No. 706,384. Patented Aug. 5, 1902.

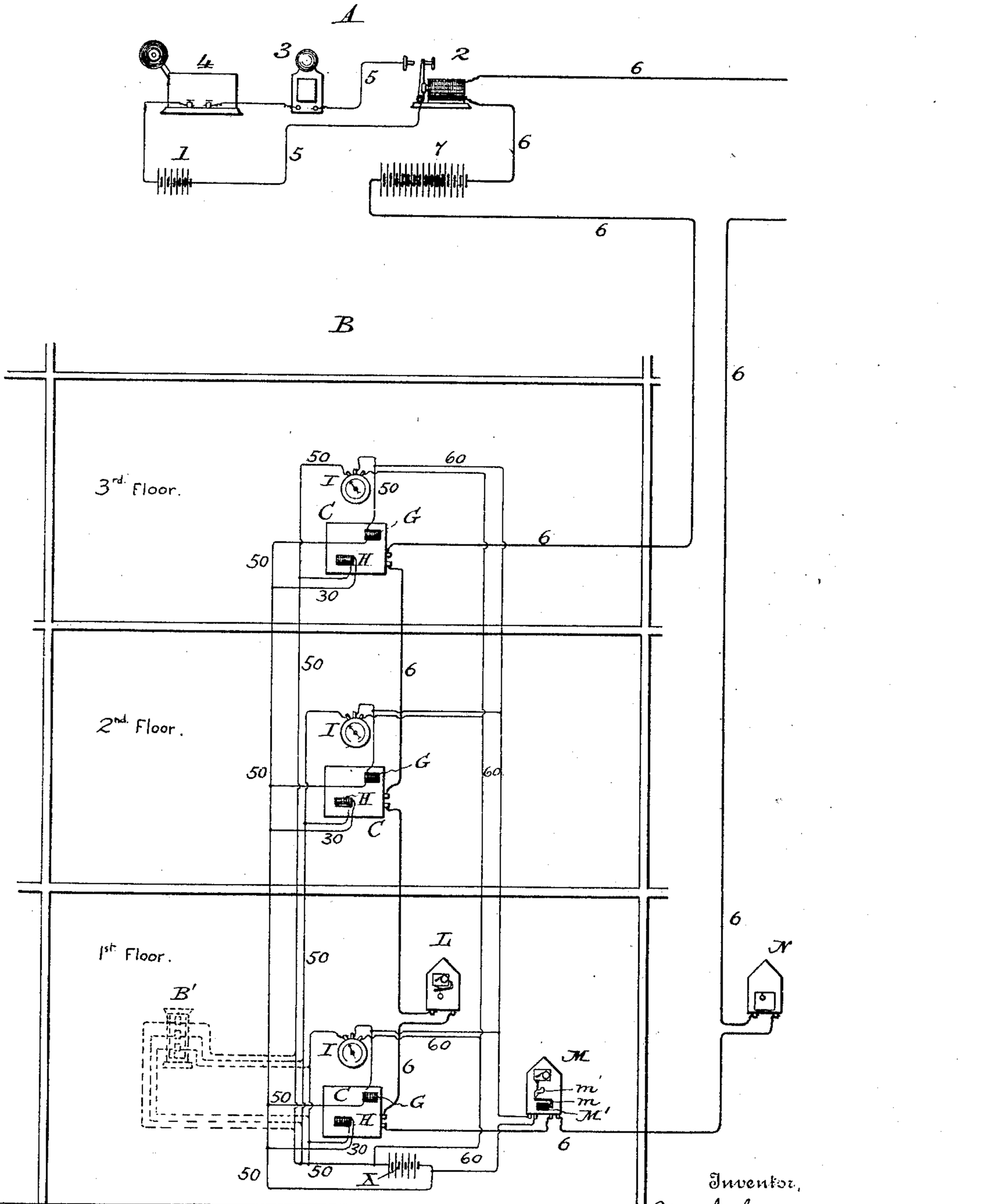
R. G. CALLUM.

FIRE ALARM TELEGRAPH SYSTEM.

