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CONTROL WIRING FOR ELECTRIC HEATING DEVICES.

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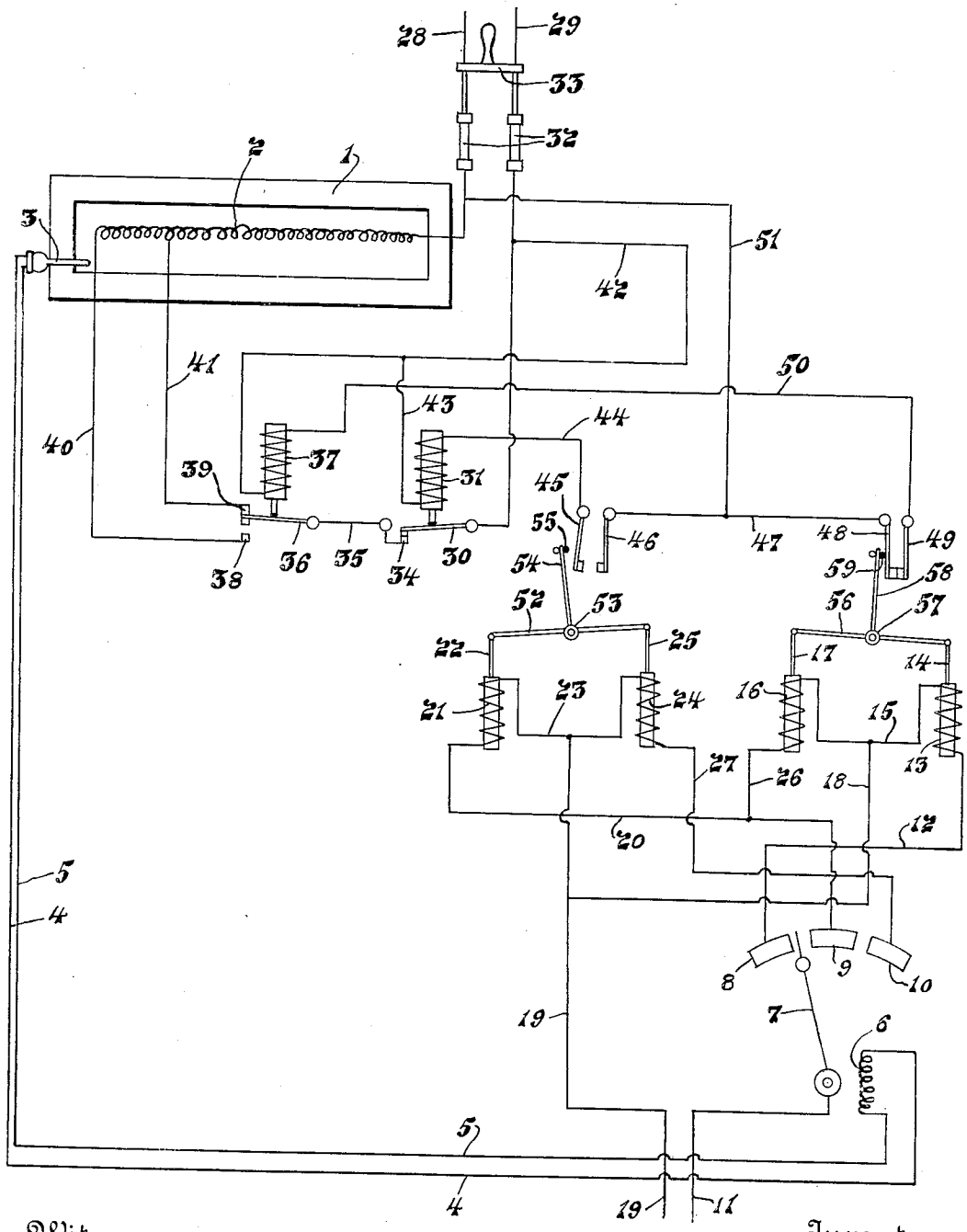

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CONTROL-WIRING FOR ELECTRIC HEATING DEVICES.

