No. 828,420. PATENTED AUG. 14, 1906.

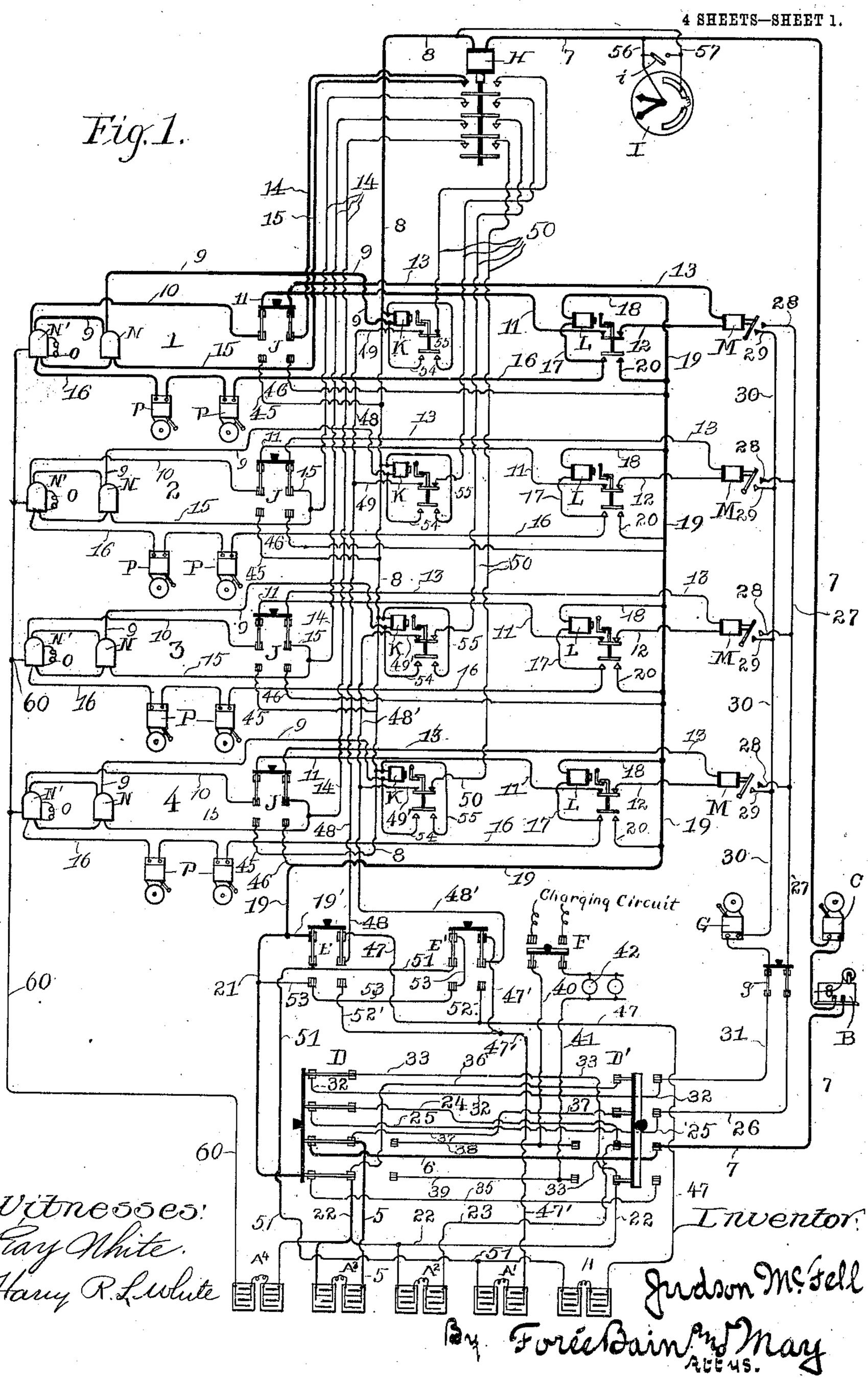
J. McFELL.

FIRE ALARM SYSTEM.

APPLICATION FILED AUG. 7, 1905.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
Ray White.
Harry R. Lewis

Inventor:
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4 SHEETS—SHEET 2.

