Feb. 11, 1930. A. H. BARKER 1,746,235

HEATING APPARATUS

Filed May 28, 1925 2 Sheets-Sheet 1

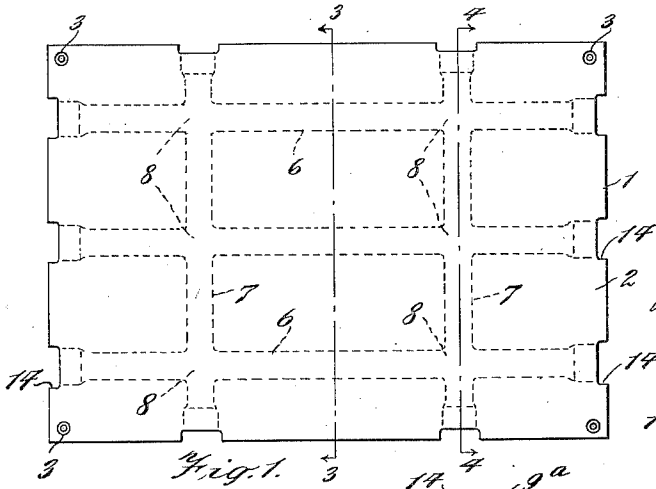


Fig. 1.

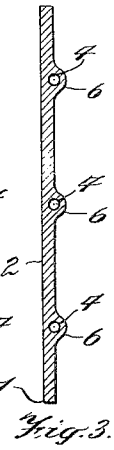


Fig. 3.

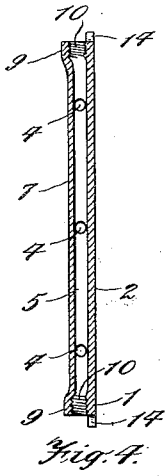


Fig. 4.

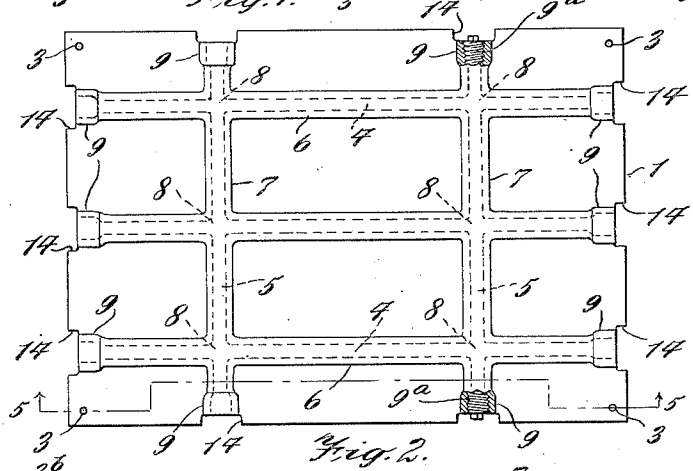


Fig. 2.

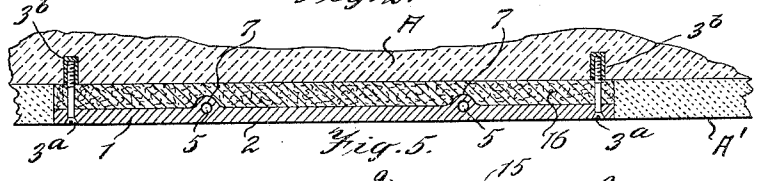


Fig. 5.

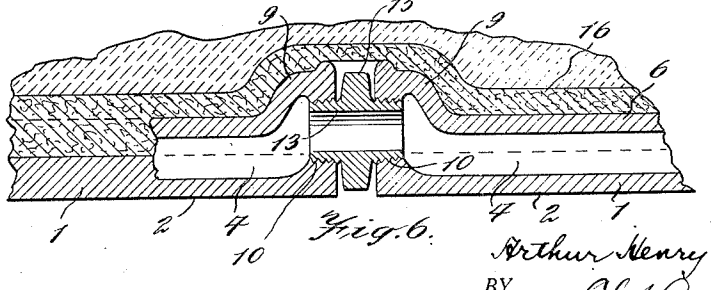


Fig. 6.

