No. 878,013. PATENTED FEB. 4, 1908.

J. G. NOLEN.

ELECTRIC SIGNALING SYSTEM.

APPLICATION FILED MAR. 11, 1904.

7 SHEETS—SHEET 1.

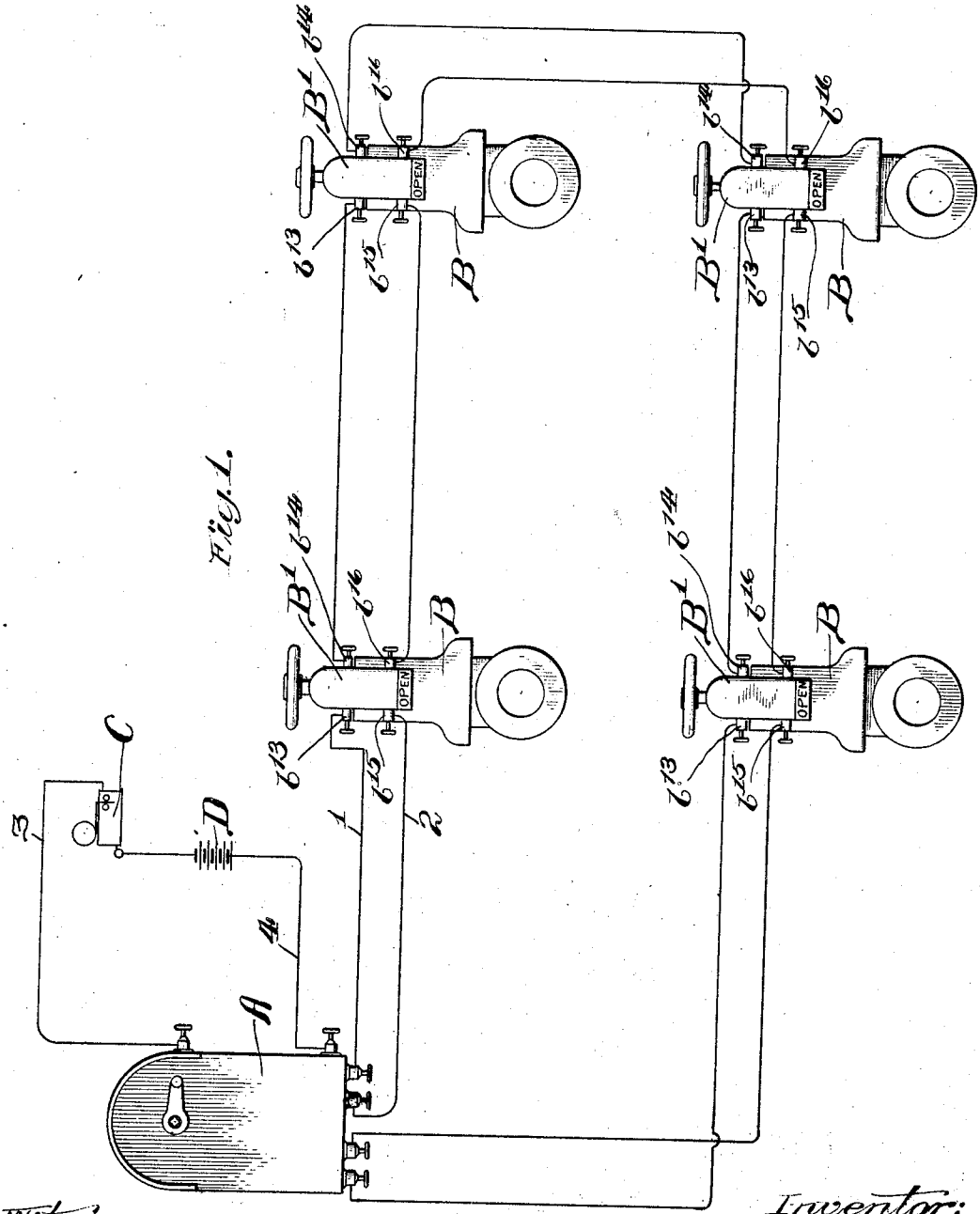


Fig. 1.

Witnesses:
J. B. Weir
Robert H. Weir

Inventor:
James G. Nolen
By Buckley & Durand
Attys.

