No. 728,544. PATENTED MAY 19, 1903.

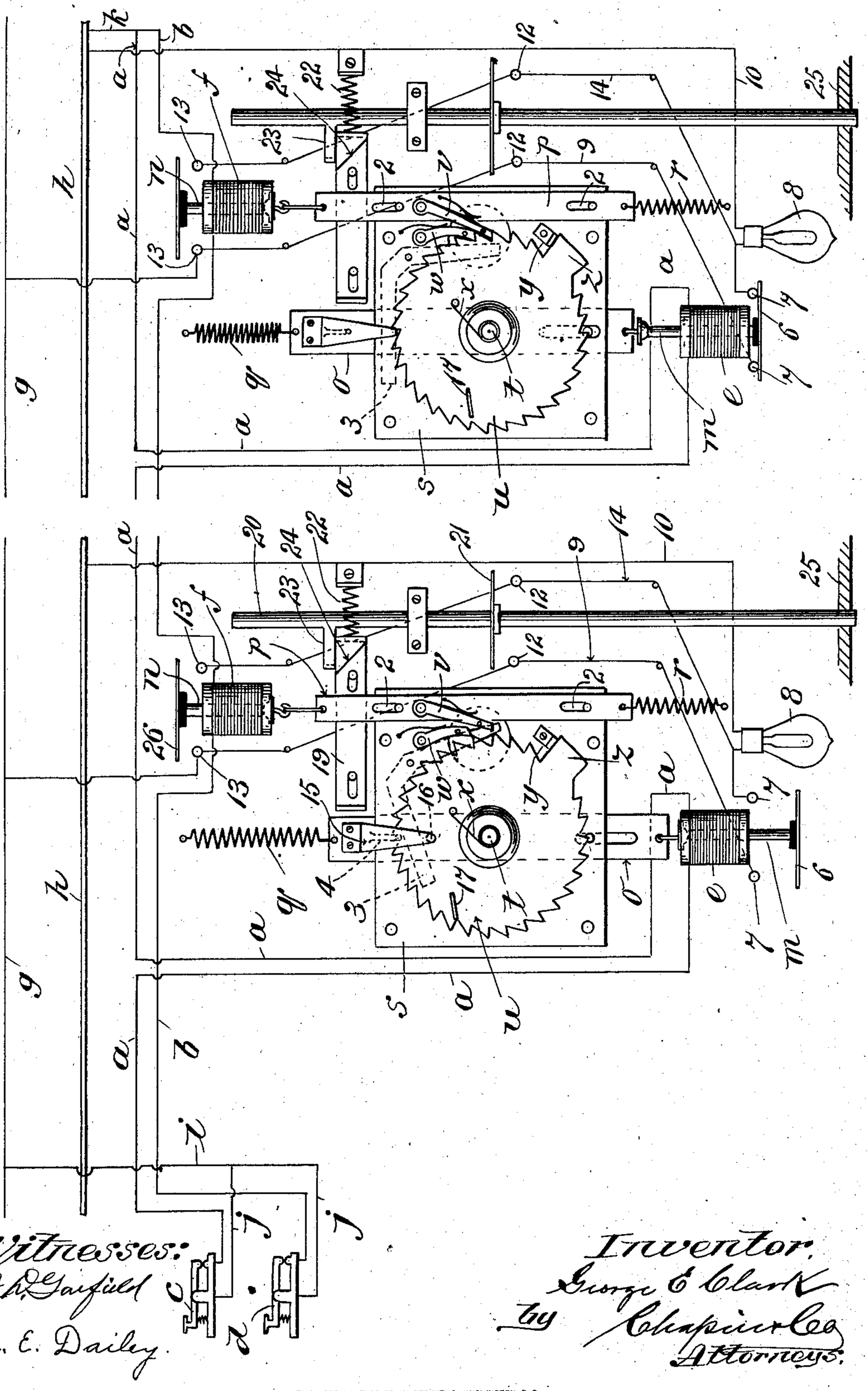
G. E. CLARK.

