A. GOLDSTEIN.

ELECTRICAL THERMOSTATIC ALARM SYSTEM.

APPLICATION FILED MAY 2, 1910.

981,998. Patented Jan. 17, 1911.

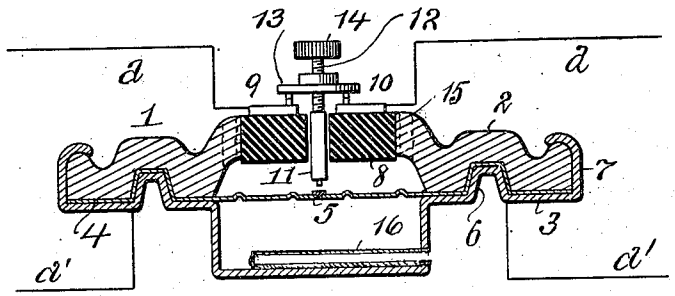

Fig. 1.

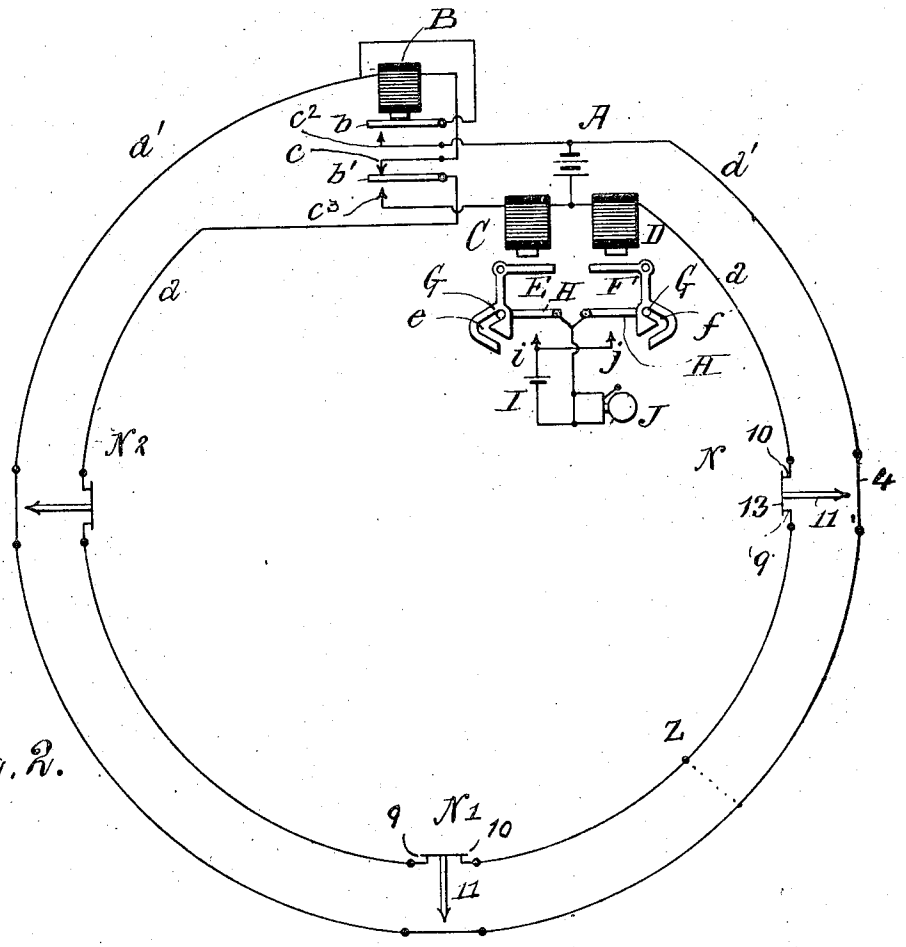

Fig. 2.

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UNITED STATES PATENT OFFICE.

ALBERT GOLDSTEIN, OF NEW YORK, N. Y., ASSIGNOR TO INTERNATIONAL ELECTRIC PROTECTION COMPANY, A CORPORATION OF NEW YORK.

ELECTRICAL THERMOSTATIC ALARM SYSTEM.

981,998. Specification of Letters Patent. Patented Jan. 17, 1911.

Application filed May 2, 1910. Serial No. 558,818.

To all whom it may concern:

Be it known that I, ALBERT GOLDSTEIN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Electrical Thermostatic Alarm Systems, of which the following is a specification.

