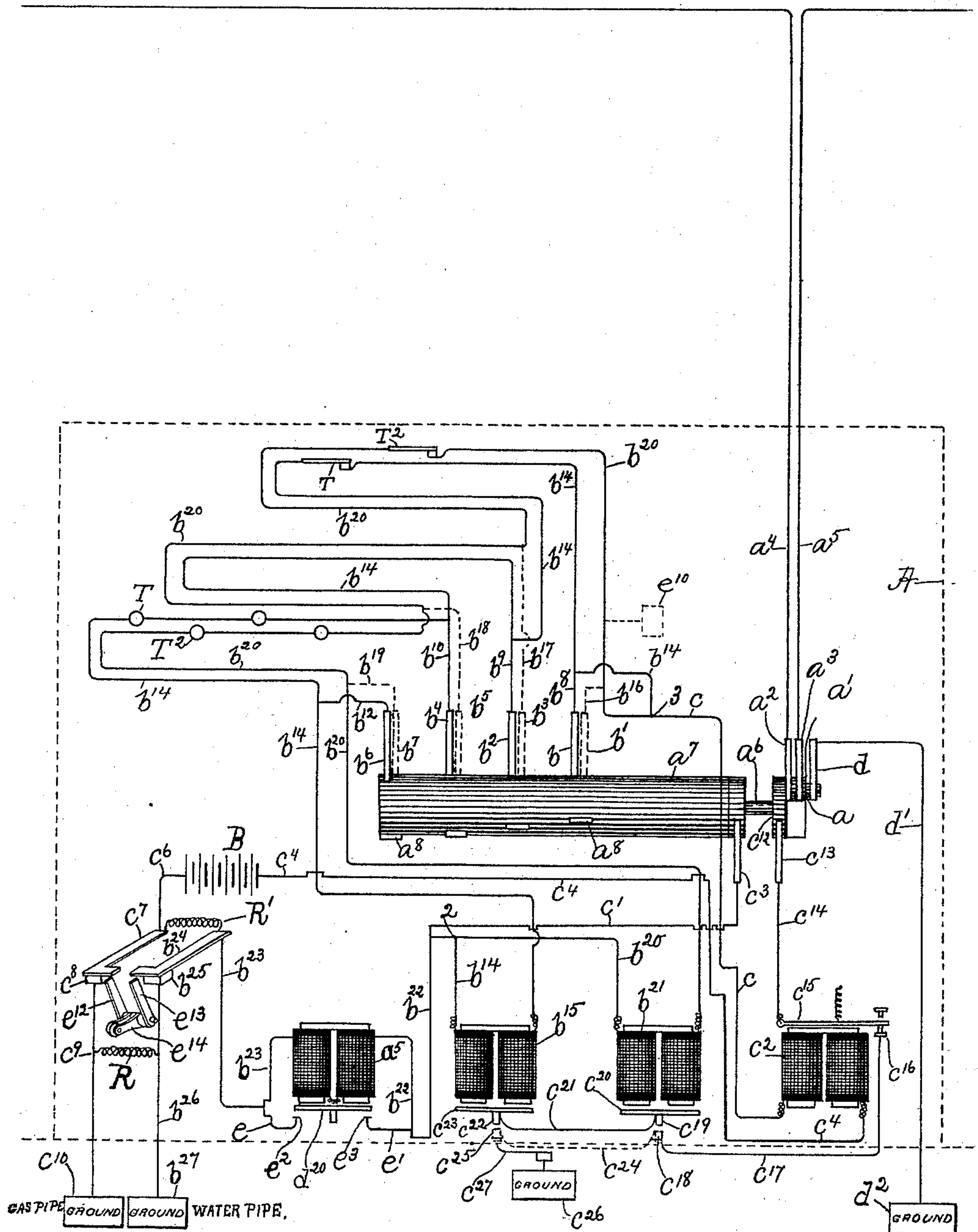


(No Model.)