Fig 2

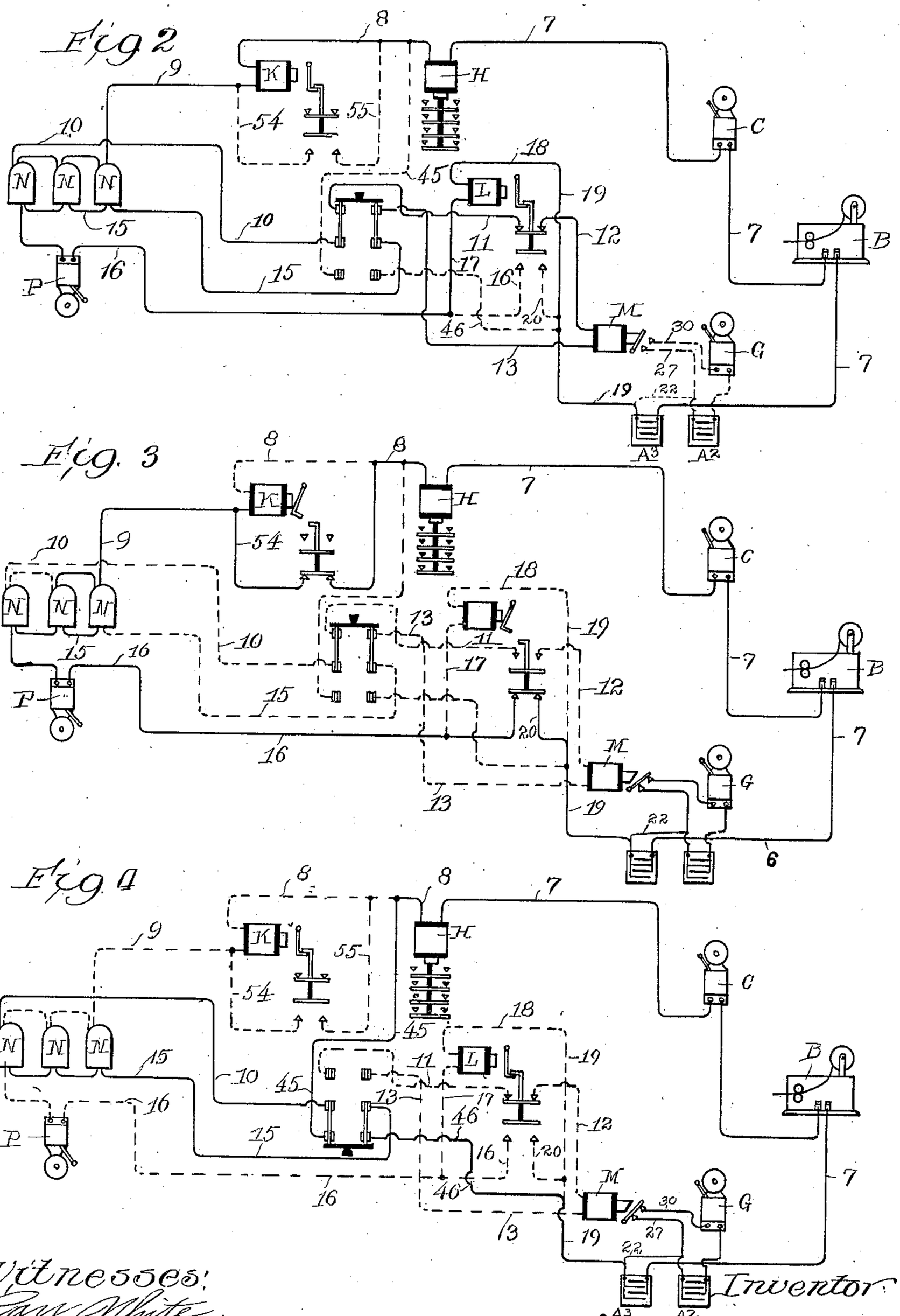

Fig. 3

Fig 4

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4 