(No Model.) 3 Sheets—Sheet 1.

F. W. TURNER & W. M. CHAPMAN.

ELECTRIC SIGNALING APPARATUS.

No. 563,336. Patented July 7, 1896.

Fig. 1

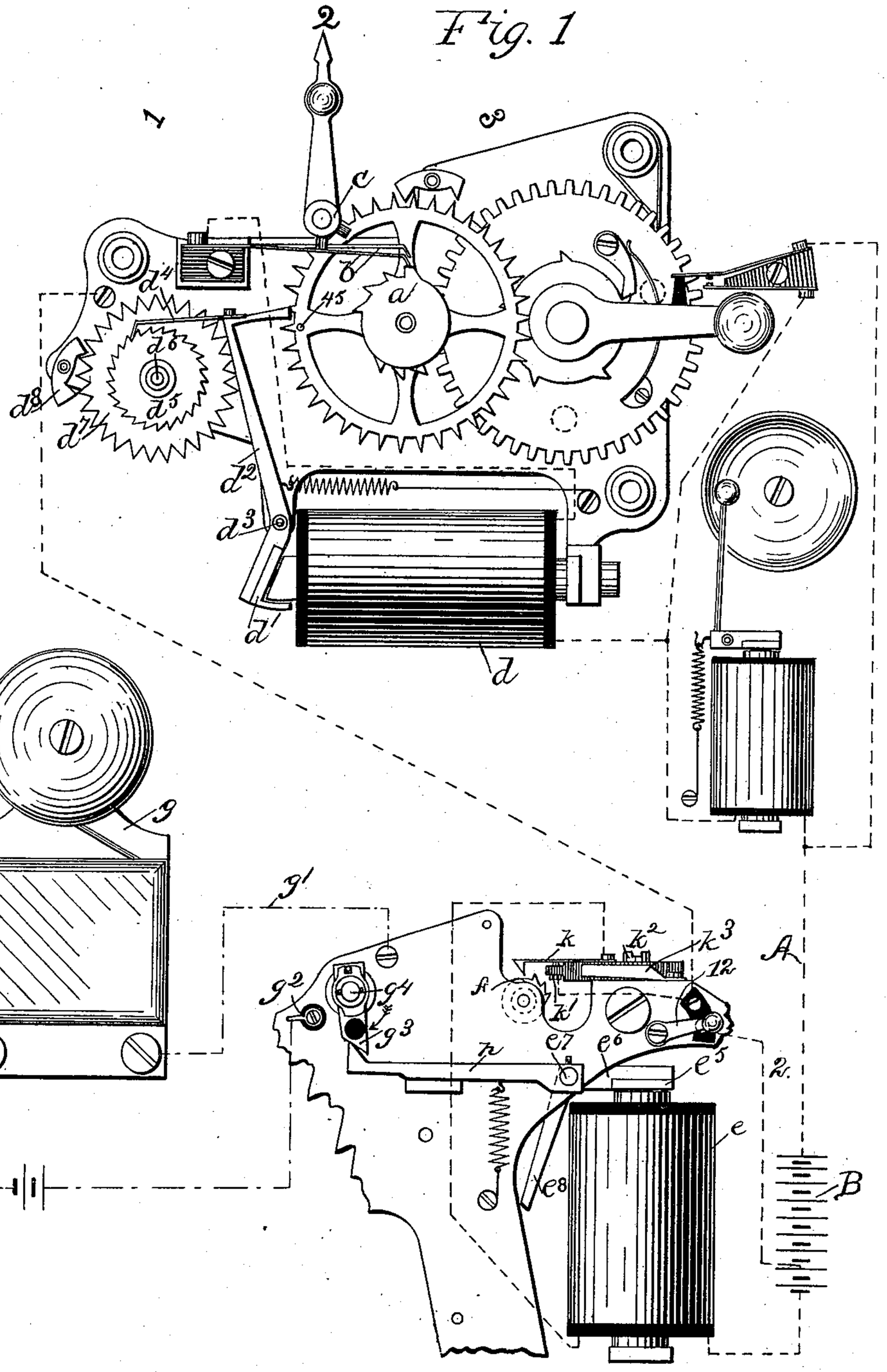

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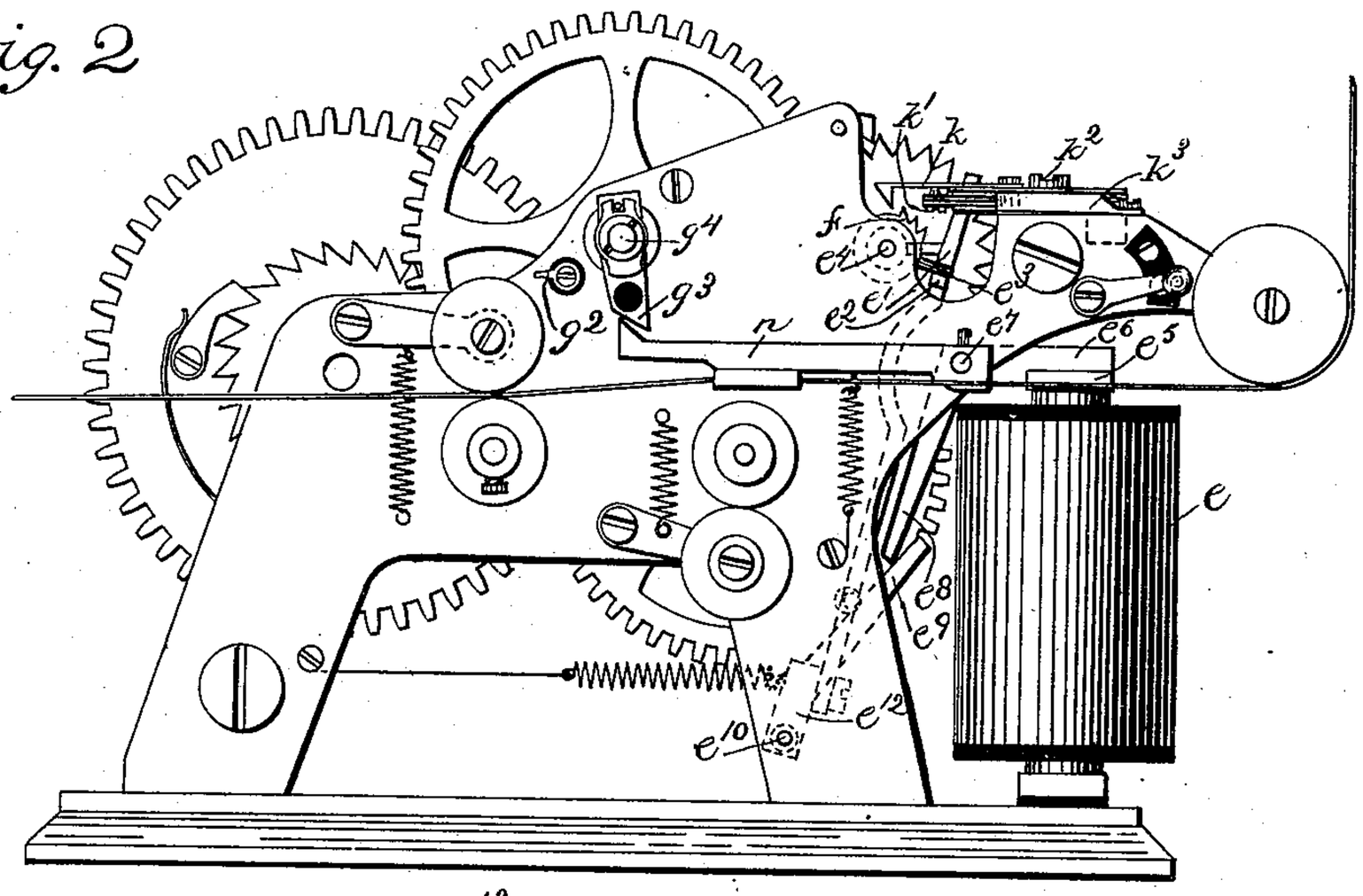
Fig. 2



