(No Model.) 3 Sheets—Sheet 1.

C. L. CLARKE.

ELECTRIC INDICATING DEVICE FOR ELEVATORS.

No. 304,908. Patented Sept. 9, 1884.

Fig. 1.

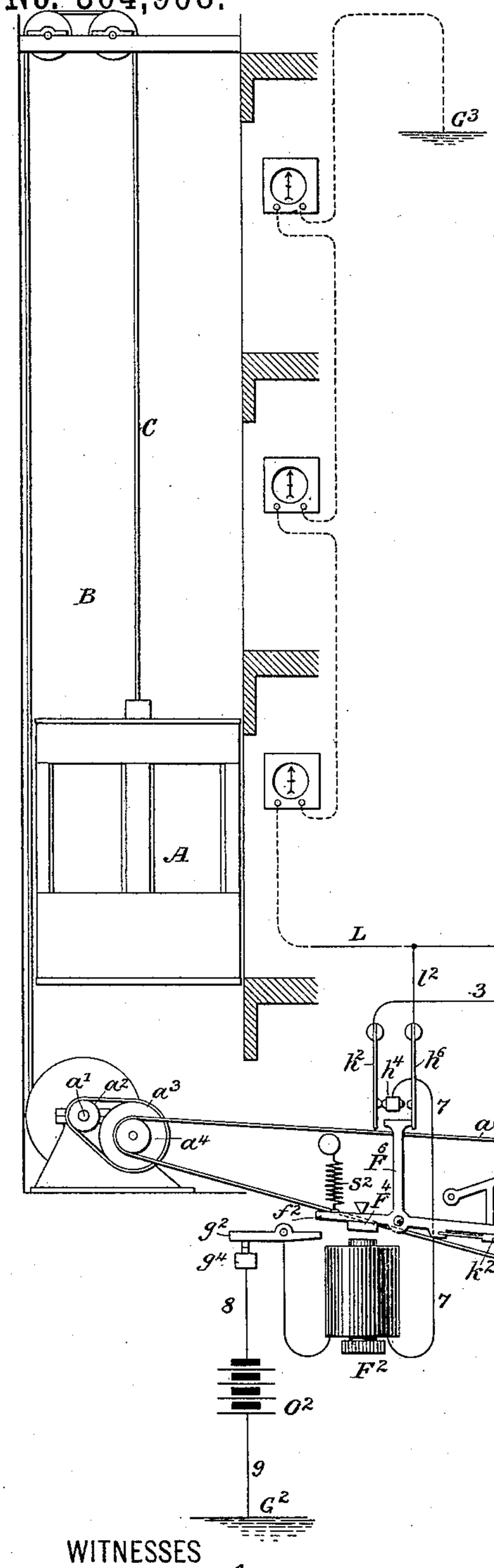
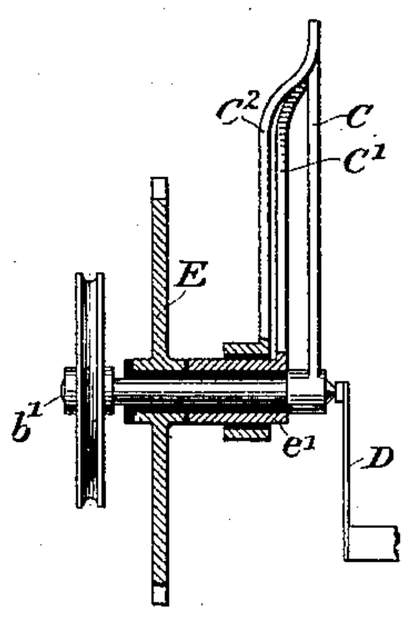


Fig. 2.



WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

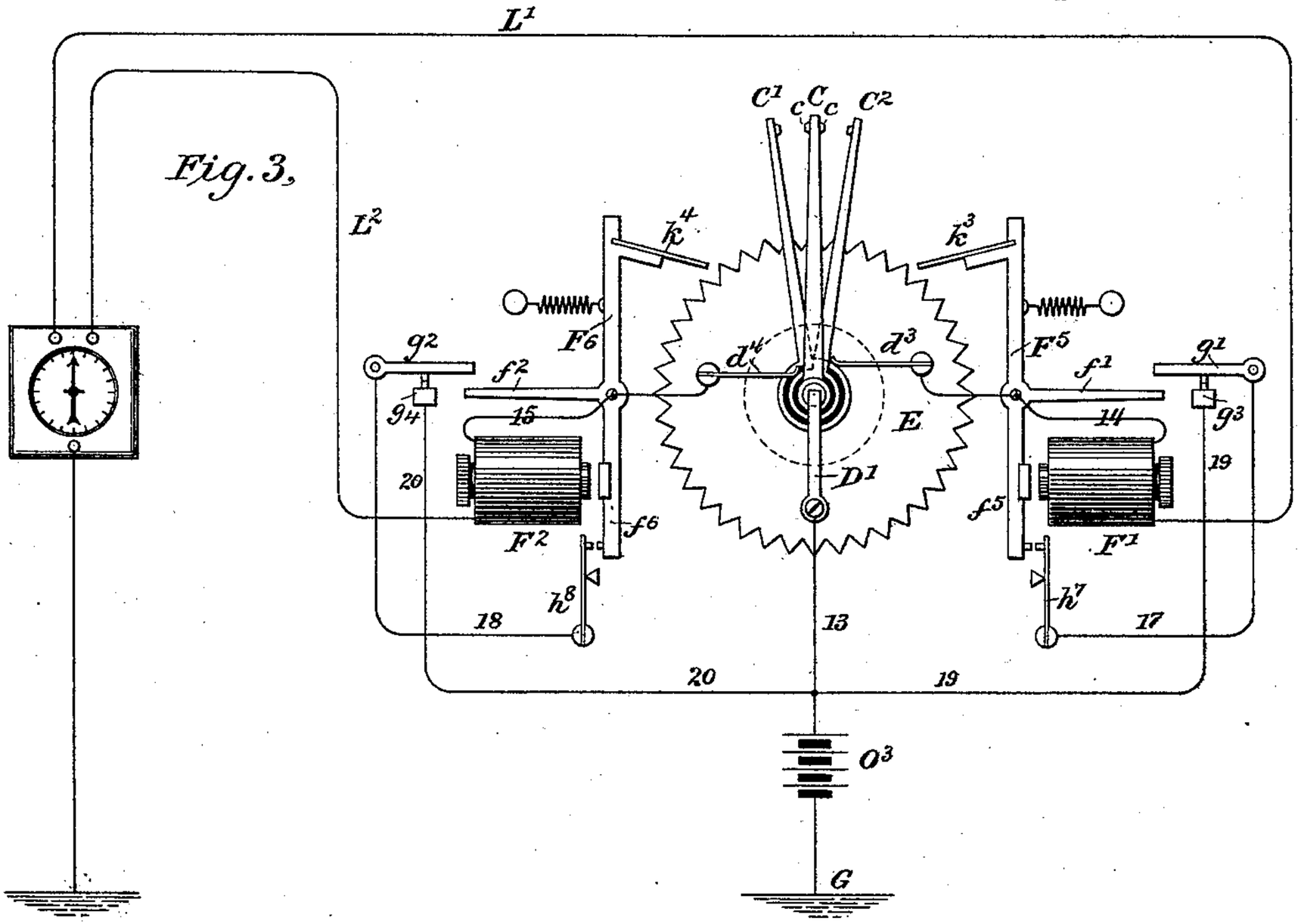

Fig. 4.

