(No Model.)

2 Sheets—Sheet 1.

A. L. CREELMAN.

TELEGRAPH SOUNDER.

No. 584,464. Patented June 15, 1897.

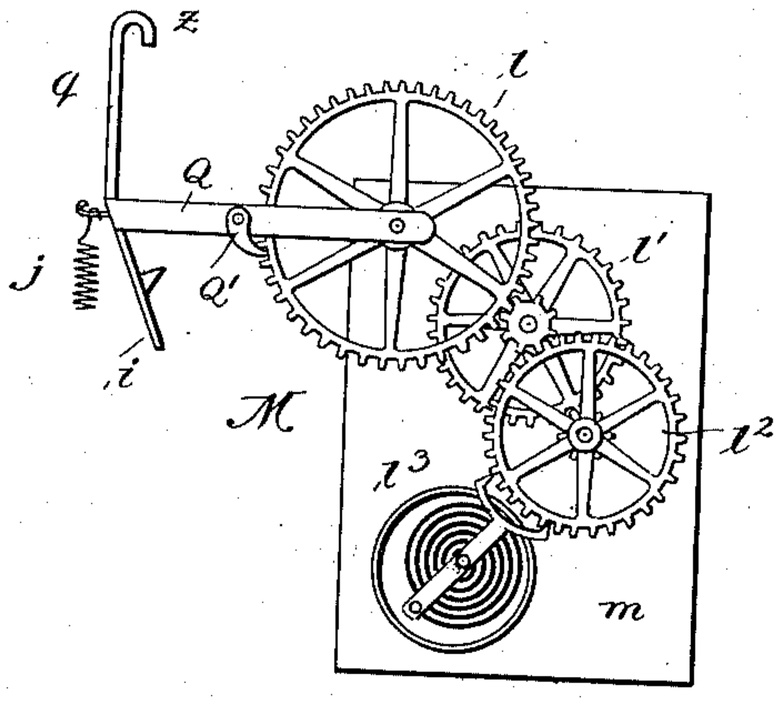


Fig. 3.

Fig. 2.

