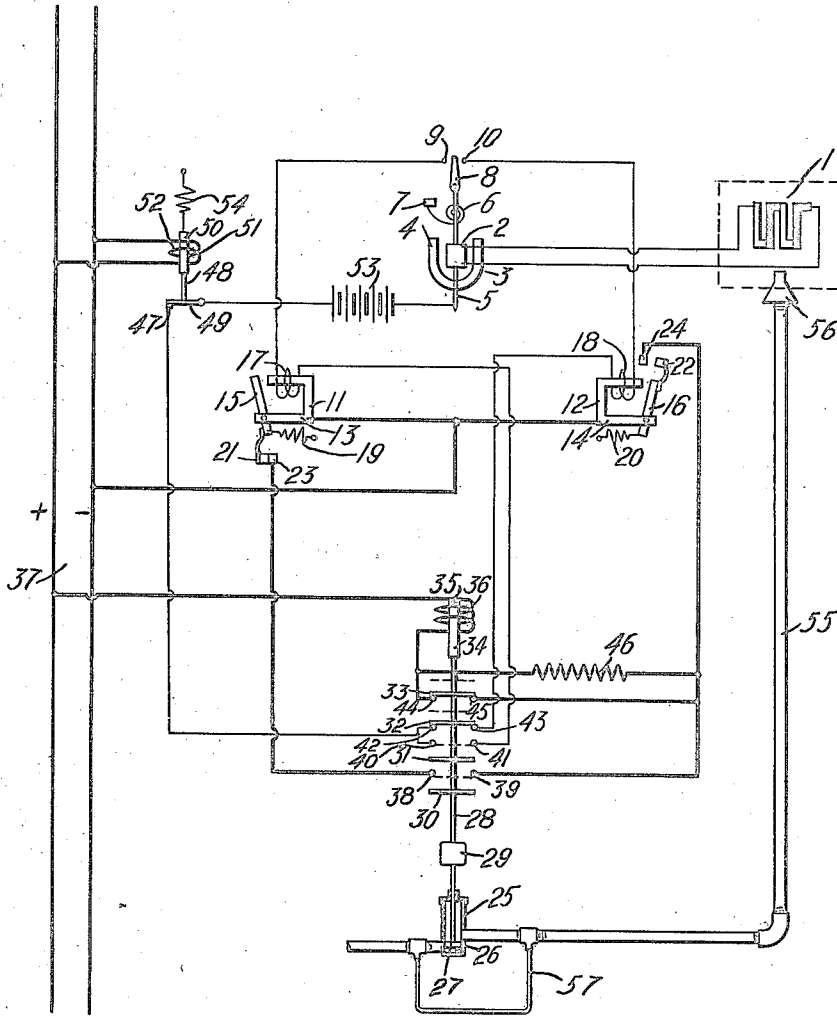


C. B. AUEL,
TEMPERATURE REGULATING DEVICE.
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1,253,201.

Patented Jan. 15, 1918.



WITNESSES:
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TEMPERATURE-REGULATING DEVICE.

1,253,201.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CARL B. AUDEL, a citizen of the United States, and a resident of Wilksburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Temperature-Regulating Devices, of which the following is a specification.

My invention relates to temperature-regulating devices, and particularly to devices for controlling the admission of a fluid to a burner for the purpose of maintaining a uniform temperature.

The object of my invention is to provide a device of the above indicated character which is automatic in its operation and which possesses unique protective features.

Temperature regulating devices are old in the art. However, those heretofore constructed are not entirely automatic in their operation. Frequently, the batteries which supply the control circuit are exhausted by reason of the interrupting of the main operating circuit at various times.

It is the purpose of my invention to provide a device which is electrically operated and controlled and to so arrange the circuits of the same that the batteries supplying the control circuit will not be exhausted in case the main operating circuit is interrupted at any time, and also to provide means for interrupting the circuit through the batteries after the control circuit has operated.

The single figure of the accompanying drawing is a diagrammatic view of circuits and apparatus embodying my invention.

A thermo electric generator or pyrometer 1 is electrically connected to the armature 2 of a motor meter 3 which comprises, besides the armature 2, a permanent magnet 4 and a shaft 5. A spring 6 has its inner end connected to the shaft 5 and its outer end to a stationary member 7. A switch blade 8 is also operatively connected to the shaft 5 for engaging either of two stationary contact terminals 9 and 10. Two electromagnetic switches 11 and 12 respectively comprise stationary core members 13 and 14, movable core members 15 and 16, coils 17 and 18, springs 19 and 20 and movable contact members 21 and 22. The movable contact members 21 and 22 respectively engage stationary contact terminals 23 and 24.