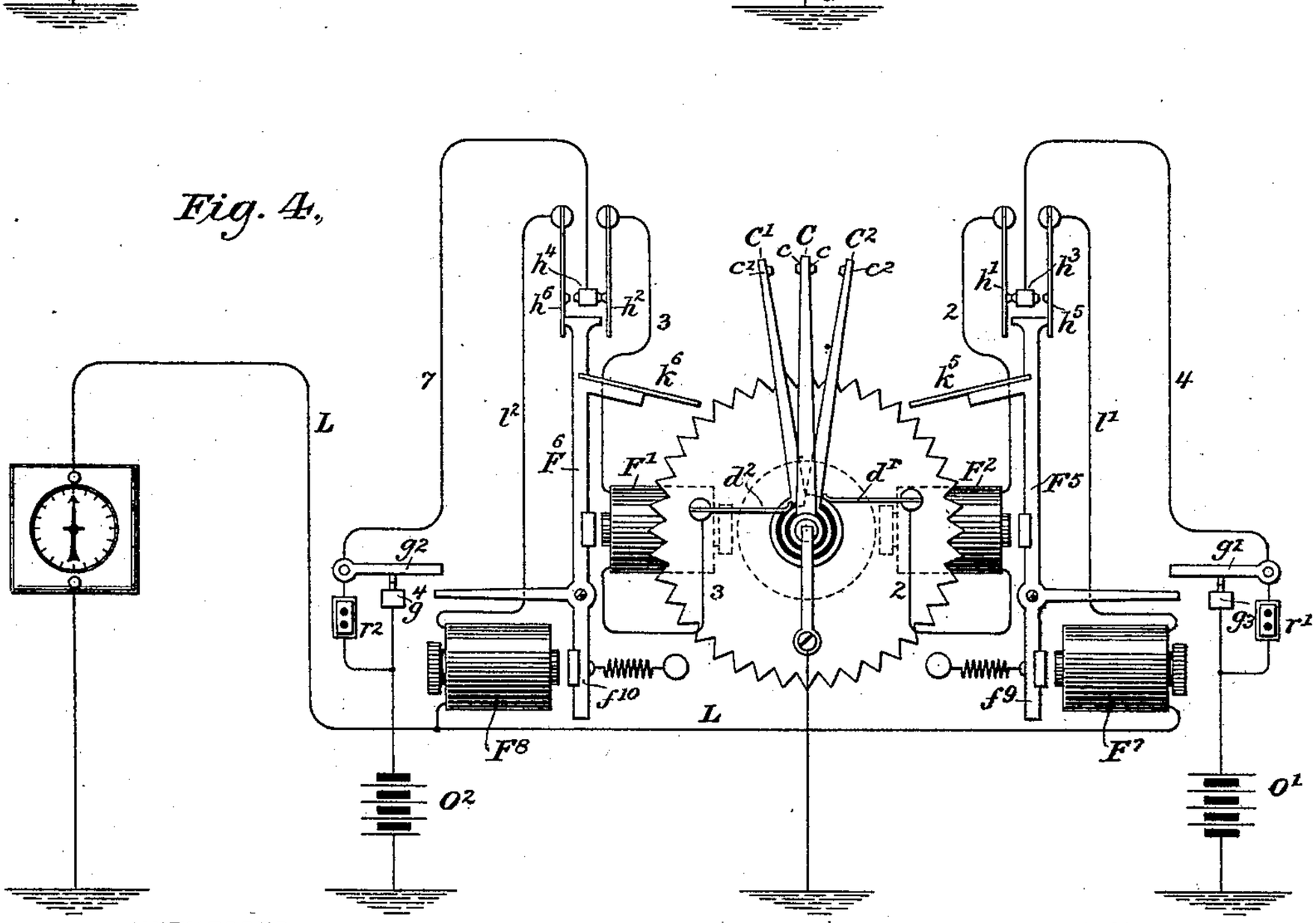

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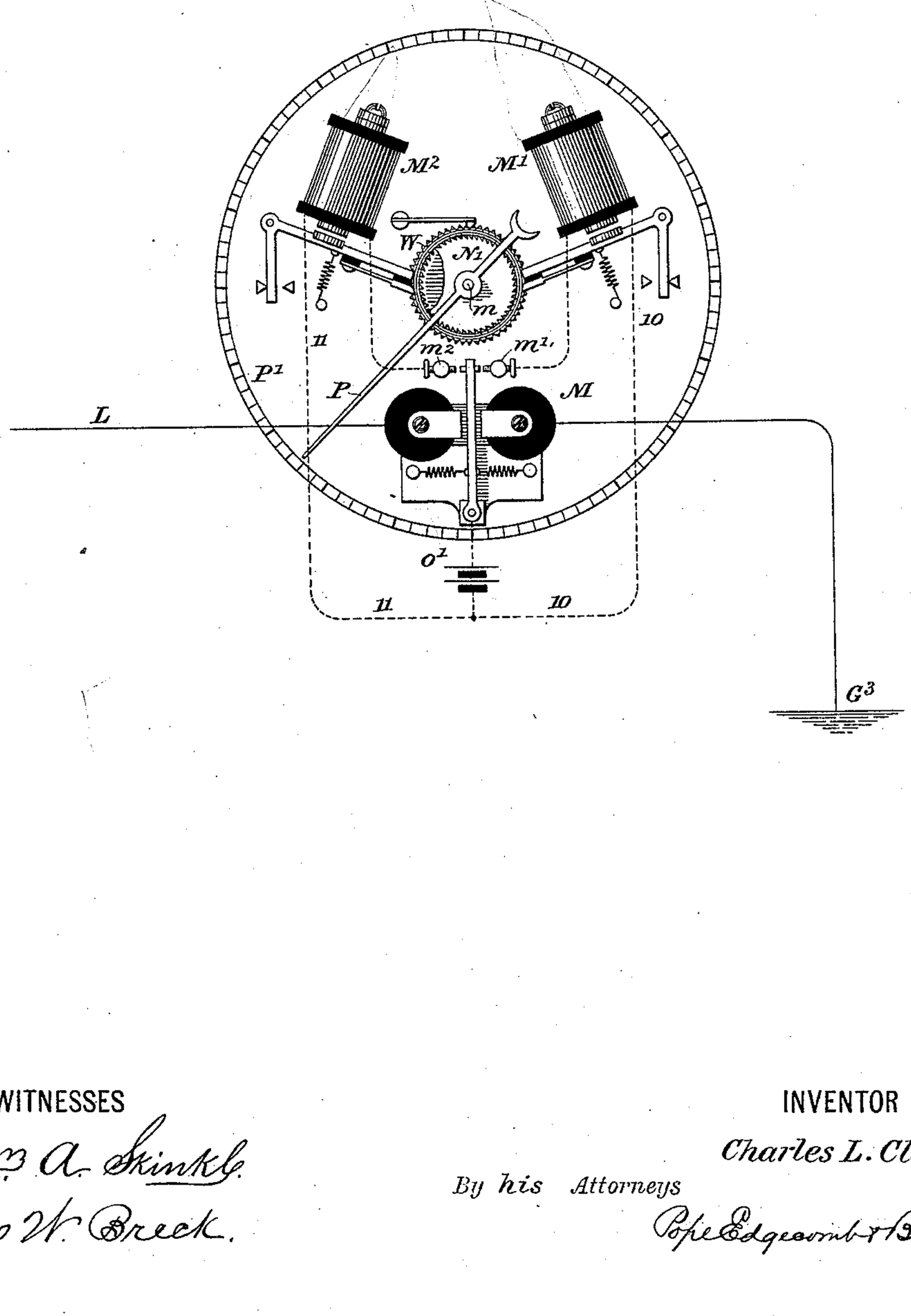
Fig. 5,



WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES L. CLARKE, OF NEW YORK, N. Y., ASSIGNOR TO THE TELEMETER COMPANY, OF SAME PLACE.

ELECTRIC INDICATING DEVICE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 304,908, dated September 9, 1884.

Application filed March 22, 1884. (No model.)

To all whom it may concern:

Be it known that I, CHARLES L. CLARKE, a citizen of the United States, residing in New York, in the county and State of New York, have invented certain new and useful Improvements in Electric Indicating Devices for Elevators, of which the following is a specification.

My invention relates to the class of apparatus employed for electrically indicating the position of an elevator with reference to the floors of the building in which it is placed, as well as its progressive movement.

The object of the invention is to provide means for moving an indicating-arm in a suitable manner for designating the position of the elevator at all times through the agency of electric currents automatically transmitted by the movements of the elevator.

The invention is based, in some measure, upon certain inventions of mine relating to telemeters which are described in Patents Nos. 284,382 and 285,572. The invention consists in attaching to some moving portion of an elevator or its operating apparatus a device adapted to transmit a predetermined number of electric impulses during the excursion of the elevator from one to the other of its limits, and during its opposite excursion to transmit a series of impulses equal in number, but either of a different polarity from those first transmitted or else through a different system of apparatus. These impulses, as they are transmitted act to move a series of indicating fingers or pointers in one direction or the other, thereby causing the position of the elevator to be at all times indicated at the several points where such indications are desired. The means which it is preferred to employ for transmitting the electric impulses consist of a shaft which is mechanically caused to revolve in one direction or the other by the movements of the elevator-shaft, and upon this shaft is carried a circuit-closing arm adapted, when moving in one direction, to successively complete an electric circuit by making contact with a contact-arm placed upon one side of the same. When moving in the opposite direction, the circuit-closing arm in like manner completes an electric circuit through a contact-arm placed upon the opposite side of the circuit-closing arm. The two circuits thus completed may either unite with a single main line or proceed independently to the receiving-instruments. In each circuit there is placed an independent electro-magnet, serving, when vitalized, to actuate the contact-arms in the direction of motion of the circuit-closing-arm, through which the circuit is at any time closed from the circuit-closing arm. The impulses, however, are transmitted over the main line to a receiving-instrument, which they serve to actuate in one direction or the other, accordingly as the movement of the circuit-closing arm is in one direction or the opposite. The contact-points through which the electric circuit is closed are preferably provided with shunt-circuits, for the purpose of preventing them from becoming corroded by the disruptive discharges which tend to occur at the instant an electric circuit is broken. These shunt-circuits are designed to be completed after the primal contact has been made, and after the delicate points have been separated the circuit is interrupted at a point specially constructed to receive the discharge.

