No. 826,752. PATENTED JULY 24, 1906.

J. B. SMALLEY & C. A. REINERS.

SIGNALING SYSTEM FOR ELEVATORS.

APPLICATION FILED MAY 24, 1905.

4 SHEETS—SHEET 1.

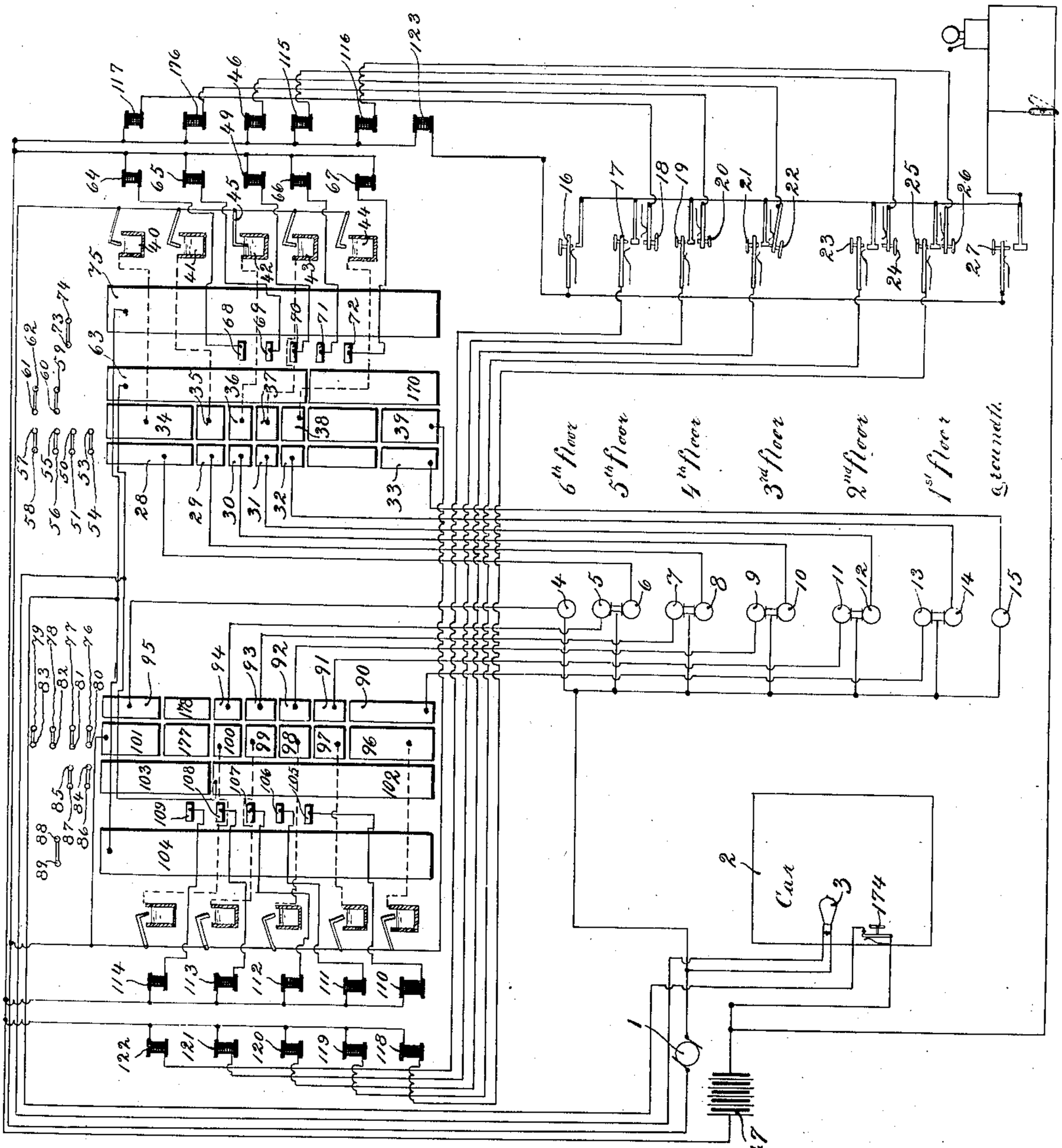

Fig. 1.

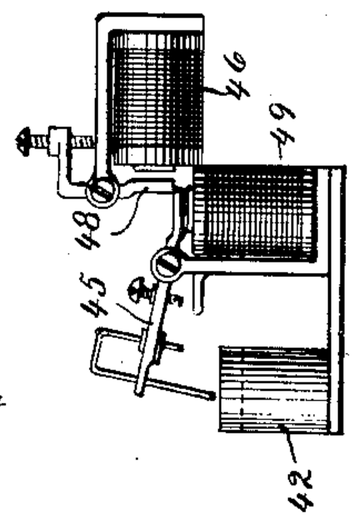

Fig. 2.

Witnesses
Wm. J. Bergman
F. W. Wright.

Inventors
James B. Smalley
Charles A. Reiners
By their Attorney Albert R. Howell

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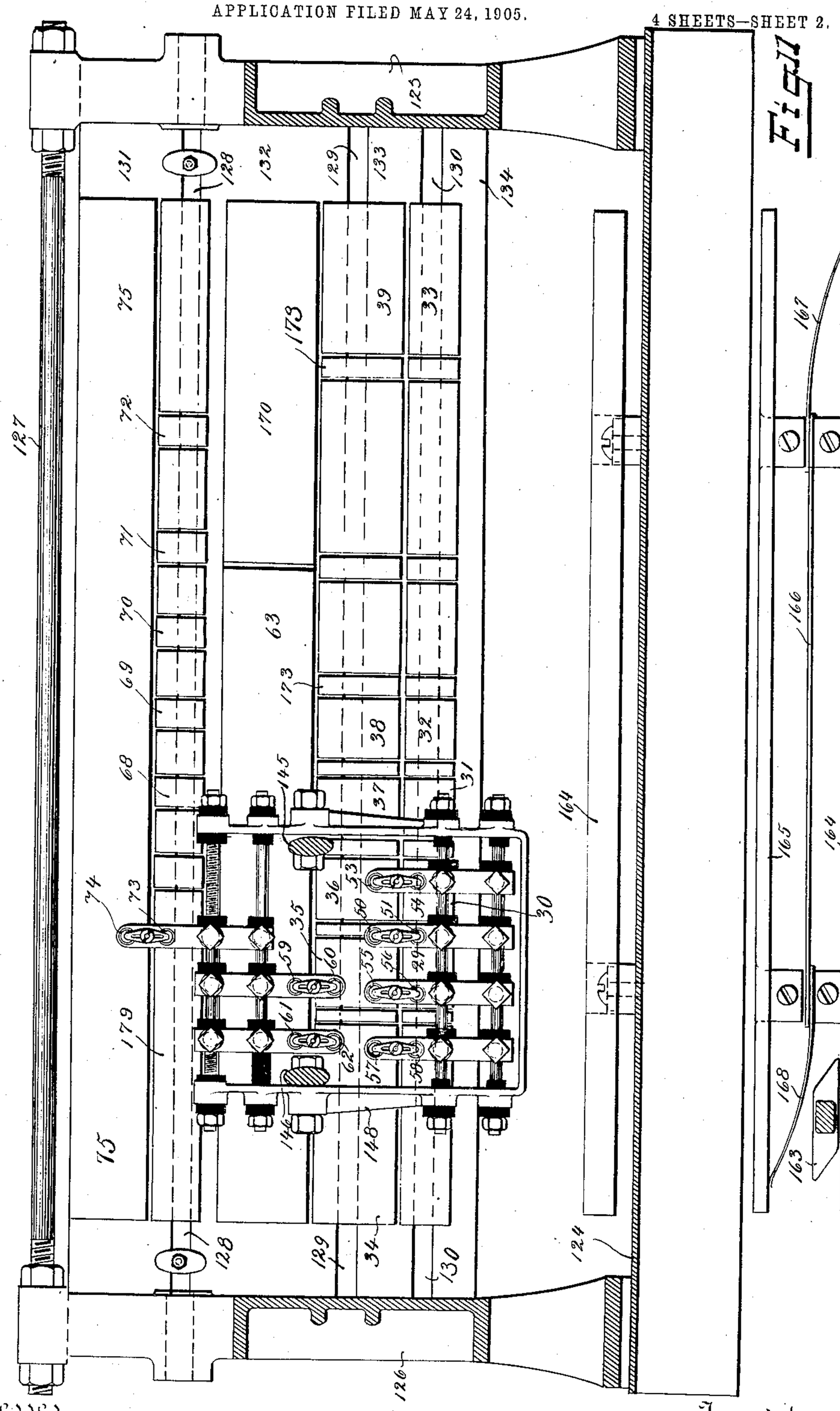
Fig. 2.



