

No. 671,898.

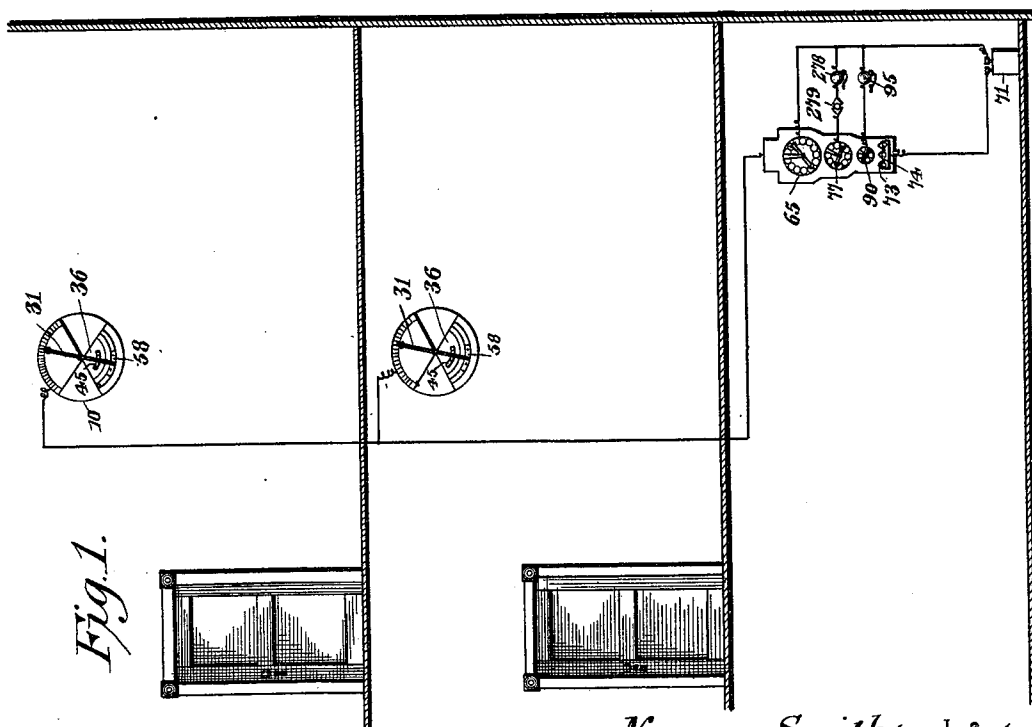
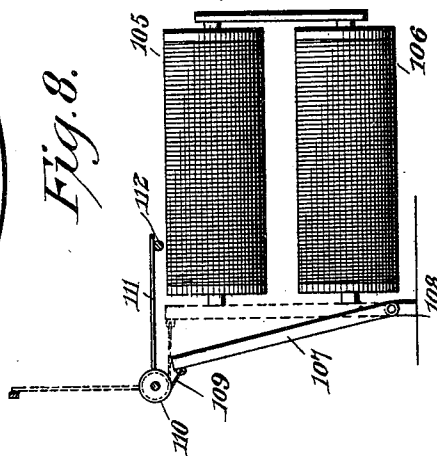
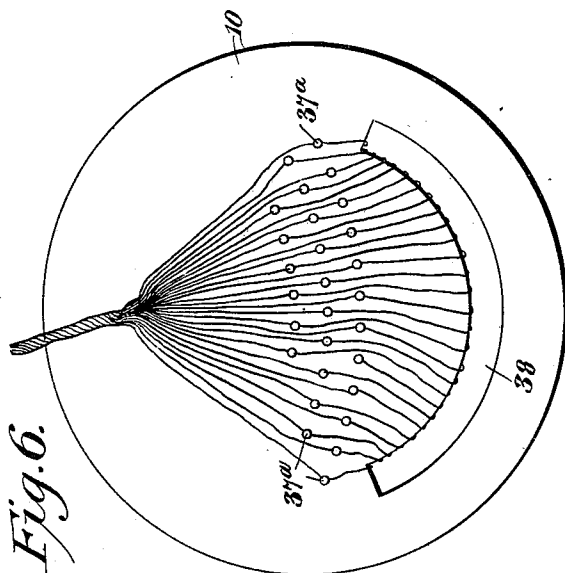
Patented Apr. 9, 1901.

N. SMITH.  
THERMOMETRIC ALARM SYSTEM.

(Application filed May 25, 1899.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses  
Jas. K. McEachron  
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N. SMITH.

