(No Model.)

R. CARTER.

CIRCUIT FOR FIRE ALARM TELEGRAPHS.

No. 254,611. Patented Mar. 7, 1882.

Fig. 1

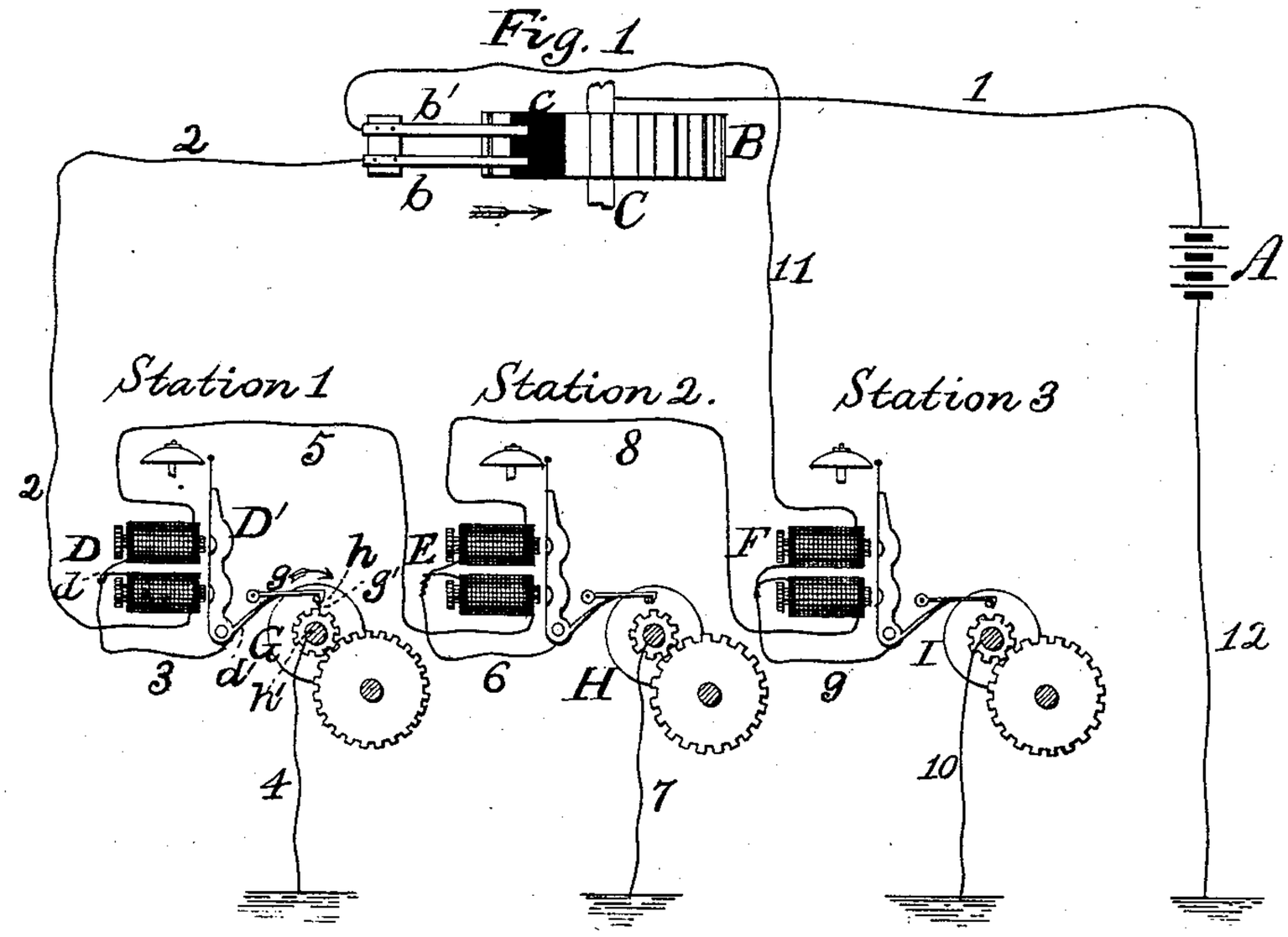


Fig. 2

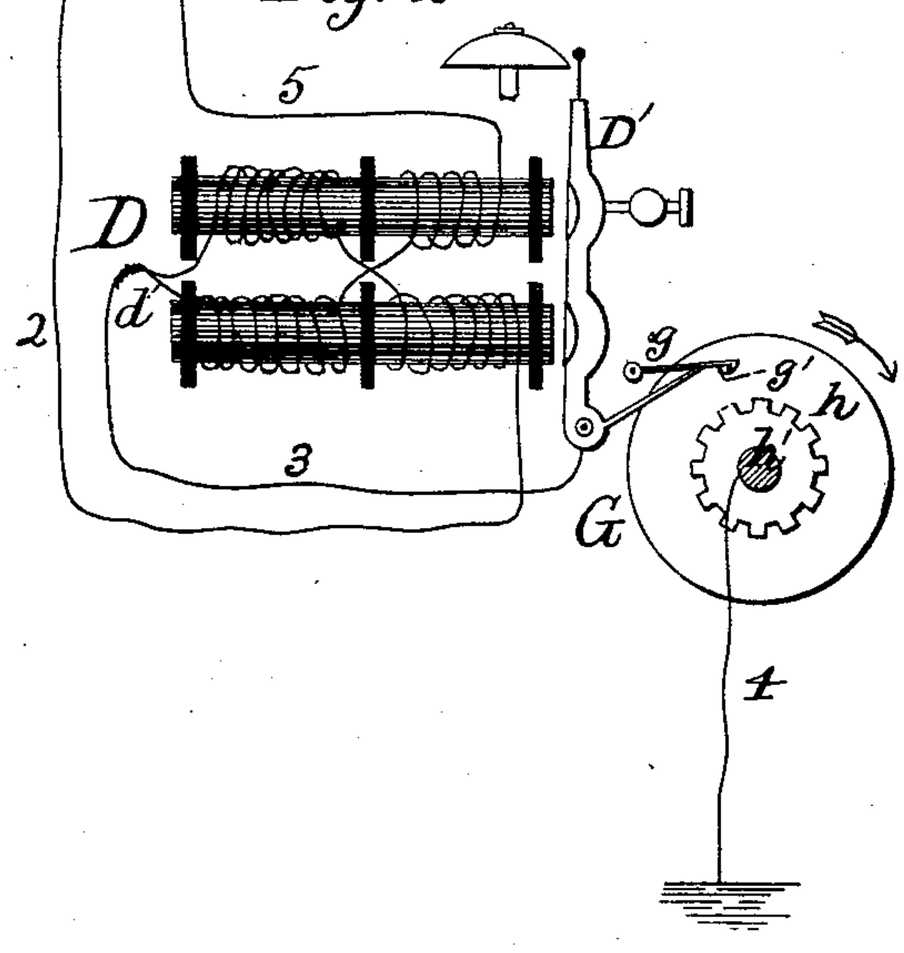
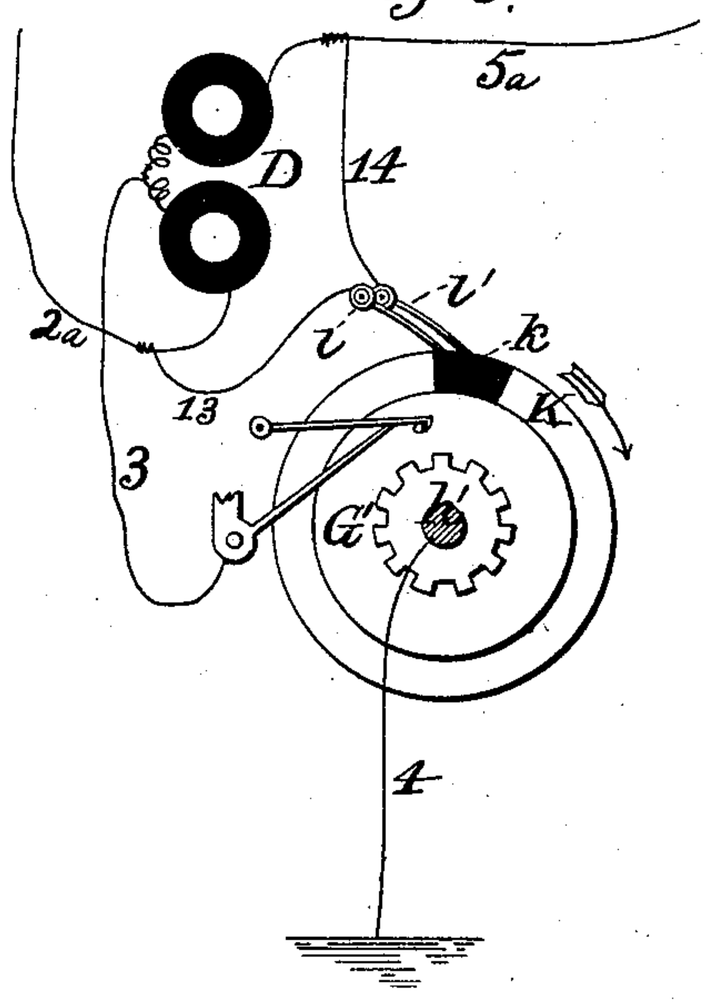


