(No Model.)

2 Sheets—Sheet 1.

J. C. WILSON.

FIRE ALARM TELEGRAPH.

No. 341,114. Patented May 4, 1886.

Fig. 1.

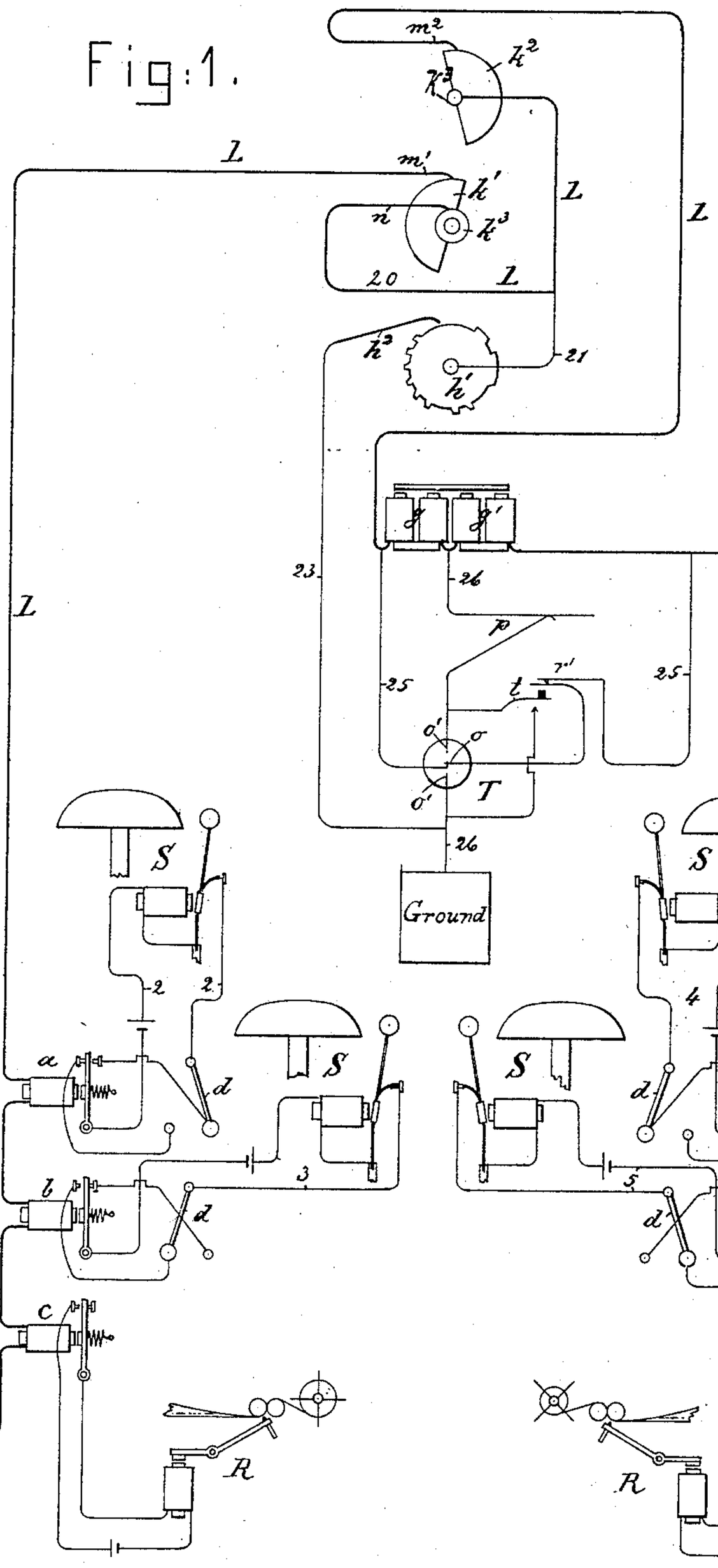


Fig. 3.

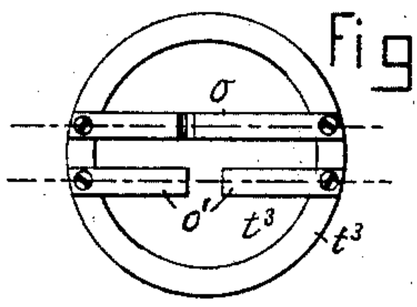


Fig. 4.