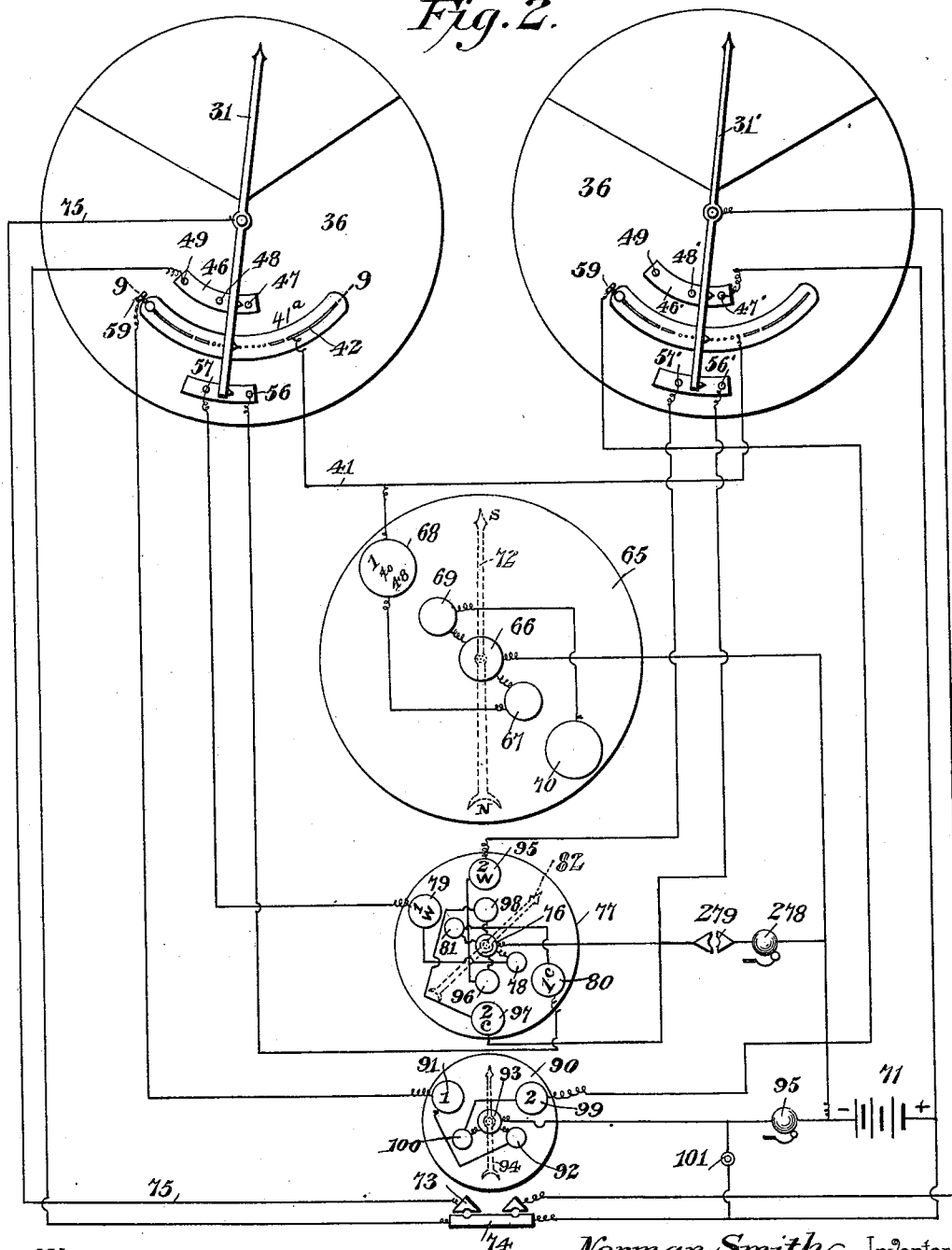
THERMOMETRIC ALARM SYSTEM.

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4 Sheets—Sheet 2.

Fig. 2.



Witnesses

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4 Sheets—Sheet 3.

Fig. 3.

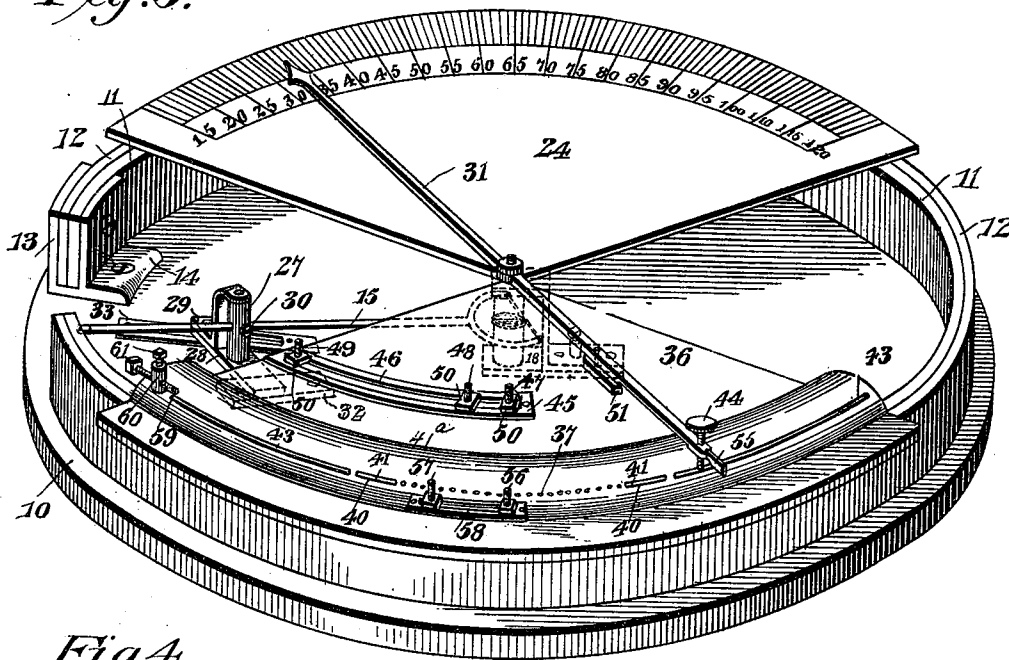


Fig. 4.

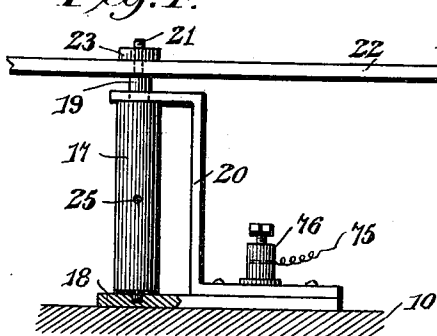


Fig. 11.

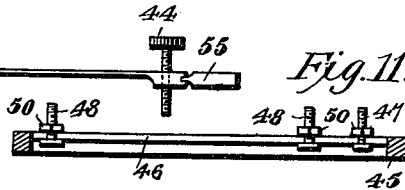


Fig. 5.

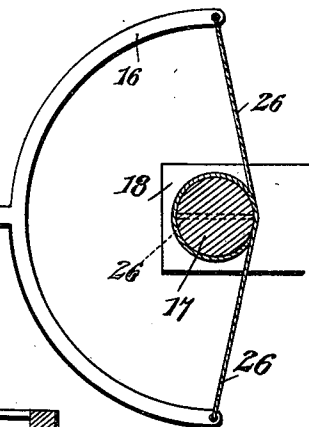


Fig. 9.

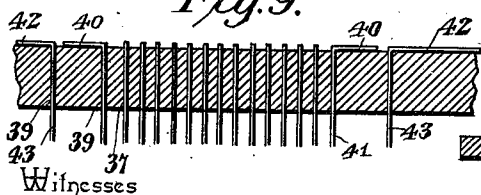
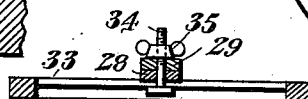


Fig. 10.