M. MARTIN.  
SIGNAL TRANSMITTING APPARATUS.

No. 497,281.

Patented May 9, 1893.



WITNESSES.

*H. Henry Marsh.*  
*A. L. Eldridge.*

INVENTOR.  
*Morris Martin*  
By *Jas. H. Churchill*  
Atty.



# UNITED STATES PATENT OFFICE.

MORRIS MARTIN, OF MALDEN, MASSACHUSETTS, ASSIGNOR TO THE UNITED STATES ELECTRIC FIRE SIGNAL COMPANY, OF PORTLAND, MAINE.

## SIGNAL-TRANSMITTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 497,281, dated May 9, 1893.

Application filed August 20, 1892. Serial No. 443,629. (No model.)

*To all whom it may concern:*

Be it known that I, MORRIS MARTIN, of Malden, county of Middlesex, and State of Massachusetts, have invented an Improvement in Signal-Transmitting Apparatus, of which the following description, in connection with the accompanying drawing, is a specification, like letters and numerals on the drawing representing like parts.

10 This invention relates to apparatus for transmitting signals or messages in an electric circuit, and is an improvement upon the transmitting apparatus shown and described in United States Patent No. 459,013, granted  
15 to me September 8, 1891, and in which the transmitting apparatus forms part of an automatic fire alarm telegraph system. In the patent referred to, the signal transmitting apparatus, which may be supposed to be located  
20 in a building or other structure to be protected, consists essentially of a main signaling surface or brake-wheel co-operating with a main line circuit connected to the receiving station and adapted to transmit a predetermined signal, designated in the patent as  
25 the building number, and an auxiliary signaling surface, shown as a drum provided on its periphery with a series of conducting projections or teeth, arranged out of line with  
30 each other about the said drum, so as to be brought into engagement with contact pens or brushes in succession, to transmit to the central office or main station over a grounded circuit, an additional or auxiliary signal, co-  
35 operating with the main signal or building number to form a fire alarm signal, indicative of the building and of the particular locality or floor of the building, in which the fire has broken out. The signal-transmitting wheel  
40 and drum are operated by a motor mechanism, the starting of which is controlled by electro-magnets located in branches of the local circuit of the building, and designated in the patent referred to as the controlling circuit, and also by another electro-magnet, designated as the ground electro-magnet, and  
45 the purpose of which is to start the motor to transmit the building number or signal, in case of an accidental ground upon the controlling circuit. The controlling circuit referred to also includes in it a relay, having its armature forming part of a normally open

ground circuit, which ground circuit is adapted to be closed upon the operation of the electro-magnets in the branches of the controlling circuit, the said ground circuit being adapted  
55 to be opened and closed by the relay to transmit the signal indicated by the contact teeth or projections on the auxiliary signaling surface or drum. 60

In the patent referred to, both sides or lines of the circuit of the battery located in the building are grounded, and in practice, this is usually effected by connecting the said sides or lines to a gas pipe and to a water  
65 pipe respectively. As shown in the patent, if one of the grounds referred to should be removed, as for instance, if either the gas or the water pipe should be disconnected from the ground, as by removing a section thereof,  
70 for instance in case of repairs, the circuit of the battery in the building as shown in the said patent, would be permanently opened, and the electro-magnets in the branches referred to and also the ground electro-magnet  
75 would be demagnetized, and as a result, the armatures of the said electro-magnets would drop or be retracted, and start the motor in operation, thereby causing the building number to be transmitted, and if one of  
80 the floor loops or branches should be opened after the removal of one of the grounds and after the motor had stopped, the motor would not be again set in operation, owing to the fact, that the armatures are all down or re-  
85 tracted from their electro-magnets, and as a result a fire alarm signal could not be given by the apparatus.

