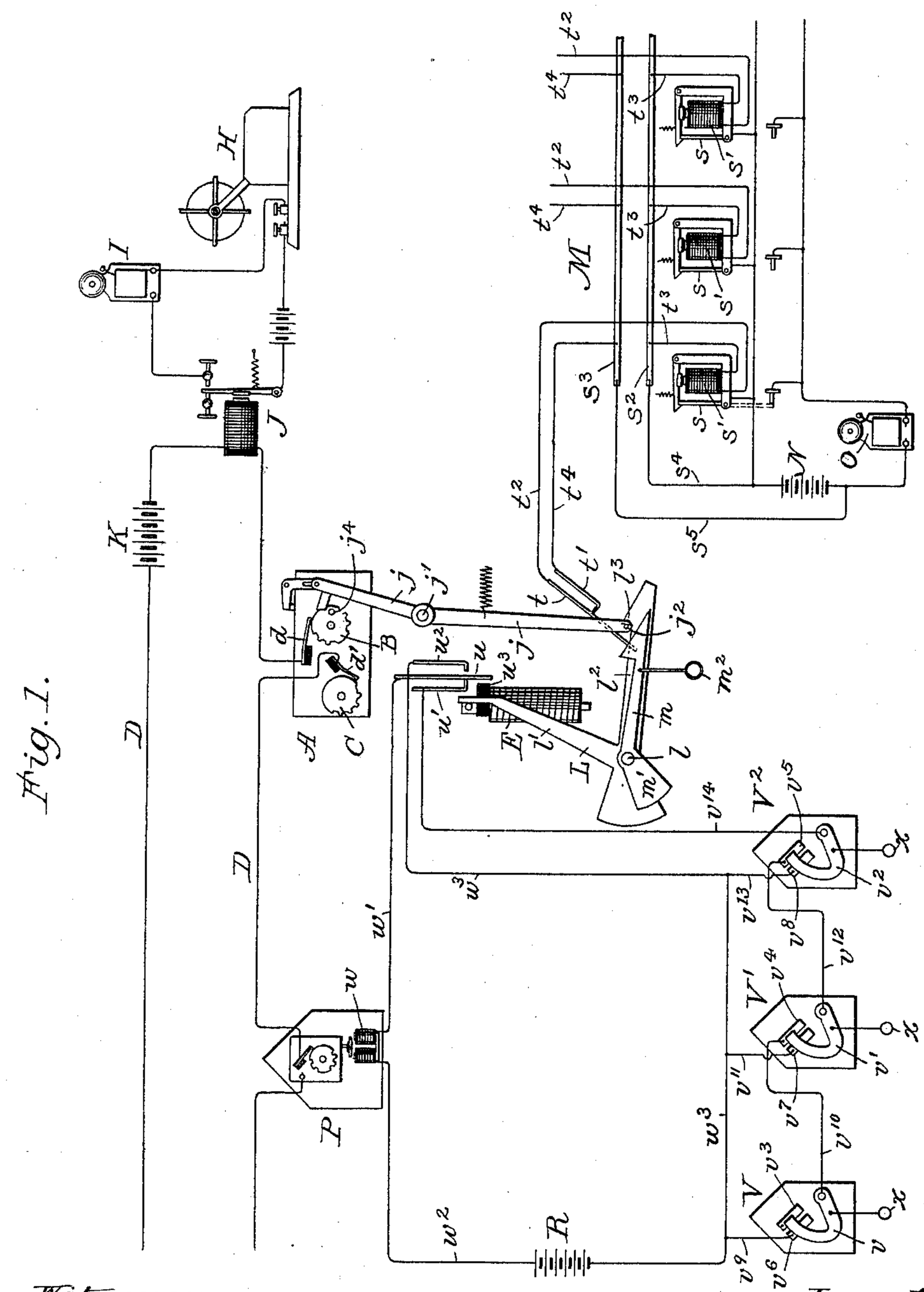
No. 626,364. Patented June 6, 1899.

R. G. CALLUM & J. W. FRITCH.

AUTOMATIC FIRE ALARM SYSTEM.

(Application filed Feb. 23, 1899.)

(No Model.) 4 Sheets—Sheet 1.



Witnesses:
Sidney P. Hollingsworth.
Chas. Neal

Inventors:
Robert G. Callum
John W. Fritch.
By Howard Barton
Attorney.