Witnesses
J. Bergman
F. W. Wright.

Inventors
James B. Smalley
Charles A. Reiners
By their Attorneys
Edmund Wetzell

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J. B. SMALLEY & C. A. REINERS.

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4 SHEETS—SHEET 3.

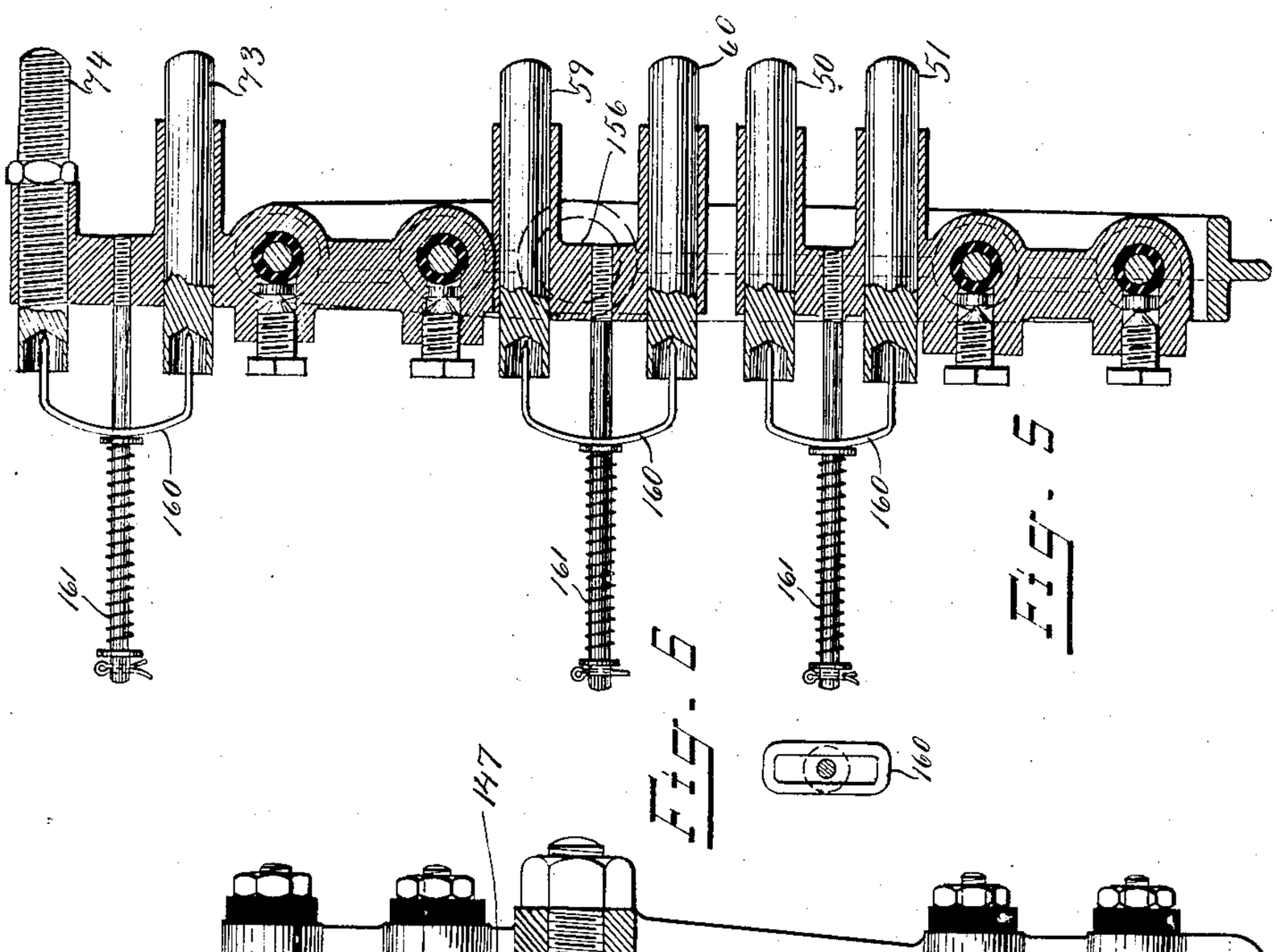

FIG. 5

FIG. 6

FIG. 4

Witnesses
Wm. J. Bergman
F. W. Wright

Inventors,
James B. Smalley
Charles A. Reiners
By their Attorneys
Edmund R. Newell

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4 SHEETS—SHEET 4.

