No. 649,661. Patented May 15, 1900.

F. K. FASSETT.

ELECTRIC SIGNALING APPARATUS.

(Application filed July 10, 1899.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

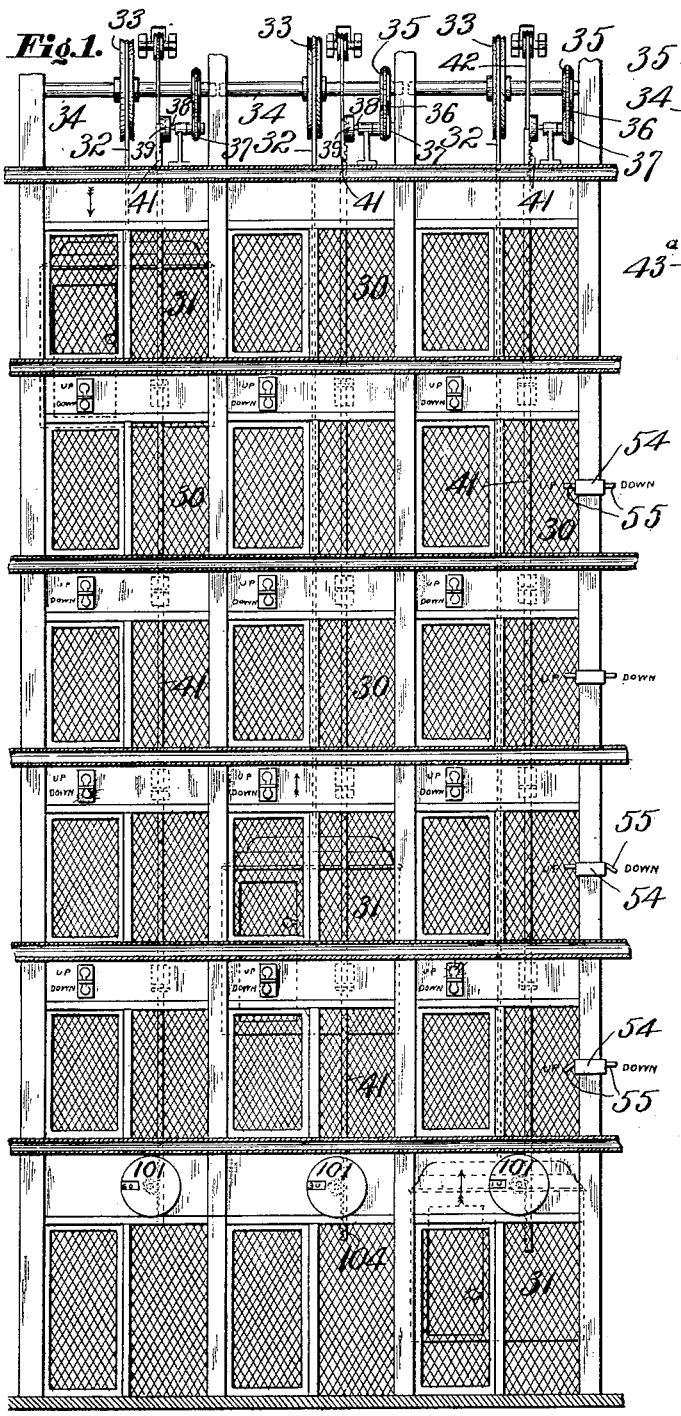
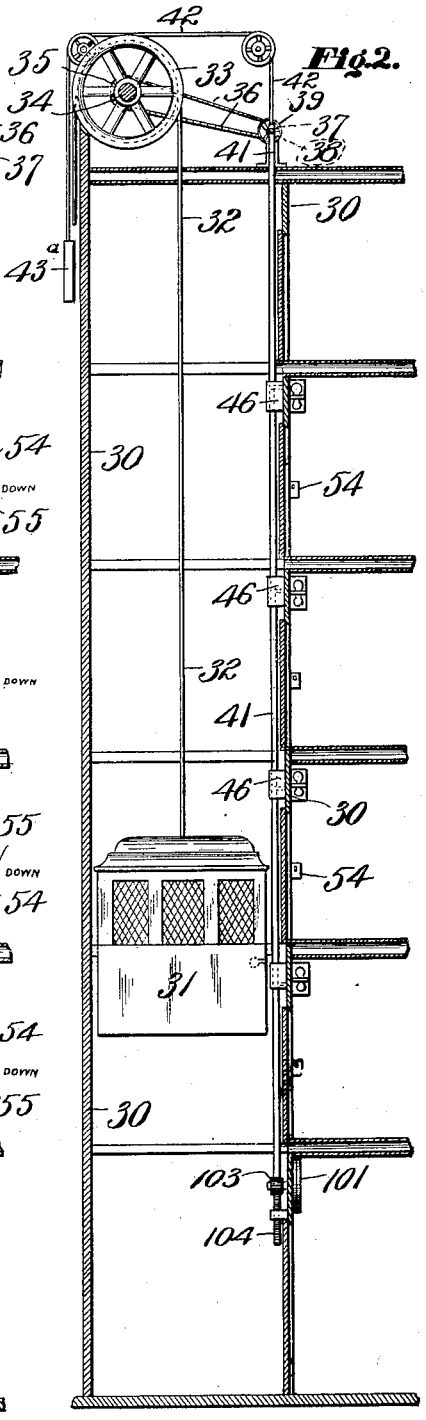


Fig. 2.



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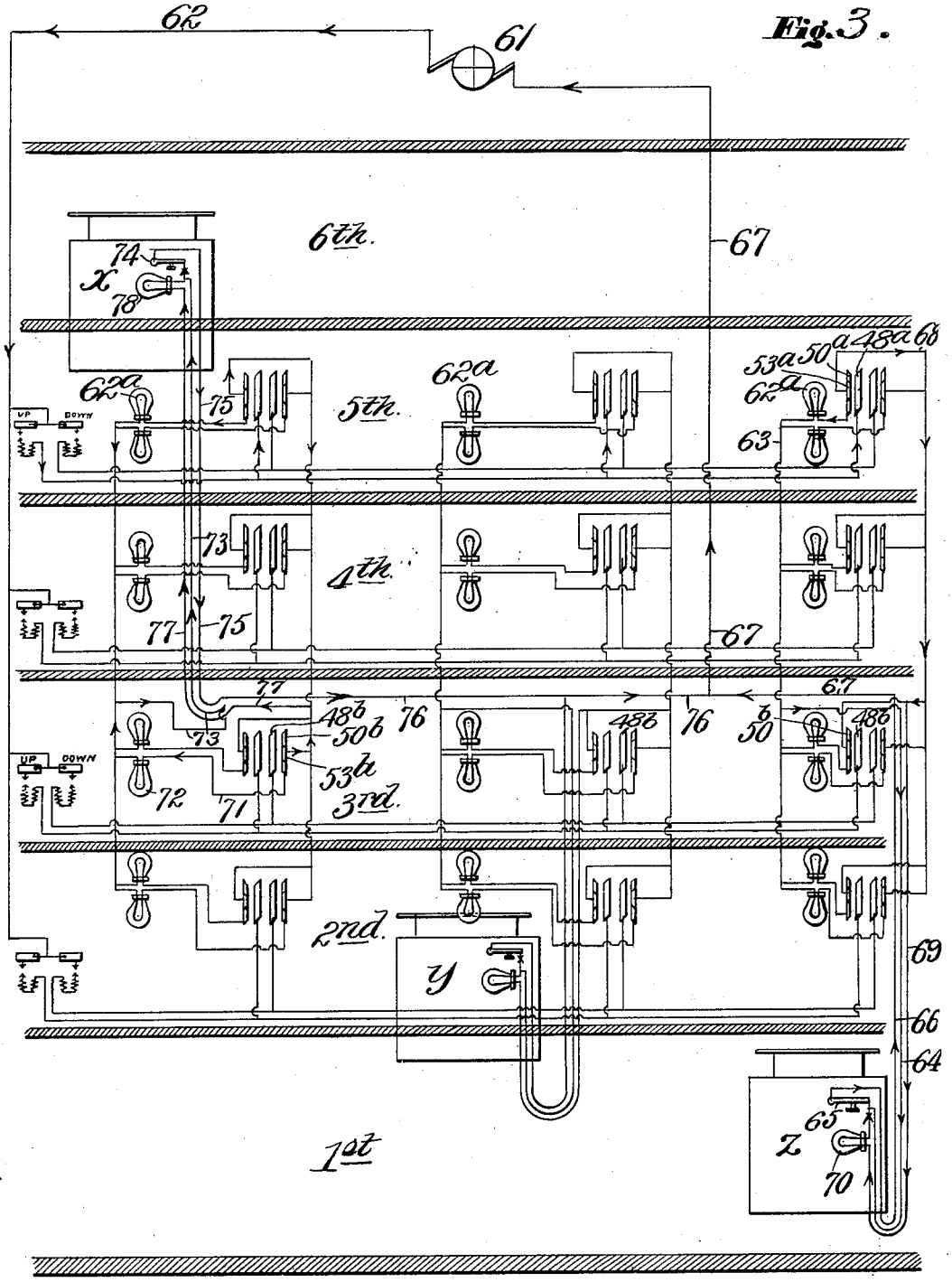
ELECTRIC SIGNALING APPARATUS.

