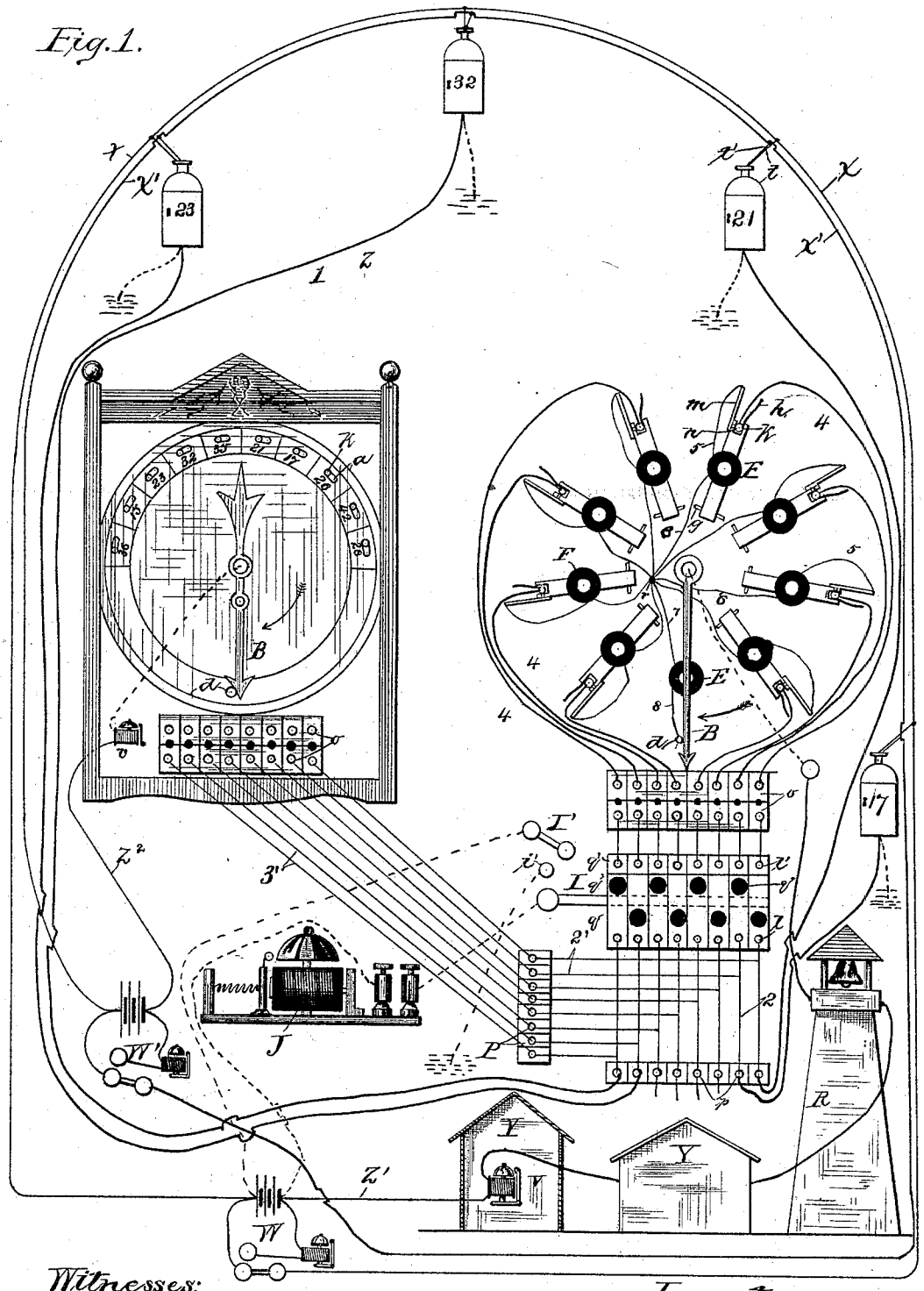
(No Model.) 2 Sheets—Sheet 1.

L. H. McCULLOUGH.

TESTING APPARATUS FOR FIRE AND POLICE TELEGRAPH SYSTEMS.

No. 329,188. Patented Oct. 27, 1885.

Fig. 1.



