(No Model.)

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C. E. BUELL.

FIRE ALARM SYSTEM.

No. 580,927. Patented Apr. 20, 1897.

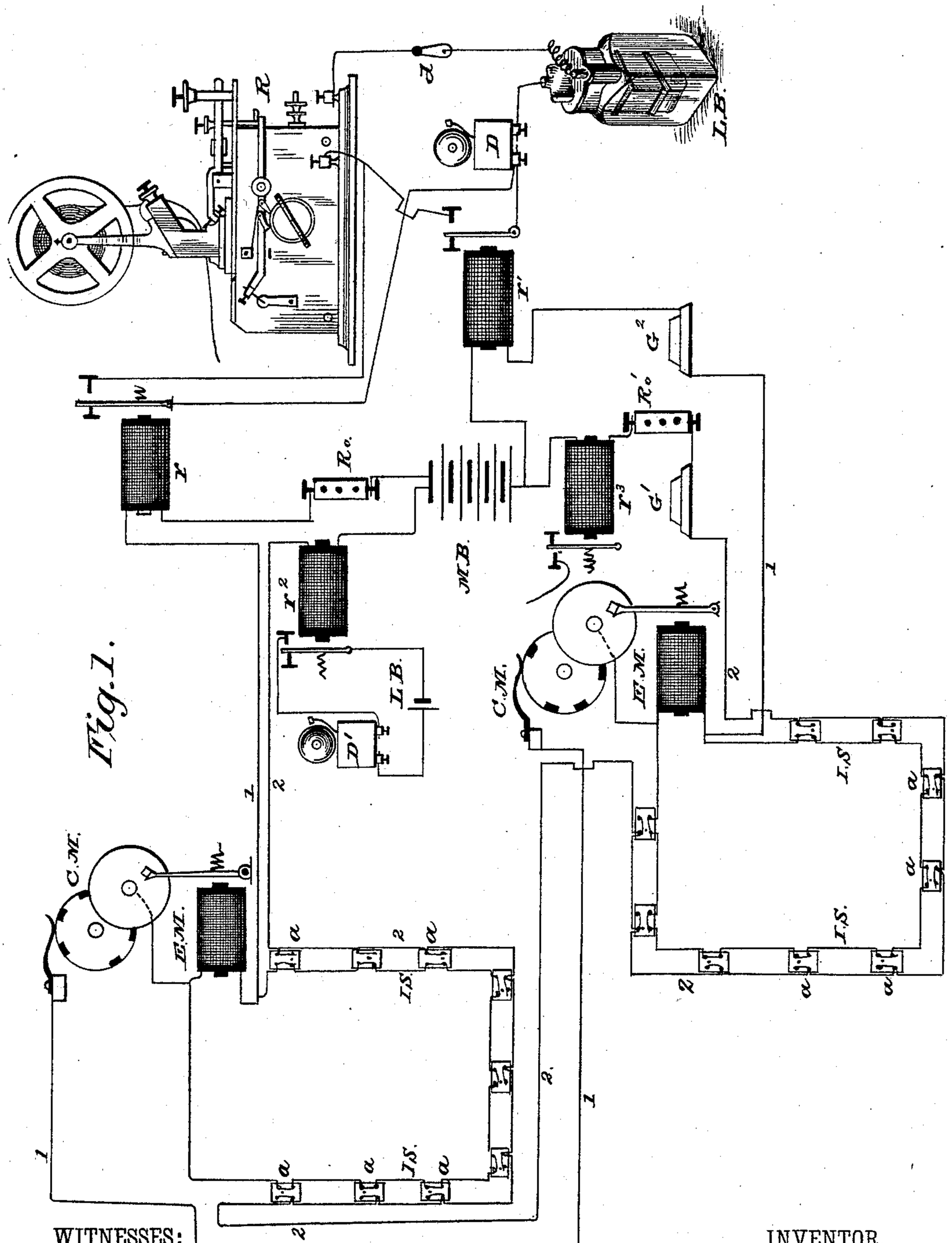

Fig. 1.

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(No Model.)

4 Sheets—Sheet 2.

C. E. BUELL.

FIRE ALARM SYSTEM.

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Fig. 2.

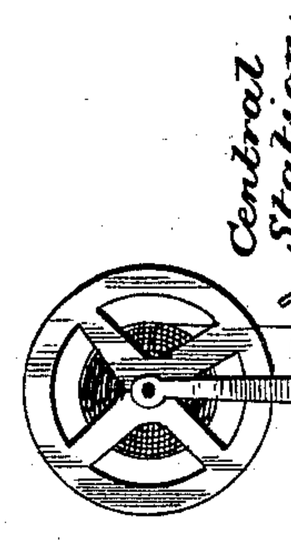


Fig. 3.

