G. W. LEVENGOOD.

TEMPERATURE INDICATING SYSTEM.

APPLICATION FILED AUG. 27, 1909.

966,224. Patented Aug. 2, 1910.

Fig. 1.

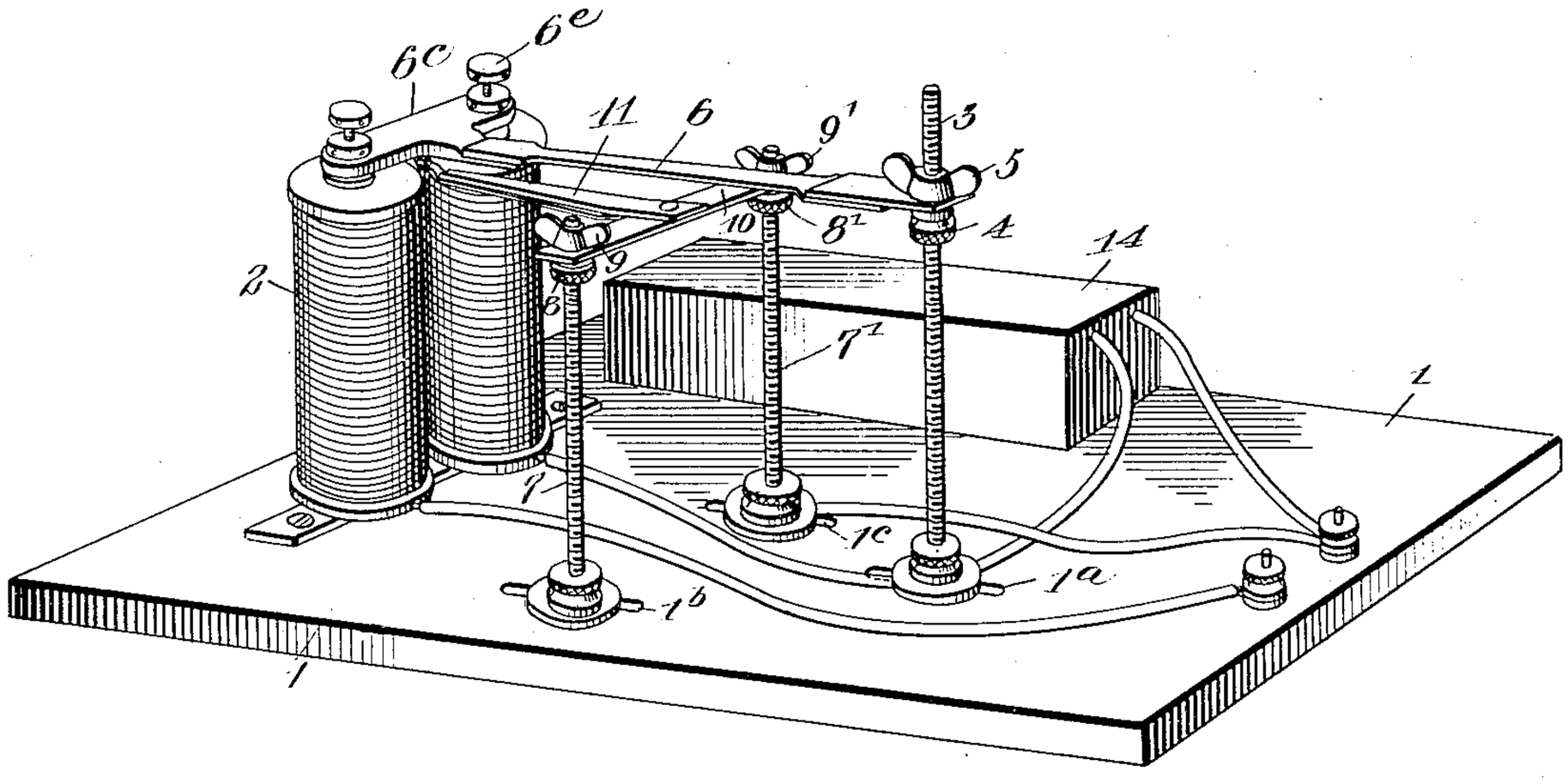


Fig. 2.

