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HEAT STORING AND WATER EVAPORATING PLANT.

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1,418,460. Patented June 6, 1922.

Fig. 1.

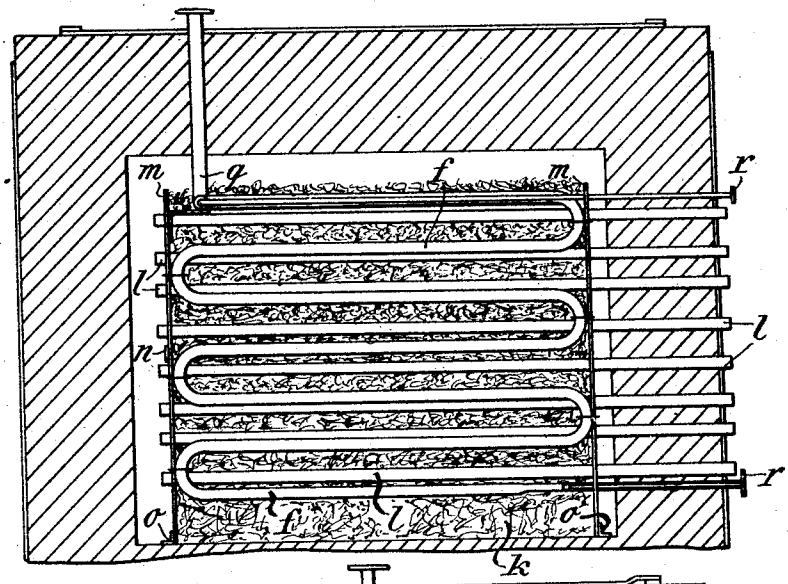
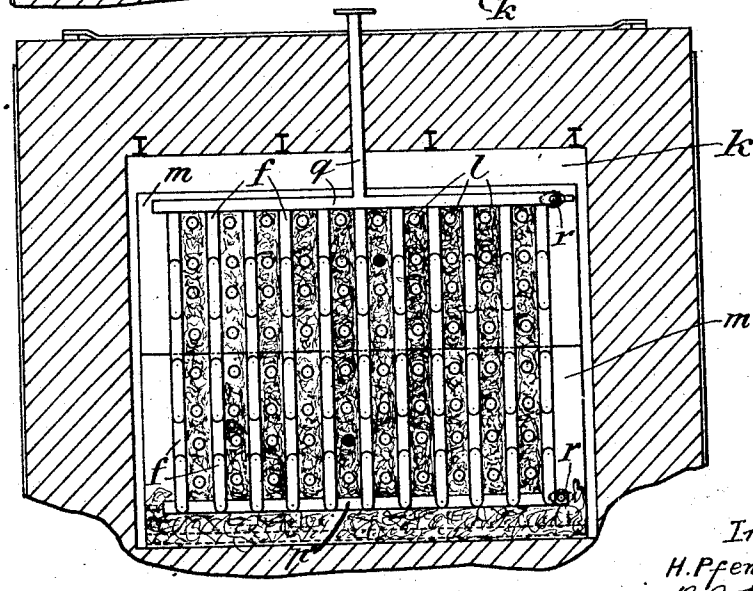


Fig. 2.



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HEAT-STORING AND WATER-EVAPORATING PLANT.

1,418,460. Specification of Letters Patent. Patented June 6, 1922.

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To all whom it may concern:

Be it known that I, HERMANN PFENNINGER, citizen of Switzerland, residing at Wadenswil, in the Canton of Zurich, Republic of Switzerland, have invented certain new and useful Improvements in Heat-Storing and Water-Evaporating Plants, of which the following is a specification.

The invention relates to that class of apparatus which is especially designed for heating liquids by means of electrical current; and it consists in the construction and in a method for the construction of an electric heater wherein liquid containing evaporating elements as well as electric heating bodies are embedded in heat-storing material.

The object of the invention is to provide means whereby a considerable amount of heat may be stored up at a suitable time before the heated liquid or vapour is used and that during consumption of such heated liquid or vapour no or only little heat has to be added to the heat storing material. In this way the heat necessary to vaporize the water which will flow through the heat storing material in the day-time may be supplied to this material during night, viz, at a time of cheaper electric current.

In the accompanying drawing, Figs. 1 and 2 are respectively a longitudinal section and a cross section of the electric heater constructed in accordance with my invention: Some parts are assumed to be removed, and the heating and evaporating elements are shown in elevation.

In the constructional form of the electric heater illustrated in the drawing, f are the water-evaporating elements and l the electrical heating elements. All these elements are arranged in a space k enclosed by rubble walls, and are surrounded by heat-storing filling material.