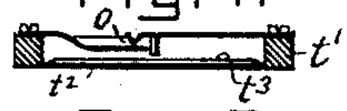
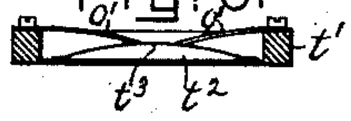


Fig. 5.



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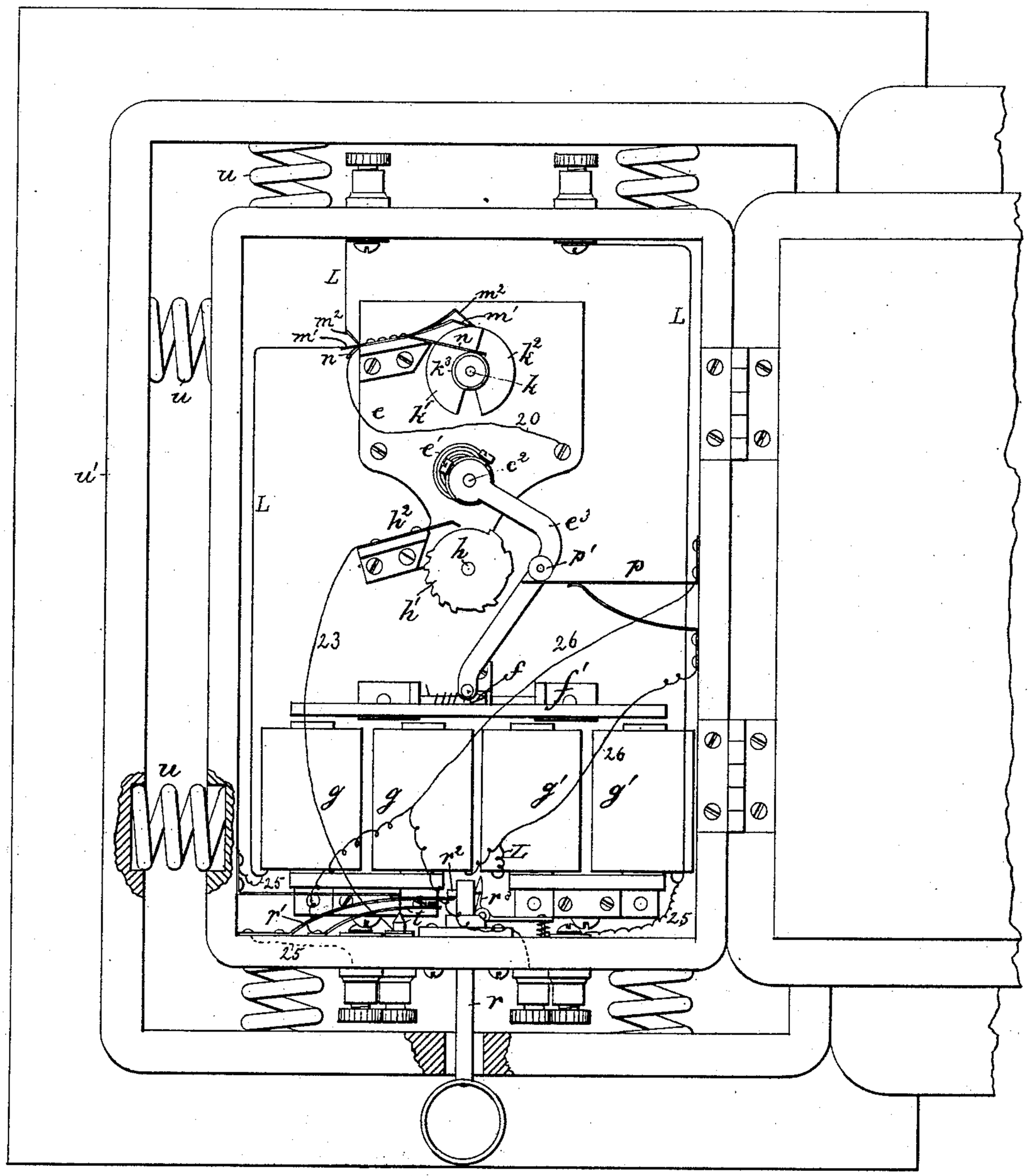
(No Model.) 2 Sheets—Sheet 2.

J. C. WILSON.

FIRE ALARM TELEGRAPH.

No. 341,114. Patented May 4, 1886.

Fig: 2.



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Inventor.
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UNITED STATES PATENT OFFICE.

JOHN CORNELIUS WILSON, OF BOSTON, MASSACHUSETTS.

FIRE-ALARM TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 341,114, dated May 4, 1886.