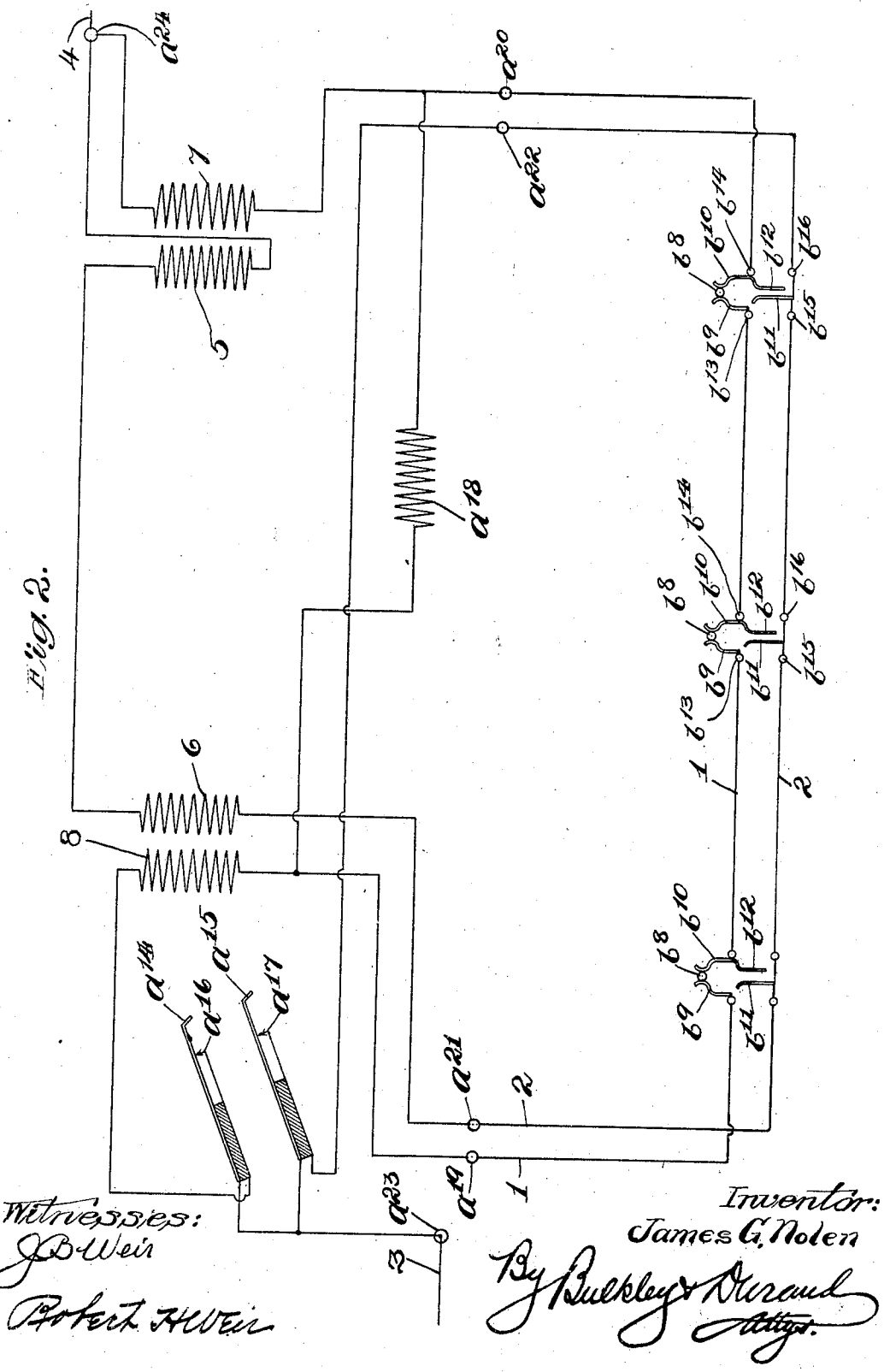
No. 878,013. PATENTED FEB. 4, 1908.

J. G. NOLEN.

ELECTRIC SIGNALING SYSTEM.

APPLICATION FILED MAR. 11, 1904.

7 SHEETS—SHEET 2.



Witnesses:
J. B. Weir
Robert H. Weir

Inventor:
James G. Nolen
By Buckley & Durand
Attys.

No. 878,013.

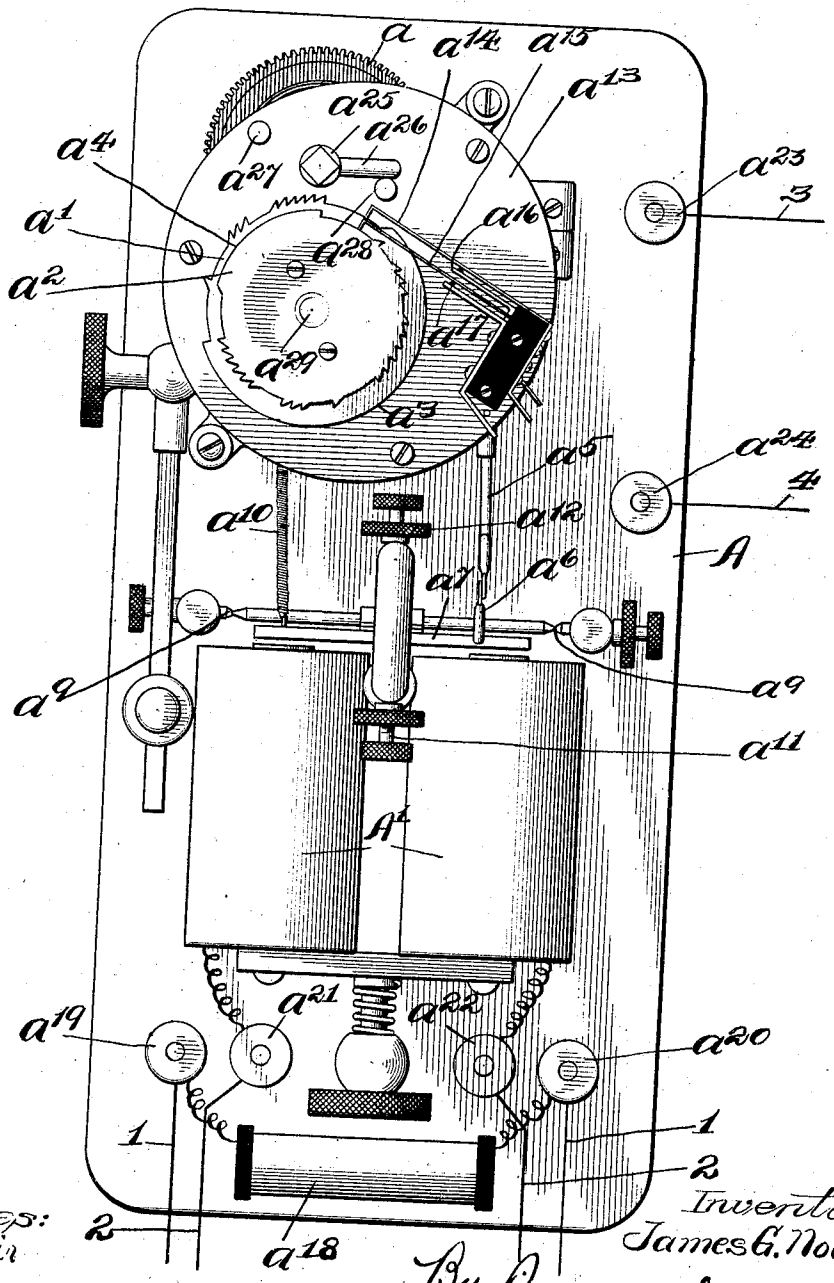
J. G. NOLEN. PATENTED FEB. 4, 1908.

ELECTRIC SIGNALING SYSTEM.

APPLICATION FILED MAR. 11, 1904.

7 SHEETS—SHEET 3.

Fig. 3.



Witnesses:
J. B. Weir
Robert H. Weir

Inventor:
James G. Nolen
By Bulkley & Durand
Attys.

No. 878,013. PATENTED FEB. 4, 1908.