(Application filed Oct. 5, 1899. Renewed Jan. 11, 1902.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses

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(Application filed Oct. 5, 1899. Renewed Jan. 11, 1902.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

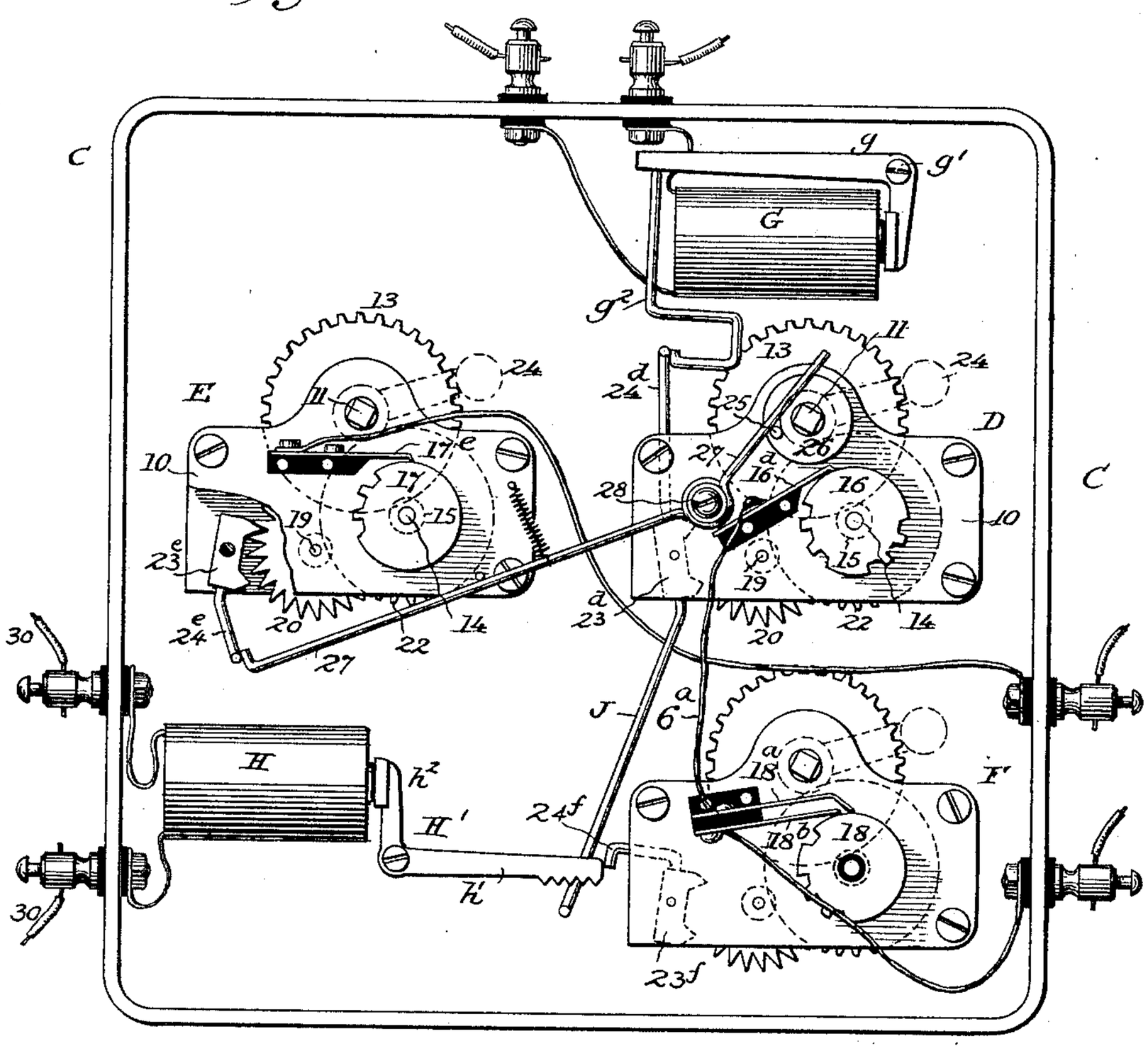


Fig. 3.