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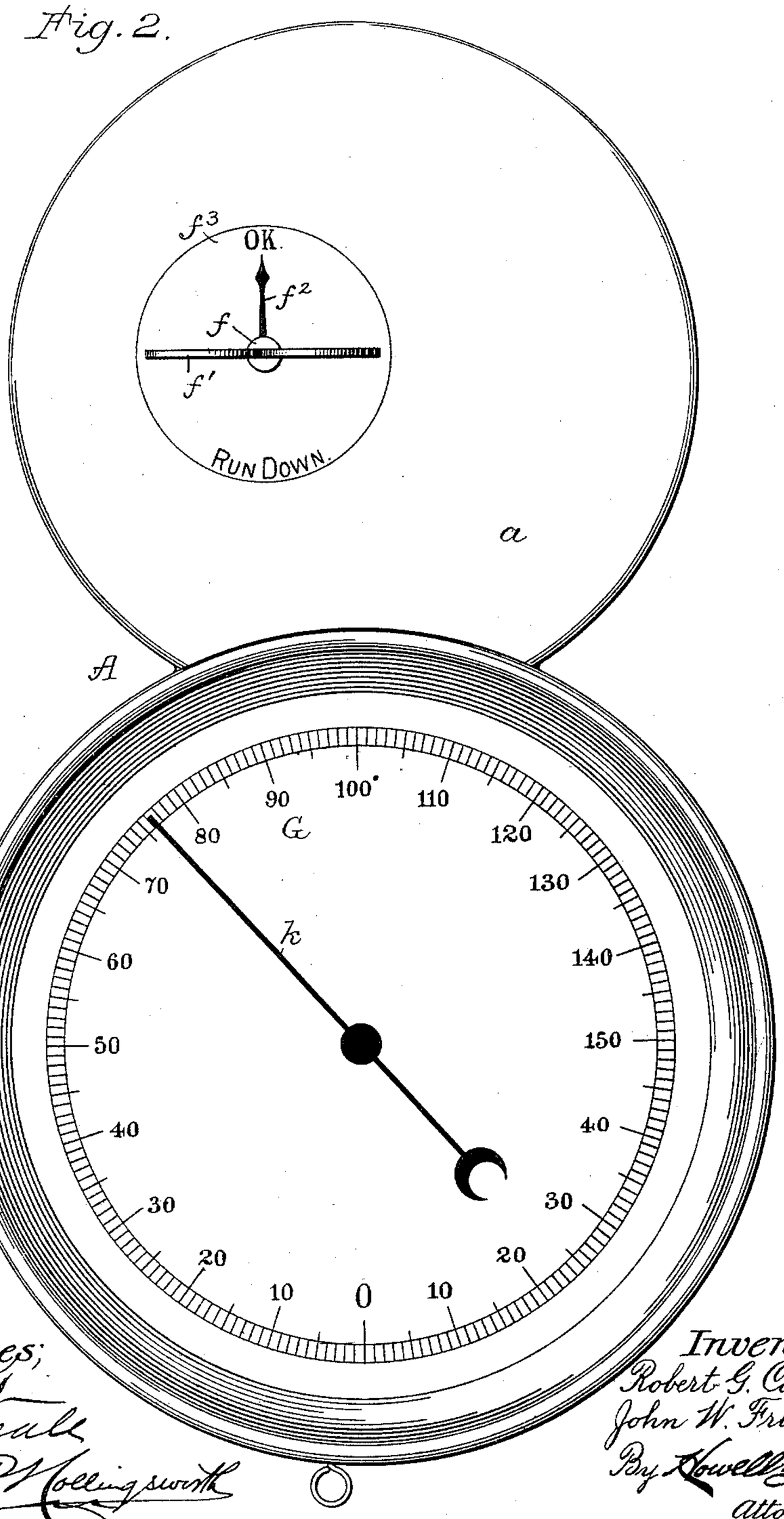
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



Witnesses;
Edw. Neale
Sidney P. Hollingsworth

Inventors:
Robert G. Callum
John W. Fritch
By Howell & Battle
Attorney.

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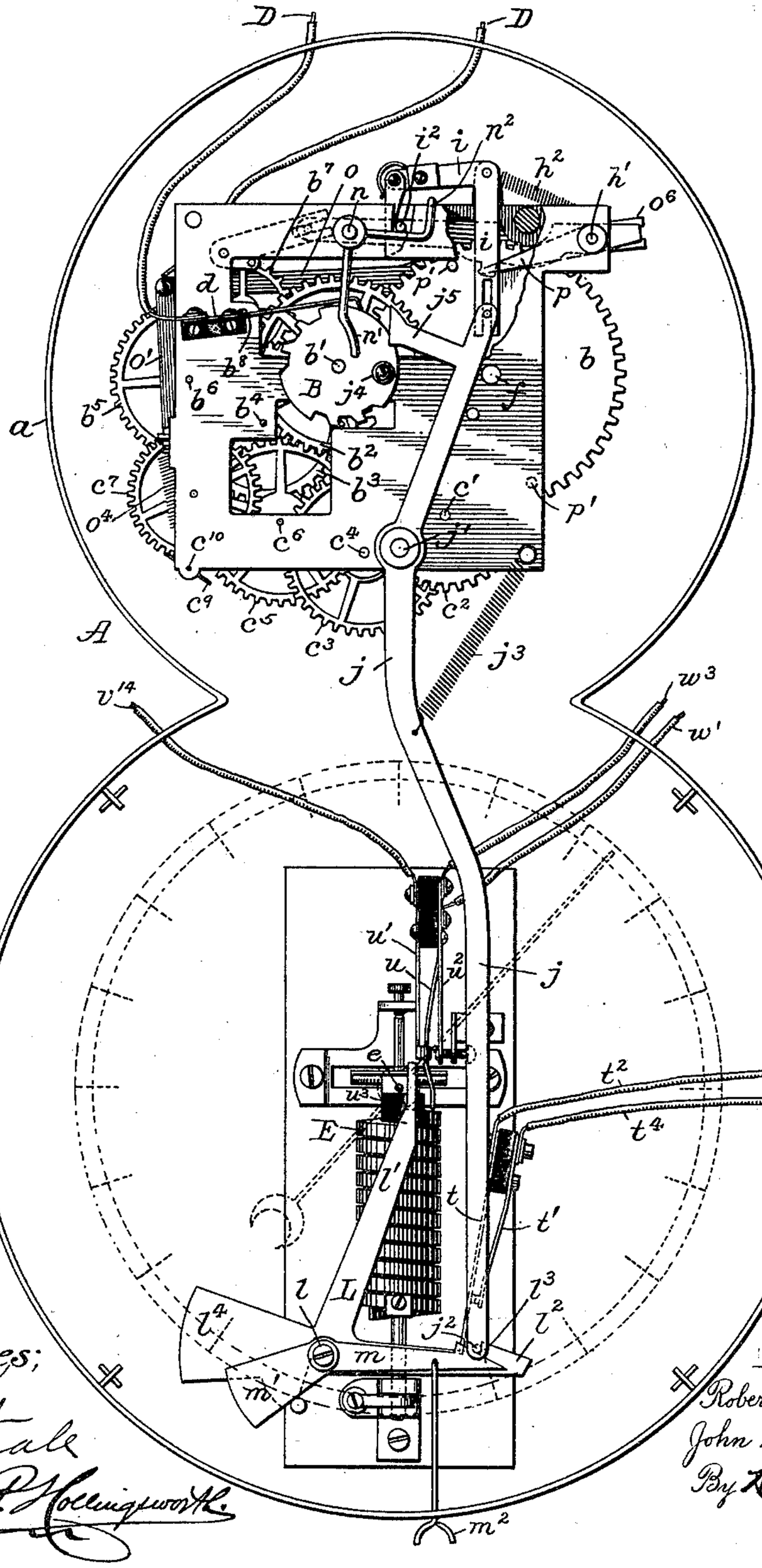
(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



Witnesses;

Edw. Neale

Sidney P. Hollingsworth.