J. G. NOLEN.

ELECTRIC SIGNALING SYSTEM.

APPLICATION FILED MAR. 11, 1904.

7 SHEETS—SHEET 4.

Fig. 4.

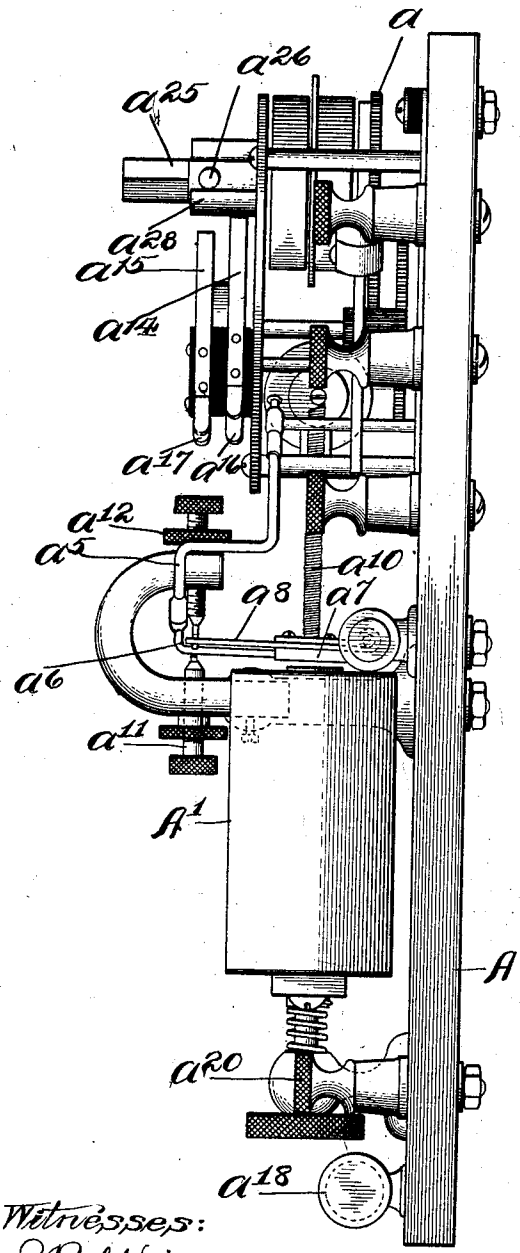
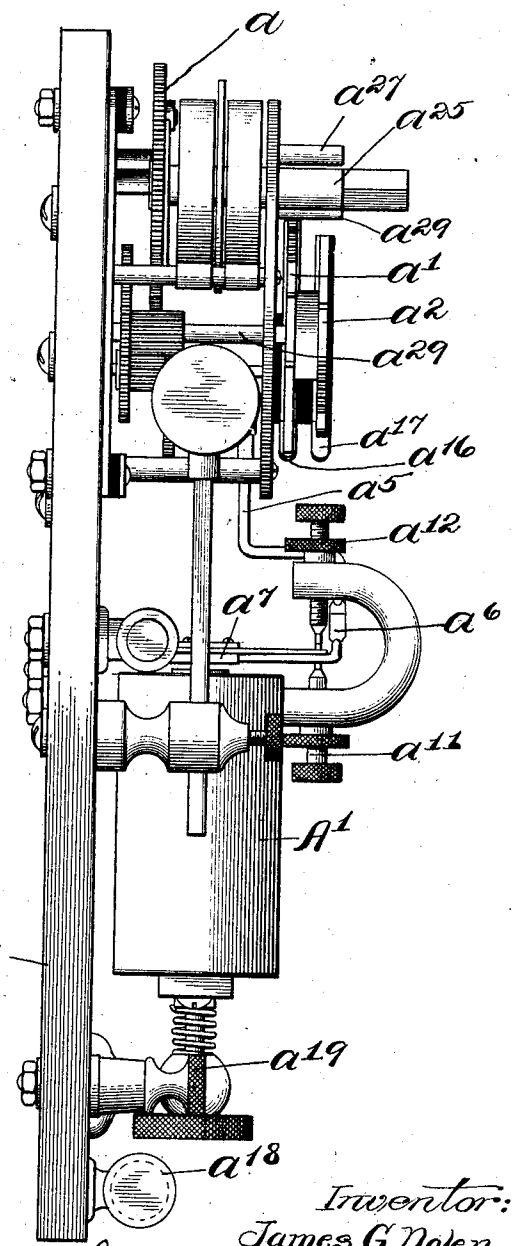


Fig. 5.



Witnesses:
J. B. Weir
Robert N. Weir

Inventor:
James G. Nolen
By Bulkley & Durand
Attys.

No. 878,013. PATENTED FEB. 4, 1908.