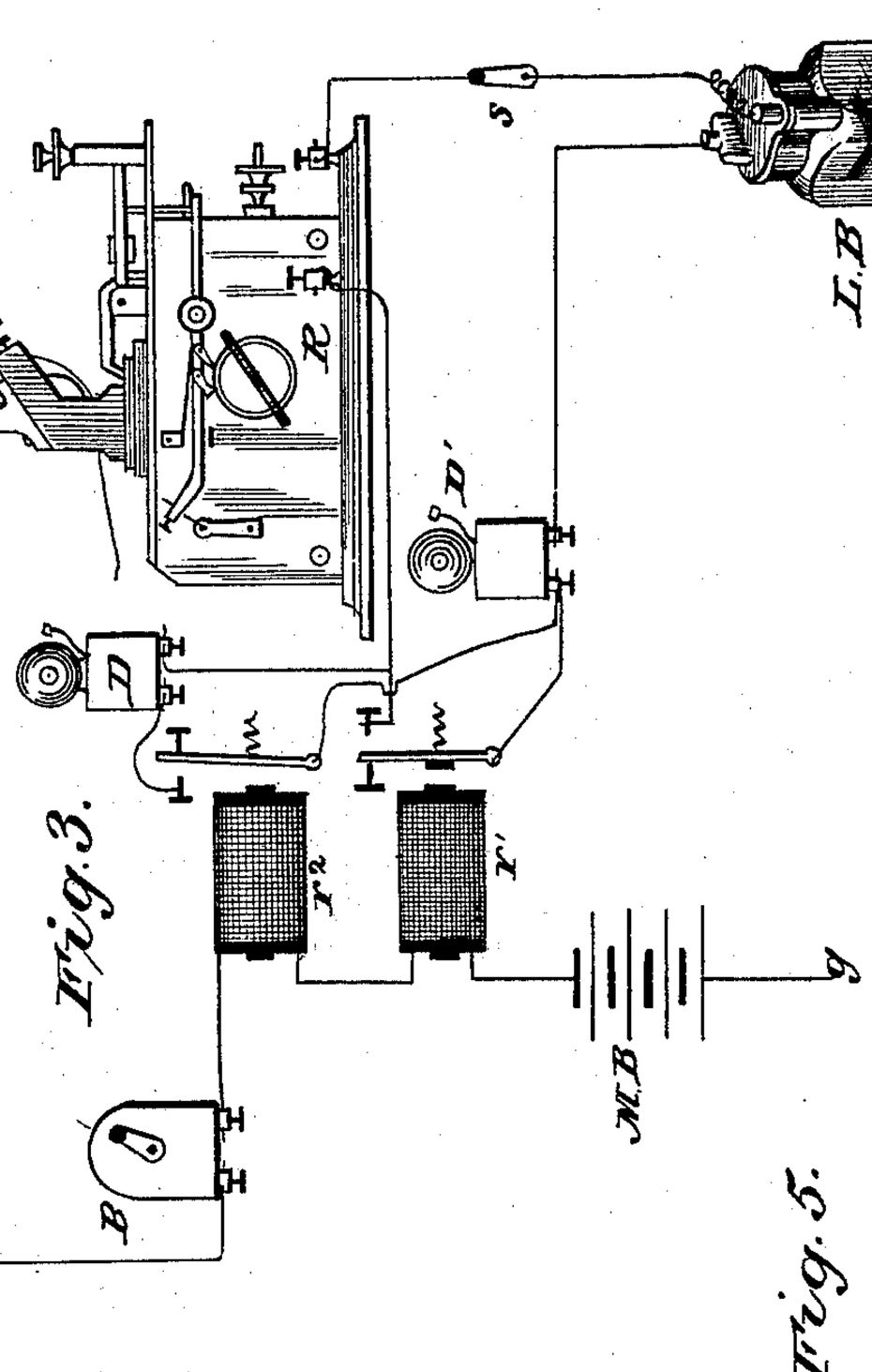
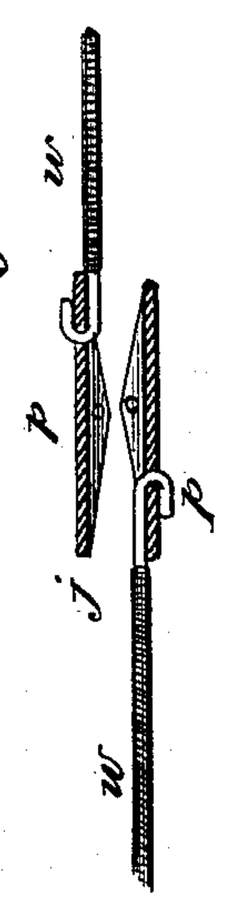
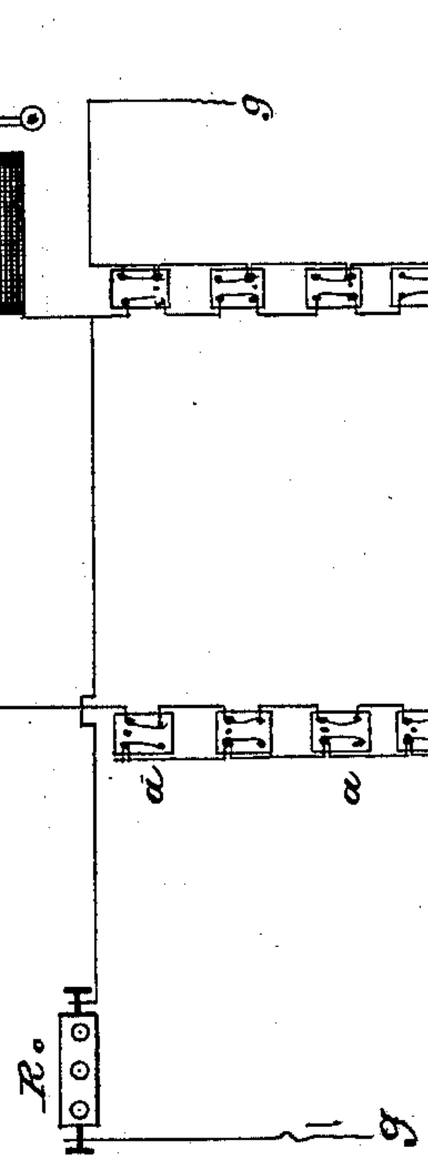


