No. 693,067. Patented Feb. 11, 1902.

H. C. & W. G. ROOME.

ELECTRIC BURGLAR ALARM.

(Application filed Feb. 28, 1895.)

(No Model.) 2 Sheets—Sheet 1.

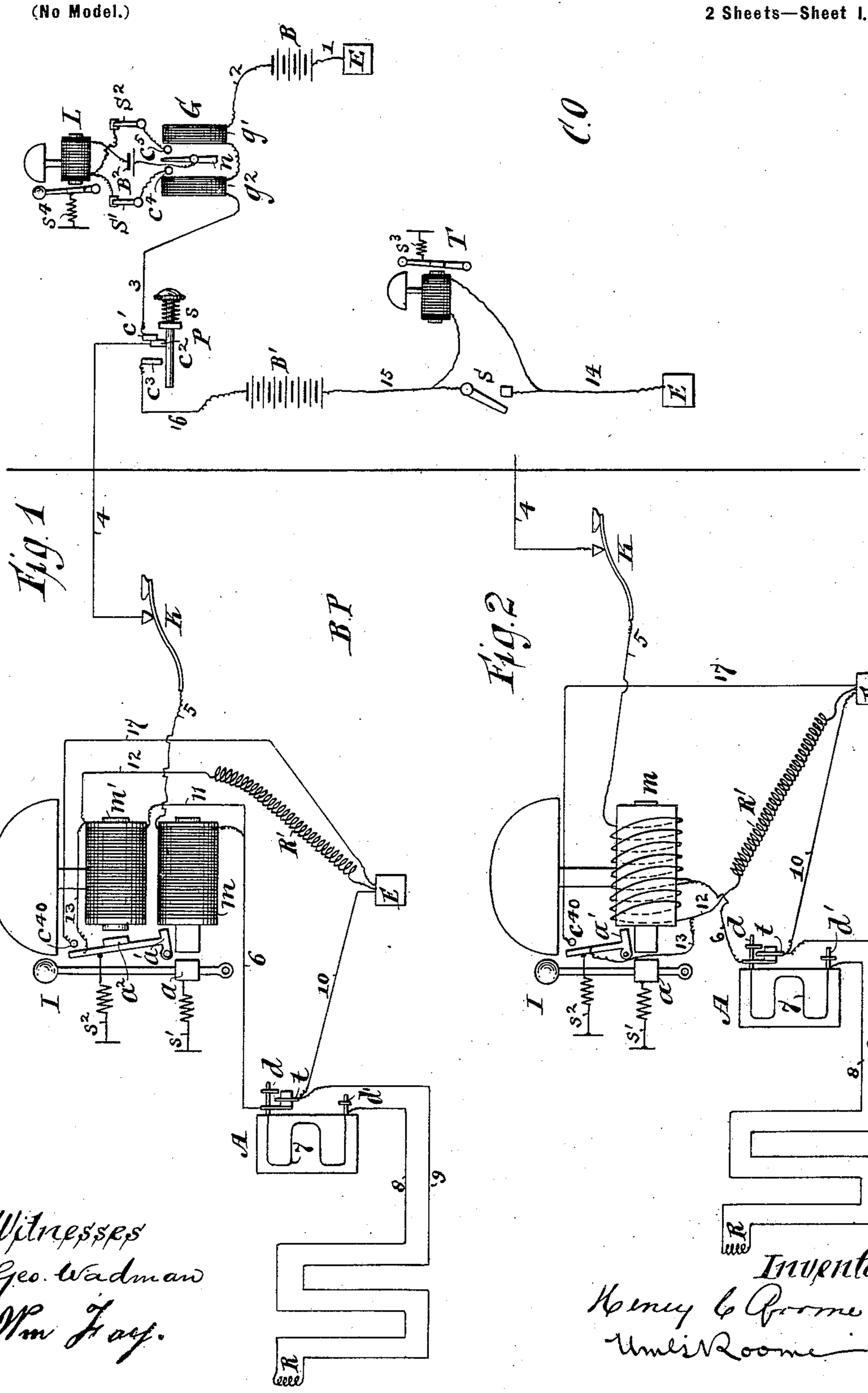

Fig. 1