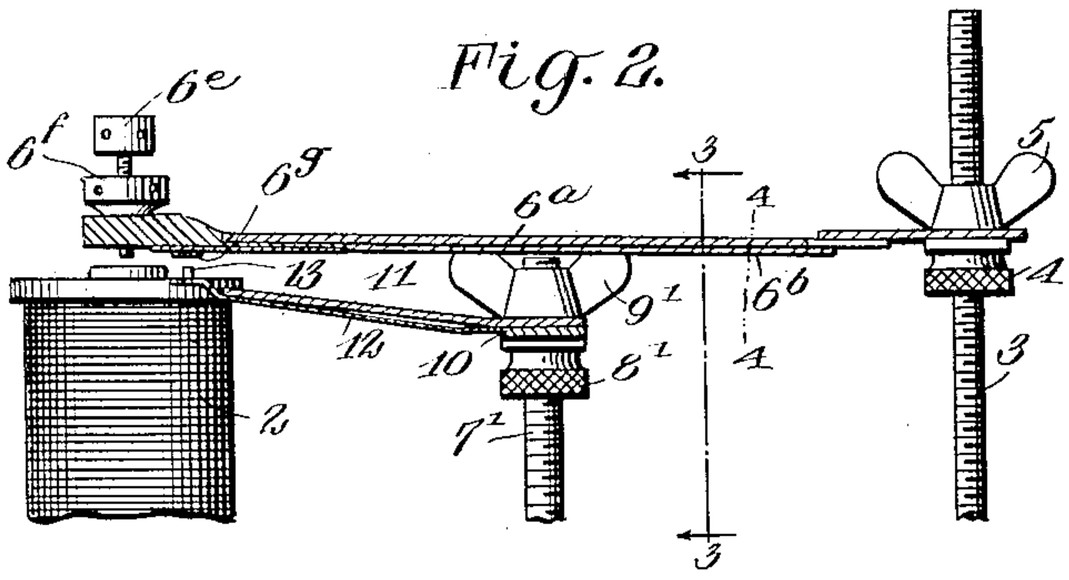


Fig. 3.

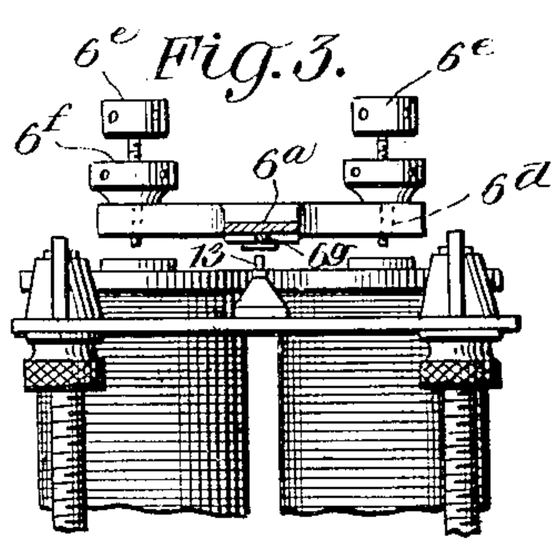


Fig. 5.