Inventor

Robert G. Callum

John W. Fritch.

By Howell Battle.

Attorney.

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Fig. 4.

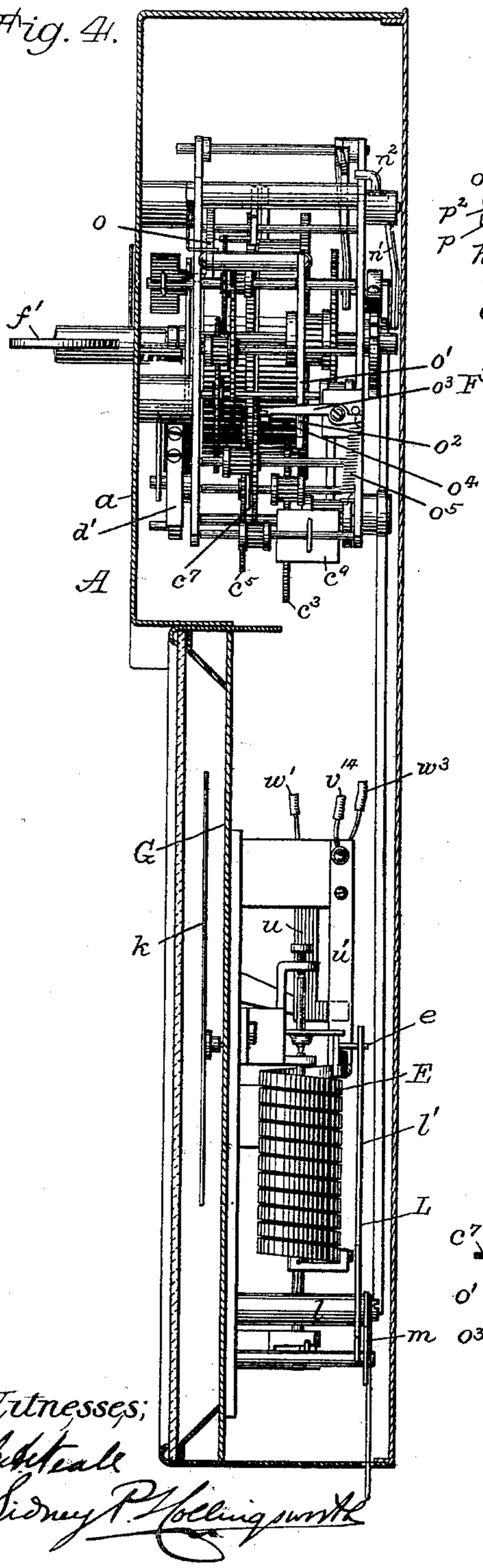


Fig. 5.