(Application filed July 10, 1899.)

(No Model.) 5 Sheets—Sheet 2.

Fig. 3.



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ELECTRIC SIGNALING APPARATUS.

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(No Model.) 5 Sheets—Sheet 3.

Fig. 4.

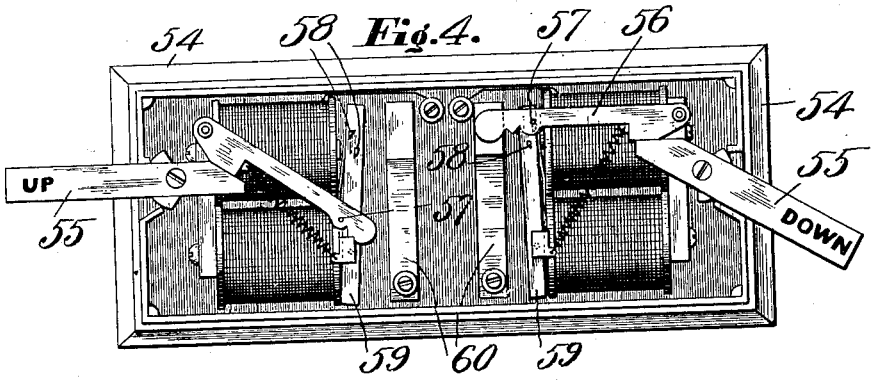


Fig. 5.

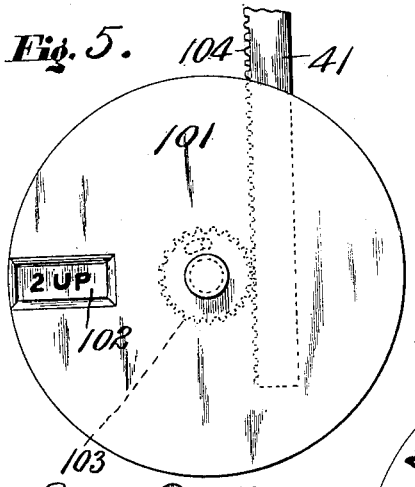


Fig. 7.

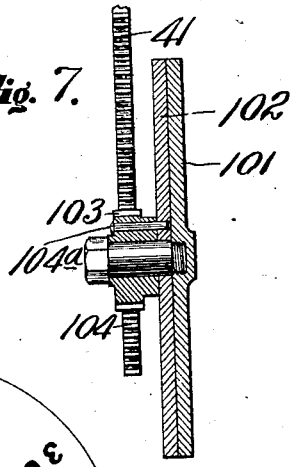


Fig. 6.

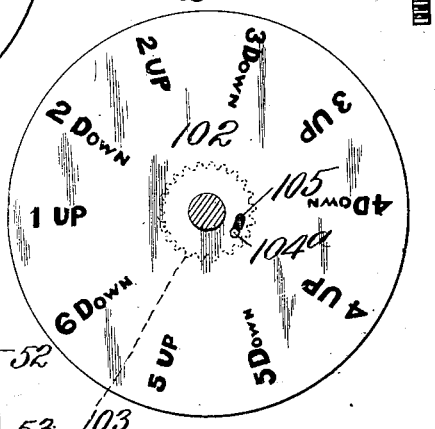
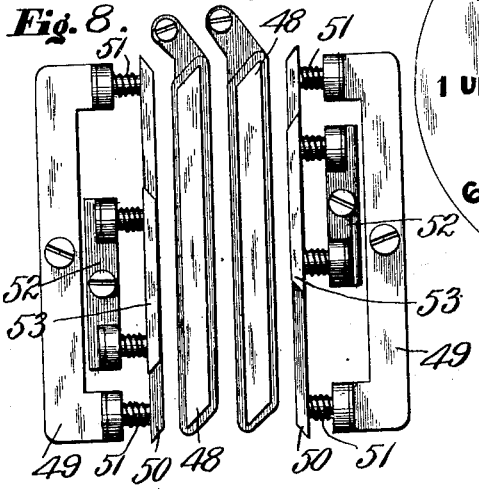


Fig. 8.



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(Application filed July 10, 1899.)

(No Model.) 5 Sheets—Sheet 4.

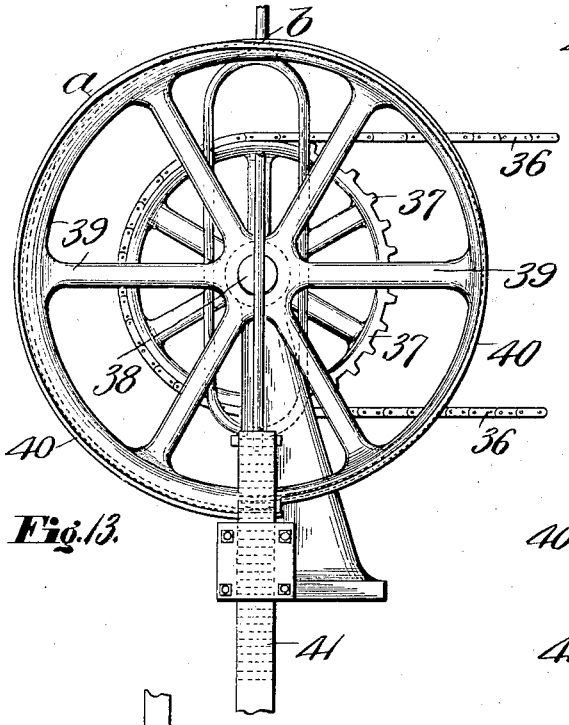

Fig. 13.

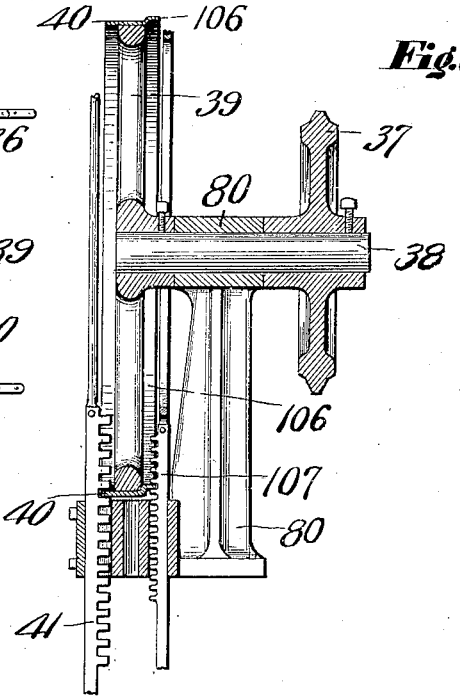

Fig. 14.

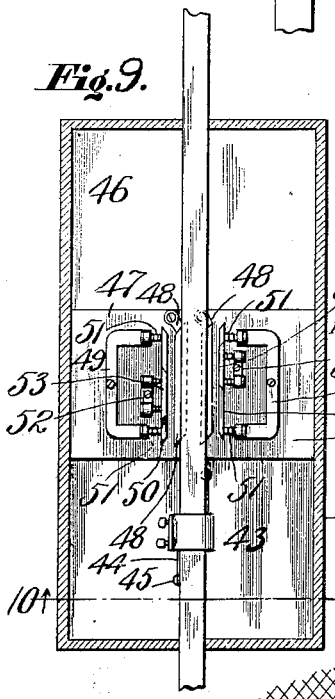

Fig. 9.