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**No. 671,898.**

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**N. SMITH.**

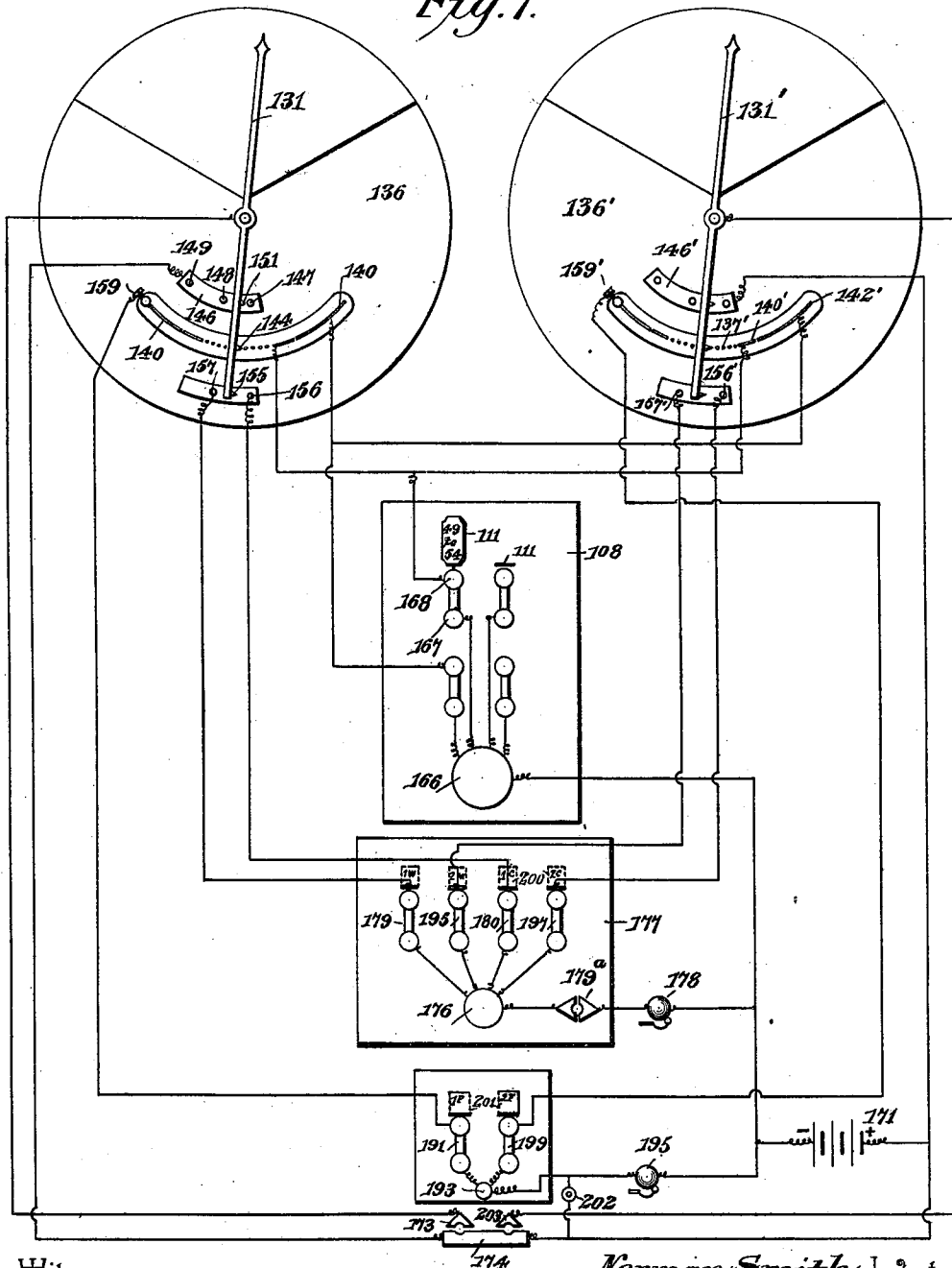
## THERMOMETRIC ALARM SYSTEM.

(Application filed May 25, 1899.)

(No Model.)

**4 Sheets—Sheet 4.**

*Fig. 7.*



Witnesses

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# UNITED STATES PATENT OFFICE.

NORMAN SMITH, OF ONEONTA, NEW YORK, ASSIGNOR TO N. S. MURPHY, OF CENTRALIA, PENNSYLVANIA.

## THERMOMETRIC ALARM SYSTEM.

SPECIFICATION forming part of Letters Patent No. 671,898, dated April 9, 1901.

Application filed May 25, 1899. Serial No. 718,155. (No model.)

*To all whom it may concern:*

Be it known that I, NORMAN SMITH, a citizen of the United States, residing at Oneonta, in the county of Otsego and State of New York, have invented a new and useful Thermometric Alarm System, of which the following is a specification.

This invention relates to thermometric indicators; and it has for one object to provide a system in which at a definite point will be indicated or may be indicated the different temperatures of a series of other points containing apparatus in circuit with the indicator.

A further object of the invention is to provide alarms which will be operated when the temperature at a point has reached a predetermined height, thus to give warning of a fire or an excessive temperature from other cause.

The invention is also designed to give an alarm when the temperature has dropped to a certain point and at the same time to give visual indication of the location of drop in temperature.

The apparatus employed by me in this system is designed to embody in a single instrument a means for giving the different visual signals and for sounding the different alarms and to embody in other single instruments means for closing electric circuits to energize the apparatus of the first-named single instrument.

In the drawings forming a portion of the specification, and in which like symbols of reference indicate similar parts in the several views, Figure 1 is a view showing the arrangement of the different instruments of my system. Fig. 2 is a diagrammatic representation of the apparatus of each instrument and the connecting-circuits. Fig. 3 is a perspective showing the form and construction of a thermometer and its accompanying circuit-closing apparatus. Fig. 4 is a detail showing a portion of a thermometer-index and the circuit-closing elements carried thereby. Fig. 5 is a detail view showing the connection between the expansible bar of the thermometer and the index-carrying cylinder. Fig. 6 is a rear view of the thermometer shown in Fig. 3 and illustrating the cable connection with the thermometer. Fig. 7 shows in diagram a

different form of indicating apparatus in circuit with thermometers similar to that shown in Fig. 3. Fig. 8 is a detail view of one of the visual indicating elements of the indicator shown in Fig. 7. Fig. 9 is a section on line 99 of Fig. 2, showing the connections between the contact-points upon the base of the thermometer and the temperature-indicating element of the indicating apparatus. Fig. 10 is a detail section showing the adjustable connection of the lever-supporting plate. Fig. 11 is a detail section showing a plate which supports certain of the movable contacts with which the index 22 engages.