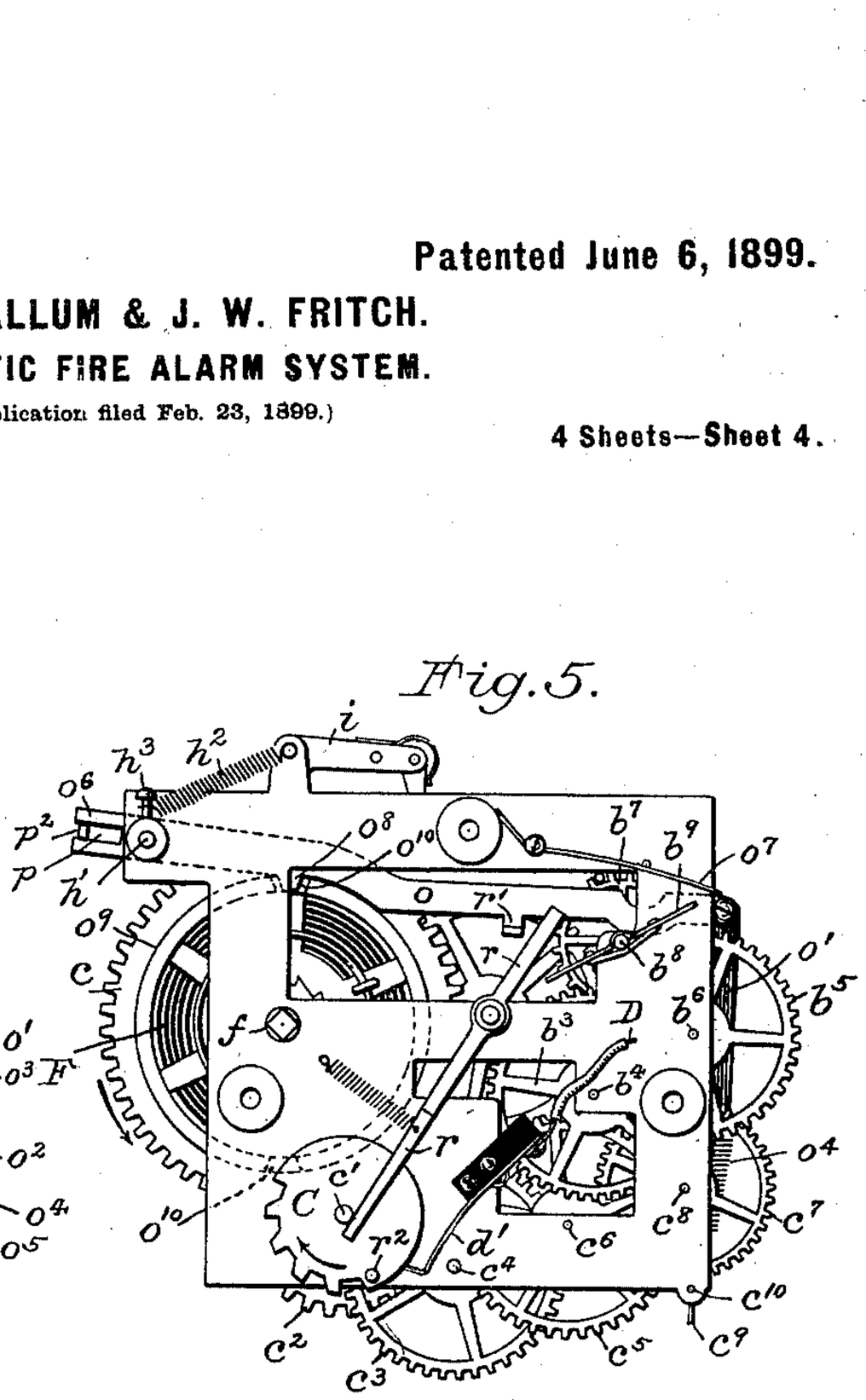
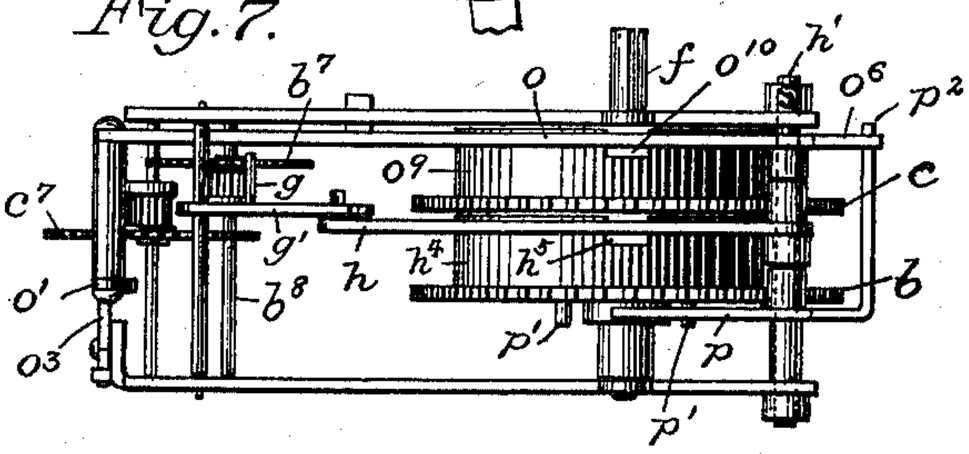


Fig. 6.

Fig. 7.



Witnesses;
b. b. Steele
Sidney P. Hollingsworth

Inventors:
Robert G. Callum.
John W. Fritch
By Howell & Gatlin
Attorney

UNITED STATES PATENT OFFICE.

ROBERT G. CALLUM AND JOHN W. FRITCH, OF WASHINGTON, DISTRICT OF COLUMBIA; SAID FRITCH ASSIGNOR TO SAID CALLUM.

AUTOMATIC FIRE-ALARM SYSTEM.

SPECIFICATION forming part of Letters Patent No. 626,364, dated June 6, 1899.

Application filed February 23, 1899. Serial No. 706,575. (No model.)

To all whom it may concern:

Be it known that we, ROBERT G. CALLUM and JOHN W. FRITCH, citizens of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Automatic Fire-Alarm Systems, of which the following is a specification.

Our invention relates to the class of fire-alarm systems in which a warning or precautionary and a second or fire signal are automatically transmitted to a central or receiving station, the first or warning signal indicating the presence of undue heat and the second indicating the presence of fire, or that the temperature is above a predetermined danger-point at the place signaled from.

In a system embodying our invention each building included within the system is provided with signaling transmitting instruments placed at such points upon each floor thereof as may be deemed most liable to danger from fire, and all of said instruments are included within a closed metallic circuit connected with receiving or recording instruments located at a central station, in the usual manner. These signal-transmitting instruments, which will hereinafter be referred to as the "warning-signal" instruments, are each provided with circuit-breaking wheels driven by suitable clockwork for transmitting to the central station a signal indicating the building and the floor or point therein where such instrument is located. The clockwork of each instrument is connected with a thermostat in such a manner as to be tripped or released thereby when the surrounding temperature rises to or above a predetermined degree of heat. Each building is also provided with an annunciator connected with and operated by the clockwork of each warning-signal instrument therein, so that parties in the building may be promptly notified of the existence and location of a fire occurring therein, and as the clockwork of the warning-signal instrument must at all times be wound up and reset after each operation we have so constructed and connected the annunciator that after it has been operated by any of the instruments with which it is connected it cannot be reset until attention has been given to the particular instrument or instruments indicated thereon.

The signal transmitted to the central station by a warning-signal instrument and indicated by the annunciator in the building where such instrument is located is intended to indicate the presence of undue heat at the particular point signaled from in order that the cause thereof may be promptly removed, if possible, without the aid of the fire department; but in case the warning-signal should be neglected and the heat continue to increase we have provided for automatically operating a street fire-alarm box, which may be one of the boxes provided by the municipal authorities and connected directly with the fire-engine houses or it may be a special box in the same circuit with the warning-signal instruments. In either case said box is provided with an electromagnet for starting the mechanism in a manner well known, and said electromagnet is included within a local circuit controlled by the thermostats of the warning-signal instruments, as will be hereinafter described.

After a detail description of a system embodying our invention the features deemed novel will be specified in the claims hereunto annexed.