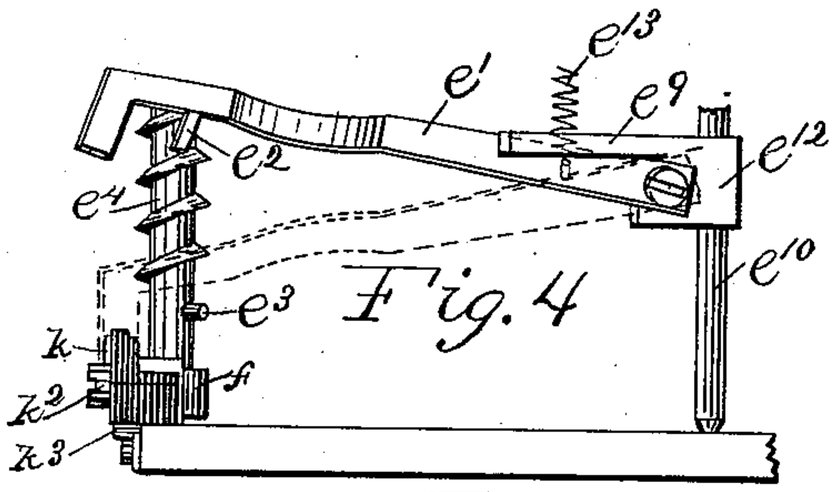


Fig. 4

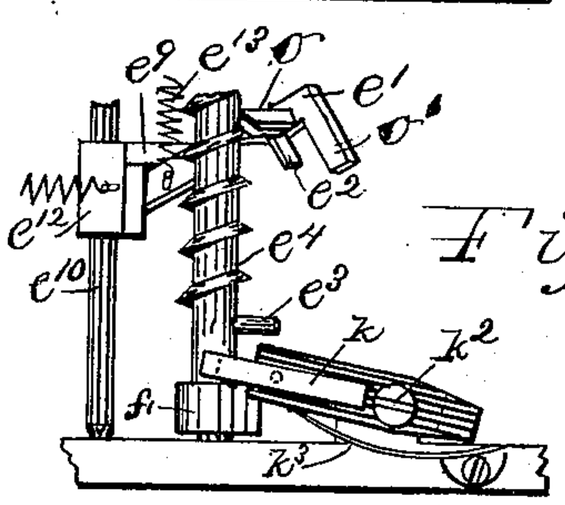


Fig. 5

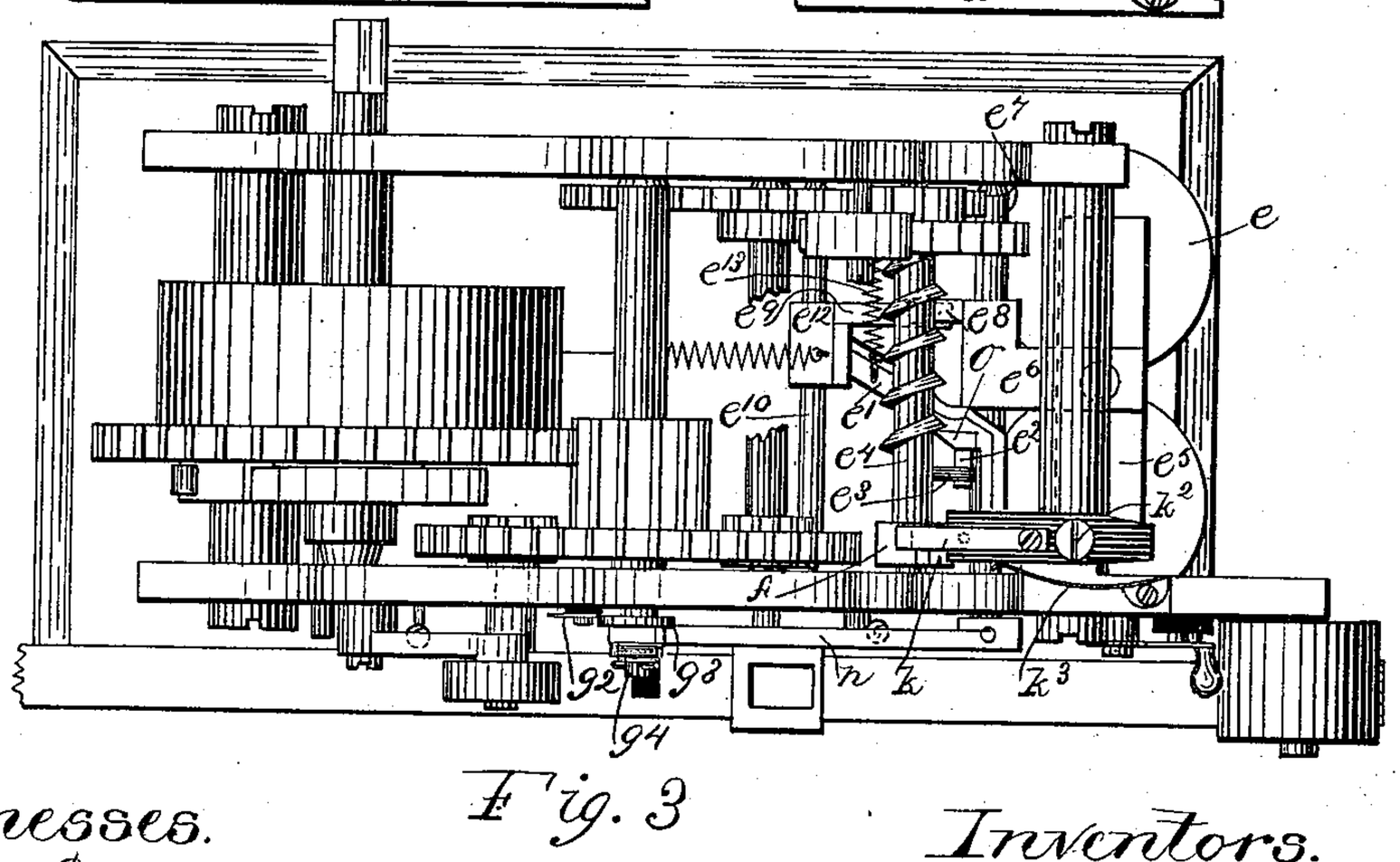


Fig. 3

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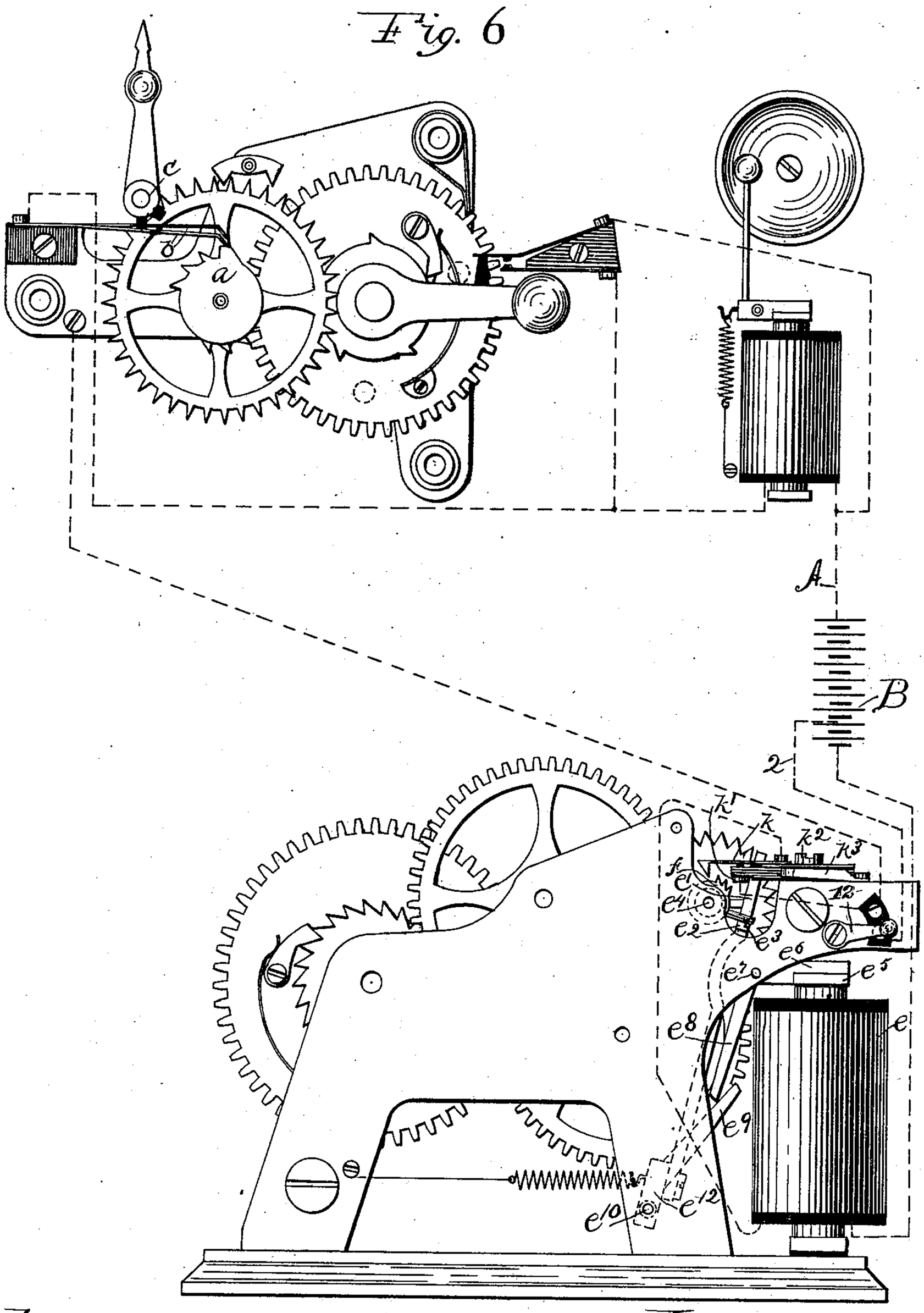
Fig. 6



Witnesses.
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UNITED STATES PATENT OFFICE.

FREDERICK W. TURNER, OF NEWTON, AND WINTHROP M. CHAPMAN, OF NEEDHAM, MASSACHUSETTS.

ELECTRIC SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 563,336, dated July 7, 1896.

Application filed April 18, 1891. Serial No. 389,425. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK W. TURNER, of Newton, county of Middlesex, and WINTHROP M. CHAPMAN, of Needham, county of Norfolk, Massachusetts, have invented an Improvement in Electric Signaling Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters and numerals on the drawings representing like parts.