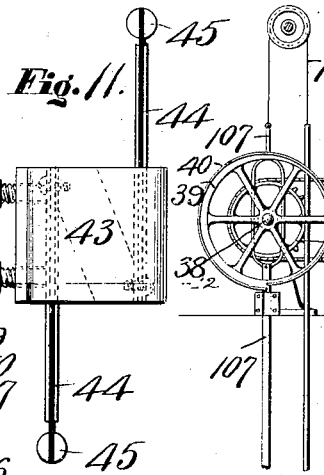

Fig. 11.

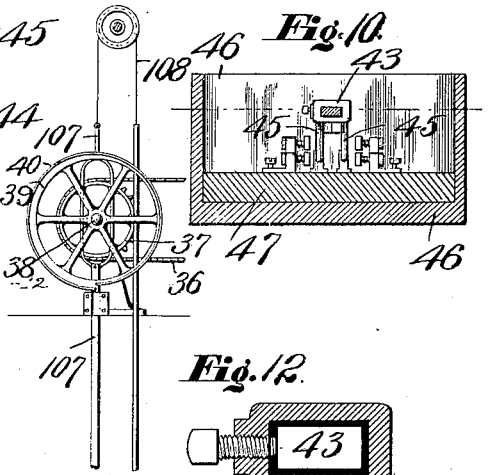

Fig. 10.

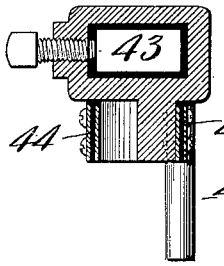

Fig. 12.

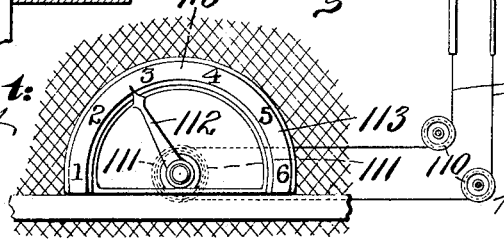

Fig. 21.

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ELECTRIC SIGNALING APPARATUS.

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(No Model.) 5 Sheets—Sheet 5.

Fig. 15.

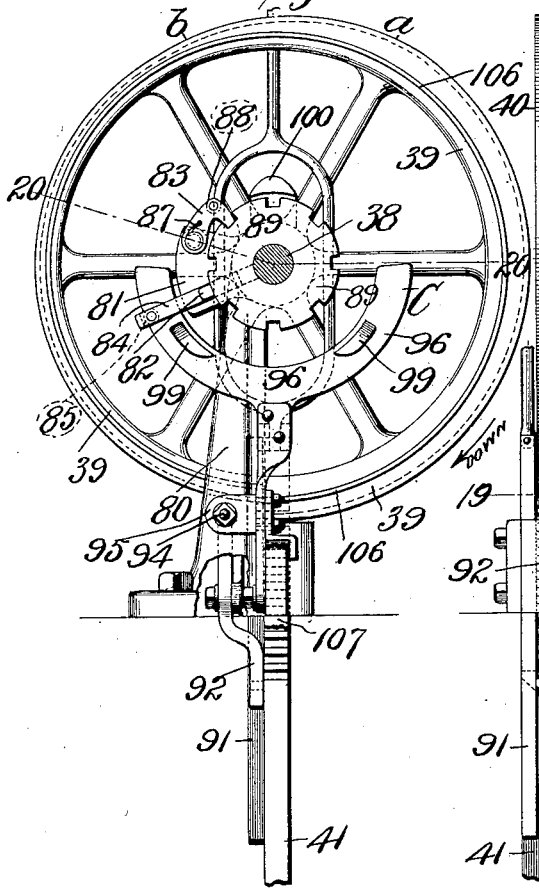


Fig. 16.

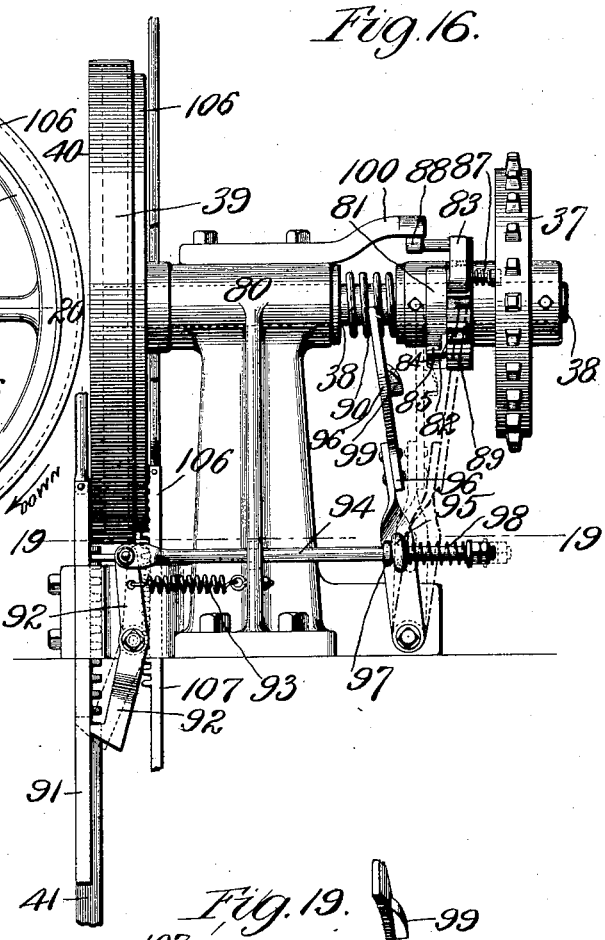


Fig. 17.

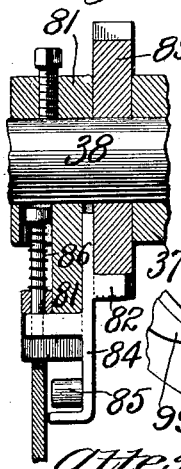


Fig. 18.

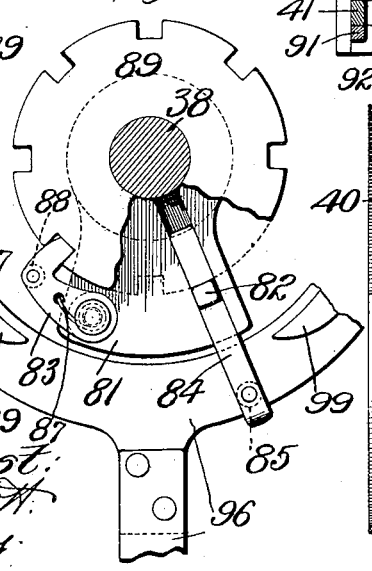


Fig. 19.

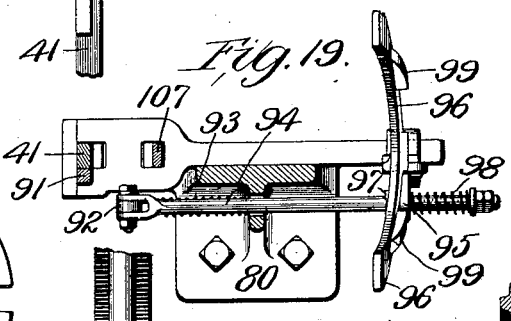
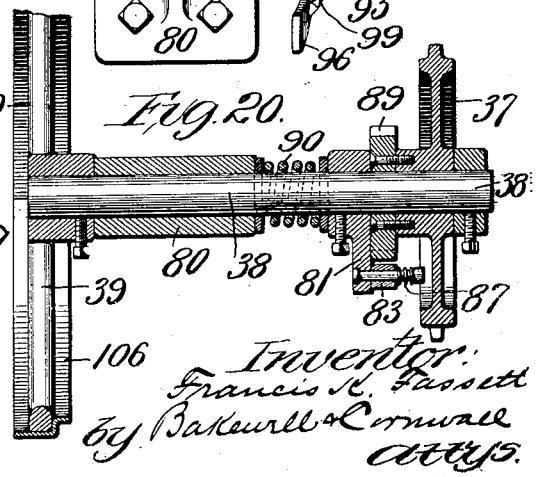


Fig. 20.