My present invention has for one of its objects, to construct the transmitting apparatus, so that, in such an emergency as just described, that is, in case either side of the line be permanently disconnected from the ground, the circuit of the battery located in the building will be maintained closed and  
95 transformed into a closed metallic circuit, including all the electro-magnets located in the building. I accomplish this feature of my invention by connecting the two sides of the normally closed grounded-controlling circuit  
100 by means of a resistance, which, under normal conditions, that is, with the two sides of the line grounded, remains passive, but when either ground is removed, as for instance by



cutting away the gas pipe or the water pipe, the circuit of the battery will be maintained closed through the said resistance. The metallic circuit thus formed, also protects the  
 5 normally open ground tap in the building and maintains the same in its normal condition, as will be described.

In the patent referred to, provision is made for converting the grounded controlling circuit into a metallic circuit, after the ground magnet is demagnetized by an accidental or foreign ground, which is effected by means of a metallic circuit closer, or switch, adapted to be brought into contact with circuit terminals or springs, when the motor is set in operation. The circuit controller shown in the patent, consists of an elbow lever having two prongs or arms adapted to be brought in contact with the circuit terminal pens or  
 15 brushes, and to lift the same from their co-operating studs or terminals.

A second feature of my present invention consists in providing means, whereby the controlling circuit is maintained closed, while the terminal pens referred to, are being engaged by the arms of the circuit-controller or switch, for in practice, it might happen that one arm of the circuit-controlling switch may be brought in contact with its co-operating circuit terminal or pen, before the other arm of the said switch made contact with its co-operating terminal or pen, and in such instance, it will be seen that the controlling circuit would be momentarily opened between  
 25 one of the said arms and its co-operating pen, which would demagnetize the electro-magnets and operate the motor to send in the building number and render the entire apparatus inoperative for a fire alarm signal, as the armatures of the electro-magnets are retracted or down and are not in position to start the motor in operation, even after the circuit controller has made contact with both pens.

In accordance with my invention, the circuit terminal pens, which are operated by the circuit-controller or switch, are connected by a resistance, so that, in case one arm of the circuit-controller should engage its co-operating pen before the other arm of the said circuit-controller engaged its co-operating pen, the controlling circuit including the electro-magnets would be maintained closed, as a metallic circuit until both arms of the said circuit-controller had made contact with their respective co-operating contact pens.

Another feature of my invention consists in providing means, whereby the current strength of the battery of the controlling circuit may be increased at the operation of the electro-magnet nearest the grounded terminal. This feature of my invention I accomplish as herein shown, by connecting to the electro-magnet nearest the grounded terminal, a normally open shunt or branch circuit adapted to be closed by the armature of the

said electro-magnet, when the latter is demagnetized.

The drawing shows in diagram a sufficient portion of the transmitting apparatus to enable my invention to be understood.

The main portion of the transmitting apparatus, which is substantially the same as that shown in the patent referred to, may be briefly described as follows:

$a$  represents a main signaling surface or break-wheel, provided on its periphery with a series of teeth or notches  $a'$ , and with which co-operate contact pens  $a^2$   $a^3$  connected by wires  $a^4$   $a^5$  to the receiving station, the said wires forming the line wires of a metallic circuit, normally closed in the building A, represented by dotted lines, by a smooth or uncut portion of the break-wheel  $a$ , with which the pens  $a^2$   $a^3$  normally rest in contact.