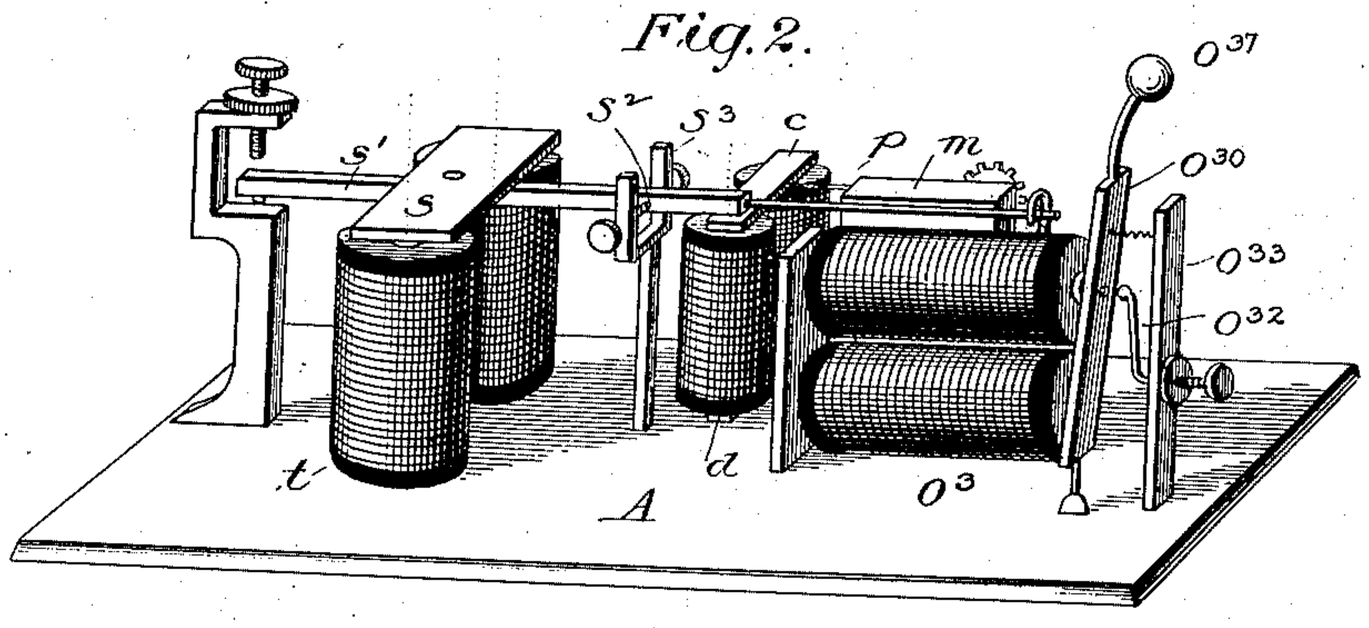
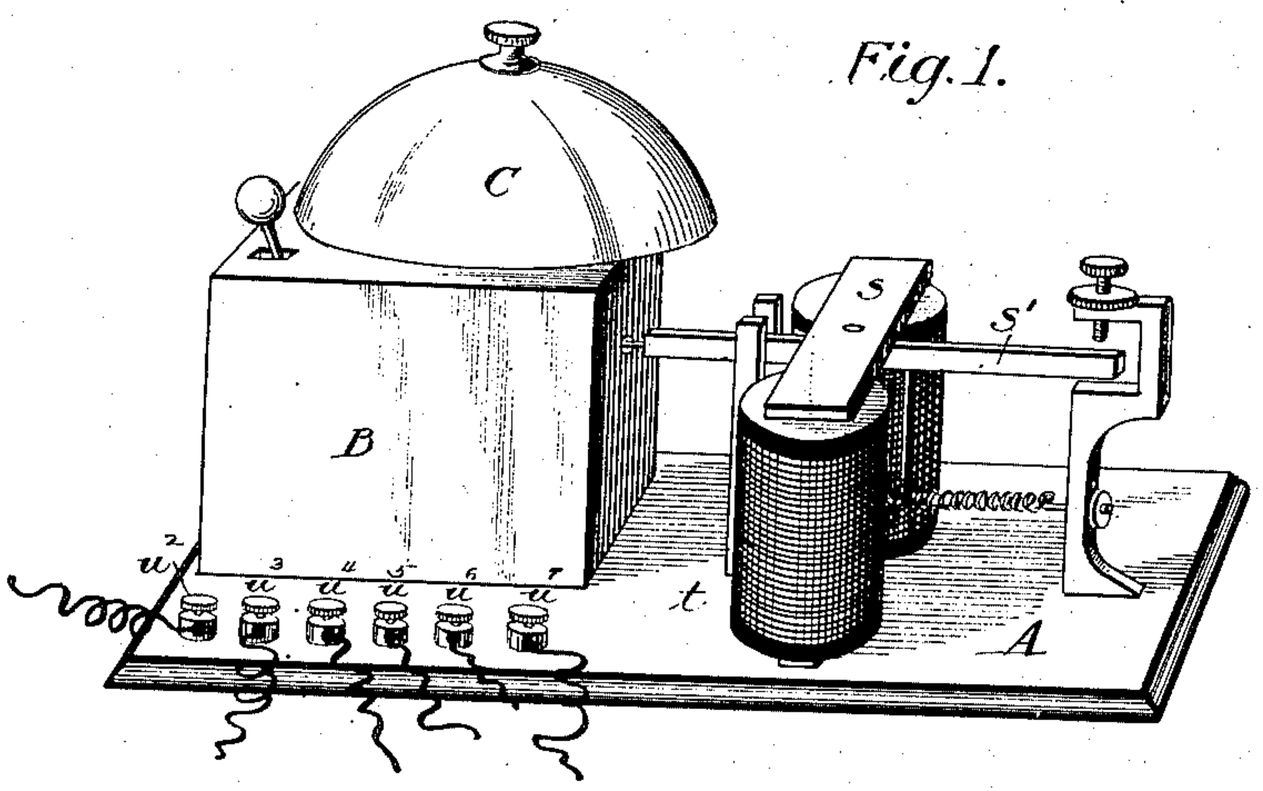


Fig. 1.