Fig. 3.



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CIRCUIT FOR FIRE-ALARM TELEGRAPHS.

SPECIFICATION forming part of Letters Patent No. 254,611, dated March 7, 1882.

Application filed November 21, 1881. (No model.)

To all whom it may concern:

Be it known that I, ROBERT CARTER, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Circuits for Fire-Alarm Telegraphs, of which the following is a specification.

My invention relates to certain improvements in the organization of electric circuits for signaling apparatus, and is especially adapted to circuits employed for the transmission of signals from a central station to a number of sub-stations, technically known as "alarm" or "gong" circuits—such, for example, as those employed for sending out a fire-alarm from the central office to the different engine-houses in a district.

In consequence of the liability of telegraph-lines to derangement and interruption from various causes, it has heretofore been customary to include the signal-boxes in a closed circuit traversed by a constant current, and to make use of a return-wire to the battery, instead of depending upon the earth to complete the circuit. If the line should then be interrupted at any point, the circuit may be temporarily completed by connecting the wires on either side of the break with the earth. This organization in such cases involves the loss of considerable time incident to locating the break and making the necessary circuit-connections, during which the circuit remains wholly inoperative.

The object of my invention is to so arrange the line and its connections that a circuit may at any time be automatically completed from the central office through each station and a signal transmitted, even when an interruption exists at some particular point in the line.

To this end my invention consists in the combination of a battery located at the central station, having one of its poles connected with the earth and the other with transmitting mechanism, two line-wires connecting said device with the respective extreme terminals of a series of signal devices, which series are located at sub-stations and are in electrical connection with each other and normally in connection with the earth, and a circuit-breaker interposed in the circuit of each earth-connection, so arranged as to be automatically actuated by the corresponding signaling device whenever a current is transmitted from the central office to automatically break said earth-connection. By this arrangement currents may be sent from the central office which will operate each of the boxes of the series in succession. The circuit, when first closed, extends from the battery through the transmitter and the two line-wires, passing also through the signaling apparatus and ground-wire at each of the extreme stations of the series. The ground-connection at the first station will thereupon be broken by the operation of the signaling mechanism and the current transmitted through the connecting-wire to the second station and the ground-wire at that station. In like manner a current may be transmitted through and caused to necessarily operate any desired number of signal-stations connected in series. Since a current is transmitted simultaneously to each end of the series of stations, the signals will be operated in a succession from each end until all have been actuated and their ground-connections broken. If, therefore, the line upon either side of the series be broken, the current will be transmitted through all of the signal-stations in succession from the opposite end of the series, and if the line connecting any two sub-stations be disconnected the apparatus on each side of the break will be operated by a current passing through the line-wire connected with that side.

In the accompanying drawings, Figure 1 represents an organization of circuits and signaling mechanism embodying my invention as applied to a fire-alarm system for striking the gongs of several engine-houses by means of a current transmitted from a central office. Fig. 2 represents certain details of construction of the apparatus, and Fig. 3 a method of applying a shunt-circuit to the receiving mechanism.