SHEETS—SHEET 3.

Fig 5

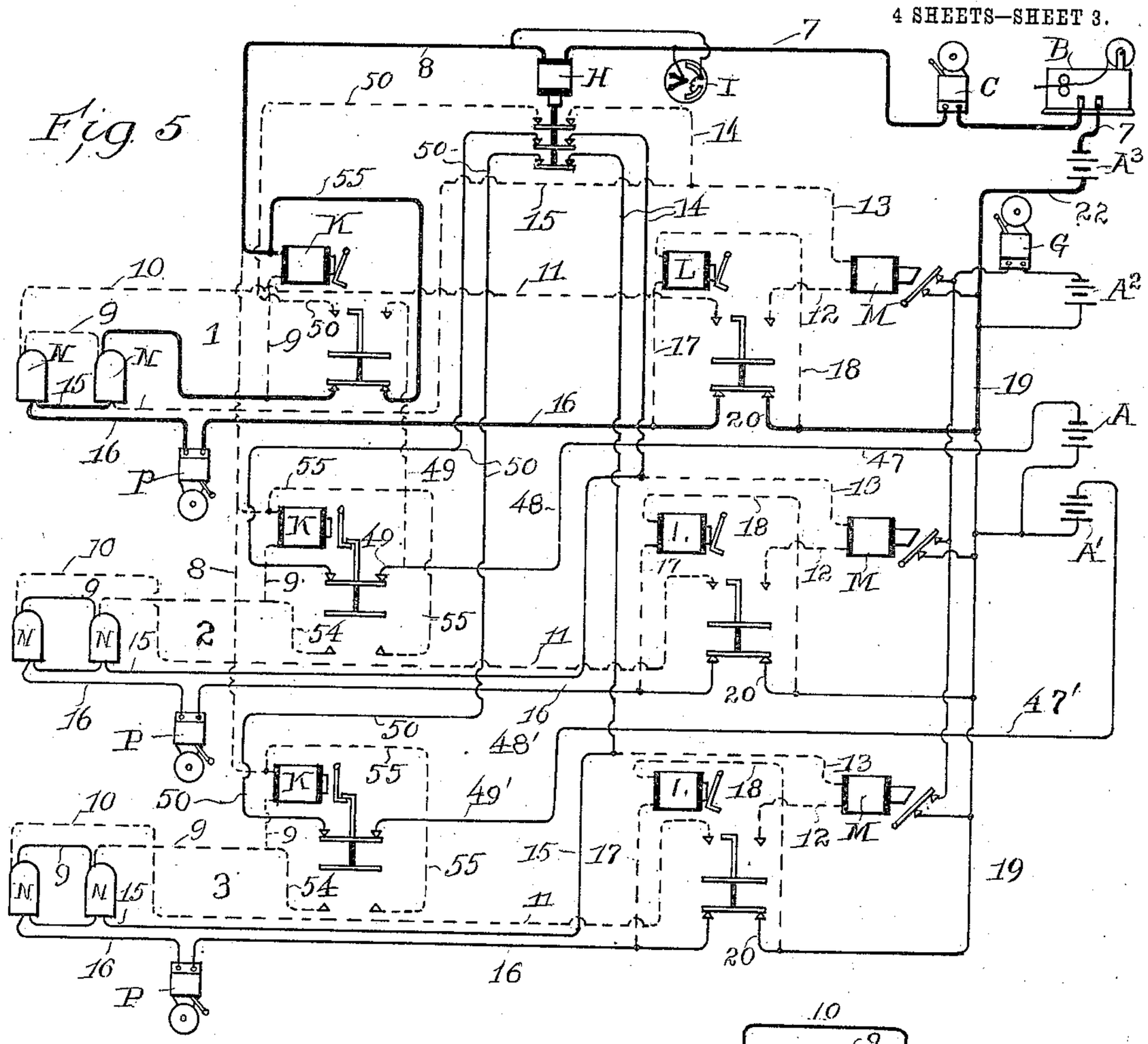
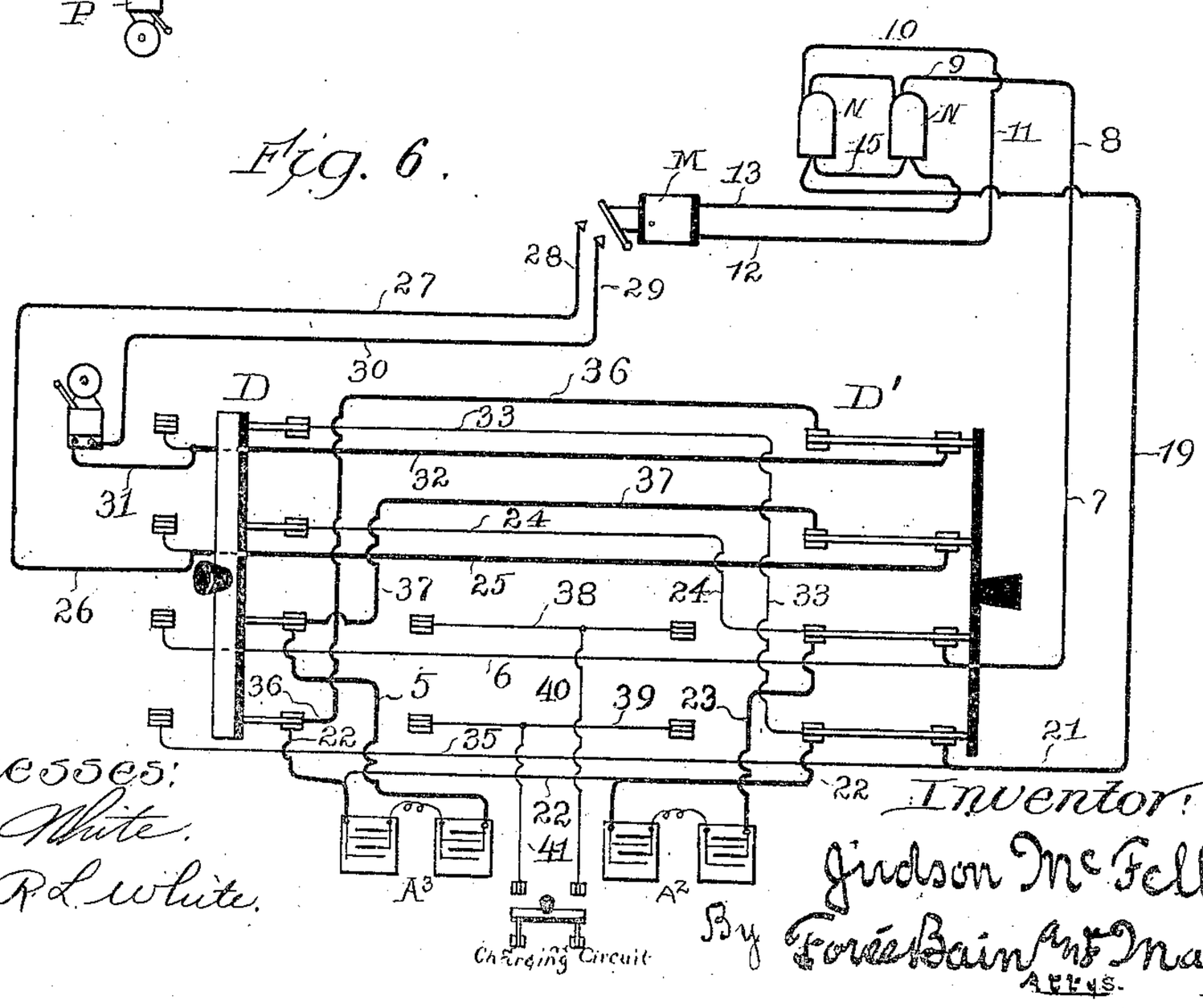


