Dec. 3, 1935. R. C. ROE 2,022,812

AIR HEATER

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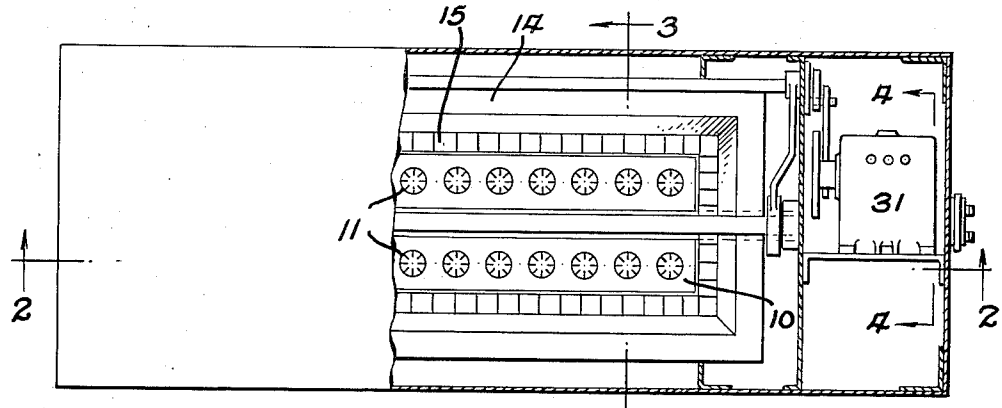


Fig. 1.

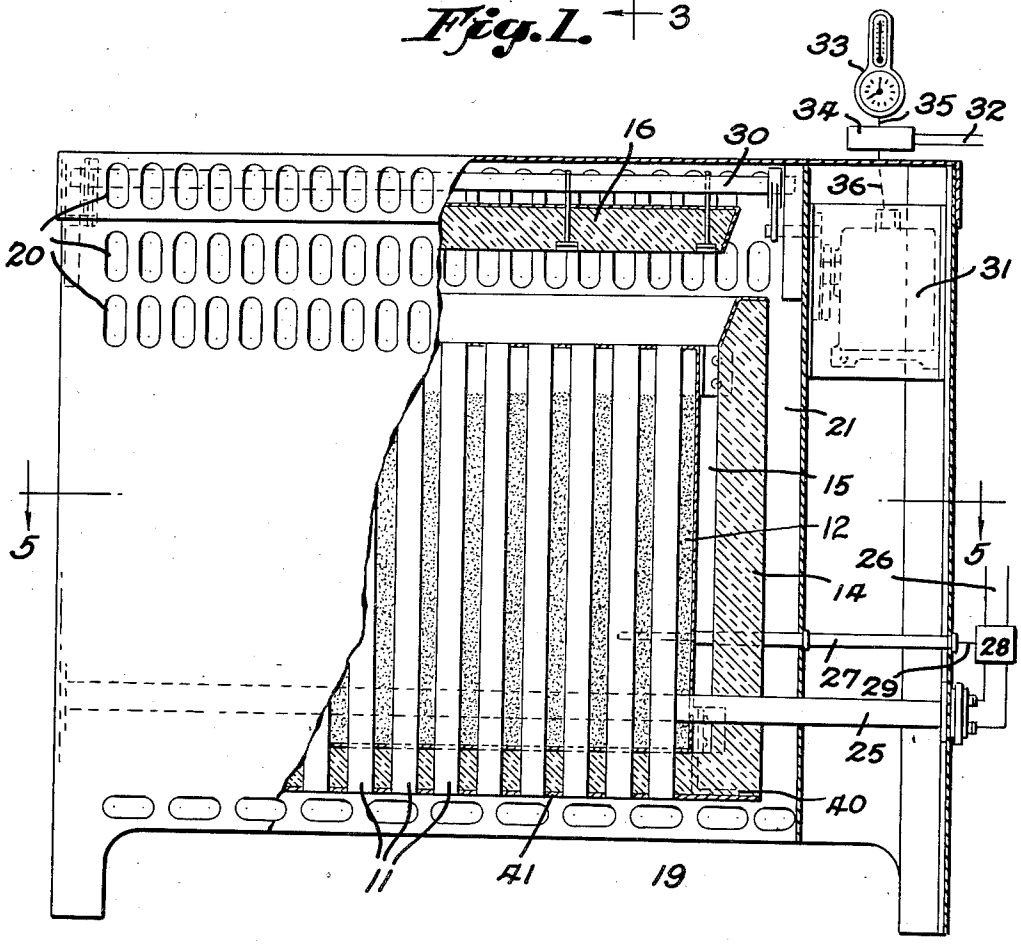


Fig. 2.