Referring to the drawings in an apparatus constructed in accordance with my invention, I arrange at a central point an indicating instrument comprising three groups of elements, one of which indicates various temperatures at points containing apparatus in circuit therewith. A second group of elements indicates the rise or the fall in temperature to a certain degree at one or more points containing apparatus in circuit therewith. The third group of elements indicates a rise in temperature to a predetermined degree at a point containing apparatus in circuit therewith. The last-named group of elements is adapted to be operated when a temperature is reached that indicates a fire, and in the circuit of the second and third groups of elements are arranged alarms which will be automatically sounded when their respective elements are operated. A short circuit for the alarm of the third group of elements, which I term a "fire-alarm," is arranged to include a circuit-closer in the form of a push-button or of other style, so that the circuit of said alarm may be operated manually when desired.

The second and third groups of elements of my indicating mechanism have direct and constant connection with an electric battery or other source of energy, and their circuits are only broken at the thermometric circuit-closers located at different points in the system and through the medium of which said circuits are closed direct. The operating-circuits of the first group of elements, however, include additional circuit-closers in the form of push-buttons, a plug-board, or of other

style, and said circuits are successively closed at the thermometers under different degrees of temperature and are normally broken only by the indicator. Thus under normal fluctuations of temperature there are no indications at the indicator excepting when a circuit including an element of the first group is closed. This will indicate the specific temperature of the point at which the thermometer in said circuit is located. When there is an excessive rise in temperature, however, the second and third elements will be operated automatically.

The thermometric circuit-closer employed by me in accordance with one embodiment of my invention consists of a base 10, of wood or other suitable material, upon the upper face of which is mounted concentric therewith a compound circular thermometer-bar comprising two split rings 11 and 12, arranged one within the other and in continuous mutual engagement at their adjacent vertical faces, the outer ring or band 12 being of brass and the inner ring or band 11 being of steel in accordance with the well-known laws of expansion and contraction. One of the ends of this compound circular bar is rigidly held within the slot of a plate 13, having a foot 14 at its base, and through the medium of which said plate is held upon the base 10. The remaining portions of the thermometer bar or ring are free to move with respect to the adjacent surface of the base, and at the opposite end of the ring from the plate 14 is pivotally connected a lever 15, extending radially of the base 10 and having at its inner end a fork 16, the ends of which project beyond the center of the base. Mounted upon the base 10 and projecting vertically therefrom and within the inclosure of the fork or arch 16 is a cylinder 17, the lower end of which is pivoted in a plate 18 upon the base 10, and from the upper end of which projects a trunnion 19, having a bearing in an angle-iron 20, the upper portion of which and in which said bearing is formed extending over the pivotal bearing in the plate 18, and with which pivotal bearing its bearing is in alignment. The foot of the angle-iron projects horizontally and is secured upon the face of the plate 18, as shown. The trunnion 19 beyond its bearing in the angle-iron 20 is contracted and threaded, as shown at 21, and receives an index 31, which is impaled thereon and is held in place by means of a nut 23 upon the contracted portion. This index extends radially of the cylinder 17 and at opposite sides thereof, one end of said index being adapted to travel over the face of a dial 24, supported above the thermometer-ring, the opposite end of the index being equipped with circuit-closing terminals, as will be hereinafter more fully described.

Diametrically of the cylinder 17 is formed a perforation 25, and through this perforation is passed a cord 26, the ends of which are passed a suitable number of times around the

face of the cylinder and are then pulled taut and attached to the extremities of the arch or fork 16.

In order to support the lever 15, I pass it through a diametrical perforation in a cylinder 27, having trunnions at its ends, which cylinder is vertically mounted with the trunnions at its lower end, having a bearing in a plate 28 and its upper trunnion having bearing in an angle-iron 29, similar to the angle-iron 20, and whose foot is connected with the plate 28. In order to hold the lever within the perforation in the cylinder 27 and to enable its being adjusted therein, I arrange a set-screw 30, passed into the cylinder and adapted to engage the surface of the lever 15. Thus it will be seen that as the end of the thermometer-ring moves in one direction or the other motion will be communicated to the lever 15, causing its inner end carrying the fork to move in an opposite direction, and through the medium of the cord 26 causing the cylinder 17 to rotate in the direction of travel of said cord. This will cause one end of the index 31 to travel over the face of the dial and indicate the temperature at that time. It will be readily understood that the dial has been previously marked in accordance with the expansibility of the thermometer-ring. In order to regulate this apparatus without altering the face of the dial, it is only necessary to vary the position of the cylinder 27 with respect to the lever 15 to shift the fulcrum of said lever, and consequently the proportionate travel of its power and work ends. This I do by mounting the ends of the plate 28, in which the lower end of the cylinder 27 is journaled, upon two plates 32 and 33, and which latter plate has a longitudinal slot, from which projects vertically the stem of a bolt 34, (shown in Fig. 10,) and which stem passes upwardly through a perforation in the plate 28 and the foot of the angle-iron 29 and is provided with a set-nut 35. Thus it will be seen that upon loosening the set-nut the cylinder 27 may be moved radially of the base 10, and that through the medium of the set-screw 30 the lever 15 may be adjusted correspondingly in the cylinder. The slot in the plate 33 is disposed radially of the base 10.

Supported from the base 10 and above the thermometer-bar is a plate 36, of vulcanite or other non-conducting material, through which plate is formed a series of perforations 37, and in which perforations are disposed the ends of a plurality of wires, as shown in detail in Fig. 9 of the drawings. These wires, as shown in Fig. 6, lead to suitably-disposed binding-posts 37<sup>a</sup> upon the under side of the base 10, and through which base is formed an arc-shaped slot 38 for the passage of said wires upward to the plate 36.