The break-wheel  $a$  is mounted upon a shaft  $a^6$ , upon which is also mounted the auxiliary signaling surface or drum  $a^7$ , provided with teeth or projections  $a^8$ , there being as many such teeth as there are floors in the building to be protected. The teeth  $a^8$  on the drum  $a^7$  have co-operating with them, preferably two sets of circuit-terminal pens or brushes  $b$   $b'$ ,  $b^2$   $b^3$ ,  $b^4$   $b^5$ ,  $b^6$   $b^7$ , the pens  $b$ ,  $b^2$ ,  $b^4$ ,  $b^6$ , being connected by wires  $b^8$ ,  $b^9$ ,  $b^{10}$ ,  $b^{12}$ , to one branch  $b^{14}$  of a controlling circuit including an electro-magnet  $b^{15}$ , and the pens  $b'$ ,  $b^3$ ,  $b^5$ ,  $b^7$ , represented by dotted lines, being connected by wires  $b^{16}$ ,  $b^{17}$ ,  $b^{18}$ ,  $b^{19}$ , to another branch  $b^{20}$  of the controlling circuit, the branch  $b^{20}$  including an electro-magnet  $b^{21}$  and being joined to the branch  $b^{14}$ , at the point marked 2 and at the point marked 3. The branches  $b^{14}$ ,  $b^{20}$ , have included in them in the different floors of the building, thermostats  $T$ ,  $T^2$ , of any usual or well-known construction, and which are operated by heat to open-circuit the said branches. The branches  $b^{14}$ ,  $b^{20}$ , are united at the point 2, and are connected as herein shown, by a single wire  $b^{22}$  to one coil of an electro-magnet  $a^5$  constituting the ground magnet above referred to, the other coil of which is connected by wire  $b^{23}$  with a terminal pen or brush  $b^{24}$ , co-operating with a contact stud or terminal  $b^{25}$ , connected by wires  $b^{26}$  to the ground  $b^{27}$ , which, for the purpose of this invention, may be supposed to be a water pipe. The wire  $b^{22}$  is also connected by wire  $c'$  to a pen or brush  $c^3$  in engagement with a smooth portion of the drum  $a^7$ . The branches  $b^{14}$ ,  $b^{20}$ , are united at the point 3, and are connected by the wire  $c$  to one coil of a relay  $c^2$ , having its other coil connected by wire  $c^4$  to one pole of a battery B herein shown as the negative pole, the other pole of said battery being connected by wire  $c^6$  to a circuit terminal pen or brush  $c^7$ , normally in contact with a circuit terminal or stud  $c^8$ , connected by wire  $c^9$  to a ground  $c^{10}$ , which, for the purpose of this invention, may be supposed to be a gas pipe.

The break-wheel  $a$  is provided with the smooth portion  $c^{12}$ , with which co-operates a



pen  $c^{13}$ , joined by wire  $c^{14}$  to the armature  $c^{15}$  of the relay  $c^2$ , the said armature being normally in contact with the front stop  $c^{16}$ , connected by wire  $c^{17}$ , to a stud or projection  $c^{18}$ , with which co-operates a stud or projection  $c^{19}$ , on the armature  $c^{20}$  of the electro-magnet  $b^{21}$ , the said stud  $c^{19}$  being connected by wire  $c^{21}$  to a like stud  $c^{22}$  on the armature  $c^{23}$  of the electro-magnet  $b^{15}$ . The stud  $c^{18}$  is connected by wire  $c^{24}$  with a similar stud or contact point  $c^{25}$ , herein represented by dotted lines, and connected to the ground  $c^{26}$ , by wire  $c^{27}$ .

The break-wheel  $a$  is provided on its side or face with a series of teeth or projections, corresponding in number to the teeth or projections on its periphery, and the teeth or projections on the side of the wheel have co-operating with them a pen or brush  $d$ , connected by wire  $d'$  to the ground  $d^2$ . This grounded circuit is for the purpose of transmitting the building number to the central office, over either side of the line  $a^4 a^5$ , in case of a break in either of the line wires, the teeth on the side of the break-wheel  $a$  being arranged so as to make contact with the pen  $d$ , while the contact pens  $a^2 a^3$  are in engagement with the smooth portion of the break-wheel  $a$ .