In the accompanying drawings, which illustrate my invention, Figure 1 shows an elevator with the transmitting and receiving apparatus connected therewith, a portion of the apparatus being shown in diagram. Fig. 2 illustrates certain details in the construction of the transmitting apparatus. Figs. 3 and 4 illustrate modifications in the organization of the transmitting apparatus. Fig. 5 illustrates a convenient form of receiving-instrument.

Referring to Figs. 1 and 2, A represents an elevator moving in an elevator-shaft, B, by means of force communicated thereto through a cable, C. Attached to a drum or pulley-shaft, a', is a small pulley, a^2, from which a belt, a^3, is extended to a belt-wheel, a^4. From this belt-wheel a belt-connection, a^5, is made with the shaft b' of the transmitting apparatus. The connections, it will be seen, between the moving mechanism of the elevator and the shaft b' of the transmitter are such that the latter will be revolved in the direction indicated by the arrow x' when the elevator is moving in one direction, and in the opposite direction when the elevator is moving in the reverse direction. The movements thus imparted to the shaft b' are caused to transmit electric impulses of one polarity or the opposite, according to the direction of the move-

ment of the elevator, by means of a circuit-closing arm, C, and two contact-arms, C′ and C². The circuit-closing arm C is mounted rigidly upon the shaft *b′* and moves therewith, and carries contact-points *c c*. The contact-arms C′ and C² are carried upon the support of a toothed wheel, E, and they respectively carry contact-points *c′* and *c²*.

The wheel E is constructed to be revolved in one direction or the other, according to the direction of movement of the arm C, by means of two electro-magnets, F′ and F². For this purpose the sleeve *e′*, forming a support for the contact-arms C′ and C², is insulated from the shaft *b′*, as shown in Fig. 2, and the contact-arms themselves are also insulated from each other, as will appear in the same figure. A contact-brush, D, serves to complete an electric connection from the earth at G, through a conductor, 1, to the shaft *e′*, and thus to the circuit-closing arm C. Two similar brushes, *d′* and *d²*, serve in like manner to complete independent electrical connections through conductors 2 and 3, respectively, with two contact-arms, *h′* and *h²*, respectively. The contact-arm *h′* normally rests against an insulated contact-stop, *h³*. A contact-arm, *h⁵*, similar to the contact-arm *h′*, normally presses toward the contact-stop *h³* upon the opposite side. This arm, however, is normally held away from the stop *h³* by means of an armature-lever, F⁵. The armature-lever F⁵ serves as a support for an armature, F³, which is applied to the electro-magnet F′, and a retractile spring, *s′*, serves to normally draw this arm and lever away from the electro-magnet into the position shown in the drawings. A similar armature, F⁴, and lever F⁶ are applied to the electro-magnet F², and serve, under the influence of a spring, *s²*, to hold a corresponding contact-arm, *h⁶*, away from the stop *h⁴*, against which the spring *h²* normally presses.

The stop *h³* is connected through a conductor, 4, with a circuit-interrupting arm, *g′*, which normally rests upon a stop, *g³*, which in turn is connected through a conductor, 5, with one pole—say the positive—of a battery, O′. The negative pole of this battery is connected through a conductor, 6, with the earth at G′. Above the extremity of the short arm of the lever *g′* extends an extension of the arm *f′* of the armature-lever F⁵, and this extension, when the armature is drawn into its forward position by the electro-magnet F′, serves to raise the lever *g′* from the point *g³*, thereby interrupting whatever circuit may be completed therethrough. A similar arm, *g²*, rests upon a stop, *g⁴*, and the point *h⁴* is connected with this arm through a conductor, 7, including the coils of the electro-magnet F². The stop G⁴ is connected through a conductor, 8, with the negative pole of a battery, O², and the positive pole of this battery is connected with the earth at G² through a conductor, 9. The function of the arm *g²* and the stop *g⁴* is similar to that of the arm *g′* and stop *g³*.