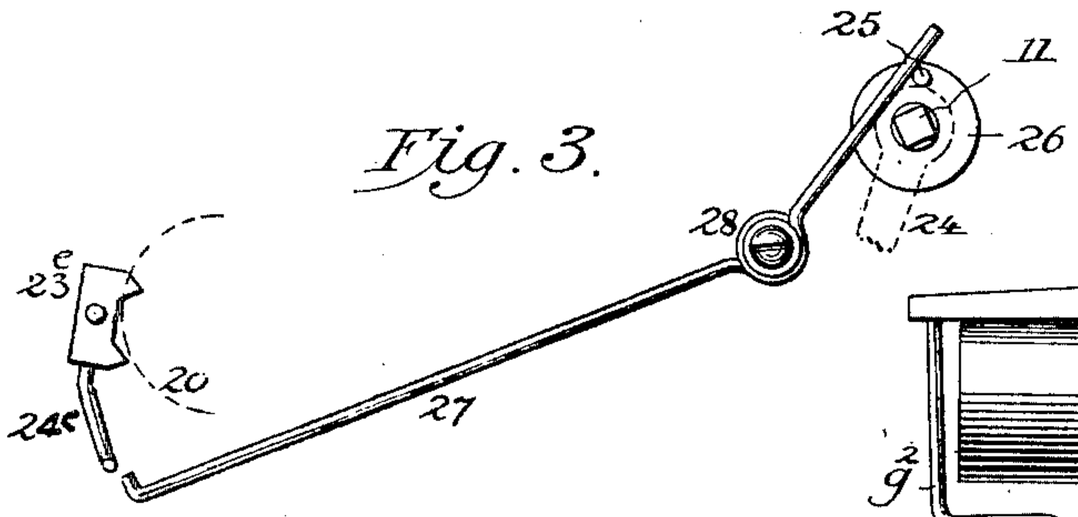
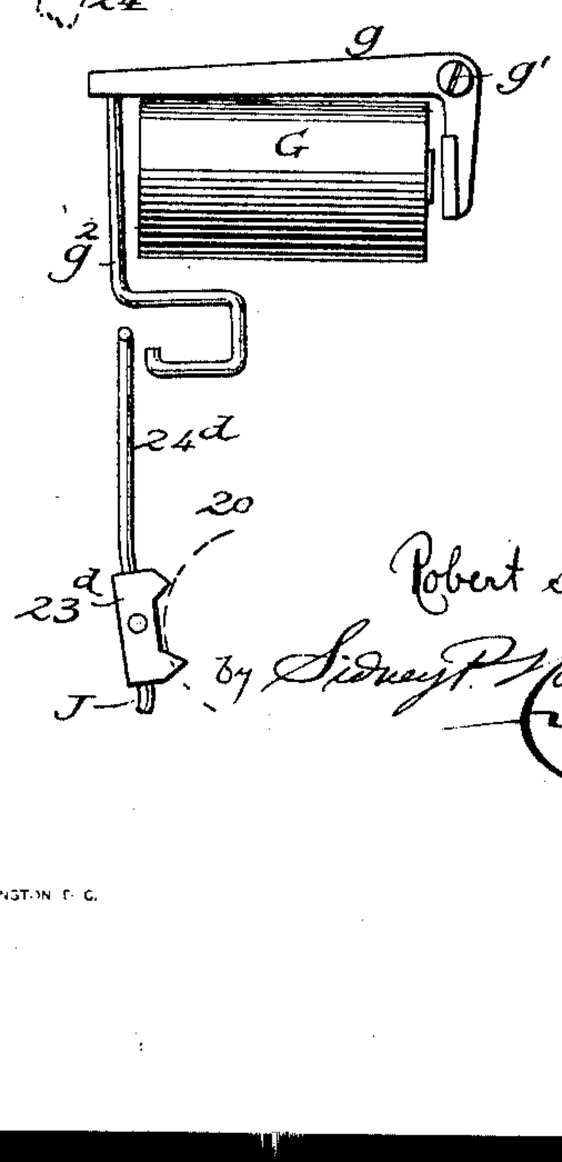