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UNITED STATES PATENT OFFICE.

FRANCIS K. FASSETT, OF ST. LOUIS, MISSOURI, ASSIGNOR TO LEO EHRLICH, OF SAME PLACE.

ELECTRIC SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 649,661, dated May 15, 1900.

Application filed July 10, 1899. Serial No. 723,357. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS K. FASSETT, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Electric Signaling Apparatus, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional view through several floors of a building, illustrating the elevator-shaft casing and my improvements attached thereto. Fig. 2 is a sectional view through the elevator-shaft, showing one of the elevators therein. Fig. 3 is a conventional illustration of the system of electric connections employed in my improved signaling and indicating apparatus. Fig. 4 is a detail view of one of the switches employed for cutting in the signaling and indicating circuits for the floor on which said switch is located. Fig. 5 is a detail view of the indicator designed to be arranged on the first floor of a building, indicating the position of any elevator of a group and the direction in which the same is traveling. Fig. 6 is a detail view of the dial employed in said indicator. Fig. 7 is a sectional view through said indicator, showing the manner of operating the same. Fig. 8 is a view illustrating the several parts constituting the contact devices, which devices are arranged in juxtaposition to a vertically-movable rod carrying a brush, whereby contact is made for the signaling and indicating circuits for the various floors of the building. Fig. 9 is a detail view showing the manner of mounting these contacts and their relation to a movable contact making and breaking device actuated by the power mechanism for the elevator-car. Fig. 10 is a cross-sectional view on line 10 10, Fig. 9. Fig. 11 is a detail view, in front elevation, of the movable contact making and breaking devices coöperating with stationary contacts. Fig. 12 is a sectional view on line 12 12, Fig. 11. Fig. 13 is an enlarged view showing the manner of actuating the rod on which the movable contacts are arranged. Fig. 14 is a vertical sectional view through the same. Fig. 15 is a rear elevational view of an automatic resetting mechanism employed in connection with the contact-carrying rod for taking up or compensating for the creep of the cables over the main sheaves or drums. Fig. 16 is a side elevational view showing said resetting mechanism. Fig. 17 is a detail sectional view illustrating the manner of mounting the main pawl in said resetting mechanism. Fig. 18 is a detail view showing the pawls and pawl-carrying frame or arm. Fig. 19 is a sectional view on line 19 19, Fig. 16. Fig. 20 is a sectional view on line 20 20, Fig. 15; and Fig. 21 is a modified form of indicator-actuating mechanism.

This invention relates to a new and useful improvement in electric signaling apparatus for elevator-cars, the object being to provide a simple and effective system cheap in construction and positive in operation.

With these objects in view the invention consists in the system of circuits and their cooperating switches, whereby when the switch on any floor of a building equipped with my improved apparatus is set said switch will establish communication in a circuit which will be completed by the first car moving in the desired direction either up or down, which car or its power mechanism will complete a circuit including the signaling apparatus within the car and indicating apparatus or device on the floor corresponding to that on which the actuated switch is located.

The invention also consists in the novel construction of the contact making and breaking devices and their means of actuation.

Another feature of the invention resides in the novel resetting mechanism for taking up or compensating for the creep of the cables over the main sheave or drum at the top of the shaft, whereby the contact making and breaking devices are caused to bear a different relation to their coöperating parts, whereby the signal and indicating devices will be operated at the proper time by any of the cars which control the circuit.

In the drawings I have shown my improved apparatus and system as being arranged in position on and including six floors of a building; but it is obvious that a greater or less

number of floors may be equipped, if occasion demands. Furthermore, I have shown a group of three elevator-shafts arranged side by side, which number and arrangement of shafts have been arbitrarily selected for the purpose of illustrating my invention, and consequently I do not wish to be understood as confining myself to the same, as the shafts may be arranged on different sides of a building or in different groups and may be isolated or placed in proximity to each other, as is well understood.

In the drawings, 30 indicates the casing of an elevator-shaft, and 31 a car within said shaft, which is suspended by an ordinary cable 32, passing over a sheave 33, arranged in the top of the shaft, said sheave being suitably mounted on a driving-shaft 34, as is well understood.

I have not deemed it necessary to show any counterweights for the elevator-car nor any mechanism for raising or lowering the car, as the same exist in various forms, with any of which my system and apparatus may be employed.

35 indicates a sprocket-wheel mounted on the driven shaft 34, over which passes a chain 36, driving a sprocket 37, mounted on a counter-shaft 38, said counter-shaft being so speeded by reason of the diameters of the sprockets 34 and 37 that their ratio is preferably one to two. Shaft 38 carries a side-face worm-wheel 39 in its other end, which worm-wheel consists of a single spiral or working face 40, the ends of which overlap each other a short distance. The working face having the major diameter preferably continues concentric with the axis of rotation to a point marked *a*, between which and the point *b* it connects with the minor working face, which minor working face is concentric with the axis of rotation. These "working faces," as I have termed them, coöperate with the teeth of a rack-bar 41, arranged in suitable guides, and said rack-bar may have a joint or flexible connection 42 at its upper end passing over suitable pulleys or sheaves and provided with a counterweight 43^a at its opposite end, whereby the weight of the rack-bar is taken off of the worm-wheel 39. It will be seen from the above that the major and minor working faces hold the rack-bar stationary until the cam-face between the points *a* and *b* move said rack-bar the distance of one tooth, either up or down, depending upon the direction of rotation of said worm-wheel. This movement of the rack-bar is comparatively quick, and as this rack-bar carries contact making and breaking devices the quick break thereof is desirable for reducing sparking to a minimum.

As shown in Fig. 1, the rod or bar 41, which I have heretofore termed the "rack-bar," extends practically from the top to the bottom floors of the building equipped with my improved system and apparatus, and this bar carries contact making and breaking devices so attached thereto as to be practically opposite the different floors in the building. This, however, is unnecessary, as these contact making and breaking devices can be grouped on one floor, as will be obvious from the following description:

43 indicates a collar or sleeve clamped to the bar 41 in such manner as to be longitudinally adjustable thereon, said sleeve having an offset to which is secured a suitable leaf-spring or other flexible supports 44, of which there are preferably two. On the ends of the flexible supports 44 are arranged contact making and breaking devices 45 in the form of rods, which, however, can be in the form of ordinary electric contact making and breaking brushes. In the construction shown in the drawings the strip which carries the brush proper is of insulating material, reinforced by metal strips on each side. If, however, we insulate the collar 43 from bar 41, that would do as well, and we could then use metal throughout in the construction of the brushes.

46 indicates a box or casing through which the rod 41 passes, said box serving as a guide for said rod and also as a housing for inclosing the electric contacts to keep dust, &c., therefrom. Within this housing is an insulation-block 47, on which are mounted, but insulated from each other, fixed contact-terminals 48, which are preferably parallel to each other and have their ends beveled to form deflecting-faces for coöperating with the brushes 45, which are designed to move in the paths of said terminal. 49 indicates a metallic frame forming a conductor for the current, which frame is secured to the insulation-block 47 and has mounted in its inner end a yielding contact plate or terminal 50, which yielding plate or terminal 50 is held in its inward position by springs 51, as shown in Fig. 8. 52 indicates another metallic current-conducting frame mounted in the insulation-block 47 and insulated from the frame 49, which frame 52 carries a spring-pressed or yielding terminal 53, whose working face is on the same plane as that of the plate 50; but the plate 53 is arranged to one side of the plate 50 and is somewhat shorter in length in order that the brush 45 will have contact therewith for a shorter period of time than with the plate 50. These stationary contacts 48 and the yielding contacts 50 and 53 are practically duplicated on each side of the box, and as the brushes 45 are designed to make contact with and complete the circuit between 48 and 50 53 it will be observed by reference to Fig. 9 that when the rod 41 is moved in an upward direction the upper brush 45 will be deflected to the right and complete the circuit between the stationary contact of terminal 48 and the yielding contacts 50 53, which press against the brush for well-known reasons. When the lower brush strikes the inclined face of its coöperating stationary terminal, it will likewise be deflected to the

right, but inwardly and out of the path of its coöperating yielding contacts. After both brushes have passed above their coöperating contacts and the rod moved downwardly the lower brush will be deflected to the left in the path of its coöperating yielding contacts and will complete the circuit therethrough, while the upper brush will likewise be deflected to the left, in which event it will permit the circuit it controls to remain open.