Application filed February 23, 1884. Renewed September 28, 1885. Serial No. 178,430. (No model.)

To all whom it may concern:

Be it known that I, JOHN CORNELIUS WILSON, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Fire-Alarm Telegraphs, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relating to fire-alarm or district telegraph systems is shown embodied in an automatic fire-alarm apparatus in which signals are automatically transmitted when a fire breaks out, the signal-boxes or transmitters being set in operation by a thermostat, although the invention is applicable to systems in which the transmission of the signals is otherwise controlled.

The invention consists, mainly, in the arrangements and combinations of the circuits, batteries, and instruments, and the construction of the transmitting-boxes used in connection therewith, by which the signals will be properly transmitted, although the circuit is broken, grounded, crossed, or otherwise in abnormal condition, and also by which a grounding or breakage of the circuit will be made known, so that proper steps may be taken for repair. The metallic circuit has both its ends brought into the central or signal-receiving main office, where each end, after passing through suitable instruments and a battery, is grounded. The two batteries are of slightly-different strength and opposed to one another, so that there is normally a weak current flowing over the line, not sufficient to actuate the receiving-instruments, but sufficient to indicate by its interruption a breakage of the circuit. The grounding of the circuit at any point will afford a distinct circuit for each battery, the current of which will act with full force on the instruments in the circuit, thus indicating the fact of grounding, and the signals are transmitted from the signal-boxes by first connecting the line at one side of the box with the ground through a break-wheel, which thus operates to send its signal through one set of instruments at the main office, and then, in the further operation of the box, the circuit at the other side of the box is connected with the ground through the break-wheel, which thus transmits its signal to the other set of instruments at the main office. If the line is broken or grounded on one side of the transmitting-box, the signals will nevertheless be properly transmitted on the other side, and if the line is in its normal condition and two boxes are operated simultaneously each will send its own signal on the side away from the other without interference of the said signals, one of which will be received upon one set of instruments and the other on the other set.

Signaling apparatus have been made prior to this invention in which the signals have been transmitted from a box or out-station over a grounded circuit extending from said box in either direction toward the main or signal-receiving station, the main circuit consisting of a metallic loop having both terminals in the main office, and being normally disconnected from the ground at the boxes or out-stations, and the ground-connection being made at the box when the latter is set in operation to transmit a signal, so that the signal may be sent from the box over the main circuit at one side thereof if the main circuit should happen to be broken or grounded at some point at the other side of the box from which the signal is transmitted.

The present invention consists, partly, in the novel construction of the appliances for controlling the ground-connection with the main line at the box.

Figure 1 is a diagram view showing the circuits and arrangement of the batteries and instruments therein; Fig. 2, a front elevation of the transmitting-instrument, and Figs. 3, 4, and 5 a plan and sectional view of the thermostat employed to effect the release of the transmitting-box.

The main line or circuit L (shown in heavier lines than the other circuits) consists of a metallic loop extending from the main or signal-receiving station, and having both ends grounded in the said station, where each end passes through suitable relays or electro-magnetic instruments, *a b c* and *a′ b′ c′*, shown for simplicity as three in number, although a single relay might perform the office of the two marked *b c* and *b′ c′*. The ends of the line L pass through independent batteries B B′, of

unequal strength, connected with like poles to the line to oppose one another, so that the line is normally affected only by a weak current, due to the difference between the two batteries, and of less amount than that produced by either of the said batteries alone. The relays *a a'* are so adjusted that their armatures remain attracted by the said weak current, while the other relays, *b c* and *b' c'*, are so adjusted that the said weak current, due to the difference between the batteries, is insufficient to close them or move up their armatures, although the current of either battery, when unopposed by the other, is sufficient to attract or move up the armatures of the magnets of the relays *b c* and *b' c'*.