B.P

Fig. 2

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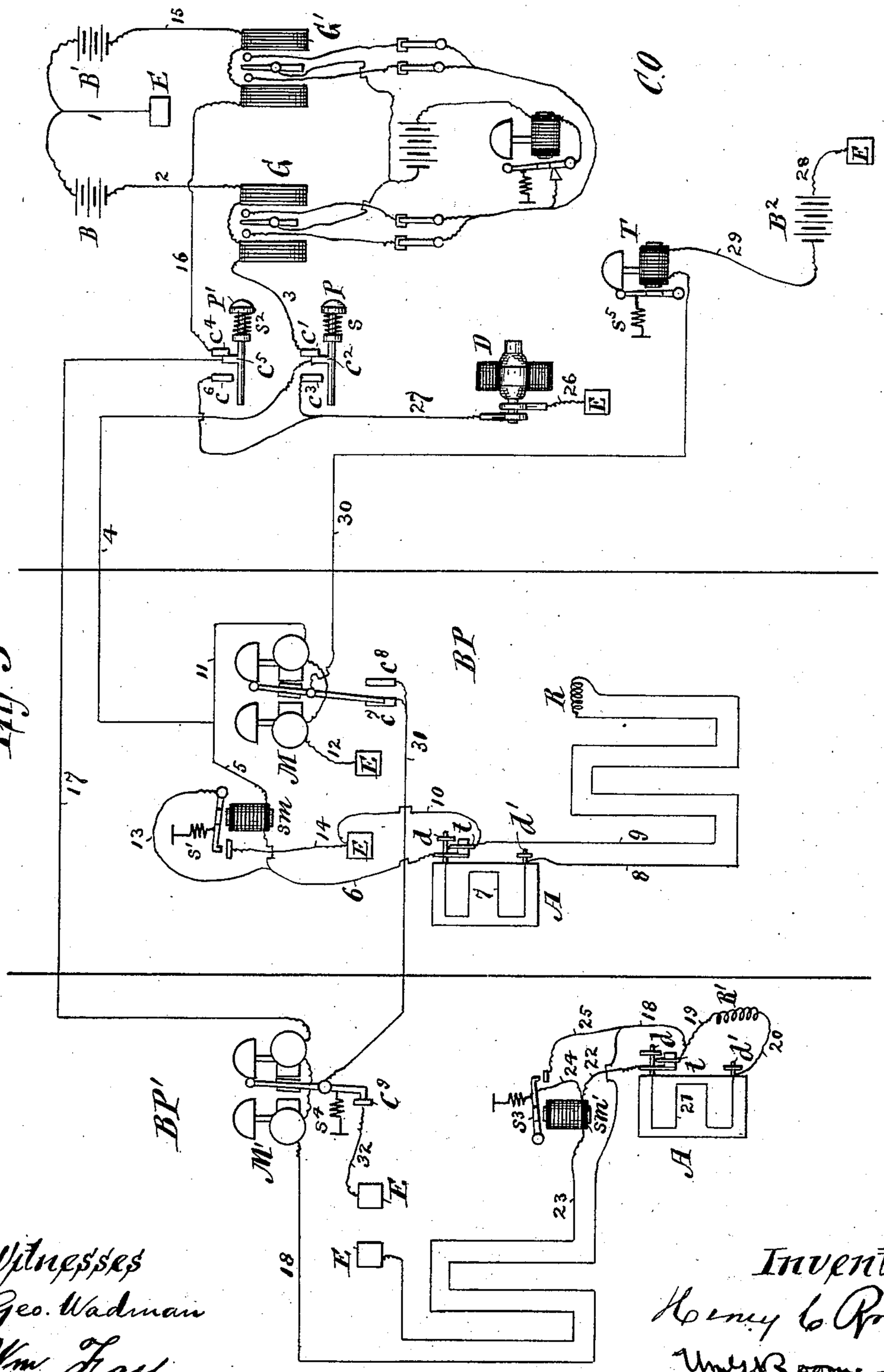
Fig 3



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UNITED STATES PATENT OFFICE.