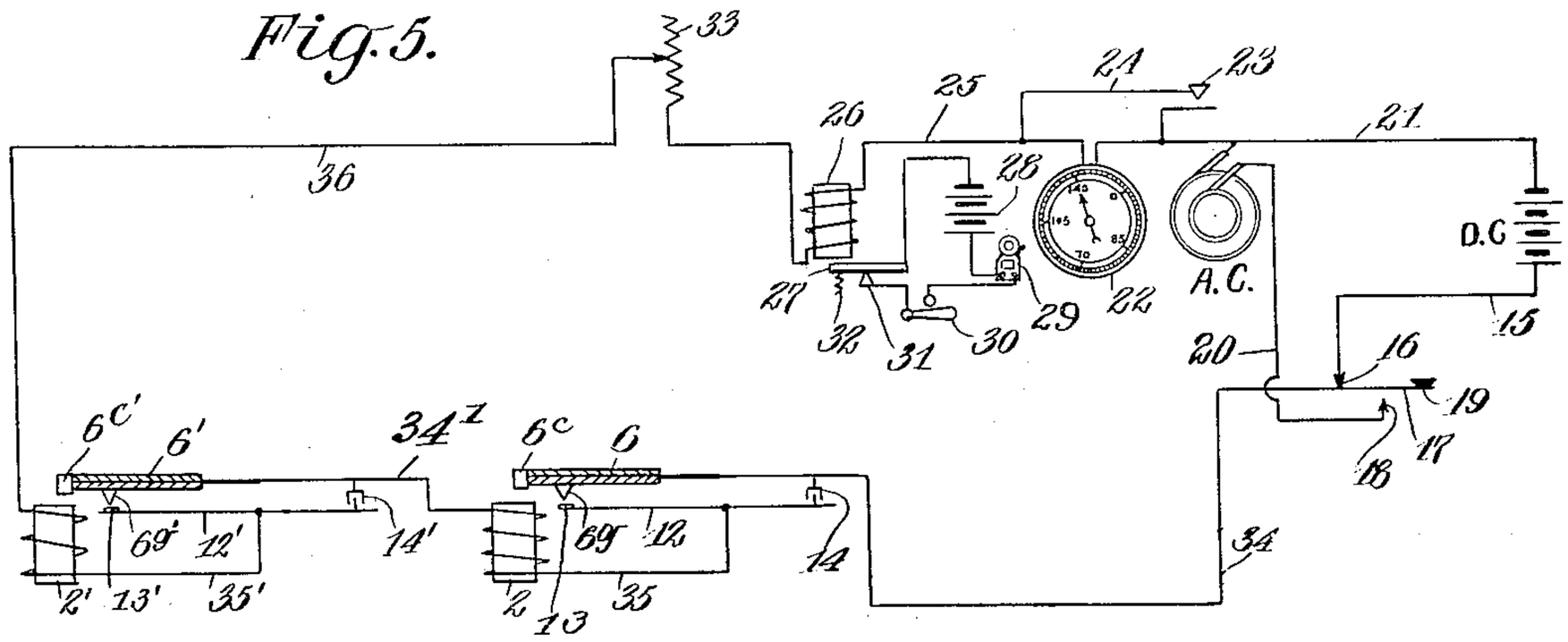
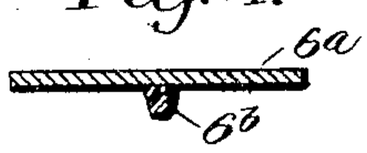


Fig. 4.



WITNESSES

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TEMPERATURE-INDICATING SYSTEM.

966,224. Specification of Letters Patent. Patented Aug. 2, 1910.

Application filed August 27, 1909. Serial No. 514,937.

To all whom it may concern:

Be it known that I, GEORGE W. LEVENGOOD, a citizen of the United States, and a resident of Lebanon, in the county of Lebanon and State of Pennsylvania, have invented certain new and useful Improvements in Temperature-Indicating Systems, of which the following is a specification.

My invention relates to improvements in devices for indicating at a central station abnormal temperatures of rooms, dwellings or inclosures situated some distance from the central station and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of my invention is to provide a device which may be located at the place at which the temperature is to be kept within certain limits so that on the undue variation of the temperature, as in case of fire, indication of such variation will be given at the central station.

A further object of my invention is to provide means by which the operator at the central station can determine whether or not the indication is caused by an accidental disarrangement of the circuit or whether it is really due to a decided change in temperature.

A further object of my invention is to provide a thermostat for use in my system which may be regulated by varying the current strength at the central station, and which will operate when the temperature reaches a predetermined point.

Other objects and advantages will appear in the following specification and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a perspective view of the adjustable thermostat which forms the main feature of my system; Fig. 2 is a longitudinal section through the compound bar of the thermostat; Fig. 3 is a vertical section along the line 3—3 of Fig. 2; Fig. 4 is a vertical section along the line 4—4 of Fig. 2, and Fig. 5 is a diagrammatic view of the circuits of the system.