Fig. 8

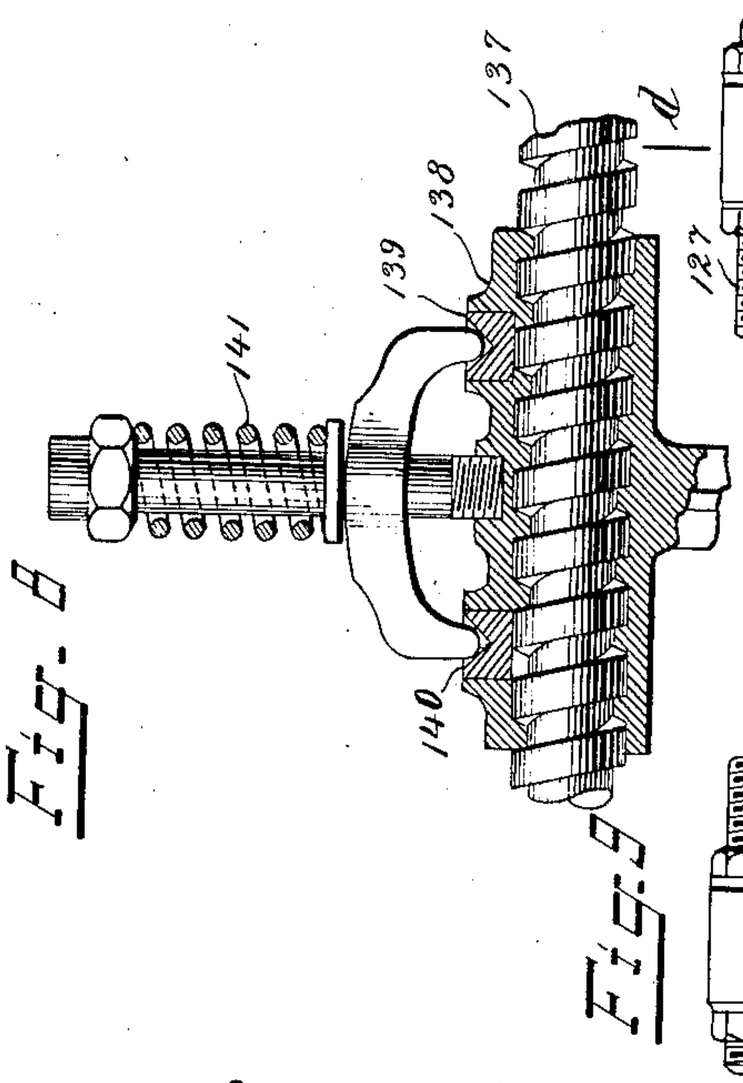

Fig. 9

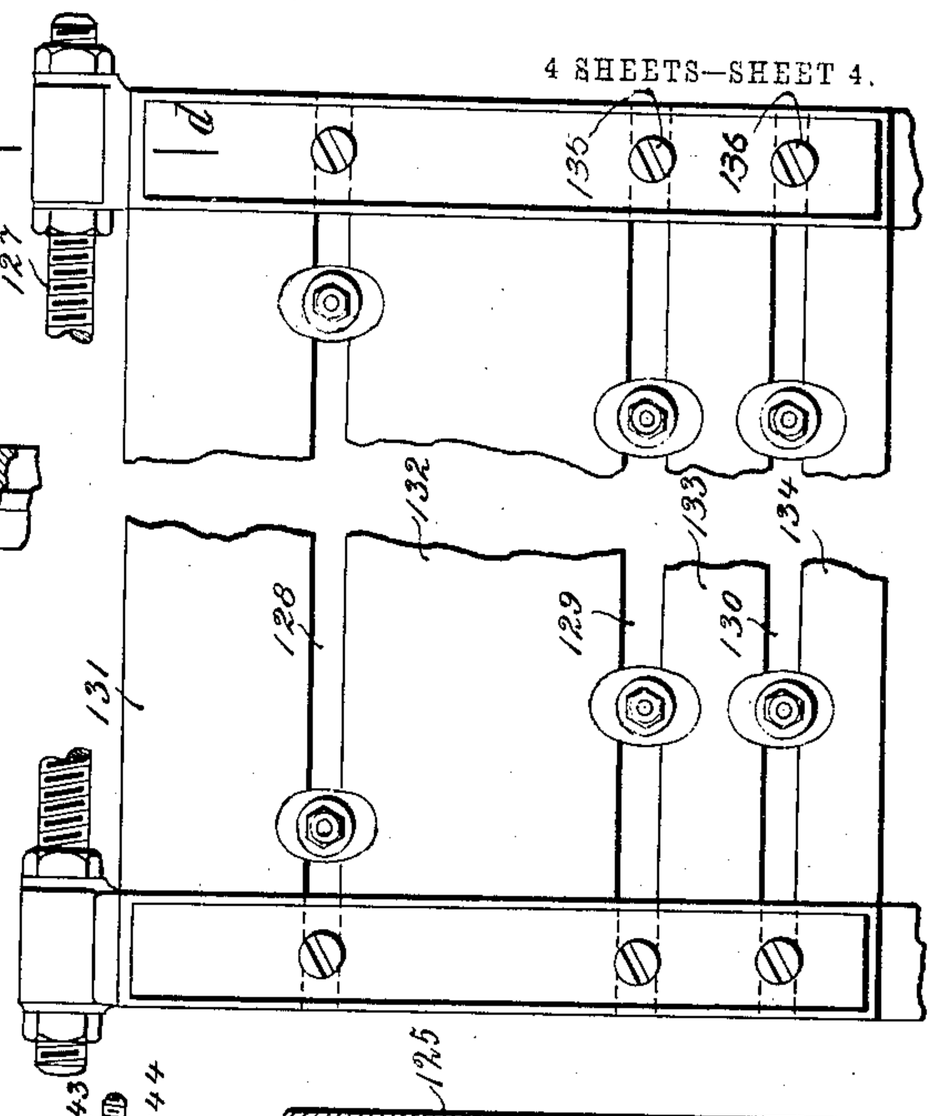

Fig. 10

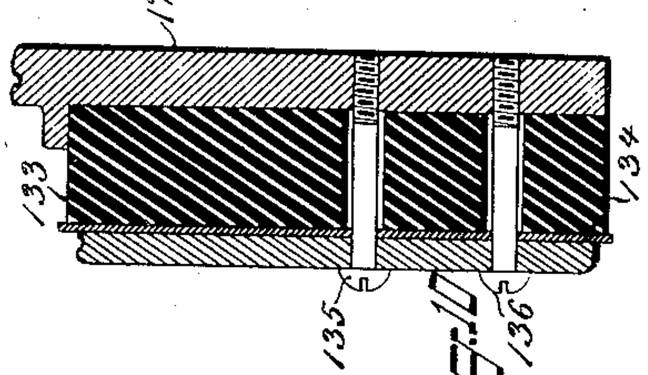

Fig. 7

Witnesses
Wm. J. Bergman
P. W. Wright.

Inventors
James B. Smalley
Charles A. Reiners
By their Attorneys
Allison & Wood

UNITED STATES PATENT OFFICE.

JAMES B. SMALLEY, OF CHICAGO, ILLINOIS, AND CHARLES A. REINERS, OF NEW YORK, N. Y., ASSIGNORS TO ELEVATOR SUPPLY & REPAIR COMPANY, A CORPORATION OF ILLINOIS.

SIGNALING SYSTEM FOR ELEVATORS.

No. 826,752. Specification of Letters Patent. Patented July 24, 1906.

Application filed May 24, 1905. Serial No. 262,038.

To all whom it may concern:

Be it known that we, JAMES B. SMALLEY, residing at Chicago, Illinois, and CHARLES A. REINERS, residing at New York, N. Y., citizens of the United States, have invented certain new and useful Improvements in Signaling Systems for Elevators, of which the following is a clear, full, and exact description.

Our invention has reference to an electric signaling system for elevators; and our object is to improve and simplify such constructions.

Our general system is similar in many respects to that set forth in our previous patent, No. 634,220, dated October 3, 1899; but we have simplified and improved such system in many respects and have materially improved the construction of the details thereof.

Our invention will be set forth in the claims.