HENRY C. ROOME AND WILLIAM G. ROOME, OF JERSEY CITY, NEW JERSEY.

ELECTRIC BURGLAR-ALARM.

SPECIFICATION forming part of Letters Patent No. 693,067, dated February 11, 1902.

Application filed February 28, 1895. Serial No. 540,115. (No model.)

To all whom it may concern:

Be it known that we, HENRY C. ROOME and WILLIAM G. ROOME, residing at Jersey City, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Electrical Burglar-Alarms, of which the following is a specification.

In systems of this class it has been usual to have a shunting device or instrument placed in the circuit at the guarded structure between the first door or other attachment to be protected and the central office in such manner that the opening of this door or attachment will act to shunt out a resistance and by increasing the flow of current through the magnet of the shunting device will act to attract the armature, which will itself close a shunt-circuit to earth or return-wire, so that should the door or attachment now be closed the recording apparatus in the central office will not record the fact, as the shunting device holds the resistance shunted out. To properly set the apparatus to normal condition from the central office, it is only necessary to break or open the circuit momentarily, when the shunting device will break the shunt around the resistance, and if in the meantime the door or other attachment has been properly closed the armature of the instrument is not again attracted sufficiently to move against its spring and shut out the resistance again. These instruments have frequently a habit of breaking circuit—that is to say, that when the door or attachment is closed the jar of the building when the door is slammed will cause the armature to fall away from its magnet, thus opening the shunt. It is highly desirable that this should be eliminated as much as possible; otherwise if a burglar were to open the door or attachment, slip inside of the building, and close the door or attachment very quickly the alarm would momentarily be given at the central office; but before the attendant could reach the recording instrument the burglar would have closed the door, and the instrument would show the place to be properly closed, and the attendant might think it a false alarm. To make this action of opening the door positive, the shunting device is added, so that when the door is closed the instrument at the office still records an opening. The device is generally added to the signaling-bell, so that the magnet of this bell has two armatures, one of which is only attracted when a heavy battery is momentarily placed to the line at the central office and acts to ring the bell. The other is adjusted to be attracted by the same magnet whenever the resistance in the guarded structure is shunted by opening a door or otherwise.

In the accompanying drawings, Figure 1 is a diagrammatic view illustrative of our improvement, showing the various circuits extending between and through the office and the guarded structure. A construction is also shown enabling the shunting-out magnet at the guarded structure to hold its armature securely. There is also shown in this figure a new system of alarm designed to give the central office more control over the signaling apparatus, at the same time recording automatically at the central office the exact signals received on the signal instrument at the guarded structure. Fig. 2 is a view similar to Fig. 1, but illustrates a modification in which a magnet having a single core is employed instead of a magnet having two cores, as shown in Fig. 1. Fig. 3 is a diagrammatic view of a burglar-alarm system in which the signaling apparatus in the guarded structure or structures embodies polarized relay-magnets. In this figure also a dynamo-electric machine is shown as a source of electrical energy. In systems now in use it is customary to have the subscriber close this guarded structure completely, and if everything is normal the central office will respond by ringing his signal-bell once. Should any of the attachments or windows, &c., be left open, the central office will respond by ringing his signal-bell three times. Should, however, a wire be broken in one of the attachments, such as wire 7 in A, Fig. 1, the circuit will now be broken and the central office cannot respond on the signal-bell, but must send a man to the guarded structure, or, as often happens, the shunt-armature is jarred by depressing the call-key K and acts to shunt out the broken wire. The instrument at the central office now records an opening and the operator will attempt to give three strokes on the bell; but the jar of the ringing-armature with the break in the circuit caused by the shifting of batteries at the central office causes the signal-