ELECTRIC SIGNALING DEVICE.

APPLICATION FILED AUG. 16, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 2.



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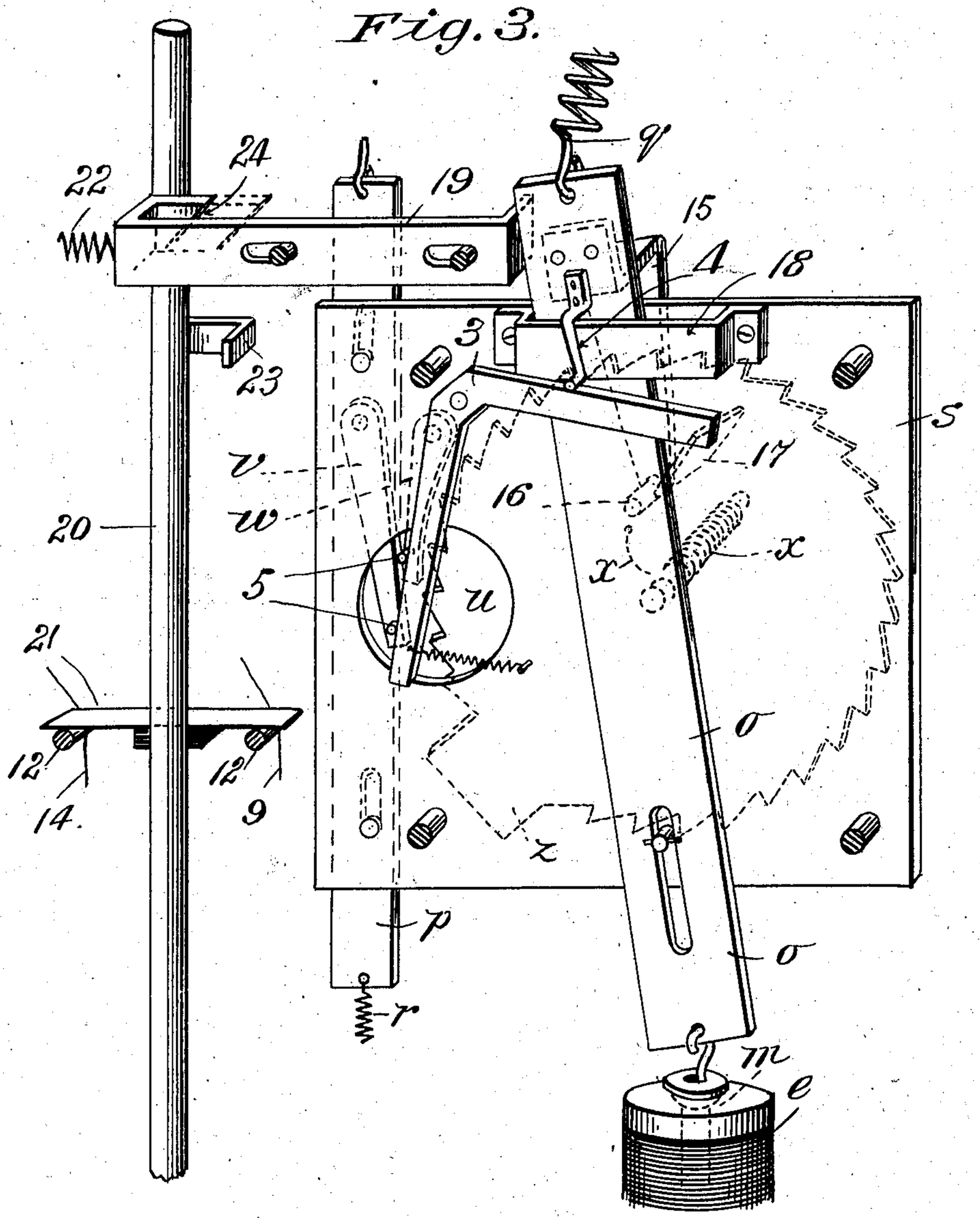
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.