Referring to Fig. 1, A represents a battery located at the central office, one pole of which is connected with the earth by a wire, 12, and the opposite pole by a wire, 1, with a revolving shaft, C, upon which is mounted a circuit-breaking wheel, B, for transmitting signals. The periphery of the wheel B is provided with any desired combination of circuit-closing pro-

jections and intervening spaces, constructed in a well-known manner. A non-conducting section, *c*, is inserted at one point in the periphery of the wheel B, against which, when the circuit-wheel is in its normal position of rest, two circuit-closing metallic springs, *b b'*, are pressed. As the wheel B rotates these springs make simultaneous contact with the successive metallic projections upon its periphery, thus completing a circuit from one pole of the battery A to each of the line-wires 2 and 11, which are respectively in electrical connection with said springs.

D, E, and F represent suitable electro magnets, which are employed for actuating a bell or other acoustic signal at each of a series of sub-stations, as at stations 1, 2, and 3. These electro-magnets are electrically connected together in series by the wires 5 and 8, and the first and last of the series are connected with the contact-springs *b* and *b'*, respectively, by means of the wires 2 and 11. The magnets D, E, and F are preferably constructed, as represented in Fig. 2, with two independent coils upon each, which are so wound that a positive current from the line-wire 2 or from the line-wire 11 and connecting-wire 5 will traverse one of the coils upon each electro-magnet, and will produce like magnetic polarity in the core in either case. A wire, 3, is attached to the loop *d* between the two coils of the electro-magnet D, and is normally in electrical connection with the earth through an automatic circuit-closer, G. This circuit-closer consists of a metallic disk or wheel, *h*, mounted upon a revolving shaft, *h'*, from the face of which disk projects a stop, *g'*, electrically connected with the earth through the axis *h'* and wire 4.

A suitable system of clock-work driven by a weight or spring is attached to the shaft *h'*, which tends to move it in the direction indicated by the arrow. A hooked arm or detent, *g*, is constructed to normally engage the stop *g'*, and thus arrest the movement of the circuit-wheel *h* when the electro-magnet D is not excited. The detent and stop also serve the purpose of a circuit-closer for completing the circuit between the loop *d* and the earth through the wire 3, arm *d'*, to which said wire is attached, detent *g*, stop *g'*, disk *h*, axis *h'*, and wire 4. Whenever the armature D' is attracted by the magnet D the detent *g* is raised from the stop *g'* by the arm *d'*, which is attached to and moved by the armature. The stop *g'* is thus released, and at the same time breaks the earth-circuit and allows the wheel *h* to perform one revolution. The mechanism which propels the respective circuit-closers B and G is preferably so regulated that while the latter describes one entire revolution one projection only of the former shall have passed under the circuit-closing springs *b* and *b'*.

The arrangement of circuits and mechanism at each of the remaining sub-stations is similar to that just described. It is evident that any desired number of similar signal-stations may be included in the series.

The operation of transmitting a signal is as follows: When the circuit-closer B is caused to rotate in the direction indicated by the arrow, the springs *b* and *b'* are brought into contact with the projections upon its periphery, thus sending similar electric currents upon the wires 2 and 11 to the electro-magnets D and F at the stations 1 and 3. The operation at both of these stations being the same, it will be necessary to describe only one. The current from the wire 2 passes through one division of the coils of magnet D to the loop *d*, thence through the wire 3, circuit-closer G, and wire 4 to the earth. The electro-magnet D is caused by the current traversing its coils to attract its armature D', thus sounding one blow by the signaling mechanism, and at the same time releasing the circuit-breaker G and disconnecting the earth-wire. The current will then reach the earth by passing through both coils of the magnet D, the wire 5, one coil of the magnet E, wire 6, circuit-closer H, and wire 7, actuating the signal at that station. Meanwhile the current through the wire 11 will have caused a signal to be given at station 3 and its ground-connection to be broken. When the current has passed through all the stations and caused a signal to be given at each, the ground-connections will all be disconnected and the currents cease to flow. When the circuit-breakers G, H, and I have each completed one revolution the ground-circuits will be again closed and a second current may be sent from the circuit-closer B. In this manner any desired number of blows may be struck in succession or at proper intervals upon the signal-bells at the several sub-stations.

