Dec. 29, 1936. G. SLAYTER 2,066,127

ELECTRICAL HEATING SYSTEM

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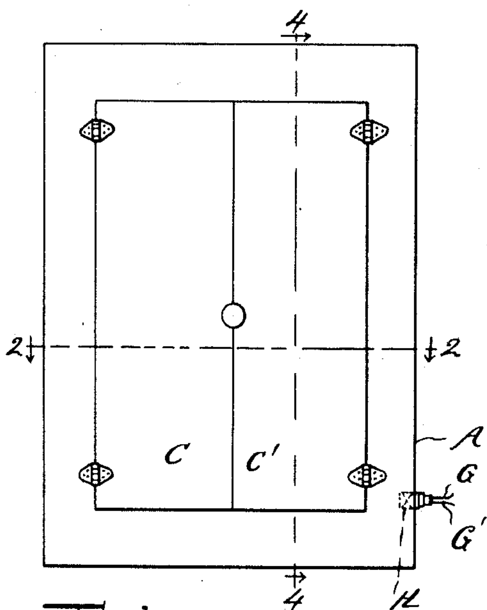


Fig.1.

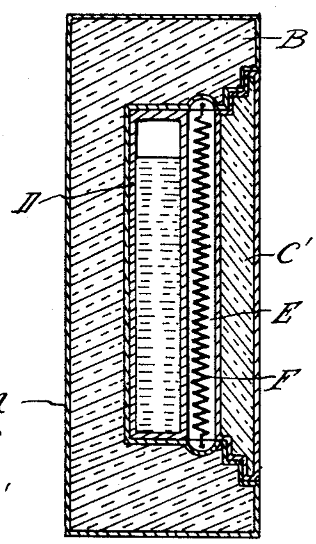


Fig.4.

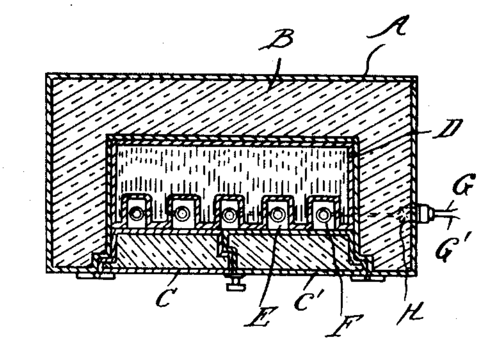


Fig.2.

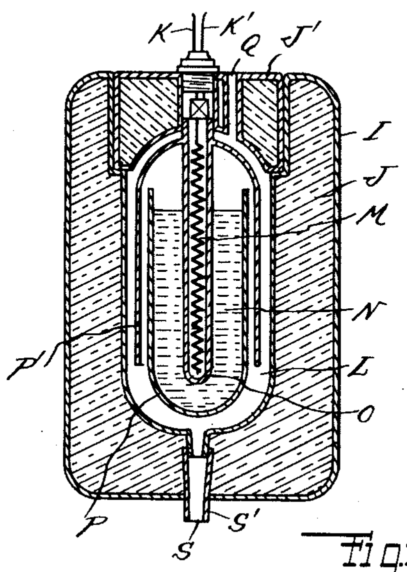


Fig.3.

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## ELECTRICAL HEATING SYSTEM

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4 Claims. (Cl. 219—19)

This invention relates to electric heating system and refers more particularly to a new and improved system of electrical heating in which the electric current can be employed during off-load periods when the current is cheap and the heat generated in the coils or other electrical resistance elements can be stored and used at any desired period, such as during the peak-load when current must of necessity cost more to produce than at the off-load periods.

Among the objects of the invention is to provide a new and improved electrical storage system of the character above referred to which can be economically manufactured and installed and which will operate for a long period of time efficiently without the destruction of the storage material or the necessity of renewal.

The invention also resides in the arrangement for utilizing the latent heat of fusion so that heat can be stored at relatively high temperatures and still be practically available for use as desired.

Another feature of the invention is the employment of a material having good conductivity so that in the case of water heaters, stoves or other places where it is desired to use a stored heat at a fairly rapid rate, the storage material will give up the heat sufficiently rapid to permit of a practical employment of the stored heat.