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No. 728,544. Patented May 19, 1903.

UNITED STATES PATENT OFFICE.

GEORGE E. CLARK, OF NORTHAMPTON, MASSACHUSETTS.

ELECTRIC SIGNALING DEVICE.

SPECIFICATION forming part of Letters Patent No. 728,544, dated May 19, 1903.

Application filed August 16, 1902. Serial No. 119,905. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. CLARK, a citizen of the United States of America, residing at Northampton, in the county of Hampshire and State of Massachusetts, have invented new and useful Improvements in Electric Signaling Devices, of which the following is a specification.

This invention relates to electrically-operated signal-boxes; and the object of the invention is to provide improved means for calling any one of a number of boxes on the same line in the provision of means for automatically setting the signal at the box called, which may remain exposed after the signal-setting devices within the box have been returned to normal position.

A further object of the invention lies in the construction of signal-boxes of this class, which may be operated by means of two separate closed circuits, either grounded or metallic.

In the drawings forming part of this application, Figure 1 is a front elevation of the signal-operating devices required for one station or box, together with the necessary electrical circuit. Fig. 2 is a similar view showing the parts in a different position. Fig. 3 is an enlarged view in perspective of a part of the mechanism of one box or station viewed from the side opposite to that shown in the other figures.

The boxes shown in the drawings are those of a type such as are distributed along the line of a street-railway and used in connection with a telephone-station whereby the office of the manager may be placed in communication with any car passing a given point of the line, and the operating-current for these boxes, as shown in the drawings, is taken from the trolley-wire in the manner to be described. It is to be understood, however, that this is simply a matter of convenience and is a construction which is simply a convenient one when the boxes are used for this purpose. Obviously any other source of electricity may be substituted, if desired.

The operating elements in this system of electrically-operated signal-box construction consist of two separate closed electrical circuits or lines, in each of which there is connected in in series one electromagnet for each station—that is to say, at each station or box there is located one of the magnets in each of the circuits. In the drawings these circuits are indicated by *a* and *b*, each of which circuits may be opened and closed, respectively, by the keys *c* and *d*. In the circuit *a* there are number of electromagnets *e*, connected in in series, which in the drawings are shown in the form of solenoids, which are preferred to the ordinary electromagnet. In the circuit *b* there are a number of electromagnets *f*, also in the form of solenoids and connected in said circuit in series. There may be as many of these magnets *e* and *f* as there are stations to be established. Comprised in these circuits is a trolley-wire *g* and one of the rails *h* of a line of track, each of the keys *c* and *d* being connected with the trolley-wire *g* by a wire *i*, from which branches *j* run to the keys. The opposite ends of each of these circuits are connected with the rail *h* by a wire *k*, the line being grounded through its connection with the rail. Both of the circuits *a* and *b* are, as stated, closed circuits. Therefore the normal position of the parts operated by the magnets *e* and *f* is that shown in Fig. 1—that is to say, the armatures *m* and *n* of the magnets *e* and *f* in the circuits *a* and *b*, respectively, are drawn into the solenoids. Attached to these armatures in any suitable manner are two slides *o* and *p*, the former being attached to the armature *m* and the latter to the armature *n*. Connected to the ends of these slides are the springs *q* and *r*, respectively. The solenoids are so arranged as to move their armatures in opposite directions, and therefore the slides *o* and *p* move in opposite directions when through the closing of the circuits the armatures are drawn into the solenoids, as shown in Fig. 1, or by their springs when the circuits are opened. These slides are supported on a suitable plate, as *s*, and the magnets and other parts may be supported in any convenient manner, and it may be assumed that these parts are all mounted on a suitable base.

