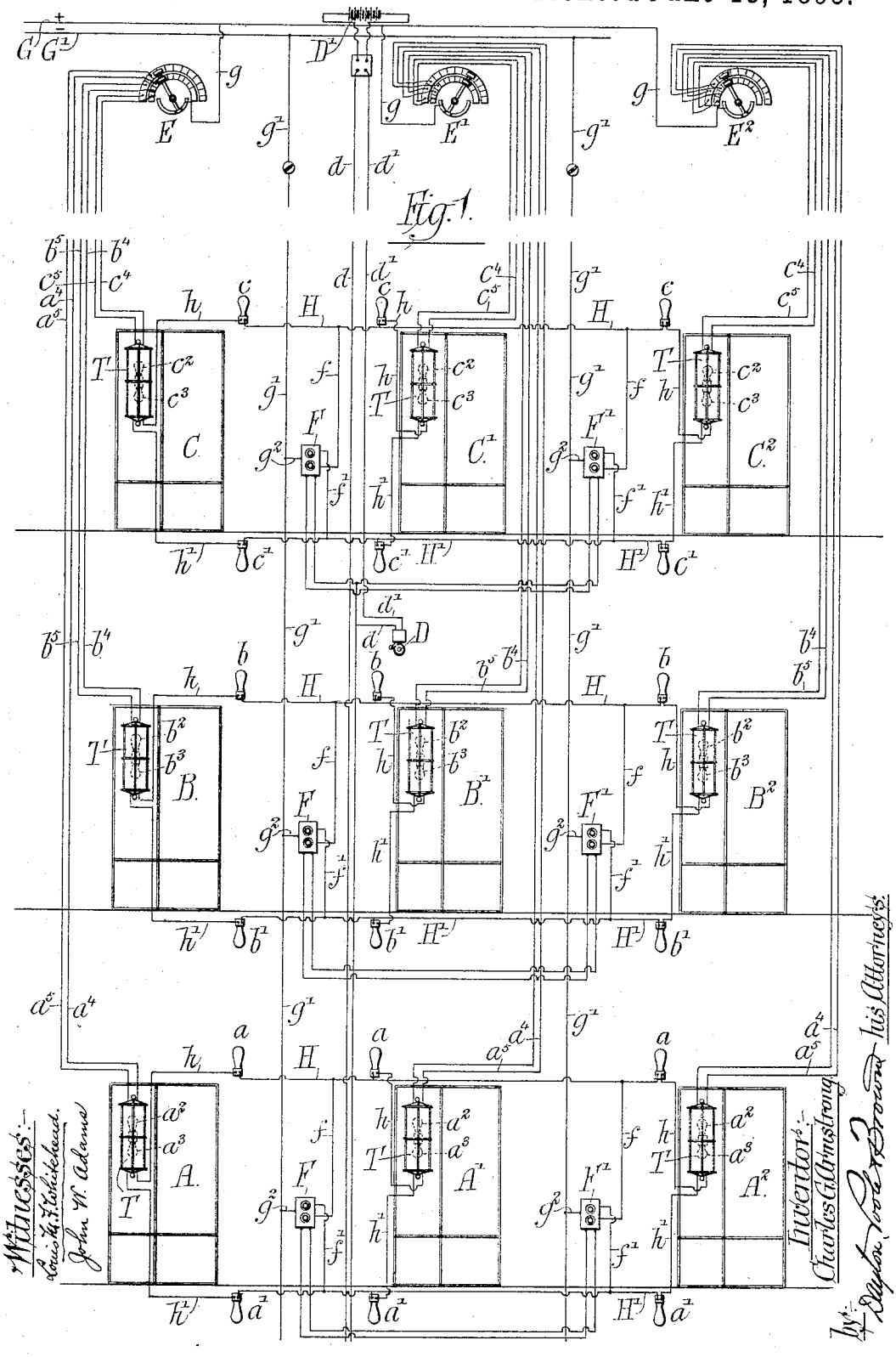
(No Model.) 4 Sheets—Sheet 1.

C. G. ARMSTRONG.

ELECTRIC SIGNALING APPARATUS FOR ELEVATORS.

No. 499,411. Patented June 13, 1893.



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Inventor:
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by Edgar Tate & Brown his Attorneys.

(No Model.) 4 Sheets—Sheet 2.

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ELECTRIC SIGNALING APPARATUS FOR ELEVATORS.

No. 499,411. Patented June 13, 1893.

Fig. 2.

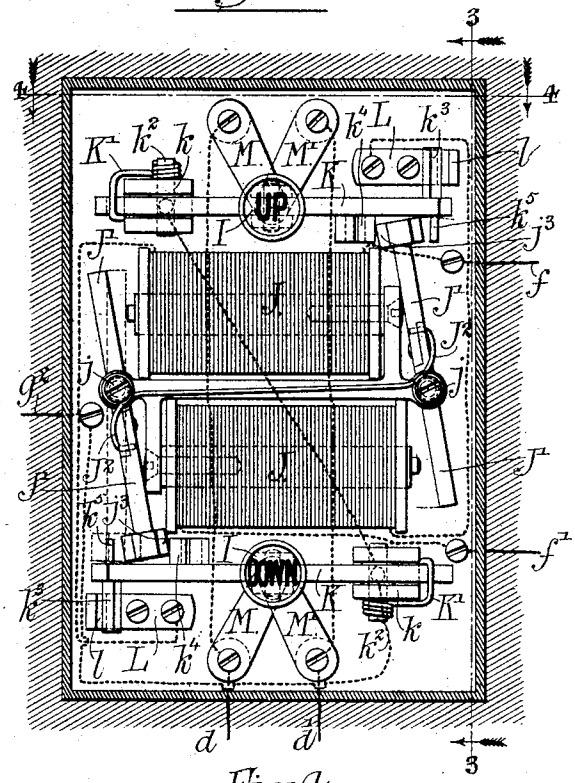


Fig. 3.

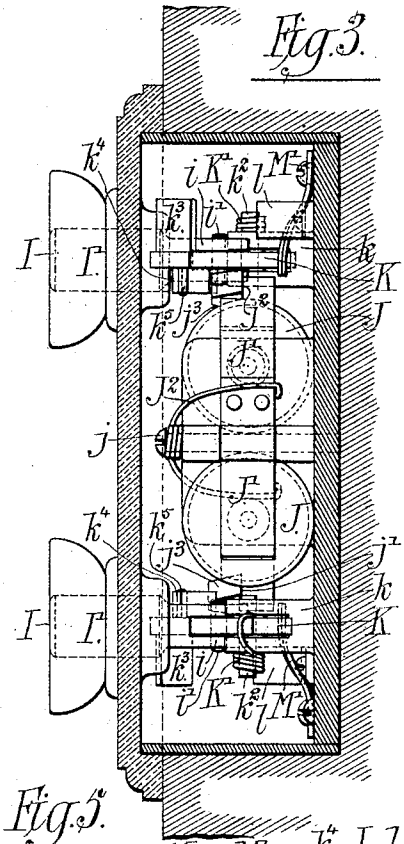


Fig. 4.