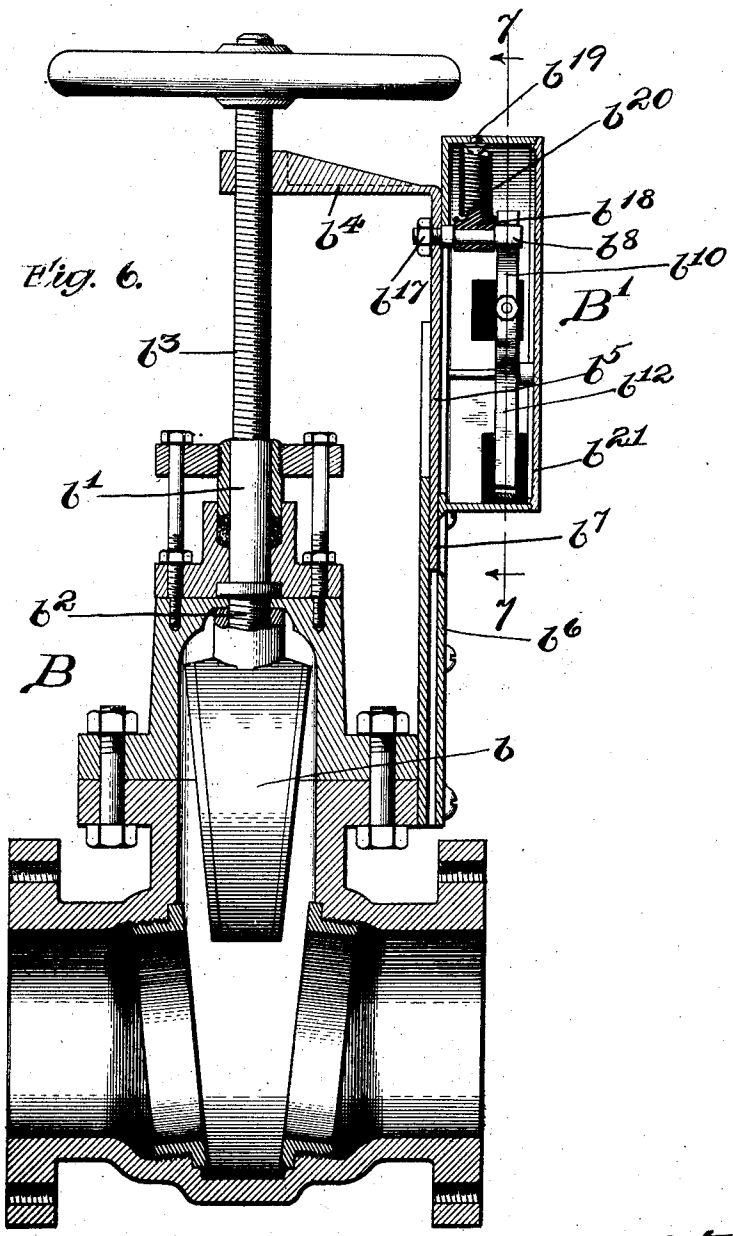
J. G. NOLEN.

ELECTRIC SIGNALING SYSTEM.

APPLICATION FILED MAR. 11, 1904.

7 SHEETS—SHEET 5.

Fig. 6.



Witnesses:
J. B. Weir
Robert H. Weir

Inventor
James G. Nolen
By Buckley & Durand
Attys.

No. 878,013.

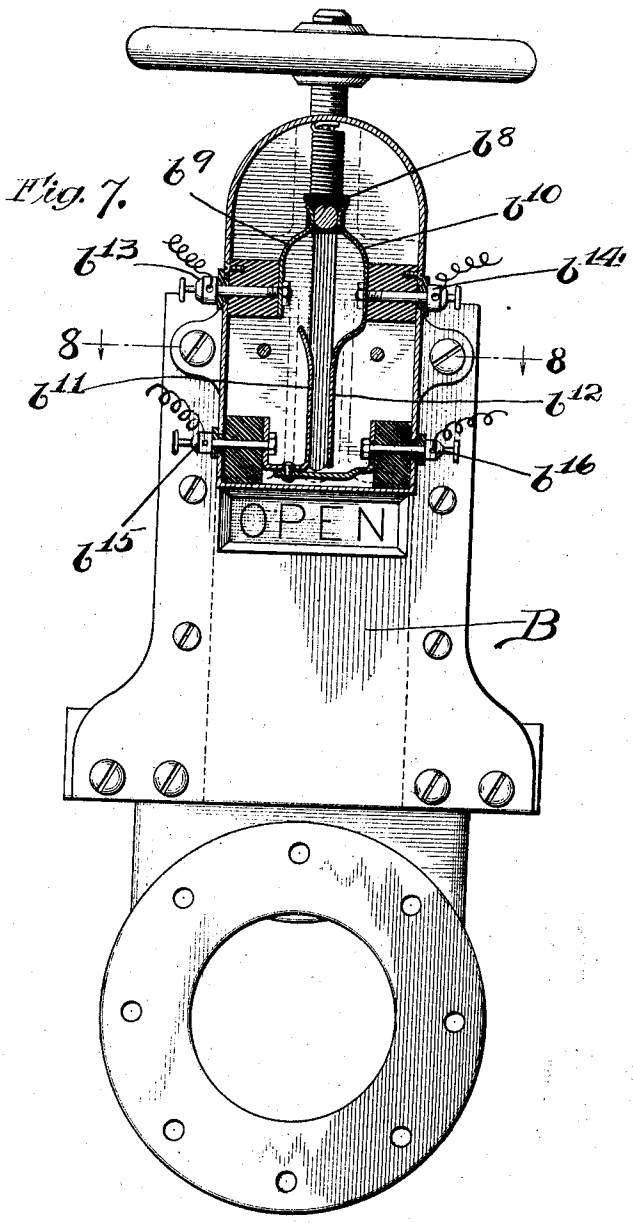
J. G. NOLEN. PATENTED FEB. 4, 1908.

ELECTRIC SIGNALING SYSTEM.

APPLICATION FILED MAR. 11, 1904.

7 SHEETS—SHEET 6.

Fig. 7.



Witnesses:
J. B. Weir
Robert A. Weir

Inventor:
James G. Nolen
By Buckley & Durand
Attys.

No. 878,013. PATENTED FEB. 4, 1908.

J. G. NOLEN.

ELECTRIC SIGNALING SYSTEM.

APPLICATION FILED MAR. 11, 1904.