It will now be readily understood that if any one of the connecting-lines be broken at any point a signal may be nevertheless transmitted to each of the signal-boxes. For example, if the line 5, connecting the stations 1 and 2, be broken, a current from the line 2 would actuate the signal at station 1, and a current from the line 11 would operate the signals at stations 3 and 2. So, also, if the line 2 be disconnected, a current upon the line 11 would operate all of the signal-boxes in succession, beginning at station 3.

By referring to Fig. 2 it will be observed that a current transmitted from the line 2 is at first sent through one coil upon each core of the electro-magnet, inducing magnetism of opposite polarity in each of the cores and passing by the point *d* through the line 3 to the earth. The earth-connection being immediately broken by the movement of the armature D', the current will then be forced to traverse the remaining coils of the magnet D and to reach the earth by way of the next station. The magnetism induced in each of the cores by the current traversing the first-mentioned coils will now be neutralized by the same current traversing the remaining coils in the opposite di-

rection, thus allowing the armature to return to its normal position and the detent *g* to fall into a position for engaging the stop *g'* when the circuit-wheel shall have completed its revolution.

If a large number of boxes are connected in series, some inconvenience may arise from the increase of the resistance offered by the successive electro-magnets, since the current must traverse all the coils of the first magnet to reach the second station, the coils of the first and second magnets to reach the third, and so on. This difficulty may be overcome by applying a shunt-circuit to the magnet and bringing it into action after the signal at each station has been given. One method of applying such a circuit is shown in Fig. 3. In this figure, K represents a circuit-closer mounted upon the same shaft, *h'*, with the circuit-closer G', but insulated therefrom. Two contact-springs, *l* and *l'*, normally rest against an insulated section, *k*, of the periphery of the wheel K. To the spring *l* is attached a wire, 13, connecting with the line-wire 2^a, and to the spring *l'* is attached a wire, 14, connecting with the wire 5^a, thus forming a normally-open shunt-circuit around the magnet D. When by the revolution of the circuit-closer G' the ground-connection at that station becomes broken the shunt-circuit around the magnet D will be completed through the wires 13 and 14 by means of the springs *l* and *l'*, which are then brought into contact with the metallic periphery of the wheel K. In this manner the electro-magnet at each station will be cut out of circuit after the operation of the signal at that station and the line resistance will not be perceptibly increased.

I do not wish to confine myself to the use of the double-wound or differential electro-magnet described with reference to Fig. 2 for actuating the signals, as it is evident that an electro-magnet of the ordinary construction may be substituted by employing only one coil for actuating the armature-lever and by sending the current through both coils to the second station.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a battery one pole of which is electrically connected with the earth, mechanism for transmitting electrical impulses from the opposite pole of said battery to the terminals of a system of signal-boxes connected together in series, a ground-connection for each of said signal-boxes, and mechanism, substantially such as described, for automatically breaking the earth-connection of each signal-box in succession upon the operation of the same commencing at either or both ends of the system.

2. The combination, substantially as hereinbefore set forth, of an electro-magnet for operating a signal, a conductor attached to an intermediate point in the wire constituting the helices of said magnet and normally connected with the earth, and a circuit-breaker for automatically severing such connection upon the operation of the signaling mechanism.

3. The combination, substantially as hereinbefore set forth, of two or more electro-magnets for operating an equal number of signals electrically connected with each other in series, an earth-connection from the central point of the wire constituting the helices of each of said magnets, and automatic mechanism for breaking said earth-connections successively upon the operation of the corresponding signal.

4. The combination, substantially as hereinbefore set forth, of a series of electro-magnets included in the same circuit, a normally-open shunt-circuit around each of said electro-magnets, an earth-connection for each of said magnets, and mechanism for automatically breaking said earth-connection and closing said shunt-circuit upon the magnetization of said electro-magnet.

In testimony whereof I have hereunto subscribed my name this 18th day of November, A. D. 1881.

ROBERT CARTER.

Witnesses:
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