The transmitting apparatus, as thus far described, is substantially the same as that shown in the patent referred to and the operation is the same, and may be briefly described as follows:

In case of an accidental opening or break in the branch  $b^{20}$ , the electro-magnet  $b^{21}$  will be demagnetized and its armature  $c^{19}$  will drop and set the motor mechanism, not herein shown, in operation, the same as described in the patent referred to, to transmit the signal indicated by the break-wheel  $a$ , which signal is designated the building number, and in case the break occurs in the branch  $b^{14}$ , the electro-magnet  $b^{15}$  is demagnetized and its armature  $c^{23}$  is withdrawn and starts the motor mechanism in operation to transmit the building number. In case only one of the branches  $b^{14}$ ,  $b^{20}$  is broken, only the building number will be transmitted, and the relay  $c^2$ , which transmits the auxiliary signal or number indicative of the floor of the building, will remain inoperative, as long as one branch remains intact, the circuit of the relay in this case being traced from the battery B, through the wire  $c^4$  to the relay  $c^2$ , thence from the relay by wire  $c$  to the point 3, thence through the unbroken branch of the circuit to the point 2, thence by wire  $b^{22}$ , magnet  $a^5$ , wire  $b^{23}$ , pen  $b^{24}$ , contact  $b^{25}$ , and wire  $b^{26}$ , to the ground  $b^{27}$ , thence by the ground  $c^{10}$ , wire  $c^9$ , contact stud  $c^8$ , pen  $c^7$ , and wire  $c^6$  to the battery. In case both of the branches  $b^{14}$ ,  $b^{20}$  are opened, as for instance by the thermostats T, T<sup>2</sup>, in the said branches, being operated by the breaking out of a fire, the circuit of the relay  $c^2$ , is opened, and its armature is withdrawn from its front stop  $c^{16}$ , thereby opening the ground circuit for the

armature, and both electro-magnets  $b^{15}$ ,  $b^{21}$  are demagnetized permitting their armatures  $c^{23}$ ,  $c^{19}$ , to be withdrawn out of the influence of the said magnets, and bring the contact studs  $c^{22}$ ,  $c^{18}$ , in engagement with the contact studs  $c^{25}$ ,  $c^{18}$ , and close the circuit of the ground  $c^{26}$ , at the said studs, the said ground being still open between the armature  $c^5$  and the front stop of the relay. The withdrawal of the armatures  $c^{23}$ ,  $c^{20}$ , starts the motor and transmits the building number over the main line metallic circuit  $a^4 a^5$ , for the said circuit remains intact, and in addition thereto, a number indicative of the floor upon which the fire has broken out is also transmitted by means of the relay  $c^2$ , for in the revolution of the drum  $a^7$ , the teeth  $a^8$  are successively brought in contact with their co-operating pens, and a circuit for the relay will be momentarily closed through the said pens and teeth  $a^8$ , up to the point where the branches  $b^{14}$ ,  $b^{20}$ , have been opened by the thermostats. For instance, let it be supposed that the branches have been opened in the third floor. In this case the branches  $b^{14}$ ,  $b^{20}$ , will remain intact up to the point where the wires  $b^{10}$ ,  $b^{18}$ , connect with the said branches, and as the teeth  $a^8$  on the drum are successively brought in contact with their co-operating pens, it will readily be seen, that a circuit for the relay will be momentarily closed by each of the first three teeth of the drum. To illustrate, the circuit may be traced as follows: from the battery B by wire  $c^4$ , relay  $c^2$ , wire  $c$  to the point 3, thence through either branch  $b^{14}$ ,  $b^{20}$ , to the pens  $b b'$ , though the first tooth  $a^8$ , when the latter is brought in contact with the said pens, through the drum  $a^7$ , pen  $c^3$ , wire  $c'$ , to wire  $b^{22}$ , thence by wire  $b^{22}$  to the electro-magnet  $a^5$ , wire  $b^{23}$ , terminal pen  $b^{24}$ , stud  $b^{25}$ , wire  $b^{26}$ , to ground  $b^{27}$ , thence by the ground  $c^{10}$ , wire  $c^9$ , stud  $c^8$ , pen  $c^7$ , and wire  $c^6$  back to the battery. At each closure of the relay circuit by a tooth  $a^8$ , its armature  $c^{15}$  is attracted, closing the ground circuit of the ground receiving instrument at the main station, which may be traced from the ground  $c^{26}$  by wire  $c^{27}$  to the studs  $c^{25}$ ,  $c^{22}$ , wire  $c^{21}$ , contact studs  $c^{19}$ ,  $c^{18}$ , wire  $c^{17}$ , front stop  $c^{16}$ , armature  $c^{15}$ , wire  $c^{14}$ , pen  $c^{13}$ , through the break-wheel  $a$ , over either side of the line  $a^4 a^5$ , to the receiving instrument. In the present instance, three successive impulses will be transmitted, which, in conjunction with the building number, indicates that the fire is located on the third floor of the building, bearing such number. In practice, it might happen that either of the grounded wires  $c^9 b^{26}$  might be disconnected from the ground, as for instance, by removing a portion of the gas or water pipe, and in either case, it will be noticed that the controlling circuit as thus far described, and as shown in the patent referred to, would be permanently opened, in which case all of the electro-magnets and the relay would be demagnetized, and the armatures  $c^{20}$ ,  $c^{23}$ , of the electro-magnets  $b^{21}$ ,  $b^{15}$ , and the armature  $d^{20}$