Witnesses:
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F. L. Elmore.

Inventor:
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By P. Y. Dodge
Atty.

(No Model.)

2 Sheets—Sheet 2.

A. L. CREELMAN.

TELEGRAPH SOUNDER.

No. 584,464. Patented June 15, 1897.

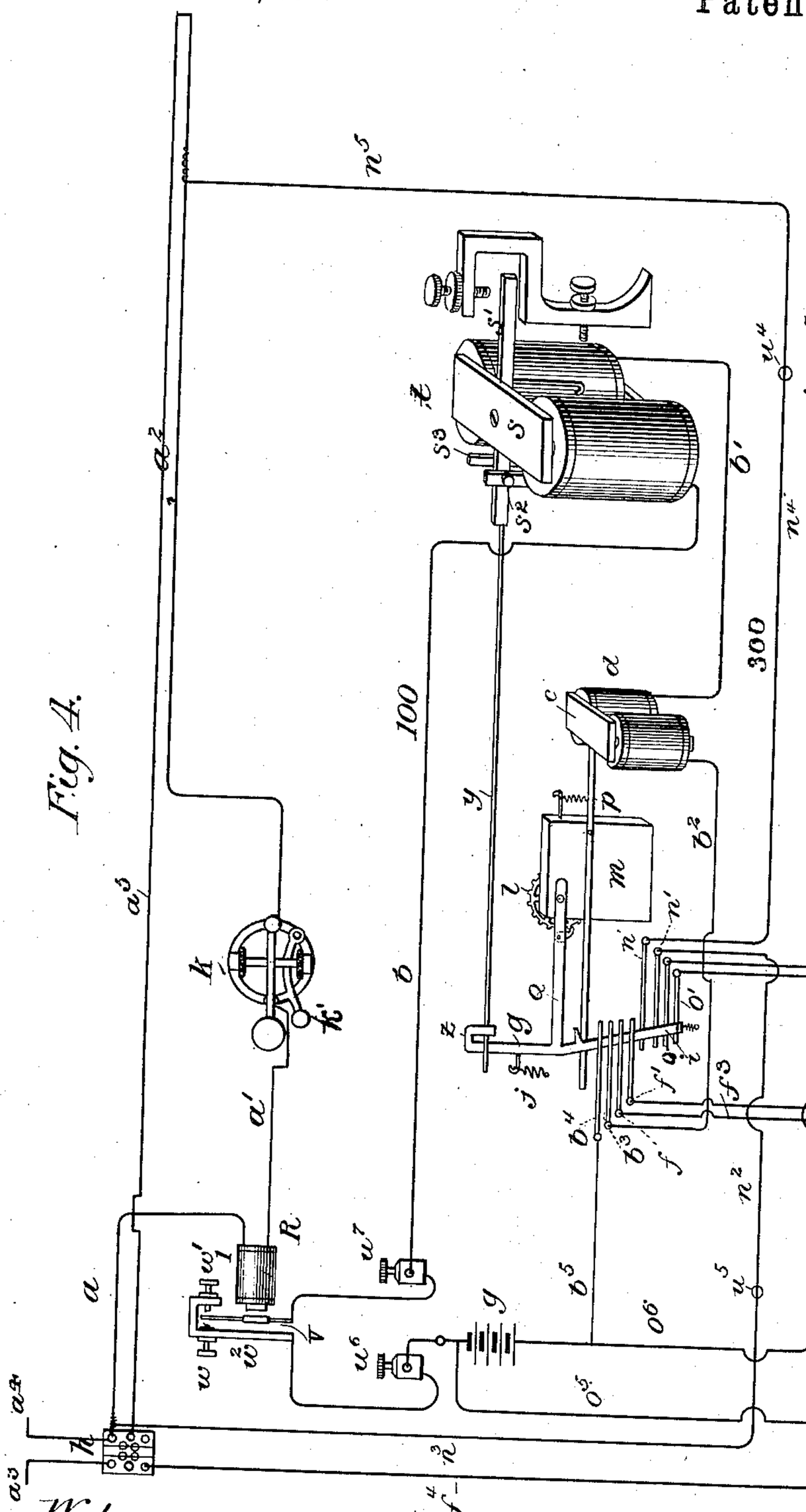

Fig. 4.