In the drawings, which show a preferred form of our present invention, Figure 1 is a diagram of the wiring arranged as for a building having seven floors. Fig. 2 is a side elevation of a detail, showing a "restoring" and a "setting" magnet and a mercury-pot, which may be used, if desired. Fig. 3 is a side elevation of one-half of the commutator, taken substantially on the line *a a* of Fig. 7. Fig. 4 is a bottom view of the brush-carrier, brush-holders, and brushes shown in Fig. 3—that is, it is a view of the same from the opposite direction from which it is seen in Fig. 3. Fig. 5 is a section of the same on the line *b b* of Fig. 4. Fig. 6 is a detail of the yoke connecting two brushes. Fig. 7 is a vertical section through the commutator, the brush-carrier at the right being shown in the same section as Fig. 5 and the brush-carrier at the left being shown in section on the line *c c* of Fig. 4. Fig. 8 is a detail view of the screw-shaft and traveling nut thereon, partially in section. Fig. 9 is a partial detail of the rear side of one side of the commutator-frame, showing the slate construction. Fig. 10 is a partial section on the line *d d* of Fig. 9, and Fig. 11 is a plan view of the guideway on the base of the frame.

In carrying out certain portions of our invention claimed the form of commutator shown in the drawings may not be necessary; but we prefer to provide a frame upon which are arranged suitable contacts having their contact-faces arranged in substantially two vertical planes separated from each other, as indicated in Fig. 7, and to provide suitable brushes for said contacts with means to move said brushes relatively over said plates so as to make proper electrical connection at the proper times.

In Fig. 1 there have been omitted from the diagram most of those contact-plates which form no part of the electrical features in order to simplify the same. In this diagram 1 is a source of electricity—such, for example, as an ordinary dynamo. 2 is an elevator-car which is adapted to travel up and down in a shaft, and 3 is an electrically-controlled signal carried by the car and which is preferably in the form of an electric lamp. Electrically-controlled signals located along the elevator-shaft may also be provided for signaling the intending passenger that an elevator-car is approaching him in the direction which he desires to go. These signals are also preferably electric lamps and are indicated at 4 to 15, the top and bottom floors each being provided with a single lamp and each of the intermediate floors with a pair of lamps, such as 5 and 6 for the fifth floor. These will be usually located outside of the elevator-shaft adjacent to each doorway, as is common at the present time, one of said lamps serving to indicate a downwardly-moving car and the other one an upwardly-moving car. We have also provided suitable hand-operated mechanism located at each floor, such as ordinary push-buttons, by which the intending passenger may control part of any signal-circuit, so that after he has pushed one of said buttons he will close or cause to be closed a break in the said signal-circuit, so that when the commutator closes the other break in such circuit the signal will be given. These push-buttons are indicated at 16 to 27, two of them being located at each floor, except the top and bottom floors, the upper ones, such as 21, being to signal upwardly-moving cars, and the lower ones, such as 22, being to signal downwardly-moving cars. Although we have not in the drawings shown more than one car or more than one commutator, and also only the floor-signals for one shaft, it will be evident that the same may be duplicated for other shafts of a bank of elevators and that the same may be cross-wired, so that one set of

push-buttons will control the circuits for all the cars of that bank, as is common in this art and as indicated in our prior patent heretofore referred to. It is not thought necessary to illustrate this duplication and cross connection in the drawings, as the same will be evident to any person skilled in this art. The commutator consists of suitable fixed and relatively moving contacts, and in the present embodiment we have shown the brushes as constituting the moving member thereof. The mercury-pots and restoring and setting magnets have in Fig. 1 been shown adjacent the commutator to more clearly indicate their relative relation; but they may be placed wherever convenient, and, in fact, are usually placed upon a separate support by themselves, being suitably wired from each separate commutator of the bank of elevators, as indicated for this one commutator in Fig. 1. The commutator is adapted to determine the time when the signal shall be operated—that is, when the lights may be lighted up, providing that a push-button has been pushed to close the other normally open break in the signal-circuit. The commutator shown comprises two series of contact-plates; but they need not necessarily be of the form shown in all cases. One such series is indicated at 28 to 32 and the other series at 34 to 38. These two series above indicated are for the car as it moves downwardly, and it will be observed that each plate of the series 28 to 32 has connected with it a "down" light—that is, lamp 6 is connected to plate 28, lamp 8 to plate 29, &c. In the present embodiment each of the plates of the series 34 to 38 is connected to a mercury-pot, plate 34 being connected to pot 40, plate 35 to pot 41, &c. These connections have been indicated by dotted lines in order not to confuse the drawing. Each pot may have a pivoted arm 45, (see Fig. 2,) connected to the other side of dynamo 1. The pivoted arm 45 is normally out of contact with the mercury, and therefore causes a break in the signal-circuit, and it and the mercury-pot constitute a switch. It will be obvious that we do not limit ourselves to this form of switch; but this mercury-pot and pivoted-lever construction is a convenient one to use, as we have found by actual practice. The pivoted lever may be caused to drop into the pot by different mechanism; but we have found that a magnet controlled by a floor push-button is a convenient and effective means to this end. In the present instance we have provided a setting-magnet, such as 46, (see Fig. 2,) for each push-button, so that when a button, such as 22, is pushed it will close a circuit from battery 47 through this setting-magnet 46, thereby attracting its armature 48 and releasing the lever 45, which will drop into the pot, as indicated in the diagram. 46, 115, 116, 117, and 176 represent a series of such setting-magnets, each of which is the same as magnet 46. We have also provided a restoring-magnet, such as 49, for each arm 45 for restoring the same to the normal position shown in Fig. 2 after the car starts to move away from the floor for which the signal has been given. This will be described more in detail hereinafter. 65 to 67 are a series of such restoring-magnets, similar to 49. It will be observed from the above that each of the intermediate floors is served by one of said floor-signals, such as 10, a plate, such as 30, of one of said series connected therewith, and a plate, such as 36, of the other series which is connected to the source of supply through a switch, (in this instance formed by the mercury-pot and arm 45,) which is controlled by hand-operated mechanism, such as push-button 22, located at said floor at which the signal 10 is also located. In order to make electrical connection between plates 30 and 36, we have provided a brush for each series of plates and which are electrically connected. Two of such brushes are indicated at 50 and 51, (see also Figs. 4 and 7,) which brushes are electrically connected by means of the brush-holder 156. While these brushes 50 and 51 are in this embodiment separate brushes, they are electrically connected by means of the brush-holder which holds them and are, in effect, a single brush having a portion rubbing over each of the two series of contact-plates, and we do not by the words "two brushes" mean to limit ourselves to two separate brushes, as are shown in the specific embodiment illustrated in the drawings. We prefer to provide three or four pairs of these brushes, as indicated. It will be obvious that when any one pair of these brushes, such as 53 and 54, touch plates 36 and 30, respectively, the floor-lamp 10 will be lighted up, as the second normally open break in the circuit (between plates 36 and 30) will then be closed, and this break will remain closed so long as any pair of brushes connects those plates. We preferably provide several pairs 53 54, &c., of these brushes and space the pairs a distance apart less than the width of any single plate of the series, so that the plates—for example, 30 and 36—will be electrically connected while the car is moving for three or four floors, so that the floor-light will light up three or four floors in advance of the car and remain lighted until the car reaches the floor. This relative arrangement is shown in the diagram and will be referred to hereinafter when the particular construction of the brush-carrier is discussed hereinafter. It will be observed that the circuit from the dynamo passes through the car-light and then to the long contact-strip 63, and we have provided a pair of brushes 59 60, the brush 59 rubbing over strip 63 and the brush 60 making contact with the series 34 to 38. We prefer to pro-

