(No Model.)

H. S. TUNNARD & A. M. KEAYS.

AUTOMATIC FIRE ALARM SYSTEM.

No. 529,000. Patented Nov. 13, 1894.

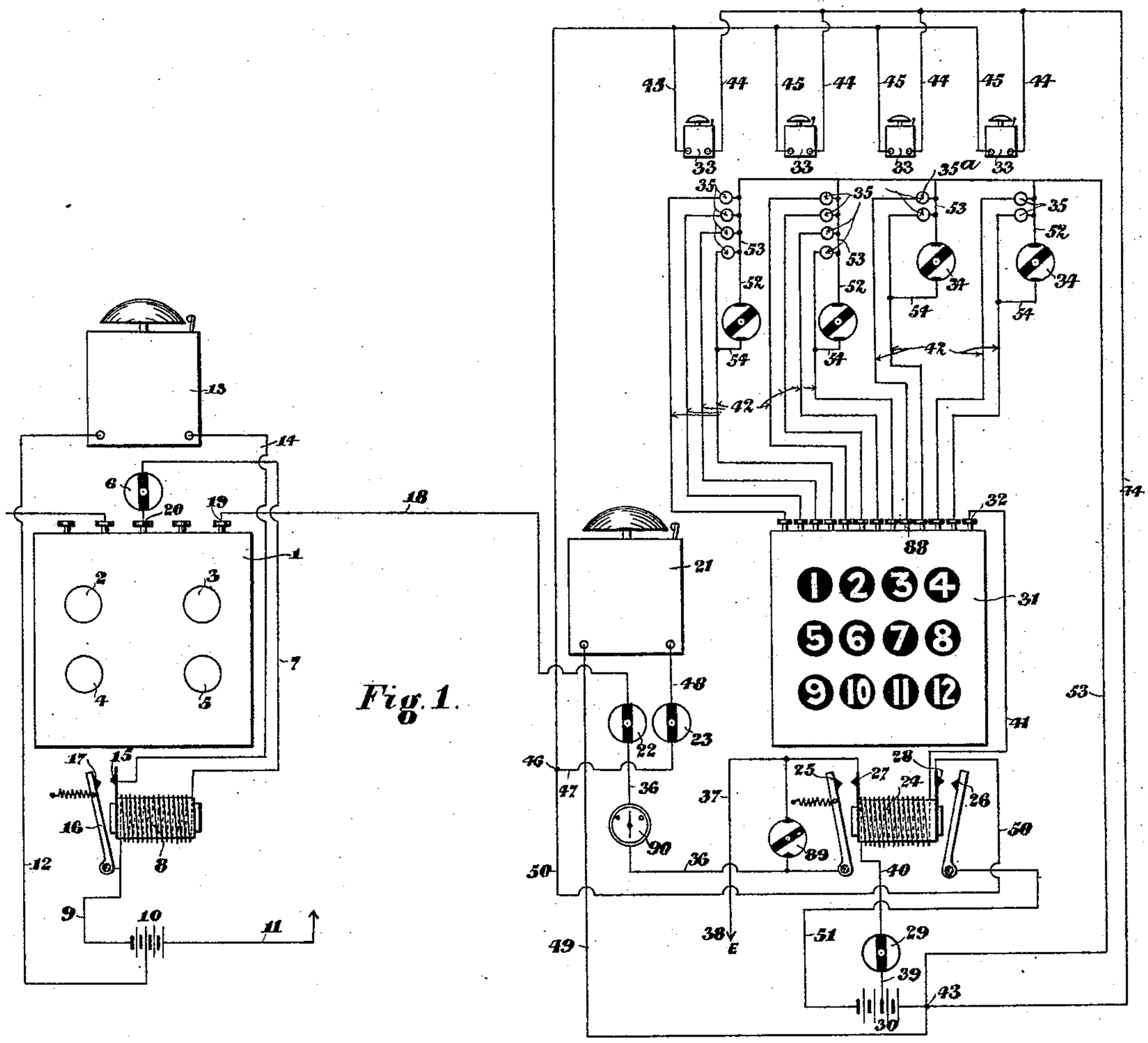

Fig. 1.