This invention relates to electric signaling apparatus of the kind especially adapted for police-signal purposes, comprising signal-boxes located at different points along the streets and a main or signal-receiving station; and our invention has for its object the production of an answer-back signaling apparatus by which the transmission of the answer-back signal from the signal-receiving station to a signal-box will not interfere with the transmission of the regular signals from the signal-box to the signal-receiving station, although both transmitters are designed to operate the same circuit; and our invention also comprehends a special form of device by which a bell or other signal-indicator may be operated in conjunction with some signals and not with others.

Figure 1 shows in front elevation a signal-transmitting apparatus and answer-back bell which is contained in a signal-box, together with a portion of the receiving apparatus and answer-back-signal transmitter; Fig. 2, a front elevation of a message-recording instrument provided with an answer-back-signal transmitter and means for operating the bell or other signal-indicator embodying this invention; Fig. 3, a plan view of a message-recording instrument shown in Fig. 2; Figs. 4 and 5, details to be referred to, and Fig. 6 a modification to be referred to.

The signal-transmitting apparatus which is contained in the box is herein shown as a multiple-signal transmitter comprising a series of break-wheels a, secured to a shaft, a series of pens b, adapted to be thrown into engagement with the break-wheels a by a selecting-cylinder c, to which a pointer is attached. The break-wheel shaft is revolved by any suitable motor mechanism. A non-interference magnet d is provided, the armature d' of which is attached to or connected with a controlling-lever d^2, pivoted at d^3, and adapted to engage a pin 45 on the escape-wheel of the signaling-train. The controlling-lever d^2 has a spring-acting pawl d^4, which engages a ratchet-toothed wheel d^5, secured to a shaft d^6, to which shaft is also secured an escape-wheel d^7, with which cooperates a pallet d^8.

If a signal is being transmitted from another box in the circuit at the time the box herein described, which, it will be understood, is the home box, is operated, the armature d' will be retracted and the signaling-train stopped, and when once retracted it will require a longer closure than the longest closure in any signal to restore the said armature to its normal position and release the train, said form of box being what is commonly known as a "successive non-interference" signal-box.

The signal-box and non-interference magnet are both included in the main signaling-circuit containing the battery B, and said circuit also contains an electromagnet e, which serves as the starting as well as pen magnet of a signal-receiving instrument, herein shown as a message-recording instrument.

Referring to Figs. 2 to 5, the message-recording instrument shown consists of a train of wheelwork normally wound up, and having a let-off lever e', which, as herein shown, is provided with a projection o, adapted to engage the worm of a worm-shaft e^4 and a projection e^2, which engages a projection e^3 on a worm-shaft. The armature e^5 of the electromagnet e is connected to an arm or lever e^6, pivoted at e^7 and having a downwardly-extended projection e^8, which engages an arm e^9, secured to an arbor e^{10}, said arm e^9 being attached to or formed integral with a block e^{12}, to which is pivoted said let-off or stop lever e'. When the armature e^5 is retracted, the arm e^8 moves the arm e^9 on its pivot, and carries the let-off or stop lever out of engagement with the worm-shaft e^4, and allows the instrument to start. As this let-off or stop lever e' is moved out of engagement with the worm-shaft the spring e^{13}, connected to it, moves it on its pivot in the direction of the length of the said worm-shaft to the opposite

end thereof, so that as soon as the armature is attracted the said stop arm or lever by its projection *o* will engage the worm-shaft, and by it will be moved in the opposite direction or restored to its normal position, provided the circuit remains closed a sufficient length of time; but if the armature e^5 is again retracted then the let-off or stop lever *e'* is thrown back to its starting-point. On one end of the worm-shaft e^4 a toothed wheel *f* is secured, which is designed to coöperate with a signal-key *k k'*, herein represented as normally closed and included in the signaling-circuit A. The signal-key *k k'* is pivoted at k^2, and when not otherwise prevented is held out of coöperative relation with or engagement with the toothed wheel *f* by means of a spring k^3. The signal-key *k k'* lies in the path of movement of a projection *o'* on the stop arm or lever *e'*, to be engaged by it and moved into coöperative relation with the toothed wheel *f* whenever the stop arm or lever is restored to its normal locking position to stop the train, and, as herein represented, the wheel *f* has three teeth close together, which, during the time that the signal-key is in engagement therewith, will cause three impulses to be transmitted over the circuit A, to operate a bell or other suitable answer-back-signal indicator contained in the box.

A short circuit is arranged around the answer-back bell, which is provided with a switch adapted to be held open by the winding-arm of the transmitter, when the latter is in its normal position, to thereby include the said bell in the main circuit, that it may respond to changes therein; but when said winding-arm is operated and the signal is being transmitted from the box the said switch will be closed, thereby shunting out the said answer-back bell. This prevents said bell from responding to the signal transmitted from the box.