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

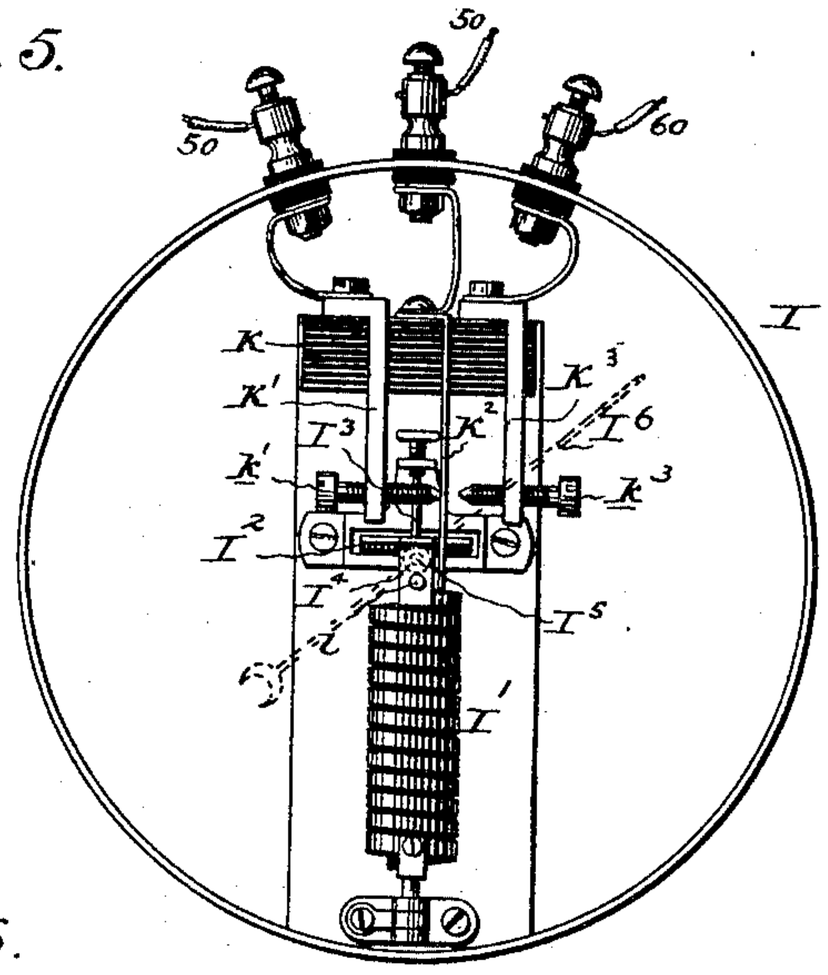

Fig. 6.

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UNITED STATES PATENT OFFICE.

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FIRE-ALARM-TELEGRAPH SYSTEM.

SPECIFICATION forming part of Letters Patent No. 706,384, dated August 5, 1902.

Application filed October 5, 1899. Renewed January 11, 1902. Serial No. 89,336. (No model.)

To all whom it may concern:

Be it known that I, ROBERT G. CALLUM, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Fire-Alarm-Telegraph Systems; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to that class of fire-alarm systems which are used for the protection of buildings by placing therein in suitable places—such as rooms, halls, &c.—automatic signal-transmitting mechanisms connected electrically in series with a central office, which will transmit to said office a first or warning signal, indicating that the temperature in the vicinity of one of the automatic signal-transmitting mechanisms is abnormally high, having reached a predetermined degree of heat, followed by a second or fire signal should the temperature continue to increase until it reaches a higher predetermined degree. In my system one or more buildings may be included in a single closed main circuit with the central office, the latter containing such signaling and recording instruments as are commonly used in fire-alarm systems. The central office may be in the protected building or in a separate building, with lines radiating to all parts of the municipality. Also included in the main circuit with the signal mechanisms will be a number of fire-alarm boxes placed within and without each building in conspicuous and public places, which are to be operated manually by any person who discovers a fire. An electrically-operated fire-alarm box will be placed in each building on the main circuit. The automatic mechanisms, one or more of which will be placed on each floor, in the cellar, basement, coal-bin, waste-room, furnace-room, and all other places wherein fire is likely to occur, consist each of two separate parts, a thermostat and a box containing a series of circuit-interrupting or signal-transmitting mechanisms, arranged to be operated by clock-trains for sending signals over the main circuit to the central office and controlled in their movements by the thermostat opening and closing local circuits from a battery situated within the building. The transmitted signals differing with each mechanism, the exciting cause acting on the thermostat to send in a signal is accurately located. From the battery two circuits lead to each thermostat, one being an open circuit, the other a closed one, the arrangement of the thermostat being such that a rise in temperature beyond a predetermined point will first open the closed circuit, sending a warning-signal to central office, which, if not attended to and the temperature continues to increase, the open circuit will be closed and a second signal sent through the electrically-operated fire-alarm box, calling out the fire department.

Another part of my invention relates to means for warning the central office when the local battery deteriorates or ceases to act or when a local closed circuit wire has become broken, cut, or disconnected from any part of the mechanism.

In the drawings, Figure 1 is a diagrammatic view of my improved fire-alarm system, showing the central office with its instruments, several floors in a building, each floor being provided with my improved automatic signal-transmitting mechanism, and the several operating-circuits. Fig. 2 is a view of the interior of the box or casing containing the several signal-transmitting mechanisms and the operating and controlling devices. Figs. 3 and 4 are detail views of certain parts of the signal-transmitting mechanism in a different position from that shown in Fig. 2. Fig. 5 is a view of a thermostat as arranged to be used in connection with my invention, and Fig. 6 is a diagram of a building, showing a previously-installed open-circuit annunciator-wiring with my system in part applied thereto.