Witnesses:
Paul A. Sullivan
J. P. Lowenstein Jr.

Inventor.
Lewis H. McCullough,
By his Attorney,
G. H. Stockbridge.

(No Model.) 2 Sheets—Sheet 2.

L. H. McCULLOUGH.

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Fig. 2

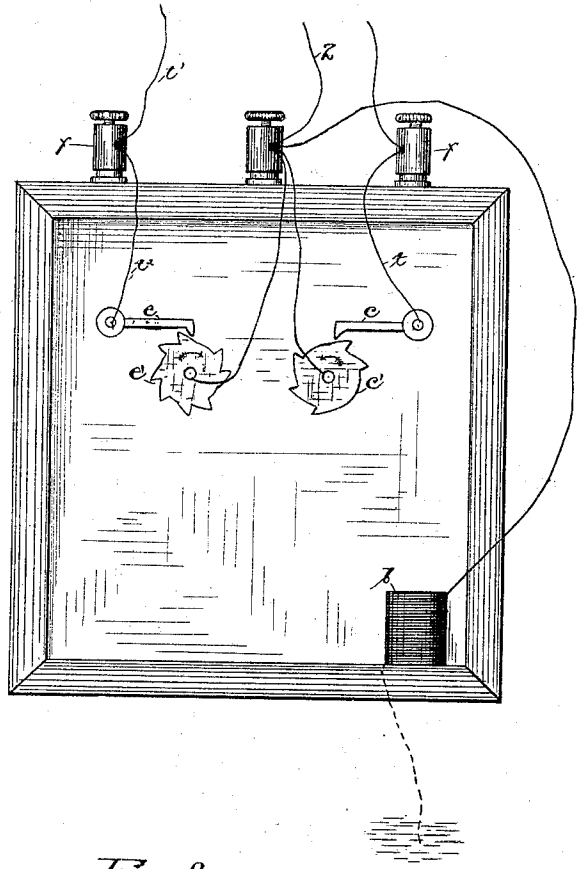
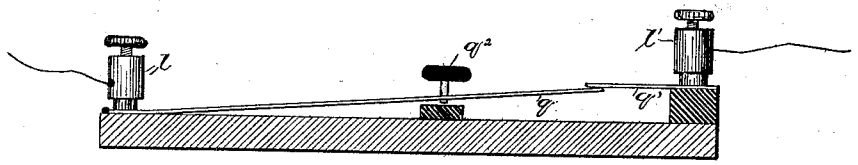


Fig. 3.



Witnesses:

Paul D. Sullivan

J. F. Howenstine, Jr.

Inventor.

Lewis H. McCullough.

By his Attorney,

G. H. Stockbridge.

UNITED STATES PATENT OFFICE.

LEWIS H. McCULLOUGH, OF RICHMOND, INDIANA.

TESTING APPARATUS FOR FIRE AND POLICE TELEGRAPH SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 329,188, dated October 27, 1885.

Application filed April 1, 1885. Serial No. 160,937. (No model.)

To all whom it may concern:

Be it known that I, LEWIS H. McCULLOUGH, a citizen of the United States, residing at Richmond, in the county of Wayne and State of Indiana, have invented certain new and useful Improvements in Testing Apparatus for Fire and Police Telegraph Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to testing apparatus for fire-telegraph systems, and is designed to be used in connection with my open-circuit system for which Letters Patent of the United States are soon to issue. I have shown it in combination with my non-interfering fire and police telegraph system for which I have filed an application for Letters Patent of an even date herewith.

The most frequent causes of derangement in systems of fire-alarm telegraphy are the breaking of a line-wire, the crossing of a loop, contact with one or more telephone or telegraph wires or other grounded conductors, and the ringing in of two or more alarms from different signal-boxes simultaneously or in immediate succession. Some of these causes of derangement it is impossible to remove entirely, and in such cases the utmost that can be accomplished by any system is that, while furnishing as many safeguards as possible against the intervention of dangerous effects, it should give an indication automatically or under test whenever a derangement occurs.