7 SHEETS—SHEET 7.

Fig. 8

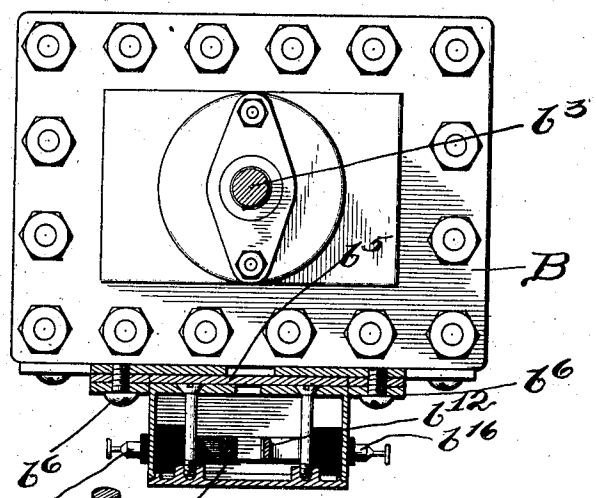
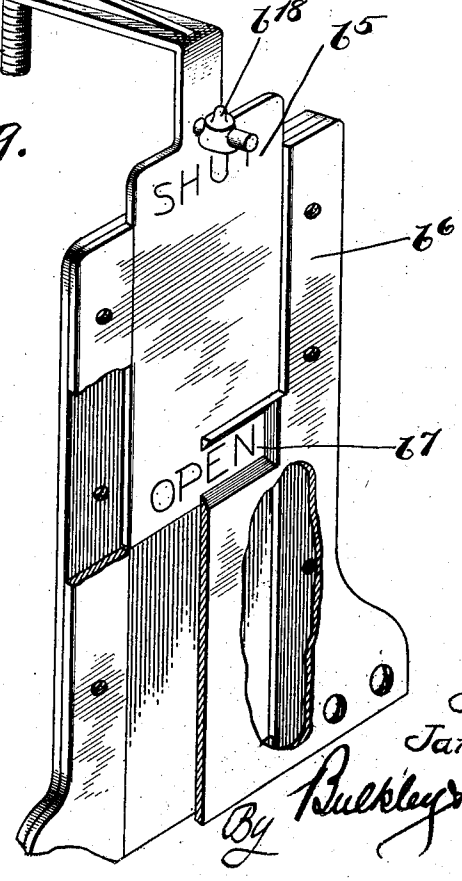


Fig. 9.



Witnesses:
J. B. Weir
Robert H. Weir

Inventor:
James G. Nolen
By Buckley & Durand
Attys.

UNITED STATES PATENT OFFICE.

JAMES G. NOLEN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO FRANK B. COOK, OF CHICAGO, ILLINOIS, AND ONE-HALF TO AUTOMATIC FIRE PROTECTION COMPANY, A CORPORATION OF MAINE.

ELECTRIC SIGNALING SYSTEM.

No. 878,013. Specification of Letters Patent. Patented Feb. 4, 1908.

Application filed March 11, 1904. Serial No. 197,702.

To all whom it may concern:

Be it known that I, JAMES G. NOLEN, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Electrical Signaling Systems, of which the following is a specification.

My invention contemplates an improved signaling system adapted for use in various connections, but adapted more particularly for use in automatically giving alarm-signals for various purposes, and especially adapted for use in supervising the valves of an automatic fire extinguisher system.

In a signaling system characterized by my invention, a box or signal-transmitting device is employed, said box containing normally wound-up clockwork, suitable make-and-break devices, and a releasing magnet. This box is connected with the signal-receiving apparatus at the central station, and also with one or more of the valves of the automatic fire extinguisher system. Preferably, parallel conductors connecting the valves with the box constitute part of a normally closed or charged line circuit including the line connection between the box and the central station, and including a battery or source of current at said station. The normally charged line circuit thus provided with parallel conductors running from one valve to the other, also includes the windings of the said releasing magnet, said magnet being preferably provided with four differentially wound coils. In this way, the releasing magnet remains normally deënergized, notwithstanding the constant flow of current through the line circuit which includes these coils and the two parallel valve conductors. Each of the said parallel conducting paths included in the line-circuit is provided with a suitable make-and-break device, and with such provision it will be seen that the two parallel valve conductors constitute parallel portions of a normally charged signaling-circuit. Also, there is inclosed within the box a third, and preferably sub-parallel conducting path, this third parallel conducting path being connected between two of the magnet-coils, so that it is only in parallel with the external portion of one of the other parallel conducting paths. Thus there are, at the substation where the box is located, at least three parallel conducting paths, each of which is capable of maintaining the continuity of the line circuit for signaling purposes. In other words, the valve conductors constituting the external parallel conducting paths can be employed successively as a part of the line or signaling circuit, providing these two paths are not broken. But should either one of these two parallel conducting paths be broken, the mechanism of the box is, by reason of the three parallel conducting paths within the box, still capable of transmitting a signal to the central station over a suitable line circuit. With this arrangement, each valve can be provided with a switch of such character that the valves cannot be closed without closing the switch, and thereby not only rupturing or opening at least one of the parallel conductors, but also establishing a cross-connection between the two parallel conductors. Obviously, and as the releasing magnet is differentially wound, the closing of the valve in this manner is accompanied by a switching operation which results in the unbalancing of the flow of current through the said releasing magnet; and such unbalancing of the flow of current through the differentially wound coils results in the energizing of the releasing magnet and the consequent release of the normally wound-up clockwork. The clockwork, when released in this manner, transmits the proper signal to the central station, thereby notifying the attendant at such station that a valve at the substation from which the signal came has been tampered with. Also, should either one or both of the parallel valve conductors be accidentally ruptured, the releasing magnet is energized and the clockwork released; for should even both external conductors be broken, there is still the said third parallel conductor, which permits sufficient current to pass to energize the magnet and release the normally wound-up clockwork. Furthermore, with the provision whereby the valve-operated switches are capable of establishing a cross or short-circuiting connection between the two parallel conductors, it is obvious that even the malicious placing of a jumper about the point in the conductor which is opened by the switch, so that the operation of the switch would not, in fact,

open such conductor, will not permit the valve to be improperly closed without such act being accompanied by the transmission of a signal; for even by applying a jumpe to the conductor, as stated, the closing of the valve is still accompanied by the establishment of a cross or short-circuit connection between the two parallel conductors; and such a cross-connection is amply sufficient to unbalance the flow of current and cause the releasing-magnet to become energized, and thereby release the clockwork. Also, when my invention is employed as a valve-supervising system, the threaded stem of each valve is preferably provided with a traveling nut which is connected with a flat slide working in a frame or guideway. Upon this flat plate or slide the words "Shut" and "Open" are preferably placed. Suitable provision is then made whereby the word "Shut" is exposed when the valve is closed, and the word "Open", when the valve is in its normal or open condition. Also, with the valve thus provided with an indicating device, the switch contacts for opening one of the parallel conductors and establishing a cross-connection between the two conductors are conveniently inclosed in a box mounted preferably in front of the said plate or slide, the movable contact of the switch being carried by the said slide. Thus the attachment for the valve is in the nature of a combined switch and indicating device.

The nature and advantages of my invention will, however, hereinafter more fully appear.