In carrying out my invention, I provide an insulating base 1 having the slots 1^a, 1^b and 1^c upon which is mounted a pair of magnets 2, these magnets being preferably wound with a large number of turns of fine wire. Secured to the base on a line midway between the magnets is an adjustable standard 3 which is adjustable toward and away from the magnets 2, in the slot 1^a. The standard 3 is screw-threaded to receive a milled nut 4 and a winged nut 5 between which the end of a compound bar 6 is secured. The structure of this compound bar is clearly shown in Figs. 2 and 5. It consists of an upper metal strip 6^a having a coefficient of expansion which is relatively low, and a lower bar 6^b of a different shape and having a relatively high coefficient of expansion. The free end of the compound bar is provided with an armature 6^c having screw-threaded openings 6^d in its ends, these openings being located immediately above the centers of the respective magnet cores. Disposed in these openings are the screws 6^e each provided with a lock nut 6^f. The armature 6^c is provided with a platinum contact 6^g.

Between the magnets 2 and the standard 3 are a pair of standards 7 and 7′, the former being adjustably mounted in the slot 1^b and the latter in the slot 1^c. These standards are also screw-threaded for the reception of the lower milled nuts 8 and 8′ and the upper winged nuts 9 and 9′, respectively.

Supported between the standards 7 and 7′ is the transverse conducting member 10 which bears a laterally projecting arm 11 beneath which is secured the spring 12, the free end of the spring being bent upwardly above the end of the arm 11 and being provided with a platinum contact 13 arranged to engage the platinum contact 6^g on the member 6. The arm 11 is for the purpose of bracing the spring and limiting its upward movement. A condenser 14 may be arranged for convenience on the plate 1.

In Fig. 5 I have shown a working circuit which may be used in my system although other specific arrangements of parts might be made without departing from the spirit of the invention.

In Fig. 5, AC denotes an alternating current generator; DC is a source of direct current such as a battery. One terminal of the battery is connected by the conductor 15 with the contact 16 which is normally in engagement with a spring conductor 17. The latter may be pushed downwardly out of engagement with the contact 16 into engagement with the contact 18 by means of a button 19. The contact 18, it will be observed is connected to one side of the alter-

nating current generator by means of the conductor 20. The wire 21 connects one side of the battery and the generator to a terminal of a resistance element 22. The latter may be of any approved form but has on its face a dial which indicates the amount of resistance cut in or out and indicates various temperatures and the purpose of this rheostat will be explained hereinafter. A shunt around the rheostat is provided by means of the contact key 23 and the conductor 24. Leading from the opposite side of the rheostat is a wire 25 which leads to the magnet 26 of a relay. The armature 27 of the relay forms part of a local circuit in which the battery 28, the alarm bell 29 and a switch 30 form the remaining parts. The armature 27 is normally held against a contact 31 by means of a spring 32. One terminal of the relay is in turn connected with a variable resistance 33. The thermostatic elements are connected with the spring 17 in the manner shown in the figure. I have illustrated two of such instruments as being connected in series in one circuit although it will be understood that more than two might be used in one circuit, the connections of the other instruments being similar to that shown. In the diagram it will be seen that the compound bar 6 is connected by the conductor 34 with the spring 17, a condenser 14 being inserted between the bar 6 and the spring 12, the latter being connected to the magnet 2 by the conductor 35. The second instrument has similar parts, the compound bar being connected with the terminal of the magnet 2 of the first instrument in the manner shown.

From the foregoing description of the various parts of the device the operation thereof may be readily understood.

Each of the thermostatic elements is calibrated before leaving the factory, at a certain temperature say 70 degrees. The contact 6^g of the compound bar will stand at a certain distance above the contact 13 of the spring. Now if a higher temperature should occur the buckling of the bar upwardly due to the unequal expansion of the two metals will cause the armature to lift farther away from the spring and also farther away from the magnet cores. It is obvious that it will take a greater current to again attract the armature than it would at a lower temperature when the armature is nearer the magnet poles. On the other hand, if the temperature should decrease, the armature will approach the magnet poles and a less current will be required for the armature to effect the engagement of the contacts. This principle forms one of the main features of the invention. The use of the variable resistance 33 will be explained later.