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Feb. 11, 1930. A. H. BARKER 1,746,235

HEATING APPARATUS

Filed May 28, 1925 2 Sheets-Sheet 2

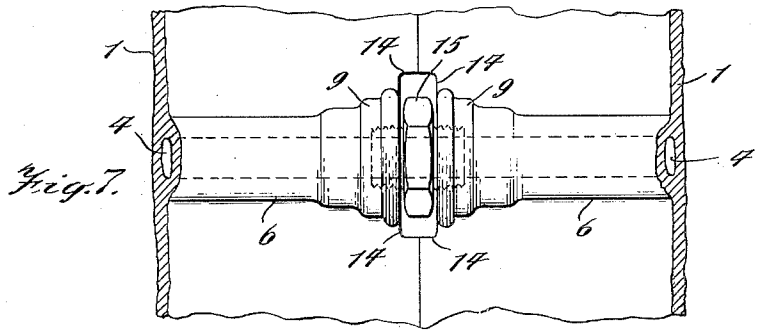


Fig. 7.

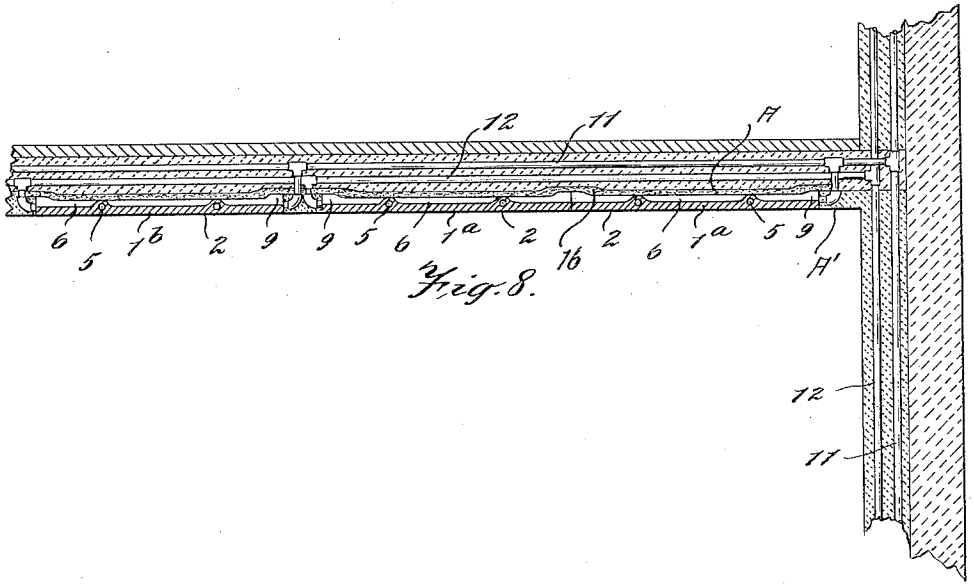


Fig. 8.

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UNITED STATES PATENT OFFICE

ARTHUR HENRY BARKER, OF LONDON, ENGLAND

HEATING APPARATUS

Application filed May 28, 1925. Serial No. 33,362.

My invention relates to new and useful improvements in heating apparatus of that character or type employed for warming a building, room, or other space, in order to maintain the same at a desired condition of warmth agreeable to the human body.

In the ordinary type of steam or water radiator, air surrounds the whole of the heat-emitting surface, and the latter is placed in such position in the space to be heated, that the air in such space has free access to it and from it, thus to produce heating of the air by convection, and its consequent circulation through the room. Such radiators require that the surface of the radiator which is contacted by the air must be highly heated, in fact much higher than the temperature effect to be comfortably produced on the human body, otherwise the air will not be heated to the desired degree, thus necessitating an ample and continuous supply of heating medium, such as steam or hot water.

I have discovered by experiment, that the bodily comfort of human beings with respect to warmth, is secured more by the impingement of radiant heat on the body than by contact of warmed air with the body. Further, that the effect on the body of radiation emanating from a relatively large surface at a low temperature, is more pleasant in effect than the same quantity or intensity of radiation emanating from a smaller plate at a higher temperature. It therefore follows that by providing a heating means by which it will be assured that an increase in the amount of radiant heat emanating from a large surface at a low temperature will be caused to impinge on the body, and if at the same time the heating of air can be avoided, there will be a corresponding reduction of the amount of heating medium needed to secure the desired heat effect, with a consequent lower cost in fuel consumption than by the heating apparatus commonly in use.