In the accompanying drawings, Figure 1 is a diagram showing several of the said valves connected with the said box, and also showing the latter connected with the battery and the recorder or signal-receiving device, located at the central station. Fig. 2 is a diagram of the box and valve connections—that is to say, a diagram of the circuit connections at the substation only. Fig. 3 is an enlarged front elevation of the box or cover removed for the purpose of showing the releasing-magnet, the normally wound-up clockwork and adjacent parts. Figs. 4 and 5 are opposite side elevations of the mechanism shown in Fig. 3. Fig. 6 is an enlarged vertical section of an automatic fire extinguisher valve embodying the principle of my invention, and adapted for use in connection with the other apparatus, as shown in Figs. 1 and 2. Fig. 7 is a vertical section on line 7—7 in Fig. 6. Fig. 8 is a horizontal section on line 8—8 in Fig. 7. Fig. 9 is a perspective of the parts constituting the indicating device of an attachment for the valve.

As thus illustrated, and referring to Fig. 1, it will be seen that my improved electrical signaling system includes a box A, termed by me a "master-box", and connected locally with the valves B. Also, as shown, the said box is connected with the central station at which are located the recorder or other suitable signal-receiving device C, and the battery D, the latter being connected and adapted for constantly supplying current to the line-circuit. The line connection between the box and the central station can be of any suitable or desired character. But the connections between the box and the valves preferably consist of parallel conductors 1 and 2, both of which, however, constitute part of the normally charged or closed line circuit. In other words, these conductors 1 and 2, constitute parallel conducting paths of a normally closed line circuit extending from the central station through the box, and thence from one valve to the other through the substation or building at which the box is located. Before describing the details of construction, and the exact mode of operation of the apparatus, it may be stated generally that should one of the valves shown be closed, so as to cut off the water from the sprinkler-heads, and thereby destroy the efficiency of the system, the switch B^1, mounted as an attachment on each valve, will operate to first open the conductor 1, and to then, if the valve is entirely closed, establish a cross or short-circuiting connection between the conductors 1 and 2. This unbalances the normally equal flow of current through the parallel conductors and through the differentially-wound coils of the releasing magnet in the box A. When thus unbalanced, the coils of the releasing-magnet energize the latter sufficiently to effect a releasing of the normally wound-up clockwork. As soon as this clockwork is released, the make-and-break devices, operated by the clockwork, then transmit a signal over the line to the central station. This signal is of a character to be instantly recognized as indicating a malicious or an unauthorized tampering with one of the valves at the station at which the box is located. Also, should both of the conductors 1 and 2 become ruptured, whether accidentally or maliciously, the flow of current through the remaining parallel conductor in the box is sufficient to energize the releasing magnet, and thereby cause the clockwork to transmit a signal. It will be seen, however, that with only one available signaling path extending between and connecting the line terminals, a signal to indicate trouble of this character is different from a signal indicating a closing of a valve. The means whereby the trouble-signals differ from the alarm-signals, will, however, hereinafter more fully appear.

Referring now to Fig. 3, it will be seen that the mechanism of the box A comprises normally wound-up clockwork *a*, of any suitable or desired construction, and adapted, when released, to rotate the toothed disks or

make-and-break wheels a^1, a^2, the same being preferably provided on their edges with raised portions a^3 and a^4. When the clockwork is in its normal or wound-up condition, the escapement a^5 thereof is held locked against movement by the finger a^6 carried by the releasing-magnet armature a^7. It will also be seen that the said armature is provided with a portion a^8 adapted to vibrate between two stops. This armature is pivotally supported by cone bearings a^9, as shown, and is held in its normal or raised position by a spring a^{10}. The vibratory movement of the armature can be limited by adjustable stops a^{11} and a^{12}. On the front plate a^{13} of the clockwork, a pair of insulated contact fingers a^{14} and a^{15} are mounted and provided with bent end portions normally engaging in notches or depressions in the peripheries of the wheels a^1 and a^2. Normally engaging these relatively long contact springs are a couple of relatively short insulated and stationary contacts a^{16} and a^{17}. Immediately below the armature a^7, the double-core releasing-magnet A^1 is mounted in any suitable or desired manner, and adapted, when energized, to attract its armature. Also, there is a resistance coil a^{18} included within the internal equipment of the box A, this resistance-coil, as will hereinafter more fully appear, constituting the third parallel conducting path.

The terminals of the valve conductor 1 are connected with the binding posts a^{19} and a^{20}, while the terminals of the conductor 2 are connected with the binding posts a^{21} and a^{22}. As illustrated, the terminals of the coil a^{18} are connected with the binding posts a^{19} and a^{20}. Thus the coil a^{18}, is, as previously stated, only in parallel with the external portion of one of the conducting paths—that is to say, only with the wire or conductor 1. The line wires 3 and 4 are connected with the binding posts or line terminals a^{23} and a^{24}. The spring-shaft a^{25} can be provided with an arm a^{26} adapted to engage the stops a^{27} and a^{28}, which latter constitutes the means for limiting the winding and unwinding movements of the clockwork. The gearing between the shaft a^{25} and the shaft a^{29}, upon which latter the disks or wheels a^1 and a^2 are mounted, may be of such character that the partial rotation of the spring-shaft will cause anywhere from one to a number of rotations on the part of the shaft a^{29} and the make-and-break wheels. This, however, can be changed or modified to suit the conditions and requirements of any particular case.

Referring now to Figs. 6 to 9 inclusive, it will be seen that the valves B may be of any suitable or desired construction. Preferably, however, the valve is provided with a sliding gate b adapted to be moved up and down by means of the rotary valve stem or screw b^1; it being understood that this screw is mounted at the top of the valve-casing structure for rotary movement, but is held against endwise axial movement. It is, of course, the lower threaded portion b^2 of said stem, which, when rotated, causes the gate b to move up and down. The outer threaded portion b^3, is, however, employed solely for the purpose of moving the traveling nut b^4 up and down. This nut b^4 is attached to or formed integral with a vertically disposed slide or plate b^5, which latter works in the guide-way or frame b^6. This frame or guide-way has its lower end portion secured to the valve casing in any suitable manner, and is preferably formed with vertically and oppositely arranged grooves adapted to receive the edges of the plate b^5. Upon this slide or plate the words "Shut" and "Open" may be placed, as shown in Fig. 9. As shown, the plate is fully concealed except at the point where the opening b^7 is formed in the guide-way or frame in which the plate slides. Thus, when the valve is in its normal position, as shown, the slide or plate b^5 is up, and the word "Open" exposed by the opening b^7; but should the valve be closed, then the movement of the valve stem necessary for so doing will cause the nut b^4 to travel down the stem and carry the slide or plate down to a point where the word "Shut" will be exposed by the opening b^7. In this way, a glance at the valve will be sufficient to enable an attendant to know whether the valve is open or closed. The attachment thus provided for the valve is not only a visual indicating device for indicating the condition of the valve, but also a switching device for effecting a switching operation when the valve is closed. In other words, the attachment to the valve is in the nature of a combined visual indicator and an electric switch.