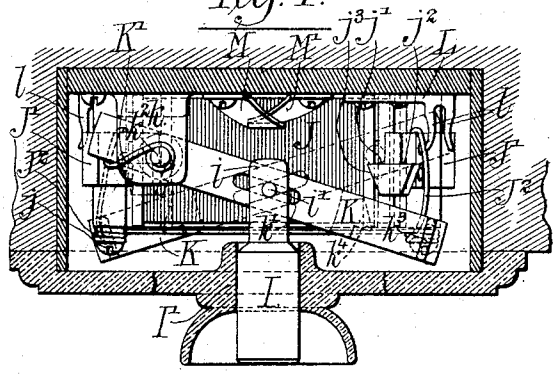


Fig. 5.

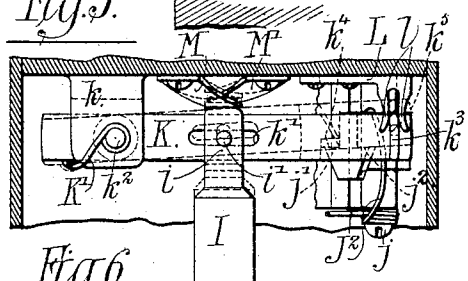
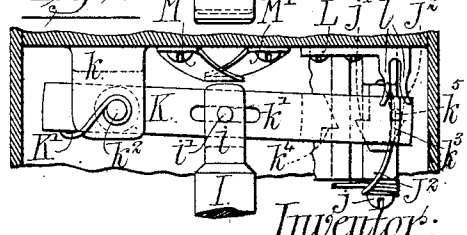


Fig. 6.



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(No Model.) 4 Sheets—Sheet 3.

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ELECTRIC SIGNALING APPARATUS FOR ELEVATORS.

No. 499,411. Patented June 13, 1893.

Fig. 7.

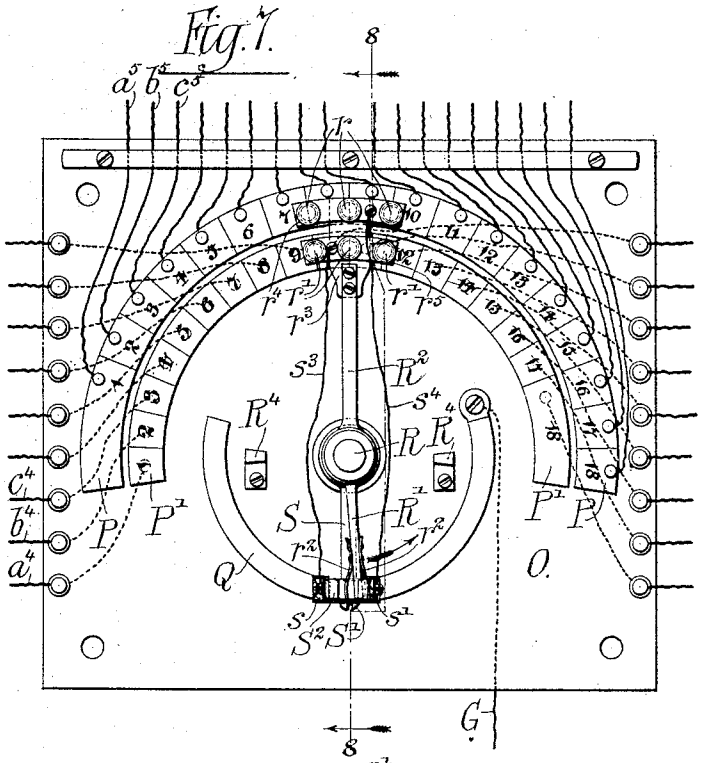


Fig. 8.

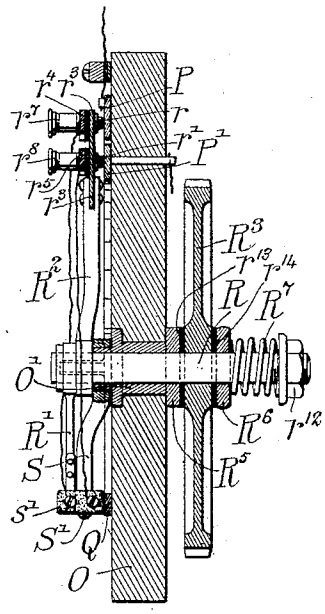


Fig. 9.

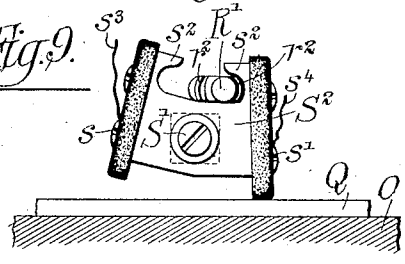


Fig. 11.

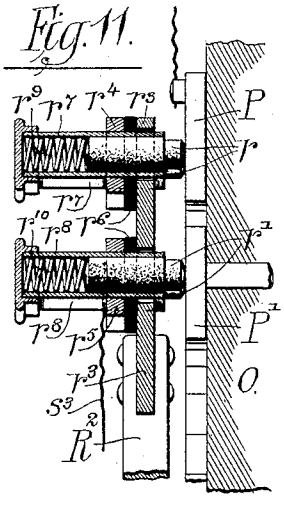
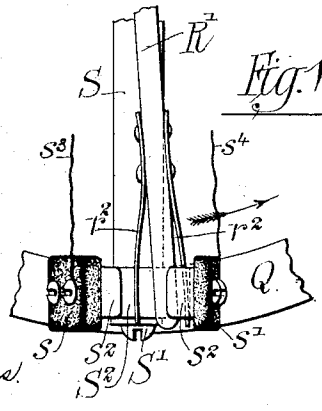


Fig. 10.



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(No Model.) 4 Sheets—Sheet 4.

C. G. ARMSTRONG.

ELECTRIC SIGNALING APPARATUS FOR ELEVATORS.

No. 499,411. Patented June 13, 1893.

Fig. 12.

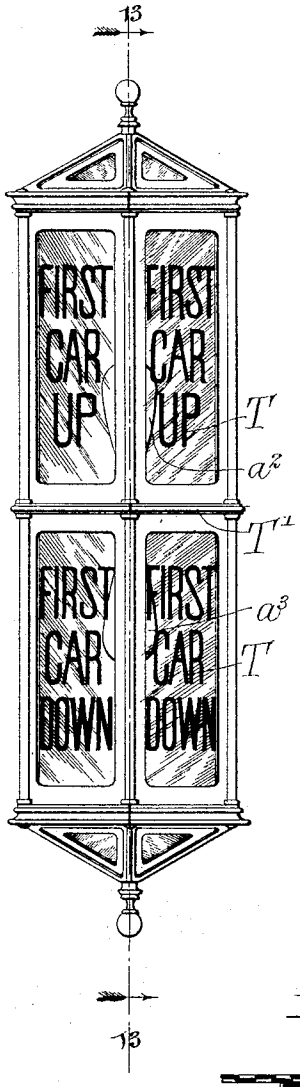


Fig. 13.