Each elevator preferably has a box 46 at each floor of the building, with the exception of the extreme top and bottom floors, and as the rod 41 extends through all of these floors it carries a number of pairs of brushes, depending upon the number of boxes through which it passes. In order that the brushes will coöperate with their respective contacts successively on the various floors as the elevator car ascends or descends, the pairs of brushes may be adjusted on their supporting-rod to accomplish the above, in which event their coöperating contacts would bear a fixed relation to the floors of the building, or said pairs of brushes may be spaced apart corresponding to the height of the different floors of the building and their coöperating contacts arranged in their respective boxes, graduating in position from high to low, as the case may be, so that they will coöperate with the pairs of brushes successively as the elevator-car ascends and descends.

Arranged on the elevator-shaft casing within convenient reach are a number of boxes or casings 54 containing switches which are normally open, but which are designed to be closed by suitable levers 55, pivoted in said box and projecting outside thereof, which levers are preferably marked with the words "Up" and "Down," according as the circuit they close is completed by the next elevator-car moving in the direction indicated, which completes the circuit effected by either of these switches to make a signal to the conductor in the elevator-car to stop at a certain floor and also indicate to the person operating the switch that the signal has been or will be received by the conductor on the elevator-car.

As the particular switch shown is not herein claimed, it is believed that the following brief description will give an adequate understanding of its construction and operation: The depression of either of the levers 55 completes the circuit at that point, said lever in turn actuating an auxiliary lever 56, carrying a projection 57, coöperating with escapement-lugs 58 on an armature 59. When the main lever is pressed down, as shown to the right in Fig. 4, the circuit is completed and the auxiliary lever elevated and sustained in such elevated position by the engagement of its pin 57 with the upper escapement-lug. The magnets which influence the armature on which said escapement-lugs are arranged are in circuit with the signal in the elevator-car and the indicator over the door, and when said signal is operated the magnets are energized, so as to attract the armature and permit the descent of the auxiliary lever 56, which restores the arm 55 to its normal position. I would state that the end of auxiliary lever 56 in its upper position serves to contact with a spring-terminal 60 in its path. The terminal spring 60 and lever 56 are the two terminals of the switch. One end of the magnet-coil is connected to the source of supply, while the other end is connected to the frame or box 54.

Referring now to Fig. 3, wherein is illustrated in conventional form the system of electric circuits I employ for a group of three elevators traveling in a building, say, six stories high, in this figure 61 indicates a source of electric energy, from which leads a wire 62 to terminals under the switches in the various boxes on the different floors of the building. For the sake of illustration we will assume that the "up" signal on the fifth floor is depressed and that car x is just starting its descent from the sixth floor, car y is just completing its down trip, and car z is just starting on its up trip. As the rod 41, controlled by car z, will be the first to be thrown into operation, or rather to complete the circuit, including the up signals and indicators which have been affected by the depression of the lever marked "Up" on the fifth floor, I will not, for the time being, refer to the operation or movement of any other parts of the system. The depression of the up lever on the fifth floor effects a connection whereby all of the stationary terminals 48^a on that floor become operative. When the brush 45 on the rod 41, controlled by the car z, contacts with its respective terminal 48^a and the coöperating yielding terminal 50^a, said brush 45 completes the circuit through an indicating device 62^a; wire 63, cable-wire 64, suspended from the bottom of the car z, switch 65, cable-wire 66, and back to the battery, dynamo, or other source of energy 61 through wire 67. When the brush 45 makes contact between terminals 48^a and 53^a, which latter is the short yielding terminal, circuit is completed through wire 68 and cable-wire 69, through the signal 70, located in the car z. It might be said that when the brush 45 first completes the circuit through the terminals 48^a and 50^a the local indicator for that floor is thrown into operation and that as the brush 45 moves upwardly, still in contact with the yielding terminal 50^a, it completes the circuit through the yielding terminal 53^a and operates the signal in the elevator-car. The terminals 48 in all of the contact-making devices referred to are of corresponding length to the long terminals 50, the object being to render the indicator operative when the car is several floors above or below that on which the person who threw the up or down switch is standing, while the short terminal 53 is so arranged as to be thrown into operation and make the signal in the car visible or audible to the conductor on the car when the car is

a little less than the distance of two floors above or below the stopping-point. The purpose of the switch 65 in the car is to enable the conductor to break the circuit and prevent the operation of either the indicating or signaling devices, as when the elevator-car is carrying a load up to its full capacity, when it is designed to make a through trip without stopping. By thus breaking the circuit within any car the next car moving in the proper direction will, through its rod 41, cause the proper signal and indicating devices to be set in operation and said next car may take on the passengers or freight passed by the preceding full car.

For further illustration of my system I will assume that the down signal on the third floor has been depressed. This places in circuit all of the stationary terminals 48^b on that floor, and as the rod 41, controlled by the car x, will be the first to have its carried brushes to complete the circuit between stationary contact 48^b and the yielding contacts 50^b and 53^b the circuit will be first established through wire 71, indicating device 72, cable-wire 73, switch 74, cable-wire 75, and wire 76 back to battery or dynamo 61 through wire 67. When brush 45 contacts with the terminal 53^b, the circuit will be divided and the divided portion completed through cable-wire 77, car-signal 78, switch 74, cable-wire 75, and wire 76 back to the battery or dynamo through wire 67. The signals in the cars are preferably in the form of electric lamps, but it is obvious that audible signals can be employed, if desired. The indicators on the different floors upon which the switches are arranged are also preferably electric lamps, suitably colored—as, for instance, the upper lamp being colored white—and it may have painted thereon the word "Up," to indicate that the signal has been received by the conductor on said car when said lamp is burning, and the lower lamp may be colored a different color and have painted thereon the word "Down," to indicate that the signal has been received by the conductor on the next descending car. As stated before, these indicators in the form of some translating device, such as a lamp or bell, are placed into operative relation when the next car is several floors distant to indicate that the conductor on said car will receive the signal, which indicator will continue in operation until the car has reached the floor on which such indicator is located. The signal on the car, however, is operated when the car is distant from the required stopping-place about one and one-half floors, sufficient for the conductor to have ample time to properly work the lever and make a service-stop.

I have found by experience that the supporting-cables of elevators will creep or slip over their sheaves in one direction or the other, and, further, that this creeping or slipping of the cable is variable. In one instance the creeping or slipping amounted to about twenty feet in three hours, while with respect to a companion elevator the creeping amounted to a few inches in the same period of time. A peculiar feature of this creeping is that an elevator whose cable will creep constantly in one direction for quite a long period of time will suddenly reverse the direction of creeping under practically the same running and load conditions. Again, these reversals in creeping occur frequently with respect to the same elevator. I am not aware of any good reason for this except that it is due, perhaps, to the stretch of separate cables, so that the strain is placed on other cables, each cable being separately attached and independent of the other and alternate cables being twisted in the opposite direction. However this might be, this creeping exists to such an extent that provision should be made to take up the same in order that the contacts heretofore described shall make and break the circuits at the proper time with respect to the position of the controlling-elevator in the shaft. It is understood that the counter-shaft 38 is driven by suitable gearing from the shaft on which the cable-sheave is mounted and that said shaft 38 carries a worm-wheel whose working faces engage the teeth of a rack-bar in order to raise or lower said rack-bar, depending upon the direction of rotation of said worm-wheel, and that said rack-bar carries the contact making and breaking brushes coöperating with the stationary and yielding contacts before described for completing the circuits through the signal in the car and indicating device on the floor on which the actuated switch is located.