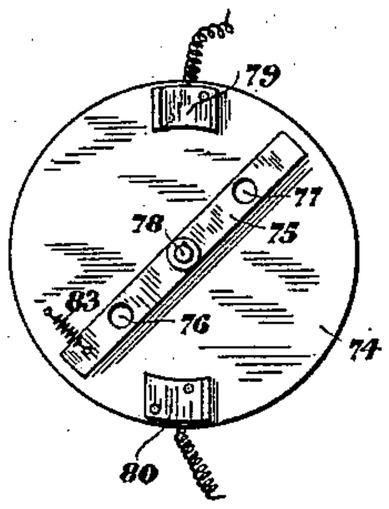

Fig. 2.

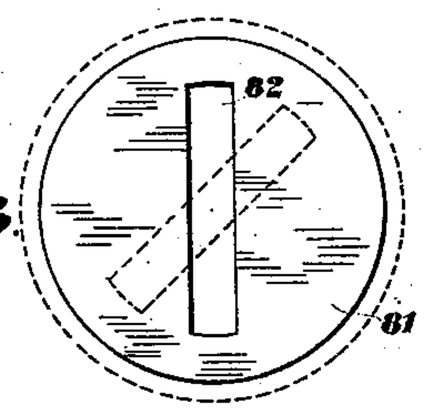

Fig. 3.

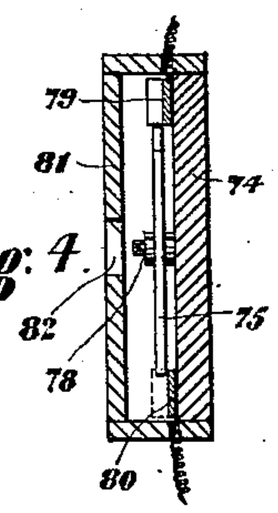

Fig. 4.

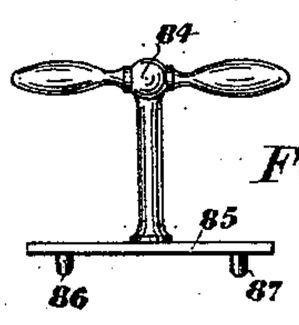

Fig. 5

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UNITED STATES PATENT OFFICE.

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AUTOMATIC FIRE-ALARM SYSTEM.

SPECIFICATION forming part of Letters Patent No. 529,000, dated November 13, 1894.

Application filed February 8, 1894. Serial No. 499,559. (No model.) Patented in England December 21, 1893, No. 24,653.

To all whom it may concern:

Be it known that we, HENRY STOPFORD TUNNARD, residing at Bilton Road, Rugby, in the county of Warwick, and ARTHUR MAITLAND KEAYS, residing at Wandle Cottage, Sutton, in the county of Surrey, in England, subjects of the Queen of Great Britain and Ireland, have invented a new and Improved Automatic Fire-Alarm System, (for which we have obtained a patent in Great Britain, No. 24,653, bearing date December 21, 1893,) of which the following is a specification.

Our invention refers to an improved automatic fire-alarm system, by which the presence of a fire is audibly indicated, first, in the room or landing or immediate locality in which the fire takes place; secondly, in the hall or central position which is set apart conveniently for inspection by indicators which show the exact spot or room in which the fire has broken out; thirdly, outside the house in a convenient position, over the door or on a gate post or wherever desirable the presence of a fire is audibly indicated by means of ringing a gong or its equivalent, and fourthly, in the fire station itself the presence of the fire is audibly indicated on a gong and visibly indicated by an indicator showing the street, or the street and house if desired, in which the fire has broken out.

The essence of our invention to effect these results consists in the improved form of thermostat, which gives a greater degree of sensitiveness than is generally given by thermostats. It is obvious that the time interval of alarms between the breaking out of the fire and its indication depends upon the degree of sensitiveness of the thermostat. Therefore, we rely largely as to the correct working of our invention and the early intimation of the presence of a fire upon the thermostat hereinafter described.

We will now proceed to describe our invention, reference being made to the accompanying drawings, in which similar numbers refer to similar parts in the several figures.