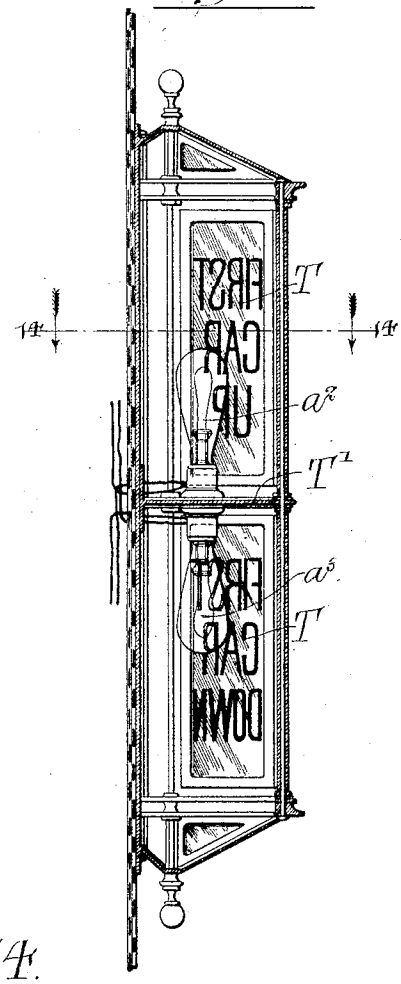
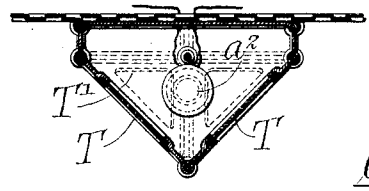


Fig. 14.



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UNITED STATES PATENT OFFICE.

CHARLES G. ARMSTRONG, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO DANKMAR ADLER, OF SAME PLACE.

ELECTRIC SIGNALING APPARATUS FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 499,411, dated June 13, 1893.

Application filed January 23, 1893. Serial No. 459,359. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. ARMSTRONG, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Signaling Apparatus for Elevators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in signaling devices for elevators and it embraces an improved construction in such signaling devices whereby a person waiting for an elevator car or cab may be informed of the approach of and the direction of its movement.

The invention consists in the matters hereinafter described and pointed out in the appended claims.

It has been common heretofore to employ in connection with an elevator a signaling device by which an intending passenger may signal to the conductor to stop the car, and also an indicating device located at each floor of the building to indicate the position of the car and its direction of movement. Devices of this kind while satisfactory in case of a single elevator are found to involve inconvenience to the passenger when several elevators are located side by side, and positive annoyance when there are a large number of elevators in a group as in the case of large office buildings; it being obvious that when the intending passenger on a certain floor approaches the group of elevators it is necessary for him to note the position and direction of movement of the indicators on all of the elevator doors and by a survey of them all determine in which elevator a car moving in the right direction is nearest to the floor on which he is standing, so that mistakes are often made and fruitless trips to several of the elevator doors are necessary before the passenger finally succeeds in securing passage. These inconveniences are especially liable to occur in case of the many rapidly moving elevators used in large modern structures, such as office buildings of Chicago, of from sixteen to twenty-one stories in height, wherein from twelve to twenty-four elevators are grouped together. In such cases not only is a person familiar with the building likely to become confused in the presence of a number of swiftly moving cars and fail to arrest a passing car until after several unsuccessful attempts, but a stranger or one unfamiliar with the building and who does not know the number designating the floor on which he stands, may not only find much difficulty but lose much time in securing the attention of the conductor of that one of the several cars which is approaching in the proper direction the floor at which he awaits. The difficulty of arresting the proper car is furthermore increased from the fact that in the running of a number of elevators according to modern practice the several cars make regular trips in succession and within a limited time, so that if the passenger is not standing in front of the shaft door in position to be seen by the conductor, and in readiness to enter, the car will not be stopped but will continue its course; and unless the passenger is capable of quickly noting the several indicators and can immediately place himself in front of the door of the elevator which is at the moment approaching in the proper direction or unless he signals the proper elevator at the proper moment by the use of the signaling device of that elevator, he is liable to make two, three or more unsuccessful efforts before he reaches the door or operates the signal at the proper time to catch a car moving in the direction wanted.

One object of my invention is to provide a signaling apparatus which shall not only enable the intending passenger to signal the car which is approaching and is nearest the floor on which he stands by manipulating a push button or other similar device but which shall also indicate to the passenger which of the several elevators is approaching the floor on which he stands in the direction which the passenger desires to go. To this end, I provide at each shaft doorway an electrically actuated indicator or signaling device which is controlled by a commutator operated from the actuating devices of the elevator, and I also place at each floor a switch for operating the signaling device, these parts being so arranged that the signaling device can only

operated when the car is adjacent to and approaching the floor at which the switch is operated. By the use of signaling in connection with each shaft, of devices and a commutator thus arranged and employing one switch to operate all of the signaling devices on each floor, it is obvious that a person desiring to ascertain which one of the doorways an approaching car is nearest, needs only to manipulate the switch at that floor, when a signal will be displayed at that doorway. In connection with signaling devices thus arranged, I provide signaling devices visible to the operators in the cars, which are controlled by the commutators and switches in the same manner as the signaling devices at the shaft doorways, so that a signal for stopping the cars can be transmitted to a car only when the latter is adjacent to and approaching the floor at which the person who signals is located. It follows that when both sets of signaling devices are used, a person desiring to enter a car can by manipulating the switch at the floor on which he stands, give to the car which is approaching nearest that floor the signal to stop, and at the same time operate the signaling device at the doorway of the shaft in which that car is located, so that the passenger may go to the doorway at which the signal is displayed with the certainty of there finding an approaching car. When two such signaling devices for both the passenger and the operator are provided at each floor, one for signaling the approach of and for stopping upwardly, and the other downwardly, moving cars, the intending passenger can not only secure the stoppage at his floor of that one of the several cars which will first reach it after he has given the signal, but he will be instantly informed as to the location of the car which he has signaled to stop on approaching the doorway indicated by the signal and will not fail to find there a car moving in the right direction.

In addition to the matters above referred to the invention includes features of construction in indicating devices applicable both to single elevators and groups of the same, and which are herein claimed as part of my invention.

The signaling apparatus shown in the accompanying drawings as one practical means of carrying out my invention, embraces as a means of signaling to the conductor for stopping the car at the several floors, a device such as is set forth in a prior Patent No. 462,834, granted me November 10, 1891, and consisting of electric lamps located within the shaft adjacent to the several doorways thereof, together with switches or controlling devices for the lamp circuits located within reach of the intending passenger at each floor; said lamps constituting a visual signaling device by which the presence of the passenger is indicated to the operator. A signaling device thus located in the shaft instead of in the cab itself has the advantage of avoiding the necessity of transmitting the operating current to devices on the moving car, as fully set forth in said patent. As far as the transmission of signals to the operator or conductor is concerned, however, any other well known or preferred form of signaling device may be employed for carrying out the general features of the present invention. The use of electric lamps for the purpose named possesses, however, important advantages when used in connection with other parts of the general signaling system herein illustrated, and when so used in connection therewith constitutes an important part of my invention and is herein claimed as such.