vide the long strip 63 and the brush 59, rather than to attach the circuit from the car-lamp directly to brush 60; but the construction shown may not be necessary in all cases. The car-signal is therefore in circuit with a brush—in this instance brush 60—on the series of contacts 34 to 38. In the present embodiment this brush 60 is a separate brush from any one of the brushes 53, 50, 55, or 57, and this is the construction we prefer; but it will be observed (see Fig. 7) that when these brushes are in the position shown in that figure the brush 60 rests upon the same plate as the brush 50, and at that time said two brushes 50 and 60 are, in effect, a single brush. The construction we have illustrated is, however, much preferable, as by it we avoid the necessity of using any moving wires connected with the movable brushes. In order to light up the car-light only a floor or so before the car reaches the floor, we have located said brushes 59 and 60 behind the brushes 53 54 and 50 51, so that the floor-light will be lighted up before the car-light is lighted. We have also provided another pair of brushes 61 62, so that the car-light may be lighted up slightly more than one floor away from the floor at which the car is to stop. We have also provided a series of restoring mechanisms for automatically restoring the circuits to normal condition after the car has passed by, in this instance raising the mercury-pot arm out of the mercury. Such a series of restoring mechanisms is shown by the restoring-magnets 64, 65, 49, 66, and 67, which are all the same as magnet 49 of Fig. 2. It will be observed that, for example, restoring-magnet 49 (see Fig. 2) when energized will raise the lever 45 and drop the right end of the same underneath the end of armature 48, where it will be held until the setting-magnet 46 is again energized. In order to energize the restoring-magnets at the proper time, we have provided a series of contacts 68 to 72 upon the commutator and a brush 73 suitably connected to the battery 47, in this instance by being electrically connected to a brush 74, rubbing over contact-strip 75, so that when the car starts to move away from the floor on which the signal has been given brush 73 will engage contact 70 and energize magnet 49 to break the signal-circuit at the mercury-pot.

The brushes at the upper right side of Fig. 1 have been shown in the relative positions they occupy as illustrated in Fig. 3. These brushes are for giving the signals with reference to a down-moving car, and practically the entire part of the commutator and setting and restoring mechanisms shown at the right of said figure are for a down-moving car. The corresponding parts at the upper left-hand corner of said figure are for an upwardly-moving car and are substantially the same, except, of course, being suitably arranged in the reverse order. It will be obseved that the brushes 76 to 83 are all in such a position that they will contact with tne series 96 to 101, the brushes 84 to 87 with the strips 102 and 103, and the brushes 88 and 89 with strip 104. This is the position of said brushes 76 to 89 when the car is moving downwardly, and it will be obvious that with such brushes resting upon said strips no "up" signals can be given for that shaft. When the car moves upwardly, the brushes 76 to 89 are shifted into a position corresponding to that of the other brushes—that is, so as to make connection between the plates 91 and 97, for example, and the brushes 84 to 87 to make connection between plate 97 and the strip 102, and the brushes 88 and 89 to contact with strip 104 and the restoring-contacts 105 to 109, so as to operate the ub signals and the signal in the car and the up restoring-magnets 110 to 114. This shifting of the brushes will be referred to hereinafter. 118 to 122 represent a set of setting-magnets for the up side. The system is therefore provided with means for controlling the signals when the car is moving up substantially the same as those heretofore described for use when the car is moving down. 123 is a suitable resistance.

Referring now to the other figures of the drawings, the commutator may be provided with a frame which, in the present embodiment, has a base 124, provided with U-shaped end pieces 125 and 126, tied together by suitable cross-rods 127, which may be adjusted by the nuts, as indicated. Upon the frame are mounted suitable supports for the contact-plates, in the present embodiment consisting of two bases of slate or other suitable insulating material, provided with longitudinal slots 128, 129, and 130. These slots are preferably formed by making the supports out of separate strips 131 to 134 of slate. (See Fig. 9.) These slate strips are mounted in the frame, as indicated in Fig. 10, and are slidable therein and removable by loosening the screws, such as 135 and 136. Each side of the commutator is provided with a similar slate contact-bearing support, as shown in Fig. 7. The contact-plates shown in Fig. 1 are mounted upon these supports so that the faces are arranged in two substantially vertical planes separated from each other, this being much preferable to locating the lines of contacts with their faces in horizontal plane, as dirt and dust will not collect upon the same so easily and there will be practically no danger of short-circuiting by reason of anything dropping upon them. It also has numerous other advantages. The brushes are arranged as shown in Fig. 7, so that they are located between said planes and bear on said plates. In order to move the brushes over the plates, we have, in the present embodiment, provided a horizontal

screw-shaft 137, actuated by the overhead mechanism of the elevator, as is old in the art, and upon this shaft travels a nut 138, so as to move correspondingly with the movement of the car. Suitable friction-blocks 139 and 140, with a spring 141 pressing upon them, may be provided, if desired.

In the embodiment shown we have located the series of plates over the slots in the slate support and provided each of the plates of the series with a removable fastening means passing through its slot, whereby the plates may be independently adjusted longitudinally of the slot. Such a construction is seen in Figs. 3 and 7, in which the series 28 to 32 is located over the slot 129. We prefer to provide each plate with a rib, such as indicated at 142 in Fig. 7, which forms a key on the rear of the same fitting the slot and which will accurately aline all the plates of that series. The removable fastening means for the plate 30 is, in this embodiment, a threaded shank 143 and nuts 144, which may obviously constitute a binding-post for the wires by which electrical connection is made. By this construction not only can the series be assembled quickly, but the positions of the plates may be easily and quickly adjusted to meet the requirements of service.

Fixed to the traveling nut 138 are four arms, those to the right of the nut 138 in Fig. 7 being indicated at 145 and 146 in Fig. 3. Pivoted to each pair of arms is a brush-carrier, one, 148, being shown enlarged in Figs. 4 and 5, there being a brush-carrier for each side of the commutator, as shown in Fig. 7, and each carrier is pivoted to the arms by suitable bolts, as indicated in Fig. 3, so that the same may rock or swing on an axis substantially parallel to the series of contact-plates. The brush-carrier 148 is, in the present instance, provided with a plurality of brush-holders mounted thereon and means whereby the same may be adjusted on said carrier longitudinally of the series of contact-plates. In the present instance these brush-holders are adjustable independently of each other. As seen in Fig. 4, the brush-holders 149 and 150 for the car-light brushes and also brush-holder 151 for the restoring or set-back brushes 73 and 74 are mounted on a rod 152 and insulated therefrom. They are slidable upon this rod and also slidable upon and insulated from rod 153, which latter rod constitutes a means for preventing the rocking of said holders. It will be observed also that brush-holders 154 to 157 are also slidable upon two rods 158 and 159 for the same purpose, as above stated. The holders are preferably made of brass or other conductor of electricity, and therefore constitute an electrical connection between the brushes of any one pair. The brushes themselves are preferably slidable in the holders and may consist of merely round sections of brass rod, as indicated. We prefer to provide a resilient pressure upon most of the brushes for a purpose to be hereinafter specified, and in the present instance we have provided for most of the pairs of brushes a slotted yoke 160, (see Figs. 5 and 6,) forced against the brushes by a spring 161. We prefer to have all the brushes on one side of the pivot of brush-carrier 148 spring-pressed against the contact-strips, so that the brush 74, which in this instance is fixed in place, will not be forced against its contact-strip, so as to dig into the same. It will be observed by reference to Figs. 3 and 4 that all the brushes below the pivot-line *e e* of Fig. 4 are slidable and spring-pressed.

