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J. W. McKEEHAN ET AL

MEANS AND METHOD FOR WARMING FLOORS

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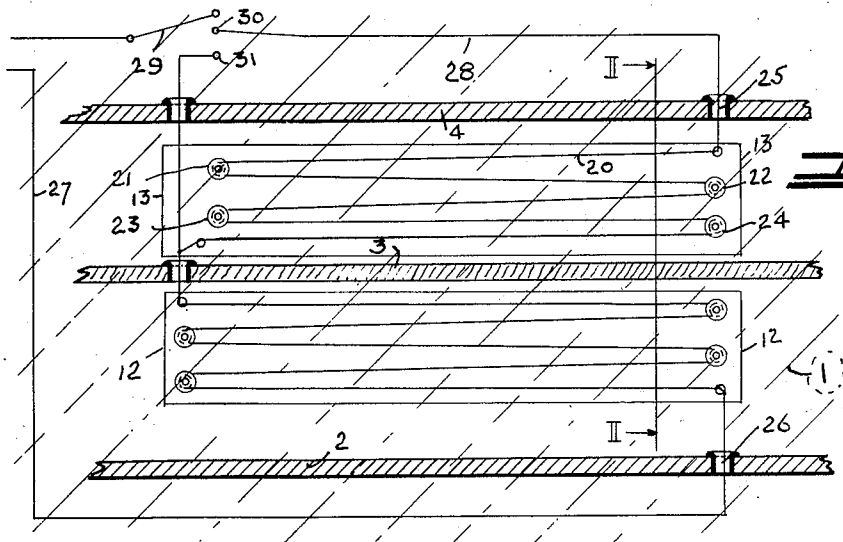



Fig. 1.

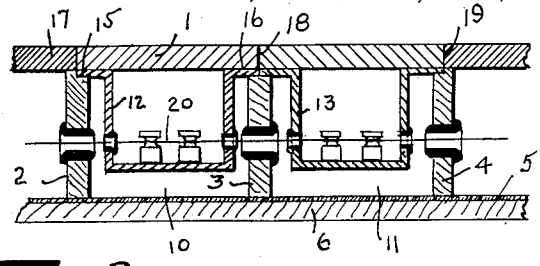



Fig. 2.

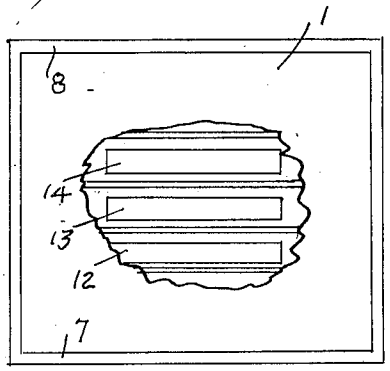



Fig 3

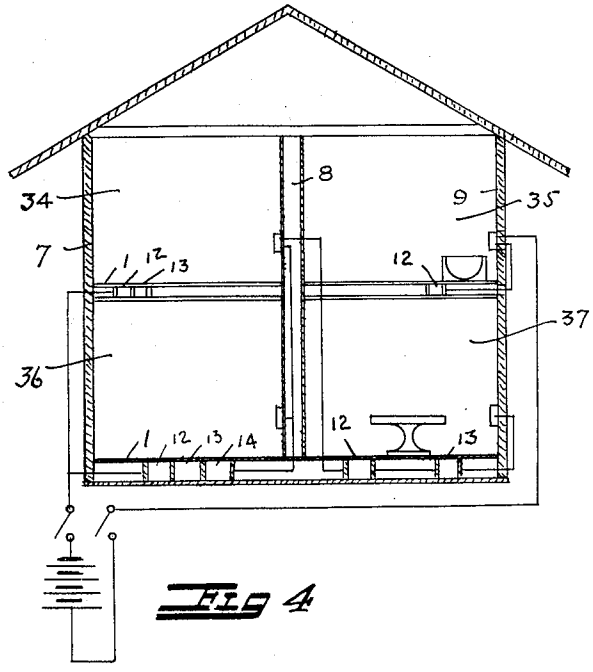



Fig 4

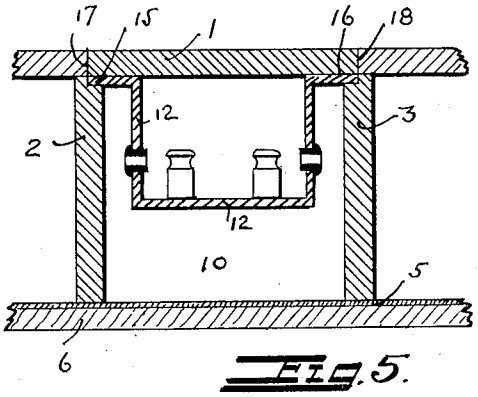



Fig. 5.

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# UNITED STATES PATENT OFFICE.

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## MEANS AND METHOD FOR WARMING FLOORS.