The armature-levers of the relays *a b* and *a' b'* control local circuits 2 3 4 5, containing alarm-signal instruments S—such, for instance, as vibrating bells and switches *d*—by which the said local circuits may be connected with the front or back contact-points of the said relays, they being normally placed, as shown in Fig. 1, to connect the said local circuits with the back contact-points of the relays *a a'* and the front contact-points of the relays *b b'*. Thus, if the main line L is broken at any point, the current from the batteries B B' will wholly cease, and the armatures of the relays *a a'* will fall back, closing the local circuits 2 and 4, controlled by them, and setting the signals in the said circuits in operation, and thus indicating that the line is broken, so that proper steps may be taken to repair it. While the line is thus broken and repairs are being made, the switches *d* of the local circuits of the relays *a a'* will be placed to connect the local circuits with the front contact-stops of the said relays, so that as soon as the circuit is repaired and the current begins to flow the signals will again be set in operation, indicating that the repair has been effected, after which the switches *d* will be restored to their normal position. The switches *d* of the local circuits 3 5 of the relays *b b'* are normally set to connect the local circuits with the front contact-points of the said relays, and in case a ground-connection should come on the line L independent circuits will be afforded for the batteries B B', the currents of which, when thus acting unopposed by one another, are sufficient to cause the said relays to attract and move up their armatures, thus closing the local circuits and setting the signals therein in operation, indicating that the line is grounded at some point. In case the line should break and one end be grounded while the other end remained open, the signals S controlled by the relays *a* or *a'* in the portion of the circuit which remained open would sound, while the signal S in the circuit controlled by the relay *b* or *b'* in the portion of the circuit that was grounded would sound, indicating accurately the condition of the line. When the line is thus grounded, the switch *d* of the relay *b* or *b'* will be moved to connect the local circuits with the front contact-point of the said relay, so that the signal will sound and indicate when the ground has been removed and the line restored to its normal condition.

The signals are transmitted by causing each of the batteries B B' to operate independently on the instruments at the same end of the line L with them, the signals being automatically produced by the transmitting-boxes, one of which is shown in Fig. 2, and will now be described. The said signal-box consists, essentially, of the usual train of clock-work, the frame-plate *e* only of which is shown, the said train being actuated by a spring, *e'*, connected with an arbor, e^2, provided with a winding-lever, e^3, which is rotated to wind the spring *e'*, and is then engaged by a detent, *f*, operated by an armature, *f'*, of a releasing magnet or magnets, *g g'*. (Shown in this instance of my invention as two in number.) The shaft e^2 is connected by gearing with another shaft, *h*, carrying the break-wheel *h'*, the periphery of which is notched to make a definite signal or produce a number of alternate openings and closings of the circuit characteristic of the said box or station, as is usual in fire-alarm or district telegraph systems, the said wheel being caused to make two or four, or any desired, preferably even, number of revolutions during the movement of the arm e^3, produced by the spring *e'* when the said arm is released by its detent. The arbor e^2 is also connected by gearing with a shaft, *k*, provided with a circuit-controlling device, (shown as two half-disks, *k' k²*,) which are separated for greater clearness in the diagram, Fig. 1, the said disks co-operating with contact-springs *m' m²*, so arranged that during the rotation of the shaft *k* one of the said springs and the corresponding disk will remain in contact, connecting the circuit between them, during one or more entire revolutions of the break-wheel *h'*, and then the other disk and spring will remain in contact while the break-wheel *h'* is making the remainder of its revolutions, the circuit being broken between one of the disks and springs and closed between the other of the disks and springs when the break-wheel is in operation, opening and closing the circuit between its periphery and the contact-spring h^2 co-operating therewith.

As shown in this instance of my invention, the circuit-connections of the transmitting-box with the main line are as follows: The main line L, passing from one side of the main office through the battery B and relays *a b c*, is connected with the spring *m'* and disk *k'*, the hub k^3 of which is continuously connected with a spring, *n*, from which the electrical connection is continued to the disk k^2, this connection being shown in Fig. 2, as made by the wire 20, connecting the spring *n* with the plate *e* or metal frame of the box, which is in electrical contact with the disk k^2, and also with the break-wheel *h'*, the latter being shown in Fig. 2 as connected by wire 21 with the two disks *k' k²*. The spring h^2, which in the normal condition of the box is disconnected