Referring to Fig. 1, a branch wire 2 leads from the battery B to the switch-point on which the switch-arm 12, secured to the frame, rests, and the worm-shaft and toothed wheel *f* are journaled in said frame, so that during the time one of the teeth of the wheel *f* is in engagement with one member of the signaling-key, as *k*, a short circuit is formed for the magnet *e*, which includes two or more cells or batteries to thereby keep the armature attracted during the time that the circuit is opened by the signaling-key *k k'*. When the switch-arm 12 is on its other contact-point, the signaling-key *k k'* is shunted out.

When a signal is transmitted from one of the signal boxes or stations, the first break in the signaling-circuit causes the armature e^5 of the receiving-electromagnet to retract, disengaging the stop-lever *e'* from the worm-shaft, that it may be moved by the spring e^{13} to the opposite end of the said shaft, and also permitting the signaling-key *k k'* to be moved from the path of engagement of the toothed wheel *f*.

When the signaling-circuit is closed, on the cessation of the first break, the armature will be attracted, the stop arm or lever moved into engagement with the worm-shaft, when it will be gradually restored to its normal position by said rotating worm-shaft, and if the signaling-circuit remains closed a sufficient length of time the said lever will be restored to its normal position moving the signaling-key *k k'* into the path of engagement with the toothed wheel *f*, and thereafter stopping the train; but it will be understood that during the transmission of a signal the impulses succeed each other so rapidly that the stop arm or lever will not at any time be permitted to stop the train until the completion of said signal, after which the answer-back transmitter is operated just before the stop arm or lever stops the train.

When the answer-back-signal transmitter breaks the signaling-circuit, the answer-back bell at the box or transmitting-station is operated and the magnet *e* of the receiving instrument short-circuited, but as soon as said circuit is again closed the magnet *e* will be included in the line, to be responsive to any box-signal, and if such signal should be started the magnet *e* would respond, causing the arm or lever *e'* to be moved by its spring e^{13} to the opposite end of the worm-shaft, thereby disabling the answer-back-signal transmitter. Hence the magnet *e* and spring-actuated controlling-lever *e'* and intermediate parts constitute a disabling device for the answer-back-signal transmitter, the lever *e'* controlling the separation of the circuit-contacts, and hence constituting the contact-controller.

If, during the time the signaling-circuit is held open by the answer-back transmitter, it should be opened at any one of the signal boxes or stations, the transmitting apparatus at such box or station will be immediately cut out or rendered inoperative by means of its non-interference magnet; and if, on the other hand, the signaling-circuit is opened by one of the boxes just after the signal has been completed by another box and just before the answer-back transmitter at the receiving-station opens the circuit, the stop arm or lever will be returned to its abnormal position, thereby preventing the answer-back-signal transmitter from operating the circuit.

If the answer-back-signal transmitter and one of the signal-boxes open the signaling-circuit simultaneously, then both will remain in operative position until the circuit is closed by one of them, and as the breaks produced by the answer-back-signal transmitter are very short, as compared to the breaks produced by the transmitter at the boxes, it will be seen that the answer-back transmitter will close the signaling-circuit and include the receiving-magnet *e* during the time the circuit is open at the box, and hence such answer-back transmitter will be immediately cut out and the controlling of the circuit given to the

box. Thus it will be seen that, by the employment of a non-interference answer-back transmitter, the signals from the boxes or transmitting-stations cannot be interfered with, and will subserve its own and proper function regardless of whether the signal-transmitters at the boxes or stations are provided with non-interference magnets; so we do not desire to limit our invention to the employment of a non-interference answer-back transmitter in combination with a non-interference signal-box.

It will be further observed that it requires a certain length of time for the armature e' to resume its normal position and stop the train, or even to throw the signaling-key $k\,k'$ into engagement with the toothed wheel f after it has once been moved into or allowed to resume its abnormal position, and this time is longer than the longest closure in any signal, so that such a closure of the signaling-circuit is required before the control thereof is given to the answer-back transmitter, that the answer-back signal may be transmitted; and even after said answer-back-signal transmitter has obtained control of the line it surrenders such control between each of its short impulses transmitted, so that if a box should be operated during such time the answer-back transmitter will be immediately disabled, permitting the box-signal to come in. This renders the answer-back transmitter successive, that is to say, if once started it will operate as soon as the control of the signaling-circuit is given to it, even though it awaits the reception of several signals.

We do not desire to limit our invention to providing the answer-back-signal transmitter with this successive feature, as it is obvious that it may be omitted; and it is also obvious that the answer-back-signal transmitter may be made separate from the register, it being herein combined in one apparatus so that one electro mechanism only may be employed. Fig. 6 shows such a signal-transmitter at a box, the non-interference magnet being omitted, and also shows the answer-back-signal transmitter, the registering mechanism being omitted.