According to this invention in its preferred form, means is provided for restricting the contact of cold air with the heating surface, so far as is possible, and exposing to the interior of the room or other space a radiating element at a relatively low temperature having a more or less flat surface of suitable shape and design to suit the dimensions of the room, but located preferably in such a way as to avoid, so far as possible, circulation of air over the exposed or radiating surface. In a preferred embodiment, the back or rear face of the radiating element may be, and preferably is, covered with a non-conducting material, or the rear surface may be embedded in a wall in such manner that air cannot have access to it. In carrying out the invention in its preferred embodiment, I provide a more or less flat or curved metallic plate, the surface of which may be designed or covered with ornamentation to match the decoration of the interior of the room.

The invention consists in the improvements to be more fully described hereinafter, and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings to be taken as a part of this specification, I have fully and clearly illustrated a preferred embodiment of the invention, and in which drawings—

Figure 1 is a front view, on a reduced scale, of a heating element constructed according to my invention, certain heating conduits or passages being shown in dotted lines;

Fig. 2 is a back or rear view of the construction shown in Fig. 1;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view showing the manner in which a heating element embodying my invention may be embedded in the surface of a ceiling, wall or other part of a building;

Fig. 6 is an enlarged sectional view showing a coupling or union to be employed when two or more sections are to be connected in series, so as to permit flow of heating medium from one section to another;

Fig. 7 is an enlarged view of a portion of the back of the section, and showing in plan view the coupling illustrated in Fig. 6, and

Fig. 8 is a vertical sectional view through a building structure, showing assemblage of two or more elements, and flow connections

for circulating heating medium through the heating conduits or passages associated with said elements.

Referring to the drawings by characters of reference, 1 designates a heat radiating element preferably comprising a plate, which in the embodiment shown is provided with a flat, front face 2, so as to adapt it to be mounted in a wall, ceiling, or floor, with said flat face flush with the surface thereof. The plate is preferably rectangular in form, but it will be understood that it may be of any form which will adapt it to the purpose just stated, and that it may be provided with ornamentation, not shown, if desired. This plate is preferably made of cast metal, such as iron, and is provided at suitable points with apertures 3 to receive bolts or other fastening devices 3^a by which it may be secured in position to a wall 3^b. The plate is provided in rear of its face 2 with one or more suitable heating passages or ducts by which a heating fluid such as hot water or steam of the required temperature may be employed to heat said plate by conduction. In the embodiment shown, these ducts comprise longitudinal parallel passages 4 and transverse parallel passages 5, preferably provided by casting hollow conduits or tubes 6, 7 on the back of the plate and integral therewith. It will be noted that the said transverse and longitudinal passages cross each other at right angles an intercommunicate, as at 8, at the points where they cross, so that when a fluid heating medium, such, for example, as steam or water, is admitted to said passages, such medium may pass freely through the same. The ends of the conduits or tubes forming said passages terminate adjacent the edges of the plate and are provided with hubs 9 which are interiorly threaded, as at 10, by means of which suitable connection may be made with the supply line 11 and return line 12 (see Fig. 8) leading to and from the source of heating medium—for example, a hot water heater or steam boiler of any suitable form, not shown. One or more of the plates may be employed, as shown in Fig. 8, in which case the hubs on adjacent plates will be arranged in register, as shown in Figs. 6 and 7, and be connected by right and left-hand screw nipples 13, so that the flow of heating medium may readily take place from one radiating element to the other. If desired, the plates may be provided at the points adjacent such couplings with recesses 14, in which the wrench heads 15 of the coupling may be located and be readily accessible for engagement by a wrench when assembling or dissembling the sections. Such of the hubs as are not employed for coupling purposes may be sealed by suitable threaded plugs 9^a (see Fig. 3).

In the preferred embodiment, the heating passages are so arranged and distributed over the back of the plate as to assure that the entire area of the plate will be maintained at a temperature most suitable for producing the most efficient and comfortable heating effect by radiation. For this purpose the conduits or tubes are of such transverse diameter, and are spaced apart at such distances as will assure that the superficial area of the plate between such passages or tubes will be great enough to cause the heat given off from the heating fluid to be absorbed by the plate through conduction, and emitted from the plate by radiation at rates so rapid as to maintain the area of the plate adjacent or between the passages at a temperature substantially below that of the heating medium flowing through the passages. In the plate or section of the construction shown, the result will be obtained efficiently by employment of a plate of a proportion of substantially six feet by three feet in area, and such distribution or location of the heating passages on the back of the plate that the area of the plate in the spaces or rectangles bounded by or between the passages may be from substantially three square feet to substantially four square feet. In the case of a plate of the size mentioned, the tubes may be, and preferably are, substantially one inch in diameter, and have a bore or passage of one-half inch in diameter.

