

M. W. DEWEY.  
ELECTRIC HEATING APPARATUS.

Patented Dec. 3, 1889.

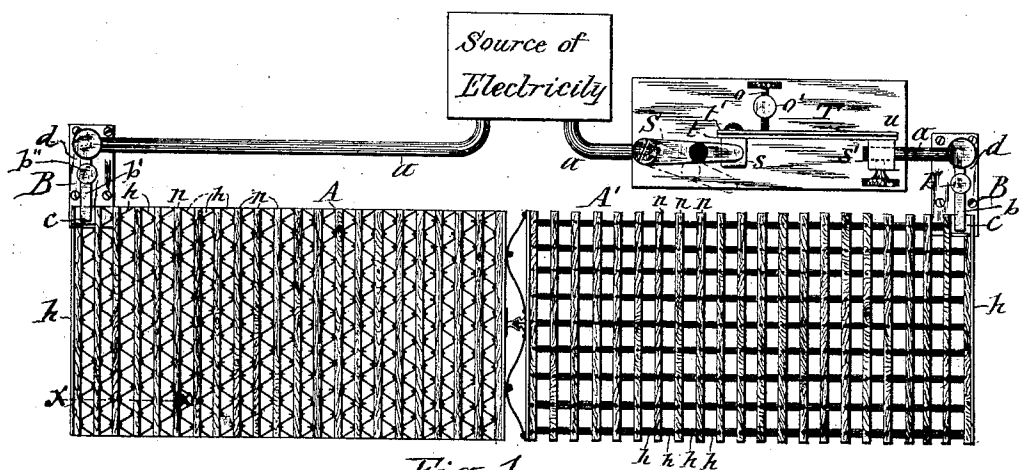


*Fig. 1*

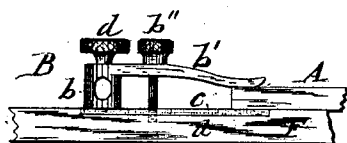


*Fig. 4*

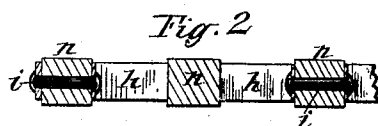


Fig. 2



Fig. 3

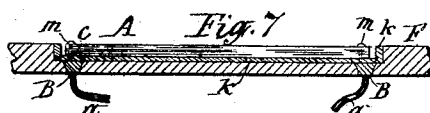


Fig. 7

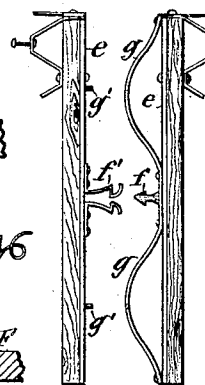


Fig. 5

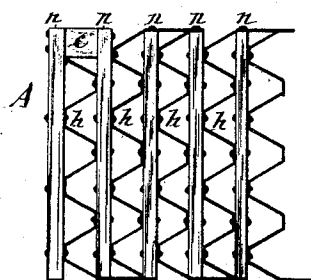


*Fig. 6*



Fig. 11

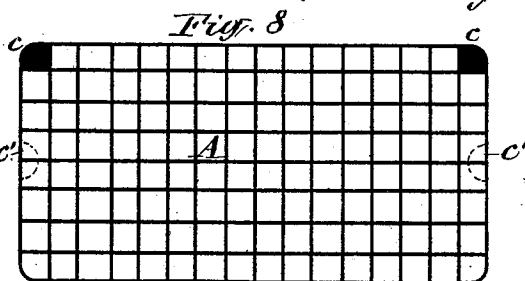


Fig. 8

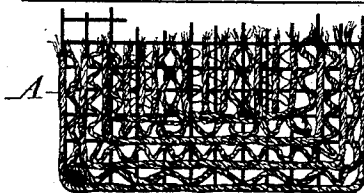
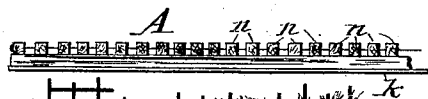
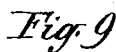


*Fig. 10*

**WITNESSES :**

J. J. Gaess,  
A. F. Walz

INVENTOR:

INVENTOR:  
*Mark W. Dewey*  
BY  
*Smith, Lacey & Smith*  
his ATTORNEYS

# UNITED STATES PATENT OFFICE.

MARK W. DEWEY, OF SYRACUSE, NEW YORK, ASSIGNOR TO THE DEWEY CORPORATION, OF SAME PLACE.

## ELECTRIC HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 416,360, dated December 3, 1889.

Application filed September 18, 1889. Serial No. 324,317. (No model.)