A bell g or other signal-indicator (see Fig. 1) is located at the signal-receiving station, which is included in a local circuit g', one terminal of which is connected to a contact-block g^2, secured to but insulated from the frame, and the other terminal of which is secured to the frame, and a plate g^3, having an inclined end portion, is frictionally connected to a shaft g^4, mounted in the frame and driven by the train.

When the armature e^5 is retracted, an arm n, secured to the shaft e^7, carrying the arm e^6, recedes from engagement with the friction-plate g^3, which will then begin to turn in the direction of the arrow as the shaft g^4 is revolved. As soon as the circuit is again closed and the armature e^5 attracted the beveled end of the arm n strikes the beveled end of the plate g^3 and restores it or sets it back to its starting-point, provided that the circuit has not been open a sufficient length of time to allow the friction-plate to pass by the outer end of the arm n.

Should the circuit be opened for a sufficient length of time, the plate g^3 will pass by the end of the arm n and close on the contact g^2, thereby closing the local circuit g' and causing the bell g to respond. The bell g will continue to ring until the plate g^3 has been restored by hand. By this means it will be seen that the bell g will be operated on a change in the circuit of long duration, but not in a change in the circuit of short duration.

The multiple-signal transmitters at the boxes are designed to transmit two different classes of signals, one of which demands immediate attention, and such special signals calling for immediate attention have an impulse of long duration for the special purpose of operating the bell g.

We claim—

1. In an electric signaling apparatus, the combination of an electric circuit, a signal-box containing a signal-transmitter, and an answer-back bell, the former operating and the latter operated by said circuit, a signal-receiving instrument operated by the circuit, and a non-interference answer-back-signal transmitter, comprising a motor-driven circuit-changing device, and an electromagnet included in or controlled by said circuit, which releases said circuit-changing device, and thereafter controls its action, substantially as described.

2. In an electric signaling apparatus, the combination of an electric circuit, a signal-box containing a signal-transmitter and an answer-back bell, the former operating and the latter operated by said circuit, a signal-receiving instrument operated by the circuit, an answer-back-signal transmitter, comprising a circuit-changing device, motor for operating it, a controlling-lever for said motor, and an electromagnet included in or operated by the circuit, which releases said motor and thereafter governs the action of said controlling-lever, substantially as described.

3. In an electric signaling apparatus, an electric circuit, a signal-box containing a signal-transmitter and an answer-back bell, the former operating and the latter operated by the said circuit, combined with a signal-receiving instrument operated by the circuit, an answer-back-signal transmitter set in operation and thereafter governed by the armature of an electromagnet included in or operated by the circuit, and constructed and arranged to effect or permit the transmission of the answer-back signal on a closure in the signaling-circuit of longer duration than the longest closure in any signal, substantially as described.

4. In an electric signaling apparatus, an electric circuit, a signal-box containing a sig-

nal-transmitter and an answer-back bell, the former operating and the latter operated by the said circuit, combined with a signal-receiving instrument operated by the circuit, an answer-back-signal transmitter, comprising a motor-driven circuit-changing device, a controlling-lever for it which is governed by the armature of an electromagnet included in or operated by the circuit for a longer time than the longest closure in any signal before permitting or effecting the transmission of said answer-back signal, substantially as described.

5. In an electric signaling apparatus, an electric circuit, a signal-box containing a signal-transmitter and an answer-back bell, the former operating and the latter operated by the circuit, combined with a signal-receiving instrument and a self-starting successive non-interference answer-back-signal transmitter, comprising a transmitting device for the circuit and means for operating it, a controlling-electromagnet operated by the circuit, controlling mechanism governed by the armature of said electromagnet constructed and arranged to effect or permit the operation of the circuit by the transmitting device on a closure in the signaling-circuit of longer duration than the longest closure in any signal, substantially as described.

6. In an electric signaling apparatus, an electric circuit, a signal-box containing a signal-transmitter and an answer-back bell, the former operating and the latter operated by the circuit, combined with a signal-receiving instrument, and an answer-back-signal transmitter, comprising a circuit-changing device, a controlling-lever for it governed by an electromagnet included in or operated by the circuit, a motor mechanism released by said electromagnet, for moving said controlling-lever into position to permit or effect the transmission of said answer-back signal which requires a longer time than the longest closure in any signal to effect such movement, substantially as described.

7. In an electric signaling apparatus, a signal-transmitter, and an answer-back bell, contained in a box or case, combined with a signal-receiving instrument, an answer-back-signal transmitter comprising two members, an arm controlling their coöperation moved in one direction by a spring, and in the other by a motor mechanism, the engagement of said arm with said motor mechanism being controlled by an electromagnet, substantially as described.