Referring to the drawings, Figure 1 is a diagrammatic illustration of so much of a fire-alarm system as is deemed necessary for a proper understanding of our invention. Fig. 2 is a front view of the warning-signal instrument. Fig. 3 is a rear view of the same with the back plate of the casing removed for disclosing the interior mechanism. Fig. 4 is a longitudinal sectional view through the casing of the warning-signal instrument, showing the interior mechanism in side view. Fig. 5 is a front view, and Figs. 6 and 7 detail views, of the clockwork for rotating the circuit-breaking wheels.

In the warning-signal instrument A, illustrated in diagram in Fig. 1 and in detail in Figs. 2 to 7, inclusive, there are two circuit-breaking wheels B and C, rotated successively by separate trains of gearing propelled by a single spring, as will be hereinafter explained. These circuit-breaking wheels are each provided with notches for in-

terrupting a circuit in the usual way, and both are in closed circuit with a central station by a wire D, which is connected with a contact spring or brush d in contact with circuit-breaking wheel B and with a contact-brush d' in contact with the circuit-breaking wheel C, so that current will pass from brush d to circuit-breaking wheel B, through the various parts of the clockwork to circuit-breaking wheel C, and out by way of brush d'. The circuit-breaking wheels B and C are rotated by separate trains of gearing, each provided with its own starting and stopping mechanism. The train controlling the wheel B is started by the action of a thermostat E and that controlling the wheel C by the action of the train controlling the wheel B after the latter has performed its service of transmitting a signal to the central station. The driving-spring F is secured to a shaft f; but instead of controlling a single driving-gear said spring is connected for driving either of two separate gears, each controlling independent trains connected, respectively, with the circuit-breaking wheels B and C. The driving-gear b is rotatively mounted on the spring-shaft f and drives the train controlling the circuit-breaking wheel B. The driving-gear c rotates with the shaft f and drives the train controlling the circuit-breaking wheel C. The inner end of the spring F is connected to the shaft f in the usual manner; but instead of having its outer end secured to a fixed stud it is secured to the driving-gear b, so that the latter may be driven while the gear c remains stationary or the gear c driven while the gear b is stationary, as will be readily understood. The shaft f and gear c are rotatively coupled together by a ratchet and pawl in the usual manner, so that the shaft may be turned for winding the spring, and said shaft projects to the outside of the casing a and is provided with a handle f', as clearly shown in Figs. 2 and 4.

The driving-gear b meshes with a pinion on shaft b', to which is secured the break-wheel B and a gear b^2, the latter driving a train consisting of gear b^3 on shaft b^4, gear b^5 on shaft b^6, and toothed wheel b^7 on shaft b^8, the latter carrying a fan b^9, and each shaft is provided with a pinion meshing with its driving-gear in the usual manner. The toothed wheel b^7 is engaged and disengaged for stopping and starting the train by a pin g, carried by a lever g^8, the latter being moved toward and from the toothed wheel by a lever h, fixedly mounted on a shaft h' and held in its depressed position by a spring h^2, attached to an arm or stud h^3 at the end of the shaft h^8, as clearly shown in Fig. 5. Pivoted at a point above the lever h is a bell-crank lever i, one arm of which carries a hook i', engaging with a pin or stud i^2 on the lever h, the other arm being provided with a forked end engaged by a pin at the end of a lever j, pivoted at j' and extending downwardly for engagement with mechanism connected with the thermostat, as clearly shown in Fig. 3. The thermostat E is a sensitive helical coil the lower end of which is held stationary and the upper end free to wind and unwind with changes in temperature, after the manner of coils employed in ordinary dial-thermometers, and in order that said coil may also act as a thermometer we have provided a dial G and pointer k, the latter being connected to the coil by means of a pinion and toothed sector in the usual way. Pivotally supported by a suitable stud l is a bell-crank lever L, the upper arm l' of which lies in the path of a pin e, attached to the free end of the helical coil or thermostat E, so that said bell-crank lever will be moved by said pin at a predetermined degree of heat by the unwinding of the thermostat-coil. The lower arm l^2 of the bell-crank lever L is provided with a latch or hooked end l^3, which engages a pin j^2 on the lower end of the lever j for holding the latter in proper position when the instrument is set ready for use. The bell-crank lever L is weighted, as at l^4, for maintaining it in proper working relation to the thermostat and the lever j. It is now to be understood that the adjustment between pin e and the upper arm of the bell-crank lever L is such that the lever j will only be released from engagement with the lower arm of the bell-crank lever when the temperature reaches the degree of heat determined upon as that for which a warning-signal should be given. The lever j after being released is moved by a spring j^3 away from the bell-crank lever L, which causes the bell-crank lever i to raise the lever h. This in turn raises the lever g' and releases the pin g from engagement with the toothed wheel b^7 and permits the circuit-breaking wheel B to revolve, as will be readily understood. If the lever j be allowed to remain in the position to which it is moved by the spring j^3, the circuit-breaking wheel will continue to revolve until the spring F has spent its force. It is desirable that a signal be repeated a sufficient number of times to guard against possible error in reading; but as the spring F is relied upon for revolving the circuit-breaking wheel C after the wheel B has performed its service we provide for automatically stopping the latter after it has completed three revolutions. Upon the circuit-breaking wheel B is a pin or projection j^4, which engages an arm or projection j^5 on the lever j and moves the latter back to a point a little beyond its original position upon the first revolution of the wheel B, the pin upon the subsequent revolutions of the circuit-breaking wheel performing no service so far as the lever j is concerned. The bell-crank lever L having been moved by the thermostat from the path of the pin j^2 at the lower end of the lever j, a latch m is provided for engaging said pin and holding the lever j to the position to which it has been moved by the pin on the circuit-breaking wheel B. The latch

m is pivoted to the stud l, supporting the bell-crank lever L and is weighted, as at m', for insuring proper latching engagement. At the inner side of the driving-gear b and surrounding the spring F is a concentric flange h^4, provided at two diametrically opposite points with openings or slots h^5 h^5, and on the under side of the lever h is a lug or projection h^6, which when the train is at rest rests in one of said openings. When the lever h is raised for starting the train, the lug h^6 is sufficiently above the flange h^4 to permit the rotation of the driving-gear b, and the lever h is held in its raised position by the hook i' of the bell-crank lever i until the lever j is moved rearwardly by the circuit-breaking wheel B. The driving-gear b having then carried the opening h^5 past the lug h^6, the latter rests upon the flange h^4 and prevents the descent of the lever h until the slot or opening h^5 at the opposite side of the flange is brought beneath the lug h^6, the lever h being then permitted to descend and cause the pin g upon lever g' to engage the toothed wheel b^7 and stop the train, as will be readily understood.