Application filed November 13, 1922. Serial No. 600,537.

*To all whom it may concern:*

Be it known that we, JOHN W. McKEEHAN and GEORGE J. HENRY, citizens of the United States, and residents of Contra Costa County, California, and San Francisco, county of San Francisco, California, respectively, have invented new and useful Improvements in Means and Methods for Warming Floors, of which the following is a specification.

Our invention relates particularly to a device by which heat is generated through the flow of electricity through a resistance member and associated parts, and the method of applying the same for the purpose of warming the living space in rooms and buildings generally and has particular reference to the even distribution of heat more particularly through those portions of the rooms and living space that are occupied, thus making more efficient the results obtained from given expenditure of energy.

One of the principal objects of our invention is to remove the chill from the floor of rooms and to warm the strata of air in the room adjacent to the floor and particularly of those portions of the floor most frequently occupied by persons in a quiescent state.

We have found that the ordinary systems of heating enclosed spaces by convection and conduction make necessary the expenditure of a large number of heat units to warm the air and the walls and ceilings of a room, which heat units are largely wasted as regards any warming of the persons in the room. The hot air rising rapidly to the ceiling and there forming a layer of greater warmth, whereas the lower portions of the room that may be occupied are still left in a comparatively cold condition until the entire body of air in the room has reached the desired temperature.

One of the objects of our invention is the application and distribution of heat on the floor of the room so that the floor of the room itself is warm and this warmth is communicated also to the strata of air lying in the lower portions of the room. This warming of the floor and lower strata is evenly distributed over a considerable space so that there is no intensive circulation which heretofore has brought about the rapid movement of the warm air to the top portions of the room. By our invention we are thus enabled to retain the greatest distribution of warmth in the floor and in the lower part of the room, thus conserving a large amount of energy for an equivalent warming of the occupants of the room, or in other words we are able to increase the warmth of the used parts of the room by a less expenditure of energy than that heretofore attained.

Other objects will appear from the drawings and specifications which follow.

These objects we accomplish by introducing under the floor of a room, and preferably between the conventional floor joists a conductor of electricity of relatively low resistance and large exposed area and having a conductivity suited to distribute the required number of heat units. By such a warming element we are enabled to keep the actual temperature of the conductor such that it can be touched or handled at any time without burning and so that under no condition will it be sufficiently hot to establish combustion thereabouts, and still will be sufficiently warm to warm the floor in proximity thereto and to keep the occupants of the room always comfortably warm.

The above mentioned conductor, which is adapted to be placed just under the floor is mounted upon suitably insulated supports and preferably entirely surrounded by the still air between the floor joists and also is preferably arranged within a box form of structure, the upper side or top of which is preferably left off and the box attached directly to or immediately adjacent to the floor to be warmed. In this way the heat established in the air space about the conductor is communicated directly to the floor in a most efficient way and every heat unit generated by the said conductor is distributed in the warming of the floor and lower strata of the room. Asbestos or other suitable insulation may be placed about the conductor or between the said conductor and bottom of the box structure and if desired and especially when the space between the floor and lower ceiling and joist is entirely confined the said box may be dispensed with entirely and the insulated supports and asbestos heat insulation arranged about the conductor to suit the requirements of the local conditions or the builders' wishes.

It is to be borne in mind that with our conductor its conductivity and dimensions

are to be proportioned so that at no time or in any part thereof is the temperature raised to a point where burning or combustion could occur within the confined space in which it is to be installed. In other words its unit resistance is maintained low throughout the entire structure between the floor, ceiling and joints whereby it will be impossible for a fire to occur therefrom, and preferably such as will maintain a temperature of approximately 70 degrees Fahrenheit on the floor.

Referring to the accompanying drawings:

Fig. 1 illustrates in plan view a portion of the floor and floor joists of a room wherein the floor is shown in dotted lines to better illustrate the arrangement of our conductor element mounted there below.

Fig. 2 is a cross section of Fig. 1 on the line II—II thereof.

Fig. 3 is a reduced plan view of a room 36 of Fig. 4 with a portion of the floor shown broken away to expose the joists and our warming units 12, 13, 14 located there-below.

Fig. 4 is a cross section of a house in which four rooms are shown, each provided with our warming conductors and showing particularly the electrical connections thereto and means by which the degree of heat may be varied in accordance with the conditions or suit the wishes of the occupants.

Fig. 5 is an enlarged cross section of one of the conductor units shown in place below the floor and particularly illustrating the preferred arrangement of the conductor and enclosing box and their attachment to the floor.

Throughout the figures similar numerals refer to identical parts.

