T. VAN ALLER.

SYSTEM OF ELECTRIC HEATING.

APPLICATION FILED MAY 11, 1918.

1,282,330. Patented Oct. 22, 1918.

Fig. 1.

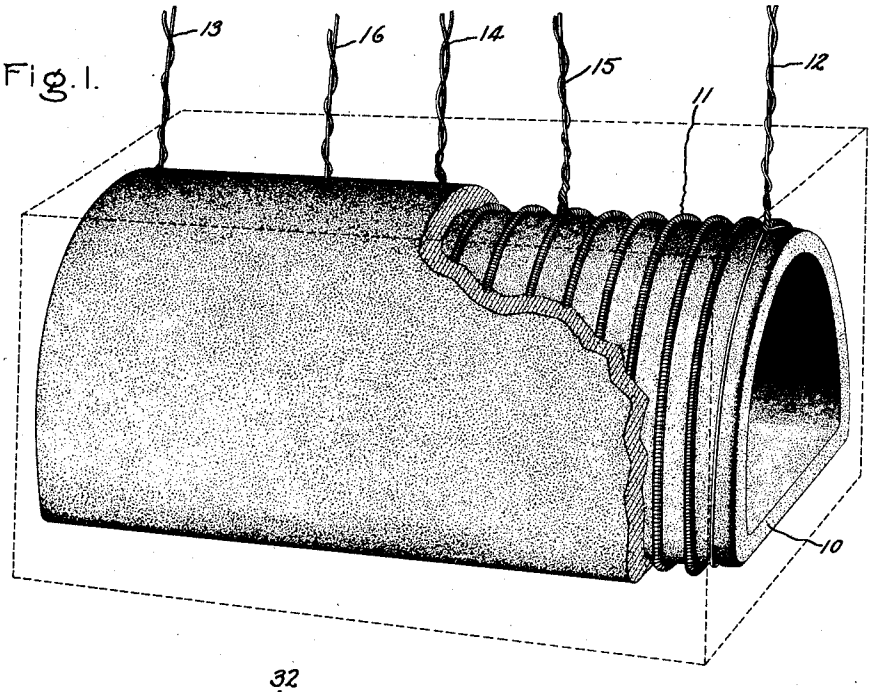


Fig. 2.

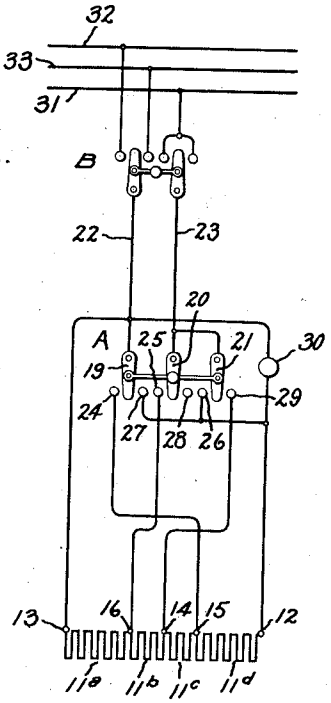
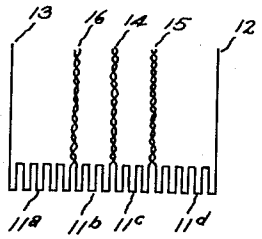


Fig. 3.



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UNITED STATES PATENT OFFICE.

TYCHO VAN ALLER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SYSTEM OF ELECTRIC HEATING.

1,282,330. Specification of Letters Patent. Patented Oct. 22, 1918.

Application filed May 11, 1918. Serial No. 233,825.

To all whom it may concern:

Be it known that I, TYCHO VAN ALLER, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Systems of Electric Heating, of which the following is a specification.

My invention relates to a system of electric heating so arranged that a variety of degrees of heat may be obtained, and it has for its object the improvement in a system of this character.

Heretofore, so far as I am aware, different degrees of heat in an electric heating device have been secured either by the use of an external resistance, or by the use of two distinct heating elements having a switch associated therewith and so arranged as to connect the two elements in series to the supply circuit for low heat and to connect the two elements in multiple for high heat. The first system involving the use of an external resistance is, of course, wasteful of energy. The second system as stated, involves the use of two distinct heating elements and to that extent increases the cost of the device. Furthermore, the ratios of heat obtained by connecting two equal resistances in series and in parallel are as one to four. respectively, and this ratio is not always the most desirable in practice.

In accordance with my invention, an electrically continuous heating element is provided to which intermediate terminals are connected in such a manner as to divide the resistance element into different numbers of substantially equal parts, with associated means for connecting the parts of the element formed by either system of division to the supply circuit in multiple, thereby obtaining different heat capacities. At the same time all parts of the resistance element carry the same amount of current at any given time, thus tending to produce a long life in the heating element.

For a better understanding of my invention, reference may be had to the accompanying drawing in which Figure 1 is a perspective view, partially broken away, of a heating device associated with my invention; Fig. 2 is a diagram of the connections and Fig. 3 is a diagram illustrating the heating element and the terminals therefor.