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Fig. 3.

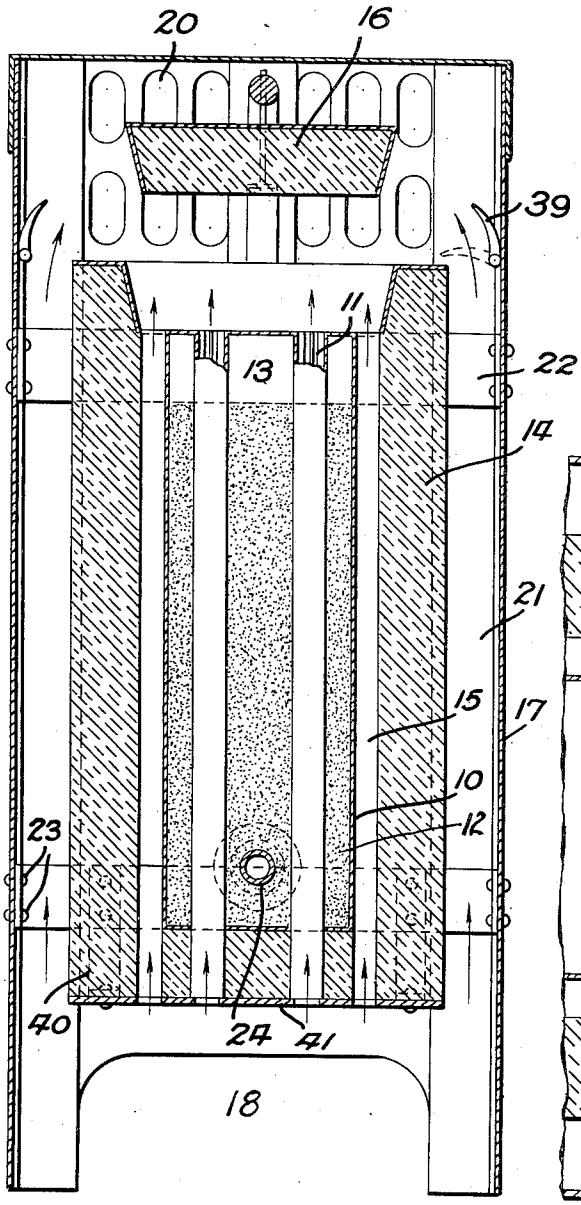


Fig. 4.

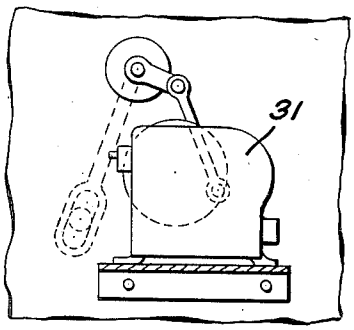
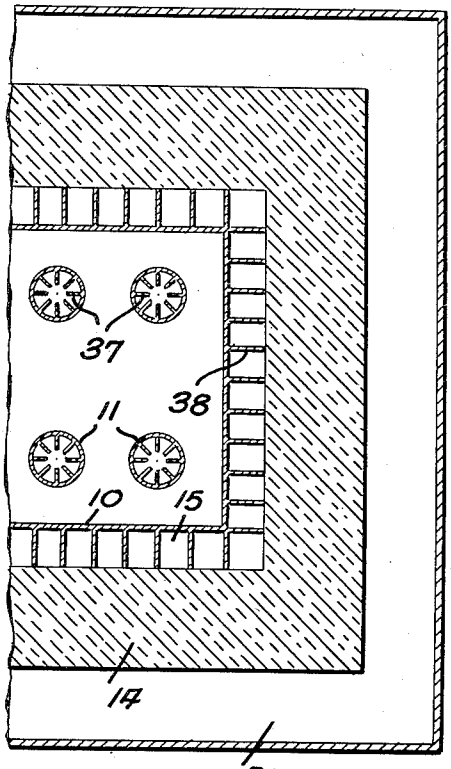


Fig. 5.