The invention relates to an electrical thermostatic alarm system, and consists, first, in the combination whereby two changes must be produced in the circuit, such as a make and a break, by the thermostat, both acting upon the alarm before the said alarm operates: and also in the construction of the thermostat whereby upon the movement of the diaphragm due to expansion of air within the case, said changes are caused. In this way, a single accidental change occurring on the line, such as a ground or crossing, is prevented from giving a false alarm.

In the accompanying drawing—Figure 1 is a cross section of my thermostat, and Fig. 2 is an electrical diagram of an alarm circuit including three of said thermostats located at different stations.

Similar letters and numbers of reference indicate like parts.

The circular case 1 comprises two flanged cup-shaped members 2, 3, between which the diaphragm 4 is received and held. Said diaphragm is to be made of thin sheet metal, preferably the thinnest sheet copper procurable, and may be corrugated and provided with a central contact boss 5. The member 2 is to be preferably made of steel much heavier than the member 3, so as to form the chief support for the device. The member 3 is preferably of a metal that is highly conductive of heat, such as copper, and as thin as will afford the necessary rigidity. The flange of member 3 has a corrugation 6 which enters a similar corrugation in the flange of member 2. The flange of diaphragm 4 is clamped between said corrugated members, so that the diaphragm is thus strained and a close air-tight joint formed between the parts. The member 3 may be secured by bending its circumferential edge 7 over the edge of member 2.

Centrally disposed in member 2 is a block 8 of insulating material, on which are two contact plates 9, 10. In the block is an opening through which loosely passes a metal rod 11 supported on a screw 12, which passes through a metal bridge piece 13, which normally rests on the contact plates 9, 10. The bridge piece 13 forms a nut for the screw 12 in which said screw may be adjusted by turning the milled head 14 so as to bring the lower end of rod 11 into desired proximity to the boss 5 on diaphragm 4. The contact plates 9, 10 are respectively connected to terminals of the circuit wire *a*, while the diaphragm 4 is connected to terminals of the circuit wire *a'*.

Air vents 15 (dotted lines Fig. 1) may be made in member 2 and communicate with the chamber therein on one side of the diaphragm. In the chamber in member 3 on the other side of the diaphragm is a tube 16 open at both ends and at its outer end communicating with an opening in the wall of said chamber.

The operation of the thermostat is as follows: The contact piece 11 is first adjusted in suitable proximity to the diaphragm 4. When the surrounding atmosphere increases in temperature, the heat is rapidly conducted through the thin metal wall of the chamber in member 3 and expands the air therein. This air can escape only through the tube 16 which is made long and of small cross sectional area, so as to retard the air flow. The consequence is, that the expansion of the air in the chamber containing the tube is so quick as to be practically an impulse in the confined air body which, being communicated to the diaphragm 4, first moves it into contact with rod 11, thus producing a crossing from wire *a* to wire *a'*, and then the further upward movement of the diaphragm raises the rod 11 and bridge 13 to break circuit between the terminal plates 9, 10 on wire *a*.

In Fig. 2 the thermostat is shown in an alarm circuit. The wires *a*, *a'* are line conductors connected to opposite poles of the battery A. In the conductor *a'* is a magnet B which controls the two switch levers *b* and *b'*. In the conductor *a* and on opposite sides of the battery A are two magnets C, D. The battery current normally energizes magnet B, so that a metallic circuit proceeds from one pole of battery A, by wire *a'*, to magnet B, to contact point *c*, switch lever *b'*, and wire *a*, through mag-

net D, back to battery. Magnet B is to be made of high resistance, so that magnet D, although included in the metallic circuit, does not receive sufficient current to cause it to actuate its armature. The pivoted armatures E, F of magnets C, D are in bell-crank form. At the end of each vertical arm of the armatures E, F, are formed V-shaped slots *e*, *f*, which receive pins G on the ends of the pivoted arms H. Said arms meet contact points *i*, *j*, and so close a local circuit which includes a battery I and electric bell J. In the circuit conductors *a*, *a'* at N, N', N^2 are interposed as many of the thermostats, shown in Fig. 1, as there are stations from which it is desired alarms shall be given. The operation is as follows: Assume the diaphragm of the thermostat at N, Fig. 2, to be moved to close contact with its rod. This short-circuits magnet B. The switches *b*, *b'* then drop and close circuit at the points c^2 and c^3. Circuit is then established through both magnets C, D, which attract their armatures E, F to bring the upper portions of slots *e*, *f* in a more nearly vertical position. The pins G then drop until they reach the angles in the slots. The diaphragm continuing to move under the air impulse, lifts the contact rod 11 and bridge 13, thus breaking circuit in wire *a* at 9 and 10. Magnets C and D then fail, and the armatures E, F return to the position shown in the drawing. But the pins G on arms H being now, as above stated, at the angles of the slots *e*, *f*, readily slide down the lower portions of said slots, thus permitting the arms H to close at points *i* and *j* the local circuit including the alarm J. The alarm then continues sounding until the air pressure on the diaphragm 4 is suitably decreased, and until the parts associated with the armatures E, F are manually restored to their original position. It will be observed, therefore, that this thermostat requires two successive changes in the circuit to insure its operation; namely, (1) a short-circuiting produced by the contact of diaphragm 4 and rod 11, and (2) an opening of the circuit produced by the separation of the bridge piece 13 from the contact plates 9 and 10.