1,204,731. Specification of Letters Patent. Patented Nov. 14, 1916.

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To all whom it may concern:

Be it known that we, THADDEUS F. BAILY and FRANK T. COPE, citizens of the United States, both residing at Alliance, in the county of Stark and State of Ohio, have invented a new and useful Control-Wiring for Electric Heating Devices, of which the following is a specification.

This invention relates to control wiring for electric heating devices and has more especial reference to a system of wiring arranged to electrically control the temperature of a furnace or the like.

The object of this invention is to provide a system of control wiring by means of which the temperature of a furnace or the like may be electrically controlled.

A further object is to provide in combination with an electrically heated chamber a system of wiring controlled by a heat measuring device connected to said chamber.

With these objects in view the invention consists in the novel construction and arrangement of parts, hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of construction may be made within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawing the figure represents a diagrammatic view of control wiring for a furnace and the like constructed in accordance with our invention.

Similar numerals of reference indicate corresponding parts throughout the figure of the drawing.

Referring more especially to the construction illustrated in the accompanying drawing, the numeral 1 indicates a furnace or the like adapted to be heated by means of the coil 2 or an equivalent electrical heating device. The thermo-couple 3, of any ordinary construction, is connected by means of wires 4 and 5 with a measuring instrument such as the pyrometer 6, the needle 7 of which is controlled in the usual manner by the temperature of the thermo-couple 3.

The needle 7 of the pyrometer is adapted to contact, as it is moved by changes in temperature in the furnace, with a plurality of electrical contacts 8, 9 and 10. As the temperature in the furnace drops the needle will contact with the plate 8 and as the temperature increases the needle will be moved to contact, first with the plate 9 and then with the plate 10.

A wire 11 leads from a source of electrical current to the needle 7 of the pyrometer. From the contact plate 8 a wire 12 leads to the coil 13 of a solenoid provided with a plunger 14, a wire 15 connecting said coil with the coil 16 of a similar solenoid which is provided with a reciprocating plunger 17. The wire 15 is connected by means of a wire 18 with the wire 19 upon the other side of the line, said last named wire leading back to the source of electrical supply.

The contact 9 is connected by means of a wire 20 with the coil 21 of a solenoid provided with a plunger 22, said coil being connected by means of a wire 23 with a similar coil 24 of the solenoid provided with the reciprocating plunger 25. The wire 19 leading from the other side of the line is connected to the wire 23 and the wire 20 is connected by means of a wire 26 to the coil 16. The coil 24 is connected by means of a wire 27 with the contact plate 10.

A wire 28 leads from a source of electrical supply to the resistance coil 2, the wire 29 from the other side of said line being connected to the armature 30 of the solenoid 31. Fuses 32 are provided in the line above mentioned and the usual switch is indicated by the numeral 33. The armature 30 is adapted to contact with the point 34, the wire 35 connecting said point with the armature 36 of the solenoid 37, said last named armature being adapted to contact with the points 38 and 39 which are connected respectively to the extremity and to a point intermediate the ends of the resistance coil 2 by wires 40 and 41.

A wire 42 is connected to the wire 29 or leads from some other source of electrical supply and is connected to the solenoid 37, a wire 43 leading from said wire to the solenoid 31. A wire 44 connects the solenoid 31 with the spring arm 45 of a switch com-

posed of said spring arm, which is normally located in the position shown in the drawings, and the rigid arm 46. A wire 47 connects said rigid arm to the spring arm 48 of a similar switch the rigid arm 49 thereof being connected by means of a wire 50 with the solenoid 37. The wire 47 is connected to the wire 28 of the supply line by means of a wire 51.