Fig. 4.

Fig. 5.





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(No Model.)

4 Sheets—Sheet 3.

C. E. BUELL.

FIRE ALARM SYSTEM.

No. 580,927. Patented Apr. 20, 1897.

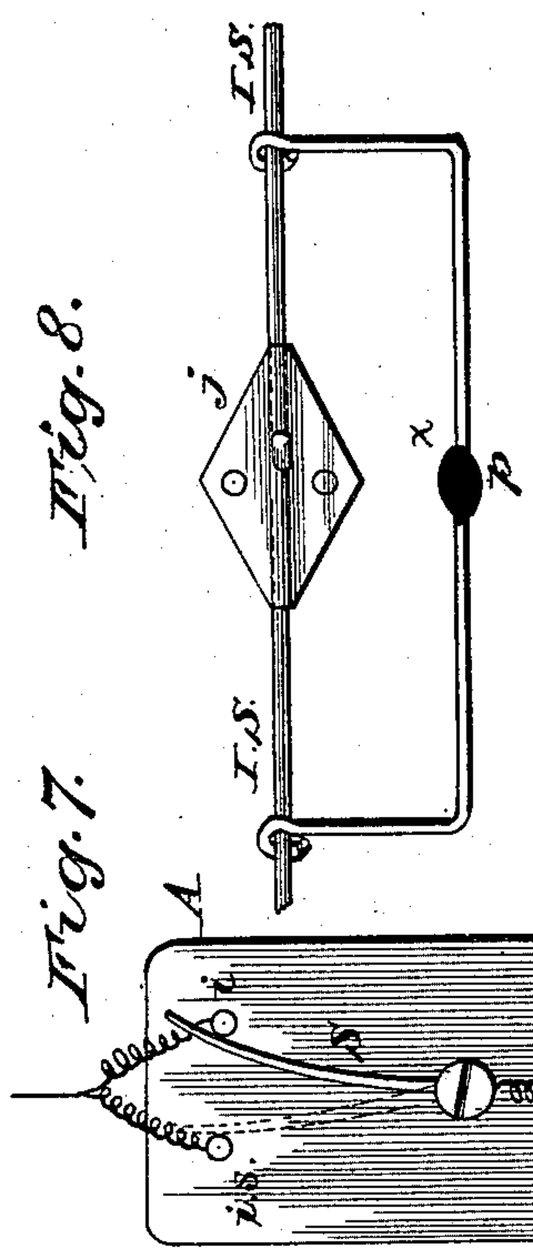

Fig. 8.

Fig. 7.