In the present example the evaporating elements consist of heating coils which are arranged in a suitable horizontal distance apart one from another in vertical planes. The electric heating elements l are arranged in the intermediate spaces and consist in the usual manner of metal tubes with removable heating bodies inserted therein. These heating elements l are arranged in vertical planes parallel to the planes of the elements f and are mounted in vertical cross walls m fixed to the ends of the heating coils f and shut in the ends of the spaces situated between them.

The cross walls m consist of superposed parts held together by fishplates n and are supported on the floor of the space k by means of angle-irons o. p is a distributing pipe which serves to supply the water to the evaporating elements f; it may be connected to any water supply as for example a reservoir or feed piping. q is a collecting pipe for the generated stem; it is connected to the upper ends of the elements f and leads to the steam or heat consuming device (not shown). A water gauge may be mounted between the pipes p and q by means of flanges r.

In two of the tubes constituting the outer part of the electrical heating elements (indicated by hatching in Fig. 2) it is preferred to insert, instead of electrical heating bodies, thermometers with long insertion stems to allow of ascertaining the temperature existing in the filling material. The spaces between the several heating and evaporating elements which are open at top and bottom, and are bounded at their ends by the plates m, are assumed to be filled with some kind of stone or rock in the form of large and small lumps and powder, for instant steatite (steatite waste). This filling material may have an admixture of a binding agent, such as for instance cement, lime, gypsum or the like. Iron chips may also be used as heat-storing filling material.

The construction of the above described electric heater, so far as it relates to the internal arrangements, may be effected for instance somewhat as follows:—

First the evaporating elements f are arranged in the described manner in the chamber k, and the lower halves of the cross walls m are fixed provisionally to the said elements and to the angle-irons o. Then the filling material is filled in and rammed. When the rammed filling has been brought up to the lower edge of the apertures provided in the cross walls m for mounting the lowest heating elements l, the heating elements of the lowest group are then inserted from the right hand side (Fig. 1) through the apertures of the respective cross wall m and are mounted with their closed front ends in the left hand cross wall m. Then the filling and ramming of the filling material is continued, whilst preferably the finer ma-

terial is placed directly around the heating and evaporating elements for the purpose of causing the filling material to lie as closely as possible up against the elements.

In this manner, the filling and ramming of filling material, and the insertion of heating elements (which may be effected singly or in groups) is continued until the filling material projects up beyond the upper end of the evaporating elements *f*. The latter are thus embedded in the heat-storing material throughout their entire extent, so that no loss of heat can take place from them. By proceeding with the insertion of the heating elements only at the same rate as the heat-storing material is being filled in and rammed, the risk is avoided of such material becoming heaped up against one or the other of the elements and thereby forming a cavity. As a matter of fact the filling material is caused to lie closely against the heating elements from the bottom to the top at all points.

Radiators of the kind used in steam or warm water heating-plants may be employed as water evaporating elements instead of the heating coils *f*; whilst other shapes may be employed instead of the rod-like electrical heating bodies. An evaporator of the kind described may be employed for different purposes, for instance in combination with a steam heating plant for the purpose of re-evaporating the water of condensation discharged from the heating bodies.

In this case the improved evaporator is preferably connected in parallel with the steam boiler, so that according to circumstances, after the heating plant has been supplied once from the steam boiler, either the improved evaporator alone can maintain the heating, or it can be helped by the steam boiler.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An electric heater comprising in combination a chamber, a plurality of tube-like horizontal evaporating elements located therein and arranged in groups in vertical planes parallel one to another, electrical heating bodies also located in said chamber and arranged in groups in vertical planes which are parallel to the planes in which said evaporating elements are disposed, the groups of evaporating elements alternating with the groups of the electrical heating bodies, heat-storing material filled in said chamber between the different elements and the heating bodies and in close contact thereto.

2. An electric heater comprising in combination a chamber, a plurality of water leading coils located therein and arranged in vertical planes parallel one to another, electric heating elements consisting of tubes with removable heating bodies inserted therein, said tubes being arranged horizontally in groups in vertical planes parallel to the planes in which the said coils are arranged, heat-storing material filled in said chamber between the heating coils and the said tubes so as to lie as closely as possible up against the water-coils and the tubes.

3. An electric heater comprising in combination a chamber, a plurality of water leading coils located therein and arranged in vertical planes parallel one to another, electric heating elements consisting of tubes with removable heating bodies inserted therein, said tubes being horizontally arranged in vertical planes parallel to the above mentioned planes, a vertical cross partition on each end of sail coils, resting on the floor of said chamber, holding in place said coils and forming bearings for the heating elements which are inserted from outside through a wall of said chamber parallel to the vertical cross partitions, fine-divided heat-storing material being filled in between the water-leading coils, the heating elements and said partitions so as to lie as closely as possible up against the coils and the heating elements, the coils being thus embedded in the heat storing material throughout their entire extent.

In testimony whereof I have affixed my signature in the presence of two witnesses.

HERMANN PFENNINGER.