of the electro-magnet  $a^5$  would drop, thereby setting the apparatus in operation, and transmitting the signal indicated by the break-wheel  $a$ . After the building number has been transmitted, the desired number of times usually four, the motor is stopped, and owing to the fact that the armatures  $c^{19}$ ,  $c^{22}$ ,  $d^{20}$ , are withdrawn or down, it will be noticed, that the motor cannot be again operated by the opening of the floor circuit, so that in case of fire, the apparatus would be inoperative, until the armatures had been again positively placed in position. In order to provide against such action, I have coupled the two branches  $c^9$ ,  $b^{26}$  together, by means of a resistance  $R$ , which is preferably of the same resistance as the electro-magnet  $a^5$  which may, for example, be supposed to be one hundred ohms. The resistance  $R$  is preferably connected to the ground wires  $c^9$ ,  $b^{26}$ , substantially near the contact studs or terminals  $c^8$ ,  $b^{25}$ , and in case either or both of the said grounds, as for instance, either or both the gas pipe or water pipe should be removed, the circuits of the electro-magnets and of the relay  $c^2$  would still be maintained closed, and the armatures of the electro-magnets  $b^{15}$ ,  $b^{21}$ , would be maintained in operative condition, ready to start the motor and transmit a fire alarm signal.

The circuit of the battery thus described, may be traced as follows:—from the positive pole of the battery  $B$  by wire  $c^6$ , terminal pen  $c^7$ , stud  $c^8$ , resistance  $R$ , stud  $b^{25}$ , terminal pen  $b^{24}$ , wire  $b^{23}$ , electro-magnet  $a^5$ , wire  $b^{22}$  to the point 2, through the branches  $b^{14}$ ,  $b^{20}$ , electro-magnets  $b^{15}$ ,  $b^{21}$ , to point 3, thence, by wire  $c$ , relay  $c^2$  and wire  $c^4$ , to the negative pole of the battery. The resistance  $R$ , when thus interposed into the circuit, may weaken the strength of the battery  $B$  sufficient to cause the electro-magnet  $a^5$  to release its armature  $d^{20}$ , in which case the armature  $d^{20}$  would start the motor and transmit the building number indicated by the break-wheel  $a$ , to indicate trouble at the building designated by the number of the said break-wheel. In order to restore the battery  $B$ , to its normal strength, when the resistance  $R$  is interposed in the circuit as just described, I have provided a normally open shunt for the electro-magnet  $c^5$ , which is herein represented by wires  $e$ ,  $e'$ , connected respectively to the wires  $b^{23}$ ,  $b^{22}$ , and to contact studs or posts  $e^2$ ,  $e^3$ , the armature  $d^{20}$ , when withdrawn from the influence of the electro-magnet  $a^5$ , engaging the contact studs or posts  $e^2$ ,  $e^3$ , and forming a short circuit for the electro-magnet  $a^5$ , which may be traced from the wire  $b^{23}$ , through the wire  $e$ , contact stud  $e^2$ , armature  $d^{20}$ , contact stud  $e^3$ , wire  $e'$ , to wire  $b^{22}$ . In the normal condition of the circuit, that is, with the wires  $c^9$ ,  $b^{26}$ , connected to the ground, the electro-magnet  $a^5$ , which in practice is located near one extremity of the circuit of the battery  $B$ , that is, near the grounds  $c^{10}$ ,  $b^{27}$ , will become shunted out of circuit in case of an accidental ground, and will operate the motor to transmit the