The plungers 22 and 25 are pivotally connected to opposite extremities of the lever 52, said lever being pivoted intermediate its extremities at 53 and provided with a rock arm 54, said rock arm being provided with an insulated tip 55 adapted to contact with the spring arm 45 to move said spring arm into contact with the arm 46. A similar lever 56 is pivotally connected at its extremities to the plungers 14 and 17, said lever being pivoted intermediate its ends at 57 and provided with a rock arm 58, said rock arm having an insulated tip 59 adapted to contact with the spring arm 48 to move said arm into contact with the arm 49.

In operation, the device is designed to maintain, as nearly as possible, an even temperature within the furnace or other heating chamber. When the temperature within the furnace drops, the needle 7 will be moved into contact with the plate 8, the path of the current from the wires 19 and 11 then being up through the needle to the plate 8 through the coil 13 and back through the wire 18 to the other side of the line. The current follows this path from the coil 13 because it has comparatively no resistance as compared with the resistance through the coils 21 and 16. As the coil 13 is energized the plunger 14 is moved into said coil rocking the lever 56 and closing the circuit through the switch arms 48 and 49 as illustrated in the drawing. The current from the wire 51 will then pass through the wire 47 to the closed switch and through the wire 50 to the coil 37 and then back through the wire 42 to the other side of the line. As the coil 37 is thus energized the armature 36 will be moved into contact with the point 39, the current from the wire 29 thus passing through the armature 30 and wire 35 to the armature 36 and thence through the wire 41 to the heating coil 2, and then back through the wire 28 to the other side of the line, thus increasing the current flowing through coil 2, due to this lowering of the resistance and naturally increasing the heating effect of the coil by reason of the increased wattage taken by same. As the temperature of the furnace increases the thermo-couple will operate the pyrometer 6, the needle 7 moving into contact with the plate 9 at which time the current from the wire 11 will flow through the needle to the wire 20, part of the current flowing through the wire 26 to the coil 16 and then to the wire 18 to the other side of the line and part of the current flowing through the coil 21 and wire 23 to the wire 19; that is the current divides, half of it going through each of the coils 16 and 21. There is no disadvantage in the current flowing through the coil 21 at this time as it does not actuate the plunger in the coil 21, since said plunger is already in the position shown. The plunger 17 in the coil 16, however, is moved into the coil as said coil is energized thus moving the rock arm 58 out of engagement with the spring arm 48 and opening the switch. If the heat within the furnace continues to increase the needle 7 will be moved into contact with the plate 10 at which time the current from the wire 11 will flow through the needle 7 and through the wire 27 through the coil 24 and then to the wire 19 to the other side of the line, thereby energizing the coil 24 and changing the position of the plunger 25 thus rocking the lever 52 and bringing the rock arm 54 into contact with the spring arm 45 moving said arm into contact with the arm 46. The current from the wire 51 thus passes to the wire 44, the switch being closed and through the coil 31 energizing said coil, the plunger thereof being moved into the coil thus raising the armature 30 out of contact with the point 34, breaking the circuit from the wire 29 to the heating coil 2.

The coil 21 will be energized as the needle falls back to the contact 9 the plunger 22 thereof being in position to operate but the current passing through the coil 16 does not move the plunger 17 thereof as said plunger is already into the coil as far as it can go. The switch arms 45 and 46 thus being separated and the switch arms 48 and 49 having already been separated the armature 30 will drop into contact with the point 34 and the armature 36 will drop into contact with the point 38 the current from the wire 29 passing to the wire 40 and through the entire length of the coil 2 and back to the wire 28 to the other side of the line. If the needle falls back to the point 8 the current will flow through the coil 13 and draw the plunger 14 down as above described.

Although the drawings and above specification disclose the best mode in which we have contemplated embodying our invention we desire to be not limited to the details of such disclosure, for, in the further practical application of our invention, many changes in form and construction may be made, as circumstances require or experience suggests, without departing from the spirit of the invention, within the scope of the appended claims.