Referring now to Figs. 15 to 20, the sprocket-wheel 37 is loosely mounted on the shaft 38, while the worm-wheel 39 is fixed to said shaft. Shaft 38 is mounted in a suitable bearing 80 and has fixed thereto a pawl-carrying arm 81, on which are arranged a "main" pawl 82, as I shall term it, and an auxiliary pawl 83. This main pawl 82 is in the form of a lateral projection extending from a radially-disposed arm 84, whose outer end carries a roller 85, while a spring 86 tends to hold said arm and its carried pawl and roller inwardly toward the shaft. This arm is preferably slidingly mounted in a radially-disposed groove in the arm 81. The auxiliary pawl 83, before referred to, is likewise pressed inwardly by a spring 87, shown as a torsional spring, while said pawl carries a roller 88 on its outer or free end, as shown more clearly in Fig. 16. A notched disk 89 is conjoined to the hub of the sprocket-wheel 37, and said disk is preferably located in juxtaposition to the arm 81 and assists in holding the sliding arm 84 in its groove. A spring 90 is interposed between the bearing 80 and the hub of the arm 81 for the purpose of yieldingly holding the fixed and loose members mounted on the shaft in frictional contact with each other. The rod or rack 41 heretofore described and which is actuated by the worm-wheel 39 is provided with a lateral rib 91,

against which rides a dog 92, said dog when the rack-bar 41 is elevated sufficiently being adapted to fall under the rib 91, as shown by dotted lines in Fig. 16. A spring 93 tends to force the lower end of the dog 92 in engagement with the rib 91 and under said rib when said rib is elevated. A rod 94 is connected to the upper end of said dog, said rod passing through an eye 95 in a rocking frame 96, which for the sake of distinction may be called a "crescent," as its shape is substantially semicircular. A shoulder or collar 97 is arranged on the rod 94, so as to positively actuate said rocking crescent in one direction, while a spring 98, arranged on the rod 94, yieldingly actuates said crescent in the opposite direction. Crescent 96 is provided with two cam-like projections 99 on its outer face, the outwardly-disposed edges of which projections recede toward the crescent, as shown in Figs. 16 and 19, while the inner lower edges of said projections are tapered, as shown in Figs. 15 and 18. 100 indicates a shoe secured to the bearing 80 and projecting outwardly in the path of the roller 88 on the auxiliary pawl. The operation of this resetting mechanism is as follows: The pawls 82 and 83 are so arranged that when either is in engagement with a notch the other will ride on the periphery of the disk 89 between two notches. The pawl 82 being the main pawl is normally in engagement with a notch in the disk, and when in such position will cause the shaft and its carried worm-wheel to rotate with the sprocket-wheel 37. Assuming that the worm-wheel is rotating in the direction of the arrow in Fig. 15, as the car descends the rack 41 will be elevated by reason of the engagement of the worm-face 40 with the teeth thereof until the dog 92 falls under the rib 91. In this position the arm 84 is opposite the front end C of the crescent, and the front face of said crescent will strike thereagainst, being forced into contact therewith by the spring 93 when the rib 91 releases dog 92. The final descending movement of the car causes the arm 84 to ride against the front or outer face of the crescent, which accomplishes the following: The arm when contacting with the face 99^a of the first cam-like projection 99 idly vibrates the crescent without accomplishing any change in the position of the pawls. When the roller 85 on the outer end of the pawl-arm 84 contacts with the lower inner cam-face 99^b of the rear cam projection 99, it retracts the pawl 82 from engagement with its notch and permits the sprocket 37 and its conjoined notched disk to rotate freely without rotating the worm-wheel 39 or its shaft until the auxiliary pawl 83 falls into its notch, (being the next adjacent notch,) which auxiliary pawl will cause the shaft and its carried worm-wheel to be once more locked to the sprocket-wheel, when said sprocket-wheel will turn the worm-wheel to its final movement, which is preferably in such a position that the arm 84 rests against the rear end of the crescent. When the elevator starts on its upward movement, the sprocket-wheel is rotated in an opposite direction, in which event the arm 84, being in its outward position, passes the cam-like projection 99 (left-hand one in Fig. 15) without having its position affected, since it simply vibrates the crescent. This vibration of the crescent moves the lower end of dog 92 from under the end of rib 91, so that the latter is free to descend. The rotation of the disk continues until the roller 88 of the auxiliary cam rides up and over the shoe 100, which causes the disengagement of the auxiliary pawl from its notch, permitting the sprocket-wheel and its conjoined notched disk to rotate freely, the shaft and worm-wheel remaining stationary meanwhile until the pawl 82 is again in line with the notch out of which it was raised, when said pawl will drop into the same notch it formerly occupied and so cause the shaft and its carried worm-wheel to rotate and the rod 41 to lower. The crescent is held retracted by reason of the end of the dog 92 sliding on the rib 91 while the car is making its up and down trips until such time as the car is about to complete its down trip. The main pawl 82 is likewise in engagement with a notch in disk 89 while the car is making its up and down trip and until the car is about completing its down trip. This operation of the resetting mechanism continues at the termination of each down trip as long as the cable occupies its proper position relative to the sheave 33; but for the sake of illustration we will assume that said cable has gradually crept over its sheave in a rearward direction relative to the rotation of said sheave on the downward movement of the car until such an amount of creepage has taken place that it is desired to compensate for the same to prevent the improper operation of the contact making and breaking devices operated by the sheave mechanism. The car in about completing its final movement under such conditions will, through its sheave mechanism, drive the shaft 38 until its worm-wheel 39 has elevated the rack 41 and operated the dog 92, so that the crescent will be thrown against the arm 84. When the crescent is thrown against the arm, it has not completed its outward movement, but is held yieldingly in that position, the arm riding over the face thereof until the end of the crescent is reached, when the arm permits the crescent to move outwardly in the completion of its movement by the tension of the spring 93, so that when said arm starts on its return movement it will travel in a path behind the crescent. The arm 84 idly vibrates the crescent by coming in contact with the first cam 99 and is withdrawn out of engagement with the notch in the disk by the second cam 99, so as to permit the sprocket 37 and its conjoined notched disk 89 to rotate until the auxiliary pawl 83 falls into the next adjacent notch. The auxiliary pawl 83 will now carry the worm-wheel

around until the shoe 100 raises said pawl out of engagement with the disk, when the disk will continue rotating until one of its notches alines with the pawl 82, which will drop thereinto. When the parts are in this position, the pawl 82 will be in the next adjacent notch from that which it previously occupied and the arm 84 will have passed the rear end of the crescent. When the parts rotate in an opposite direction under these conditions, the arm 84 will, as above stated, pass back of the crescent instead of over the face, as heretofore, in which event the pawl 82 is not disturbed. The crescent may be said to occupy an abnormal forward position, as illustrated by the dot-and-dash lines in Fig. 16, when the pawl is passing behind the same. Arm 84 starts on its backward movement at the same time that rack 41 commences to descend. Arm 84 has not passed beyond the crescent in the first revolution of the parts when rib 91 forces dog 92 laterally and tends to pull crescent back. Arm 84 being in the way, rod 94 will slip through eye 95 and press spring 98 until arm 84 passes out of the path of the crescent, and the crescent will now take its normal retracted position. Subsequent revolutions of arm 84 are in a path in advance of the crescent, and so the crescent is not affected under normal conditions. Spring 98 when the crescent is in this abnormal forward position permits the dog 92 to be forced laterally and by the rib 91, so that the rack 41 can descend, and after the arm 84 has passed the forward end of the crescent said crescent will be restored to its normal position by the spring 98. We will now assume that the creepage of the cable has reversed, so that the cable instead of creeping rearwardly over the sheave with respect to the direction of rotation when the car is descending is creeping forwardly over said sheave upon the descent of the car, in which event the sheave will not make as many revolutions to carry the car from the top floor to the bottom as it would under normal conditions or under the abnormal conditions just described. The decreased number of revolutions on the part of the sheave due to this creepage and the displacement of the sheave relative to the cable we will assume cause the arm 84 to keep dropping back gradually. Under these conditions when the crescent is tripped the arm 84, engaging the first cam, idly vibrates the crescent, and when the car stops it occupies a position between the cams 99. When the car commences to ascend, the movement of arm 84 is reversed, and when it engages cam-surface 99^b of the cam 99 it has just passed the pawl 82 will be thrown out of engagement with the notch in the notched disk. The worm-wheel will now cease rotating; but the sprocket will continue until the auxiliary pawl 83 falls into a notch, when the worm-wheel will be forced to rotate, by reason of the engagement of this auxiliary pawl, until the pawl is raised out of engagement with the notched disk by the shoe 100, when the notched disk will continue to rotate until the pawl 82 drops into a notch and then carries on the rotation of the worm-wheel. By this operation it will be seen that the resetting mechanism has dropped behind the distance of one notch and will continue so to drop behind at the end of each down trip until the cable ceases to creep forwardly over the sheave on the descent of the car. The instant the cable starts to creep in the opposite direction upon the descent of the car the resetting mechanism will commence to pick up notches, as before described. Of course it will be understood that in speaking of the creepage of the cable on the descent of the car this creepage might occur while the car is ascending as well as descending; but in whatever direction the car is going when the cable creeps, as described, the creepage will be taken up by the resetting mechanism at the end of each down trip of the car.