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Patented Dec. 3, 1935 2,022,812

UNITED STATES PATENT OFFICE

2,022,812

AIR HEATER

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Application October 25, 1932, Serial No. 639,451

4 Claims. (Cl. 219—38)

The present invention has for its object to produce a simple, novel and inexpensive device for storing heat which is later to be released for heating the air of a room and especially a device wherein the heated air is tempered by being mixed with cooler air before it is released into the room and wherein the air flow through the device is maintained by thermo action and regulated by varying the area of the air passages. Other objects will appear from the description and the drawings, wherein:

Fig. 1 is a plan view with part of the exterior casing broken away and with the insulating stopper 16 removed. Fig. 2 is an elevation, partly in section on the line 2, 2 of Fig. 1 and showing the insulating stopper 16 in the full open position. Fig. 3 is a vertical cross section on the line 3, 3 of Fig. 1. Fig. 4 is a view of the power unit taken on the line 4, 4 of Fig. 1. Fig. 5 is an enlarged top view on the line 5, 5 of Fig. 2. Like symbols indicate like parts.

Referring to the drawings, 10 is a metal container. Within the container and extending through the top and bottom thereof, are a number of metal tubes 11. The container is partially filled with heat storage substance 12, and hermetically sealed. In some cases the container contains also an inert gas, as 13, on top of the substance.

Completely surrounding the container 10 is an enclosure 14, constructed of heat-insulating material. Between the container 10 and the enclosure 14 is a vertical airway 15 in which are located a series of radiating fins 33, attached to the container 10. Inside the tubes 11 there are located a number of fins 37, extending lengthwise of the tubes.

That portion of the insulating enclosure 14 which is directly above the container 10 and airway 15, is removable and forms a stopper 16. The stopper is attached to the number 30 which is actuated by motor 31 so as to raise and lower the stopper. The motor 31 is provided with current by circuit 32 via the switching mechanism 34 which mechanism may be controlled by a thermostat as 33. The lines 35 and 36 represent whatever wiring may be necessary for the purpose.

An exterior casing 17 encloses the other parts and is provided with openings as 18 and 19 for the admission of air to be heated and forming at the top a mixing chamber with openings, as 20, for the exit of tempered air. Between the enclosure 14 and the casing 17 is an air passage 21, provided with an air deflector 39, which may be stationary or adjustable. The container 10 and enclosure 14 are supported by members 22 which are attached to the casing 17, as by rivets 23. The container 10 may be welded to support 22 and the enclosure 14 rests upon plate 41 which is attached to member 22 by a bracket 40.

An electric heater 24 is located within a pipe sleeve 25, which extends horizontally through the container 10 at a point near the bottom and lengthwise of the container. The heater 24 is connected to the electric circuit 26, which may be time controlled, and which is controlled by a switching device 28 which in turn is controlled by the thermostat 27 which is located in heat exchange relation with the heat storage substance 12. The line 29 represents whatever wiring is necessary between the thermostat and the switch 28.

There are several substances which may be used for storing the heat but one of the best is made up of sodium chloride (NaCl), magnesium chloride ($MgCl_2$) and potassium chloride (KCl) in proportions to give a melting point of about 330 degrees Fahrenheit. When in the presence of moisture this solution becomes corrosive and in order to exclude all air or other source of moisture from container 10, I replace the air with an inert gas such as argon or helium. Preferably sufficient gas is introduced so that a slight pressure above atmosphere will exist when the heater is at its lowest temperature. Expansion of the solution with increase in temperature is compensated for by compression of the gas. The solution has a boiling point, at atmospheric pressure, well above 1200 degrees F. at which maximum liquid temperature the device herein described has been designed to operate. The specific heat is about .7.