In the accompanying drawings illustrating my invention: Figure 1 is a view in the nature of a diagram illustrating the doorways of three elevator shafts, signaling devices in connection therewith both for the operator and passenger, and the electric wires or circuits by which the same are operated. Fig. 2 is a view in front elevation with the outer wall or cover of its casing removed of one of the switch boxes. Fig. 3 is a sectional view of the same, taken on the line 3—3 of Fig. 2. Fig. 4 is a plan view of the same, taken on the line 4—4 of Fig. 2. Figs. 5 and 6 are detail views showing changed positions of parts of the switch mechanism which are operated by the push button. Fig. 7 is a detail front elevation of the commutator device forming part of the signaling mechanism. Fig. 8 is a sectional view thereof, taken on the line 8—8 of Fig. 7. Fig. 9 is an enlarged detail view of the two of the brushes or sliding contact devices of the commutator. Fig. 10 is a plan view of the same. Fig. 11 is a detail sectional view of the lidings contact pieces shown at the upper part of Fig. 7. Fig. 12 is an enlarged detail view of the indicating device for the passenger. Fig. 13 is a sectional view thereof, taken on line 13—13 of Fig. 12. Fig. 14 is a cross-section, taken on line 14—14 of Fig. 13.

In said drawings the shaft doorways of several elevators located in a group or side by side are indicated by the letters A A′ A^2 B B′ B^2 C C′ C^2, the same letter indicating the several doorways belonging to each floor.

a a′ b b′ c c′ indicate electric signal lamps located inside of the elevator shaft adjacent to the several doors thereof, such lamps being of the kind known as incandescent or glow lamps, and the lamps *a b c* being located above the doors and the lamps *a′ b′ c′* below the same. The lamps above and below the doors will preferably be constructed to give lights of different colors so that they may be easily distinguished by the operator in the car. The lamps above the doors are intended when lighted to signal the conductors of descending cars to stop at the floor at which the lights show and similarly the lamps below the doors when lighted are to similarly signal the conductors of upwardly moving cars, in the same manner as set forth in said prior Patent No. 462,834, hereinbefore referred to.

D indicates an electric bell in circuit with electric conductors d d' and a battery D', and serving to give audible signals in case the same are needed in addition to the visual signals to indicate that a passenger is awaiting a car on one of the floors of the building.

a^2 a^3 b^2 b^3 c^2 c^3 indicate signal lamps located at the several shaft doorways for indicating to the passenger the approach of the elevator car at one of the door-ways. These lamps will be constructed to give lights of different colors or will be surrounded by a glass inclosure such as herein shown and which will be provided with letters or otherwise marked, so that the lamps may be easily distinguished from a distance, the said lamps in connection with devices hereinafter described by which they may be lighted and extinguished at will from points upon the floor at which they are located, constituting visual signals by which intending passengers may be informed of the approach of the car at either of the several doorways on that floor; one of the lamps being used to indicate the approach of a downward moving car and the other an upward moving car, for which purpose the lamps are made of different colors or otherwise made capable of being distinguished from each other as hereinbefore stated.

E E' E^2 indicate commutating devices for controlling the several lamp circuits one of which is employed in connection with each elevator, and which are severally operated by the actuating mechanisms of the elevators to which they belong. These commutators are shown as located at the upper ends of the elevator shafts, but they may be placed elsewhere if found convenient or desirable.

F F' indicate switch boxes containing circuit closing and breaking devices for the lamp and bell circuits. One or more of such switch boxes are located on each floor, and preferably one of the same is placed near each shaft doorway so that a passenger approaching the group of elevators at any point will find one of them within convenient reach; all of the switch boxes on each floor when more than one are used being alike and usually connected with the lamp circuits and all having the same effect in the operation of the apparatus.

G G' indicate supply and return conductors or wires which are connected with the opposite terminals of a dynamo or other electric generator, and by means of which current is supplied to all of the signal lamps. The supply wire G is connected by branch wires g g g with the several commutators E E' E^2. The wire G' is connected with wires g' g' from which branch-wires g^2 g^2 lead to the switch boxes F F'.

H H' are wires at each floor, which are connected with one terminal of each of the several signal lamps a b c and a' b' c' respectively, said wires being connected with the switch boxes F F' by branch-wires f f' f' f'. From the opposite terminals of the said signal lamps, wires h h h lead to the signal lamps a^3 b^2 c^2 and wires h' h' h' lead to the lamps a^3 b^3 c^3. The signal lamps a^2 b^2 c^2 of each shaft are connected with the commutator of the same shaft by conductors a^4 b^4 c^4 and similarly wires a^5 b^5 c^5 lead from the lamps a^3 b^3 c^3 of each shaft to the commutator thereof. From this arrangement of the wires it will be clear that both sets of signal lamps, to wit, those within and those without the shafts, are connected in the same circuits, that each switch box is connected with the return wire G', and (through the wires H H') with the signal lamps of all of the shafts on the same floor and that both the inside and outside signal lamps can be brought into circuit with the supply wire G only through the medium of the commutators E E' E^2, with which they are connected by the wires a^4 b^4 c^4 and a^5 b^5 c^5. The inner and outer signal lamps (as b and b^2 or b' and b^3) for upwardly or downwardly moving cars being connected by the conductors h h h' and the outer lamps being connected with the commutators and the inner lamps with the signal boxes, it follows that a circuit will be closed through said lamps at any doorway only when both the commutator and switch are in position to bring one of the wires a^4 b^4 c^4 a^5 b^5 c^5 in connection with the wire g and the wire f or f' in connection with the wire g^2. The commutator, therefore, determines the time at which any pair of inner and outer lamps can be lighted, and it follows that the commutator being so arranged that it will only close the circuit of any pair of lamps when the car is approaching the doorway at which that pair is located, the closing of the switch will complete a circuit through that pair of lamps only and will display a signal only at the door which the car is approaching. As for instance, if the elevator car is approaching the doorway B, and is moving in a downward direction, the commutator will establish connection between the lamps b and b^2 and the supply wire G, and the circuit closing device in the switch box F can then be manipulated to close a circuit through and light the said lamps; which circuit may be traced from the wire G through the wire g, the commutator E, the wire b^4, the lamp b^3, the wire h, the lamp b, the wire H, the wire f, the switch box, the branch wires g^2 and g' to the wire G'. The same result will be produced by manipulation of the switch in the switch box F', the circuit in that case being completed through the other set of wires f, g^2 and g'.

It follows from the above that the circuit closing and breaking devices in the switch boxes F F' are not at all times in circuit with and capable of controlling the several signal lamps at the floor at which said switch boxes are located, but by the action of the commutators which are operated by mechanical connection with the actuating devices of the elevator cars the said circuit closing and break-

ing devices will be capable of positively controlling the lamps at any doorway only when an elevator car is approaching that doorway.

