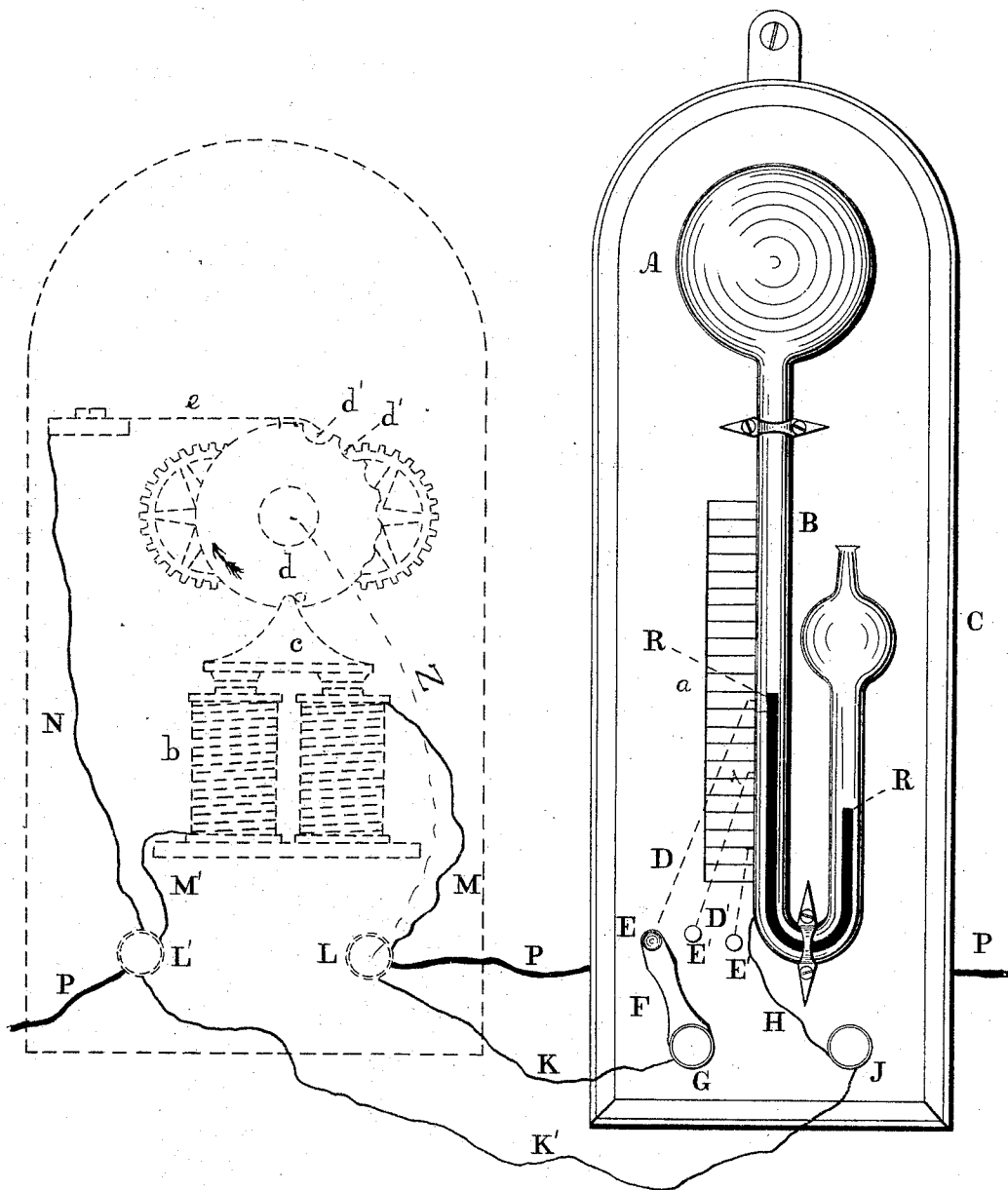


E. J. FROST.

Electro-Thermostatic Fire-Alarms.

No. 156,560.

Patented Nov. 3, 1874.



Witnesses

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ONE-HALF TO JACOB HAEHULEN, OF SAME PLACE.

IMPROVEMENT IN ELECTRO-THERMOSTATIC FIRE-ALARMS.

Specification forming part of Letters Patent No. **156,560**, dated November 3, 1874; application filed September 4, 1874.

To all whom it may concern:

Be it known that I, EDWARD J. FROST, of the city and county of Philadelphia and the State of Pennsylvania, have invented a new and useful Improvement in Electric Fire-Detectors; and I do hereby declare the following to be a clear and exact description of the nature thereof, sufficient to enable others skilled in the art to which my invention appertains to fully understand, make, and use the same, reference being had to the accompanying drawings making part of this specification, in which the figure is a face view of the device embodying my invention, which consists of a thermostat or thermometer, made of a U-shaped tube having a ball at the upper end, in which end a partial vacuum is formed, so that when the mercury is placed in the bottom of the U it will rise higher in the limb having the ball than in the other. In this limb are secured a series of conductors, capable of being singly connected by means of switch-buttons and a switch with a pole of a battery or one terminus of a line-wire entering the house or apartment wherein the apparatus is located. The other pole or terminus is permanently connected to the mercury near the base of the U. Hence the expansion of the remnant of air in the partial vacuum-ball will force the mercury to descend and break eventually the circuit. This circuit, however, is only a shunt to another circuit containing an electro-magnet controlling an alarm or signal mechanism. The electro-magnet being of much greater resistance than the mercury of the thermostat, the greater part of the current passes through the circuit of the latter, leaving the electro-magnet inactive until this circuit is broken by the depression of the mercury-balance due to the expansion of air by heat, when, only the circuit through the magnet being left, the current traverses it, charging its magnet, which attracts its armature, releasing the alarm or signal mechanism, to which the armature acts as a detent. This mechanism embraces a circuit-wheel and spring, to which connections are made from the poles or termini before mentioned. Normally, however, the spring is resting over a depression in or insulation on the circuit-wheel. As soon, however, as the wheel