building number. In such emergency, the circuit of the battery  $B$ , is transformed into a metallic circuit as described in the patent referred to, by a switch or circuit controller, consisting of two arms or prongs  $e^{12}$ ,  $e^{13}$ , of an elbow lever, having its other arm  $e^{14}$  adapted to be operated by the motor mechanism, to turn the said elbow lever and bring the prongs  $e^{12}$ ,  $e^{13}$  into engagement with the terminal pens or brushes  $c^7$ ,  $b^{24}$ .

To provide against opening the controlling circuit, by the failure of the prongs or arms  $e^{12}$ ,  $e^{13}$ , to be simultaneously brought in contact with their co-operating terminals or pens  $c^7$ ,  $b^{24}$ , which event would demagnetize the electro-magnets  $b^{15}$ ,  $b^{21}$  and start the motor and render the armatures of the magnets  $b^{15}$ ,  $b^{21}$  inoperative, and prevent the sending in of a fire or trouble alarm, I have connected the opposite sides of the circuit of the battery  $B$  beyond the terminal studs or posts  $b^{25}$ ,  $c^8$ , by a resistance  $R'$ , preferably connected to the terminal pens or brushes  $b^{24}$ ,  $c^7$ . By means of this construction it will be seen, that when the contact arms or prongs  $e^{12}$ ,  $e^{13}$ , of the switch or circuit-controller, are out of contact with the circuit terminals  $c^7$ ,  $b^{24}$ , the battery  $B$  is included in a metallic circuit, which may be traced as follows:—from the battery  $B$ , through the wire  $c^6$ , resistance  $R'$ , wire  $b^{23}$ , electro-magnet  $a^5$ , wire  $b^{22}$  to point 2, through the branches  $b^{14}$ ,  $b^{20}$ , electro-magnets  $b^{15}$ ,  $b^{21}$ , to the point 3, thence by wire  $c$ , relay  $c^2$ , and wire  $c^4$  back to the battery. It will therefore be seen, that in case of an accidental ground coming upon the line so as to cut out the trouble magnet  $c^5$ , as for instance, by the ground  $e^{10}$ , and the motor is started to operate the circuit controller or switch, to bring the prongs or arms  $e^{12}$ ,  $e^{13}$ , in contact with the terminal pens or springs  $c^7$ ,  $b^{24}$ , the circuit for the relay and for the remaining electro-magnets, will be maintained closed through the resistance  $R'$ , in case the arms or prongs  $e^{12}$ ,  $e^{13}$  should not simultaneously engage their co-operating terminals  $c^7$ ,  $b^{24}$ ; and as soon as the said arms have been brought into positive engagement with the said terminals  $c^7$ ,  $b^{24}$ , the resistance  $R'$  will be short-circuited, and the circuit of the battery restored through the terminal pen  $c^7$ , arm  $e^{12}$ , arm  $e^{13}$  and terminal pen  $b^{24}$ . The arrangement of the transmitting apparatus herein shown is substantially the same as in the patent referred to, but differs therefrom in that I have rearranged the controlling circuit, so that the relay  $c^2$  is included in one unbranched portion of the circuit between the battery and the electro-magnets  $b^{15}$ ,  $b^{21}$ , and the trouble or ground electro-magnet in the other unbranched portion of the circuit.