When the invention is applied in operative position to a ceiling or wall A, it is preferably embedded therein with its heat-radiating face 2 flush with the outer surface A′ of the wall and exposed toward the area into which the heat is to be directed from the plate by radiation. In the arrangement shown in Figs. 5 and 8, the plate is secured in position by suitable bolts 3^a, or other fastening devices, and the back of the plate has applied thereto a suitable layer 16 of non-conducting composition—for example, asbestos cement, or its equivalent, so that circulation of air in contact with the rear of the plate is prevented. The result is that the heat given off from the medium flowing through the passages is transferred to and absorbed by the plate, and the latter being of a superficial area considerably in excess of that directly receiving the heat from the conduits, serves to radiate or emit the heat with sufficient rapidity to maintain the plate at a temperature substantially less than that of the heating medium. In the example stated, when employing a heating medium of substantially 212 degrees F., as with steam, the plate will absorb and emit the heat at such a rate that the radiating surface of the plate or section will be maintained at substantially 120 degrees F. In Fig. 8 I have shown two plates 1^a, 1^a, connected in series, and one plate 1^b separately connected to the same supply and return lines 11, 12 leading from the source of fluid heat, this figure showing

one of the many arrangements which may be employed to accomplish the desired result.

It will be understood that suitable controlling valves (not shown) may be inserted in either the supply or return lines 11, 12 to control the supply of fluid heating medium to the heat radiating element, the location of such valves being a matter of convenience and suitability for each installation.

In the embodiment shown and described wherein, according to the invention, the heat is applied to a comparatively small area or areas of a radiating plate having a relatively much larger area, it is assured that the radiating face of the plate will be maintained at a temperature much lower, as shown by the example above, than that of the heating medium employed, which in the case of steam is usually constant at 212 degrees F. It therefore follows that the plate may be heated by a smaller quantity of heating medium to produce an adequate heating effect, thus reducing the consumption of fuel without reducing the comfort desired.

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

1. A device of the character described comprising a plurality of cast-metal heating plates arranged in edge to edge contact, conduits formed integrally with each of said plates and adapted to carry a fluid heating medium, certain of said conduits being alined and opening through the plates at their meeting edges, said certain conduits being provided at their ends with internally threaded hubs, said plates having edge recesses adjacent said hubs into which said certain conduits open, the opposed recesses of alined conduits forming an opening through said plates, and a reverse threaded hollow nipple threaded into opposed hubs and located in said opening.

2. A device of the character described comprising a plurality of cast-metal heating plates arranged in edge to edge contact, conduits formed integrally with each of said plates and adapted to carry a fluid heating medium, said conduits being alined and opening through the plates at their meeting edges and provided at their ends with internally threaded hubs, the plates having registering edge recesses adjacent said hubs and into which said alined conduits open, and a reverse threaded hollow nipple threaded into opposed hubs of the contacting plates and located in the opening formed by the opposed recesses, each said nipple having means midway its ends and within said opening whereby said nipple may be rotated to screw the nipple into the opposed hubs, said nipples serving to hold said plates in tight edge to edge contact.

3. A heating apparatus of the character described, comprising a plurality of imperforate heat-radiating plates of cast metal adapted to be secured to a wall of a room to heat objects therein solely by radiation, each of said plates having a plurality of tubular, substantially parallel conduits cast integral with a face of the plate and extending substantially parallel to the heat-radiating face thereof, a conduit cast integral with said first-named face and extending transversely to said first-named conduits and in the plane thereof whereby said transverse conduit and said first-named conduits intersect for intercommunication, the ends of each of said conduits terminating in internally threaded hubs, each of said plates having recesses in its edges into which the hub ends of certain of said conduits open, certain of the conduits of the plates being alined and being joined together by connecting means comprising reversely threaded nipples screwed into the opposed hubs, the opposed recesses forming an opening through the joined plates, said nipples being accessible through said openings whereby the nipples may be screwed into the opposed hubs, said nipples serving to draw said plates tightly into edge to edge contact and to hold said plates rigid with respect to each other, and sealing plugs screwed into the hubs of the remaining open conduit ends.

In testimony whereof I have hereunto subscribed my name.

ARTHUR HENRY BARKER.