We claim:—

1. The combination of a heating chamber, an electric resistance element located therein, a wire leading from a source of

electrical supply to one extremity of said resistance element, a second wire leading from the other extremity of said resistance element to a contact point, a third wire leading from a point intermediate the extremities of said resistance element to a second contact point, a circuit closing device arranged to contact with either of said contact points, a wire leading from said circuit closing device back to the source of electrical supply, a temperature measuring device connected to said heating chamber and means controlled by said temperature measuring device for moving said circuit closing device into contact with either of said contact points.

2. The combination of a heating chamber, an electric resistance element located therein, a wire leading from a source of electrical supply to one extremity of said resistance element, a second wire leading from the other extremity of said resistance element to a contact point, a third wire leading from a point intermediate the extremities of said resistance element to a second contact point, a circuit closing device arranged to contact with either of said contact points, a wire leading from said circuit closing device, a switch connected to said last named wire, a wire leading from said switch back to the source of electrical supply, a temperature measuring device connected to said heating chamber, means controlled by said temperature measuring device for moving said circuit closing device into contact with either of said contact points and means controlled by said temperature measuring device for operating said switch.

3. The combination of a heating chamber, an electric resistance element located therein, a wire leading from a source of electrical supply to one extremity of said resistance element, a second wire leading from the other extremity of said resistance element to a contact point, a third wire leading from a point intermediate the extremities of said resistance element to a second contact point, a circuit closing device arranged to contact with either of said contact points, a wire leading from said circuit closing device back to the source of electrical supply, a magnet arranged to operate said circuit closing device, a second circuit adapted to energize said magnet, a temperature measuring device connected to said heating chamber and means controlled by said temperature measuring device for opening and closing said second circuit.

4. The combination of a heating chamber, an electric resistance element located in said heating chamber, a wire leading from a source of electrical supply to one extremity of said resistance element, a second wire leading from the other extremity of said resistance element to a contact point, a third wire leading from a point intermediate the extremities of said resistance element to a second contact point, a circuit closing device arranged to contact with either of said contact points, a wire leading from said circuit closing device, a switch connected to said last named wire, a wire leading from said switch back to the source of electrical supply, a magnet arranged to operate said circuit closing device, a second magnet arranged to operate said switch, a second circuit adapted to energize said first magnet, a third circuit adapted to energize said second magnet, a temperature measuring device connected to said heating chamber and means controlled by said temperature measuring device for opening and closing said second and third circuits.

5. The combination of a heating chamber, an electric resistance element located in said heating chamber, a wire leading from a source of electrical supply to one extremity of said resistance element, a second wire leading from the other extremity of said resistance element to a contact point, a third wire leading from a point intermediate the extremities of said resistance element to a second contact point, a circuit closing device arranged to contact with either of said contact points, a wire leading from said circuit closing device, a switch connected to said last named wire, a wire leading from said switch back to the source of electrical supply, a magnet arranged to operate said circuit closing device, a second magnet arranged to operate said switch, a second circuit adapted to energize said first magnet, a third circuit adapted to energize said second magnet, normally open switches in said second and third circuits, a temperature measuring device connected to said heating chamber and means controlled by said temperature measuring device for closing said normally open switches.

6. The combination of a heating chamber, an electric resistance element located therein, a wire leading from a source of electrical supply to one extremity of said resistance element, a second wire leading from the other extremity of said resistance element to a contact point, a third wire leading from a point intermediate the extremities of said resistance element to a second contact point, a circuit closing device arranged to contact with either of said contact points, a wire leading from said circuit closing device, a switch connected to said last named wire, a wire leading from said switch back to the source of electrical supply, a temperature measuring device connected to said heating chamber, means controlled by said temperature measuring device for moving said circuit closing device into contact with said second named contact point as the tempera-

ture of the heating chamber is lowered, means controlled by said temperature measuring device for moving said circuit closing device into contact with said first named contact point as the temperature of the heating chamber is raised and means controlled by said temperature measuring device for opening said switch as the temperature of said heating chamber continues to increase.

In testimony that we claim the above we have hereunto subscribed our names.

THADDEUS F. BAILY.
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