Figure 1 is a diagram of the complete apparatus. Fig. 2 shows the arrangement of a testing switch with the cover removed. Fig. 3 shows the switch with the cover in position. Fig. 4 is a section of the switch with the cover on. Fig. 5 is an elevation of the switch key.

It is obvious that the action of the thermostat for working our invention depends upon a rise of temperature.

With reference to Fig. 1, 1 is the indicator fixed in the fire station and is provided with "drops" 2, 3, 4 and 5. (There may be any number of "drops" according to the requirements.) This indicator is provided with any number of terminal screws, corresponding with the number of drops, and an additional terminal for the return circuit is provided. A wire is connected from this terminal to a switch 6 hereinafter described. The other terminal of the switch 6 is connected by a wire 7 to a relay 8. The other end of relay 8 is connected by a wire 9 to one pole of a battery 10. The other pole of battery 10 is connected by a wire 11 to earth. From the center of battery 10 a wire 12 is connected to one terminal of the gong 13. The other terminal of the gong 13 is connected by a wire 14 to the contact stop 15 of the relay 8.

16 is the armature of the relay 8 provided with a suitable contact stop 17. The armature 16 is connected to the wire 9. The street line wire 18 is connected to a suitable terminal 19 on the indicator 1, this terminal being in connection with one of the indicator "drops." The other wire from the indicator "drop" is taken to the return terminal 20 this return terminal being common to all the "drops."

21 is the gong or bell placed on the gate or any convenient position outside the building.

22 and 23 are testing switches.

24 is a double pole relay provided with two armatures 25 and 26, also with two stop contacts 27 and 28.

29 is a testing switch.

30 is the main battery.

31 is the indicator placed in the hall or any convenient position and is provided with any number of indicator "drops," one indicator "drop" being provided for every room, landing or other place where one or more thermostats are fixed.

The indicator 31 is provided with a suitable

number of terminals, one for each indicator "drop," and one return terminal 32 which is common to all the indicator "drops."

33 are gongs placed in the rooms or suitable positions in the house.

34 are circuit testing switches and 35 are thermostats.

The line wire 18 is connected to one terminal of the testing switch 22. The other terminal of this switch is connected by means of a wire 36 to one terminal of the detector galvanometer 90. The other terminal is connected to the armature 25 of relay 24. A wire 37 is taken from the stop contact 27 of relay 24, and goes to earth at 38. A wire 39 is taken from the center of the battery 30 to the switch 29. The other terminal of the switch 29 is connected to the coil of relay 24 by means of a wire 40. The other end of the coil of relay 24 is connected by means of a wire 41 to the return terminal 32 of indicator 31. Wires 42 are led from the other terminals of the indicator 31 to each of the thermostats 35 that are situated in any position. The other terminal of each thermostat 35 is connected to a common wire 53. This wire 53 may branch off into any number of rooms, passages or floors in the building. The other end of the wire 53 is connected to the terminal screw 43. This terminal screw 43 is in connection with one pole of the battery 30. From the terminal screw 43 is led a wire 44 which is common to one terminal of all the gongs 33. The other terminal of each of the gongs or bells 33 is connected to a wire 45. The other end of the wire 45 is connected to a terminal 46. A wire 47 from terminal 46 is led to one terminal of the switch 23. The other terminal of the switch 23 is connected by a wire 48 to one terminal of the gong 21. The other terminal of the gong 21 is connected by means of a wire 49 to the terminal 43. The terminal 43 is connected to the battery 30. From the terminal 46 is connected a wire 50 which is joined to the contact stop 28 of the relay 24. The armature 26 of relay 24 is connected by means of a wire 51 to the battery 30 and one terminal of each of the testing switches 34 is connected by means of a wire 52 to the wire 53. The other terminal of each of the testing switches 34 is connected by means of a wire 54 to the wires 42.

The switches 29, 34 and 89, also switches 22 and 23, are of similar construction.

The switches 6, 22, 23 and 29 are constructed to be normally closed. The switches 34 and 89 are constructed to be normally open.