When the circuit-closing arm C is revolved in a given direction—say that indicated by the arrow *x′*—it will make contact with the contact-arm C′, thereby completing the connections of an electric circuit as follows: from the earth at G, through the conductor 1, brush D, arm C, brush *d′*, conductor 2, arm *h′*, stop *h³*, conductor 4, including electro-magnet F′, the arm *g′*, stop *g³*, conductor 5, to the positive pole of the battery O′, the negative pole of which is connected through the conductor 6 with the earth. The electro-magnet F′ will thereupon be vitalized, the armature-lever F⁵ will be drawn into its forward position, thus serving to release the arm *h⁵*, allowing it to rest against the contact-stop *h³*, and immediately afterward forcing the arm *h′* away from that stop. There will be then substituted therefor a circuit from the battery O′ to the point *h³* in the manner already shown, from thence to the contact-arm *h⁵*. This arm is in connection through a conductor, *l′*, with a main line, L, and an impulse will then be transmitted from the positive pole of the battery O′ to the main line. The remote terminal of the line L, it will be understood, is connected with the earth at G³, or it may be connected back through a metallic conductor with the grounded poles of the batteries O′ and O². In the same manner, when the movement of the arm C is in the opposite direction, the circuit of the battery O² will first be closed through the arms C and C², and, upon the movement of the armature F⁶, through the conductor *l²* with the main line L, and a negative current will then be sent to line. In this manner positive or negative currents will be sent, according to the direction of the movement of the arm C; but it becomes necessary, in order to permit a further movement of the arm, that the contact-points should be separated from the circuit-closing arm C. For this purpose the armature-levers F⁵ and F⁶ are respectively provided with actuating-pawls *k′* and *k²*, which serve, when either armature-lever is drawn into its forward position, to engage the wheel E, and during its return movement, in response to the spring *s*, turns it in the direction of the movement of the arm C. Thus the pawl *k′* turns the wheel E in the direction of the arrow *x′*, and the pawl *k²* in the opposite direction. It will be observed that the result of this movement is as follows: The forward movement of the lever F⁵, for instance, causes the contact of the arm *h⁵* to be substituted for that of the arm *h′* with the contact-stop *h³*, and before the circuit is again completed through the arm *h′*, the reverse movement of the lever causes the contact-arm C′ to be separated from the circuit-closing arm C. Both arms C′ and C², being carried upon the same support, are moved in the direction of the arrow *x′*, and the distance through which they are thus moved corresponds to the distance through which it is designed that the arm C shall be moved before making a second contact with the arm C′. It will be observed, moreover, that this interruption takes place while no current is traversing the arms C′ and

C, so that no electrical discharge will take place across the points *c* and *c'* carried thereby. The forward movement of the armature-lever F^5 will cause the contact-arm *g'* to be separated from the point g^3, thereby interrupting the circuit of the battery, and whatever electrical discharge may tend to take place will occur at the point g^3, which for this purpose is constructed to receive such discharge without injury. This interruption causes the electro-magnet F' to be demagnetized, thereby permitting the return movement of the lever F^5. Precisely the same operation will occur when the electro-magnet F^2 is vitalized by the contact of the circuit-closing arm C with the contact-arm C^2, with the exception that the movement of the wheel E will be in the opposite direction. So long as the elevator continues to move in one direction—say upward—the circuit will continue to be completed and interrupted in this manner, positive electric impulses being sent upon the line L through the action of the arm C', and in precisely the same manner a series of negative impulses will be transmitted, when the elevator descends, through the agency of the arm C^2. The impulses thus transmitted are employed for actuating the receiving-instruments in one direction or the other, in correspondence to the movements of the arm C, in the same manner as set forth in my Patent No. 284,382. The main line is connected through the coils of a polarized relay, M, (see Fig. 5,) with the earth at G^3. An electro-magnet, M', is connected with one arm of an electric circuit, 10, and a corresponding electro-magnet is connected in a branch circuit, 11, of the same battery, *o'*. When a positive electric impulse is sent over the main line through the coils of the electro-magnet M, the armature of that magnet will, by resting against the stop *m'*, cause the circuit of the battery *o'* to be completed through the conductor 10, including the electro-magnet M'. A negative electric impulse serves, by carrying the armature into contact with the contact-point m^2, to complete the connections of the local battery through the conductor 11, including the electro-magnet M^2.

The electro-magnets M' and M^2 are provided with armatures and armature-levers for actuating a wheel, N', in one direction or the other, accordingly as it is a positive or negative impulse which is transmitted over the line. The shaft *m* of the wheel W carries a pointer, P, extending in front of a dial, P'. Upon this dial are formed characters of any convenient description for indicating the number of impulses of a given character which have been transmitted, or, in other words, the position of the circuit-closing arm C, and thus of the elevator A.