In the applications above referred to I have described a system in which there is absolutely no danger of false or confused signals when two or more boxes are operated simultaneously or successively; in which a single break in the line-wire causes no disturbance in the working of the system, and in which two or more breaks render inoperative only that box or those boxes which are located between the extreme points of rupture; in which the crossing of a loop or the contact of both the outgoing and return wires with two or more telephone or telegraph wires sounds an alarm and locates the point of disturbance; and in which the contact of either wire alone with any number of telephone or telegraph wires or other grounded conductors exercises no deranging effect whatever. Besides, in a system illustrated herein but claimed in another application filed herewith, I provide for sending over circuits in part the same both fire-alarm and police or police-patrol signals by such means that the signals of either class not only do not interfere with each other, but are also free from liability to interfere with those of the class not their own.

Hitherto I have made no provision for ascertaining when or determining where a line-wire may be broken. My system being an open-circuit system, the breaking of a wire will not change the condition of the circuit, and will therefore not operate to sound an alarm. I have accordingly devised means for testing the condition of the line, and the operation of my testing devices may be accomplished by clock-work, if desired, at predetermined intervals. The form of apparatus illustrated in the drawings is, however, adapted to be operated by hand.

I will first describe my combined fire and police telegraph system, and afterward my improved testing apparatus, reference being had to the accompanying drawings, in which—

Figure 1 represents my testing devices in connection with my fire and police telegraph system. Fig. 2 represents a part of a signal-box, showing the circuit-connections within the same, and Fig. 3 shows a detail.

In my fire-telegraph system above referred to, for which Letters Patent of the United States are about to issue, I run a wire from one pole of a battery in a loop back to the same pole, and I lead another wire from the opposite pole through gong and bell magnets in engine-houses and bell-towers, and arrange a number of open-circuit signal-boxes in multiple-arc relation between these wires. I also provide apparatus at a central station adapted to be actuated by the operation of any signal-box in such a manner as to cut every other signal-box out of the circuit. The central-office apparatus, besides cutting out all the boxes except the one first operated, causes a hand to point to the number of that box. I prefer on this account to call the central office apparatus an "indicating apparatus" or "indicator."

In the system illustrated in the drawings I

have precisely the same arrangement of circuits, gong and bell magnets, signal-boxes, and indicating apparatus, but I have, in addition to this, a similar system for police-telegraphy, with a separate battery, loop, and receiving apparatus, but with the same return-circuits. The only extra wire that is required for the combined fire and police telegraph besides the loop is that necessary for connecting the indicators in the fire and police headquarters.