Referring now to the drawings, 10 is a refractory tube forming a part of an electric furnace in connection with which I have here illustrated my invention. An electrically continuous resistance element 11 is wound around the tube and is provided with end terminals 12 and 13 and with intermediate terminals, here illustrated as three, 14, 15 and 16, dividing the resistance element into sections 11^a, 11^b, 11^c and 11^d, the terminal 14 dividing the element into two equal parts, the one part made up of the sections 11^a and 11^b and the other part made up of the sections 11^c and 11^d, while the terminals 15 and 16 divide the resistance element into three equal parts, one part being the section 11^a, another part made up of the sections 11^b and 11^c and the third part coinciding with the section 11^d. If the resistance element is wound beginning at the left as viewed in Fig. 1, a length of wire is left projecting from the tube sufficient to form the terminals 13, and the section 11^a is wound, the other end of the section being brought out away from the tube and twisted together with or otherwise secured to the projecting end of the adjacent section 11^b to form the terminal 15. In Fig. 1 the wires 13 and 12 are the terminals, the other wires there shown being the continuations of wires that are wound around the tube 10 as supports. The remaining sections are wound similarly to the section 11^a. In this manner a single electrically continuous resistance unit is provided, the terminals of which are continuous with the resistance members of the various sections and may be carried to points sufficiently remote from the heating device itself to prevent their becoming overheated at the points where they are connected to the supply conductors. For convenience the terminals in Fig. 2 are indicated by small circles. The connections between the resistance element and the supply conductors 22 and 23 are controlled by a three pole double throw switch A provided with three arms 19, 20 and 21, the arm 19 being connected to the supply conductor 22. When the switch is moved to the left as viewed in Fig. 2, the arms 19, 20 and 21 engage stationary contacts 24, 25 and 26, respectively, and when it is moved to the right, they engage contacts 27, 28 and 29. The contacts 24 and 25 are connected to the terminals

15 and 16, respectively, and the terminals 26 and 27 are connected together and are connected to the terminal 12 and are also preferably connected through a pilot light 30 to the supply conductor 22. The contact 28 is a blank contact and the contact 29 is connected to the resistance element 14 and hence to the middle of the entire resistance element. The supply conductor 22 is connected to the terminal 13.

It will be apparent that when the switch is moved to the right, the two parts of the resistance element between the terminals 12 and 14, and 13 and 14, respectively, are connected to the supply conductors 22 and 23 in multiple, and when the switch is moved to the position at the left, as viewed in Fig. 2, the three parts formed between the terminals 13 and 16, 16 and 15, and 15 and 12 are connected to the supply conductors 22 and 23 in multiple. These ratios of heat are substantially as 1:2 and I have found that this ratio is particularly desirable for certain classes of work and particularly for furnaces where it is desirable to utilize the high heat in raising the furnace to the desired temperature and then operating the same at a heat which is substantially half that of the high heat.

In order further to vary the amount of heat that may be obtained in the heating device, I have shown the supply conductors 22 and 23 connected to two different supply circuits of different voltages through a switch B. Different voltages are assumed to exist between the lines 31 and 32, and 31 and 33. For instance, the voltage between the lines 31 and 33 may be 125 and that between 31 and 32 may be 250. By moving the switch B to the right or to the left, either of these voltages is impressed on the supply conductors 22 23 and still further variations in the heating element thereby obtained.

It will be apparent that the pilot light 30 is connected in circuit when the switch A is thrown to the high heat position.

It will be apparent that under all conditions of operation, the parts of the resistance element carry the same amount of current thereby tending to increase the life of the resistance element.

While I have herein shown and described one modification of my invention, I do not desire to be limited to the exact arrangement shown and described but seek to cover in the appended claims all those modifications which come within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In combination, an electric heating device comprising an electrically continuous resistance element, intermediate terminals dividing the element into differing numbers of substantially equal parts, a supply circuit, and means for connecting the parts of the resistance element formed according to either division to the supply circuit in multiple.

2. In combination, an electric heating device comprising an electrically continuous resistance element, intermediate terminals dividing the element into two and into three substantially equal parts respectively, a supply circuit, and means for connecting the parts of the resistance element formed in accordance with either division to the supply circuit in multiple.

3. In combination, an electric heating device comprising an electrically continuous resistance element, intermediate terminals formed as continuations of the resistance element and dividing the element into differing numbers of substantially equal parts, a supply circuit, and means for connecting the parts of the resistance element made according to either division to the supply circuit in multiple.

4. In combination, a hollow electric heating device, an electrically continuous resistance element wound around the same, intermediate terminals dividing the element into differing numbers of substantially equal parts, a supply circuit, and means for connecting the parts formed by either division to the supply circuit in multiple.

In witness whereof, I have hereunto set my hand this 9th day of May, 1918.

TYCHO VAN ALLER.