With reference to Fig. 2, to an insulating base 74, which may be of wood, slate, ebonite or other material, is pivoted a switch contact maker 75. This contact maker consists of a strip or bar of conducting material having two holes 76 and 77 pierced in it. This bar is pivoted at 78. Fixed to the base 74 are metallic contact pieces 79 and 80.

With reference to Fig. 3, which is a plan of the cover of the switch, 81 is a cover of insulating material which screws on to the base 74. The cover 81 has a slot 82 in the top.

Fig. 4 is a cross section of Fig. 2 with the cover 81 in position. 83 is a spring which tends to return the contact bar 75 to its normal position.

With reference to Fig. 5, which represents the switch key by means of which the switch is operated (this switch key is separate and independent of the body of the switch), 84 is the handle of the key to which is attached a bar 85. Fixed to the bar 85 are pins 86 and 87. The action of this switch is as follows:—When the switch key 84 is inserted in the slot 82 the pins 86 and 87 enter the holes 76 and 77. If the handle 84 is now turned the bar 78 will break or make the contacts as the case may be at 79 and 80. One wire is led from the contact strip 79 and another wire is led from the contact strip 80. When the switch is operated the circuit between 79 and 80 is either completed or else it is broken. The switches are constructed to effect both operations, that is to say, the circuit through the switches may be normally made or normally broken as the case may be.

For the purpose of ascertaining the correct working of the circuits to the line wire 18 we find it convenient to provide a detector galvanometer 90 inserted in the circuit of wire 36. It is obvious that when a current is sent along the line wire to the fire engine station the needle of this galvanometer will be deflected, and in the event of a break in the line wire to the fire engine station no deflection will be visible on this galvanometer.

The operation of our invention is as follows:—On a fire breaking out in any room, landing or place in which one or more thermostats are fixed, on the temperature reaching a predetermined limit the thermostat in that particular place will come into action and will automatically close the electric circuit. Take the case of a fire breaking out in the room which is protected by, say thermostat 35^a. On the thermostat coming into action the current from battery 30 will flow to the terminal 43, wire 53, thermostat 35^a, to terminal 88, indicator 31 and passes round to the magnet of the indicator "drop" which corresponds to thermostat 35^a, to terminal 32. The current passes through wire 41, round the coil of relay 24, to wire 40, through switch 29 which is normally closed, to the wire 39 and back to the battery 30. Relay 24 is excited and attracts the armatures 25 and 26 simultaneously. The current from the battery 30 now goes to terminal 43, wire 44, rings all the bells 33 and returns by the wire 45 to terminal 46, through the wire 50 to the stop contact 28 of the relay 24, to armature 26, to wire 51 and back to the battery 30. It will thus be seen that when the switch 29 is closed, when the relay 24 is excited and the armature 26 is in contact with the stop 28 the battery 30 rings the whole of the bells 33 automati-

cally. The switch 23 being normally closed, the gong 21 which is placed outside the house is also rung automatically through the medium of the wire 49, wire 48, passing through switch 23, and wire 47 to terminal 46.

The operation of the circuit actuated by the armature 25 of relay 24, is as follows: The armature 25 being in contact with the contact stop 27 the wire 37 is automatically put to earth at 38, and the normal position of the switch 22 is closed. The circuit of the line wire 18 to the fire engine station is now completed in the following manner:—The circuit from the battery 10 passes to the wire 11 and to earth, entering the earth terminal 38. The current passes to wire 37, to contact 27 of relay 24 to armature 25, wire 36, through switch 22 which is normally closed, to the line wire 18 and to the terminal 19 of the street indicator 1 in the fire engine station. The current passes round the electro-magnet of the indicator "drop" to the terminal 20, through switch 6 which is normally closed, to wire 7, round the coils of relay 8 to wire 9, and to the other pole of battery 10. The relay 8 is now excited and attracts its armature 16. The contact stop 17 makes contact with the stop 15 and the current passes from the battery 10, to wire 12, round the coils of the gong 13, to wire 14, stop 15, stop 17, armature 16, wire 9, and back to the battery 10. It will thus be seen that when the relay 24, is excited and armature 25 is automatically brought in contact with stop 27, the indicator "drop" in indicator 1 at the fire engine station will indicate the number of the street, or it may be the number of the house, in which the fire has originated, and the relay 8 attracting its armature 16, and causing the stop 17 to make contact with the stop 15 will automatically set ringing the gong 13. It will thus be seen that on a thermostat coming into action in any one room of the house the indicator 31 will indicate by means of its "drop" the exact position in the house in which the fire has broken out, the gongs 33 will be simultaneously rung in the various parts of the house, the gong 21 will be simultaneously rung on the outside of the house, and the gong 13 will be simultaneously rung in the fire engine station. At the same time the indicator in the fire engine station will indicate the street or in some cases the number of the house to which the "call" has been made.