With the high temperatures and specific heat available it is possible to store a relatively large amount of heat in a given space. The heat requirements of an ordinary living room, for instance, may be supplied by a heater having an overall content of about 12 cubic feet. The heat may be stored over a period of about 6 hours, say from 12 midnight to 6 A. M. and delivered to the room during the balance of the day.

In the preferred solution, in addition to the specific heat, there is available the latent heat of fusion which further increases the heat storage capacity in its relation to size of apparatus. This is true of any usable solution whose fusion temperatures are sufficiently higher than maximum, desirable room temperatures to provide necessary heat head. In the case illustrated, the working temperature range could readily be say

from 1200 degrees F. to 300 degrees F. This range on account of its breadth and on account of the high specific heat of the preferred solution, as well as the latent heat, makes possible a large storage in a very small space.

When the heater is connected to the supply circuit 26, which ordinarily is time controlled, the electric heating unit 24 will draw current from the circuit until solution 12 reaches a predetermined temperature, when the thermostat 27 will cause the circuit to be opened thus shutting off the source of heat. When heat is drawn from the device, the temperature of the solution will drop until a predetermined lower temperature is reached when the thermostat 27 will cause the electric heater to be reconnected to the supply circuit.

When it is desired to release heat it is only necessary to raise the stopper 16. The heated air in the passages 11 and 15 will move quickly upwards which will cause an inflow of cool room air into the bottom of the tubes via the openings 18 and 19. As the very hot air passes out the orifice between the stopper 16 and the enclosure 14 and thence generally upwards, it creates a suction at the outlet of the cold air passage 21. Thus the very hot air coming from direct contact with the highly heated surfaces and which therefore may be dangerously hot, is mixed with cold room air before it is ejected into the room. The proportions of the mix may be easily adjusted by adjusting the area of the cold air outlet, which may be conveniently done by adjusting the deflector 39, or by otherwise varying the relative sizes of the outlets of the hot and cold air passages. The fins 37 and 38 increase the amount of heat which will be taken up by a given amount of air thus producing higher air temperatures and resulting in a more rapid flow of air thereby increasing the maximum rate at which the device will deliver heat to the room.

When the room air has attained a suitable temperature the flow of heat from the heater is stopped by lowering the stopper 16 into the opening at the top of the container 10, which opening it is designed to fit snugly, the fit being improved by its tapered construction. This shuts off the circulation of hot air via spaces 11 and 15 and also the radiation from the top of container 10.

The stopper 16 may be raised and lowered by hand or by power, as by an electric motor, and if by motor the motor may be easily controlled by a thermostat located so as to be responsive to the room temperature. Any of the methods and refinements of regulation associated with the thermostatic control of ordinary house heating equipment may be employed so far as they are applicable.

It is to be understood that the thermostat 33 may be attached to the outside of casing 17 and that all the wiring and all the devices as 28 and 34 may be located within the casing 17, as may also the terminal of thermostat 27, heater tube 25 and heater 24, the circuits 26 and 32 terminating in a suitable connection fitting attached to the casing 17.

Since the heater need not be structurally connected to any part of the building except by an electric circuit, it is obvious that it may be arranged in portable form, which form is very desirable for many uses, its usefulness as such being greatly increased by its ability to give off a large amount of high temperature heat in a relatively short time.

While I have illustrated and described with particularity only a single preferred form of my invention, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:

1. An air heater which includes: a container; heat storage substance in the container; means for heating the substance; an enclosure of heat-insulating material for the container; a casing for the enclosure including a mixing chamber near the top of the enclosure having air exit apertures, and including air inlet apertures below the enclosure; a vertical airway within the enclosure, said airway being arranged in heat exchange relation with the heat storage substance, and extending through the enclosure at the bottom of the container and extending into the mixing chamber; means for controlling the flow of air from the airway into the mixing chamber; and a vertical cold air passageway exterior to the enclosure and within the casing and terminating in the mixing chamber for conveying cold air to the chamber for tempering the heated air.

2. In a heater as defined by claim 1, means for regulating the flow of cold air.

3. In a heater as defined by claim 1, an inert gas hermetically sealed in the container with the heat storage substance.

4. A heater according to claim 1 characterized by the fact that the heat storage substance is sodium, magnesium and potassium chlorides in any proportions which will give a melting point of about 330 degrees Fahrenheit.

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