I claim—

1. The combination with a signal-transmitting apparatus, of an electric circuit constituting a controlling circuit for the said transmitting apparatus, having its opposite sides normally connected to the ground and having



two normally closed branches including electro-magnets, and a resistance interposed between and connecting together the grounded sides of the said circuit, substantially as described.

2. The combination with a signal-transmitting apparatus, of an electric circuit constituting a controlling circuit for the said transmitting apparatus, having its opposite sides normally connected to the ground and having two normally closed branches including electro-magnets, a third electro-magnet in the unbranched portion of the said circuit, and a resistance interposed between and connecting together the grounded sides of the said circuit, substantially as described.

3. The combination with a signal-transmitting apparatus, of an electric circuit constituting a controlling circuit for the said transmitting apparatus, having its opposite sides normally connected to the ground and having two normally closed branches including electro-magnets, a third electro-magnet in the unbranched portion of the said circuit, an armature for the said third electro-magnet, a normally open shunt circuit for the third electro-magnet, controlled by the armature of the said electro-magnet, and a resistance interposed between and connecting together the grounded sides of the said circuit, substantially as described.

4. The combination with a signal-transmitting apparatus, of an electric circuit constituting a controlling circuit for the said transmitting apparatus, having its opposite sides normally connected to the ground and having two normally closed branches including electro-magnets, normally closed circuit terminals included in the said electric circuit, a switch or circuit-controller to operate the said circuit terminals, and a resistance  $R'$  connecting the opposite sides of the electric circuit, between the said circuit terminals and the battery of the said circuit, substantially as described.

5. The combination with a signal-transmitting apparatus, consisting of a main signaling surface or break wheel, and an auxiliary signaling surface or drum, an electric circuit constituting a controlling circuit for said transmitting apparatus having its opposite sides normally connected to the ground, and having two normally closed branches including electro-magnets, and provided with circuit terminal pens or brushes, co-operating with the auxiliary signaling surface or drum, a relay in an unbranched portion of the said circuit responsive to the signal transmitted by the auxiliary signal transmitting surface or drum, and a resistance connecting together

the grounded sides of the said circuit, to operate, substantially as described.

6. The combination with a signal-transmitting apparatus, consisting of a main signaling surface or break-wheel, and an auxiliary signaling surface or drum, an electric circuit constituting a controlling circuit for said transmitting apparatus having its opposite sides normally connected to the ground, and having two normally closed branches including electro-magnets and provided with circuit terminal pens or brushes co-operating with the auxiliary signaling surface or drum, a relay in an unbranched portion of the said circuit responsive to the signal transmitted by the auxiliary signal transmitting surface or drum, normally closed circuit terminals in said controlling circuit, means to act on said circuit terminals as described, a resistance  $R$  connecting together the sides of the said circuit on one side of the normally closed circuit terminals, and a resistance  $R'$  connecting the sides of the said circuit on the opposite sides of the normally closed circuit terminals, substantially as described.

7. The combination with a signal-transmitting apparatus, of an electric circuit, constituting a controlling circuit for the said transmitting apparatus, having its opposite sides normally connected to the ground, and having two normally closed branches including electro-magnets, normally closed circuit terminals  $b^{24}$ ,  $c^7$ , in said circuit, a switch or circuit controller to operate said terminals, a resistance  $R$  connecting the grounded sides of the said circuit on one side of the circuit terminals, and a resistance  $R'$  connecting the sides of the said circuit on the opposite sides of the circuit terminals, substantially as described.

8. The combination with a signal-transmitting apparatus, of an electric circuit constituting a controlling circuit for the said transmitting apparatus, having its opposite sides normally connected to the ground and having two normally closed branches including electro-magnets, a relay in one of the unbranched portions of the said controlling circuit, an electro-magnet  $a^5$  in the other unbranched portion of the controlling circuit and a resistance connecting the unbranched portions of the controlling circuit, substantially as described.

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

MORRIS MARTIN.

Witnesses:

JAS. H. CHURCHILL,  
A. L. ELDRIDGE.