The further advantage of the employment of material having good conductivity is that heat generated during a short period of three or four hours can be stored rapidly enough to permit of the storage during that period of an amount of heat required during the remainder of the day or whatever period is desired.

The invention further resides in the arrangement for insulating the storage material and such further features, arrangements and combination of parts as will more fully hereinafter appear.

In the drawing:

Figure 1 represents a front elevational view of a storage element employed in connection with my invention;

Figure 2 is a horizontal cross section on the line 2—2 of Figure 1;

Figure 3 is a vertical sectional view through a hot water heater employed in connection with my invention;

Figure 4 is a vertical section on the line 4—4 of Figure 1.

It is possible at the present time to buy electric current at an extremely low rate if the current can be used at off-load periods, for example, between midnight and six o'clock in the morning. For instance, the cost of current and the direct labor necessary to create a kilowatt hour of electricity is only a fraction of that at which the electrical companies are compelled to sell the current, because of the necessity of maintaining sufficient apparatus to take care of the peak-load. The electric companies are therefore willing on off-load periods, to sell their current at the satisfactory small profit on their fuel and labor, sometimes as low as ⅛ of the average cost of the electric current in the home. It is therefore highly desirable to have some means for utilizing the current between midnight and six o'clock in the morning and storing this current in the form of heat for use as desired throughout the day. This not only tends to permit the balancing of the electrical generating systems by maintaining higher rates of generation during the night, but it also tends to reduce the amount of the peak-load by taking off current which would otherwise be used for heating and cooking purposes during the day. For example, an electric hot water heater could be built which uses 550 watts and which could be plugged in on the average home lighting circuit, the hot water heater could be arranged to store its heat in aluminum or other suitable storage material and make possible the drawing off of water as rapidly as desired at high temperature, for example, 550 watts will heat continuously about a quart of water about every ten minutes. While this would be entirely too slow for an instantaneous heater it becomes practical by having the reserve heat stored so that water could be drawn off as rapidly as desired, taking its heat from that stored in the aluminum or other storage material, rather than from the electrical coils alone.

Another example of a use for the present invention consists in the case of electrical cook stoves. Such stoves create a rather undesirable load on the power companies because of their high demand of electric current during short periods of the day. Moreover, in order to obtain sufficient heat special wiring is necessary with the ordinary electric range. By the use of the present novel invention the container full of aluminum can be heated continuously at low current consumption rate and the heat stored in this aluminum can be used at a high rate when desired for cooking as well as for heating water, household heating and other purposes.

Describing in detail the constructions shown in the drawing and referring first to that of Figures 1, 2 and 4 A designates a household radiator having outside insulation walls B the front wall of which consists of doors C and C' which can be completely closed so as to retain practically all of the heat during the night or at other times when it is not desired to heat the building but which can be opened as much as desired to give off whatever heat is required. While I have shown ordinary manually operable doors it is of course understood that the opening and closing of the doors could be operated by any thermostatic arrangement, for example, so as to open up and permit the escape of heat whenever the temperature falls below 70° F. and automatically closed when the temperature of the room exceeds that. Located within the insulated walls B is a cast iron container D which is adapted to receive aluminum or other suitable material in which the heat is to be stored. The front wall of the container D is preferably provided with a plurality of recesses E in which the electrical coils F are located. Current to the electrical coils F from the supply lines is provided by lead-in lines G and G′ and if desired a thermostatic shut-off for the switch H may be employed so as to shut-off the current from the lead wires G and G′ whenever the heat stored in the aluminum reaches the desired temperature. While I have mentioned aluminum as one of the materials, I do not desire to limit the invention to any particular material except as ultimately set forth in the claims. Aluminum has the advantage of being able to rapidly absorb heat and to rapidly give it off. In addition to its good conductivity qualities, aluminum has the advantage of being fairly light and has a sufficiently low melting point that the latent heat of fusion can be used to store heat very economically. Aluminum has an average specific heat of .225 B. t. u.'s per pound per degree, that is, the heat necessary to raise one pound of aluminum one degree F. The melting point of aluminum is 1200° F. so that if the heat stored above 200° F. is utilized for the purpose of heating, there would be approximately a difference of 1000° F. At the melting temperature there is without any change in temperature of aluminum, 138 B. t. u.'s per pound absorbed in melting the aluminum. This additional 138 B. t. u.'s is available as heat given off in cooling so that the heat available for heating a room would be 348 B. t. u.'s per pound of aluminum. The material has the further advantage that because of the good conductivity it can rapidly absorb heat and rapidly give it off so that whenever the doors C and C′ are open, heat can be rapidly given off. This feature of the good conductivity, that is, the ability of the aluminum to give up its heat as well as absorb it rapidly is especially valuable for cooking and hot water heating.