It may not always be necessary to employ a continuity-preserving key such as that presented at *h'*, h^2, and h^3 in Fig. 1; but an organization similar to that shown in Fig. 3 may be adopted under certain circumstances. This organization is designed to employ two main lines, L' and L^2, over which the electric impulses are transmitted. In this figure I have shown the pawls k^3 and k^4 arranged to move the wheel E during the forward movement of the armature-levers F^5 and F^6, which are applied to the electro-magnets F' and F^2, respectively. A single battery, O^3, is employed, and this battery is connected through a conductor, 13, with the contact-brush D', which completes the circuit with the circuit-closing arm C. The brushes d^3 and d^4 are respectively connected with extensions f^5 and f^6 of the armature-levers F^5 and F^6, and through conductors 14 and 15, respectively, with the main lines L' and L^2. The coils of the electro-magnets F' and F^2 are included in the conductors 14 and 15, respectively. When, therefore, the arm C makes contact with either of the contact-arms C' or C^2, the circuit is first completed through the coils of the corresponding electro-magnet to the main line. The armature responding thereto immediately causes a contact-point carried upon the arm f^5 or f^6 to strike against an arm, h^7 or h^8, which are respectively applied thereto. These arms h^7 and h^8 are respectively connected through conductors 17 and 18 with the corresponding circuit-interrupting arm, *g'* or g^2. The contact-points g^3 and g^4 are respectively connected through conductors 19 and 20 with the conductor 13, leading from the battery O^3. When, therefore, one of the extensions f^5 or f^6 strikes against the corresponding spring, h^7 or h^8, the circuit of the battery will be completed through the corresponding conductor, 19 or 20, and the arm *g'* or g^2 to the extension f^5 or f^6, and thence through the conductor 14 or 15 to the corresponding main line. The points *c* will thereby be shunted, and the further advancement of the pawl causes the points to be separated. The still further advancement of the armature F^5 or F^6 causes the extension *f'* or f^2 to actuate the circuit-interrupting arm *g'* or g^2, thus entirely interrupting the circuit of the battery O^3. The armature-lever thereupon resumes its normal position, the contact-arms having been advanced through the distance represented by one tooth. It will be observed that in this organization the contact-arms C' and C^2 are applied relatively upon the opposite sides of the wheel E from that represented in Fig. 1, for the reason that the pawls are constructed to revolve the wheel in the opposite direction from that shown in Fig. 1. This, however, is a feature in the organization which may be variously modified without in any way affecting the principle of the invention. The receiving-instrument employed in this organization may be any suitable form described in the patents hereinbefore referred to.

In Fig. 4 a modification is illustrated in which the continuity-preserving keys described in connection with Fig. 1 are employed in connection with two additional electro-magnets, which act to take the place of those employed for imparting the primary movements to the armature-levers F^5 and F^6, and to hold

the same in their advanced positions until the circuit is interrupted by the interrupting-arm g' or g^2. In this organization the batteries O′ and O² are connected with the stops g^3 and g^4, respectively, and the arms g' and g^2 are connected through the conductors 4 and 7 with the stops h^3 and h^4, respectively. The electro-magnets F′ and F² are, however, not included in these conductors, as in Fig. 1, but are included in the conductors 2 and 3, which lead to the brushes d' and d^2, respectively, from the arms h' and h^2. Two supplementary electro-magnets, F⁷ and F⁸, are included in the conductors l' and l^2, leading from the arms h^5 and h^6 to the main line L. These electro-magnets act upon arms f^9 and f^{10}, applied to extensions of the levers F⁵ and F⁶. These electro-magnets are placed in circuit after the circuit of the battery O′ and O² has been completed by the action of the circuit-closing arm C striking against the contact-arm C′ or C², and the electro-magnet F′ or F² has advanced the armature-levers F⁵ and F⁶ until the arm h^5 or h^6 is in contact with its stop h^3 or h^4. The further advancement of the armature-lever in response to the attraction exerted by the supplementary electro-magnet causes a separation of the points c by the action of the pawl k^5 or k^6, in the same manner as described with reference to Fig. 3, and also a separation of the arm h' or h^2 from the points h^3 or h^4. This last action preferably takes place after the separation of the points c, although it is evident that it may take place before or simultaneously therewith. The circuit of the battery then remains closed only through the supplementary electro-magnet. The still further advancement of the armature-lever which is being actuated causes the circuit through the supplementary electro-magnet to be also interrupted through the agency of the arm g' or g^2, whereupon the armature-lever resumes its normal position. In practice it is found desirable in this organization to so construct the apparatus that the points c shall separate after the arm h' or h^2 has been separated from the stop h^3 or h^4, for in this manner the discharge of the electro-magnet F′ or F² will take place entirely at the stops h^3 and h^4, and no spark will be possible at the points c.

In practice it will be found desirable in some instances to connect the arms g' and g^2, respectively, with their stops g^3 and g^4, through artificial resistances r' and r^2, which are designed to relieve the points carried by the same from the electric discharge by affording a path of high resistance for the same. It is evident, however, that the resistance offered by these artificial resistances should be sufficiently great to prevent the passage of currents from the batteries O′ and O² of sufficient force to vitalize the electro-magnets F′ and F².