An electro-magnetically operated valve

mechanism 25 comprises a valve chamber 26, a piston valve 27 that is operatively connected to a rod 28 upon which is mounted a weight member 29, bridging contact members 30, 31, 32 and 33, and the movable core member 34 of an electromagnet 35 the winding 36 of which is supplied with energy from a main circuit 37, and the energization of which is controlled by the electromagnetic switches 11 and 12, according to the temperature to which the pyrometer 1 is subjected.

Two stationary contact terminals 38 and 39 are respectively connected to the stationary terminal members 23 and 24 of the electromagnetic switches 11 and 12 and are connected together by the bridging contact member 30 at such times as the electromagnet 35 is energized. When the electromagnet 35 operates, two stationary terminals 40 and 41 are connected together by the bridging contact member 31. Two stationary terminals 42 and 43 are connected together by the bridging contact member 32, and the stationary terminals 44 and 45 are connected together by the bridging contact member 33 when the electromagnet 35 is de-energized, as will be seen from the drawing.

One terminal of the winding 36 of the electromagnet 35 is connected to the positive conductor of the main circuit 37 and its other terminal is connected to the terminal member 44 and to one terminal of a non-inductive resistor 46. The other terminal of the resistor is connected to the conductor which connects the contact terminal 39 to the contact terminal 24. The contact terminal 45 is also connected to the conductor which joins the contact terminals 39 and 24. The contact terminals 40 and 42 are electrically connected together and to a stationary terminal member 47 of a switch 48 the movable member 49 of which is operatively connected to a movable core member 50 of an electromagnet 51 the winding 52 of which is excited from the main circuit 37. The movable contact member 49 of the switch 48 is electrically connected to one terminal of a battery 53, the other terminal of which is connected to the switch blade 8. One terminal of the coil 17 is connected to stationary contact terminal 9, and one terminal of the coil 18 is connected to contact terminal 10. The other terminals of the coils 17 and

18 are respectively connected to the stationary contact terminals 41 and 43. The movable contact members 21 and 22 are electrically connected to the negative conductor 5 of the main circuit 37, for reasons hereinafter set forth.

Assuming that the switch blade 8, the rod 28, the movable contact member 49 and the movable members 15 and 16 of the electromagnetic switches 11 and 12 are in the positions shown in the drawing, and also that the pyrometer 1 has been inserted in a receptacle (not shown) containing a molten material which is to be kept at a constant temperature, my invention operates as follows:

When the temperature of the hot junctions of the pyrometer 1 decreases by reason of the cooling of the molten metal in which it is immersed, a decreased current will flow 20 through the armature 2 which is not sufficient to operate it in opposition to the force of the spring 6. The spring will therefore rotate the armature until the contact blade 8 engages the contact terminal 10. The engagement of the contact blade 8 with the 25 contact terminal 10 completes an electric circuit through the coil 18, the contact terminals 42 and 43, bridging member 32, switch 48 and battery 53 to energize the electromagnetic switch 12 which operates to effect engagement of the contact members 22 and 24. Engagement of the contact members 22 and 24 completes a circuit through the coil 36 of the electromagnet 35 to attract the 35 movable member 34 upwardly, thus moving the piston valve 17 in the valve chamber 26 to open the valve and cause the bridging contact members 30, 31, 32 and 33 to assume the positions shown in dotted lines. Since the 40 valve chamber 26 is connected by a pipe 55 to a burner 56 for heating the molten metal in which the thermo-electric generator is immersed, the opening of the valve to admit more gas causes the hot junction of the pyrometer 1 to increase in temperature and an 45 increased current to flow through the armature 2 which is sufficient to overcome the force of the spring 6 and cause the switch blade 8 to engage the contact terminal 9. When the switch blade 8 engages the contact terminal 9, a circuit is completed through the coil 17, terminal members 40 and 41, bridging member 31, the switch 48, and the battery 53. The energization of the coil 17 50 causes disengagement of the contact members 21 and 23, thus opening the circuit through the coil 36. The deenergization of the electromagnet 35 allows the weight 29 to move downwardly, carrying therewith the 60 piston 27 for the purpose of closing the valve chamber 26, as will be understood by those versed in the art. However, a relatively small by-pass 57 around the valve chamber 26 prevents the complete cutting off of the 65 gas, allowing a pilot flame to burn continu-

ously so that when gas is again admitted through the valve chamber 26, it will be ignited.