Fig. 6.



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4 SHEETS—SHEET 4.

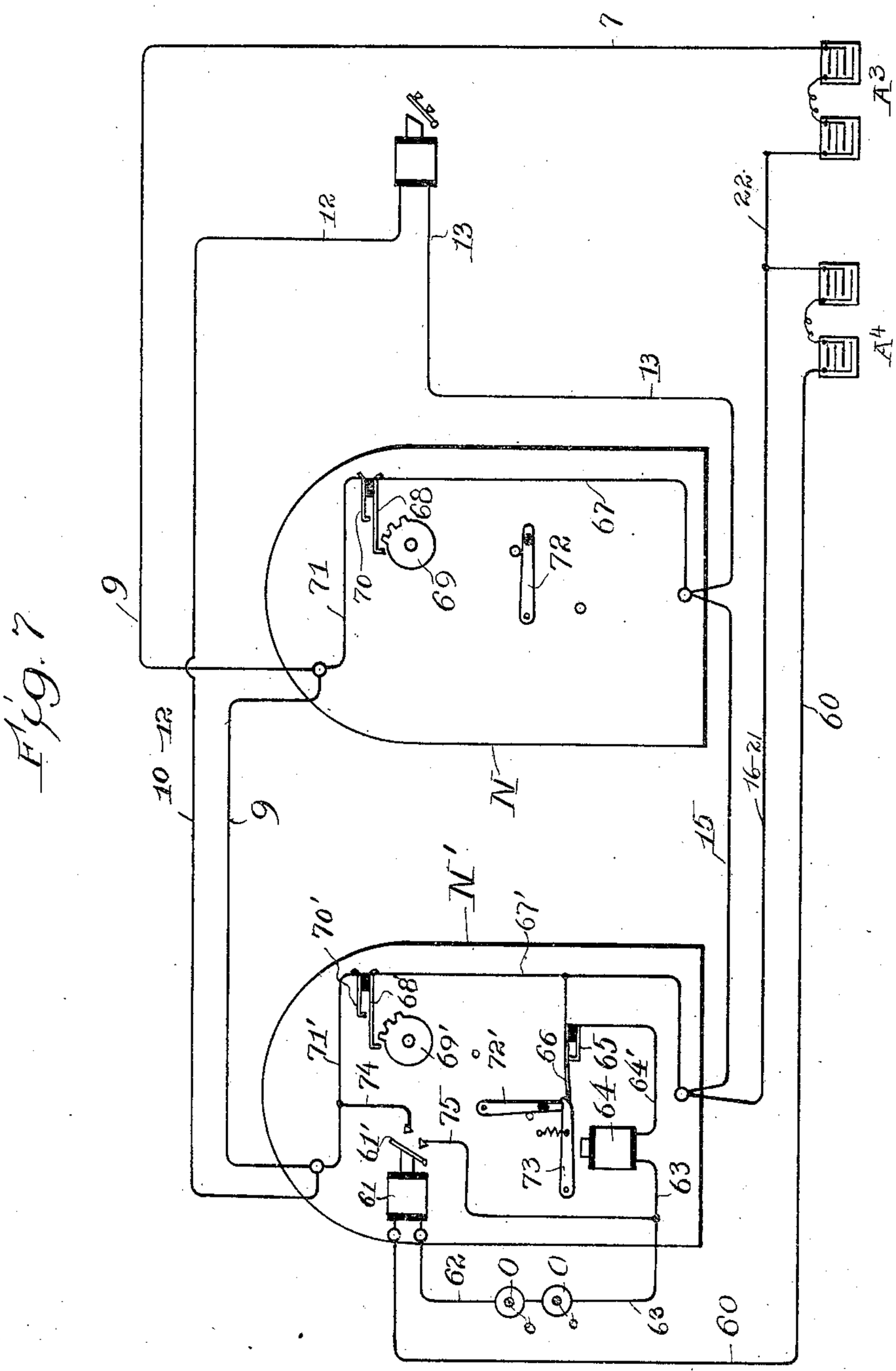

Fig. 7

Witnesses:
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Harry R. L. White.

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UNITED STATES PATENT OFFICE.

JUDSON McFELL, OF CHICAGO, ILLINOIS.

FIRE-ALARM SYSTEM.

No. 828,420. Specification of Letters Patent. Patented Aug. 14, 1906.

Application filed August 7, 1905. Serial No. 272,973.

To all whom it may concern:

Be it known that I, JUDSON McFELL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Fire-Alarm Systems, of which the following is a specification.

My invention relates to fire-alarm systems and embodies improvements applicable to fire-alarm systems described in my prior patent, No. 797,907, dated August 22, 1905, and applicable also in some features to other systems. In general the system to which I have shown my improvement as applied comprises an arrangement wherein open-circuit alarm-boxes are bridged between wires maintained under constant test, thereby incorporating the advantages of open-circuit boxes and closed-circuit wiring in one system. In general this is herein shown as accomplished, as in my prior system, by the provision in the main circuit, preferably at the supervisory station, of a relatively high-resistance test-relay magnet which when the system is in normal condition is sufficiently energized to retain in attracted position an armature constituting an element of a local test-circuit, the alarm-boxes being arranged when actuated to short-circuit the high-resistance magnet, thereby releasing its armature and permitting it to perform its functions as an element of the test-circuit.

One of the objects of my present invention is to provide in such a system means for positively opening the circuit of the test-relay magnet upon the actuation of the boxes in the main circuit with said test-relay magnet.

A further object of my invention is to provide means whereby in the event of an accidental break of the normal circuit an "emergency-circuit" may be established wherethrough the boxes may transmit their signals to the central station during the continuance of the broken conditions of the normal circuit.

Another object of my invention is to provide for the division of the signaling-circuits into a plurality of substantially independent sections in each of which the instrumentalities mentioned may perform their functions independently of the apparatus of the remaining sections.

A yet further object of my invention is to provide in a system divided into sections, as described, means whereby alarm-bells normally local to the several sections may at will or at predetermined intervals be so associated with the signaling-boxes of every other section that upon the actuation of a signaling-box in any one section the alarms of all other sections will be caused to operate to give a "general" alarm without in any way interfering with the operation of the signal-transmitting instrumentalities of the signal-initiating section.

A further object of my invention is to provide such a system wherein the entire energy may be supplied from a central station, the batteries being so arranged that different sets thereof are available to energize the normal circuit, the test-circuit, and the general-alarm circuits of the various branches.

A still further object of my invention is to provide automatic means for initiating the activity of one or more alarm-boxes of each circuit branch; and yet other and further objects will become apparent to those skilled in the art from the following description, taken in conjunction with the appended drawings, wherein—

Figure 1 is a diagrammatic view of a complete installation. Fig. 2 is a diagrammatic view illustrating the normal signaling-circuit under normal conditions. Fig. 3 is a diagrammatic view illustrating the circuit conditions during the operation of normal signal transmission. Fig. 4 is a like view illustrating the circuit conditions during the transmission of a signal through the emergency-circuit. Fig. 5 is a like view illustrating the circuit conditions during the transmission of a general alarm. Fig. 6 is a detail of the switch connections. Fig. 7 is a diagrammatic view illustrating the connections of the automatic and manual boxes.

It will of course be understood that the devices illustrated may be of any suitable construction to perform their respective functions, the showing here made being intended for clear and simple illustration only.

In the complete embodiment of my invention shown in Fig. 1, I provide in general the following instrumentalities: suitable sources of current-supply, such as batteries (preferably storage batteries) of suitable number and size, (indicated by A, A′, A^2, A^3, and A^4,) a signal-recording instrument B, an electromechanical gong C, all suitably disposed at the central station, and a switchboard having suitably mounted thereon the following instrumentalities: two four-pole double-throw switches D and D′ for the main, test, and

charging circuits, the double-pole double-throw switches E and E′ for the general-alarm circuits, a single-throw switch F for the charging-circuit, an electric bell or buzzer G for the telltale or test circuit, a relay H, controlling the general-alarm circuits and having as many pairs of contacts as there are divisions or branches of the main circuit, a clock I and switch *i* having suitable electrical connections with the relay H, and for each section of the main circuit (there being shown four sections numbered, respectively, 1, 2, 3, and 4) a two-pole double-throw switch J for establishing an emergency-circuit, two-pole double-throw relays K and L, and a high-resistance relay M, whose functions will be later described. In each of the several branches of signaling-circuits 1, 2, 3, and 4 are provided open-circuit signaling-boxes N N′, thermostats O for initiating the activity of the automatic boxes N′, and local bells or other signaling devices P.