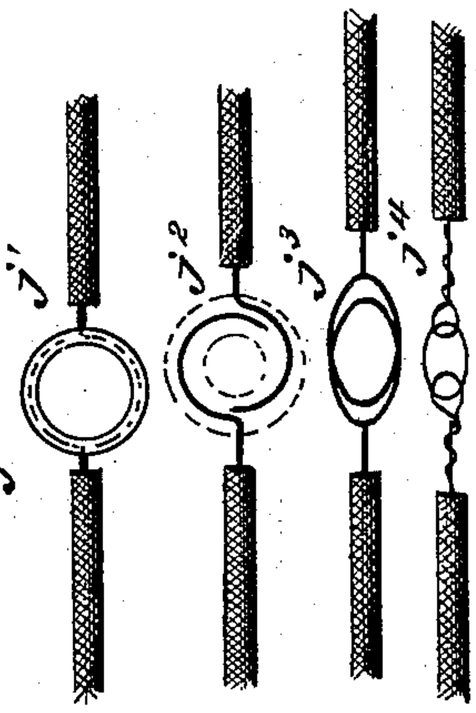

Fig. 9.

Fig. 6.

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(No Model.) 4 Sheets—Sheet 4.

C. E. BUELL.

FIRE ALARM SYSTEM.

No. 580,927. Patented Apr. 20, 1897.