At each side of the series of perforations 37 is formed an additional series of perforations 39, Fig. 9, the spaces between the perforations of each series gradually increasing outwardly. Leading from the outer side of the

innermost perforation of each of the series 39 is an arc-shaped groove 40, concentric with the cylinder 17, and in this groove lies the outwardly-extending end of a wire 41, passed through the corresponding perforation and then bent laterally and seated therein. From the second perforation of the series of perforations 39 extends a similar groove 42, in which lies the laterally-turned end of a wire 43, passed through its corresponding perforation. The extent of these grooves and of the ends of the wires lying therein is such that the extremities of these laterally-extended ends are separated from the succeeding wires by a very slight interspace. The perforations 37, as also the grooves 40 42, &c., lie in a continuous arc concentric with the cylinder 17, as above intimated, and the wires therein form a series of contacts 41<sup>a</sup>. Formed in the adjacent end of the index 31 is a threaded perforation, in which is located a screw 44, which screw and index are of brass or other suitable metal, and this screw is adapted to contact successively with the portions of the wires projecting above the face of the plate 36, said screw forming one terminal and said wires forming the opposite terminals of a plurality of circuits including the different parts of the temperature-indicating element of my indicator above referred to, and which said circuits will be hereinafter described.

Arranged upon the face of the plate 36 is a brass or other metallic plate 45, which is arc-shaped and which has a similar concentric slot, in which are adjustably arranged a series of contact-points 47, 48, and 49, which contact-points are in electrical connection with the plate 45 and are held in place in the slots by means of jam-nuts 50, engaging the screw-threaded bodies thereof and lying upon the upper surface of the plate 45, as shown in Fig. 11 of the drawings. These contact-points 47, 48, and 49 are adapted to be successively engaged by a spring contact-finger 51, lying below and parallel with the index. This finger is held in place through the medium of a bolt 52, passed through alining perforations in its base and in the index, a washer 53 being interposed between the index and the finger to allow a free movement of the latter. A nut 54 upon the bolt 52 holds the finger adjustably in position. This spring-finger 51 successively engages the sides of the contact-points above referred to as the index is swung under the influence of the expansion or contraction of the thermometer-ring. A second spring contact-finger 55 is secured upon the rear end of the index 31 beyond the screw 44 and is adapted to successively engage with a second series of contact-points comprising a point 56 in radial alinement with the cylinder 17 and the point 47 and so positioned as to be engaged by the spring-finger 55 simultaneously with the engagement of the spring-finger 51 with the contact 47. A second contact-point 57 in the last-named series is in radial alinement with the contact-point

48 and the cylinder 17 and is positioned to be engaged by the finger 55 at the same time as the engagement of the finger 51 with the point 48. The points 56 and 57 are carried by a common insulating-plate 58, secured to the face of the insulating-plate 36, said points being held adjustably in a longitudinal slot in the plate 58 in a manner similar to that shown in Fig. 11.

The plate 58 and its contact-points are of course arranged beyond the terminals of the wires projecting through the perforations 37 and 39.

In radial alinement with the contact-point 49 and the cylinder 17 is a final contact-point comprising a screw 59, passed through the threaded perforation in a post 60 and held against rotation therein through the medium of a set-screw 61, lying in the perforation at right angles to the screw 59. Thus the screw 59 may be adjusted as desired.

From the above description it will be seen that the circuit-closer comprises three series of contacts, one series including the contacts 47, 48, and 49, a second series including the ends of the wires that are passed through the plate 36, and the third series including the contacts 56 and 57. In practice, as shown in Fig. 1 of the drawings, I arrange one of these thermometric circuit-closers in each of a series of rooms in a building, although where a room is very large more may be used. In connection with this series of thermometric circuit-closers I employ in one embodiment of my invention an indicating device consisting of three groups of electromagnetic indicator elements above referred to, which groups of indicator elements are similar in form and operation. Referring to the upper group of elements, which I term a "temperature group," this consists of a base 65, centrally of which is located a metallic plate 66, Fig. 2, in circuit with which are the coils 67 and 68 of an electromagnet, forming one element of the group, which magnet has one of its poles arranged at each side of the plate 66, the pole carrying the coil 67 being adjacent the plate 66, and the opposite pole 68 being adjacent the periphery of the base 65 and being separated from the plate 66 by an interspace sufficiently large to accommodate the pole and coil of a second electromagnet. The rear ends of the poles of the electromagnet are connected by any suitable form of back armature and which armature, if desired, may be in the form of a disk of soft iron and may be connected to all of the electromagnets mounted upon the base 65 and hereinafter referred to. The coils 67 and 68, as shown, are in alinement with the plate 66. Intermediate the coil 68 and the plate 66 is the coil 69 of a second electromagnet, forming a second element of the group, comprising also a coil 70, intermediate the coil 67 and the periphery of the base 65, said coils 69 and 70 being in alinement with the first-named coils. All the coils upon the

base 65 thus adjacent to the plate 66 are connected directly with said plate, and which plate has a direct connection with one terminal of an electric battery 71, in this instance  
 5 with the negative terminal the connections between the coils of which electromagnet and between the innermost coils and the plate 66 being such that when the magnets are energized from the battery 71 the outer poles of  
 10 said magnets will be north poles, while the poles adjacent the plate 66 will be south poles. Pivotally connected with the base 65 and concentric therewith is a pointer 72 of hard steel and which pointer is polarized, with  
 15 its forward end a south pole and with its rear end a north pole. This pointer is rotatable upon its pivot transversely of the fields of the several electromagnets upon the base 65, and thus when any one of such electromagnets is energized the pointer will swing into the center of the active field, with its forward end over the outer pole.

In Fig. 2 of the drawings I have shown the coil 68 connected directly with wire 41, passed  
 25 through the plate 36, the index-finger 31 being electrically connected with one element 73 of a plug-board, comprising a second element 74, connected with the positive terminal of the battery 71. The circuit between the index-finger 31 and the element 73 of the plug-board is completed through the cylinder 17 and the plate 18 and iron 20 by means of a wire 75, leading from a binding-post 76 upon the iron 20 to the said element 73. The wire  
 30 43 will be engaged by the screw 44 continuously during the movement of the index-finger 31 over the dial from 1° to 48°. Therefore the head of the coil 68 bears the inscription "1° to 48°." Thus if the janitor or other  
 40 person at the location of the indicator inserts a plug to complete the circuit between the elements 73 and 74 of the plug-board, and the screw 44 being, as shown, in engagement with the wire 43, the coils 67 and 68 will be immediately energized from the battery 71, and the pointer 72 will be rotated to lie above the coils 67 and 68, and will thus indicate with its forward end that the room corresponding to the plug-board element 73 is at a temperature of  
 50 from 1° to 48°. It will be readily understood that the wire 43 may be arranged to cover a lesser fluctuation in temperature, which result may be attained by diminishing its horizontal projection. Each of the wires passed through the perforations 37 and 39 is connected directly with a similar electromagnet upon the base 65; but it is of course unnecessary to show more than a single electromagnet and its connections.