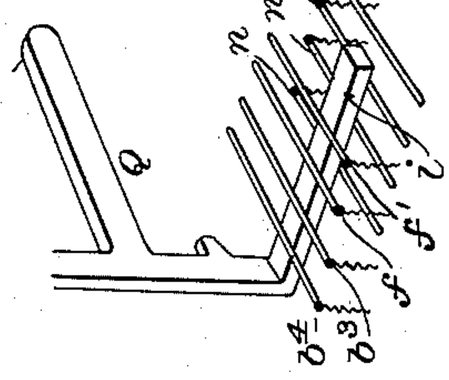

Fig. 5.

Witnesses:
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UNITED STATES PATENT OFFICE.

ALVAH LEWIS CREELMAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CIRCUIT PROTECTING SOUNDER COMPANY, OF MEMPHIS, TENNESSEE.

TELEGRAPH-SOUNDER.

SPECIFICATION forming part of Letters Patent No. 584,464, dated June 15, 1897.

Application filed September 3, 1895. Renewed February 26, 1897. Serial No. 625,177. (No model.)

To all whom it may concern:

Be it known that I, ALVAH LEWIS CREELMAN, of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Telegraphic Sounders, of which the following is a specification.

My invention relates to that class of sounders commonly known as "receiving-sounders" and used in telegraphic or analogous circuits in connection with circuit-protecting devices.

The object of the invention is to provide a single instrument adapted to perform the functions both of a sounder and a call or alarm bell and which shall embody within itself the devices and connections for protecting the circuit, for avoiding open circuits, for calling attention to imperfect connections, open circuits, and ground connections, for automatically changing connections in the local circuit to give notice within a definite or predetermined time of the opening of the main line, for automatically changing the local circuit and for giving notice thereof within a certain or predetermined time, for automatically shunting open keys after a predetermined time, for preventing mechanism operated by the sounder from interfering with the latter to prevent the production of a full sound, and for facilitating and insuring the proper working of telegraphic and analogous circuits.

To these ends the invention comprehends a sounder provided with a second electromagnet and with devices controlled thereby for making and breaking connections through which the various operations referred to are effected.

It further comprehends an apparatus in which are combined the usual sounder, located in one branch of a local circuit, an alarm or call bell, located in another branch of said circuit, and electrically and automatically operated devices for changing the local circuit to operate either the sounder or the bell.

It further comprehends details of construction and arrangement, all as hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a perspective view of my sounder complete; Fig. 2, a similar view with the inclosing case and bell removed; Fig. 3, a side view of a train of retarding-gear, and Fig. 4 a diagrammatic view showing the connections between the operating devices and the means for changing the connections. Fig. 5 is a perspective view of a detail, showing the action of the contact-lever in controlling the circuits.

Referring to the drawings, A designates the base, t the electromagnet, s the armature, and s' the armature-lever, of an ordinary sounder, the lever being fulcrumed at s^2 in a fork or standard s^3, rising from the base, all as usual. Back of the magnet t is a second magnet d, of which c is the armature and p the armature-lever, the latter being fulcrumed on a casing or frame m, in which is mounted a train of regulating-gearing M, comprising a main driving-gear l, a driven gear l', an escapement-wheel l^2, driven by the gear l', and a balanced escapement l^3 for controlling the escapement-wheel.