If the lever h be permitted to descend, the moment the supporting-flange passes the lug h^6 the edge of the flange or the side of the opening h^6 will be in such close contact with the lug as to be liable to bind and prevent the lug from being withdrawn, and thus render the device wholly unreliable. We have therefore provided for holding the lever h in its raised position until the opening h^5, which is somewhat larger or wider than the lug h^6, is exactly central beneath the lug, so that the latter may enter free from contact with either edge thereof. Pivoted at n is a bell-crank lever having an arm n' projecting in the path of the pin j^4 on the circuit-breaking wheel B and its other arm n^2 projecting beneath the pin i^2 on the lever h, so that when the arm n' is acted upon by the pin j^4 the lever h will be supported in its raised position by the arm n^2. The circuit-breaking wheel B is geared to make three revolutions to one half of a revolution of its driving-gear b, and the pin j^4 is so located thereon as to engage the arm n' of the bell-crank lever just before the opening h^5 in the flange h^4 reaches the lug h^6 on the lever h and to release the same the moment the opening h^5 is central beneath the lug h^6. The arm n' is acted upon by the pin j^4 at each revolution of the wheel B, but during the first two revolutions the lever h is maintained in its raised position by the flange on the driving-gear and it is only at the end of the third revolution, when the opening in the flange reaches the lug h^6, that the support of the lever h by the arm n^2 is required.

The signal transmitted to the central station by the circuit-breaking wheel B is intended to designate the building and that of circuit-breaking wheel C the floor of the building where such instrument is located. At the moment the circuit-breaking wheel B has completed the transmission of its signal the circuit-breaking wheel C is set in motion by its driving-gear c, which, with its starting and stopping mechanism, is a substantial duplication of what has already been described in connection with circuit-breaking wheel B. The driving-gear c meshes with a pinion on shaft c', to which is secured the circuit-breaking wheel C and a gear c^2, the latter driving a train consisting of gear c^3 on shaft c^4, gear c^5 on shaft c^6, gear c^7 on shaft c^8, and a governor-fan c^9 on shaft c^{10}, each shaft being provided with a pinion meshing with its driving-gear in the usual manner. The starting and stopping mechanism consists of a lever o, loosely mounted on shaft h' and carrying at its outer end a rod or arm o', having a slot o^2, which, when the lever is in its depressed position, engages and holds a lever o^3 in the path of a pin o^4 on the gear c^7. The rear end of the lever o^3 is attached to a light spring o^5, which raises its forward end out of the path of the pin o^4, when permitted to do so, by the raising of the lever o. The lever o has a forked rearward extension o^6 and is held in its depressed position by a spring o^7. Loosely mounted on shaft h' is a lever p, arranged in the path of two pins p' p', carried by the driving-gear b, and at the opposite end of said lever is a pin p^2, which engages the forked end of the lever o. The pins p' p' are located upon the gear b at diametrically opposite points in position to raise the lever p just before the gear b is stopped in its rotation by the stopping mechanism connected therewith. The raising of the lever p by one of the pins p' causes the lever o to be raised for permitting the lever o^3 to be moved by its spring out of the path of the pin o^4 on the gear c^7. This allows the train to be revolved by the spring F, through the driving-gear c, and after the circuit-breaking wheel C has completed three revolutions the train is automatically stopped in the same manner as before described in connection with circuit-breaking wheel B. The lever o is prevented from descending and stopping the train before the proper time by a lug o^8, which rides upon a flange o^9 on driving-gear c, said flange being provided with two diametrically opposite slots or openings o^{10} o^{10} for receiving said lug and stopping the train, as will be readily understood. The lever o is prevented from descending until the slot o^{10} is central beneath the lug o^8 by a spring-actuated lever r, which is pushed beneath a projection r' on the lever o and released therefrom at the proper moment by a pin r^2 on the circuit-breaking wheel C, as will be readily understood.

Now referring to Fig. 1, it is to be understood that while we have illustrated but one warning-signal instrument the line-wire D may extend to any number of buildings, and it includes within its circuit all of the warning-signal instruments in each building. At the central station is the usual recording in-

strument H and attention-bell I, operated from the main circuit by a relay J in the usual way. All of the instruments on the line-wire D are in closed electric circuit with the central station. The current passes from battery K to the relay J, and thence by line-wire D through each warning-signal instrument A, entering said instrument by way of brush d, through the circuit-breaking wheel B, through the metallic parts of the instrument to circuit-breaking wheel C, and out by way of brush d' to the next instrument, and so through all the instruments back to battery K. When the clockwork of a warning-signal instrument is set in motion by the action of its thermostat, the circuit-breaking wheel B is caused to revolve and by means of the notches therein to break the current at intervals, the number of breaks being recorded at the central station, and indicate the number of the building in which the instrument is located. After this number has been repeated three times, the wheel B is automatically stopped and circuit-breaking wheel C rotated, as already explained, the latter breaking the current in the same manner and recording at the central station a number corresponding to the floor where such instrument is located. As already explained, these signals, accurately locating the point of disturbance, are intended as a warning that the temperature is above a predetermined degree of heat, and that immediate attention is required to prevent serious damage.