60 The second group of elements, which I term the "warm and cold indicator," is adapted to indicate a warm or a cold condition of a room having its apparatus in circuit therewith—that is, a temperature of 65° would be considered a cold temperature for a living-room, whereas a temperature of 75° would be considered warm, meaning too warm. In this

element I have for each thermometric circuit-closer two electromagnets similar in construction to the electromagnets of the temperature element and comprising each two  
 70 coils arranged upon opposite sides of a central plate 76, of metal, upon a base 77. This plate 76 is connected with the negative terminal of the battery 71 through an alarm 278 and a plug 279. One of the electromagnets  
 75 upon the base 77 comprises a coil 78 adjacent the plate 76 and a second coil 79 in alinement with the plate and coil 78 and located adjacent to the periphery of the base 77. The  
 80 face of the outer coil 79 is marked with the number of the room in which its respective thermometer is located, in this instance "1," and also with the letter W. Diametrically opposite the coil marked "1<sup>w</sup>" is a coil whose  
 85 face is marked "1<sup>c</sup>," this last-named coil 80 being arranged adjacent the periphery of the base 77 and in circuit with a second coil 81, connected electrically with the plate 76. The coil 78 is also electrically connected with the  
 90 plate 76.

Upon reference to Fig. 3 of the drawings it will be noted that the contact-points 48 and 57 are in alinement with the 75° of temperature upon the dial 24, and thus when the index-finger 31 swings into a position to indicate that temperature the spring-fingers 51 and 55 will engage the said points. The plate 46, upon which the contact-point 48 is located, is connected directly with the positive terminal of the battery 71, while the point 57 is connected directly with the coil 79. Thus if the temperature in the room reaches 75° the fingers 51 and 55 will engage their respective contact-points 48 and 57 and will close the  
 105 circuit through the coils 79 and 78 and through the alarm 278, if the plug 279 be in position, and will sound the alarm 278, and will furthermore cause the polarized pointer 82 to arrange itself over the coils 78 and 79, indicating that room No. 1 has become warm. It will be readily understood that the pointer 82 is polarized and has such a magnetic relation to the electromagnet, including the coils 78 and 79, as to arrange itself in the position  
 115 described. The coil 80 of the cold magnet is in direct electrical connection with the point 56, while, as above stated, the plate 46, which bears the point 47, is connected directly with the positive terminal of the electric battery 120 71, the terminal 47 being electrically connected with said plate 46. Thus if the index-finger 31 swings under the influence of a dropping temperature to indicate a temperature of 65° the spring-fingers 51 and 55 will  
 125 engage the points 47 and 56 and will complete the circuit through the coils 80 and 81 and through the alarm 278, causing the alarm to sound and indicating with the pointer 82 that room 1 is cold.

130 Finally, referring to the third group of elements, this consists of a base 90, upon which is arranged an element consisting of an electromagnet comprising a coil 91 adjacent the

periphery of the base and a second coil 92 adjacent a central plate 93, which latter is in electrical connection with the negative terminal of the battery 71. A similar electromagnet is arranged for each thermometric circuit-closer included in the system. As shown in Fig. 2 of the drawings, the coil 92 is electrically connected with the coil 91, as is usual, and the coil 91 is in direct electrical connection with the screw 59, which is adapted to be engaged by the adjacent end of the index 31. The point 49 and engaging point of the screw 59 are in alinement with the 115° upon the thermometer-dial, and thus when the index rotates to indicate this temperature the spring-fingers carried thereby will engage the point 49 and screw 59 and will complete the circuit of the battery 71 through the coils 91 and 92, causing the polarized pointer 94 to rotate and arrange itself with its forward end over the coil 91. This coil is marked with the figure "1," indicating the room with which it is in circuit, and thus when the pointer is thereover and the alarm 95 in circuit between the plate 93 and the battery 71 is in operation this will be indication of a temperature of at least 115° in room No. 1. Thus it will be seen that critical temperatures will be automatically indicated visually and by alarm and that at any time the plug-board may be plugged to ascertain the specific temperature or the approximate temperature of any of the rooms included in the system. It is of course not necessary to bridge over the high and low degrees on the thermometric circuit-closer by means of the lateral extensions of the wires 41 and 43, and, if desired, each degree may have its individual wire.

In Fig. 2 of the drawings I have shown a second thermometric circuit-closer connected with the indicator, the connections of which are absolutely the same with respect to the magnets of the temperature group of elements and with which magnets the similar degrees of the two circuit-closers are connected in multiple. In the case of the second group of elements of the indicator there is a second pair of elements in the form of magnets comprising a warm magnet marked "2<sup>w</sup>" and consisting of coils 95 and 96 adjacent the coils 79 and 78, respectively, and similarly arranged. The coil 95 is connected directly with the point 57' of its respective thermometer, while the coil 96 is connected with the plate 76, and therethrough with the battery 71. The circuit between the point 57' and its corresponding point 48' is completed by the index 31' to the plate 46', which latter is in direct communication with the positive terminal of battery 71. A cold electromagnet comprising a coil 97 (marked "2<sup>c</sup>") and a second coil 98 upon opposite sides of the plate 76 has its coil 98 connected directly with the plate 76 and its coil 97 connected directly with the cold point 56', which latter is closed upon the point 47' at times by the index 31', said point 47' being connected di-

rectly with the positive terminal of the battery 71 through the medium of the plate 46'.

The fire group of elements comprises an electromagnet consisting of a coil 99 and a coil 100, secured to the base 90 and located on opposite sides of the plate 93, the coil 100 being connected directly with the plate, while the coil 99 is connected with the contact-screw 59. Thus when the index 31 moves to the proper position it will close the circuit between the screw 59 and contact-point 49, which latter is in electrical connection with the battery 71, and will cause the alarm 95 to sound and will at the same time cause the pointer 94 to indicate that the signal is coming from room 2. Between the alarm 95 and the plate 93 a short circuit, including a push-button 101, is arranged, through the medium of which the alarm 95 may be sounded manually.