Fig. 14

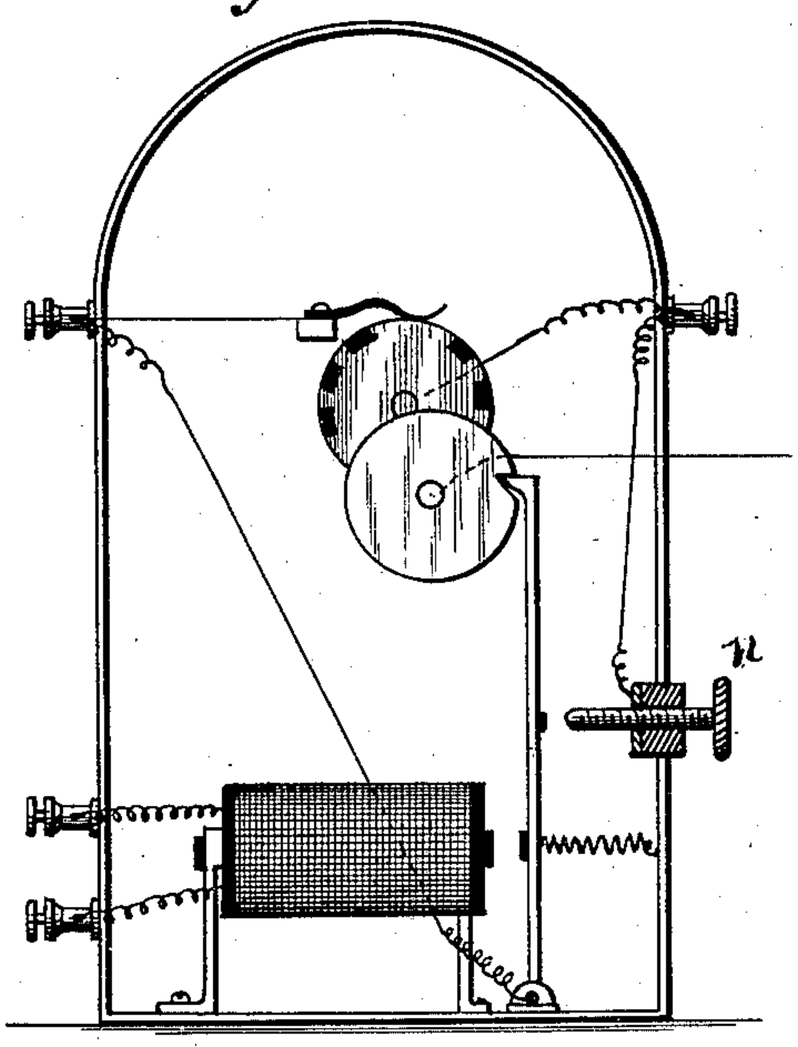


Fig. 15

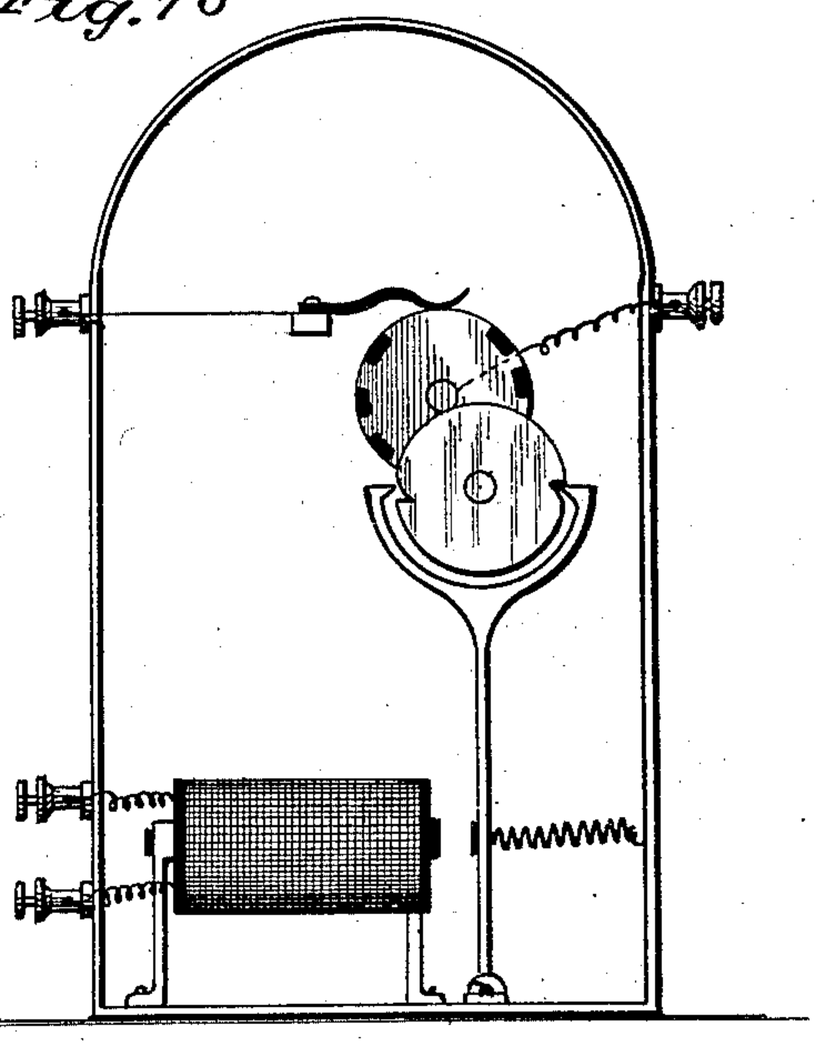


Fig. 13

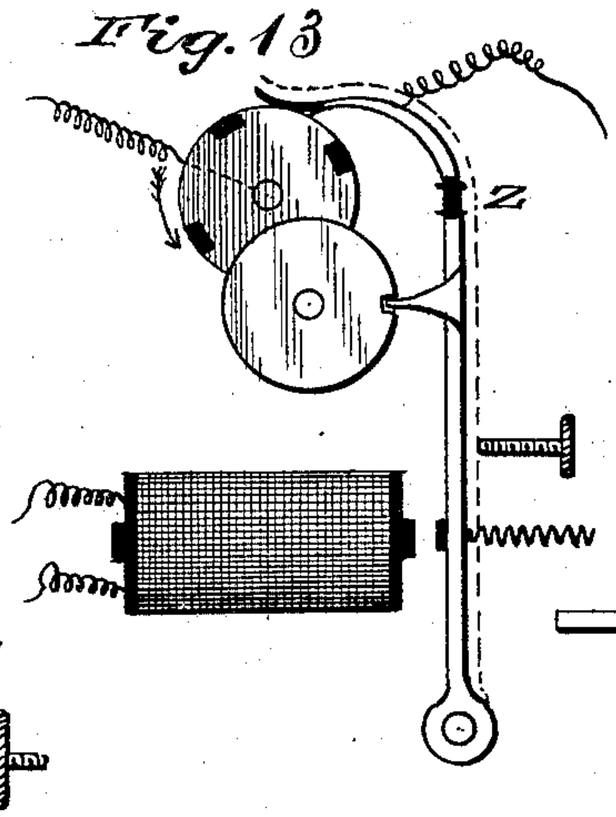


Fig. 12

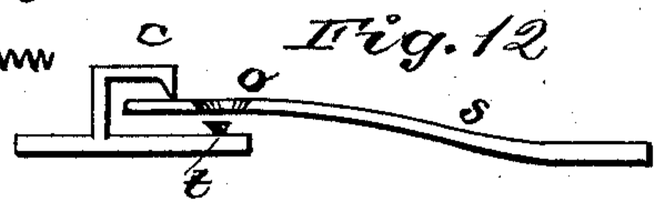


Fig. 10

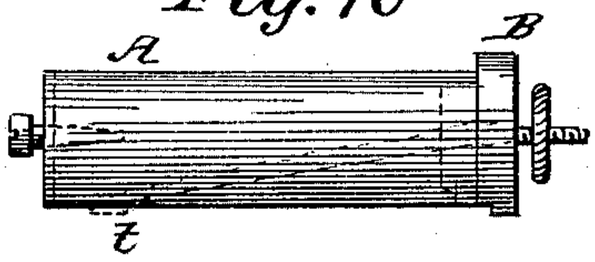
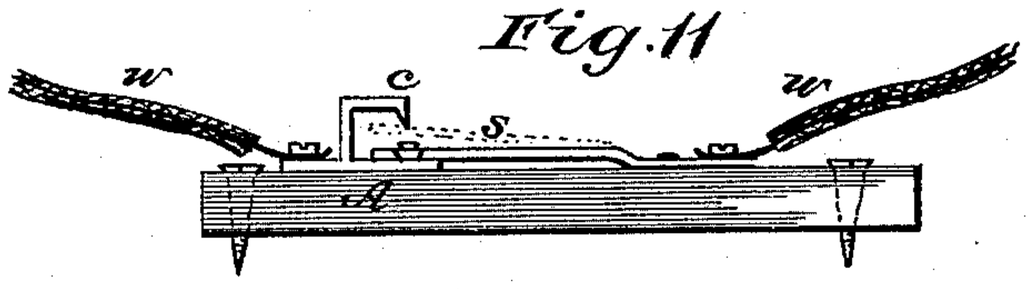


Fig. 11



WITNESSES:

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Joseph A. Burll.

INVENTOR.

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UNITED STATES PATENT OFFICE.

CHARLES E. BUELL, OF NORTH PLAINFIELD, NEW JERSEY, ASSIGNOR TO THE BUELL HYDRAULIC AND ELECTRICAL MANUFACTURING COMPANY, OF NEW YORK.

FIRE-ALARM SYSTEM.

SPECIFICATION forming part of Letters Patent No. 580,927, dated April 20, 1897.

Application filed April 29, 1884. Serial No. 129,754. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BUELL, of North Plainfield, Somerset county, State of New Jersey, have invented Improvements in Fire-Alarm Systems, of which the following is a specification.

My invention consists, primarily, in the combination, with a controlling-circuit and alarm apparatus that will give a specified signal when said circuit is broken momentarily and a different signal if said circuit is permanently ruptured, of one or more circuit-controlling keys or devices normally closing said circuit and adapted to change said circuit in its electrical condition when acted upon by heat to give a signal different in its character from the signal that would result if said controlling-circuit became permanently broken.

My invention further consists in certain combinations and subcombinations which will be hereinafter described.

In the accompanying drawings, Figures 1, 3, and 6 represent circuits and apparatus arranged according to my invention. Figs. 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, and 15 represent detailed parts of my invention.

Referring to Fig. 1, r r' are relay-electromagnets at a central station in the circuit of main line 1. r^2 r^3 are relay-electromagnets at the said central station included in the circuit of main line 2, both circuits 1 and 2 being represented as metallic circuits charged by the main battery M B. A rheostat R o is included in the circuit 1 on the copper side of the battery M B, and a rheostat R o' is included on the zinc side of the battery M B in circuit 2. Galvanometers G' G^2 are shown in circuits 1 and 2, respectively, for indicating their condition and for testing.