ing instrument to get only the first ring of the bell and the shunt opens the circuit and the other two strokes are lost. The subscriber having received one bell thinks everything correct and departs. By providing a leak-circuit at the guarded structure ahead of any of the attachments, doors, or fixtures with a resistance so heavy that with the normal battery B the recording instrument or galvanometer G is not affected to any very great degree we are able to give correct signals to the guarded structure at any and all times, and are also able, by the addition of a test apparatus at the central office, to know positively that the magnet of the store-bell I has responded properly. Should at any time the circuit-wires become broken, it is possible to locate the break, whether in the structure guarded or on the line-wire from the office to the building. In Fig. 3 is shown another improvement in which the signaling apparatus in the guarded structures BP and BP′ consists of polarized relays or magneto bells, which may be adapted to vibrate continuously, while the dynamo D at the central office is connected to the line. One of these, M, is shown in BP as connected to the leak-circuit and is preferably of high resistance, so as to take the place of a heavy resistance-coil. The other is shown in BP′ as directly connected in the circuit in the ordinary manner. It is arranged so that the pulsations of the armatures of the polarized relays or magneto bells shall open and close in succession the circuit of an omnibus wire, which may lead from the central office to all the customers in succession. Thus it will be seen that the central office can at any time test the alarm-wire and know that the circuit to the guarded structure is complete, and it would be impossible for any one to tamper with the wire and attempt to substitute a resistance ahead of the guarded structure, so as to disconnect the same, as the central office may at different times test all its wires with this apparatus, any failure of the test apparatus T to respond being noted.

Referring to Fig. 1, the portion of the drawings marked CO may represent the central office or point at which the alarm is received, and BP the building protected or guarded structure. The normal circuit proceeds from the earth E by wire 1, battery B, wire 2, galvanometer or recording instrument G, wire 3, contacts c' c^2 of the push-button P, wire 4, call-key K, wire 5, magnet m of the bell I, wire 6, metal of door-spring d of the attachment or door A, passing through the attachment by wire 7, leaving by break-spring d', wire 8, through the wiring-circuit, resistance-coil R, back through the wiring-circuit by wire 9 to the tongue t of the door-spring d, thence by wire 10 to the earth at E. A very small portion of the current also passes through the leak-circuit from wire 6, via wire 11, magnet m', wire 12, and the high resistance R′ to the earth E. This resistance is large enough so that with the normal battery B to line no very great change is made upon the galvanometer G. The short-circuit armature a' a^2 of the bell I acts to connect the wires 13 and 17, thus making a direct shunt to earth, shunting out the balance of the guarded structure. It has in this example of our improvement two pole-pieces a' a^2. The pole a' is attracted by the magnet m and the pole-piece a^2 by the magnet m' against the action of the spring s^2. The spring s^2 is adjusted so that when the alarm is in the normal condition, as shown, the circuit from battery B, including the resistance-coils R and R′, is not strong enough to attract the armature a' a^2; but when the door or attachment A is opened the resistance is shunted out by the door-spring d, which acts to connect the wires 6 and 10 to earth at E. The strength of the magnet m is now increased sufficiently to attract its pole-piece a', and the armature is attracted and closes the shunt from the wire 6 via wire 11, magnet m', wire 13, contact c^{40}, and wire 17 to earth at E. It will be observed that this also increases the strength of the magnet m', which now acts strongly to hold its pole-piece a^2, and when the door or attachment A is closed no effect is produced upon the armature a' a^2, as it holds its own shunt-circuit closed at c^{40}. By this arrangement a far stronger pull is exerted upon the armature a' a^2 to hold it against the contact c^{40}, as it now has the strong attraction of both magnets m m'. In fact, the closing of the door A acts to increase the strength of the magnet m', as the shunt from the wire 6 to wire 10 by the door-spring d is now broken and the path is through the resistance R. This acts to send an increased amount of current via the shunt-path and through the wires 11, magnet m', wire 13, contact c^{40}, and wire 17 to earth E. This acts to make the armature a' a^2 hold against the contact c^{40} very firmly, so that it is almost impossible to jar it away from the contact c^{40}. The armature a of the bell I is normally held away from its magnet M by the action of the spring s'. It is adjusted to respond only to the heavy or ringing battery B′. The push-button P at the central office is adjusted to normally have the contacts c' and c^2 together, as shown. This is secured by means of a spring s. When the push-button P is pushed in, the contact c^2 is first broken from the contact c', producing a break in the circuit. When pushed all the way in, the contact c^2 and the line-wire 4 are connected to the contact c^3 and the ringing or heavy battery is now in circuit via earth E, wire 14, test-bell T, wire 15, battery B, wires 16, and contacts c^3 c^2. This acts to overcome the spring s' and rings the signal-bell I. Should any of the wires beyond the wire 6, as wire 7, be broken, the bell will still respond to the push-button at the central office. Supposing wire 7 to be broken when the subscriber calls the office by depressing his call-key K, thus breaking the line, the shunt-armature a' a^2 will fall away