In Fig. 7 of the drawings I have shown a construction in which the thermometric circuit-closers are the same as those shown in Fig. 2, just described, the difference being in the construction of the indicating mechanism. In this form of my invention I have an annunciator comprising a temperature element, a warm and cold group of elements, and a fire group of elements. The temperature element consists of a series of annunciators comprising electromagnets and armatures therefor, said armatures being adapted to expose cards having degrees of temperature marked thereon.

As shown in Fig. 8 of the drawings, each annunciator consists of an electromagnet comprising coils 105 and 106, arranged one above the other and with their cores horizontal. An armature 107, pivotally connected with a base 108, has a cord 109 attached to its free end and passed around a roller 110 in such a manner that when the armature 107 is attracted by the electromagnet the drawing of the cord from said roller will rotate its upper surface in a direction away from the electromagnet. A card 111 is secured to the roller 110 and extends radially thereof and lies normally horizontally and rests upon a stop 112. Thus when the armature 107 is attracted and the roller 110 is rotated, as shown in dotted lines, the card 111 will be erected to expose what is normally its upper face. Upon this upper face is marked the degree of temperature.

In Fig. 7 of the drawings I have shown four annunciators in the temperature group of elements corresponding to four different degrees of temperature. This is done to avoid confusion of circuits, and it will be readily understood that an annunciator is arranged for each of the contact-pieces upon the plate 136, whether said contact-pieces represent a single degree of temperature or whether they represent a number of degrees in the manner hereinbefore described. As will be noted, the thermometric circuit-closers employed in this form of my invention are the same in

construction as those hereinbefore explained, and one consists of a base upon which is pivoted an index 131, one end of which is adapted to travel over a dial and the other end of which is provided with contact-fingers 155 and 151 and with a third contact-point 144, adapted to contact with the terminals similar in form and arrangement with those shown in Fig. 3 of the drawings. These last-named contact-points comprise two cold contacts 147 and 156 in radial alinement with the pivot of the index 31, two warm terminals 148 and 157 in radial alinement with the pivot of the index, and two fire terminals 149 and 159 also in radial alinement with the pivot of the index, so that when the index oscillates it may successively engage the different series of alining terminals and close an electric circuit between the terminals of each series.

In connection with the annunciators in the temperature group of elements of the indicator I arrange a plate 166, which has direct connection with the negative terminal of an electric battery 171, with which plate also is in electrical connection the windings of each of the annunciators. I have shown the first annunciator, including coils 168 and 167, in direct connection with that terminal 140 with which the finger 144 upon the index 131 will engage during the passage of the forward end of the index over the dial from  $49^{\circ}$  to  $54^{\circ}$ . Thus the positive terminal of the battery 171 being in direct connection with the common plate 174 of the plug-board and the index 131 being in direct connection with one of the individual plates 173 of said board when the dial 131 indicates any degree of temperature from  $49^{\circ}$  to  $54^{\circ}$  the completion of the circuit by the insertion of a plug between the elements 173 and 174 will energize the annunciator comprising the coils 167 and 168, causing the erection of the card 111 and exposing the sign from  $49^{\circ}$  to  $54^{\circ}$ , thus indicating such a temperature in the room corresponding to the plug-board element 173.

The cold and warm group of elements of the indicator includes the base 177, upon which are arranged a series of annunciators 179, 195, 180, and 197, the similar terminals of the windings of which are in direct connection with a common plate 176, which is in turn in circuit with the negative terminal of battery 171 through the plug 179<sup>a</sup> or other form of circuit-closer, and an alarm 178. The plate 146, upon which the terminals 147, 148, and 149 are arranged, is in direct connection with the positive terminal of the battery 171, while the cold terminal 156 is in direct electrical connection with the annunciator 180, and the warm terminal 157 is in direct electrical connection with the annunciator 179. Thus when the index 131 is swung to a temperature corresponding to the terminal 156 the fingers 151, and 155 will close the circuit between said terminals and through the annunciator 180, causing an exposure of the card 200, carried thereby, and which card

bears the inscription "1<sup>c</sup>," indicating that room No. 1, in which its thermometric circuit-closer is located, is cold. It will be readily understood that the plug 179<sup>a</sup> is in place at this time and that at the same time the alarm 178 will be sounded, calling the attention of the janitor or other attendant to the indicator. The annunciator 179, as shown, is in direct connection with the terminal 157, and thus when the fingers of the index 131 engage the points 148 and 157 they will close the circuit therebetween and cause the operation of the annunciator 179 and the sounding of the alarm 178. The card of the annunciator 179 is marked "1<sup>w</sup>" and when exposed indicates that room 1 is warm.

The fire group of elements of the indicator includes an annunciator for each of the rooms in the system, and in this instance I have shown an annunciator 191 corresponding to the room 1 and the second annunciator 199 corresponding to room 2. The card 201 of the annunciator 191 bears the inscription "1<sup>F</sup>," while the card of the annunciator 199 bears the inscription "2<sup>F</sup>." The similar terminals of the annunciators 191 and 199 are directly connected with a common plate 193, which in turn is connected with the negative terminal of the battery 171 through an alarm 195. The opposite terminal of the winding of the annunciator 191 is connected directly with the contact-screw 159, and thus when the index 131 has moved to one limit of its oscillation it will engage the screw 159, and its finger 151 will engage the terminal 149, resulting in a closing of the circuit between said screw and terminal and through the electrical battery 171 and alarm 195, and the annunciator 191 causing operation of the annunciator and alarm. This will raise the card 201, indicating that an excessive temperature from fire or other cause is in the room 1. A short circuit is made between the positive terminal of the battery 171 and the conductor intermediate the plate 193 and the alarm 195. This short circuit contains a push-button 202 or other form of circuit-closer, through the medium of which the alarm may be sounded independently of the thermometers in the system and for any desired purpose.