On the plate *s* there is mounted on a spindle *t* a toothed wheel *u*, which wheel is adapted to be rotated by the vertical movement of the slide *p*, on which is a pawl *v*, adapted to

engage the teeth of the wheel. Mounted upon the plate *s* there is a stop-pawl *w* to hold the wheel against backward movement in the usual manner. When this wheel is rotated by the pawl *v*, it turns against the tension of a coiled spring *x* on the spindle *t*, whereby when the wheel is released from the restraint of the pawls *v* and *w* it will return to its normal position, which is determined by a stop *y* on the plate *s*, with which a projection *z* on the wheel may come in contact.

If the key *d* be manipulated to break the circuit *b*, the slide *p* and the attached armature *n* of the solenoid *f* will be drawn downward by the action of the spring *r*, said downward movement being limited by the guide-slots 2 in the slide. Normally, however, as may be seen by referring to Fig. 1, the pawl *v* and the stop-pawl *w* are held out of engagement with the teeth of the wheels *u* until the circuit *a* has been broken and the slide *o* thus released and drawn upward by the spring *q* to the position shown in Fig. 2. Means for thus holding the pawls *v* and *w* out of connection with the teeth of the wheel *u* consist in an elbow-lever 3. (Shown in dotted lines only in Figs. 1 and 2 and in different positions.) This lever, as may be seen by reference to Fig. 3, is pivotally mounted on the back side of the plate *s*, and one arm of the lever extends transversely of the slide *o* and the other arm thereof extends downward toward the ends of the two pawls *v* and *w*.

On the rear side of the slide *o* is a finger 4, which when the circuit *a* is closed and the slide thus drawn downward will strike the upper arm of the elbow-lever 3, and thus swing the other arm against pins 5 in the pawls and swing them out of engagement with the teeth of the wheel *u*, said pawls, as usual, being normally spring-pressed against said teeth.

From the foregoing description it is seen that in order to operate the wheel *u* by means of the magnet *f*, as described, it is first necessary to break the circuit *a* to permit the slide *o* to be drawn up by the spring *q*, and thus bring the pawls *v* and *w* in operative relation to the wheel *u*. When this (which is the first step in the operation of calling a particular box) is done, the metal strip 6 on the end of the armature *m*, which is insulated therefrom, will strike the two posts 7 and bridge the space between them. This will close an electrical circuit in which is included a signal-lamp 8, and this circuit is composed of the wires 9 and 10, running, respectively, to and being connected with the trolley-wire *g* and the rail *h*, and, therefore, whenever the circuit *a* is broken the lamps 8 of all the stations will be lighted, all the magnets *e* being connected in said circuit in series. The wire 9, forming a part of the lamp-circuit, runs from the post 7 to another post 12 and from thence to still another post 13, and from the wire 10, forming the other part of the lamp-circuit, a wire 14, which is connected into the wire 10, also runs to the second of the two posts 12 and 13.

Near the upper end of the slide *o* is an arm 15, which extends over and down in front of the wheel *u*, and on the end of which, as shown clearly in Fig. 3, there is a post 16, extending inwardly toward the side of the wheel, and on the front of the latter, located near the bottom of one of the teeth, is a rib 17, which extends out from the side of the wheel and whose longitudinal direction is oblique to the radius of said wheel. This is a cam-rib, which is located, counting from the vertical center of the wheel, one side of the center line thereof, as many teeth distant from said center line as will indicate the number of the box, to the end that when the wheel *u* has been rotatably moved step by step by the pawl such number of times as will indicate the number of the box the cam-rib 17 will find itself located under the overhanging arm 15, with the outer end of the rib lying in close proximity to the post 16, and thus when the circuit *a* is again closed and the slide *o* is again drawn down by the magnet *e* the post 16 in its descent will come in contact with the rib 17, and the slide *o* will thus be forced more or less to the right. To permit this sidewise movement of the slide in its descent at this time, it is supported on the rear of the plate *s* by a strap 18, as shown in Fig. 3, in such manner that the slide may move to the right within the limits of the strap-support, its opposite end being pivotally connected with the armature *m*. In its said movement sidewise the slide *o* comes in contact with the end of a slide 19, located at right angles thereto, which in turn supports a circuit-holding drop-rod 20 in such manner that the movement of said slide in one direction will release the rod. On the latter there is a metal plate 21, insulated from the rod and in all respects similar to the strip 6 on the armature *m*, which plate when the rod falls constitutes a bridge between the two posts 12, and thus closes the lamp-circuit whereby the lamp may be kept lighted after the circuit *a* has been closed and the lamp-circuit thereby broken between the posts 7. After the movement of the slide 19, whereby the rod 20 has been released to close the lamp-circuit through the posts 12, a spring 22, operating against the end of said slide, moves the latter again toward the slide *o* in position to be again operated by the latter. If now the circuits *a* and *b* be left closed, the parts of the mechanism of the box just called will return to the position shown in Fig. 1 with the exception that the rod 20 will be in the position shown in Fig. 3—that is, supported on the post 12 by the plate 21. The drop-rod 20 is supported on the slide 19 by means of an arm 23 on the side of the rod, the extremity of which, as shown in Fig. 3 more clearly, is bent in toward the slide 19. The outer end of this slide is bent rectangu-