Referring first to Fig. 1, A indicates a central office, which may be the headquarters of

a city fire department or other designated office, containing a local battery 1, relay 2, call-bell 3, and register 4, all of the usual form, they being connected in series in an open circuit 5, adapted to be closed when the current through the relay-magnet is broken. A closed circuit 6, which constitutes the main line, extends between the central office A and the building or buildings B to be protected. Included in the main-line circuit 6 is a battery or other generator 7 and the magnet of the relay 2, situated in the central office, and the automatic mechanisms and fire-alarm boxes situated in various parts of the building or buildings B, each automatic mechanism consisting of two independent parts, the signal-transmitting mechanism and the thermostat.

Referring first to the improved form of thermostat illustrated in detail in Fig. 5, it will there be seen that I indicates a case within which a compensating thermostat-coil I′ of well-known form is held stationary at its lower end, its upper end being fastened to a toothed sector I^2, attached to a short shaft I^3, pivoted in suitable bearings secured to the case I. The expansion and contraction of the coil by changing temperature causes the sector to oscillate and turn a pinion I^4 on a shaft I^5, carrying a hand or pointer I^6 on the front side or face of the case I, which moves over a scale on said face, indicating the degree of temperature. An insulating-block K, fastened to the case I, has secured thereto two depending arms K′ K^3 and a spring-finger K^2, extending downwardly between and below the lower ends of the arms K′ K^3, which are provided, respectively, with adjusting-screws k' k^3. The screw k' is normally in contact with the spring-finger K^2, a space intervening between said finger and the screw k^3, which is increased or decreased as the screw is turned. A pin i, projecting from the sector I^2, is arranged to strike the lower end of the spring-finger K^2 as the temperature rises, and acting on the coil I′ turns the sector I^2 in the proper direction. By adjusting the screw k' the spring-finger will break the closed circuit through wires 50 at any degree of temperature desired and close the open circuit through wires 60 at any higher degree, the point being determined by the position of the screw k^3.

The signal-transmitting mechanism C (illustrated in Figs. 2, 3, and 4) is formed of two successively-acting clock-trains D E, similar to each other in all respects. Each train has a frame 10, in which is journaled a winding-shaft 11, carrying a driving-spring and a spur-gear 13. A shaft 14, on which is fixed a pinion 15, driven by the spur-gear 13, extends through the upper frame-plate and carries a notched circuit-breaking disk, the one on the clock-train D being numbered 16, while that on the train E is numbered 17. The number and grouping of the notches on each disk indicate the signal sent to the central office. A shaft 19 in each train is turned by a gear-wheel 22 on the shaft 14 meshing with a pinion on said shaft 19, which also carries an escape-wheel 20. Pallets 23^d and 23^c engage, respectively, the escape-wheels 20 of the clock-trains D E and retard their movement. A handle 24 or other means for winding the driving-spring of each clock-train is attached to the shaft 11, less than one turn of the handle being required to wind the spring sufficiently for rotating the notched disks 16 17 the necessary number of times. Above the clock-train D is fixed an electromagnet G, the armature of which is attached to one arm of a bell-crank lever g, pivoted at g'. The other arm of the bell-crank lever extends across the electromagnet and has a downwardly-extending portion g^2, which projects into the path of a finger 24^d on the pallet 23^d and stops the train D when the circuit through the magnet G is closed, but which falls when the circuit is opened, thus releasing the finger and train D, which then operates to turn the notched disk 16 and send its signal-number to central office through a contact-finger 16^d in the main circuit 6. After the clock-train D has sent in its signal-number and before it runs down a pin 25, projecting from a disk 26, rotating with the winding-shaft 11, rocks a lever 27, pivoted at 28, disengaging the pallet 23^e of the clock-train E, which until this time had been held against movement by the lever 27 engaging a finger 24^e, projecting from the pallet. The notches in the periphery of disk 17, which are arranged differently from those on disk 16, will cause a different signal to be sent to the central office through the contact-finger 17^c and the main line. The clock-train F, which is designated the "battery-signal," is used to warn the central office whenever the local battery X in the building B has deteriorated to such an extent as to be inoperative or when a wire has been cut, broken, or become disconnected. The clock-train F differs from D and E in the fact that two insulated contact-fingers 18^a and 18^b lie in contact with the notched disk 18, one of which fingers, 18^a, is connected electrically by wire 6^a to the contact-finger 16^d, while the other one, 18^b, is connected directly to the main line 6. The clock-train F is held against movement by means of a finger 24^f, attached to pallet 23^f, resting on one arm h' of a bell-crank lever H′, its other arm h^2 carrying the armature of an electromagnet H in a closed local circuit 30. Depending from the pallet 23^d is a finger J, its lower end being in such relation to the arm h' that it is free to vibrate when the circuit through the magnet H is closed; but as soon as the circuit is broken the armature falls by gravity, turning the elbow-lever H′ and bringing the notched edge of arm h' into contact with finger J stops the train D. As the arm h' moves forward to engage the finger J the finger 24^f is released and the train F rotates, sending in