from the break-wheel h', is connected by wire 23 with the ground, the wires 21 23 26 with the break wheel, and its spring thus constituting an earth branch at each box, which branch is normally open at the break-wheel. From the spring m^2 the main line L is continued through the releasing-magnets g g', (the operation of which will be subsequently described,) to the main office, where it passes through the instruments a' b' c' and the battery B′ to the ground. The operation of transmission is as follows: When the arm e^3 is released, as will be described later on, the signal-box is set in operation by the spring e', rotating the break-wheel h' and disks k' k^2. After the said rotation begins the disk k^2 is almost immediately removed from the spring m^2, thus leaving the portion of the main line L connected with the battery B in connection with the break-wheel h', and the signals are transmitted through the relays c by the alternate closing and opening of the ground-circuit, including the said break-wheel, spring h^2, instruments a b c, and battery B. It will be seen that the signal is wholly independent of the condition of the portion of the line leading from the box to the battery B′, and that the said portion may be broken or grounded, or may contain another box which is also in operation. After the half-rotation of the disks k' k^2 and one or more whole rotations of the break-wheel h', the disk k passes out of contact with the spring m', leaving that portion of the line connected with the battery B open, and the disk k^2 comes in contact with the spring m^2, thus connecting the portion of the line passing through the battery B′ with the break-wheel h' and ground, and the signal will be transmitted through the relay c', independently of the condition of the portion of the line L leading from the box to the battery B, the same signal thus being transmitted first through one and then through the other of the relays c and c', if the line is in normal condition, and being received by at least one of the said relays, even if the line is in abnormal condition between the transmitting-box and the other relay. Since the transmission of the signals over the line at one side of the box does not affect and is wholly independent of the condition of the line at the other side of the box, it will be seen that two boxes may be operated simultaneously, and each will transmit its message over the line on the side away from the other box without interference.

So far as the transmission and the receipt of the signals is concerned, the signal-box e may be set in operation in any usual manner, the arm e^3 being, for instance, turned by the operator to wind the spring e' when a signal is to be sent; or, if desired, the spring e' may be such as to produce a large number of signals, the wheel-work being released and permitted to turn sufficiently for the transmission of one signal by a suitable pull or starting device, as is well known in fire-alarm and district signaling. The said arm e^3 is, however, shown in this instance as normally turned to wind the spring, and then engaged and held by the detent f until the proper time for sending a signal. The said detent may be automatically operated to release the arm e^3 by either of the magnets g or g', which are included in the main circuit, as shown in Fig. 2, but are normally shunted, so as to be unaffected by the currents in the main line, by means of the shunt-circuit 25, including a circuit-breaker, o, controlled by a thermostat, T, which, when heated to a certain temperature, will cause the said circuit breaker o to open, thereby permitting the current from the main line to traverse the said magnets g g' and actuate their armature so as to release the arm e^3, permitting the signal-box to operate.

In order that one or both of the batteries B B′ may act with full strength upon the releasing-magnets g g', the main circuit L between them is adapted to be connected with the ground by a ground branch, 26, containing a circuit-closer at o', adapted to be closed at the same time that the circuit breaker o in the shunt is opened, it being shown as controlled by the same thermostat, T. Thus on the breaking out of a fire the temperature of the thermostat is raised, the shunt 25 is broken, and the main line L between the magnets g g' connected with the ground, so that if the said line is intact the current of the battery B′ will traverse the magnet g', and that of the battery B the magnet g, and even if the line is broken or grounded at some point, the current of one of the said batteries will traverse the corresponding magnet, the attraction of which will be sufficient to release the arm e^3 of the signal-box. The arbor e^2 of the signal-box engages the wheel-work by a ratchet and pawl in the usual manner, and when arrested in the position shown in Fig. 2 there is some lost motion between the ratchet and pawl, so that the arm e^3 moves a considerable distance, under the action of the spring e', before it engages and turns the wheel-work with it in its further movement. The ground branch 26 is provided with a circuit-breaker, p, normally kept closed while the box is in position ready to be operated, as shown in Fig. 2, by a stud, p', on the arm e^3; but when the said arm is released it immediately permits the circuit-closer p to open, thus removing the ground-connection from the line L between the releasing-magnets g g', which connection had just been made by the circuit-closer o.

When desired, the signal box may be set in operation by an attendant, independently of the automatic operation of the thermostat T, by means of a pull, r, operating a circuit-breaker, r', in the shunt 25, and at the same time closing the ground-connection 26. The said pull r is provided with a projection, r^2, engaging the spring of the circuit-breaker r', and the latter in its movement engages the spring of the circuit-closer t in the branch 27 of the ground-circuit 26. When the pull r is depressed to operate the instruments r' and t,

it is engaged by a catch, r^3, which retains it in its depressed condition until the box is opened and the said catch released, it showing that the box had been operated by a person, and not automatically by the thermostat T.

In signal-boxes controlled by a detent—such as herein shown—intended to be released automatically there is danger of the detent being released by a jar or concussion taking place in the building in which the box is situated, thus giving a false alarm of fire. In order to obviate such accidental operation of the detent, the signal-box is supported by springs *u*, (see Fig. 2,) which are interposed between the inclosing-box of the signal-transmitting mechanism and an outer casing, *u'*, somewhat larger than the said box.