The mechanical operation of the embodiment of the commutator shown in the drawings is as follows: As the elevator moves downwardly with the parts in position shown in Figs. 3 and 7 the brushes on the brush-carrier at the right of Fig. 7 make contact with the different contact-strips, as shown, the brushes on the brush-carrier at the left resting upon the strips indicated in Fig. 7 and also indicated at the upper left side of Fig. 1, the brushes on brush-carrier 148 making the proper connections between the different contact-plates at the proper times. The nut 138 has an extension 162 therefrom, which has a foot 163 (see Fig. 11) at the bottom of the same resting in a guideway formed by rails 164 and 165, which guideway determines the extent to which said nut may be rocked in either direction. Running through the center of the guideway is a rib 166, having springs 167 and 168 thereon for preventing the rocking of the nut and consequent displacement of the brushes if the car, for example, runs a short way past a floor and then returns to it. It will be obvious that as the car and commutator reaches the end of its travel the springs will cause the nut to be rocked in the opposite direction when the car travels in the opposite direction. This rib 166 and the springs 167 and 168 are, however, only an additional feature which is not necessary, for the friction of the nut 138 will usually be amply sufficient to cause the rocking of the nut as the elevator-car reverses its movement; but we prefer to use some such positive shifting means, as indicated. When the commutator-brushes reach the end of their travel to the right and the car reverses its movement, the nut will be rocked to the left in Fig. 7, which will shift the brush-carrier 148 upward, so that the brushes will rest in the position corresponding to those of the brushes on carrier 169, and will consequently make the brushes on the carrier at the left operative to give the proper signals for an upwardly-moving car and make the brushes on carrier 148 substantially inoperative, because then the

brushes 59 to 61 will all four rest on plate 170 of Fig. 1 and the brushes 50 to 58 rest on and travel over the series 34 to 39 only, and brushes 73 and 74 will both rest on long contact-strips 75. Brushes 76 to 83 will then travel over and make electrical connection between strips 90 to 95 and 96 to 101, and brushes 84 to 87 will then travel over and make electrical connection between strip 102 and said series 96 to 101, and brushes 88 and 89 will travel over the contacts 105 to 109 and strip 104. It will be observed that this shifting of the brush-carriers will carry some of the brushes off from the strips over which they formerly moved, and as the adjacent strips are close together and the brushes are rounded at their ends and resiliently pressed toward the contacts they will easily slide across to their new position. It is of a distinct advantage that all the brushes shall be at all times in contact with some contact plates or strips, for in that way the accumulation of dirt or grease upon the contact-plates is avoided. It will also be observed that the pressure of the brushes against the contact-plates is not dependent upon the friction between nut 138 and the screw-shaft, because the brush-carriers are pivoted to the arms which support them, and consequently no matter how great the friction between the nut and shaft is it will not cause fixed brush 74, for example, to dig into the strip over which it moves, the pressure of this brush 74 upon its strip being entirely dependent upon the strength of the springs which press upon the brushes located below the pivot on which the carrier swings. As the brush-carrier is pivoted to the arms extending from the nut, the strength of the springs which press upon the brushes will not react upon the nut—that is, they will not oppose the rocking of the nut—which is an advantage over the construction illustrated in our previous patent, No. 634,220.

It will be observed that in the construction of commutator shown the slate contact-bearing supports are separated from base 124 a distance so that an opening along said base is formed between the base and each contact-bearing support. As seen in Fig. 7 and also in Fig. 3 there is quite a space left between the base and the lower slate strip 134, and in Fig. 7 there is also a space left between the base and the lower slate strip 172. Longitudinal openings are in this way formed, so that the mechanic may insert his hand to easily remove the lower brushes, if desired.

In Fig. 3 we have illustrated an arrangement of contact-plates, some of which are separated by "dead-plates," such dead-plates being illustrated, for example, at 173 and which have not been illustrated in Fig. 1 because they form no part of the electrical features.

174 is a normally closed "transfer-button" or switch in the car by which the operator may open the restoring-magnet circuit and thus prevent the restoring-magnet from opening the signal-circuit at the mercury-pot. Such a construction is of particular advantage where several elevators are present and is claimed in our previous patent, No. 634,220.

It will be obvious that our construction claimed has many points of advantage not specifically mentioned above, and we are aware that many variations from the construction illustrated may be made without departing from the spirit of our invention as claimed. We therefore do not intend to limit ourselves to the embodiment shown in the drawings.

What we claim is—

1. In a signaling device for elevators in combination, a source of electricity, an electrically-controlled signal carried by the elevator-car, electrically-controlled signals located along the elevator-shaft, one at each floor, a commutator adapted to determine the time when said signals shall be operated and in part comprising two series of contact-plates; each of said floors being served by one of said floor-signals, a plate of one of said series connected therewith, and a plate of said other series connected to the source of supply through a switch controlled by hand-operated mechanism located at said floor; said commutator also comprising two brushes one for each series of plates and relatively movable over the same, said brushes being electrically connected whereby electrical connection is made between a plate of each series and said floor-signal is operated, said car-signal being in circuit with a third brush on one of said series and connected to the source of supply in parallel with said floor-light.

2. In a signaling device for elevators in combination, a source of electricity, an electrically-controlled signal carried by the elevator-car, electrically-controlled signals located along the elevator-shaft, one at each floor, a commutator adapted to determine the time when said signals shall be operated and in part comprising two series of contact-plates; each of said floors being served by one of said floor-signals, a plate of one of said series connected therewith, and a plate of said other series connected to the source of supply through a switch controlled by hand-operated mechanism located at said floor; said commutator also comprising three brushes contacting with said two series of plates and relatively movable over the same, two of said brushes being electrically connected, one for each series of plates, whereby electrical connection is made between a plate of each series, the third of said brushes being in circuit with said signal carried by the car.

3. In a signaling device for elevators in combination, a source of electricity, an electrically-controlled signal carried by the ele-

vator-car, electrically-controlled signals located along the elevator-shaft, one at each floor, a commutator adapted to determine the time when said signals shall be operated and in part comprising two series of contact-plates; each of said floors being served by one of said floor-signals, a plate of one of said series connected therewith, and a plate of said other series connected to the source of supply through a switch controlled by hand-operated mechanism located at said floor; said commutator also comprising three brushes contacting with said two series of plates and relatively movable over the same, two of said brushes being electrically connected, one for each series of plates, whereby electrical connection is made between a plate of each series, the third of said brushes being in circuit with said signal carried by the car and located behind said other brushes whereby said car-signal is operated after said floor-signal.