to the central office its signal-number to call attention to the fact that something is wrong in the building B.

In the operation of my system, the normally closed main circuit which extends from the central office, where are placed the signal-receiving instruments, to the building or buildings designed to be protected from fire, the wire 6, which forms a part of the main circuit, connects the main battery or generator 7 to the relay-magnet of the signal-receiving instruments, from whence it passes to the building B, being connected to the contact-finger 17^e of one of the signal-transmitting instruments C. A wire 6^a connects contact-fingers 16^d and 18^a on clock-trains D and F, respectively. From contact-finger 18^b the wire 6 passes to a second signal-transmitting instrument C, and so on through all the instruments in the building. At convenient places, such as in halls and public rooms, manually-operated fire-alarm boxes L are introduced into the circuit. An electrically-operated fire-alarm box M is also placed in each building in the circuit of wire 6, which then passes out of the building and back to the central office, its circuit including an outside fire-alarm box N and, if desired, other similarly-arranged buildings. Within the building B is placed a local battery X, from which an electric current passes by way of wire 50 to the binding-post of the arm K′ of one of the thermostats I. The screw k' being normally in contact with the central finger K^2, the current will pass through said finger to wire and thence to the electromagnet G of its accompanying signal-transmitting instrument and back to battery. It will thus be seen that a normally closed circuit will always be maintained from the battery X through the arm K′ and the circuit-closing fingers K^3 of each thermostat and the electromagnet G of its accompanying circuit-transmitting instrument when the temperature is normal and the battery X in working order. Should, however, a fire occur in the vicinity of one of the thermostats, the rise in temperature would expand the coil I′ and turn the sector I^2, causing the pointer I^6 to indicate the degree of temperature on the dial and at the same time bring the pin i nearer the finger K^2. As soon as the temperature rises to the predetermined degree the pin i will move contact-finger K^2 away from the screw k' and break the circuit. At the instant the circuit is broken electromagnet G becomes deënergized, the arm g falls and disengages the finger 24^d on the pallet 23^d, which had been prevented from moving by the downwardly-extending portion g^2 of the arm g. The clock-train D will now operate, rotating the notched disk 16 and, interrupting the normally closed main circuit whenever a notch passes beneath the point of contact-finger 16^d, will cause the bell 3 at central office to ring and register 4 to indicate on a ribbon of paper the signal—which, for instance, is "33"—sent in from instrument C, the signal being usually repeated four times. The pin 25 on the disk 26, which latter had been slowly rotating with the shaft 11, now raises the lever 27, which disengages the pallet 23^e of the clock-train E. The notched disk 17 thereon immediately rotates and sends its signal to the central office, which in this instance is "3." The signals thus sent indicate on the third floor of a building, known as No. 33, there is an undue amount of heat, whereupon an employee will be sent to examine into the matter. If from any cause this warning signal is disregarded and the temperature increase, or should the heat increase so rapidly as to raise the temperature to the danger-point before the arrival of assistance, a fire alarm will be sent through the electrically-operated box M in the following manner: From the battery X wires 60 extend to all the thermostats, being connected to the binding-post of arm K^3, returning to battery from finger K^2 through electromagnet M′ in the electrically-operated fire-alarm box M within the building. This circuit through wire 60 being an open one, the mechanism in the fire-alarm box M will remain out of action until the circuit is closed, which will occur when the finger K^2 makes contact with screw k^3, the contact taking place when the thermostat reaches the predetermined degree of heat for which it is adjusted. The circuit being closed through the electromagnet M′, its armature will be attracted, raising the lever m and permitting the gravity-latch m' to fall, thus disengaging the clock mechanism and sending in a second alarm over the circuit 6, calling out the fire department.