Any conventional form of floor is illustrated by the numeral 1 which is suitably supported on the joints 2, 3, 4, and to the under side of which latter may be affixed the laths 5 and plaster ceiling of the room below 6, thus providing with the building walls 7 and 8 and 9 the enclosed spaces 10, 11, bounded by the floor of the room to be warmed 1, joists 2, 3, and the lower ceiling 5, 6. Within the space 10, 11, we mount any required number of conductor boxes or warming units as 12, 13, 14, which are preferably made relatively long, thus extending over a considerable portion of the room area. These boxes are open at the top and are mounted directly adjacent the floor 1 as shown in detail in Figs. 2, 5. The upper flanges 15, 16, may be supported upon the joists 2, 3, thus enabling the boxes 12, 13, to be set in place as the construction of the floor and the floor joists proceeds, or the floor may be trapped in any conventional way as at the joints 17, 18, 19, and the units attached directly to said traps or mounted upon the joists if preferred, whereby the warming units may be readily reached at any time. However, the construction of conductor herein recommended will not require attention after original installation throughout the life of the building.

Within the box 12, 13, 14, we mount the conductor element preferably a long wire or other like resistance conductor indicated at 20 and which may be reaved about the insulators 21, 22, 23, 24, and which is connected from the electric circuit through the insulators as 25, 26, and these units 12, 13, 14, with their conductors therein, may be mounted in series as illustrated in Fig. 1 wherein the two units in series are energized from the conductors 27, 28, for one position of the switch lever 29 when on the contact 30 or one of the said units may be cut out by shifting the switch 29 to the conductor contact 31 or any plurality of heating units may be connected into any combination either in series or parallel in well known ways by conventional switches and connections.

The boxes 12, 13, 14, are preferably made of heat resisting material or they may be formed of metal and asbestos lined or of any other suitable material or construction by which the air body therein is confined or by which the surrounding air in the spaces 10 and 11 serves as a suitable heat insulator to concentrate the heat distribution from the conductor 20 upon the floor 1. In Fig. 3 is shown distribution of three such conductor units located under the floor in the center portion of the room, being that portion to be most occupied, as for example a living or dining room, although it is to be understood that the heat units may be advantageously located in other portions of the room, as for example in the upper bedroom 31 of Fig. 4 the heat units are shown adjacent one of the walls to correspond with the position of the dresser, whereas in the bath room 35 the heating units are shown on the floor adjacent the bath tub, and in the living room 36 they are shown located in the central portion of the room and in the dining room 37 they are shown as distributed around, but not in the center, as the central space is here occupied by the dining room table.

We claim:

1. Room heating means in combination with an imperforate floor, a casing mounted in substantial contact with the under side of a portion of said floor, and an electrical resistance within said casing adapted when energized to heat the floor.

2. An electric heater adapted to heat the floors of rooms and comprising a casing adapted to be fixed to the underside of a floor and an electric resistance within said casing comprising a plurality of loops in a plane substantially parallel with the floor.

3. Room heating means in combination with an imperforate floor, a casing of elongated form and adapted to be mounted in substantial contact with the under side of a portion of said floor between the floor joists, an electrical resistance within said casing adapted when energized to heat the said floor and comprising a plurality of loops insulated from each other.

4. Room heating means as set forth in claim 3 wherein said loops lie in a plane parallel to said floor.

5. Room heating means in combination with an imperforate floor, a casing mounted in substantial contact with the under side of a portion of said floor, an electrical resistance within said casing adapted when energized to heat the floor and heat insulation means adapted to confine the heat generated by said resistance against the floor and substantially preventing the escape of heat except through said floor.

6. An electric heater adapted to heat the floors of rooms and comprising a casing adapted to be fixed to the underside of a floor, an electric resistance within said casing comprising a plurality of loops in a plane substantially parallel with the floor and heat insulation means adapted to confine the heat generated by said resistance against the floor and substantially preventing the escape of heat except through said floor.

7. Room heating means in combination with an imperforate floor, said means comprising a casing of elongated form and adapted to be mounted in substantial contact with the under side of a portion of said floor between the floor joists, an electrical resistance within said casing adapted when energized to heat the said floor and comprising a plurality of loops insulated from each other and heat insulation means adapted to confine the heat generated by said resistance against the floor and substantially preventing the escape of heat except through said floor.

8. The method of warming a floored space which consists of transforming electrical energy into heat immediately beneath the said floor, and maintaining said heat substantially within 400° F.

9. The method of warming a floored space which consists of transforming electrical energy into heat energy under adjacent sections of a selected portion of said floor and maintaining said heat substantially within 400° F.

10. The method of warming a floored space which consists of transforming electrical energy into heat immediately beneath the said floor, said transformation being within a space closed against air circulation.

11. The method of warming a floored space which consists of transforming electrical energy into heat energy under adjacent sections of a selected portion of said floor, said transformation being within a space closed against air circulation.

12. The method of warming a floored space which consists of transforming electrical energy into heat immediately beneath the said floor, and establishing resistance to the transmission of the heat in a downward direction said transformation being within a space closed against air circulation.

13. The method of warming a floored space which consists of transforming electrical energy into heat energy under adjacent sections of a selected portion of said floor and establishing resistance to the transmission of the heat in a downward direction said transformation being within a space closed against air circulation.

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