In order that occupants of the building may also receive prompt warning of disturbance therein, each building is provided with a closed-circuit annunciator, (illustrated at M in Fig. 1.) This annunciator is provided with as many indicators or drops s as there are warning-signal instruments within the building. Each drop s is held by an electromagnet s', included within a closed circuit extending to a warning-signal instrument, where it is connected to a circuit-breaking device to be presently referred to. In the annunciator are two bars s^2 s^3, coupled by wires s^4 s^4, respectively, to opposite poles of a battery N. In each warning-signal instrument there are two spring-contacts t and t', the former projecting in the path of the pin j^2 on lever j, so as to be moved thereby, and separated from contact t' when the lever j is moved rearwardly by the circuit-breaking wheel B. When the lever j is in its normal or working position, the contacts t and t' are in electrical engagement; but when said lever, after having been released by the bell-crank lever L, is moved back by the pin j^4 on the circuit-breaking wheel B it is carried beyond its original position in order that the pin j^2 may engage the end of contact t and move it away from contact t', the latch m holding it in this position, as already explained. The contact t is connected by wire t^2 to one coil of an electromagnet s', the other coil of said magnet being connected to bar s^2. Contact t' is connected by wire t^4 to bar s^3. Each warning-signal instrument is coupled to the annunciator in the manner described, and it will be seen that each magnet thereof is in a normally-closed circuit from battery N through wire s^4 to bar s^2, thence through the coils of all the electromagnets s by way of wires t^3, thence to spring-contact t in each warning-signal instrument, through contact t' and wire t^4 to bar s^3, and back to battery through wire s^5. It will now be understood that the breaking of a circuit by the separation of contacts t and t' in any of the warning-signal instruments will cause an electromagnet of the annunciator to release a drop s, and thus indicate that a particular warning-signal instrument has been operated. In order that attention may be attracted to the operation of the annunciator, the drops s are connected to battery N, and in proper relation to each drop is a contact s^7, also connected to battery N, so that when a drop falls it will complete a circuit, in which is included a bell O in the usual manner.

With any automatic signaling apparatus dependent for its operation upon clock mechanism there is a liability of the clockwork being run down at a time when it is most needed. The warning-signal instrument above described, unless it be wound up and reset after after each operation, will fail to respond to the next disturbance, which might be of a serious character and cause great loss of property. This we guard against by the closed-circuit annunciator and its connections. After a warning-signal instrument has been operated the lever j is held by the latch m, and the pin j^2 upon said lever holds the contacts t and t' apart, and the annunciator-drop controlled thereby cannot be reset until the contacts are again brought together. It is therefore necessary to release the lever j from the latch m. This is done by pulling the ring m^2, attached to said latch, as shown in Fig. 1. The cause of the operation of the instrument having been removed, and the temperature consequently lowered, the bell-crank lever L will be in position to engage the lever j upon its release from latch m, the instrument then being set ready for action. When the party goes to the instrument to pull the ring m^2 in order to reset the annunciator, he resets the warning-signal instrument and at the same time his attention is called to the position of a pointer f^2 with relation to a dial f^3. The pointer f^2 is attached to the spring-shaft f of the clockwork, and when the spring F is wound up the pointer registers with the letters "O K" on the dial; but when the instrument has been operated the shaft f makes a half-turn and the pointer f^2 then points to the words "Run down." The party seeing this gives a half-turn to the handle f', which rewinds the spring and returns the pointer to the "O K" mark.

We have so far described our system with reference to the warning-signal only. Now in case the warning-signal should be neglected

or the cause thereof be not removed in time and the heat continue to rise above a predetermined danger-point we have provided for automatically operating a street fire-alarm box, one of which is illustrated at P, Fig. 1. These street-boxes are located at various points throughout the district covered by the system and may be in a separate circuit communicating directly with the fire-engine houses or in the same circuit with the warning-signal instruments communicating to the central station, as illustrated in Fig. 1. The signal from a street-box designates a certain section or district, and each warning-signal instrument within the section or district is operatively connected with the box, as will now be described. Within each warning-signal instrument are three spring-contacts u u' u^2. The contact u is normally in electrical contact with contact u' and projects in the path of an insulated block or projection u^3, carried by the movable end of the coil or thermostat E, so that said contact will be moved out of engagement with contact u and into contact with contact u^2 when the temperature reaches a predetermined degree of heat above that required for sending a warning-signal. Each building is or may be provided with house-boxes for enabling the street-box to be operated by hand in the event of a fire occurring at a point unprotected by a warning-signal instrument. These boxes, of which three are shown at V, V', and V^2, are of a well-known form, in which a switch is shifted from one contact-plate to another for making or shifting the direction of a circuit. The street-box P is operated by an electromagnet w in a normally open circuit, which when closed pulls a trip for starting the signal mechanism in the usual manner. One coil of the electromagnet w is connected by wire w' to spring-contact u, the other coil of said magnet being connected by wire w^2 with one pole of a battery R, the other pole of said battery being connected by wire w^3 to spring-contact u^2. The house-boxes V, V', and V^2 are each provided with a switch v v' v^2, normally resting upon contact-plates v^3, v^4, and v^5, respectively, and each switch is provided with a pull or handle x for shifting it to a second contact-plate v^6 v^7 v^8. Contact-plate v^6 of box V is tapped to wire w^3 by wire v^9, and the switch v of said box is connected by wire v^{10} to contact-plate v^4 of box V'. The contact-plate v^7 of box V' is tapped to wire w^3 by wire v^{11}, and its switch v' is connected by wire v^{12} to contact-plate v^5 of box V^2. The contact-plate v^8 of box V^2 is tapped to wire w^3 by wire v^{13}, and its switch v^5 is connected by wire v^{14} to spring-contact u'. It will now be seen that with the several parts in the position shown the magnet of the street-box P is in open circuit; but should the switches of any of the house-boxes be shifted from the contact-plate with which it is in contact to the adjacent plate the circuit will be closed and the street-box operated. For instance, if the switch v' of box V^2 be pulled to contact-plate v^7 the current will pass from battery R through wires w^3 and v^{11} to contact-plate v^7, to switch v', to contact-plate v^5, switch v^2, wire v^{14}, spring-contact u', spring-contact u, wire w', to magnet p, and back to battery by wire w^2. Now after a warning-signal has been given and the temperature continues to rise to a predetermined higher degree of heat, the spring-contact u is moved by the thermostat away from contact u' and into contact with spring-contact u^2. This also closes the circuit controlling the operation of the street-box and sends in an alarm of fire. The current passes from battery R through wire w^3 to spring-contact u^2, through spring-contact u to magnet w by wire w^8, and thence back to battery through wire w^2.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a fire-alarm system, the combination of a normally-closed electric circuit including electric signal receiving or recording instruments, a warning-signal-transmitting instrument in said circuit, clock mechanism for operating said warning-signal instrument, an annunciator or other signaling instrument controlled by the movement of said clock mechanism, a fire-alarm signaling instrument operated by an electromagnet, an auxiliary circuit controlling said electromagnet, and a thermostat adapted to trip the clock mechanism of the warning-signal instrument when the temperature rises to a predetermined degree of heat, and to make or break the auxiliary circuit when the temperature rises to a predetermined higher degree of heat, substantially as described.