The construction of the circuit closing and breaking devices within the switch boxes, and the commutators will now be described in detail after which reference will be made particularly to the operation of these parts in connection with the conductors described.

Referring first to the said switch boxes containing the circuit breaking and closing devices, one of these is shown in detail in Figs. 2 to 6, and the same is made as follows: Each of these devices is duplex and comprises two push buttons I I and switches operated thereby, which are identical in construction and one of which controls the signal lamps for descending cars and the other the signal lamps for ascending cars. The push buttons and switches operated thereby being alike they are similarly lettered in the drawings, the push button which controls the signals for upwardly moving cars being marked "up," while the one which controls the signals for downwardly moving cars is marked "down."

Referring now to the construction in detail of the devices operated by each push button I, J indicates an electro-magnet, and J′ an armature lever mounted on a horizontal pivot j with one of its ends opposite the pole of the magnet so that the lever will be oscillated by the passage of a current through the coils of the electro-magnet. The armature lever J′ is held normally away from the pole, of the electro-magnet J by means of a spring J^2. This spring is shown in the drawings as made double so as to operate the armature levers of both switch mechanisms, but it acts independently upon each lever, and a separate spring may be employed for each if desired.

K is a switch lever arranged parallel or approximately parallel with the magnet J and approximately at right angles to the armature lever J′; said lever K being pivoted at one end to a supporting post or standard k and at its opposite or free end arranged adjacent to the end of the armature lever J′. The switch lever K is arranged to swing in a plane at right angles to that in which the lever J′ moves, these parts being so arranged, in the instance illustrated, that the lever J′ moves in a vertical plane and the lever K swings in a horizontal plane. Said lever K is arranged opposite or in position to be acted upon by the push button I, these parts being preferably so disposed that the push button engages with the lever at a point between the ends of the latter. In the particular construction shown the push button is provided with a shank i, which is longitudinally slotted to receive the lever K, and a pin i' is inserted through the slotted shank of the push button and through a longitudinal slot k' in the lever; the said push button being held or guided at its outer end in a tubular guide I′ attached to the front wall of the casing, in the usual manner. A spring K′ attached to and coiled around the pivot pin k^3 of the lever K is engaged at its free end with the said lever in such manner as to throw the lever and push button connected therewith outwardly. In its normal position or when the push button is thrown outwardly the free end of the lever K stands outside of the plane in which the armature lever J′ moves, as clearly seen in Fig. 4.

The main purpose of the lever K is to make and break the signal lamp circuit. To accomplish this end it is provided with a lateral arm or contact piece k^3 adapted to engage with the spring jaws $l\ l$ of a contact plate L attached to the bottom of the switch box. One of the conductors f or f' of the signal lamp circuit is connected with the contact plate L, while a third conductor g^2 leading from the wire g' is connected with the post or standard k of the said lever K. It follows from this construction that when the push button I is thrust inwardly against the action of the spring K′ the free end of the lever K will be moved inwardly so as to carry the contact arm k^3 between the spring arms $l\ l$ of the contact plate L and thus bring the wire f or f' in connection with the wire g^2, so as to complete one of the circuits at this point.

The armature lever J′ is constructed for engagement with the free end of the lever K in such manner as to retain said lever in its depressed or inward position after said lever has been moved or thrust inwardly by pressure on the push button I. To accomplish the engagement of the armature lever with the lever K for this purpose, said armature lever is provided at its free end or that adjacent to the lever K with surfaces $j'\ j^2$, parallel with the plane of movement of the said armature lever and adapted to engage laterally projecting parts or lugs $k^4\ k^5$ on the said lever K; the said lugs or projections k^4 having such relation to the surface j' that when the lever K is thrust inwardly into the position shown in Fig. 5 the surface j' will extend over or overlap the outer surface of the lug k^4 and will thereby hold the lever K from being thrown outwardly under the action of the spring K′; the said armature lever standing normally under the action of the spring J^2 in position to engage the lug k^4 in the manner described. The armature lever is shown as also provided adjacent to the surface j' with an inclined surface j^3, arranged for contact with the lug k^4 when the lever K is thrown inwardly or depressed so that the free end of the armature lever will be swung laterally by the action of the lug to allow the passage of the latter past the end of the lever, the said spring J^2 serving to restore the lever to its original position and effect the engagement of the same with the lug k^4 after the lug has so given lateral movement to the lever.

In the particular construction illustrated the surfaces $j'\ j^2$ and j^3 are formed on a transverse bar or head attached to the armature lever J′, but this construction is obviously

not essential and the surfaces for engagement with the lever K may be formed by any suitable construction or configuration of the armature lever. The lug k^5 hereinbefore referred to is adapted for engagement with the surface j^2 of the lever J′, but is so located that said surface will be free from the same at the time it is engaged with the lug k^4, as clearly seen in Fig. 2. The working or bearing surface of said lug k^5 is moreover, located somewhat in the rear (referring to the direction of movement of the lever K under the action of the spring K′) of the working or bearing surface of the lug k^4. The result of this construction is that when the armature lever is moved by the attractive action of the magnet so that its end will be swung clear of the lug k^4, the surface j^2 of said lever will pass over and engage said lug k^5, so that the said lever K will still be held from springing inward and breaking the lamp circuit, notwithstanding said movement of the armature lever. The engagement of the end of the lever with the lug k^5 is insured by the location of the working face of said lug k^5 at the rear of the working face of the lug k^4; it being obvious that inasmuch as the armature lever is moved very quickly by the action of the magnet, a very light movement only of the lever K will take place after the armature lever has passed from engagement with the lug k^4, so that the surface j^2 will pass over and engage the lug k^5 before the lever K has moved far enough to carry said lug k^5 outwardly past said surface. The purpose of the construction described is to enable the lamp circuits to be held closed and the lamps to remain lighted from the time the intending passenger actuates one of the push buttons for signaling the car until after the car has stopped and begins its movement past the floor on which the passenger stands.

As hereinbefore stated, the commutator devices are so arranged as to enable a signal to be given only to that car which is approaching the floor at which the passenger stands, and the said commutator device is also arranged to break or interrupt the signal lamp circuit at that floor as soon as the elevator reaches it and begins to move away from it. It follows, therefore, that if the push button is thrust inwardly at any time the lever K will be moved thereby until the lug k^4 passes and is engaged by the end of the armature lever. The parts will remain in this position until the approach of the car to the floor at which the circuit closing device is located, when the commutator will complete the circuit through the signal lamps and the conductors g^2 and f or f' when the magnet J will attract the armature lever and thus swing the free end thereof away from the lug k^4 into engagement with the lug k^5. The lever K will thus be held in position to keep the lamp circuit closed until the car passes the floor, at which time the commutator device will break the circuit, the armature lever will be released and will become disengaged from the lug k^5 by the action of the spring J^2; after which the lever K will be thrown outwardly by its actuating spring and will thus restore the push button to its normal position and disconnect the lamp circuit at this point. It will be observed that the lugs k^4 k^5 in connection with the surfaces at the end of the armature lever, arranged as described, constitute a mechanism operating on the principle of a watch or clock escapement; it obviously requiring a double movement or oscillation of the armature lever to fully release the switch lever K.