4. In a signaling device for elevators in combination, a source of electricity, an electrically-controlled signal carried by the elevator-car, electric lamps located along the elevator-shaft, one at each floor, a commutator adapted to determine the time when said lamps shall be lighted and in part comprising two series of contact-plates, each of said floors being served by one of said floor-lamps, a plate of one of said series connected therewith and a plate of said other series connected to the source of supply through a switch controlled by hand-operated mechanism located at said floor; said commutator also comprising three brushes contacting with said two series of plates and relatively movable over the same, two of said brushes being electrically connected, one for each series of plates, whereby electrical connection is made between a plate of each series, the third of said brushes being in circuit with said signal carried by the car.

5. In a signaling device for elevators in combination, a source of electricity, an electrically-controlled signal carried by the elevator-car, electrically-controlled signals located along the elevator-shaft, one at each floor, a commutator adapted to determine the time when said signals shall be operated and in part comprising two series of contact-plates; each of said floors being served by one of said floor-signals, a plate of one of said series connected therewith, and a plate of said other series connected to the source of supply through a switch controlled by hand-operated mechanism located at said floor; said commutator also comprising three brushes contacting with said two series of plates and relatively movable over the same, two of said brushes being electrically connected, one for each series of plates, whereby electrical connection is made between a plate of each series, the third of said brushes being in circuit with said signal carried by the car, said third brush and one of said other brushes being carried by a rigid connection between them.

6. In a commutator in combination, a plurality of series of contact-plates, the faces of which are arranged in two substantially vertical planes separated from each other, one or more brushes for each series located between said planes and bearing on said plates, and means to move said brushes over said plates.

7. In a signaling device for elevators in combination, two series of contact-plates, the faces of which are arranged in two substantially vertical planes separated from each other, one or more brushes for each series located between said planes and bearing on said plates, and means to move said brushes over said plates, an elevator-car, an electrically-controlled signal carried by said car, one of said series controlling the time of operation of said signal when said car moves in one direction and the other series controlling said signal when said car moves in the opposite direction.

8. In a commutator in combination, a plurality of series of contact-plates, the faces of which are arranged in two substantially vertical planes separated from each other, one or more brushes for each series located between said planes and bearing on said plates, and a screw-shaft and nut thereon carrying said brushes and adapted to move said brushes over said plates.

9. In a commutator in combination, a plurality of series of contact-plates, the faces of which are arranged in two substantially vertical planes separated from each other, one or more brushes for each series located between said planes and bearing on said plates, and a horizontal screw-shaft and nut thereon carrying said brushes and adapted to move said brushes over said plates.

10. In a commutator in combination, a plurality of series of contact-plates, the faces of which are arranged in two substantially vertical planes separated from each other, one or more brushes for each series located between said planes and bearing on said plates, and a screw-shaft and nut thereon carrying said brushes and adapted to move said brushes over said plates, there being on each side of said nut and pivoted thereon a holder for the brush of one of said series of plates.

11. In a commutator in combination, a frame having a base, two contact bearing-supports separated from said base whereby an opening along said base is formed between said base and each contact bearing-support, contact-strips on each of said supports arranged at an angle to said base, and suitable brushes and means to move the same over said contact-strips.

12. In a commutator in combination, a

frame having a base, two contact bearing-supports separated from said base whereby an opening along said base is formed between said base and each contact bearing-support, contact-strips on each of said supports arranged in two substantially vertical planes, and suitable brushes between said planes and means to move the same over said contact-strips.

13. In a commutator in combination, a frame having a base, a contact-bearing support of insulating material running longitudinally and separated from said base whereby an opening along said base is formed between said base and said support, said support having its contact-bearing face substantially vertical, a plurality of contact-strips running longitudinally of said support and suitable brushes and means to move the same over said strips.

14. In a commutator in combination, a frame provided with a contact-bearing support of insulating material having a longitudinal slot therein, and a series of independent contact-plates on said support, said series being located over said slot, each of the plates of said series being provided with a removable fastening means passing through its slot, whereby the plates of that series may be independently adjusted longitudinally of said slot, one or more brushes for said series of plates and means to automatically move the same over said series.

15. In a commutator in combination, a frame provided with a contact-bearing support of insulating material having a longitudinal slot therein, and a series of independent contact-plates on said support, said series being located over said slot, each of the plates of said series being provided with a removable fastening means passing through its slot whereby the plates of that series may be independently adjusted longitudinally of said slot, one or more brushes for said series of plates and means to automatically move the same over said series, some of said plates having a key on the rear of the same adapted to fit its slot.

16. In a commutator in combination, a frame provided with a contact-bearing support of insulating material having a longitudinal slot therein, and a series of independent contact-plates on said support, said series being located over said slot, each of the plates of said series being provided with a removable fastening means passing through its slot and constituting a binding-post, whereby the plates of that series may be independently adjusted longitudinally of said slot, one or more brushes for said series of plates and means to automatically move the same over said series.

17. In a commutator in combination, a contact-bearing support comprising independently-removable strips of insulating material separated slightly from each other to form longitudinal slots, and a series of independent contact-plates located over each slot and each provided with means passing through its slot and adapted to adjustably fasten said plate to said support.

18. In a commutator in combination, a contact-bearing support comprising independently-removable strips of insulating material separated slightly from each other to form longitudinal slots, and a series of independent contact-plates located over each slot and each provided with means passing through its slot and adapted to adjustably fasten said plate to said support, said strips being longitudinally slidable in said frame.

19. In a signaling device for elevators in combination, an elevator-car and an electrically-operated signal carried thereby, an electrically-operated signal at each floor, two series of contacts, one series for the car-signal and the other for said floor-signals, a brush-carrier and means for moving said carrier over said series, said carrier having one or more brush-holders for each series, and means whereby said brush-holders may be adjusted on said carrier longitudinally of said series.

20. In a commutator in combination, a plurality of contact-strips, a brush-carrier, and means for moving said carrier over said strips, said carrier having a plurality of brush-holders, and means whereby each brush-holder may be independently adjusted on said carrier longitudinally of said strips, said carrier being pivoted to swing on an axis substantially parallel to said strips.

21. In a commutator in combination, a plurality of contact-strips, a brush-carrier, and means for moving said carrier over said strips, said carrier having a plurality of brush-holders, and means whereby each brush-holder may be independently adjusted on said carrier longitudinally of said strips, said carrier being pivoted to said means which moves it so as to swing on an axis substantially parallel to said strips, said carrier having one or more of said brushes on each side of said pivot.

22. In a commutator in combination, a plurality of contact-strips, a brush-carrier, and means for moving said carrier over said strips, said carrier having one or more brush-holders, said brush-holders having two brushes movable toward and away from said strips, a yoke resting on said brushes and a spring pressing said yoke against said brushes.

23. In a commutator in combination, a plurality of contact-strips, a brush-carrier, and means for moving said carrier over said strips, said carrier having a plurality of brush-holders, said carrier being pivoted to said means which moves it so as to swing on an axis substantially parallel to said strips, said carrier having one or more of said brushes on

each side of said pivot and all the brushes on one side of said pivot being resiliently pressed toward said strips.

24. In a commutator for elevators in combination, a plurality of contact-strips, a brush-carrier and means for moving the same over said strips, said carrier comprising a rod running substantially parallel with said strips and provided with a brush-holder adjustable longitudinally on said rod.