larly back upon itself, as shown in Fig. 3, the under side of said extremity being beveled, as indicated by 24, and the end of the arm 23 rests upon this beveled-off end of the slide. Thus when the slide is moved, as described, to permit the rod 20 to drop and the spring 22 then moves the slide back again to normal position the arm 23 will then lie under the beveled-off portion 24 of the slide, and when the call signaled for by the box has been answered the rod 20, whose lower extremity drops down through the bottom of an inclosing box, (a portion of which is indicated in Figs. 1 and 2 by 25,) is moved in and the lamp-circuit is immediately broken, and the arm 23, striking the beveled edge of the slide, will move the latter endwise sufficiently to permit the end of the arm to slip over the end of the slide, when the spring 22 will immediately throw the slide back, moving the end thereof under the arm 23, and thus all the parts of the device will be restored to normal position and again ready for operation.

It will be seen that the lamp-circuit runs also to the posts 13 near the magnet *f*, and that the upper end of the armature *n* is also provided with an insulated metal plate 26, adapted to close the lamp-circuit through the posts 13 whenever the circuit *b* is opened. Obviously when the circuit *a* is opened and the lamp-circuit is closed through the posts 7 the contact of the plate 26 with the posts 13 is of no effect. If, however, the circuit *a* remains closed, the parts being in the position shown in Fig. 1, then the circuit *b* may be broken by the manipulation of the key *d* and the lamp-circuit thus closed between the posts 13. By this means by alternately making and breaking the contact between said posts the number of any box which it is desired to call may be signaled by the flash of the lamps, which of course will be operated along the whole line. It is thus seen that the extension of the lamp-circuit to the posts 13 is made merely as a matter of convenience, and it is not a feature which is necessary to the proper operation of the boxes.

The operation of the herein-described devices for the purpose of calling any particular box of a number located along the line of track is as follows: The key *c* is depressed, opening the circuit *a*, allowing the slide *o* to be drawn upward by the spring *q* to the position shown in Fig. 2. This closes the lamp-circuit throughout the entire line through the posts 7 of each box, and the elbow-lever 3, by the upward movement of the slide *o*, swings out of contact with the pawls *v* and *w*, actuated by a suitable spring, and the pawls come into operative contact with the teeth of the wheel *u*. Holding down the key *c*, and thus keeping the circuit *a* open, the key *d* is manipulated to make and break the circuit *b* as many times as the number of the desired box calls for, whereby a certain number of impulses will be given to the slide *p*, each of which will move the wheel *u* one tooth. Assuming the box shown in the drawings to be numbered 6, six of these impulses will bring the cam-rib 17 (whose normal position is six teeth distant) in operative position under the post 16, carried on the arm 15, secured to the slide *o*. At this point the keys *c* and *d* may be released, closing both circuits *a* and *b*, whereby the slide *o* is drawn downward and by means of the cam-rib thrown against the end of the slide 19 in its downward movement, which movement of the slide 19 releases the drop-rod 20 and closes the lamp-circuit through the posts 12. Simultaneously with this movement the slide *p* is drawn upward and the pawls *v* and *w* thrown out of engagement with the teeth of the wheel *u*, the coiled spring *x* on the spindle of said wheel then rotating the latter back again to the normal position of rest against the stop *y*. The lamp of whatever box has been called will remain lighted by means of the released drop-rod 20 until the call is answered and the drop-rod reset in its elevated position by whomsoever has answered the call.