In the construction illustrated the push button for signaling upwardly moving cars is located at the upper part of the casing and the push button for signaling downwardly moving cars is located at the lower part of the same, and the conductor f leading to the signal lamps for downwardly moving cars enters the upper part of the casing while the conductor f' leading to the signaling lamps for upwardly moving cars enters the lower part of the casing; this relative relation of the parts arising from the fact that in the construction illustrated the electro-magnet belonging to one push button is located between the other push button and its electro-magnet. This construction, however, is merely adapted as a matter of convenience and compactness, and is not essential to the working of the apparatus.

M M′ are two spring contact arms located with their free ends beneath or opposite the push button I, with the end of one arm overlapping that of the other, so that when the push buttons are thrust inwardly the arms will be brought into contact. The arms are connected with the wires d d' of the bell circuit, so that each time the push button is actuated to signal an upwardly or downwardly moving car, the bell D will ring. The push button is so located relatively to the arms M M′ that contact will only be made with the latter when the push button is thrust in farther than is necessary for engagement of the lever J′, (as shown in dotted lines in Fig. 5) the parts being so arranged that when pressure of the finger on the push button is released the switch lever will be caught and held by the lever J′ in position to maintain the push button free from contact with the arms M M′ so that the bell circuit will remain closed for a brief time and as long only as the finger is kept on the push button.

To now refer to the commutating device hereinbefore referred to, this is shown in detail in Figs. 7 to 11, and it consists generally of a base O of insulating material, curved contact strips P P′ and Q attached thereto, a rock-shaft R mounted concentrically with the contact strips P P′ and Q, and carrying oscillating arms R′ and R^2 to the latter of which are attached two sets of contact pieces r r r and r' r' r', which rest respectively in contact with the strips P and P′. A third oscil-

lating arm S is mounted on the base O, and is operated through the medium of the arm R′, said arm S carrying two contact pieces or brushes *s s′* which act on the strip Q. A gear wheel R^3 mounted on the shaft R at the rear of the base O constitutes a means of communicating motion from the elevator actuating mechanism to the commutator, and for this purpose it may be connected by any suitable gearing with such actuating mechanism so that the rock-shaft will be moved or oscillated in harmony with the movement of the elevator, the rock-shaft being turned in one direction when the car is moving upwardly, and in the opposite direction when the same is moving downwardly. The contact strips P P′ are connected, one with the signaling circuits for downwardly moving cars; these strips consisting of insulated blocks or sections one of which is provided for each floor of the building and to which severally lead the wires a^4 b^4 c^4 a^5 b^5 c^5 from the several doorways of the shaft to which the commutator belongs. In the construction illustrated, the wires a^4 b^4 c^4 lead from the several signal lamps above the doors or those which signal the downwardly moving cars to the sections forming inner contact strip P′, while other conductors a^5 b^5 c^5 from the signal lamps below the doorway of the shaft lead to the outer contact strip P. Attached to the contact strip Q is the supply wire G which leads to the dynamo or other source of current supply. The oscillating arms R′ R^2 and S and parts connected therewith constitute an automatic switch by which the wire G will be thrown into circuit successively with the wires leading to the signal lamps for downwardly moving cars when the car is moving downwardly and with the wires leading to the signal lamps for upwardly moving cars when the car is moving upwardly, so that the current is transmitted through one only of the contact strips, P or P′, at a time. These parts are constructed in detail as follows: The arms R′ and R^2 are mounted on the shaft R and are rigidly attached to said shaft so as to move together. The arm S is mounted concentrically with the said shaft R with its free end adjacent to the outer or lower end of the arm R′. Said arm S is provided at its end with a bearing stud or journal S′ on which is mounted an oscillating brush-supporting block S^2 adapted for contact with the end of the arm R′, said block being provided with two brushes *s s′* adapted to bear upon or engage the contact strip Q and the parts being so arranged that the oscillatory movement of the block S^2 produced by the contact of the arm R′ therewith will operate to bring either one or the other of the said brushes *s s′* into engagement with the said strip Q, while at the same time oscillatory motion is transmitted to the said arm S through the medium of said block. Said block S^2 is mounted on the arm S in such manner as to oscillate about an axis of rotation parallel with the arm itself, and said block is provided with two outwardly projecting stops or lugs s^2 s^2 located in the path of the arm at a distance apart considerably greater than the width or thickness of the arm, so that when the said arm R′ is moved in one direction or the other it will strike one or the other of the stops s^2 s^2 and by its contact therewith swing or oscillate the block S^2 about its pivotal support and thereby bring one or the other of the brushes *s s′* against the strip Q; the contact of the arm R′ with one of the stops s^2 obviously having the effect of throwing downwardly or inwardly toward the strip Q that end of the block S^2 at which the stop is located while lifting or throwing outwardly the opposite end of the block. The arm S is so arranged as to have frictional engagement with a stationary part tending to hold it from turning with the rock-shaft R so that the contact of the arm R′ with one of the stops s^2 s^2 will always result in the swinging of the block S^2 before any movement of the said arm S itself takes place; it being obvious that after the block has been turned by contact of the arm with one of the stops until the turning movement of the block is stopped by the contact of one of the brushes with the strip Q the continued movement of the actuating arm R′ will carry the block and the arm S′ on which it is mounted in one direction or the other, according to the direction in which the rock-shaft is turning. It follows from the above that when the rock-shaft is turned in one direction one of the brushes will first be brought against the strip Q and the arm S thereafter bodily moved, and when the direction of movement of the shaft is reversed the other brush will first be brought into contact with the strip and the arm S then moved in the opposite direction. The block S^2 is either made of insulating material or provided with a block of insulating material (as indicated in dotted lines in Fig. 9) through which the journal bearing S′ passes, so that the brushes *s s′* are electrically insulated from the said arm S. The brushes *s s′* are herein shown as consisting of blocks of carbon, but they may be of any other desired or preferred material or construction.

r^2 r^2 are leaf springs attached to the opposite sides of the arm R′ with their free ends in position to engage the lugs s^2 s^2, so that the arm acts usually against said lugs s^2 through the medium of said springs instead of by direct contact therewith. Said springs serve to hold the brushes on the block S^2 against the strip Q with a yielding pressure and one which is practically uniform notwithstanding the variations in the length of the brushes produced by the wearing away of the same, or other circumstances.