Describing in this connection the hot water heater shown in Figure 3, I represents the electrical heater having the heat insulation J, the upper end of which is formed as a cover or cap J′. Extending down through the cover or cap J′ are the lead-wires K and K′ from the electrical supply line. The insulating walls are hollow and are provided with inner walls R forming a chamber L in the center into which extends the electrical resistance element M. The latter is separated from the aluminum N by means of a tube O surrounding which is the aluminum N located within the container P. A cover P′ is provided over the container P so that the water from the water inlet Q is compelled to disperse and pass all around the aluminum container and between the latter and the inner walls R formed at the inside of the insulation walls. The water to be heated from the inlet Q therefore passes from the inlet to all sides of the container rapidly absorbing heat from the aluminum and passes through the outlet S which is preferably provided with a porcelain tube S′ to prevent the dissipation of heat from the inside of the insulated container to the outside atmosphere. During the off-load periods the aluminum N is highly heated by means of the electrical resistance M and may as above described, be heated to a temperature in excess of 1200° F. so that the latent heat of fusion is also used to increase the storage capacity for a given volume of aluminum. When the water is turned on it will rapidly absorb the stored heat. It will thus be practical with a small water heater containing approximately 18 lbs. of aluminum to rapidly raise the temperature of 15 gallons of water 50° F. and to store this amount of heat by using the ordinary household current without special wiring.

It will be noted that the aluminum is melted by an electrical resistance element which extends down into the center of the aluminum and that the water is compelled to pass between the aluminum or other storage material and the insulating walls, thus greatly improving the efficiency of the insulation and reducing the amount of heat which would ordinarly escape through the insulation walls during periodic use.

The invention however, is not limited to any particular form of heater such as hot water heater, a household heater or to any particular form of heating element except as ultimately set forth in the claims. It will be noted however, that in the structure shown in Figures 1 and 2 the container D is so formed that the recesses which receive the heating elements are located at the front adjacent the doors giving the added advantage that in case it is desired to use the radiator for quick heating purposes, the current could be turned on with the doors open and heat become immediately available.

What I claim as my invention is:

1. An electrical heating system comprising a heat insulated container, means for generating heat by electricity within said container, a storage mass for said heat comprising material located within said container, which material melts at a temperature that will permit of the storing of the latent heat of fusion of said material, and means for utilizing the stored heat in said material and for utilizing direct radiation from said heat generating means to heat the atmosphere adjacent said container.

2. In combination, a heat insulated container, a movable closure for said container, a heat storage mass within said container, and heat generating means within said container so positioned as to heat said storage mass and as to be exposed upon opening of said closure to provide for the heating of the atmosphere adjacent said container not only by the heat given off by said storage mass but also by direct radiation from said heat generating means.

3. In a heating device of the character described, a container, a movable closure for said container, a heat storage mass within said container, and a plurality of electrical heating elements disposed within the container between the heat storage mass and the movable closure whereby upon opening of said closure the atmosphere adjacent said container will be heated not only by the heat given off by said storage mass but also by direct radiation from said electrical heating elements.

4. In a heating device of the character described, a container, a movable closure for said container, a heat storage mass within said container, and a heating means within said container so positioned as to heat said storage mass and as to be exposed upon opening of said closure to provide for the heating of the atmosphere adjacent said container, not only by the heat given off by said storage mass but also by direct radiation from said heating means.

GAMES SLAYTER.