*To all whom it may concern:*

Be it known that I, MARK W. DEWEY, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Electric Heating Apparatus, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

The object of my invention is to provide simple, effective, and safe electrical heaters for heating rooms, cars, and other inclosed spaces, and that will occupy little or no valuable space, and yet be located in the most desirable and advantageous position accessible.

The disadvantages common to usual modes of artificial heating that have been heretofore employed is that in it the heat is concentrated, and is therefore not as effective as it should be, since the parts of the room in the vicinity of the heater must be heated to an undesirable degree in order that the parts more remote may be raised to the required temperature, and the resistances must be so highly heated for this purpose as to make it dangerous or liable to ignite surrounding combustible objects.

I employ in my invention heating devices having very large surface area, and these consequently have a very large or extended radiating-surface. On account of their construction they are capable of developing a great amount of heat without becoming very hot, and this without employing expensive resistances.

The heating devices I employ are in the shape of a floor-mat, which may extend over the entire floor or only a part of the same, so that the heat may be equally diffused throughout the room or apartment. As the heating devices have a large radiating-surface and extend to all parts of the room upon the floor, said room will be equally and comfortably heated, and this without raising the temperature of the heater above 80° or 90° or thereabout.

In order to prevent undue heating of the devices or to keep their temperature below the igniting-point of wood or other similar combustible material, I provide a thermostatic cut-out or current-controller arranged

so that it may be adjusted for any desired degree of temperature and cut out the heating device when the temperature rises above the desired degree.

It is evident that the lower a heater can be located in a room the more equal and more comfortable will be the temperature. This form of heater is especially adapted for street-cars, where the room under the seats is occupied—as, for instance, storage-battery cars—or, in fact, all cars employing the electric current for propelling or lighting purposes.

In the accompanying drawings, Figure 1 represents a top view of floor-mats coupled together and connected with a suitable source of electricity and a thermostatic current-controller in circuit. Fig. 2 is an enlarged sectional view of a portion of the mat on the left in Fig. 1, taken on line *xx*. Fig. 3 is a similar view of the mat on the right of the figure. Fig. 4 is an elevation of a mat clamp or connection from which the mat can be removed. Fig. 5 is an enlarged top view of the floor-mat couplings or detachable electric connections between the mats. Fig. 6 is a plan view illustrating the arrangement of the heat-developing conductor in the mat to be employed when the volume of the source is small. Fig. 7 is a transverse sectional view of a floor-mat inlaid or countersunk in a floor. Fig. 8 is another form of mat. Fig. 9 shows a portion of an edge view of a metallic floor-mat with protecting material upon and under the same. Fig. 10 is a plan view of an open-work or ventilated fiber mat upon a metallic electric mat to form a shield for the latter and also prevent noise when walked upon, and Fig. 11 is a side view of another and very simple form of mat that can be used also for heating.

Referring specifically to the drawings, A and A' in Fig. 1 represent the floor-mats to be heated by an electric current from a suitable source, as a secondary or primary battery or a dynamo-electric generator.

It will be unnecessary to describe a particular source of electricity herein, as any suitable and well-known source can be employed for the purpose.

In some cases, especially where cars are to

be heated, a heating-current may be employed similar to that described in my prior patents on electric heating apparatus for railway systems, Nos. 401,482 and 406,890, dated, respectively, April 16, 1889, and July 16, 1889. Such current is more economical and safer than high-tension currents. There is no danger of receiving a shock in case of contact with exposed parts of the mat, even though it may be uncomfortably hot to touch, due to the passage through said mat of the heating-current. For this reason, also, the current will not leave its conductors as readily as currents of higher potential. The conductors *a a* leading from the source to the mat or mats when a heavy heating-current is used are formed of large metal rods or stranded cables. The thermostatic cut-out located in one of the conductors *a* may be of any suitable form, but preferably, as shown in Fig. 1, consists of two thin strips *t t'* of the same or different metals, placed one upon the other and fixed jointly at one end to a post *s* on the base-plate *T*. If the strips are of the same metal, they are insulated from each other; but if of different metals they may not be insulated from each other. When insulated one from the other by non-conducting varnish or a thin strip of mica, or other suitable material, the strip *t*, through which the current passes, will be heated more than the strip *t'*, and consequently cause the strips to warp and throw the free end *u* out of contact with the post *s'*, and thus break the circuit, allowing the heated mat to cool. The warping of the strips is due to their unequal expansion, as is well known. To regulate the action of the strips *t t'* under the influence of heat, and thereby control the development of heat in the mat, I employ an adjusting-screw inserted in a screw-threaded post *o'*, and standing at right angles to the plane of the thermostatic strips *t t'* and bearing upon the same, as shown in Fig. 1 of the drawings. By increasing the pressure of the screw upon the said strips the separation of the strips from the post *s'* will be resisted, so as to require a higher degree of heat to effect said separation. To guard against excessive heating of the mat, the screw-post *o'* may be made to serve as a stop to the movement of the screw *o* by setting said post in a position to bring the head of the screw in contact therewith when said screw is adjusted to the required limit. On the same base-plate *T* is a common circuit maker and breaker or switch *S*. As shown in the same figure, the circuit is closed. When the switch is moved, as shown by the dotted lines, the circuit is open.