In another application filed December 26, 1883, (Serial No. 115,514,) I have shown and described certain organizations of apparatus in some particulars similar to certain organizations shown and described herein, and I do not therefore herein claim anything shown, described, and claimed in said application and not specifically claimed herein.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, with an elevator and a shaft and means for revolving said shaft in one direction or the other, in accordance with the movements of said elevator, of a circuit-closing arm carried upon said shaft, two contact-arms upon opposite sides of said circuit-closing arm, means, substantially such as described, for causing said circuit-closing arm to repeatedly complete an electric circuit through one or the other of said contact-arms, according to the direction of motion of said elevator, one or more indicating devices which are actuated when a circuit is thus completed, and means, substantially such as described, for separating said contact-arms from said circuit-closing arm.

2. The combination, substantially as hereinbefore set forth, with an elevator and a series of indicating devices for indicating the position of said elevator, of a circuit-closing arm actuated in one direction or the other by the movements of said elevator, two contact-arms, against one or the other of which said circuit-closing arm is caused to impinge, according to the direction of movement of said elevator, one or more electric batteries from which electric impulses are transmitted in the proper manner to actuate said indicating devices when said circuit-closing arm impinges against one or the other of said contact-arms, and means, substantially such as described, for separating said contact-arms from said circuit-closing arm.

3. The combination, substantially as hereinbefore set forth, with an elevator and a series of indicating devices for determining the position of the same, of a revolving circuit-closing arm, means for actuating the same in one direction or the other, according to the movements of said elevator, two revolving contact-arms upon the respective sides of said circuit-closing arm, and means, substantially such as described, for causing said circuit-closing arm to transmit an electric impulse for each predetermined distance through which said elevator passes in a given direction.

4. The combination, substantially as hereinbefore set forth, of an elevator, a series of indicating devices for determining the position of said elevator, a circuit-closing arm moving at a rate proportionate to the movements of said elevator, two contact-arms respectively applied to said circuit-closing arm, and means for causing said circuit-closing arm to complete an electric circuit through one or the other of said contact-arms, thereby causing said indicating devices to be actuated in one direction or the other, and also advancing said contact-arms in the direction depending upon the direction of movement of said elevator.

5. The combination, substantially as hereinbefore set forth, of an elevator, means for

raising and lowering the same within its shaft, a circuit-closing arm moving in one direction or the other, according to the direction of movement of said elevator, two electro-magnets, through one or the other of which an electric circuit is completed by the action of said circuit-closing arm, accordingly as it is moved in one direction or the opposite, and independent circuit-interrupting devices included in circuit with said electro-magnets, and serving, substantially as described, to interrupt the circuit thus completed through one or the other of said electro-magnets.

6. The combination, substantially as hereinbefore set forth, with an elevator and means for actuating the same, of a series of indicating devices, a circuit-closing point caused to move in one direction or the other, according to the direction of movement of said elevator, two electro-magnets, through the coils of one or the other of which said point acts to complete an electric circuit, thereby actuating said indicating devices in one direction or the other, accordingly as said circuit-closing point is moving in one direction or the other, and independent means, substantially such as described, for interrupting the circuit thus completed when said indicating devices have been actuated.

7. The combination, substantially as hereinbefore set forth, of an elevator, a movable circuit-closing point, the movements of which are controlled by the movements of said elevator, one or more indicating devices for determining the changes in position of said elevator, two contact-points respectively applied to said circuit-closing point, means, substantially such as described, for moving said contact-points in the direction of movement of said circuit-closing point, and two electro-magnets, through one or the other of which an electric circuit is completed, accordingly as said circuit-closing point is caused to impinge against one or the other of said contact-points.

8. The combination, substantially as hereinbefore set forth, of a revolving circuit-closing arm, two contact-arms, against one or the other of which said circuit-closing arm is caused to impinge, accordingly as its motion is in one direction or the other, two batteries, two electro-magnets respectively included in conductors normally connected with said contact-arms, respectively, armatures and armature-levers applied to said electro-magnets, respectively, one or more indicating devices included in a normally-open circuit, and circuit-changing devices applied to said armature-levers, whereby the conductor leading from either battery to the corresponding contact-arm is automatically disconnected from that arm and connected with the conductor, including said indicating instrument or instruments.

In testimony whereof I have hereunto subscribed my name this 20th day of March, A. D. 1884.

CHARLES L. CLARKE.

Witnesses:

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CHARLES A. TERRY.