With the system arranged as shown in Fig. 5, we will first consider the operation necessary to set the thermostatic device so that it will sound an alarm at a given temperature, say 75°, or above. The operator at the central station places the indicating pointer of the rheostat 22 at 140°, thereby cutting out all of the resistance of the rheostat. (Obviously the scale might be arranged with indications higher than 140°, this being purely an arbitrary matter.) He now presses the button 19 connecting the alternating current generator with the two thermostatic elements, thereby sending a current over the following path from the generator, through 20, 18, 17, 34, condenser 14, 35, magnet 2, 34′, condenser 14′, 35′, magnet 2′, 36, 33, 26, 25, 22, 21 and back to the generator. The connection with the battery is broken, of course, at 16 during the movement of the key 17. The pulling down of the armatures 6 and 6′ of the thermostats causes the engagement of the contacts 6^g and $6^{g'}$ with the springs 12 and 12′, respectively. The button 19 is now released, the alternating circuit is broken, and the direct current circuit established at 16. The tendency of the armatures 6 and 6′ is to fly back again, but they are followed in their upward movement by the springs 12 and 12′ so that before the contacts 6^g, 13, $6^{g'}$ and 13′ are broken, a direct current is established through these contacts and through the magnet around to the battery. This keeps the magnets closed. The operator now moves the pointer of the rheostat 22 down, thereby switching in resistance and decreasing the current through the magnets, which will eventually let go when the current becomes so weak that it cannot retain the spring armatures. This will occur if the room in which the instrument is situated is at 70° when the pointer indicates 70° on the rheostat 22. If the room is at a higher temperature, it will occur before the pointer reaches 70° and will indicate the temperature at which the room is. The retraction of the armatures of the thermostatic devices breaks the current in the relay 26, whose armature 27 is held while the current is flowing. This armature falling back on its contact 31 completes a local circuit, the switch 30 having been closed previously, and rings the alarm 29. The operator now moves the pointer of the rheostat 22 back several points, say to 75°, cutting out more resistance, and permitting a stronger current to flow. He now presses the key 23, thereby shunting the rheostat 22 entirely. The key 19 is now depressed at the same time that the key 23 is in contact with its spring. This will cause both magnets 2 and 2′ to again be energized. Keys 19 and 23 are now released and the thermostat will operate whenever the temperature of the room in which it is located reaches 75°. Of course, the rheostat dial might have been set at 80° instead of 75°,

or at any other temperature at which it is desired to operate the device.

The testing and resetting of the device is supposed to be conducted at predetermined intervals so that the operator can keep direct account of the temperatures of the rooms or places at which the devices are stationed. He accomplishes this by moving the rheostat pointer back toward 0°. As soon as the temperature of the room is reached (the temperature might have risen, say to 73°), the thermostat will let go, thereby sounding the alarm, and indicating the temperature at which the room is now. The resetting of the instrument may be accomplished in the same manner as before and the instrument is preferably set 5° higher than the temperature of the room, this time being set at 78°. The rise of temperature in the room above 78°, therefore, will cause the device to operate. If the device should operate, the attendant at the central station may determine whether it is a false alarm or whether the temperature is actually rising by proceeding as follows: He first presses the key 23, thereby shunting the rheostat 22. The key 19 is then pressed, which causes the magnets 2 and 2′ to pull down the armatures. He then releases the keys 19 and 23 in consecutive order. If a false alarm had been given, the armatures will not let go, but if there is an abnormal rise of temperature, then the armatures will let go, even if the rheostat hand is pushed around several degrees higher than the operative point, thereby proving conclusively that there is a dangerous rise in temperature.

It will be noted that the thermostatic instruments are connected up in series. Since there must be a current of given strength when the rheostat indicates a given temperature, an additional resistance 33 is necessary when adding another instrument to the line. The resistance 33 is placed in circuit so that for a given amount of resistance added for each additional thermostat in circuit, the same amount of resistance may be cut out of the circuit by the variable resistance 33, thereby leaving a uniform resistance on the line and permitting more or less of the instruments to be added as occasion demands.