Referring now to the drawings by letter, W is the battery for operating the fire-telegraph system, and X is the loop which runs out from and back to the same pole of the battery. Z′ is the wire that leads from the opposite pole of the battery, and it passes, as shown, through engine-houses and bell-towers, as Y and R, which are provided with suitable receiving apparatus, as V. From the engine-houses and bell-towers it passes to the hand B of the central-office apparatus, which is mounted on a suitable frame. The hand B is normally held from rotating in the direction of the arrow by a conducting-stop, *d*, which is attached to the armature of the magnet E in such a manner as to be normally held out in the path of the hand when the said magnet is not energized. The circuit passes from the stop *d* through the magnet E to a point, *r*, where it divides and goes through all the magnets F to the different signal-boxes, as will be fully explained hereinafter. The magnets F and E are arranged behind a dial-face similar to the one shown at A in the left of the drawings. This dial is provided with a series of slots, *a*, each of which is substantially at right angles to that radius of the dial which passes through its center. The armatures H of the magnets F have extensions *k*, which project into the slots *a*, and normally lie therein with their ends flush, or nearly so, with the dial-face. Whenever any magnet F is energized, it thrusts forward the extension *k* of its armature into the path of the hand B. The extension *k* of every armature is normally pressed by a spring, *h*, into that end of its slot *a* which is first reached by the hand B in its rotation. In pressing the extension *k* into that end of the slot the spring *h* also presses it against a platinum point, *n*, on the conducting-arm *m*, which is attached to the frame of the dial. Tracing the circuit now from that pole of the battery to which the loop is connected, it passes through X in two directions, and by wires *t t* to one terminal, *c*, of a circuit-closer in every signal-box. (See Fig. 2.) From the other terminal, *c′*, the circuit continues by wires 1 to binding-posts *p*, by wires 2 to binding-posts *l*, to springs *q* and plates *q′*, to binding-posts *l′*, by wires 3 to insulated plates *o o* and their connecting-plugs, by wires 4 to extensions *k*, to platinum points *n*, to conducting-arms *m*, by wires 5 to magnets F, by wires 6 to a common point, *r*, by wires 7 to releasing-magnet E, by wire 8 to conducting stop *d*, to hand or pointer B, and by wire Z′ through the gong and bell magnets to the opposite pole of the battery. It will be observed that the magnet E is common to all the box-circuits, while the magnets F are each in the circuit of a different box. On the operation of any signal-box then the magnet E will always be energized, but only that magnet F will be energized which is connected with the particular box that is operated. Suppose, for example, that the circuit-closer of box 23 is set in operation. At the first closure of the circuit the magnet E will withdraw the stop or detent *d* and release the hand or pointer B, and the magnet F, which is connected with box 23, will cause its extension *k* to project into the path of the hand and stop its rotation. At the same time the first stroke of 23 will be made on the gongs and bells. Now, the driving-spring (not shown) for the hand B is made considerably stronger than the springs *h h*, in consequence whereof the extension *k* will be pushed away from the platinum point *n* to the opposite end of the slot *a*, thereby breaking the circuit of all the box-magnets. The circuit of magnet E is broken when the hand leaves the stop *d*. After the hand has reached the extension *k*, connected with box 23, and pushed it away from the point *n* there is no circuit for any other box, whereas that box will have a complete circuit through the gong and bell magnets whenever its own circuit-closer acts. Thus all the strokes of 23, except the first, will be sounded through a circuit which passes directly from one of the extensions *k k* through the hand B and back to battery by the course already described. It is understood, of course, that the fire-alarm circuit-closer in each box is adapted to close the circuit a definite number of times corresponding to the number of the box. The tension of the driving-spring is made such that the hand B will be carried to the extension *k* farthest around the dial before the second closure of the circuit at the box. Both the original and the secondary circuits traverse the hand B. As soon, therefore, as the hand has left the stop *d*, there is no circuit for any box except one that has already been operated. Moreover, in case two boxes should be operated at the same time, the hand would be mechanically obstructed from passing to the extension *k* which was farthest around the dial until the nearest extension *k* had been pushed back after the receipt of its box-signal. The extension *k* will be held in its forward position by the force of the spring *h* pushing it against the end of the hand B. After the signal has been sent in, the extension *k* will be restored by hand or by automatic mechanism, as desired. The plates *o o* are ordinary metallic insulated plates attached to a board or frame at a central office, which board or frame also supports the dial and its connected apparatus, together with the connecting devices shown in the immediate neighborhood of the plates. The springs *q* and the plates *q′* are also insulated each from the others of its class. There are as many binding-