The switching functions of the attachment are performed by the movable contact b^8, and the stationary contacts b^9, b^{10}, b^{11}, and b^{12}. It will be seen that the upper contacts b^9 and b^{10} are mounted on the binding posts b^{13}, b^{14}, and that the contact b^{11} is connected both with the binding posts b^{15} and b^{16}, the contact b^{12} being also electrically connected with the binding post b^{14}. The movable contact b^8 is preferably in the nature of a pin, as shown in Fig. 6, and is mounted on the upper end-portion of the slide or plate b^5 and secured in place by the nut b^{17}. Preferably, the contact b^8 supports a seat b^{18}, between which and the seat b^{19} a strong spring b^{20} is normally compressed. It will be seen that the said upper seat of the spring is secured to the top wall of a suitable box or inclosure b^{21}. This box or inclosure can be of any appropriate design or construction, and is provided as a means for inclosing the electrical contacts, and at the same time concealing the upper portion of the plate or slide. The front of the box can, of course, be made re-

movable, so as to permit access to the contacts.

Referring now to Fig. 2 of the drawings, it will be seen that the contacts b^8, b^9, and b^{10} normally maintain the continuity of the valve conductor 1, and that the contact b^{11} of each switch is connected with the conductor 2. The coils 5 and 6 of the differentially wound releasing magnet are connected between the binding posts a^{24} and a^{21}, and thus, together with the conductor 2, constitute a normally closed conducting path between the line terminals or binding posts a^{24} and a^{23}, this conducting path also including the normally closed contacts a^{15} and a^{17}. In a similar way, the releasing magnet coil 7 is connected between the binding-posts a^{24} and a^{20}, while the fourth coil 8 is connected between the binding posts a^{19} and a^{23}, this latter connection also including the contacts a^{14} and a^{16}. It is therefore evident that the conductor 1, together with the coils 7 and 8 and the contacts a^{14} and a^{16}, provide a second normally closed conducting path between the line terminals or binding posts a^{23} and a^{24}. Also, as will be observed, the high resistance coil a^{18} connected in series with the coils 7 and 8, but in parallel with the external portion of the conducting path including the conductor 1, constitutes a third and permanently closed parallel conducting path; and this third parallel conducting path, which is in the nature of a sub-parallel conductor, as it does not parallel the full length of the other parallel conductors, is wholly inclosed within the master-box A. The coils 5, 6, 7 and 8 may be of any suitable resistance, say 75 ohms each. The coils a^{18} may then be of 500 ohms resistance. This difference in resistance is sufficient to prevent enough current from flowing through the coil a^{18}, when the system is in its normal condition, to preclude all possibility of a materially unequal flow of current through the coils of the releasing-magnet, and the consequent unbalancing of the latter.

Now suppose that a valve is closed. The act of rotating the valve-stem causes the contact b^8 to move downwardly from its position between the contacts b^9 and b^{10}, thus rupturing or opening the conductor 1. Even should the valve be thus only partially closed, it will be seen that the gap or opening produced in the conductor 1 is sufficient to unbalance the releasing magnet. The releasing magnet, when thus energized, attracts its armature and thereby releases the normally wound-up clockwork. The clockwork when thus released operates the make-and-break devices, which results, of course, in the transmission of a signal over the line to the central station; and this signaling circuit first includes the contacts a^{15} and a^{17}, the conductor 2, and the coils 5 and 6, the contacts a^{14} and a^{16} remaining open by reason of the cam-like or raised peripheral portion a^5 of the contact wheel a^1. After this, the contacts a^{15} and a^{17} remain open, owing to the provision of the cam-like or raised peripheral portion a^4 on the wheel a^2, and the signaling action is continued over a line circuit including the contacts a^{14}, a^{16}, the coils 7 and 8, and the high resistance a^{18}. If desired, the clockwork can be of such character as to again revolve the two make-and-break wheels, thereby producing a repetition of the signaling action just described.

Now suppose that the conductor 1 is accidentally broken or ruptured. In such case it is evident that the signaling action thereby produced is identical with that resulting from either the partial or complete closing of a valve. But suppose, however, that both valve conductors are either accidentally or maliciously broken. Then it is evident that only the contacts a^{14} and a^{16} are employed in transmitting a signal to indicate a double break in the valve conductors, there being no available path over which the contacts a^{16} and a^{17} can produce the make-and-break action necessary to produce a signaling action. Hence, in the case of a double break in the valve conductors, a signal is transmitted over a line circuit including the contacts a^{14}, a^{16}, the magnet coils 7, 8, and the resistance a^{18}. Suppose also that a jumper wire or short-circuit is placed in the conductor 1 in such manner as to extend around the contacts b^9 and b^{10} of one of the valve switches. Even in such case, it is evident that the valve cannot be completely closed without setting up conditions of such character as to unbalance the flow of current through the releasing magnet. This is true for the reason that the valve when completely closed causes the contact b^8 to move into engagement with the contacts b^{11} and b^{12}, thereby establishing a cross or short-circuiting connection between the conductors 1 and 2. In other words, the establishment of a cross-connection of this kind permits the current to flow, for example, around the coil 8, rather than through the coils 7 and 8 in series; and one winding of the magnet being thus short-circuited, it is evident that the magnet will be energized sufficiently to attract its armature and thereby release the normally wound-up clockwork. The signal transmitted as a result of trouble of this kind will be identical with the signal transmitted to indicate the closing of a valve without the introduction of the jumper or shunt connection in the conductor 1, with the exception, however, that the second "round" of the signal is transmitted through the conductor 1, rather than through the resistance a^{18}. When both valve conductors are broken or ruptured, the current from the battery at the central station then only flows through the coils 7 and 8 and the resistance a^{18}. Thus, in this way, it will be seen that the resistance