The manually-operated boxes L are intended to be operated by any person about the building who discovers a fire and without waiting for the automatic mechanism to operate.

An annunciator B′ may be introduced into the circuit 50, if desired, or should the system be introduced into a hotel in which an open annunciator-circuit is already established the thermostats may be introduced without the signaling instruments, as illustrated in Fig. 6, a shunt-circuit passing around the usual push-button y and connected to the arm K^3 and the fingers K^2 of the thermostat. When an old hotel is to be remodeled or an annunciator first introduced, a closed-circuit system will be used. An annunciator-drop having fallen, all attempts to return it in case of fire in a room will prove unavailing, because the circuit through the contacts K′ K^2 of the thermostat remains broken. This being the case, the officer of the hotel will at once know the cause of trouble and can take immediate steps to rectify the evil. This system is also adaptable to steam and other vessels.

It may happen that the local battery X for some cause known or unknown becomes weak and inefficient, a cell breaks, or a wire becomes disconnected, broken, or cut. With-

out some means of discovering or detecting this fact, a building supposed to be protected would be in great jeopardy. To overcome this difficulty, I have placed within each case containing the successively-acting signal-transmitting mechanisms a device F, which I call a "battery-signal." A closed circuit 30 from battery X, which may be a shunt from circuit 50, passes through the electromagnet H and holds the elbow-lever H′, to which is fixed the armature in the elevated position shown in Fig. 2. The main circuit 6, as before described, includes the insulated contact-fingers 18^a 18^b, which rest on the insulated notched disk 18. When the battery is in working order, the finger 24^f rests on the upright arm h' of the elbow-lever H′; but the moment it weakens the electromagnet H becomes deënergized, and the lever-arm h^2 drops, rocking the lever H′ and withdrawing the arm h' from beneath the finger 24^f. The clock-train F will then be free to run, turning the notched disk 18 and sending to the central office its number, "13." This number alone being received at the central office will show that the battery or circuits connected therewith require attention.

Having thus described my invention, I claim—

1. The combination of a normally closed main electric circuit, a fire-alarm box included in said circuit, successively-acting signal-transmitting instruments operated by clock-trains, a controlling-electromagnet, a closed local electric circuit, an open local electric circuit, and a thermostat adapted to open the closed circuit through said electromagnet and release the clock-trains when the temperature reaches a predetermined degree of heat, and close the open circuit through the fire-alarm box when the temperature reaches a predetermined higher degree of heat, substantially as set forth.

2. In a fire-alarm system, the combination of a normally closed main electric circuit, a fire-alarm box, and an automatic signal-transmitting instrument included in said circuit, an electromagnet, G, for controlling the signal mechanism of the transmitting instrument, a thermostat, a local battery, a closed circuit from the local battery through the magnet, G, and the thermostat, and an open circuit from said local battery through the fire-alarm box and the thermostat, substantially as set forth.

3. In a fire-alarm system, the combination of a normally closed main circuit, a fire-alarm box, and a signal-transmitting instrument included in said circuit, an electromagnet, G, in said transmitting instrument, a thermostat, a local battery, a closed circuit from the local battery through the magnet, G, and the thermostat, an open circuit from local battery through the fire-alarm box, and the thermostat, a battery signaling instrument also on the main circuit, and a second closed circuit from the local battery through the battery signaling instrument, substantially as set forth.

4. In a fire-alarm system, the combination of a normally closed main electric circuit, a fire-alarm box and an automatic signal-transmitting instrument operated by clock-train, included in said circuit, a closed local circuit containing an electromagnet for tripping the clock-train, a battery, a thermostat adapted to open the closed local circuit when the temperature reaches a predetermined degree of heat, an open circuit from said battery to the fire-alarm box, which circuit is closed when the temperature reaches a predetermined higher degree of heat and trips the mechanism in said fire-alarm box, and a separate instrument on the main circuit adapted to transmit thereover an arbitrary signal when the local battery fails, substantially as set forth.

5. In a fire-alarm system, in combination with a normally closed main circuit, including signal-receiving instruments, successively-acting signal-transmitting instruments, an independent, automatic signal-transmitting instrument and manually and electrically operated fire-alarm-signaling instruments, a battery, a closed circuit from battery to the electromagnet of the successively-acting signal-transmitting instruments, an open circuit from said battery to the electrically-operated fire-alarm-signal instrument, a thermostat adapted to open the closed and close the open circuits, and a second closed circuit also from said battery to the magnet of the independent, automatic signal-transmitting instrument, substantially as set forth.