The clamp, *B B*, connecting the conductors *a a* with the terminals *c c* of the mats, may be greatly varied in form, and I do not limit myself to the precise construction shown. One of the clamps *B* is clearly shown in Fig. 4, and consists of a plate *d* to be screwed to the floor *F*. A binding-post *b* is mounted upon one end of the plate. *b* is a spring arm

or clamp proper fixed to or forming a part of the binding-post *b* and extending to and over the opposite end of the plate *d*, and holding a portion of a mat *A* between said spring-arm and plate, thereby securely clamping the terminal of the mat and making a large surface contact with the same. The binding-screw *b''* is employed for creating greater pressure upon the terminal *c* of the mat.

When mats are large or too long to be handled conveniently, they are made in sections with couplings or detachable connections between them to hold them together and make electric connection between the parts. This coupling or connection, like the clamps already described, may be greatly varied in construction, but it will be sufficient herein for the purpose of this invention to describe clearly only the form shown in the drawings.

Referring to Fig. 5, which is an enlarged view of the coupling, it will be seen that the mats have end strips of metal *e e*, to which the connecting parts are fixed. The connecting parts on one strip consist of an arrow-head *f*, projecting from the middle of one strip, and a spring *g* on each side of the arrow-head and fastened to the strip at each end, the middle portions of the springs bowing outward from the strip to which it is attached to make good contact with the opposite strip *e*. On the middle of the said opposite strip are fixed two springs *f'*. These springs extend outward from the strip and are formed to receive the arrow-head between them and there hold the same. When the said arrow-head is inserted, the springs *g g* on both sides of the same are in contact with the opposite strip, as shown in Fig. 1. The latter strip *e* is also provided with pins *g' g'*, which enter the springs *g g* and serve to hold the mats in place.

Both of the mats *A* and *A'* in Fig. 1 are formed of conducting and non-conducting material, the conducting material forming the heat-developing and radiating electric conductor or conductors, and the non-conducting material forming the shield or protecting part. The conducting part *h* of the mat *A* is formed of a strip or strips of metal, as iron, nickel, copper, or bronze. The metallic strips *h* are waved or zigzagged in a suitable manner, preferably as shown, and placed between slats of wood *n* or other suitable non-conducting material. The wooden slats are thicker than the metallic portion of the mat, as shown clearly in Figs. 2 and 3, and are therefore more prominent than the heat-developing conductor, and shield or protect the latter from contact with more combustible materials. Rivets *i* or small bolts connect the metallic strips through the wooden slats of the mat.

On account of the form of construction the mat *A* in Fig. 1 is rigid or stiff; but the mat *A'* in the same figure is flexible and may be rolled up. The metallic or conducting

part *h* of this latter mat is formed of a series of springs leading through the wooden slats *n*, placed equidistantly apart. Pins *p* extend through the slats where the springs pass through them to prevent the shifting of the slats on the springs. A sectional view of a portion of the latter mat *A'* is clearly shown in Fig. 3 of the drawings. The heat-developing devices of these mats may be said to be connected in multiple arc, which is the preferred form; but if the qualities of the current to be utilized are not sufficient to produce the required amount of heat with such a mat the heat-developing conductor of the mat can be connected with the terminals of the same in series, thereby allowing the employment of a current of moderately-low volume, as shown clearly in Fig. 6 of the drawings.

Fig. 7 represents an edge view of a floor-mat *A* inlaid or let in the surface of the floor, *F* representing a section of the floor. In order to prevent ignition, if the mat is designed to be heated to a high temperature and the floor is composed of a combustible material, fire-proof and non-heat-conducting tiling *k* is placed on the floor underneath and around the mat. In some cases a perforated asbestos mat may be employed to cover the heating-mat as a shield and protection, as hereinafter fully described, and shown in another figure. The electric connection to this mat is effected by leading the conductors *a a* from the source of electricity and underneath the floor to the binding posts or clamps *B*, which extend from the under side of the terminals *c c* of the mat through the floor. In some cases the mat may simply lie upon the said posts, and in other cases to obtain more perfect contact between the parts screws *m m* may be inserted through the mat into the posts *B B*, as shown in the figure.