posts p' and as many magnets F as there are signal-boxes in the system, and the number of signal-boxes will usually correspond to the number of slots in the dial less one, although the dial may be constructed to have several more slots than there are signal-boxes, to provide for future needs or contingencies. For the sake of the clearness of the drawings only eight box-magnets and eight binding-posts, p, are shown, although the number of slots in the dial at the left is represented as somewhat greater than that. The signal-boxes are placed, as usual, in different parts of a city or village, and each connected with one of the magnets F and with the magnet E. The magnets F and E being operated simultaneously, the end of the extension k will always be out in position to engage the hand B as soon as it comes along. It will be seen that the signal-boxes 17 to 21, &c., are each connected in two directions with one pole of the battery, a feature by virtue of which no box is cut out unless the circuit is broken on both sides thereof. If preferred, a loop may be run from each binding-post p to a separate box, whereby each box will have double connections with each battery-pole. An accidental closure of the circuit, as by the falling of a loose wire across both X and Z, or by the contact of both those wires simultaneously with telephone or telegraph wires or other grounded conductors, will sound one stroke on the gongs and bells and cause the hand B to point to that number on the dial-face which corresponds to the number of the precinct where the disturbance has taken place. The point of disturbance having been once located, it will not be difficult, either by night or day, to take proper measures for removing its cause. This constitutes substantially my non-interfering fire-alarm telegraph system. Besides this invention, the drawings illustrate a non-interfering police-telegraph system, the operation of which is precisely the same, although it is provided with a different generator and different receiving apparatus. For convenience, I shall call the wires Z Z the "return-circuits" of the boxes. Starting now from one pole of the battery W′, I lead a loop, X′, as before, in a circuit back to the same pole, and from the opposite pole I lead a wire, Z^2, through a tap-bell magnet, v, to the hand of the dial located at the police headquarters. The connections behind the dial are exactly the same as those illustrated at the right of the drawings, wires being run in the same manner from the extensions k to the plates o o. From here the circuit goes back to the loop X′ by way of the wires 3′, binding-posts P, and wires 2′ to the corresponding wires, 2, and from there to the signal-boxes over the routes already described. Within the signal-boxes the connections are as shown in Fig. 2—that is, (for the police telegraph,) by wire Z to the wheel terminal e', and by spring terminal e and wire t^2 to the binding-post f. This binding-post is connected by wire t' to the loop X′. Suppose now that both circuit-closers in box 23 should be operated at the same time. The outgoing circuit for the fire-telegraph system would be through either branch of the loop X and the wire t. The outgoing circuit for the police-telegraph system would be through either branch of the loop X′ and the wires t' and t^2. The return-circuit for both systems would be the wire Z as far as the binding-post p, but would divide a little beyond that point, the current from the battery W passing on through the magnets F and E of the fire-alarm indicator and operating the gongs and bells, as above described, and the current from battery W′ passing similarly through the apparatus in the police headquarters and sounding a definite alarm on the tap-bell v. Signals corresponding to the number of teeth in the circuit-closing wheel at the box are sounded on the tap-bell v, while the hand B points to the number of the box from which the signal is sent in.

The testing devices which I use in connection with the above-described system are very simple. In the first place, the return-wire of every box is connected through a rheostat, b, to the ground. These return-wires are also connected through the binding-posts l l with the springs q, which are provided with the buttons q^2.

Under the springs q on the frame of the fire-alarm indicating apparatus is a bar, I, which is connected through a tap or vibrating bell, J, with one pole of the battery W. A wire runs from the opposite pole to a switch, I′, the button i' of which is connected to ground, as shown. Whenever it is desired to test the line, the switch is turned on and the springs q are successively depressed until they come into contact with the bar I, when, if there is no break in the circuit, the bell J will respond. If the alarm fails to sound when any spring is depressed, it will indicate that there is a rupture of the circuit which is connected with that spring, and the linemen can be sent out to inspect and repair that portion of the line.

The magnet of the bell J is made of very high resistance, and a rheostat is put, as has been said, in the ground-circuit of every box. This is done in order to render the current on line, in case of an accidental grounding of the other end of the battery, too slight to affect the gong and bell magnets. Ordinarily the switch I′ will be open, and it will be closed simply for testing purposes.

For testing the condition of the loops X X′, switches are inserted near the batteries and wires run from the buttons through bells to the poles opposite those with which the loops are connected. The circuit is broken between q and q' before a new circuit is formed between q and the bar I.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a battery having

one of its poles grounded, of a series of open-circuit conductors connected through rheostats to ground, a series of springs connected to the said conductors, a contact bar or plate connected to the opposite pole of the battery and located behind the said spring, and an electro-magnetic bell of high resistance for indicating the condition of any or all the circuits when the springs are depressed, substantially as set forth.

2. The combination, with an open-circuit fire-telegraph system in which the signal-boxes are arranged in multiple-arc relation between the poles of the battery, of a ground-conductor at each box, including a rheostat, and connected to the return-circuit, a ground-conductor for the opposite pole of the battery, an electro-magnetic bell of high resistance, and means whereby the bell can be brought into the circuit of any box for testing purposes, substantially as set forth.

3. The combination, with an open-circuit fire and police telegraph system in which the signal-boxes are arranged, substantially as described, in multiple-arc relation between the poles of two batteries, of a ground-conductor at each box, including a rheostat, and connected to the common return-circuit, a ground-conductor for the opposite pole of one of the batteries, an electro-magnetic bell of high resistance, and means whereby the bell can be brought into the circuit of any signal-box for testing purposes, substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

LEWIS H. McCULLOUGH.

Witnesses:
J. W. HAMILTON JOHNSON,
GEORGE H. STOCKBRIDGE.