2. In a fire-alarm system, the combination of a normally-closed electric circuit including electric signal receiving or recording instruments, a warning-signal instrument in said circuit consisting of a pair of circuit-breaking wheels, clock mechanism for driving said wheels successively, an annunciator or other signaling instrument controlled by the movement of said clock mechanism, a fire-alarm signaling instrument operated by an electromagnet, an auxiliary circuit controlling said electromagnet, and a thermostat adapted to trip the clock mechanism of the warning-signal instrument when the temperature rises to a predetermined degree of heat and to make or break the auxiliary circuit when the temperature rises to a predetermined higher degree of heat, substantially as described.

3. In a fire-alarm system, the combination of an electric signal-transmitting instrument operated by windable mechanism, a closed-circuit annunciator, and means whereby a circuit of the annunciator will be opened by the operation of said instrument and kept open until said instrument is set for another operation, substantially as described.

4. In a fire-alarm system, the combination of a series of signal-transmitting instruments, each controlled by a thermostat for automat-

ically transmitting a signal when the temperature reaches a predetermined degree of heat, a circuit-breaking device in each instrument controlled by the operation thereof, an annunciator consisting of a series of drops or indicators, each controlled by an electromagnet, all of said magnets being coupled in closed multiple circuit and each including within its circuit the circuit-breaking device of one of said transmitting instruments, substantially as described.

5. In a fire-alarm system, the combination of a signal-transmitting instrument operated by suitable clockwork, a latch, a lever normally engaged by said latch and adapted to start the clockwork of the transmitting instrument when released therefrom, a thermostat adapted to move said latch and release said lever when the temperature reaches a predetermined degree of heat, a second latch in the rear of the first-mentioned latch, and means controlled by the clockwork for moving said lever in engagement therewith, whereby the instrument may be reset by releasing the lever from said second latch, substantially as described.

6. In a fire-alarm system, the combination of a signal-transmitting instrument operated by suitable clockwork, a latch, a lever normally in engagement with said latch and adapted to start the clockwork when released therefrom, a thermostat adapted to move said latch and release said lever when the temperature reaches a predetermined degree of heat, a second latch in the rear of the first-mentioned latch, means controlled by the transmitting instrument for moving the lever in engagement with said second latch, a circuit-controlling device in line with said lever and adapted to be operated thereby, and an annunciator or other signaling instrument in circuit with said circuit-controlling device, substantially as described.

7. In a fire-alarm system the combination of a signal-transmitting instrument operated by suitable clockwork, a latch, a lever normally in engagement with said latch and adapted to start the clockwork of the transmitting instrument when released therefrom, a thermostat adapted to move said latch and release said lever when the temperature reaches a predetermined degree of heat, a second latch in the rear of said first-mentioned latch, means controlled by the operation of the transmitting instrument for moving the lever in engagement with said second latch, electric contacts adapted to be separated by said lever when in engagement with said second latch and closed when released therefrom, and an annunciator or other signaling instrument in circuit with said contacts, substantially as described.

8. In an electric signaling instrument the combination of two circuit-breaking wheels for transmitting separate signals, clockwork for driving first one and then the other of said wheels a predetermined number of times, mechanism for starting and stopping said clockwork, and a thermostat connected therewith and adapted to operate the same for starting said clockwork at a predetermined degree of heat, substantially as described.

9. In a fire-alarm system, the combination of a signal-transmitting instrument operated by suitable clockwork, a spring for operating said clockwork, a pointer connected with said spring for indicating the condition thereof, a thermostat connected with mechanism for starting said clockwork at a predetermined degree of heat, a closed-circuit annunciator, and means controlled by the movement of said clockwork for breaking the circuit of the annunciator, substantially as described.

10. In a fire-alarm system, the combination of a normally-closed electric circuit including electric receiving or recording instruments, of a series of signal-transmitting instruments operated by suitable clockwork, a spring for driving the clockwork of each instrument, a pointer connected with said spring for indicating the condition thereof, an annunciator consisting of a series of electromagnets each in a closed electric circuit and controlling an indicator or drop, a circuit-breaking device in each signal-transmitting instrument in circuit with an electromagnet of the annunciator and adapted to be operated for breaking said circuit when the signal-transmitting instrument is operated, substantially as described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

ROBERT G. CALLUM.
JOHN W. FRITCH.

Witnesses:
JOHN MCC. GLOVER,
HENRY W. REED.