The advantages of this construction are—

(1) That it is impossible for a single change in the circuit, such as an accidental crossing of the lines, or a break, or a ground, to operate the alarm.

(2) That a single break in the circuit wires will not prevent the alarm from operating. Thus assume the break to occur at the point Z. Two leads from the battery will then be formed, one including magnet C and thermostats N' and N^2, and the other including magnet D and thermostat N. Hence if either thermostat N' or N^2 be operated, magnet C only will respond, while if thermostat N be operated, magnet D only will respond either magnet then performing the same alarm circuit-closing operation as was previously done by both magnets.

(3) That a single accidental crossing of the circuit wires will not prevent the alarm from operating. Thus suppose the accidental crossing to occur at the point Z. Two leads will be formed as before, but in this case, both magnets C and D will be energized, thus performing the first step in lowering the arms H. Now suppose any one of the thermostats to be operated, say the thermostat N. The closing of circuit between diaphragm 4 and rod 11 does nothing. But when the circuit is broken at points 9 and 10, the results are as follows. The breaking at point 10 deënergizes magnet D, which accomplishes the second step in lowering its arm H to close the local circuit to the alarm. The other magnet C remains energized, since its lead is closed through the thermostats N' and N^2 and the accidental crossing at Z, and therefore its arm H remains motionless. Now, suppose the accidental crossing, as before, being at Z, the thermostat N' is operated. Then the opening of circuit at point 9 will deënergize magnet C, which will perform the second step in lowering its arm H to close local circuit through the alarm, while the magnet D will remain energized, its lead being closed through thermostat N and the accidental crossing at Z. The necessity for having two circuit-breaking contacts 9, 10 at each thermostat, one or the other of which comes into operation to deënergize one of the two previously energized magnets, depending upon whether the crossing is at one side or the other of the working thermostat, will now be apparent.

I claim:

1. In combination, an electric circuit, an alarm device, controlling means therefor operated in two steps by successive changes in the electrical condition of said circuit, and means for producing said changes.

2. In combination, an electric circuit, an alarm device, controlling means therefor operated in two steps by successive changes in the electrical condition of said circuit, and thermostatically controlled means for producing said changes.

3. The combination in circuit of an electrical thermostat comprising a diaphragm, means controlled by said diaphragm for making two changes in the electrical condition of the circuit, an alarm device and controlling means therefor operated in part by said first change and having its operation completed by said second change.

4. In combination, an electric circuit, an alarm device and controlling means therefor operated in part by a closing of said circuit and having its operation completed

by a breaking of said circuit, and thermostatically controlled means for first closing and then breaking said circuit.

5. The combination in circuit of an electrical thermostat comprising a case, a diaphragm in said case and operated by air expansion therein, means controlled by said diaphragm for first making and then breaking said circuit, and an alarm device operating only after said break.

6. The combination in circuit of a magnet, a circuit closing switch controlled by said magnet to move over two successive portions of its path before closing circuit, and an electrical thermostat comprising a case, a diaphragm in said case and operated by air expansion therein, and means actuated by said diaphragm to control said magnet to cause said movement of said switch.

7. The combination of the line members of a circuit, a thermostatic diaphragm connected to one of said members, and a loose contact piece bridging the terminals of the other of said members and movable by said diaphragm to open circuit at both of said terminals: the said diaphragm operating, first, to establish a crossing between said line members through said contact piece, and second, to open circuit at said terminals.

8. The combination of a source of current, the line members of a circuit, a circuit closer normally energized to close said circuit, two magnets in one of said line members and disposed on opposite sides of said current source, a local alarm circuit controlled by each of said magnets, fixed terminals in said line member, a loose contact piece bridging said terminals, and a thermostatic diaphragm interposed in the other line member: the said diaphragm operating, first, to establish a crossing between said line members through said contact piece, and second, to open circuit at said terminals.

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

ALBERT GOLDSTEIN.

Witnesses:
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