In Figs. 5, 6, and 7 I have shown an indicator designed for use in connection with the rack 41, which indicator is preferably arranged on the first floor of the building, so that the "starter" can see the position of all the cars under his charge and the direction in which they are going. This indicator consists of a face-plate 101, which is provided with an opening. (See Fig. 5.) 102 indicates a dial mounted to rotate behind the face-plate, said dial being provided with a pinion 103 in mesh with a rack 104 on the end of the rod 41. The dial is provided with words or other symbols on its face which indicate the direction in which the car is going and the floor at which the car may be at any time. In order to have the indicator read correctly, alternate signs are provided, one set being for the up movement and the other for the down movement. The pinion 103 is provided with a pin 104^a, fitting in a slot 105 in the dial, so that as the rack 41 descends the down signals only will be shown, due to the quick movement of said rack heretofore described in connection with the cam working face between the points *a* and *b* on the worm-wheel 39, and when the car has completed its down trip and the rod 41 starts upwardly there will be sufficient lost motion between the dial and pinion so that said dial will only exhibit the up signals.

Another method of indicating the position of the car is illustrated in Fig. 21, wherein (see particularly Figs. 15 and 16) a worm 106 is provided on the rear face of worm 39, which worm 106 operates a rack-bar 107, said rack-bar having a flexible connection 108 on its upper end passing over an idle sheave, so as to make an endless-belt arrangement. The lower portion of this endless belt consists of flexible cords or chains 109, passing over sheaves 110 and around a drum 111, on whose axle is arranged a pointer 112, adapted to travel over the face of a dial 113, which dial is provided with numbers indicating the

floors of the building, so that the starter can by looking at this indicator see the exact position of the elevator and in which direction it is going. The reason for providing a separate worm 106 for this indicating mechanism is to have the movement of the pointer 112 continuous while the elevator is moving, and not intermittent, as is the movement imparted to the rod 41 by the worm 39.

From the above description it will be apparent that my resetting mechanism will operate to always insure the proper relative positions of the elevator-car and the indicator, whether the indicator be an electric or a mechanical indicator, for the rack-bar is the means immediately operating the signals, and it is the position of the bar which is corrected.

I am aware that there are minor changes in the arrangement, construction, and combination of the several parts of my device which can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination with an elevator-car operating in a suitable shaft, and car-operating mechanism including a cable, of movable contacts actuated by said car, a plurality of stationary contacts which are successively engaged by said movable contacts to make and break the circuit for a signal in the car, and resetting mechanism acting automatically to insure the correct relative position of the car and movable contact when the same has been changed by either an under or over movement of the car-operating mechanism caused by creepage in the same; substantially as described.

2. The combination with an elevator-car operating in a suitable shaft, and car-operating mechanism including a cable, of movable contacts actuated by said car, a plurality of stationary contacts which are successively engaged by said movable contacts to make and break a circuit including an indicating device on the floor, and resetting mechanism acting automatically to insure the correct relative position of the car and movable contact when the same has been changed by either an under or over movement of the car-operating mechanism caused by creepage in the same; substantially as described.

3. The combination with an elevator-car operating in a suitable shaft, and car-operating mechanism including a cable, of movable contacts actuated by said car, a plurality of stationary contacts which are successively engaged by said movable contacts to make and break the circuit of a signaling device in the car and an indicating device on the floor, and resetting mechanism acting automatically to insure the correct relative position of the car and movable contact when the same has been changed by either an under or over movement of the car-operating mechanism caused by creepage in the same; substantially as described.

4. The combination with an elevator-car operating in a suitable shaft, and car-operating mechanism including a cable, of movable contacts actuated by said car, a plurality of stationary contacts which are successively engaged by said movable contacts, a signaling-circuit terminating at said stationary contacts, a switch for completing said signaling-circuit on the floor of the building whereby, when said movable contact completes the signaling-circuit, a signaling device is operated within the car, and resetting mechanism acting automatically to insure the correct relative position of the car and movable contact when the same has been changed by either an under or over movement of the car-operating mechanism caused by creepage in the same; substantially as described.

5. The combination with an elevator-car operating in a suitable shaft, and car-operating mechanism including a cable, of movable contacts actuated by said car, a plurality of stationary contacts which are successively engaged by said stationary contacts, an indicating-circuit terminating at said stationary contacts, a switch for completing said indicating-circuit whereby, when the movable contacts operate therewith, said circuit will be completed to operate the signal on the floor where said switch was thrown, and resetting mechanism acting automatically to insure the correct relative position of the car and movable contact when the same has been changed by either an under or over movement of the car-operating mechanism caused by creepage in the same; substantially as described.

6. The combination with an elevator-car operating in a suitable shaft, and car-operating mechanism including a cable, of movable contacts actuated by said car, a plurality of stationary contacts which are successively engaged by said movable contacts, signaling and indicating circuits terminating at said stationary contacts whereby, when said movable contacts coöperate with said stationary contacts, the circuit is completed through a signaling device in the car and an indicating device on the floor where the switch was operated, magnets arranged in series with said circuits for restoring the switch to its normal position and breaking said circuits, and resetting mechanism acting automatically to insure the correct relative position of the car and movable contact when the same has been changed by either an under or over movement of the car-operating mechanism caused by creepage in the same; substantially as described.

7. The combination with a plurality of elevator-cars operating in suitable shafts, and car-operating mechanism for each car including a cable, of movable circuit making and

breaking devices which are actuated by the respective cars, a plurality of stationary contacts mounted in the elevator-shafts, and in the path of said movable contacts, signaling and indicating circuits terminating at different stationary contacts, signaling devices in the several cars included in said signaling-circuits, indicating devices on different floors of the building included in said indicating-circuits, switches arranged on the different floors of the building for completing the circuit which terminates at some of the stationary contacts whereby, when any of the elevator-actuated making and breaking devices complete the circuit through the stationary contacts and the operated switch, a signal will be given to the conductor on the car moving in either direction that a switch on a certain floor has been set, and also an indicating device on the floor where the switch was thrown, will be operated to indicate to the person throwing the switch that the conductor on the next car going in the proper direction will, or has received the signal to stop at the floor where the switch was thrown, and resetting mechanism acting automatically to insure the correct relative position of the car and movable contact when the same has been changed by either an under or over movement of the car-operating mechanism caused by creepage in the same; substantially as described.

8. The combination with a plurality of elevator-cars operating in suitable shafts, and car-operating mechanism for each car including a cable, of movable circuit making and breaking devices which are actuated by the respective cars, a plurality of stationary contacts mounted in the elevator-shafts, and in the paths of said movable contacts, signaling and indicating circuits terminating at different stationary contacts, signaling devices in the several cars included in said signaling-circuits, indicating devices on different floors of the building included in said indicating-circuits, switches arranged on the different floors of the building for completing the circuit which terminates at some of the stationary contacts whereby, when any of the elevator-actuated making and breaking devices complete the circuit through the stationary contacts and the operated switch, a signal will be given to the conductor on the car moving in either direction that a switch on a certain floor has been set, and also an indicating device on the floor where the switch was thrown, will be operated to indicate to the person throwing the switch that the conductor on the next car going in the proper direction will, or has received the signal to stop at the floor where the switch was thrown, switches in the elevator-cars for breaking the circuit to render the movable making and breaking devices actuated by its respective car, inoperative, and resetting mechanism acting atuomatically to insure the correct relative position of the car and movable contact when the same has been changed by either an under or over movement of the car-operating mechanism caused by creepage in the same; substantially as described.

9. The combination with an elevator-car operating in a suitable shaft, and car-operating mechanism including a cable, of signaling and indicating circuits terminating at stationary contacts, a circuit making and breaking device actuated by said car to engage with said stationary contacts in succession, and in such manner that different stationary contacts will be engaged when the car is moving in different directions, a switch for completing the circuit through stationary contacts which are engaged when the car is going in a certain direction, and resetting mechanism acting automatically to insure the correct relative position of the car and making and breaking device when the same has been changed by either an over or an under movement in the car-operating mechanism caused by creepage in the same; substantially as described.