a^{13} serves as a permanently closed parallel connection for energizing the releasing-magnet, regardless of the nature of the disturbance in the valve circuits, and that it also serves as a part of the line circuit over which either all or a portion of the signal is transmitted, according to the nature of the disturbance in the normally charged valve circuits. Thus, it is readily apparent that no valve in the normally charged line circuit can be tampered with without a signal being immediately communicated to the central station. Also, it is evident that the local conductors of the normally charged valve circuit cannot be accidentally or maliciously broken without the immediate transmission of a trouble signal to the central station. Furthermore, the valve switches are of such character and the wires are so arranged, that even the placing of a jumper or shunt connection in the conductor which is opened by the valve will not enable an attendant or any other person to maliciously close a valve without causing the transmission of a signal.

I do not herein broadly claim the association of two transmitter pens with parallel branches of the circuit, nor the division of the magnet windings between such branches, as these ideas are shown and claimed in my earlier applications, No. 155,525, filed May 4, 1903 and No. 195,500 filed Feby, 26, 1904.

I claim as my invention:

1. An electric signaling system, comprising a box having normally wound-up clockwork and a releasing-magnet, a central source of current and signal-receiving apparatus connected with said box, a plurality of signal-initiating devices, said magnet having four differential windings connected with said signal-initiating devices by parallel conductors, and a resistance-coil connected in parallel with one of said conductors and in series with two of said windings, there being a normally charged circuit including said windings and parallel conductors.

2. An electrical signaling system, comprising a box having normally wound-up clockwork and a releasing-magnet, a centralized source of current and signal-receiving apparatus connected with said box, and a plurality of valve-operated switches, said releasing-magnet having differential windings connected by parallel conductors with said switches, there being a normally charged circuit including said windings and parallel conductors.

3. An electrical signaling system, comprising a box having normally wound-up clockwork and a releasing-magnet, a centralized source of current and signal-receiving apparatus, and a valve-operated switch having normally open contacts, said magnet having differential windings connected by parallel conductors with said switch, there being a normally charged circuit including said windings and parallel conductors.

4. An electrical signaling system, comprising a box having normally wound-up clockwork and a releasing-magnet, a centralized source of current and signal-receiving apparatus connected with said box, a fire extinguisher system valve, a switch associated with said valve and adapted to be operated in the manipulation of the valve, said magnet having four differential windings connected by two parallel conductors with said switch, there being a normally charged circuit including the said windings and parallel conductors.

5. An electrical signaling system, including a box having normally wound-up clockwork and a releasing-magnet, a source of current and signal-receiving apparatus at the central station, suitable line connection between the said box and the central station, a plurality of signal-initiating devices, said magnet having four differential windings connected by two parallel conductors with said signal-initiating devices, and a resistance-coil of relatively high resistance as compared with the resistance of said windings, the said resistance-coil being connected in parallel with one of said conductors and in series with two of said windings, there being a normally charged line circuit including said windings and parallel conductors.

6. An electrical signaling system, comprising a box having normally wound-up clockwork and a releasing-magnet, a source of current and signal-receiving apparatus at a central station, two parallel line conductors extending from the central station and terminating at the box, a plurality of signal-initiating devices, two normally closed make-and-break devices operated by the clockwork, the said magnet having four differential windings connected by parallel conductors with said signal-initiating devices, and a relatively high resistance connected in parallel with one of said parallel conductors and in series with two of said windings, each of said make-and-break devices being connected in series with two of said windings and one of said parallel conductors, one of said make-and-break devices being also connected in series with said resistance-coil, and there being a normally charged line-circuit including said windings and make-and-break devices and parallel conductors.

7. An electrical signaling system, comprising a box inclosing a signal transmitting mechanism, a central source of current, a signal-receiving apparatus connected with said box, a fire extinguisher system valve, a switch associated with said valve and adapted to be operated thereby, and two parallel conductors connecting said switch and said signal transmitting mechanism,

there being a normally charged circuit including said parallel conductors and including also the connection between the box and the signal-receiving apparatus.

8. The combination of a box inclosing normally wound-up clockwork and a releasing-magnet, a centralized source of current signal-receiving apparatus connected with the box, a fire extinguisher system valve, a switch associated with said valve and provided with normally closed and normally open contacts, a pair of parallel conductors connecting said switch with the coils of said magnet, the magnet being differentially wound, said switch when operated from its normal position being adapted to open one of said parallel conductors and establish a cross-connection between the two parallel conductors, and there being a normally charged circuit including the magnet-windings and the said parallel conductors.

9. An electrical signaling-system, including as a necessary element a signal-transmitting box provided with normally wound-up clockwork and a releasing-magnet, the said magnet having four differential windings, there being also a relatively high resistance-coil connected in series with two of said windings and in parallel with the other two windings.

10. An electrical signaling system, comprising a central source of current supply, a signal receiving apparatus, a signal transmitting box, providing electrically operated controlling means, suitable circuit connections for said parts including a pair of parallel conductors operatively connected with the transmitter controlling means and extending to an area to be protected, and a valve operated switch associated with said parallel conduztor, said switch being arranged and adapted, when operated, to open one of said conductors and establish a cross connection between said two conductors.

11. In a system of the class described, a signal transmitter comprising two make and break devices, a motor device for actuating said make and break devices, and a magnetically controlled controller for said motor devices, signal responsive apparatus, a main circuit connecting said transmitter and responsive apparatus, two branches extending from said main circuit to the area to be supervised, and including therein in balanced relations the coils of the transmitter controlling magnet, and including also the two make and break devices, means associated with the device to be supervised arranged when actuated to rupture one of said branches and subsequently establish a cross between said branches, and means establishing a constant relatively high resistance shunt around the portion of one of said branches extending to the area to be supervised.

Signed by me at Chicago, Cook county, Illinois, this 9th day of March, 1904.

JAMES G. NOLEN.

Witnesses:

SEVERINUS B. CHABOWSKI,

WM. A. HARDERS.