from the magnets m m' and will remain held back by its spring s^2. In the ordinary alarm system it would now be impossible for the central office to ring the bell I; but by the addition of the leak-circuit, composed of wire 11, magnet m', wire 12, resistance R′ to earth E, the circuit from the heavy or ringing battery, coming over the wires 4 5, passes through the magnet m, thence through wire 11, magnet m', wire 12, and resistance R′ to earth by the leak-circuit, causing sufficient magnetism in the magnet-coils m m' to attract the armature a' a^2, which itself makes a direct shunt to earth E via wire 13, contact c^{40}, and wire 17. The armature a is now attracted by the magnet m as the heavy resistance R′ is shunted out by the armature a' a^2 at c^{40}. Thus it will be seen that the signals can be perfectly given to the subscriber and he can be signaled that his store is not properly closed and he can be detained until it is in working order. At the central office the test-bell T has also responded to each stroke of the bell I, and the central office is aware that he has received the proper signal. Should a break occur at any time, the operator at CO can by pushing in the push-button P at once ascertain whether the break is between the office and the leak—viz., in the guarded structure or on the line-wire. In the first case an inspector is dispatched to the guarded structure. In the latter the lineman is started out. A switch S at the central office is shown to disconnect the test-bell and may only be open as shown when a test is desired. The test-bell T has combined with it a spring s^3, to normally hold the armature away from the magnet.

The galvanometer G may consist of the coils g' g^2, as shown. The magnetic needle n is adapted to make contact with contact-points c^6 or c^5, closing the local circuit of battery B^2 through the local bell L. Switches S′ and S^2 are shown to disconnect the battery from the local bell L, the switch S′ opening the local circuit when the needle n touches the contact c^5 and the switch S^2 opening the local circuit when the needle n touches the contact c^6. The local bell L has combined with it a spring s^4 to normally hold the armature away from its magnet.

Fig. 2 shows an improvement designed so as to incorporate the two magnets m and m' into one magnet. This is done by providing the magnet m with an extra winding designed to increase the strength of this magnet when the circuit passes through the extra winding. The winding is shown in perspective on the magnet m, the circuit for the store or guarded structure being taken off, as in Fig. 1, by wire 6, and extra windings are shown on the magnet m. Beyond this point, where wire 6 connects, these extra windings constitute the leak-circuit and are connected by wire 12, heavy resistance R′, to the earth at E, the action of this magnet on the armature a' being similar to the combined action of the magnets m and m' on a' a^2 in Fig. 1.

The connections of the bell in Fig. 2 are similar to the connections in Fig. 1, with the exception that the wire 11 is not shown in Fig. 2, as the two coils in this figure are directly connected together. The leak-circuit wire 12 and resistance R′ to earth E may be dispensed with and the two windings on the magnet m, Fig. 2, or separate windings of m and m', Fig. 1, may be used solely for the purpose of holding the shunt-armature in a more rigid position.

