engage the stationary contacts next adjacent the one engaged by said contact strip; a wire connecting said contact strip to the other side of said source, said strip thus successively and individually connecting said lamps to said source as the car moves up and down the hatchway and thereby causing said lamps to be illuminated in accordance with the position of the car with respect to said floors; a feed brush for each of said segments; and means for connecting the feed brush for that one of said contact segments which follows the contact strip during each direction of car travel to the other side of said source, said following segment thus completing the circuits for the lamps for the floors which the car has passed to maintain said lamps illuminated after said contact strip disengages the stationary contacts for said lamps, thereby providing conjointly with the contact strip illumination of said lamps to indicate both the progress and direction of travel of the car, the length of the contact segments and the positions of their feed brushes being so coordinated that the following contact segment is disengaged from its feed brush as the car arrives at each of the terminal ones of said floors, thus causing all of said lamps except the one for the upper terminal floor to be extinguished when the car is at the upper terminal and all except the one for the lower terminal floor to be extinguished when the car is at the lower terminal floor.

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