10. The combination with an elevator-car, car-operating mechanism including a cable, and pairs or sets of stationary contacts, of movable contact making and breaking devices which are operative with respect to one pair or one set of said stationary contacts when said movable contact is moving in one direction, and inoperative with respect to the other pair or set of stationary contacts when moving in the first-mentioned direction, said movable contact being operative with respect to the other pair or set of stationary contacts when moving in the opposite direction, and inoperative with respect to the first-mentioned stationary contacts, circuits which are connected to said stationary contacts, a switch for making and breaking the circuit with respect to either or both sets or pairs of stationary contacts, and resetting mechanism acting automatically to insure the correct relative position of said movable and stationary contacts when the same has been changed by either an under or an over movement in the car-operating mechanism caused by creepage in the same; substantially as described.

11. The combination with a pair of stationary contacts arranged substantially parallel to each other, one of which is formed with beveled ends, of a movable contact-carrier, means for moving the same, a yielding contact on said carrier which is movable in opposite directions beyond said beveled stationary contact, whereby when said movable contact is moving in one direction it is thrown to one side of said beveled contact, in between the pair of stationary contacts and completes a circuit therethrough, and when said movable contact is moving in the opposite direction it is thrown to the other side of said beveled contact so as to be incapable of operation with respect to said stationary contact; substantially as described.

12. The combination with a fixed contact formed with a beveled end, of yielding contacts 50 and 53 arranged parallel to said first-

mentioned contact, and on different planes with respect to each other, a movable making and breaking contact, which travels in a path including the first-mentioned fixed contact, means for moving said movable contact in opposite directions, and circuits which terminate at said fixed and yielding contacts whereby, when the movable contact making and breaking device is traveling in one direction, it is deflected between the fixed contact and its companions to complete the circuits, and when traveling in the opposite direction it is deflected oppositely, so as to leave the circuit broken between said fixed and yielding contact; substantially as described.

13. The combination with an elevator mechanism, of a rod moved in opposite directions thereby, said rod extending through several floors of the building, contact making and breaking devices adjustably mounted upon and carried by said rod, oppositely-disposed pairs of stationary contacts in the paths of the contact making and breaking devices carried by the rod and adapted to be operated successively thereby, signaling and indicating circuits terminating at said pairs of stationary contacts, switches for making the circuits to either or both of said oppositely-disposed pairs of stationary contacts, and means for moving said movable contact making and breaking devices to render the same operative with respect to one of the opposite pairs of stationary contacts, and inoperative with respect to the other of said pairs of stationary contacts when said movable contact is moving in one direction and vice versa; substantially as described.

14. The combination with an elevator mechanism, of a fixed contact member, a worm-wheel driven by said elevator mechanism, a rack-bar in mesh with said worm-wheel, a yielding contact making and breaking device carried by said rack-bar, and a stationary contact into engagement with which said yielding contact is forced by said fixed contact member when said yielding contact making and breaking device is traveling in one direction, said fixed contact member forcing said making and breaking device out of contact with said stationary contact when said device is traveling in the opposite direction, substantially as described.

15. The combination with an elevator mechanism, of a worm-wheel driven thereby, a rack-bar in mesh with said worm-wheel, a contact device carried by said rack-bar, stationary contacts adapted to be engaged by said contact device, a signal in circuit with said contacts, a pinion in mesh with said rack-bar, an indicating-dial arranged in juxtaposition to said pinion, and a slot-and-pin connection between said pinion and indicating-dial; substantially as described.

16. The combination with an elevator mechanism, of a worm-wheel driven thereby, said worm-wheel having concentric circular major and minor working faces, and a short eccentric working face, and a rack-bar in mesh with said working faces; substantially as described.

17. The combination with an elevator mechanism, of a circuit making and breaking device, operating means for the making and breaking device actuated by the elevator mechanism, and a resetting mechanism interposed between the elevator mechanism and the circuit making and breaking mechanism for automatically compensating for either an over or under movement of said operating means caused by creepage in the elevator system; substantially as described.

18. The combination with an elevator mechanism, of a circuit making and breaking device, operating means therefor actuated by the elevator mechanism, and means for compensating for either an over or under movement of the said operating means caused by creepage of the cable, whereby the said circuit making and breaking device is maintained in substantially a fixed relation to the elevator mechanism; substantially as described.

19. The combination with an elevator mechanism, of a driven element carrying contact making and breaking devices, operating means therefor, and means controlled by said driven element for throwing the same into and out of engagement with the elevator mechanism, either upon an over or an under movement of said operating means; substantially as described.

20. The combination with an elevator mechanism, of a rack-bar driven thereby, signal-contacts operated by said rack-bar, and means coöperating with said rack-bar for throwing the same into and out of engagement with the elevator mechanism; either upon an over or an under movement of the driving member; substantially as described.

21. The combination with an elevator mechanism, of a worm-wheel driven thereby, a rack-bar in engagement with the worm-wheel, signal-contacts operated by said rack-bar, and means for throwing said worm-wheel out of engagement with the elevator mechanism, either upon an over or an under movement of the worm-wheel; substantially as described.

22. The combination with an elevator-signal, operating means therefor, and an elevator mechanism, of a driven element normally in engagement therewith, and means coöperating with said driven element and with said elevator mechanism for disengaging the one from the other and reëstablishing an engagement between said driven element and the said elevator mechanism in the same or a different relation; substantially as described.

23. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising an oppositely-

rotatable notched driving-disk, devices which are driven thereby, a pawl connecting the driven devices with said notched disk, and means connected to and operated by the driven devices for throwing said pawl into and out of engagement with said notched disk; substantially as described.

24. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising a notched driving-disk, devices which are driven thereby, a plurality of pawls in engagement with said notched disk and connected to said driven mechanism, and means for throwing said pawls into and out of engagement with said notched disk at different times; substantially as described.

25. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising a notched driving-disk, devices which are driven thereby, a plurality of pawls in engagement with said notched disk and connected to said driven mechanism, and means for throwing said pawls into and out of engagement when said notched disk is in different positions; substantially as described.

26. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising a notched driving-disk which rotates in opposite directions, a main and an auxiliary pawl coöperating therewith, driven mechanism to which said pawls are connected, and means operated by said driven mechanism for changing the relation of said pawls relative to said disk; substantially as described.

27. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising a notched driving-disk, a main and an auxiliary pawl coöperating therewith, driven mechanism to which said main and auxiliary pawls are connected, and a device for tripping the main pawl, which device is thrown into its tripping position by the driven mechanism; substantially as described.

28. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising a notched driving-disk, a main and an auxiliary pawl coöperating therewith, driven mechanism to which said main and auxiliary pawls are connected, a device for tripping the main pawl, which device is thrown into its tripping position by the driven mechanism, and a fixed cam for coöperating with the auxiliary pawl; substantially as described.

29. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising a notched disk, a pawl coöperating therewith, driven mechanism to which said pawl is connected, a tripping device which is placed in an operative position by the driven mechanism, and cam projections on said tripping device for coöperating with said pawl; substantially as described.

30. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising a notched driving-disk, a pawl coöperating therewith and connected to the driven mechanism, a pivoted frame carrying two cam projections for coöperating with said pawl, and a dog which is yieldingly connected to said frame for operating the same, said dog being actuated by the driven mechanism; substantially as described.

31. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising a notched driving-disk, driven mechanism comprising a worm-wheel and rack-bar, a lateral projection on said rack-bar, a dog which is operated by said lateral projection, a rocking frame carrying cam projections, said frame being connected to said dog, and a pawl coöperating with the notched disk and said cam projections on the rocking frame for disengaging the notched disk from the driven mechanism; substantially as described.

32. The combination with an elevator-signal, an elevator drive mechanism, and resetting mechanism for insuring the correct operation of the signal comprising a notched driving-disk, a main and an auxiliary pawl coöperating therewith, a fixed shoe for disengaging the auxiliary pawl from said notched disk, a rocking frame for disengaging the main pawl from said notched disk, a driven mechanism which is connected to said disk by said pawl, and means operated by said driven mechanism for moving the rocking frame into and out of the path of the main pawl; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 12th day of June, 1899.

FRANCIS K. FASSETT.

Witnesses:
F. R. CORNWALL,
A. S. GRAY.