The main circuit.—The main circuit in my present case is in general similar to the main circuit shown in my patent referred to. In general it may be understood that batteries A^2 and A^3 supply current to the main circuit and the test-circuit, respectively, the switch connections being so disposed that when the switch D is closed and the switch D′ opened battery A^3 supplies current to the main circuit and battery A^2 to the test-circuit, whereas reversal of the condition of said switches reverses the connections of the batteries with said circuits, throwing battery A^2 onto the main or signaling circuit and battery A^3 onto the test-circuit. The several posts and associated parts of the main switches D D′ being referred to by the designations "first," "second," "third," and "fourth," commencing at the top of each switch, the circuit connections under the conditions shown in Fig. 1 of the drawings may be traced as follows: from battery A^3 by wire 5 to the third post of switch D, through its blade to the third outer contact, thence by wire 6 to the corresponding contact of switch D′, whence proceeds the main-circuit wire 7, including in series therein the recording instrument B and electro-mechanical gong C, and terminating in the coil of the relay H. From said relay the main circuit continues by "battery-wire" 8 to the coil of all the relays K, from each of which a branch extends by wire 9 to one side of all the boxes N N′, thence by wire 10 to the left post of switch J, through the switch-blade to the upper left post, thence by wire 11 to the upper contact of the relay L, through the upper blade of the relay to wire 12, leading from the other contact of said blade to the high-resistance relay M, thence by wire 13 back to the right-hand upper blade of switch J, through the right-hand blade, through the post thereof by wire 14 to a contact of the upper blade of relay H, and back by wire 15 to the opposite side of all the boxes N N′, thence by wire 16 through the local bells P of the section to the lower normally open contact point or relay L by wire 17 to the relay-coil, thence by wire 18 to battery-wire 19, with which contacts the taps 20, leading to the lower contacts of all of the relays L, the said wire 19 connecting with the wire 21, leading to the fourth outer contact oi switch D, connected through the fourth switch-blade and the corresponding post to wire 22, to which the opposite side of the battery A^3 is connected in parallel with one side of battery A^2. Thus it will be seen in general that the main circuit (more simply shown in Fig. 2) includes in the battery-wire 7 the recording and signaling instrument at the central station and the coil of relay H and thence extends along one side of all of the boxes of one section, is looped back through a blade of the relay L to include the high-resistance magnet M, thence proceeds along the other side of the boxes, and back to the main battery-wire 19. The main-circuit wires of the remaining branches 2, 3, and 4 are connected between the battery-wires 7 and 19 in identical manner with that above described in parallel with the circuit of section 1, the connections being in all cases the same as those shown in Fig. 1, save that for convenience of illustration the wire 14 for each section extending to the contact for a corresponding blade of the relay H is shown as a tap to the wire 15. It will be apparent that the effect of these two connections is the same, save that in the arrangement shown in section 1 the wire 14 is under constant test, whereas in the arrangement shown in the remaining sections it is not.

Test-circuit.—The normally open test-circuit energized when the main switches are in the condition shown in Fig. 1 by battery A^2 may be traced as follows: from battery A^2 by wire 23 to the third post of switch D′, thence by cross connections 24 to the second post of switch D, through the second blade of the switch by cross connection 25 to the second outer contact of the switch D′, thence by wire 26 to one post of the switch *g*, thence by wire 27 and taps 28 to one contact of each of the armatures of test-relay M. The remaining contacts of said armatures are connected by taps 29 to test-wire 30, which includes the bell G, and leads to the remaining contact of the switch *g*, the corresponding post whereof is connected by wire 31 with the first contact of switch D′, cross-connected by wires 32 with the corresponding contact of switch D, connected (under the conditions shown) by the corresponding switch-blade with the cross connection 33, leading to the fourth post of switch D′, with which the common battery-wire 22 is connected, as heretofore described. Thus it will be seen in general that the test-circuit is normally

open at the contacts of the respective test-relays M, but is adapted to be closed by the falling of the armature of any one of said relays.

Operation in general.—As to the general operation it will be observed that if the main circuit be broken at any point the relay M of the particular section (if the break be local to one section) or the relays of all of the sections (if break be in battery-wires 8 19, &c., of the main circuit common to all of the sections) will be deënergized, permitting their armatures to fall and close the test-circuit last traced, thereby causing the bell G to ring to attract attention to the abnormal condition of the circuit. It will further be apparent that whenever a box N is set in operation, intermittently closing and opening connection between wires 9 and 16, a short circuit will be established parallel to the relay M, the circuit being traceable under the conditions shown in Fig. 1, as follows, as may best be seen in Fig. 3: from battery A^3 by wire 5 to wires 6 7 8 9, the signal-initiating box, and wires 15, 16, 17, 18, 19, 21, and 22 back to the battery. The coils of relays H, K, and L are so wound that they do not operate to actuate their relay-blades when normally energized by the small current flowing through the high-resistance magnet M, but will functionally operate when the high-resistance relay is short-circuited by a box. Consequently upon the establishment of such a circuit as that described the parts immediately assume the conditions shown in Fig. 3, the relay H being operated to close all of the circuits controlled thereby for purposes to be described, the relay L creating a break between wires 11 and 12 and closing a short circuit through wires 16 and 20 around its own coil and relay K opening the normally closed circuit controlled thereby and to be hereinafter described and establishing a short circuit around its own coils.