is started metallic connection is made and a circuit completed through the spring or wheel. As this circuit is really of no resistance in comparison with the electro-magnets, it acts as a shunt to the magnets and the current passes therethrough, giving the proper alarm or signals at any place, and leaving the magnet inactive, upon which the armature is released and springs back to arrest the circuit-wheel on the completion of its revolution.

Referring to the drawings, A represents a hollow ball, of glass or other suitable material, to which is connected, and with which communicates, a U-shaped mercury receiving-tube, B, properly mounted on a plate or frame, C, and which, if desired, may have a series of graduations or a scale, *a*, arranged relatively to one limb of the tube, whereby a thermometer is readily provided. D represents a wire or other conductor, which has one end hermetically sealed in the tube B, and extends to a switch button or contact, E; and D' represents wires or other conductors, which are similarly sealed in the tube B at different points, and extend to switch buttons or contacts E' E', which are secured to the plate or frame C. A switch, F, is jointed to a binding screw or post, G, on the plate C, and is adapted to have one end come in contact with either of the switch buttons or contacts E E', whereby there may be formed a circuit or communication between either of the wires D D' and the said binding screws or posts G. A wire or other conductor, H, extends from a binding screw or post, J, on the plate C to the tube B, at a point below the wires D D'. K K' represent conductors, which extend, respectively, from the binding screws or posts G J to binding screws or posts L L', arranged in a box, (shown in dotted lines,) and within which is arranged a magnet, *b*, whose armature *c*, when attracted thereby, permits motion of a train of gear-wheels, *d*, to which is attached suitable mechanism for sounding an alarm of fire in a manner to be indicated. Conductors M M connect the binding screws or posts L L and magnet *b*, and a conductor, N, extends from the binding screw or post L' to a spring, *e*, (shown in dotted lines,) above the wheel *d*, which is geared with the train of wheels, and has a series of

depressions, d' , on its face. The main line or wire is shown at P, and is connected to the binding screws or posts L L in the alarm-box.

The arrangement of the circuits will be perceived in the following description of the operation of my devices.

As shown, the apparatus is in its normal condition. The switch F is turned on the button E, completing the circuit through wire D. If the alarm were desired for a higher degree it would be turned to one of the buttons E. Suppose the current to come in on main line P to binding-post L', and emerge on line P from post L. At L' it finds two circuits: One by M' through the magnet b , thence by M to line; the other through wire K', post J, wire H to the mercury-balance; thence by D, switch F and K to L and line P. The latter being of little resistance in comparison to the former, the current takes it, leaving the magnet inactive. Upon the elevation of the temperature in the room or place where the thermostat is located, the portion of air left in A is expounded, forcing the money down and uncovering the end of D, thereby breaking the circuit through the balance, and leaving for the current only the circuit through the magnet, which is there charged and attracts its armature C. This releases the circuit-wheel d , which is revolved in the direction of the arrow by its train of gearing. As soon as the wheel and its spring e are brought in contact a new circuit is made—viz., P L' N e —to wheel D, thence either through the frame or by a wire, as shown in dotted lines at Z to L, and line P. This circuit having no resistance comparatively the current follows it whenever it is closed, and the circuit through the magnet when it is broken; hence, the signals are transmitted to a distance station, if desired, the instruments then being operated by the differ-

ence in power of the currents transmitted due to the difference of resistance in the circuits through the wheel and through the magnets.

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

1. The thermostat consisting of the U-tube with ball A, in which a partial vacuum is created, and mercury-balance, substantially as described.

2. The combination, with the thermostat described, of a conductor, H, the series of conductors D D' D', and switch F, substantially as and for the purpose set forth.

3. The combination, with a closed main-line circuit and an electro-magnet placed therein and controlling a signal or alarm mechanism, of a shunt-circuit normally closed and controlled by a thermostat, substantially as and for the purpose set forth.

4. The combination, with a closed main-line circuit and an electro-magnet placed therein and controlling a signal or alarm mechanism, of a shunt-circuit formed by and through the signal or alarm mechanism controlled by the electro-magnet, substantially as and for the purpose set forth.

5. The combination, with a closed main-line circuit and an electro-magnet placed therein, of two shunt-circuits, as described, the one through and controlled by a thermostat, the other through the alarm or signal mechanism and brought into operation by the action of the magnet when the first is broken by the thermostat, substantially as and for the purpose set forth.

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