It is necessary that facilities should be provided for testing the circuits within the house without at the same time calling up the fire engine station.

The facilities we provide for testing the efficiency and proper working of the electrical circuits throughout the system, are as follows:—It is essential for the proper testing of any fire alarm system, that it shall be impossible for unauthorized persons to operate the testing switches. We therefore provide switches of special construction, hereinabove described, for this purpose. One or more switch keys are provided and are placed in the hands of responsible persons. The switches can only be operated by means of these switch keys. The normal positions of the various switches are as follows:—The switch 6 is normally closed. The switch 29 is normally closed. The switches 24 and 39 are normally broken. The switches 22 and 23 in Fig. 3 are normally closed.

Let us suppose that it is required to ascertain the correct working of the circuits throughout the house, the operation is as follows:—The switch 22 is first broken. This interrupts the circuit of the line wire 18 to the apparatus in the fire engine station. Shown in Fig. 1. Now if the switch key is inserted in any of the switches 34 and these circuits are in proper working order the whole of the bells 33 throughout the house will be rung, together with the bell 21 placed on the outside of the house. It is obvious that if the switch 23 is broken the bells 33 can be rung without ringing the bell 21. The switches 34 are shown in the figure as controlling the thermostats in each separate floor, but it is obvious that switches 34 may be provided to control every individual thermostat rather than a series of thermostats. In other words, it is possible by providing a testing switch 34 to every thermostat fixed in the building every circuit from that thermostat and every indicator "drop" together with the circuits to every bell in the building can be readily tested and this with efficiency without ringing up the fire station. When the testing has been completed the switches 22 and 23 will be closed to their normal condition and the switches 34 will remain broken in their normal condition and the line will again be restored to working order. In the event of the whole of the circuits in the house breaking down and assuming that the wire 37 remains in working order it is possible to mechanically call the fire station up by operating the armature 25 of relay 24, or a testing switch 89 can be provided for this purpose.

The electrical connections to the bells 33 together with the gong 21 are joined up in parallel so that if the circuits are in complete order the whole of the bells will be rung simultaneously. Any one bell that failed to ring would indicate a break in the wires, either 44 or 45, that are in connection with that particular bell.

The fireman or other person in charge at the fire station, by opening the switch 6 interrupts the circuit to the battery 10 together with the circuit to the gong 13. If the switch 29 be broken the whole of the circuits through the relay 24 together with those to all the bells will be interrupted and the bells if ringing will cease to ring.

We are aware that previous efforts have been made to effect partial results in so called automatic fire alarm systems. We are further aware that audible and visual signals have been given at fire stations for indicating the

localities of fires, and again that visual and audible indications have been given in central positions in a building, such as the hall or watchman's room for indicating the locality, and we are further aware that substitutes for thermostats and thermostats have been used in fire alarm systems. We therefore do not claim broadly any of these by themselves, but

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

In an automatic fire alarm system, the combination, with a series of thermostats arranged in different parts of a building, a series of alarm bells arranged in different parts of the said building, and an indicator located at a central station inside the said building and provided with a series of drops, one for each thermostat; of electric connections arranged between the thermostats, bells and indicator drops, whereby each thermostat, when heated, will operate simultaneously all the bells and that single drop to which it pertains; an electric alarm bell and an indicator drop at the fire station, connected with said electric connections in the building by a line wire and free to be operated simultaneously by any of the said thermostats; and a police alarm bell located on the outside of the said building, included in the said line wire and operated simultaneously with but independent of the said alarm bells inside the building, substantially as set forth.

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