The main switches.—The connections of the main switches, as has heretofore been generally suggested, are such that by opening switch D and closing switch D′ the battery A^2 is connected with the main circuit instead of the test-circuit and the battery A^3 connected with the test-circuit instead of the main circuit. The switch connections may best be seen in Fig. 6, wherein will be apparent that as the outer contacts of the first, second, third, and fourth blades are respectively tied together by wires 32, 25, 6, and 35 wires 32 and 25 are connected at approximate posts with test-circuit wires 31 and 26, wires 6 and 35 are connected at approximate posts with the main-circuit wires 7 and 21, the first and second posts of switch D are cross-connected by wires 33 and 24 with the fourth and third posts, respectively, of switch D′, the first and second posts of switch D′ are correspondingly cross-connected by wires 36 and 37 with the fourth and third posts of switch D, and batteries A^2 and A^3 are at one side connected in common by wire 22 with the fourth posts of both switches and are respectively connected at their opposite terminals by wires 5 and 23 with the third posts of switches D and D′, reseectively, it follows that when switch D is closed, as shown in Fig. 1, battery A^3 is connected, as heretofore described, with the main-circuit battery-wires and battery A^2 is connected with the test-circuit, whereas when switch D′ is closed battery A^2 is connected with the main circuit as follows, as shown in Fig. 6; by wire 23 and switch-blade 3 of switch D′ to main wire 7 and by common battery-wire 22 and switch-blade 4 of switch D′ with the opposite main battery-wire 21. Under such conditions battery A^3 is connected with the test-circuit as follows: on the one hand, by wires 5 37 and the second blade of switch D′, with the test-wire 26, and, on the other hand, by wire 22, cross connection 36, the first blade of switch D′, and cross connection 32, with wire 31 of the test-circuit. For convenience in charging, the inner third and fourth contact-points of the respective switches are cross-connected, as at 38 and 39, and to said cross connections are tapped charging-wires 40 41, leading to the charging-switch F, one of said wires, as 41, preferably including therein a proper equipment of lamps or like resistance 42.

The emergency-circuit.—To prevent the disabling of the boxes in any section by a rupture of one or both wires thereof, the switches J are provided, their lower normally open contacts being respectively connected by wires 45 and 46 with wires 8 and 19. Obviously under normal conditions these wires being disconnected at the switch play no part in the operation of the system; but should a ringing of the bell G, occasioned by the falling of the armature of a single relay M and unaccompanied by the transmission of an alarm from one of the boxes, indicate a rupture in the wiring of any section the switch J of such section is thrown to close connection between its post and the contacts connected with wires 45 and 46, thereby establishing emergency connections as follows, as may best be seen in Fig. 4: from battery-wire 8 in parallel through both sides of the loop, including, on the one hand, the relay K and wire 9 and, on the other hand, the wire 45, the blade of switch J, the wire 10, and from the battery-wire 19 through both sides of the second loop, including connections 20 16 or relay L, and, on the other hand, by wire 46, right-hand blade of the switch J, wires 14 and 15. It will be seen that if a box be operated under such conditions, for instance, as shown in Fig. 4, wherein breaks in both wires 16 and 9 are shown, a circuit will be established

from battery-wire 8, by wire 45, the active box, wire 15, right blade of switch J, and wire 46 to the return battery-wire 19. The connections of the wires 9 10 and 15 16 being in parallel when a switch J is thrown to its emergency position, it will be apparent that a break at either one or both of the wires will not affect the operativeness of the boxes to transmit their signals.

General-alarm connections.—I will next describe the connections whereby the operation of a box in any section is caused to initiate the activity of the signaling-bells P in all the sections, thereby giving what we may term a "general alarm." In general the mechanism peculiar to this part of the system comprises certain of the batteries, the relays K, the relay H, and preferably the clock I. In general the arrangement, it may be stated, is such that whenever the relay H operates to close its connected circuits (which it does whenever any high-resistance relay M is short-circuited by the turning in of an alarm in any section) it connects the bells P of all of the sections (except the alarm-initiating section) in series parallel with one or more of the central-station batteries—in the present instance with two sets of batteries A A′. To trace the general-alarm circuit of sections 1 and 2: From battery A extends wire 47 to the upper right of switch-contact E, to the right post whereof a wire 48 is connected, and from said wire by taps 49 to the upper contacts of the relays K K, normally connected by the upper relay-blades with the wires 50 50, extending to the normally open contacts of the first and second blades, respectively, of relay H. The opposite contacts for said blades of the relay H are connected by wires 15 (or 14 and 15) 16 17 18 19 and tap 19′ to the left upper contact of switch E, through the switch-blade to the left post, which is connected in common with the like post of switch E′ by wire 51, common to one side of both batteries A A′ to the opposite terminal of the battery A, so that closing of the contact of the relay H without other interference with the connections above described closes connection between the battery A and the bells P of sections 1 and 2. In like manner A′ is arranged for connection with the general-alarm apparatus of sections 3 and 4, wire 47′ connecting with the upper right-hand contact of switch E′, the post whereof is connected by wires 48′ and taps 49′ with the proper contacts of relays K K, normally closed by the relay-blades to make connection with the wires 50, extending to the third and fourth contacts of the relay H. The switches E and E′ are further so arranged that all of the general-alarm circuits may be connected with either battery A or A′, the lower right contact of switch E′ being tapped, as at 52, to wire 47 and lower right contact of switch E being tapped, as at 52′, to wire 47′ and both left contacts of switch E′ being connected to both left contacts of switch E and to wire 21, as by wire 53. The relays K are provided to open the general-alarm circuit above described for the signal-initiating section in order that the general-alarm circuit may not interfere with the active signaling instruments. The operation may best be noted from Fig. 5, wherein the heavy lines indicate the signaling-circuit in operation, the light solid lines indicate the general-alarm circuits in operation, and the dotted lines indicate the short-circuited or dead portions of the circuit connections. It will be apparent now that when the main circuit through section 1, for example, is closed, as heretofore described, both of the relays K and L are energized to cause their functional operations, their blades dropping to open their upper contacts and close the coil short-circuiting shunts 54 55 and 16 20, respectively. Accordingly the general-alarm circuit for the first section is opened at the upper contact of relay K; but it being remembered that the normal signaling operation does not disturb any of the branch circuits other than that initiating the signal it will be apparent that the remaining relays K K remain functionally inactive. The operation of the signal-initiating device from section 1, however, causing the functional activity of the relay H, closes the general-alarm circuits traceable, as hereinbefore described and as shown in light lines in Fig. 5, it being noteworthy, however, that the current from batteries A A′ does not flow through the coils of relays K K. Accordingly the bells P of all of the sections save that initiating the signal receive current from the batteries A A′ and sound a continuous alarm. The opening of the circuits of the high-resistance relays M M, as shown in Fig. 5, is accounted for by the fact that instantly upon the closing of the circuit by relay H the normal current-flow through relays L is increased by the current emanating from batteries A or A′ and taking the path shown in full light lines, save that the wires 20 16 being disconnected current flows through the coils L, causing said relays to become functionally active to open the high-resistance relay-circuit and close the short-circuiting shunt across from wire 20 to wire 16. In factories and like environments where during certain hours of the day the presence of numerous persons renders it unnecessary to sound a general alarm upon the occurrence of an ordinary fire a clock-operated time-switch, as diagrammatically illustrated at 1, may be employed and so connected by wires 56 and 57 with the wires 7 and 8 as to short-circuit the relay H during such periods of the day. The switch *i* is also connected in said wires 56 57 to permit the short-circuiting of the relay at will. Obviously when the relay is short-circuited the

general alarm cannot be turned in, as the change in circuit conditions of any branch of the circuit will not materially affect the relay H.