The second thermometric circuit-closer shown in the system, including the plate 136', is equipped in the same manner as are the other thermometers described, its temperature terminals 137', 140', and 142', &c., being connected directly with their respective conductors leading from the similar terminals of the thermometer, including the plate 136', just described. The plate 146' is connected directly with the positive terminal of the battery 171, the cold terminal 156' is connected directly with the windings of the annunciator 197, the warm terminal 157' is connected directly with the windings of the annunciator 195, and the index 131' is in direct electrical connection with a corresponding element 203 of the plug-board of the indicator. The con-

tact-screw 159' is connected directly with the windings of the annunciator 199 of the fire element of the indicator. Thus with similar conditions the thermometer in room 2 having the index 131' will operate the annunciators of the temperature element when it is plugged in and will automatically operate the other elements of the indicator and their respective alarms when conditions are favorable.

It will be readily understood that I may employ any number of thermometric circuit-closers in the system and that I may employ whatever specific circuits may be desirable between said thermometers and the indicator; also, that I may use a plurality of indicators and that I may locate the alarms, as also any of the other elements of the system, wherever desirable. It will also be evident that I may substitute a column of mercury for the compound thermometer bar or ring and that I may employ in the manufacture of the parts of my apparatus any materials that may appear expedient.

Referring to Fig. 2 of the drawings, the operation of the apparatus is as follows: Supposing the temperature in the room containing the left-hand thermometer rises to a point to cause the index 31 to swing to engage the contact-strip 42, then if a plug be inserted between the plates 73 and 74 the circuit would be from battery 71 to plate 66, to the windings of 67 and 48, through conductor 41 to contact 42, thence through the index 31 and through conductor 75 to the plate 73, and thence through the plug to 74 and to the battery, the result being that the annunciator will drop to show a temperature of from 1° to 48° in the room to which the plate 73 corresponds. Now in the passage of the index 31 to engage with the contact 42 the brushes of said index will engage the points 47 and 56, so that before the operation just described the circuit of the battery 71 will be from the battery through the bell 278, through the plug at 279, to the plate 76, to coils 81 and 80, to contact-point 56, to index, to contact-point 47, to plate 46, thence by the conductor connected with the said plate 46 to the plug-plate 74, and thence to the battery 71, the result being that the second annunciator will operate the drop bearing the sign "1°," indicating that room No. 1, containing the left-hand thermometer, is cold. At the same time the bell 278 will ring, and if the janitor or other person desires then to know the specific temperature of room No. 1 he inserts the plug to bridge between the plates 73 and 74, when a proper operation of the uppermost annunciator will be performed to show the specific temperature through the engagement of the index with one of the contact-points which is in alinement with the point 42, above described. If the index moves from the position shown in Fig. 2 so as to engage the contacts 57 and 48, then the circuit will be from the battery 71 through the bell 278 and plug 279 to the plate 76, thence to the coils 78 and 79 to contact-point 57, to con-

tact 48, to the plug-plate 74, and to the battery. If the temperature then increases to engage the index 31 with the contact 59, the circuit will be from battery 71 to the plate 93, to coils 92 and 91, to contact 59, to index, to contact 49, to plug-plate 74, and to battery, the current between the battery and plate 93 passing through the bell 95 to operate it. The energization of the coils 91 and 92 will effect the drop of the annunciator to indicate what the excessive temperature is in room No. 1.

The operation of the arrangement shown in Fig. 7 of the drawings is the same as that above described.

Having thus described my invention, what I claim is—

1. In a thermometric alarm system, the combination with a plurality of circuit-closers, each comprising a number of series of contacts, and means for engaging the contacts, of an indicator comprising a plurality of groups of visual indicator elements, one group of indicator elements being connected to the corresponding series of contacts of all of the circuit-closers, a source of electricity, separate means for completing the circuits through the last-named indicator elements and all of the corresponding contact-points of each circuit-closer, a second group of indicator elements having individual connections with the corresponding contacts of their respective circuit-closers, the circuits of the second group being adapted to be completed by their respective circuit-closers.

2. In a thermometric alarm system, the combination with circuit-closers each comprising a number of series of contacts, and an index having a contact-piece for engagement with each series of contacts, an indicator comprising a plurality of groups of visual indicator elements, the elements of one group being connected to the corresponding series of contacts of all the circuit-closers, separate circuit-closers for completing the circuits through the last-named indicator elements and all of the corresponding contact-points of each circuit-closer, a second group of visual indicator elements each of which is connected with its corresponding contact of one of the first-named circuit-closers only, an alarm connected to all the circuits of the second group of indicator elements, and a battery common to all the circuits.

3. In a thermometric alarm system, the combination with a plurality of circuit-closers each comprising a number of series of contacts, and means for engaging the contacts, each series of contacts of one closer corresponding to the series of each of the other closers, of an indicator comprising a plurality of groups of visual indicator elements, one group of indicator elements being connected to their respective contacts of the corresponding series of all the closers, a second group of visual indicator elements having independent connections with their respective closers, and a common means for energizing the cir-

5 cuits, the circuits of the series of contacts as 41<sup>a</sup> of each circuit-closer that correspond to the first group of indicator elements having a second circuit-closer 73 which is common to

10 all of the contacts of that series.  
4. An electrically-operated indicator embracing an element comprising a plurality of electromagnets arranged in pairs with their fields in alinement and with a pole of each  
15 magnet intermediate the poles of the other magnet.

5. An electrically-operated indicator comprising a plurality of electromagnets arranged in pairs with a pole of one magnet intermediate the poles of the other, and a common back  
20 armature for said magnets.

6. An electrically-operated indicator comprising a plurality of electromagnets, each consisting of two cores having windings thereon said cores being mutually parallel, a core of each electromagnet lying intermediate the  
25 cores of another electromagnet, and a paramagnetic plate secured to said cores and forming a common back armature therefor.

7. In a thermometric alarm system, a circuit-closer comprising a base having an annular thermometric bar thereon and fixed at

one end, an insulating-plate mounted above the bar and having perforations therethrough and grooves leading laterally from certain of the perforations, conducting-wires passed  
30 through the perforations and certain thereof having their upper ends bent to lie in the grooves, said wires forming contact-points, said contact-points being disposed in an arc  
35 concentric with the thermometric bar, a slot-plate at each side of the line of wires, bolts passed upwardly through the slots of the metallic plates and having nuts thereon for impingement with the plates to hold the  
40 bolts against movement, a dial, and an index operatively connected with the thermometric bar and disposed to traverse the dial, the opposite end of the index having contacts for engagement with the ends of the bolts and  
45 wires.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

NORMAN SMITH.

Witnesses:

FILLEY BLAKELY,  
ELMER BETTS.