25. In a commutator for elevators in combination, a plurality of contact-strips, a brush-carrier and means for moving the same over said strips, said carrier comprising a rod running substantially parallel with said strips and provided with a brush-holder adjustable longitudinally on said rod, and means for preventing the rocking of said holder on said rod.

26. In a commutator for elevators in combination, a plurality of contact-strips, a brush-carrier and means for moving the same over said strips, said carrier comprising a rod running substantially parallel with said strips and provided with a brush-holder adjustable longitudinally on said rod, and means for preventing the rocking of said holder on said rod comprising a second rod on which said holder is also adjustable.

27. In a commutator for elevators in combination, a plurality of contact-strips, a brush-carrier and means for moving the same over said strips, said carrier comprising a rod running substantially parallel with said strips and provided with a brush-holder adjustable longitudinally on said rod, said carrier being pivoted between its point of support and said strips so as to swing on an axis substantially parallel with said strips.

28. In an elevator-commutator in combination, a plurality of contact-strips, a brush-carrier and means for moving the same over said strips correspondingly to the movement of the elevator-car and comprising a screw-shaft and nut, said carrier being pivoted to swing on an axis at one side of said shaft and substantially parallel to said strips, and one or more brushes on said carrier at each side of said pivot, said brushes being spring-pressed against said strips.

29. In an elevator-commutator in combination, a plurality of contact-strips, a brush-carrier and means for moving the same over said strips correspondingly to the movement of the elevator-car and comprising a screw-shaft and nut, said carrier being pivoted to swing on an axis substantially parallel to said strips, and one or more brushes on said carrier at each side of said pivot, all of the brushes at one side of said pivot being spring-pressed toward said strips.

30. In a commutator in combination, a pair of contact-strips, one of said strips comprising a series of insulated plates, a brush for each strip, an electric connection between said brushes, said brushes being movable longitudinally over said strips correspondingly to the movement of the elevator-car, and means for also moving one of said brushes transversely off from its strip, said brush being mounted to move toward and away from its strip, and means resiliently pressing said brush toward said strip.

31. In an elevator-commutator in combination, a pair of contact-strips, one of said strips comprising a series of insulated contacts, a brush resting on each strip, an electric connection between said brushes, said brushes being adapted to be moved longitudinally over said strips correspondingly to the movement of the elevator-car, and means for automatically moving one brush transversely off from its strip onto said other strip so that both brushes rest on the same strip.

32. In an elevator-commutator in combination, a pair of contact-strips, one of said strips comprising a series of insulated contacts and the other a continuous strip, a brush resting on each strip, an electric connection between said brushes, said brushes being adapted to be moved longitudinally over said strips correspondingly to the movement of the elevator-car, and means for automatically moving one brush transversely off from its strip onto said continuous strip so that both brushes rest on said continuous strip.

33. In an elevator-commutator in combination, a pair of contact-strips, one of said strips comprising a series of insulated contacts, a brush resting on each strip, an electric connection between said brushes, said brushes being adapted to be moved longitudinally over said strips correspondingly to the movement of the elevator-car, and means for automatically moving one brush transversely off from its strip onto said other strip so that both brushes rest on the same strip, said transversely-moved brush being movable toward and away from its strip and provided with a spring pressing the same toward its strip.

34. In an elevator-commutator in combination, a frame, a screw-shaft carried by said frame and a nut on said shaft, a contact-bearing support on each side of said shaft, each support carrying a plurality of contact-strips, a brush-carrier on each side of said nut and moved thereby longitudinally over said strips, a plurality of brushes on each carrier, at least one for each strip, each of said carriers being pivoted to said nut on an axis substantially parallel with said strips.

35. In a signaling device for elevators in combination, an electrically-operated signal carried by the car, a switch in said car-signal circuit controlled by hand-operated mechanism, a series of restoring mechanisms for automatically restoring the circuit for said car-signal to normal condition, a commutator-

frame, a screw-shaft carried by said frame and a nut on said shaft, a contact-bearing support on each side of said shaft, each support carrying a series of contacts for the car-signal and a series of contacts for the restoring mechanisms, a brush-carrier on each side of said nut and moved thereby longitudinally over said two series, a plurality of brushes on each carrier, at least one for each series, each of said carriers being pivoted to said nut on an axis substantially parallel with said series.

36. In an elevator-signaling apparatus in combination, an electrically-operated signal carried by the car, an electrically-operated signal at each floor, each signal being in part controlled by hand-operated mechanism located at a floor, a series of restoring mechanisms adapted to restore the circuits for said signals to normal condition, a frame, a screw-shaft carried by said frame and a nut on said shaft, a contact-bearing support on each side of said shaft, said support carrying a series of contacts for the car-signal, a series of contacts for said restoring mechanisms, and a series of contacts for said floor-signals, a brush-carrier on each side of said nut and moved thereby longitudinally over said series of contacts, a plurality of brushes on each carrier, at least one for each series, each of said carriers being pivoted to said nut on an axis substantlally parallel with said strips.

37. In a commutator for elevators in combination, a plurality of contact-strips, a screw-shaft and traveling nut thereon, a brush for each strip carried by said nut, said brushes being spring-pressed into contact with said strips, said nut being adapted to be rocked on said shaft, an extension from said nut and a guide engaging said extension and adapted to determine the extent to which said nut may be rocked in either direction.

38. In a commutator for elevators in combination, a plurality of contact-strips, a screw-shaft and traveling nut thereon, a brush for each strip carried by said nut, said brushes being spring-pressed into contact with said strips and carried on a brush-carrier pivotally connected with said nut, said nut being adapted to be rocked on said shaft, an extension from said nut and a guide engaging said extension and adapted to determine the extent to which said nut may be rocked in either direction.

39. In an elevator-commutator in combination, a frame comprising a pair of substantially vertically-arranged contact-supports made out of insulating material, a screw-shaft between the same, a nut thereon, a plurality of series of contact-plates on the inner face of each of said supports and arranged longitudinally of said shaft, a brush-carrier on each side of said shaft and pivotally connected with said nut to swing on an axis substantially parallel to said shaft, each of said carriers having a brush for each of said series of contacts adjacent to it, said brushes being independently adjustable on said carrier longitudinally of said screw-shaft.

40. In an elevator-commutator in combination, a frame comprising a pair of substantially vertically-arranged contact-supports made out of insulating material, a screw-shaft between the same, a nut thereon, a plurality of series of contact-plates on the inner face of each of said supports and arranged longitudinally of said shaft, a brush-carrier on each side of said shaft and pivotally connected with said nut to swing on an axis substantially parallel to said shaft, each of said carriers having a brush for each of said series of contacts adjacent to it, said brushes being independently adjustable on said carrier longitudinally of said screw-shaft, said nut being adapted to rock on said shaft whereby some of the brushes of one of said brush-carriers are moved transversely off from the series of contacts upon which they rest.

Dated this 22d day of April, 1905.

JAMES B. SMALLEY.
CHARLES A. REINERS.

Witnesses to Smalley:
E. WYLDE,
D. M. BRENT.

Witnesses to Reiners:
EMERSON R. NEWELL,
BEATRICE MIRVIS.