Q designates an operating-lever fulcrumed on the frame or casing m, preferably on or in the line of the shaft of the gear l, and provided with a pawl Q', which engages the teeth of the gear l and actuates the latter when the lever is depressed, such depression being effected by a spring j. The lever Q has at its outer end a depending arm i, the purpose of which will be explained hereinafter, and this arm is in engagement with the rear end of armature-lever p, the arrangement being such that when the magnet d is energized and its armature c drawn down the lever Q will be raised and its spring j distended and put under tension. When the magnet is deënergized and its armature released, the spring draws the lever Q down and drives the gearing M. It will of course be understood that the descent of the lever will be gradual and that the time of descent will depend upon the range of movement and the speed of the gearing; and it is also to be understood that the invention in this respect is not limited to the specific form of gearing shown and described and that the train may be extended at pleasure to lengthen the time required for the descent of the lever Q, as may be found desirable or expedient in practice. The lever Q

has also an upwardly-extending arm q, at the end of which is a hook z, which engages the end of an arm y, connected with and forming an extension of the armature-lever s', the arrangement being such that when the lever Q is depressed the hook z will hold the arm y with a force sufficient to prevent the armature s from responding to its magnet t when a current is passing through the latter.

Back of the magnet d is a third magnet O^3, which, as represented in Fig. 1, is covered or inclosed by a casing B, on which is mounted a bell C. The magnet O^3 is preferably mounted in a horizontal position, (but it may be vertical,) and it has a pivoted armature O^{30}, provided at its free or swinging end with a bell-hammer O^{37}, the arm of which projects through a slot in the casing B, arranged to permit the vibration of the armature and hammer, so that the latter may strike and sound the bell. When the magnet O^3 is deënergized, its armature is drawn back by a spring, and in its retracted position it contacts with an arm o^{32}, mounted on a post o^{33}, which rises from the base A, said arm being in and forming part of a local circuit 200, as shown in Fig. 4 and as hereinafter further explained.

Referring now particularly to Fig. 4, the main line enters a switchboard h of the usual and customary construction by conductor a^3 and leaves the same by conductor a^5, and passing through conductor a^2 includes the usual key k and relay R, whence it again enters the switchboard by conductor a and leaves the same by conductor a^4. The key k is of the customary construction, including the usual switch k', by which the main-line circuit is kept normally closed when the operator is not sending messages by the key and by which the main line is opened when the key is to be operated to send messages.

The relay comprises a magnet l, front and back stops w w', sustained by a bracket w^2, an armature v, mounted to vibrate between said stops, and binding-posts u^6 and u^7, connected, respectively, with the bracket w^2 and armature v, these connections forming part of a local circuit, as hereinafter described.

g designates a relay-battery, one pole of which is connected with a binding-post u^6 and the opposite pole with a wire b^5, terminating in a contact-point b^4, consisting of a flexible rod or wire with which the arm i of lever Q is adapted to contact. From the binding-post u^7 the circuit runs through a wire b to magnet t, from the latter through wire b' to magnet d, and thence through wire b^2 to a contact-point b^3, consisting of a flexible rod or wire similar to b^4, with which the arm i is adapted to contact. The arrangement is such that when the lever Q is in its elevated position and vibrating under the influence of the make and break of the usual telegraphic code the arm i will, through its contact with points b^3 and b^4, maintain the closure of circuit 100. When, however, the main line is interrupted for any cause and for a predetermined period, the arm i of lever Q will move downward, as more fully described hereinafter, under the influence of its spring j, and when beyond a certain point will disengage from points b^3 and b^4.

It will now be understood that when a current is passing through the main line the armature v, being attracted by its magnet, closes against stop w' and closes the local circuit at this point, and the current of the local battery passing through the magnet d energizes the latter and draws down its armature c, whereby lever Q is raised and contact made with flexible points b^3 and b^4 by the arm i. The raising of the lever Q also liberates the armature s, which was before held down by the hook z, and leaves this armature in a condition to vibrate freely, the hook z being then above the range of movement of the arm y, so that the sounder may operate to produce a full sound. The sounder is now operative and will continue so long as the main line is active. When, however, the main line is opened and remains so for a predetermined time, as will be more fully described hereinafter, the relay-magnet will be deënergized the armature v will open against the back-stop w, which is insulated, and open the local circuit at this point. The magnets t and d are now deënergized and the lever Q, responding to the action of the spring j, is drawn down, its descent, however, being gradual and its movement being retarded by the train M, as above explained. This movement of the lever carries the arm i out of contact with the flexible terminals b^3 b^4, thereby opening the local circuit at this point, and the movement of the lever continuing the arm i will contact with the terminals of a branch circuit of the local containing an alarm, as more fully described hereinafter.