Referring to Fig. 3, CO may represent the central office or point at which the alarm is received. BP may represent a guarded structure, and BP′ another guarded structure. The normal circuit of guarded structure BP may be traced from the earth E by wire 1, battery B, wire 2, galvanometer or recording instrument G, wire 3, contacts c' c^2 of push-button P, wires 4 5, magnet sm, wire 6 to metal of door-spring d of attachment A, through the attachment by wire 7, coming out on the break-spring d', thence via wire 8 through the wiring-circuit, resistance-coil R, back through the wiring-circuit by wire 9 to tongue of door-spring d, and wire 10 to earth E. In all our drawings we have shown a separate zigzag circuit called the "wiring-circuit." This is intended to be distinguished from the attachment-circuit or part of the circuit protecting the attachments, doors, windows, movable connections, &c. It is generally run, as shown, so that if a wire is broken the alarm is given, or if an attempt be made to cut out any of the wires it would probably result in shunting the resistance-coil R, and the alarm would also be given. The attachments are generally placed between the office and the wiring-circuit. This is not absolutely necessary, as shown in BP′. The leak-circuit of the guarded structure BP is shown by the wire 11, connected to the wire 4, thence through the coils of the magneto-bell or other signaling device M, wire 12, to earth E. The shunt-magnet sm acts to connect the wire c^6, via wires 13 and 14, to the earth E when the door A is opened and to keep the circuit shunted to earth E when the door A is closed. It has combined with it a spring s' to normally hold the armature away from its magnet. It is intended in this example of the improvement that the magneto M should have its coils wound of a very high resistance, so as to take the place of the resistance-coil R′ in Fig. 1. It is not esssential, however, that such be the case, as it will work if an ordinary magnet be placed in the wire 4 before it reaches the leak-wire 11, and then there is inserted in place of the high-resistance magneto M the resistance-coil R′, as shown in Fig. 1. The normal circuit for BP′ may be traced from E by wire 1, battery B′, wire 15, galvanometer G′, wire 16, contacts c^4 c^5 of push-button P′, wire 17, magneto M′, wire 18, through the wiring-circuit to the tongue t of the door-spring d of the attachment A, thence by wire 19, resistance-coil R′, wire 20 to break-spring d' of attachment A,

through the attachment A by wire 21, passing out by the metal of the door-spring *d*, wire 22, shunt-magnet *sm'*, wire 23, through the wiring-circuit, thence to earth E. The magnet *sm'* acts to connect the wires 18 and 22 by wires 24 and 25, so as to make a shunt around the resistance-coil R' when the door A is opened. A spring s^3 is adapted to normally hold the armature away from its magnet. In this example of the improvement an alternating-current generator is shown at the central office. This may be a dynamo, such as D, one collector-ring being connected to the earth E by wire 26, the other connected by wire 27 to the contacts c^3 c^6. The push-buttons P and P' have combined with them the springs *s* and s^2, respectively, to retain them in the normal position, as shown. The test-circuit in this example of the improvement is shown as an omnibus wire, which may extend to all the guarded structures in succession, being adapted to be opened and closed by each of the various magneto-bells as they vibrate. The circuit may be traced from the earth E by wire 28, battery B^2, wire 29, test-bell or recording instrument T, wire 30, the armature of the magneto-bell M, contact c^7, wire 31, the armature of the magneto-bell M', contact c^9, wire 32, and to other signaling armatures in succession. At the end of the system it would be connected to the earth, here shown as wire 32, which is connected to earth at E. The magneto M is shown as having an extra contact c^8, so that whichever side the armature may remain when it has ceased to vibrate the circuit will be closed, the break being made in passing from one contact to the other. The magneto M' accomplishes the same object by means of the spring s^4, which always keeps the omnibus wire closed irrespective of the polarity of the last pulsation of the alternating current. Neither of these devices are absolutely necessary, as it can be readily seen that the armatures of the magneto may always be kept against the contacts c^7 and c^9 by having the proper pole of the burglar-alarm batteries B and B' connected to the wire 1 or earth. These being permanent batteries cannot operate the magneto which requires the reversals of polarity to operate it. In this case the spring s^4 of magneto M' and the contact c^8 of magneto would be unnecessary. When the push-button P is pushed in so that the contacts c^2 c^3 are made or connected, the alternating current passes over the line 4 and divides, a portion going by wire 5 through the coils of shunt-magnet *sm* and through the wires of the guarded structure to earth E. The electromagnet *sm* acts as a choke-coil to the alternating current, as its core need not be laminated, and a portion of the current passes through the leak-circuit, via wire 11, through the coils of the magneto M, wire 12, to earth E. As long as the push-button P is held in so that the contacts c^2 c^3 are together the armature of the magneto M will vibrate, alternately opening and closing the circuit of the omnibus wire 30 31 at the contacts c^7 c^8, and the test-bell T at the central office will respond, thus showing that the circuit is intact to the guarded structure BP. By pressing in the button P' the magneto M' will respond to the reversals in the usual manner, opening and closing the omnibus wire at the contact c^9, and the test-bell T at the central office will respond as long as the button P' is pushed in. The test-bell T has combined with it a spring s^5, which acts to draw it away from its magnet when the circuit is deënergized. This test-bell or the test-bell in Fig. 1 may be a register, if desired. The signals given from the office are then a matter of record and by marking down the time and name on the register-tape become a check on the operators at the central office, as the manager has then before him a record of all signals given, with their time.