In their normal condition the relays r r' r^3 have their armatures attracted and are adapted to make operative the register R, gong D, or other equivalent apparatus when their respective circuits are ruptured or fall below normal. Relay r^2 has its armature normally retracted and is adapted to make operative an alarm-gong, register, or other equivalent apparatus by an increase in force upon the circuit in which it is included. When short circuits are used, the register, gong, or other receiving apparatus may be included in the main circuits.

C M is a transmitting mechanism of ordinary construction adapted to be released by the attraction of the armature of electromagnet E M, which is included in circuit 1, the said circuit passing through the mechanism C M. A shunt-circuit I S is connected to shunt around electromagnet E M, and consists of a thermostatic branch which is normally closed by devices that are adapted to open the shunt when acted on by heat and thus make operative the electromagnet E M, which starts the mechanism C M, that, in running down, opens and closes circuit 1, producing a definite-number signal upon the register R, gong D, or other receiving apparatus through the intermediate action of relays r r'. Circuit 2 is shown as being run parallel to the shunt I S and is connected to thermostatic devices that are adapted to act by heat to connect circuit 2 to circuit 1 without rupturing circuit 2, which is normally a closed circuit. By thus connecting circuit 2 to circuit 1 the resistances R o R o' are avoided by a current from battery M B, which flows out on circuit 2 and returns on circuit 1, and by the increase of force on circuit 2 makes operative the relay r^2 to produce a signal, and by the opening and closing of circuit 1 a definite-number signal may be produced by the action of relay r^2, said relay being adapted to respond to a rise and fall of the tension of a closed circuit and without circuit 2 passing through the call mechanism.