It is seen, therefore, that when the main line is in operation, either closed or transmitting messages the clockwork M, including the escapement l^3 and gearing l, l', &c., before described, remains at rest with the lever Q, held up by the sounder-armature y. When, however, the local circuit 100 through the sounder-magnets t is broken for a predetermined time the arm Q will be released by the armature and its spring will pull it downward, its descent being retarded and made gradual by the gearing and escapement, so that the closing of the shunt and alarm circuits is not instantaneous with the opening of the local circuit, but follows after a predetermined time, which is governed by the nature of the gearing, which gearing is regulated to allow a predetermined period to elapse before the lever Q reaches a position to close said circuits. The necessity of such a mechanism is obvious, for were the shunt and alarm circuits closed immediately on the breakage of the local the ordinary make and break in sending messages would shunt the key and sound the alarm. By the clockwork mechanism these two circuits are only closed

after the local has been left open for a predetermined time—for instance, where the key is left accidentally open or where other accidents due from carelessness or otherwise occur.

The local circuit has two branches—that above described and marked 100 and that now to be described and marked 200.

A branch wire o^6, connected with the wire b^5, terminates in a point o', with which the arm i of lever Q is adapted to make and break contact. To the opposite pole of the battery is connected a branch wire o^5, which runs to the contact-arm o^{32}. From the foot of the armature a wire o^4 runs into the magnet O^3, and from the latter extends a wire o^2, which terminates in a contact-point o, with which the arm i is also adapted to make and break contact. The arrangement of the points o o' relatively to the arm i is such that when the lever Q falls to its lower position the arm i makes contact with both points and completes the circuit, but when in its elevated position contact is broken and the circuit is open at this point. It will then be understood that the two branches 100 and 200 of the local circuit are opened and closed alternately by the vibrations of lever Q, one branch being open when the other is closed and vice versa, from which it results that when the circuit through magnets t and d is broken for a predetermined time a new circuit is formed through the bell-magnet O^8, whereby the bell is sounded and audible notice given of the change. The bell will continue to ring as long as the apparatus remains in this condition or until the circuit 200 is broken, which may be done by pressing down the armature s, which will, through the arm y and hook z, raise the lever Q on its pivot to its former position, raising the arm i from the lower contact-terminals and engaging the same with the upper terminals. The line then being active the lever Q will be held in this position by armature-lever p until another break occurs in the main line, when the lever Q will again move slowly downward as before.

From the foregoing it will be understood that should relay-armature v fail to work and remain open, or should the connections in the local circuit 100 become loose and inoperative, or should the battery g become too weak to operate magnets d t, the circuit 100 would remain open and the circuit 200 closed, and that notice thereof would be given by the bell, which is adapted to be operated by a relatively weaker current than is required to operate the devices in circuit 100.

It sometimes happens that the key of an office is left open either by accident or design, and in order that the line may not be rendered inoperative thereby I provide a shunt 300 around the key, the connections being as follows: To the main line at one side of the key, preferably at a point outside of the relay, is connected a wire n^3, which runs to a binding-post u^5, where it joins a wire n^2, which terminates in a contact-point n', with which the arm i of lever Q is adapted to make and break contact. At the opposite side of the key a wire n^5 runs from the line to a post u^4, where it joins a wire n^4, which terminates in a contact-point n, with which arm i is also adapted to make and break contact, the arrangement being such that when the lever Q is down the arm i contacts with both of the points n n' and completes the connection, the main current then passing through the shunt 300 around the open key, cutting the office out of the main line. This connection being established the local branch circuit 100 will be open and the branch 200 closed, as above explained, the current of the local battery then passing through the bell-magnet and causing the bell to ring and to continue ringing as long as the key remains open and the line active, thus giving audible notice of the condition of the line. It also sometimes happens that the main line is purposely or accidentally grounded at the switchboard, and to cut out such ground connection and restore the line to operative condition I provide the following connections through the sounder.