6. In a fire-alarm system, successively-acting signal-transmitting instruments, each operated by a clock-train, a circuit-breaking disk adapted to be rotated by each clock-train, means for arresting the movement of each clock-train, an electromagnet in a closed circuit adapted to release one of the clock-trains when the circuit is broken, a battery in the closed circuit, an independent signal-transmitting instrument containing a clock-train, a rotatable disk, and means for stopping the clock-train, an electromagnet in a second closed circuit from the battery, and mechanism for releasing the independent signal-transmitting instrument and arresting the movement of the successively-acting signal-transmitting instruments when the circuit through the last-named magnet is broken, substantially as set forth.

7. In a fire-alarm system, successively-acting signal-transmitting instruments, an independent signal-transmitting instrument, a circuit-breaking disk on each instrument rotated by clockwork, means for arresting the movement of each circuit-breaking disk, a thermostat, an electromagnet on a closed electric circuit adapted to be broken by the movement of the thermostat for releasing the first of the successively-acting signal-transmitting instruments, a battery in the closed circuit,

an electromagnet energized by a second closed circuit from the battery, means controlled by said electromagnet for alternately releasing and arresting the operation of the successively-acting and independent signal-transmitting instruments, and a normally closed main circuit passing through the several circuit-breaking disks, substantially as set forth.

8. In a fire-alarm system, successively-acting signal-transmitting instruments, rotatable circuit-breaking disks thereon, a battery, an electromagnet for arresting the operation of the circuit-breaking disks while the circuit remains unbroken, a normally closed main circuit through said signal-transmitting instruments, a second electromagnet in a closed circuit from the battery, and means in the normally closed main circuit for sending an arbitrary signal therethrough should the battery become inoperative, substantially as set forth.

9. In a fire-alarm system, the combination of a normally closed main circuit, signal-receiving instruments therein at a central office, signal-transmitting instruments also in the normally closed main circuit in various parts of a building to be protected, a local battery, closed local circuits, controlling through the movement of thermostats the operation of each signal-transmitting instrument, and means in the normally closed main circuit for transmitting an arbitrary signal to the central office when the local battery fails, substantially as set forth.

10. A signal-transmitting instrument provided with an electromagnet, a battery, a circuit from the battery through said electromagnet, a second signal-transmitting instrument also provided with an electromagnet, a second or shunt circuit from aforesaid battery to the second electromagnet, and means for locking against movement the first-mentioned signal-transmitting instrument while the second instrument is in operation.

11. A signal-transmitting instrument operated by clockwork and provided with an electromagnet and a circuit-breaker, a thermostat, a battery, a closed local circuit from the battery through the electromagnet and the thermostat, a second signal-transmitting instrument similar to the first, a second closed circuit from the aforesaid battery to the magnet of the second signal-transmitting instrument, and a normally closed main circuit passing through the circuit-breakers of the two instruments, substantially as set forth.

12. A signal-transmitting instrument operated by clockwork and provided with an electromagnet and a circuit-breaker, a thermostat, a battery, a closed local circuit from the battery through the said electromagnet and the thermostat, a second signal-transmitting instrument operated by clockwork also provided with an electromagnet, and a circuit-breaker, a closed local circuit from the aforesaid battery to the second electromagnet, means for locking against movement the first-mentioned signal-transmitting instrument when the second instrument is in operation, and a main circuit passing through the circuit-breakers.

13. In a fire-alarm system, the combination of a normally closed main electric circuit, a fire-alarm box and an automatic signal-transmitting instrument included in said main circuit, controlling-magnets, M′, G, in the fire-alarm box and automatic signal-transmitting instrument respectively, a closed local electric circuit through the magnet, G, an open local circuit through the magnet, M′, a battery, and a thermostat through which both local circuits pass, substantially as set forth.

14. In a fire-alarm system, the combination of a normally closed main circuit, a fire-alarm box and a signal-transmitting instrument included in said main circuit, a controlling-electromagnet, M′, in the fire-alarm box, a similar magnet, G, in the signal-transmitting instrument, a closed local circuit through the magnet, G, an open local circuit through the magnet, M′, a battery and a thermostat through which both local circuits pass, and a battery signaling instrument on the main closed circuit, containing an electromagnet in a closed shunt-circuit from the aforesaid battery, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT G. CALLUM.

Witnesses:

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C. C. MOTHERSEAD.