The automatic boxes.—If deemed desirable, certain of the signal-boxes or all thereof may be normally wound and arranged to be conditioned for operation by the automatic action of proper thermostats. My preferred arrangement for thus rendering the boxes automatic in action may be seen in Fig. 7, wherein is diagrammatically shown in simplified form the main circuit and the connections of a simple or ordinary box and an automatic box are diagrammatically shown. Referring to said figure, A^4 indicates the battery for the supervisory or thermostat circuit connected at one side to the common battery-wires 22 and at its other side connected by wire 60 with the coil of a high-resistance relay 61, forming part of the automatic-box equipment. The opposite terminal of the magnet is connected by wire 62 with one or more thermostats O, which in their simplest form may comprise contacts normally connected by bodies of fusible material *o*, the wire 63, leading from the thermostat, terminating in the coil of an electromagnet 64, the opposite terminal of which is connected by wire 64′ to a contact-anvil 65, with which normally contacts a spring 66, tapped to a wire 67′, affording connection between the wire 15 and a contact-spring 68′, controlled by the signal-wheel 69′ of the box and adapted when elevated by a tooth of said signaling-wheel to make contact with an anvil 70′, connected by wires 71′ with the wire 9. A box-handle 72 is arranged when pulled down to wind the box and condition it for operation, to be engaged by an armature 73 of the magnet 64, said armature being also arranged when in normal or unattracted position to maintain the spring 66 in contact with its anvil 65 and when attracted by its magnet 64 to release the spring 66 and the handle 72. The armature 61′ of the high-resistance magnet is arranged to constitute a circuit-closer for normally open contacts, one of which is connected by wire 74 with wire 71′ and the opposite contact connected by wire 75 with wire 63.

The operation of the device as described is as follows: Normally current flows through wire 60, the high-resistance magnet 61, wire 62, thermostat O, wire 63, magnet-coil 64, contacts 65 and 66, and wire 67′ to the main circuit-wire 16 and thence, as heretofore described, back to the battery A^4. It will be understood that the magnet 61 is so wound that when in series with the magnet 64 the latter is not sufficiently energized to attract its armature 73, but that when said magnet 64 is included in a low-resistance circuit with any of the batteries it is energized to attract its armature. Now it will be apparent that if one of the thermostats O fuses, opening the circuit last described, the relay 61′ of the magnet 61 falls, closing a circuit as follows: from the main battery A^3 by wires 74, 75, and 63 to the magnet-coil 64, thence by wire 64′ to the anvil 65 and pen 66, and thence by wires 67′ to the wire 16, connected with the common return side of the batteries. Under such conditions the magnet 64 is energized, attracting its armature and releasing the controlling-handle 72 of the box, so conditioning the box for operation and at the same time releasing the spring 66, which breaks contact with the anvil 65, opening the circuit last described. Now the box being set in motion, circuit may be established therethrough only by the wires 71′, pen and contact 70′ 68′, and wire 67′ to connect the wires 9 and 16, connected, as heretofore described, with the main battery and signaling instrumentalities whenever a tooth of the signaling-wheel 69′ passes beneath the pen 68′.

It will be understood that those boxes which are not intended for automatic operation are provided with controlling-handles 72, which must be depressed and released to set the box in operation, and are provided with the usual signal-wheels 69, operating the pens 68, adapted to close connection through wires 71, anvils 70, and wires 67 between the wires 9 and 15, as heretofore described.

While I have herein described in some detail a specific arrangement of parts embodying my invention, it will be apparent that numerous slight changes might be made therein without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a fire-alarm system, a battery, a main circuit comprising two wires extending from opposite sides of the battery and each normally connected at one end only with its side of the battery, a signal-receiving device, a signal-transmitting device bridged between the main wires, and means comprising a switch for connecting a point of each wire beyond the transmitting device with its side of the battery.

2. In a fire-alarm system, a battery, and a receiving instrument, a main circuit comprising two line-wires, each connected at one end to its side of the battery, and at their opposite ends connected together through a high resistance, bridged normally-open-circuit signal-transmitters, means for connecting each side of the main circuit beyond the transmitters with itself beyond the signal-receiving instrument and battery, to constitute of each wire a loop and to which loops are connected the transmitters.

3. In a fire-alarm system, a battery, a signal-receiving instrument, a main closed circuit, a high-resistance magnet at the central

station, boxes in parallel with said magnet adapted to short-circuit the same, and means for cutting out said magnet and connecting the disconnected ends of the main circuit to the respective circuit-wires on each side of the battery and receiving device.

4. In a fire-alarm system, a battery, a signal-receiving device, a main circuit looped back to a central station, signal-transmitters bridged in said circuit and arranged to normally transmit through a circuit exclusive of the loop, and means for connecting said loop with the signal-responsive device to constitute thereof part of a signaling-circuit.

5. In a fire-alarm system, a source of current-supply, a signal-receiving device, a normally closed circuit, a resistance in said circuit through which insufficient current flows to actuate the signal-receiving apparatus, a signal-transmitter adapted when actuated to establish around said resistance a short circuit through which current flows to actuate the signal-receiving device, and means for breaking the connection of said resistance with the main circuit upon the actuation of said signal-transmitter.