This system is particularly adapted to the operation of signal-boxes in use along the line of an electric road, because by the use of the trolley-wire and rail the wiring for the system is made extremely simple, consisting of two simple closed circuits *a* and *b*.

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

1. A selective electric signaling apparatus comprising a plurality of signaling mechanisms, one for each station, two normally closed electrical circuits having independent operating means, magnet-actuated means associated with each mechanism for operating the same and the magnets of which are included in one of the circuits, and separate magnet-actuated means whose magnets are included in the other of said circuits and which are associated with each signaling mechanism to permit and prevent the operation thereof.

2. A selective electric signaling apparatus comprising a plurality of signaling mechanisms for the several stations and each including a signal and a signal-controlling device, two normally closed electrical circuits having independent operating means, magnet-actuated means controllable from one of said circuits for operating the signaling mechanism and also the signal of each mechanism, and separate means controllable from the other of said circuits for maintaining the signal of any station in action after the closing of the first-named circuit.

3. A selective electric signaling apparatus comprising a plurality of signaling mechanisms for the several circuits, each including a signal and a signal-controlling device, operating means for selectively exposing the signal of any one of the mechanisms, said operating means including two normally closed electrical circuits, and actuating-magnets in-

cluded in series in said circuits, and operative connections between the magnets and the mechanisms arranged, upon deënergization of the magnets of one of the circuits, to bring all of the mechanisms into a position to be selectively operated by the opening and closing of the other circuit.

4. A selective electric signaling apparatus comprising a plurality of signaling mechanisms for the several stations, each including a signal-lamp and a signal-controlling device having a normally open electrical circuit, two normally closed electrical circuits, and separate magnet-actuated devices included in each closed circuit and controllable thereby, said magnet-actuated devices comprising means for operating the signaling mechanisms to expose the lamps of all of the mechanisms, and also to maintain the activity of any one of said lamps selectively.

5. A selective electric signaling apparatus comprising a plurality of signaling mechanisms for the several stations each including a signal-lamp and a signal-controlling device having a normally open electrical circuit, two normally closed electrical circuits having independent operating means, magnet-actuated means controllable from one of the circuits for effecting the lighting and extinguishing of the lamp of each mechanism a predetermined number of times, and magnet-actuated means controllable from the other closed circuits for maintaining the activity of any one of the lamps selectively after the lighting thereof by the first-named circuit.

6. A selective electric signaling apparatus comprising a plurality of signaling mechanisms for the several stations, each including a signal-lamp and a signal-controlling device, two normally closed electrical circuits having independent operating means, magnet-actuated means controllable from one of the circuits for operating each mechanism, separate magnet-actuated means controllable from the other circuit to permit and prevent the operation of each signaling mechanism, both of said magnet-actuated means including devices for opening and closing the signal-circuits, and one of said magnet-actuated means also being operatively related to said signal-controlling device for holding any one of the lamps exposed selectively.

7. In combination with the trolley-wire and rail of an electric-car system, of a selective electric signaling apparatus comprising a plurality of signaling mechanisms for the several stations, each including a signal and a signal-controlling device having a normally open circuit including the trolley-wire and rail, two normally closed electric circuits having independent operating means and also including the trolley-wire and rail, means associated with each mechanism for operating the same and controllable from one of said closed circuits, and separate means controllable by the other of said closed circuits to permit and prevent the operation thereof.

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