In the construction shown in the drawings the arm R^2 is provided at its end with a flat metal plate r^3 to which are attached two segmental plates r^4 r^5, the outer one of which carries the contact pieces *r r r* and the inner one the contact pieces *r′ r′ r′*. Said plates

r^4 r^5 are insulated from the plate r^3 by blocks r^6 r^6 of insulating material. The contact pieces r r' consist of cylinders of carbon placed within tubular receptacles r^7 r^8 which are inserted through and secured in the plates r^4 r^5; coiled springs r^9 r^{10} being placed within the receptacles between the outer closed ends thereof and the carbon cylinders forming the brushes, and acting to thrust said cylinders outwardly from the open ends of the receptacles and to hold them yieldingly and with a constant and uniform pressure against the sectional strips P P'. The brush or contact piece s which acts against the strip Q is connected with the brushes r' r' r' by means of a conductor s^3; said conductor s^3 being attached to the segmental plate r^5 which supports said contact pieces r' r' r', and a similar conductor s^4 extends from the brush s' to the contact plate r^4 carrying the contact pieces r r r. The two sets of contact pieces r r' bear continually on both strips P P' during the oscillatory movement of the rock-shaft but by means of the actuating arm R' and swinging block S^2 electric connection between the contact strip Q and one only of the strips P and P' is established at a time; it being obvious that when the rock-shaft and actuating arm R' are being moved in the direction indicated by the arrow in Fig. 7, the current passes from the conductor G through the brush s', the conductor s^4 and contact pieces r r r, to the strip P, and when the said rock-shaft and actuating arm are moving in the opposite direction a circuit is completed from the conductor G through the strip Q, the brush s, the conductor s^3 and contact pieces r' r' r' to the segmental contact strip P'. The contact pieces r r r and r' r' r' are arranged at such distance apart as to rest on and engage three of the segments forming the strips P P' for a purpose hereinafter described.

The arm S may be mounted concentrically with the rock-shaft R in any suitable manner, said arm in the construction illustrated being arranged to engage immediately with a sleeve O' which passes through the base O and forms a bearing for the said rock-shaft. The arms R' and R^2 are shown as made separate from each other and secured to the end of the shaft R which projects beyond or outside of the sleeve O'. The mounting of the arm S on the sleeve O' instead of directly upon the rock-shaft insures that the said arm S will be frictionally retarded in its movement, and thereby renders certain the proper actuation of the block S^2 in the oscillatory movement of the rock-shaft.

The gear wheel R^3 will preferably be driven from the actuating mechanism of the elevator through the medium of a rope and pulley, and inasmuch as a gear of this kind is not positive in its action, by reason of the slipping or "creeping" of the rope on the pulleys over which it passes, and inasmuch as it is necessary, in order to secure a proper operation of the commutator that the oscillating arms thereof should make a full stroke at each trip of the elevator car and be carried to the extreme end of their throw when the car reaches the limit of its movement, I have provided a yielding connection between the wheel R^3 and the rock-shaft, and gearing which actuates the wheel is arranged to turn or carry the same at such limit of travel of the car, somewhat farther than necessary for giving full stroke to the rock-shaft and arms thereon; stops R^4 R^4 being provided to limit the movement of the arms and rock-shaft and to stop them at the proper points. In this construction all lost motion in the actuating gear is taken up by the turning of the wheel R^3 on the rock-shaft after the arms on the shaft have completed their stroke, so that the said arms will in all cases start in their return movement from the same point. The device herein shown for affording such yielding connection of the wheel with the shaft, consists of two loose collars R^5 R^6 on the shaft and a coiled spring R^7 surrounding the shaft and held by a nut r^{12} on the outer end of the shaft so as to exert presure tending to hold the collars in frictional contact with the hub of the wheel; leather washers r^{13} r^{14} being placed between the wheel hub and the said collars to increase the frictional resistance afforded to the turning of the wheel on the shaft. Both collars being loose on the shaft and the inner collar R^5 being in contact with the bearing sleeve O, the spring obviously tends to draw the shaft endwise in a direction to carry the arms R' toward the base O, and to thereby hold the contact pieces r r r r' r' r' with a constant pressure against the strips P P', notwithstanding wear of the parts or imperfections of adjustment.

The contact pieces r r r r' r' r' are so arranged as to be engaged at once with three adjacent commutator sections, representing three floors of the building, in order that the signals may be operative at any time when the car is not more than two floors distant from the one at which the signaling device is operative, thus being a distance sufficient usually to give timely warning of the approach of the car. The arm S may of course make contact with more or less of the sections, if it is desirable that the notification of the approach of the car should take place sooner or later. Commonly however, if the signal is given at a point so far away as four floors, the notification will be an unnecessarily long time in advance of the arrival of the car and the approach of more than one car may be indicated at once, and if the signal is given when the car is only two floors away a rapidly moving car may not receive the signal to stop soon enough to safely do so at that floor. The sections at the ends of the contact strips at which the contact pieces rest when the car is beginning its trip in either direction are made three times as long as the other sections, so that all three of the contact pieces will rest

thereon at such time, and movement of the switch by one of the second or third floors from the bottom when the car is starting upward, or at the second or third floors from the top when the car begins its descent, will operate any signal until after the car has started.

It will be noted that, in a construction in which signal lamps are used both for the operator and passenger, the same lamp may be employed to indicate the approach of the car as is used to signal the operator to stop, considered the more practical and desirable one.

Figs. 12, 13 and 14 illustrate a desirable form of signaling device for the passenger, consisting of a glass casing T which surrounds the signal lamps and which is lettered to indicate the direction in which the approaching car is moving, the casing being divided by a horizontal non-transparent partition T′ between the lamps.

A signaling apparatus of the character described will obviously be useful when applied to one elevator or shaft only, for the reason that it will in each case serve to indicate when a car moving in the right direction, is approaching any floor.

As far as the operation of the main features of the signaling system shown is concerned electrically operated or controlled signaling devices other than electric lamps may obviously be used, and the same are included in my invention. A signaling system embracing such signal lamps is however, in itself novel, and constitutes an important improvement in the art, and is therefore herein claimed as part of my invention.

I claim as my invention—

1. A signaling apparatus for elevators comprising a signaling device at each doorway of the shaft, means for operating the same, and means controlled by the elevator mechanism making the signaling device at each floor inoperative except when a car is approaching that floor, substantially as described.

2. A signaling apparatus for elevators comprising signaling devices visible outside of the shaft at the several doorways of the same, means operated by the elevator making the signaling devices at each floor operative only when the elevator is approaching that floor, and means for actuating the said signaling devices, substantially as described.

3. An electric signaling apparatus for elevators comprising signaling devices at each floor visible outside of the shaft, a switch device at each floor for controlling the circuits which operate said signaling devices, and a commutator operated by the elevator mechanism and acting to complete the said circuits which operate the said signaling devices when the car is approaching the floor at which the signaling device is located, substantially as described.

4. An electric signaling apparatus for elevators comprising signaling devices visible to the operator within the car, signaling devices at each floor visible outside of the shaft, a switch device at each floor for controlling the circuits which operate said signaling devices, and a commutator operated by the elevator mechanism and acting to complete the said circuits which operate the said signaling devices when the car is approaching the floor at which the signaling device is located, substantially as described.

5. A signaling apparatus for elevators comprising visual signaling devices located within the shaft adjacent to the several doorways thereof, visual signaling devices located outside of the shaft adjacent to the several doorways thereof, means for actuating the several signaling devices at each floor, and means operated by the elevator actuating mechanism constructed to render the signaling devices at each floor inoperative except when the car is approaching that floor, substantially as described.