The thermostat employed to control the box may be of any suitable or usual construction. The one preferably employed is shown in Figs. 3, 4, 5 as consisting of a ring or annular frame, *t'*, containing a flat reservoir or chamber, t^2, having a flexible side, t^3, and containing a few drops of a fluid which vaporizes at a low temperature, producing a sufficient pressure to raise or bulge the face t^3 of the reservoir, as shown in Fig. 5, thus acting on the springs of the circuit-breaker *o* and circuit-closer *o'*, separating the former and connecting the latter, the said springs being attached to the annular frame *t'*.

I claim—

1. In a fire-alarm or district telegraph system, a main-line circuit extending from the main or central station, having both its terminals grounded in said station, combined with unequal opposing batteries, one on each end of the line, and an instrument adjusted to respond to the weak current due to the difference between the said batteries, and other instruments adjusted to respond to the currents of the said batteries when each is operating independently, substantially as described.

2. In a fire-alarm or district telegraph system, a main-line circuit having both its ends grounded in the main or central office, combined with unequal opposing batteries, one in each end of said line, relays in said circuit, one adjusted to respond to the weak current due to the difference between the said batteries, and another adjusted to respond to the stronger current of one of the said batteries when unopposed by the other, and local circuits containing alarm-signals controlled by the said relays, substantially as described.

3. The main line having both ends grounded in the main or signal-receiving station, and having signal-receiving instruments, one in each end, combined with a transmitting-box having an earth branch and break-wheel in the said earth branch, and a circuit-controlling device, whereby the line leading from the box toward the main station in one direction is broken and the line leading in the opposite direction connected with the earth branch during one or more complete signals of the break-wheel therein, and then the main line connections are reversed, the portion previously connected with the earth branch being broken, and the portion previously broken being connected with the earth branch during one or more complete signals of the break-wheel therein, substantially as described.

4. The transmitting-box and its detent, combined with two releasing-magnets included in the main-line circuit, a normally-closed shunt around the said releasing-magnets, a normally-open ground branch connected with the line between the said magnets, and a circuit-controlling device, whereby the said shunt may be opened and the ground branch closed, as and for the purpose set forth.

5. The transmitting-box and its detent and two releasing-magnets therefor in the main-line circuit, combined with a normally-closed shunt around the said magnets, a ground branch connected with the main line between the magnets and containing a normally-closed circuit-breaker controlled by the box mechanism and opened when the said mechanism is released, and normally-open circuit-closer, and mechanism independent of the box for breaking the shunt and closing the circuit-closer of the earth branch, whereby the box is released and the earth branch again opened, substantially as described.

6. The transmitting-box and its detent, combined with two releasing-magnets included in the main-line circuit, a normally-closed shunt around the said releasing-magnets, a normally-open ground branch connected with the line between the said magnets, and a thermostat provided with a circuit-breaker in the said shunt and circuit-closer in the said ground branch, both operated by a change in temperature, substantially as described.

7. A main or signal-receiving station and a signal-box or sub-station containing a mechanical motor and main circuit passing through the signal-box and having both terminals in the main station, combined with a normally-open grounded branch at the signal-box, including a break-wheel operated by the motor, and co-operating pen or contact springs, and an electric switch or circuit controlling device actuated by the same motor which actuates the break-wheel, the said switch comprising contact-points connected with the main line at either side of the box and with the earth branch, which in the movement of the motor maintain a connection between the earth branch and main line leading from one side of the box during one or more complete movements of the break-wheel, and at the same time open-circuit the main line at the other side of the box, substantially as and for the purpose described.

8. A main or signal-receiving station and a signal-box or sub-station containing a mechanical motor, a revolving break-wheel, and co-operating contact-spring, and a revolving circuit-changing device or switch actuated simultaneously with the break-wheel by the motor, combined with a main circuit extend-

ing from the main station to and beyond the signal-box, and a normally-open grounded branch at the signal-box, and contact-pieces or springs connected with the main line and earth branch and controlled by the revolving switch, which, when the motor of the box is in motion, connects the main circuit with the ground branch through the break-wheel and spring during one or more complete rotations of the break-wheel, substantially as described.

9. In an electric circuit, two independent receiving-instruments and a transmitting-motor comprising two independent circuit-controllers mounted upon rotating shafts, and means, substantially as described, to rotate the said shafts, one of the said circuit-controllers transmitting a signal indicative of its locality, and the other circuit-controller determining which receiving-instrument shall receive the signal produced by the first-named circuit-controller, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN CORNELIUS WILSON.

Witnesses:

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