While I have shown one circuit entering the central station, it will be noted that in actual practice there are more circuits, and the attendant is supposed to test each one of these circuits at predetermined intervals. The alternating current frequency may be so high as to cause the magnets 2 and 2′ to operate, or a lower frequency may be used, which will cause them to buzz or hum, thereby attracting attention in the dwellings themselves, so that if the operator believes something to be wrong, he may thus sound the alarm for the occupants of the dwelling. The action of the thermostatic elements may be properly adjusted by means of the screws 6^e. These screws, as stated before, bear on the upper parts of the pole pieces. It is obvious that the screws may be turned so that their lower ends will contact with the pole pieces when the armature 6^c is at different distances from the pole pieces. Thus, if they are screwed down, the armature may be lifted a considerable distance from the pole pieces, and hence, will more easily spring away from the pole pieces as the current is decreased. The instrument can thus be rendered more or less sensitive.

I claim:

1. A temperature indicating system, comprising a central station, a source of direct current, and a source of alternating current at said central station, a thermostatic device provided with a magnet, means for connecting the magnet with the source of alternating current, said means also operating to cut off the alternating current and to connect the direct current for causing the operation of the thermostat at any predetermined temperature, a relay in circuit with said thermostat, and a local circuit controlled by the relay, and provided with a signal for indicating the operation of the thermostat.

2. A temperature indicating system comprising a central station, a source of direct current and a source of alternating current at said central station, a thermostatic device, connections between said thermostatic device and said sources of current, a key for connecting either the alternating or direct current source with said thermostat, and for cutting out the other source, an indicating rheostat in said circuit connections, a relay controlled by said thermostatic device, and a signaling circuit controlled by said relay.

3. A temperature indicating system comprising a central station, a source of direct current, and a source of alternating current at said station, an indicating rheostat, a relay, a local circuit controlled by said relay and provided with a signal, a thermostatic device comprising a magnet and a condenser in series with said relay and said rheostat, and an armature and a contact spring in shunt circuit around said condenser, said shunt circuit being broken normally, said condenser being normally connected with said sources of direct current and a key for cutting off the direct current and for switching on the alternating current, thereby operating the magnet of the thermostat, said key being arranged to close the direct current circuit before the actuation of the armature controlling the shunt circuit.

4. A temperature indicating system comprising a central station, a source of alternating current and a source of direct current at said central station, an indicating rheostat, a relay, a local circuit controlled by said relay and provided with a signal, a variable

resistance, a plurality of thermostatic devices each comprising a magnet, an armature, a contact spring arranged to be engaged by said armature, and a condenser having a shunt circuit, the said rheostat, relay, variable resistance, magnets, and condensers being in series, the actuation of the armatures of said magnets serving to control the shunt circuits around their respective condensers, normally closed connections between one of said condensers and said source of direct current, and a key for switching on the source of alternating current whereby the magnets are energized, said key being arranged to cut off said alternating current and to switch on said direct current again, whereby the energization of the magnets is continued through the respective shunt circuits around their respective condensers.

5. The combination with a central station provided with an indicating rheostat, of a thermostatic element comprising a magnet and a condenser in series with said rheostat, a spring armature having at one end a compound bar, a spring contact adapted to be engaged by said armature, said armature and spring contact being arranged to form a shunt around said condenser and means for adjusting the sensitiveness of the thermostatic device.

6. In a temperature indicating system, a thermostatic device comprising a magnet, an armature therefor, comprising a compound bar and a spring support therefor, a contact spring, contacts on said armature and said contact spring, a condenser between said armature and said contact spring and means for regulating the movement of the armature toward said magnet, thereby varying the sensitiveness of the instrument.

7. In a temperature indicating system, a thermostatic device comprising a magnet, an armature therefor, consisting of a compound bar, a spring contact arranged to be engaged by the armature in its movement toward the magnet and adjusting screws carried by the armature and adapted to engage the magnet for adjusting the range of movement of the armature toward the magnet.

8. A temperature indicating system comprising a central station, a source of direct current, and a source of alternating current at said central station, a thermostatic device provided with electromagnetic operating means, means for connecting the electromagnetic operative means with the source of alternating current, said means also operating to cut off the alternating current and to connect the direct current for causing the operating of the thermostat at any predetermined temperature, a relay in circuit with said thermostat, and a local circuit controlled by the relay and provided with a signal for indicating the operation of the thermostat.

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Witnesses:
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