If the voltage impressed upon the main circuit 37 is interrupted while the switch 70 blade 8 is in engagement with the terminal 10, the switch 48 will be opened by reason of the contraction of a spring 54 with which it is provided, thus opening the circuit through the battery 53 to prevent the same 75 from being unduly discharged while the circuit 37 is interrupted. If the voltage impressed upon the main circuit 37 is interrupted while the switch blade 8 is in engagement with the contact terminal 9, the coil 36 80 will be deenergized and the weight 29 be allowed to move downwardly, carrying the rod 28 and the piston 27 to close the valve chamber 26, as hereinbefore described. When the bridging member 31 moves downwardly, it 85 interrupts the circuit through the battery 53, thus protecting the same from being unduly discharged. When the winding 36 is energized, the circuit through the battery 53 is interrupted, by reason of the disengagement 90 of the bridging member 32 from the terminals 42 and 43. Thus, the battery 53 is prevented from becoming discharged by reason of its being disconnected immediately after it supplies current to the control circuit. 95

While I have described my invention in its preferred form and with respect to a particular use of the same, it is of course, not so limited, but it is capable of various modifications within the scope of the appended 100 claims.

I claim as my invention:

1. In a temperature regulating device, the combination with an electric motor, of an electromagnetically operated valve, a thermo-electric generator operatively connected 105 to said motor, a plurality of electromagnets controlled by said motor and controlling said electromagnetically operated valve and means, independent of the said motor, for 110 interrupting the circuits through the said electromagnets.

2. In a temperature-regulating device, the combination with an electro-responsive device, of an electromagnetically operated 115 valve, a thermal-responsive device adapted to actuate the electro-responsive device, a plurality of electromagnets controlled by the electro-responsive device and adapted to control the said valve, and an auxiliary means 120 for automatically interrupting the circuits comprising the electromagnets under predetermined conditions.

3. In a temperature-regulating device, the combination with an electro-responsive device, of an electromagnetically operated 125 valve, a thermal-responsive device adapted to actuate the electro-responsive device, a plurality of electromagnets controlled by the electro-responsive device and adapted to con- 130

trol the said valve, and independent electromagnetic means for automatically interrupting the circuits of the controlling electromagnets under predetermined conditions.

5 4. A temperature regulating device comprising an electric motor, a thermo-couple operatively connected thereto, a plurality of electromagnets controlled by the said motor, a source of electromotive force for said
10 electromagnets, a second source of electromotive force, means for interrupting said first source of electromotive force without interrupting said second source of electromotive force, and an electromagnetically operated valve operatively connected to said
15 second source of electromotive force.

5 5. A temperature regulating device comprising an electric motor, means for operating the same, a plurality of separately energized electric circuits controlled by said motor, a plurality of electromagnets in one of
20 said electric circuits, an electromagnetically operated valve controlled by the electromagnets, and means for interrupting said electric circuit of the controlling electromagnets when the voltage applied to the electromagnetically controlled valve is reduced to a predetermined value.

6. A temperature regulating device comprising a thermo-electric generator, a plurality of separately energized electric circuits, electromagnetic switches in said circuits, means operatively connected to said generator for controlling said electromagnetic switches, a source of electromotive
35 force, an electromagnetically operated valve connected thereto, and means for deenergizing the said electromagnetic switches when said source of electromotive force is interrupted.
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7. A temperature regulating device comprising an electric motor, a thermo-couple operatively connected thereto, a plurality of electromagnets controlled by said motor, a source of electromotive force for said electromagnets, a second source of electromotive force, means for interrupting said first source of electromotive force when said second source of electromotive force is interrupted, an electromagnetically operated valve operatively connected to said second

source of electromotive force, and means for interrupting said first source of electromotive force when said electromagnetically operated valve operates.

8. A temperature regulating device comprising an electric motor, a thermo-couple operatively connected thereto, a plurality of electromagnets controlled by said motor, a source of electromotive force for said electromagnets, a second source of electromotive force, means for interrupting said first source of electromotive force when said second source of electromotive force is interrupted, an operating electromagnet, a valve, operatively connected thereto, and means for closing said valve when the said operating electromagnet is deenergized.

9. In a temperature-regulating device, the combination with an electro-responsive device, of an electromagnetically operated valve, a thermal-responsive device adapted to actuate the electro-responsive device, a plurality of electromagnets controlled by the electro-responsive device and adapted to control the said valve, and means independent of the said electro-responsive device for interrupting the circuits of the electromagnets when the voltage that is applied to the electromagnetically operated valve is reduced to a predetermined value.

10. In a temperature-regulating device, the combination with an electro-responsive device, of an electro-magnetically operated valve, a thermal-responsive device adapted to actuate the electro-responsive device, a plurality of electromagnets controlled by the electro-responsive device and adapted to control the said valve, and means independent of the said electro-responsive device for interrupting the circuits of the electromagnets when the voltage that is applied to the electromagnetically operated valve falls to its zero value.

In testimony whereof, I have hereunto subscribed my name this 25th day of Mar., 1914.

CARL B. AUER.

Witnesses:

ALEX. J. AIRSTRO,
B. B. HINES.