Fig. 8 represents a mat composed entirely of metal, preferably of iron or nickel. Such a mat is very simple and inexpensive and can be cast in one piece. The edge view of this form of mat is shown in Fig. 7. The terminals *c c* are shown located at the corners on one side of said mat; but it is obvious that said terminals can be located on any suitable part of the mat—as, for instance, on the ends, where they are shown in dotted lines and lettered *c' c'*.

Fig. 9 represents a portion of the edge view of the same mat with non-heat-conducting material *k* underneath the same, with a mat upon it formed of wooden slats strung on wires and equidistantly apart to allow the circulation of heat through the same and to form a shield for the metallic mat beneath. This metallic mat, or the end portion of same, is shown in Fig. 10, with an open-work or braided fiber mat upon the metallic one. The fiber mat is loosely woven, to allow the ventilation of heat through the interstices thereof. This fiber mat may be made of asbestos, and thereby rendered fire-proof when it is desired

to heat the metallic mat to a high temperature.

In Fig. 11 is shown a mat formed of fluted or corrugated sheet-iron. In the left-hand portion of the same figure wooden slats are shown placed in the hollows of the iron on the upper side of the mat and riveted therein. This mat may be constructed in either style.

It will be evident that if the heating-mat is sufficiently large it will be unnecessary to heat it above the igniting-point of wood, and therefore the precautions against setting fire to combustible surrounding objects, described and shown herein, are not absolutely necessary in all cases.

I propose in some cases to have one or more holes through the floor beneath the mat to increase ventilation and diffusion of heat.

I do not desire to be limited to the precise form and construction of the floor-mats, as this may be greatly varied, according to circumstances. The mats may be connected in the circuit either in series or parallel, if required.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A floor-mat composed partly or wholly of metallic material and containing one or more heat developing and radiating electric conductors, and a suitable source of electricity connected to said mat.
2. A floor-mat composed partly of metallic electric conducting material and partly of non-conducting material and containing one or more heat developing and radiating electric conductors, and a suitable source of electricity connected to said mat.
3. In an electric heating apparatus, a floor-mat composed partly of electric conducting material and partly of non-conducting material, said non-conducting material projecting above the plane of the conducting material to serve as a protecting-shield for the latter, one or more heat developing and radiating electric conductors in said mat, and a suitable source of electricity connected to said mat.
4. In an electric heating apparatus, a floor-mat comprising one or more heat-developing electric conductors, and a covering or shield of non-heat-conducting material, and a suitable source of electricity connected to said mat.
5. In an electric heating apparatus, a floor-mat comprising one or more heat-developing electric conductors, and a ventilated covering or shield of non-heat-conducting material, and a suitable source of electricity connected to said mat.
6. A floor-mat comprising one or more flexible metallic heat-developing electric conductors, and a suitable source of electricity connected to said mat.
7. An electric heating apparatus comprising a suitable source of electricity and a

floor-mat composed partly or wholly of heat-developing electric conductors removably connected to the aforesaid source of electricity.

- 5 8. An electric heater consisting of two or more floor-mats comprising one or more heat-developing electric conductors, a detachable electric connection between the mats, and a  
10 suitable source of electricity connected to said mats.

9. An electric heating apparatus consisting of a suitable source of electricity, two or more floor-mats comprising one or more heat-developing electric conductors detachably  
15 connected to said source of electricity, and a detachable electric connection between the mats.

10. In an electric heating apparatus, a floor-mat comprising one or more heat-developing  
20 electric conductors, a suitable source of electricity connected to said mat, and a thermostatic current-controller to prevent an excessive heating of the mat.

11. In an electric heating apparatus consisting of a suitable source of electricity, a  
25 floor-mat comprising one or more heat-developing electric conductors connected to said source of electricity, a thermostatic current-controller to prevent an excessive heating of  
30 the mat, and a regulator for controlling the action of the said current-controller, as set forth.

12. In an electric heating apparatus consisting of a suitable source of electricity, a  
35 floor-mat comprising one or more heat-developing electric conductors connected to said source of electricity, a thermostatic current-controller to prevent an excessive heating of the mat, a regulator for controlling the action  
40 of the said current-controller, and a stop for limiting the movement of the regulator, as set forth.

13. In an electric heating apparatus, a removable floor-mat comprising one or more  
45 heating-developing electric conductors, a suitable source of electric heating-current, and stationary clamps adapted to connect the said mat in circuit with the source of heating-current.

14. In an electric heater, a floor-mat comprising one or more heat developing and  
50 radiating electric conductor or conductors countersunk in a floor, a suitable source of electricity, and connections leading from said source and beneath the floor to said mat.

55 In testimony whereof I have hereunto signed my name this 16th day of September, 1889.

MARK W. DEWEY. [L. s.]

Witnesses:

C. H. DUELL,  
A. F. WALZ.