6. In a fire-alarm system, a normally closed circuit including a high-resistance coil, normally-open-circuit transmitting means adapted and arranged to short-circuit the high-resistance coil when actuated, means for indicating when the coil is short-circuited, and means for breaking connection of the coil with the main circuit when said coil is short-circuited or deënergized.

7. In a fire-alarm system, a battery, a signal-receiving instrument adapted to work on a closed circuit, a normally closed circuit, a relay having its coil in said circuit, a resistance-coil in said circuit through which insufficient current normally flows to actuate the signal-receiving instrument or relay, the relay being adapted to disconnect the resistance-coil from the circuit when said relay is actuated, and means for establishing a circuit including the battery, signal-receiving instrument and relay-coils, and excluding the high-resistance coil.

8. In a fire-alarm system, a battery, a signal-receiving instrument adapted to work on a closed circuit, a normally closed circuit, a relay having its coil in said circuit and comprising a normally closed circuit-breaker for the main circuit, a high-resistance magnet in said main circuit through which insufficient current normally flows to actuate the signal-receiving device or the relay, means associated with said magnet for indicating when it is deënergized or short-circuited, and a normally-open-circuited transmitting instrument bridged between the line wires and adapted when actuated to short-circuit the high-resistance magnet through a circuit including the battery, signal-receiving device and relay-coils, whereby actuation of the signal-transmitter causes the operation of the circuit-breaker to disconnect the high-resistance magnet from the main circuit.

9. In a fire-alarm system, a battery, a signal-receiving device, a main circuit including said battery and signal-receiving device and comprising a plurality of parallel sections, each section being looped back to a central station, and having at that station a high-resistance magnet, means associated with each magnet for indicating when it is deënergized or short-circuited, a signal-transmitting device bridged across each section adapted to short-circuit, when actuated, the magnet of said section, and automatic means for disconnecting the high-resistance magnet from the circuit when it is short-circuited as described.

10. In a fire-alarm system, a continuous main circuit divided into sections, signal-transmitting means in each section, alarm instrumentalities in each section, and automatic means for causing the operation of the alarms in all other sections upon the actuation of the transmitter in any section.

11. In a fire-alarm system, a main circuit including a source of current-supply, said main circuit being divided into sections, alarms in a plurality of said main-circuit sections, transmitters in each section, a second battery, and means responsive to the operation of the signal-transmitters of any section, for connecting the alarms of all other sections with said second battery to sound alarm in all other sections upon the transmission of a signal from any section.

12. In a fire-alarm system a main circuit divided into a plurality of parallel sections, a source of current-supply for said circuit, signal-transmitting means in a plurality of said parallel sections, alarm instrumentalities in a plurality of said sections, and automatic means for conditioning the alarm in any other section for operation upon the actuation of the transmitter in any section.

13. In a fire-alarm system, a battery, a signal-receiving instrument, a general-alarm relay, a main circuit including the coil of the general-alarm relay, and therebeyond divided into a plurality of sections, in each section a high-resistance coil for preventing the effective energization of the relay and signal-receiving device by normal current to actuate them, signal-transmitting devices in each section adapted to short-circuit the high-resistance coil of said section and thereby actuate the relay and signal-recording device, a local alarm in each section, and circuits adapted to be closed by the general-alarm relay including the alarms of the other circuit-sections, and a suitable source of current-supply therefor.

14. In a fire-alarm system, a battery, a signal-receiving instrument, a main circuit including a relay H, and therebeyond divided

into a plurality of sections, in each section a local alarm, a magnet of resistance sufficient to prevent the actuation of relay H and signal-receiving instrument by the normal current-flow, and a transmitter adapted when actuated to short-circuit the magnet and thereby actuate the relay H and the signal-receiving instrument, an independent source of current-supply, a circuit for the local alarms including said independent source of current-supply, said circuit being normally open at the relay H and adapted to be closed by said relay when actuated.

15. In a fire-alarm system, a battery, a signal-receiving instrument, a main circuit, a general-alarm relay included in said circuit, said circuit being divided into a plurality of sections, in each section transmitting devices adapted when actuated to actuate the general-alarm relay and signal-receiving instruments, and also in each circuit an alarm device, a circuit normally open at the general-alarm relay, adapted to be closed thereby, including when closed said alarm and a source of current-supply.

16. In a fire-alarm system, a battery, a signal-receiving instrument, a main circuit, including a general-alarm relay H, and therebeyond divided into a plurality of sections, in each section an alarm, the coil of a relay K adapted when actuated to open the circuit controlled by it, and a transmitter adapted to actuate the signal-receiving device, the relay K and relay H; a second battery and a circuit therefrom adapted to be closed by relay H and including the normally closed circuit-breakers or relay K and the alarms of the several sections.

17. In a fire-alarm system, a main line, open-circuit transmitters bridged between the sides of said line, one of said transmitters being normally wound, and comprising a normally open connection between the lines adapted to be closed by the action of the transmitter, a thermostat-circuit including thermostats and within the box including a normally-energized, high-resistance relay, an electromagnet adapted to work on a relatively low resistance-circuit, a normally open low-resistance circuit therefor controlled by said high-resistance relay, and a latch controlled by said electromagnet maintaining the transmitter in wound or set position.

18. In a fire-alarm system, a main line, a transmitter comprising a motor-driven signal-wheel and pens associated therewith, a closed thermostat-circuit, a relay in said circuit, an open circuit controlled by said relay and adapted to be closed when said relay is deënergized, and an electromagnetic means in said normally open circuit for maintaining said transmitter-motor in wound or set condition, adapted to release the motor when the relay-controlled circuit is closed.

19. In a fire-alarm system, a main circuit, a transmitter comprising a normally open make-and-break device bridged between the sides of said circuit, a motor for said make-and-break device, a closed thermostat-circuit, a high-resistance relay having its coil in said thermostat-circuit, an open bridge-circuit across the main lines controlled by the high-resistance relay and arranged to be closed when said relay is deënergized, an electromagnet in said bridge-circuit, means for maintaining said motor in set position arranged to release the motor when the electromagnet is energized, and automatic means for breaking the bridge-circuit after the electromagnet has become energized.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

JUDSON McFELL.

In presence of—

GEO. T. MAY, Jr.,

MARY F. ALLEN.