f^4 designates one section of the ground-wire running from the switchboard h to a binding-post u^3, where it connects with a wire f^3, which terminates in a contact-point f, with which the arm i of lever Q is adapted to make and break contact. Another branch f^2 of the ground-wire runs from a contact-point f' to a binding-post u^2, where it connects with a wire running to earth, as at E. The arrangement of the points f f' relatively to the arm i is such that when the lever Q is in its elevated position, as shown in the drawings, its arm i will contact with both of the points f f' and complete the ground connection, and when in lowered position said connection will be broken. To remove or cut out this ground connection, it is only necessary to open any key on the right of the line, as viewed in Fig. 4, when, the current being interrupted and the relay-magnet deënergized, the armature v will open and break the local circuit 100, the result being that the magnet d will also be deënergized and the lever Q permitted to fall, breaking the ground connection, with the further result that the local circuit 200 will be established and the bell sounded, as already explained, to call attention to the condition of the line. It will thus be seen that when the main line is interrupted, either by grounding or opening a key, the local circuit 100 is broken and the circuit 200 closed, causing the bell to ring and call attention; also, that if the operator, either carelessly or by design, allows his connections to become loose or leaves his key open or permits his battery to run down or deteriorate in strength to a point where there is not sufficient current to operate the magnet d and reset the lever Q the current will be diverted through the circuit 200, the bell will be sounded, and the opera-

tor's or attendant's attention called to the fact that the apparatus is out of working order.

Having thus described my invention, I claim—

1. The combination of an electric circuit, a sounder-magnet located therein, a branch circuit, a bell-magnet located therein, and electrically-operated apparatus in circuit with the sounder-magnet adapted to open the branch circuit when the sounder is active, and to close the same when the sounder-magnet is deënergized.

2. A telegraphic sounder comprehending a sounding apparatus, a call or alarm apparatus, an electric circuit divided into two branches one of which includes the sounding apparatus and the other the call apparatus, and an electrically-controlled apparatus adapted to close the branch circuit through the call apparatus when that through the sounding apparatus is open.

3. The combination with a main line and with the relay therein, of a local circuit divided into two parts or branches, a sounding apparatus located in one branch, a call or alarm apparatus located in the other branch and an electrically-controlled apparatus located in the local circuit and governed by the relay, and operating to open and close the two branches of the local circuit alternately.

4. The combination with the main line and with the relay therein, of a local circuit divided into two parts or branches, a sounder located in one branch and a call or alarm apparatus in the other, electrically-operated devices located in one branch of said circuit and adapted to control the other branch thereof, the arrangement and operation being that when the sounder is active the call apparatus will be cut out, and when the sounder is inactive the call apparatus will be active.

5. The combination with the main line and with the relay therein, of a local circuit divided into two branches, a sounder in one branch, a call or alarm apparatus in the other branch, electrically-operated devices located in one branch of said circuit and adapted to control the other branch, and a retarding mechanism for regulating the movements of said controlling devices, the arrangement and operation being that when the main line is opened the local circuit will change and operate the call or alarm apparatus after a given or predetermined time.

6. The combination with a main line, and with a key for opening and closing the same, of a local circuit, a shunt around the key, electric devices in the local circuit for controlling the shunt, the latter being open when the key is closed, and a retarding mechanism for regulating the movement of said controlling devices, whereby when the main line is opened the shunt will be closed after a definite or predetermined time.

7. The combination with a main line provided with a key for opening and closing the same, of a local circuit, a shunt around the key, a call or alarm located in the local circuit, and electrically-controlled devices for simultaneously opening and closing both the shunt and the local circuit, said devices operating to open the shunt and local circuit when the main line is active, and to close the same when the key is opened.

8. The combination with a main line provided with a key for opening and closing the same, of a shunt around the key, a local circuit divided into two branches, a call or alarm apparatus located in one branch, and electric devices located in the other branch for shifting the current from one branch to the other, and for simultaneously opening or closing the shunt, the arrangement being such that when the key is opened the shunt and that branch of the local circuit containing the call apparatus will both be closed.