8. In an electric signaling apparatus, a signal-transmitter, and an answer-back bell, contained in a box or case, combined with a signal-receiving instrument, and an answer-back-signal transmitter comprising two members, means for moving one member into coöperative relation with the other which is controlled by a motor mechanism, and means for moving said member out of said coöperative position which is controlled by an electromagnet, substantially as described.

9. In an electric signaling apparatus, an electric circuit, a signal-box containing a signal-transmitter, and an answer-back bell, the former operating and the latter operated by the circuit combined with a signal-receiving instrument operated by the circuit, and an answer-back-signal transmitter for operating the signaling-circuit, and a controlling mechanism for the releasing-lever of said signal-receiving instrument operated by said answer-back-signal transmitter each and every time it opens the signaling-circuit to thereby prevent the operation of said receiving instrument, substantially as described.

10. In an electric signaling apparatus, an electric circuit, a signal-box containing a signal-transmitter and an answer-back bell, the former operating and the latter operated by the circuit, and an answer-back-signal transmitter for operating the signaling-circuit, a short circuit for said signal-receiving instrument, a battery therein, and switch therefor, operated by said answer-back-signal transmitter, each and every time it operates the signaling-circuit, substantially as described.

11. In an electric signaling apparatus, an electric circuit, a signal-box containing a signal-transmitter and an answer-back bell, the former operating and the latter operated by the circuit, combined with a signal-receiving instrument operated by the circuit, and an answer-back-signal transmitter for operating the signaling-circuit, a short circuit for said signal-receiving instrument, a switch therefor, operated by said answer-back-signal transmitter each and every time it operates the signaling-circuit, and a hand-operated switch also for said short circuit, substantially as described.

12. In an electric signaling apparatus an electric circuit, a signal-box containing a signal-transmitter, and an answer-back bell, the former operating and the latter operated by the circuit, combined with a signal-receiving instrument operated by the circuit, a non-interference answer-back-signal transmitter comprising a transmitting device for the signaling-circuit adapted to open said circuit for a shorter interval of time than the shortest break in any box-signal, and a controlling-lever which is governed by the armature of an electromagnet included in or operated by the circuit for a longer time than the longest closure in any signal before permitting or effecting the transmission of said answer-back signal, substantially as described.

13. In an electric signaling apparatus, a signal-transmitter at a signal-station, combined with a signal-receiving instrument, a bell or other signal-indicator, a circuit-changing device for the circuit of said bell or other signal-indicator, one member of which is connected frictionally with a motor-driven shaft, and means for setting said member back to

its starting-point on each impulse or change in the condition of the circuit of short duration, and allowing it to cause or effect the operation of said signal-indicator only on an impulse or change in the condition of the circuit of long duration, substantially as described.

14. In an electric signaling apparatus, an electric circuit, a signal-box containing a signal-transmitter, an answer-back bell, the former operating and the latter operated by said circuit, combined with a signal-receiving instrument operated by the circuit, and automatically operating an answer-back-signal transmitter, a disabling device for said answer-back-signal transmitter, comprising an electromagnet included in or placed under the control of the circuit on each closure thereof by said answer-back-signal transmitter, substantially as described.

15. In an electric signaling apparatus, an electric circuit, a signal-box containing a signal-transmitter and an answer-back bell, the former operating and the latter operated by said circuit, combined with a signal-receiving instrument operated by the circuit, and automatically operating an answer-back-signal transmitter, a disabling device consisting of a contact-controlling lever, which prevents the separation of the circuit-contacts and an electromagnet included in or placed under the control of said circuit on the closures thereof by said answer-back-signal transmitter, substantially as described.

16. In an electric signaling apparatus, an electric circuit, a signal-box containing a signal-transmitter and an answer-back bell, the former operating and the latter operated by said circuit, combined with a signal-receiving instrument operated by the circuit, and automatically operating an answer-back-signal transmitter, a controlling-lever for said answer-back-signal transmitter which is governed by the armature of an electromagnet included in and operated by the circuit for a longer time than the longest closure in any signal before permitting or effecting the transmission of said answer-back signal, and a controlling device operated by said answer-back transmitter for including or placing said electromagnet under the control of the circuit on each closure thereof by said transmitter that it may respond to a box-signal and disable the answer-back transmitter, substantially as described.

17. A signal-transmitter, comprising a motor mechanism, circuit-wheel, and contact-pens, and a controlling-electromagnet, a short circuit including a battery and a circuit-controller for said short circuit, and means for operating it to close said short circuit whenever the signaling-circuit is opened by said transmitter, and to open said short circuit whenever the signaling-circuit is closed by said transmitter, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FREDERICK W. TURNER.
WINTHROP M. CHAPMAN.

Witnesses:
FREDERICK W. COLE,
BERNICE J. NOYES.