The alternating generator D need not be a dynamo, as any source of alternating current would suffice. It is not necessary that the signal-bells should have their magnets connected in the leak-circuit. The leak-circuit may be simply a heavy resistance, and the signaling instruments may be placed in the line-wire from the central office before it reaches the leak—viz., between the leak and the central office.

Our system may also apply to coverings for safes, vaults, &c.

We do not wish to confine ourselves to the use of galvanometers for recording instruments, as other instruments might be used.

Various changes may be made without departing from the spirit of the invention.

What we claim as new, and desire to secure by Letters Patent, is—

1. In a burglar-alarm system, the combination of a circuit extending between a guarded structure and a central office, a divided circuit at the guarded structure, one branch of which is included in the protective wiring of the structure, normally closed, including a resistance, and another branch of which comprises a greater resistance and constitutes a leak-circuit, a signaling instrument at the guarded structure, normally in circuit with the line through the leak-circuit, a signaling-battery at the central office and normally out of the line-circuit, and means at the central office for connecting said signaling-battery with the line-circuit, whereby upon a break in the normally closed protective-wiring circuit the signaling instrument will respond.

2. The combination in a burglar-alarm of a circuit extending between the office and the guarded structure, a branch circuit at the guarded structure having an interposed high resistance, a shunting-out magnet at the guarded structure having a winding formed of a portion of the branch circuit, and means for shunting out the high resistance of the branch circuit, substantially as specified.

3. The combination in a burglar-alarm of a circuit extending between the office and the

guarded structure, a branch circuit at the guarded structure having an interposed high resistance, a magnet at the guarded structure having a winding formed of a portion of the main circuit, and a winding formed of a portion of the branch circuit, and means operated by said magnet for shunting out the high resistance of the branch circuit and operating a signaling instrument, substantially as specified.

4. In a burglar-alarm, the combination of a relay having two sets of magnets, one being in a line-circuit between a central office and a guarded structure, while the other magnet is in a circuit normally closed through a heavy resistance, an armature common to both magnets and attracted when a heavy current is sent through the line-circuit from the central office and thereby shunting out the heavy resistance, and a local circuit closed by the armature, substantially as specified.

5. In a burglar-alarm system, the combination of a circuit extending between a central office and a guarded structure, a divided circuit at the guarded structure, one branch of which is included in the protective wiring of the structure, normally closed and including a resistance, another branch of which comprises a greater resistance and constitutes a leak-circuit, a signaling instrument at the guarded structure, normally in circuit with the line through the leak-circuit, a test apparatus at the central office, a signaling-battery at the central office normally out of the line-circuit, means at the central office for connecting said battery with the line-circuit, whereby upon a break in the normally closed protective-wiring circuit of the guarded structure the signaling instrument and test apparatus will respond.

6. In a burglar-alarm, the combination of a generator, an alarm instrument at a central office, a circuit extending to a guarded structure protected by wiring, a normally closed leak-circuit located in the guarded structure parallel with said protective wiring, a signaling instrument having two sets of windings, one of which is connected to the normal circuit, and a branch circuit connected to the other winding.

7. A burglar-alarm, the combination of a central office, a circuit extending therefrom to a guarded structure protected by wiring, a combined relay and signaling instrument having two sets of windings and two armatures, an alarm instrument at the central office, and means for causing the operation of the combined relay and signaling instrument, substantially as specified.

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