9. The combination with a main line provided with a key for opening and closing the same, a shunt around the key, a local circuit divided into two branches, a call or alarm apparatus located in one branch, electrically-operated devices located in the other branch for shifting the current from one branch to the other, the arrangement being such that when the main line is open the branch circuit containing the call apparatus will be active, and a time mechanism for controlling said shifting devices, whereby when the key is opened the call or alarm apparatus will be operated on the expiration of a given or predetermined time.

10. In a telegraphic sounder the combination with the sounder-magnet and its armature, of a call or alarm magnet a divided local circuit, one branch of which runs through the sounder-magnet and the other branch through the call-magnet, a third magnet in circuit with the sounder-magnet, a movable contact-arm controlled by said third magnet to make and break contact alternately with the terminals of the two branches for shifting the current from one branch to the other, the arrangement being such that when the sounder-magnet and said third magnet are deënergized the current will be shifted and the call-magnet energized, and vice versa.

11. In a telegraphic sounder the combination with the sounder-magnet and its armature, of a call or alarm magnet, a divided local circuit one branch of which runs through the sounder-magnet and the other through the call-magnet, a third magnet in circuit with the sounder-magnet, a switch controlled by said third magnet for switching the current from one branch of the local circuit to the other, the arrangement being such that when the branch containing the controlling-magnet is broken the current will be shifted to the other branch, and a time mechanism for controlling the movement of the switch, whereby when the controlling-magnet is deënergized the current will be shifted and the call-magnet energized after a definite or predetermined time.

12. In a telegraphic sounder the combination with the sounder-magnet and its armature, of a call or alarm magnet, a divided local circuit one branch of which runs through the sounder-magnet and the other branch through the call-magnet, a switch for shifting the current from one branch of the circuit to the other, a magnet in circuit with the sounder-magnet for controlling the switch, the arrangement being such that when the switch-controlling magnet is deënergized the current of the local battery will be diverted through the call-magnet, and a connection between the switch and the sounder-armature for holding the latter open when the controlling-magnet is deënergized, whereby when the current becomes too weak to operate the switch it will be diverted through the call-magnet and the sounder will remain inoperative.

13. The combination with the main line and with the relay therein, of a divided ground-wire, a local circuit divided into two branches, a switch for alternately opening and closing the two branches of the local circuit and for simultaneously opening and closing the ground connection, a switch-controlling magnet located in one branch of the local circuit and a call-magnet in the other branch thereof, the arrangement being such that when the line is grounded the local circuit will be established through the switch-controlling magnet, whereby when the line is opened at one side of the ground connection and the relay-magnet deënergized, the switch will be operated to break the ground connection and the local circuit established through the call-magnet.

14. The combination with the main line and with the relay therein, of a divided ground-wire, a local circuit divided into two branches, a switch for alternately opening and closing the two branches and for simultaneously opening and closing the ground connection, a switch-controlling magnet located in one branch of the local circuit and a call-magnet in the other branch thereof, the arrangement being such that when the line is grounded the local circuit will be established through the switch-controlling magnet, and a time mechanism for controlling and retarding the movement of the switch, whereby when the line is opened at one side of the ground connection and the relay-magnet deënergized the switch will operate to establish the local circuit through the call-magnet and to break the ground connection after a definite or predetermined time.

15. The combination with the main line having the usual key, of a normally open shunt-circuit around the key, a normally open alarm-circuit, a normally closed local circuit, a ground-circuit, and an electrical device under the control of the main line acting to close the local circuit when the main line is closed and to open the local and ground circuits and close the shunt and alarm circuit when the main line is opened for a predetermined time.

16. The combination of a divided local circuit, a sounder therein, and an electrically-operated vibrating circuit opening and closing arm separably connected with the armature of the sounder, the arrangement being such that when said arm is in position to close the branch of the local circuit in which the sounder is located the said connection will be broken.

In testimony whereof I hereunto set my hand, this 5th day of July, 1895, in the presence of two attesting witnesses.

ALVAH LEWIS CREELMAN.

Witnesses:
C. A. GOODELL,
CORA C. POWELL.