The thermostatic devices a a a a for making operative this form of my invention by opening one circuit and by connecting two circuits together are shown enlarged in Fig. 2 and consist of a base A, of insulating material, with screws e e' e^2, springs s s', and holes f f, through which to pass screws to attach the double thermostat to the ceiling or wall of a room. The spring s is held normally retracted by being soldered to the pin i and adapted to make contact with the screw e^2 when released by heat, thus connecting circuit 2 with circuit I S. The spring s', which is held by a screw e^2, is retracted and soldered to screw e' and adapted to open the circuit I

S when acted on by heat. A contact i' may be used to prevent spring s' from coming in contact with screw e of circuit 2. Instead of being soldered, the springs s s' may be held by fusible pins in an obvious manner. The springs s s' may be adapted to be released at different temperatures. The advantages of the use of the circuits 1 and 2 and the double thermostats described are that by the accidental breaking of circuit 1 or shunt I S an alarm will be given upon relays r r' only, which will be known to be an accidental or false alarm, the location of the origin of which can be determined, while the opening of circuit 1 and the simultaneous connection of circuit 2 with circuit 1 will be indicated upon relays r, r', and r^2 and be known to be a true alarm. Other ways of arranging two main circuits so that a signal will be given when they are brought into electrical contact with each other at outlying stations are obvious, the essential prerequisite being to connect two charged circuits together at a common battery or to arrange a battery between them common to both, with suitable resistances at the opposite alternate ends of the two lines.

Fig. 3 shows a grounded circuit with a ground branch g at each station in place of circuit 2, a resistance R o being placed at a remote terminal. The closing of the ground branch g upon the shunt I S cuts out the resistance R o and makes operative relay r^2, while the rupturing of shunt I S will through the intermediate action of the mechanism C M make operative the relay r' by a make and break of the circuit in which it is included. The same apparatus may be used for receiving calls by the call mechanism B of a district telegraph.

Fig. 4 represents a double thermostat adapted to be used with the circuits previously described. I S is a portion of a closed shunt-wire electrically connected to a metal thermostat at h. This thermostat consists of two metal strips x y, brazed together, of unequal expansion. By an increase of temperature the prong-like portions tend to approach each other, and the rod b, passing through a hole in one of the prongs, makes electrical contact with the insulated spring s^2 and connects circuit 2 to shunt I S. This thermostat can be set to act at a desired temperature, may be used to open a closed circuit, and is not liable to be affected by a jarring of the building, while it may serve as a support for the wire I S. The contact-joint of bar b, being in a hole in one of the prongs, obviates the necessity of a cover to exclude dust from the contacts. The shunt I S is composed of lengths of wire not easily fused with a secured joint j. By the term "secured joint" I mean a joint in which the terminals of lengths of copper wire are flattened out or hook-shaped or bent into a spiral or loop and embedded in a ring or block of solder or easily-fused metal, as shown at j' j^2 j^3 of Fig. 9, or are hooked into plates of metal p p, Fig. 5, which are grooved to receive the wires and are soldered together in a manner to prevent the wires w w from becoming unhooked and detached, wires thus flattened, hooked, or looped and embedded being less liable to pull out and making better electrical connection than wires simply lapped and soldered or embedded or held in a fusible ring, as shown at j^4 of Fig. 9, or hooked into plates that are soldered together, the wires being hooked to the plates in a manner to make defective contact instead of being hooked and embedded as shown in Fig. 5.

Fig. 6 represents a call mechanism C M, with the armature k of its controlling-magnet adapted to interlock with the mechanism at m. A shunt-wire I S is shown composed of a single wire that shunts the controlling-magnet out of line. Thermostats a a a in the shunt I S are adapted to open the circuit and then to close it again when acted on by heat and by a further increase of temperature to again open the circuit, and by thus automatically manipulating the circuit to transmit a signal to a central station different from that which would be given if the circuit was accidentally opened, as in the first instance, the call mechanism would start, and after transmitting a signal would be stopped, and would again start and repeat the signal till it runs down, while by an accidental opening the call-signal would be repeated without any pause.

Fig. 7 shows a thermostat adapted to open a circuit when acted on by heat to again close the circuit and by a further increase of temperature to open the circuit again. A is an insulating-base to which the spring s is attached. The spring s is held at i by a solder or fusible pin and tends to come in contact when released with the pin i s, which in turn is melted by a higher temperature.