6. The combination with two or more elevator shafts and cars, of signaling devices for the operator, consisting of electric lamps located within the shaft adjacent to the several doorways thereof, signaling devices for the passenger, located exterior to the shaft adjacent to the several doorways thereof, controlling devices for the lamp circuits located on each of the several floors, and commutating devices operated by the actuating devices of the several elevators constructed to maintain the several lamp circuits broken except those located at the floor which the car is at any time approaching, substantially as described.

7. A signaling device for indicating the approach of an elevator car, comprising an electrically operated signal located at a doorway of the shaft, a commutator operated by the actuating device of the elevator and controlling the signaling device circuit, and a switch mechanism for closing and breaking the said circuit, substantially as described.

8. A signaling device for indicating the approach of an elevator comprising an electrically operated signal located at a doorway of the shaft, a commutator operated by the actuating device of the elevator and controlling the signaling device circuit, and a switch mechanism for closing and breaking the said circuit, said switch mechanism comprising a push button, a contact making and breaking lever, a spring holding the lever in position to maintain the circuit broken, a detent for holding the lever in position to maintain the circuit closed, and an electro-magnet the coils of which form part of the circuit for actuating the said detent, substantially as described.

9. A signaling device for indicating the approach of an elevator comprising an electrically operated signal located at a doorway of the shaft, a commutator operated by the actuating device of the elevator and controlling the signaling device circuit, and a switch mechanism for closing and breaking the said

circuit, said switch mechanism comprising a push button, a contact making and breaking lever, a spring holding the lever in position to maintain the circuit broken, a detent for holding the lever in position to maintain the circuit closed, and an electro-magnet the coils of which form part of the circuit for actuating the said detent, the engaging parts of the said lever and detent comprising two lugs or projections on the lever adapted to be engaged in alternation by the detent and constituting an escape device by which a double movement of the detent is required to release the lever, substantially as described.

10. The combination with an elevator shaft and car, of means for indicating the approach of the car to the several floors comprising an electrically operated signaling device at each floor, a commutator embracing a contact strip formed by a plurality of insulated plates severally in electric connection with the signaling devices on the several floors, a contact piece in electric connection with the source of supply, moved by the elevator mechanism and arranged to travel over said contact strip, and a switch at each floor controlling the actuating circuit of the signaling device belonging to the floor at which the switch is located, substantially as described.

11. The combination with an elevator shaft and car, of means for indicating the approach of the car to the several floors in either direction, comprising an electrically operated signaling device at each floor adapted to indicate the direction in which the car is moving, a commutator device embracing two contact strips formed by insulated plates, two contact pieces moving thereon, an automatic switch acting to place one only of the contact pieces in circuit with the conductor at a time, and two switches at each floor, one controlling the circuit by which upwardly moving cars are indicated and the other the circuit by which downwardly moving cars are indicated, substantially as described.

12. The combination with an elevator shaft and car, of means for indicating the approach of the car to the several floors and for signaling the conductor, comprising an electrically actuated signaling device visible to the conductor, an electrically actuated signaling device at each floor, visible to the passenger, two electric circuits at each floor severally actuating the signaling devices and provided with two switches, and a commutating device comprising two contact strips each of which is formed by insulated plates, one of which is in circuit with the signaling device of each floor, contact pieces for each strip, and an automatic switch device by which only one contact piece and commutator strip is operative at a time, substantially as described.

13. The combination with an elevator shaft and car, of electric signal lamps adjacent to each doorway of the shaft, switches at each floor controlling the lamp circuits, and a commutator comprising a contact strip consisting of a plurality of insulated sections severally connected with the lamp circuits, and a contact piece connected with the source of supply and actuated by the elevator mechanism, substantially as described.

14. The combination with an elevator shaft and car, of two electric signal lamps, one for upwardly and the other for downwardly moving cars, located adjacent to each doorway of the shaft, two switches at each floor severally controlling the lamp-circuits of the floor, at which it is located, and a commutator actuated by the elevator actuating mechanism and embracing two contact strips each consisting of a plurality of insulated sections severally in circuit with the said signal lamps, contact pieces severally engaging the said strips, and a switch bringing the contact piece in circuit with the source of electric supply when moving in one direction only, substantially as described.

15. The combination with an elevator car and its actuating mechanism, and a plurality of electric signaling devices, of a switch device located at each floor for controlling the circuits which operate said signaling devices a commutator for controlling the signaling device circuits, operated by the actuating mechanism and comprising a sectional contact strip the sections of which are severally connected with the circuits which actuate the signaling devices, and a contact piece connected with the source of electric supply, substantially as described.

16. The combination with an elevator car and its actuating mechanism, and two sets of signaling devices, one for upwardly and the other for downwardly moving cars, of a commutator for controlling the signal device circuits, operated by the actuating mechanism and comprising two sectional contact strips, the sections of which are severally connected with the operating circuits of the signaling devices, two contact pieces, and a switch device operated by the actuating mechanism and acting to bring the sections of one contact strip into circuit with the source of supply when the elevator is moving in one direction and the sections of the other strip into circuit with the source of supply when the car is moving in the opposite direction, substantially as described.

17. A commutator for elevator signaling devices, comprising two curved sectional contact strips, an oscillating arm carrying two contact pieces moving in contact with said strips, and an automatic switch acting to throw one or the other of said contact pieces into circuit with the source of supply according to the direction in which the arm is moving, substantially as described.

18. A commutator for elevator signaling devices, comprising two curved sectional contact strips, an oscillating arm carrying two contact pieces moving in contact with said strips, and an automatic switch acting to throw one or the other of said contact pieces into circuit

with the source of supply according to the direction in which the arm is moving, said switch being actuated by parts constructed to afford lost motion, whereby the direction of movement of the car may be reversed and the car moved some distance without moving the switch, substantially as described.

19. A commutator for elevator signaling devices comprising two curved, sectional strips, a third curved, continuous contact strip, an oscillating arm provided with two contact pieces acting on the sectional strips, and two brushes adapted to act on the continuous strip, which brushes are severally in electric connection with the contact pieces, and means for automatically bringing one or the other of said brushes in contact with the said continuous contact strip according to the direction of movement of the arm, substantially as described.

20. A commutator for elevator signaling devices comprising two curved, sectional contact strips, a third curved, continuous contact strip, an oscillating arm carrying two contact pieces acting on the two sectional strips, and a second arm carrying two brushes which are movably supported thereon and are adapted to act on the continuous strip, said oscillating arm being constructed to engage and give motion to the second arm and to act on the said brushes to throw either one or the other of the same into contact with the said continuous strip, substantially as described.

21. A commutator for elevator signaling devices comprising two sectional contact strips, a third continuous contact strip, a movable part or arm carrying two contact pieces movable upon the sectional contact strip, and a switch device comprising an oscillating block carrying two brushes which are severally in electric connection with said contact pieces, and which are adapted for alternate contact with the continuous strip by the oscillatory movement of said block, said movable part or arm being constructed to give both oscillatory and bodily movement to said block in its backward and forward movement, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

CHARLES G. ARMSTRONG.

Witnesses:
TAYLOR E. BROWN,
G. W. HIGGINS, Jr.