Fig. 8 shows a joint j, consisting of plates of metal, into which the wires are hooked, as shown in Fig. 5, and the plates are then soldered together. The plates may have holes in them, through which the solder will rivet, and may be of spring metal and formed to spring apart when released by heat. A wire p is hung loosely on the insulated wires I S I S, and may be soldered at x to melt at a higher temperature than the joint j. When the joint j becomes ruptured by heat, the plates come in contact with the wire p, thus closing the circuit again. It is not necessary that the wire p should rupture to distinguish between the rupture of the joint j and an accidental rupture of the circuit.

Fig. 10 shows a thermostat consisting of a metal tube A, with an insulating stopper or plug B, through which a spring passes, as shown by dotted line, the spring having a projection which protrudes through a hole in the case A at the joint t and is held in this position by a drop of solder. When released by heat, the spring comes in contact with a screw passing through the end of the tube A. A nut on the protruding end of the spring at B

and the screw at the other end of the tube serve to hold the circuit-wires. The released spring ruptures the circuit and closes it again as it comes in contact with the screw.

Fig. 11 shows another form, in which a spring S is secured to an insulating-base A and soldered to the piece C and adapted to come in contact with the projection on piece C when released and after having broken the circuit, thus closing the circuit after having ruptured it.

Fig. 12 shows the spring S released. A point *t*, with a head like a tack-head, is secured to the base of piece C. A hole O in spring S allows the point *t* to enter and pass through the spring when it is depressed, and a drop of solder in the hole O securely holds the spring in a depressed position.

Fig. 13 shows a call mechanism with the contact-spring insulated upon the armature of the controlling-magnet at *z*, the armature being normally attracted. When the armature is released and retracts, the contact is broken between the insulated spring and the break-wheel of the mechanism, and the mechanism is allowed to start. If the circuit is again closed, the contact-spring is again brought against the break-wheel of the mechanism and a definite-number signal is transmitted. If, however, the auxiliary circuit remains open, the mechanism runs down without striking a definite-number signal.

Fig. 14 shows a call mechanism in which the armature of the controlling-magnet is normally attracted and when released by a rupture of the auxiliary circuit comes against the insulated screw, releasing the mechanism but shunting it so that the otherwise definite-number signal will not be transmitted if the armature remains retracted, but will be transmitted if the armature is released and then attracted again.

Fig. 15 shows a call mechanism in which the armature of the controlling-magnet, when released, allows the wheel with which it interlocks to move slightly and then to interlock again, and when again attracted to allow the mechanism to run down and transmit its definite-number signal.

The thermostatic keys and devices may be covered to exclude dust, as shown in my previously-filed application.

What I claim is—

1. A thermostat comprising a circuit-controller that is held to close a circuit by a fusible substance, and when acted upon by heat opens said circuit and then closes said circuit.

2. A fire-alarm system that comprises a series of thermostats each of which consists of a circuit-controller having connection to a circuit at one point by a solder, and under the action of heat varies the said circuit and thereafter restores said circuit, and an apparatus in said circuit for announcing and indicating the variations of the said circuit.

3. A circuit-controlling thermostat having connections to a circuit at one point by a solder, and under the action of heat varies said circuit and makes contact at another point of said circuit.

4. A series of circuits, thermal branches connecting between the said circuits that contain each, a thermostat that includes a fusible device which, in its normal operation, varies the said branch and thereafter restores said branch to its normal condition, and a receiving apparatus having electrical connections to the said series of circuits for announcing and recording the variations of the said thermal branches.

5. The combination of the following-named elements; one or more electrical circuits comprising thermostats each of said thermostats consisting of a fusible circuit-changer, that in its normal operation varies the said circuit, or circuits, and then thereafter restores the said circuit to normal; a receiving apparatus having connection to the said circuit, or circuits, that is adapted to indicate the said variations by said thermostats, and receiving apparatus having connection to said circuit, or circuits, that is adapted to indicate a rupture of a circuit.

6. A heat-actuated fire-alarm comprising thermostats which consist of a moving member held normally in contact at one point by an easily-fusible solder, and when acted on by heat, the movable member breaks the said contact and completes another contact, and signal apparatus for the purpose of denoting the operation of said member having connection to the said heat-actuated thermostat.

7. A thermally-operated electric system comprising suitable batteries, and mechanism for indicating the signals that are sent, and signal-transmitting thermostatic apparatus that consists of a fusible circuit-interrupter held to normally close the circuit, and when displaced by heat makes connection at a different point of contact.

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