

L. P. HYNES.
ELECTRIC CAR HEATING SYSTEM.
APPLICATION FILED JULY 2, 1919.

1,398,521.

Patented Nov. 29, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

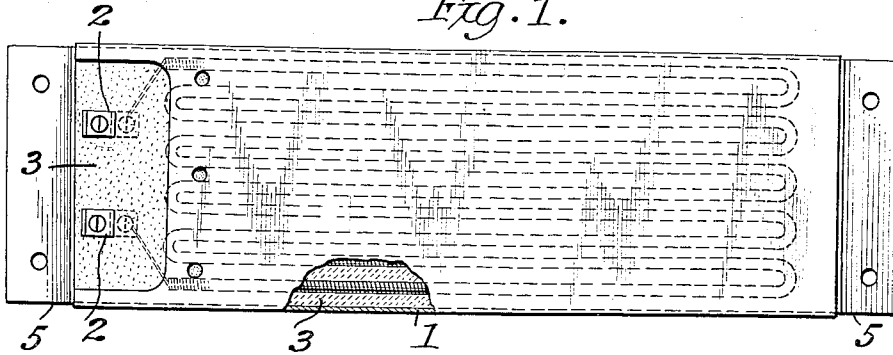


Fig. 2.

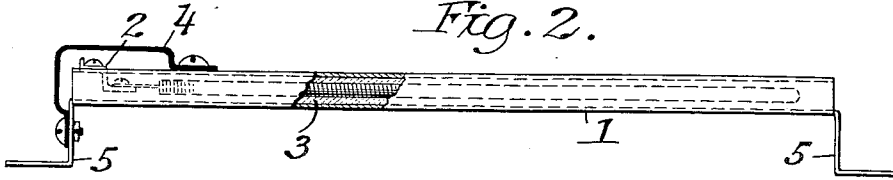
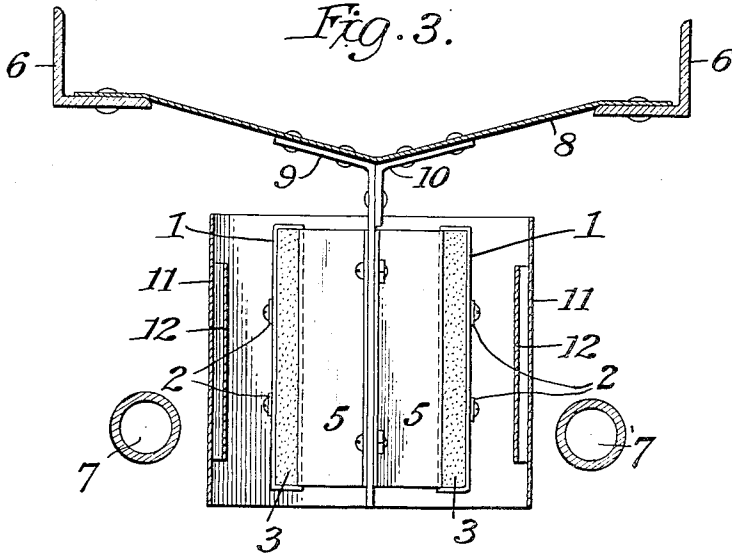


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

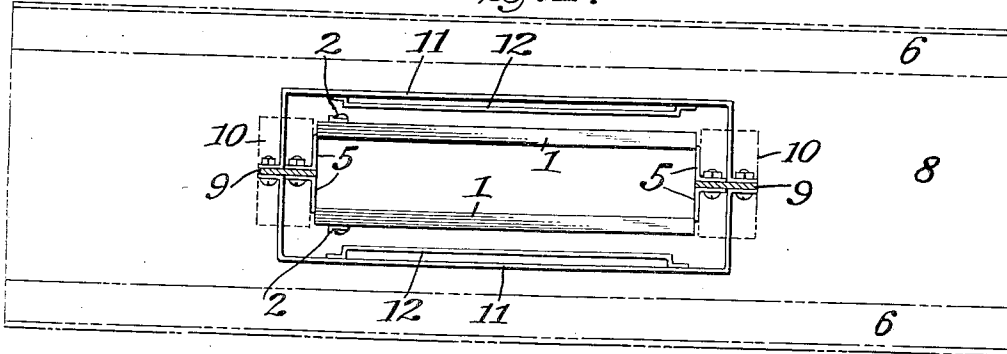


Fig. 5.

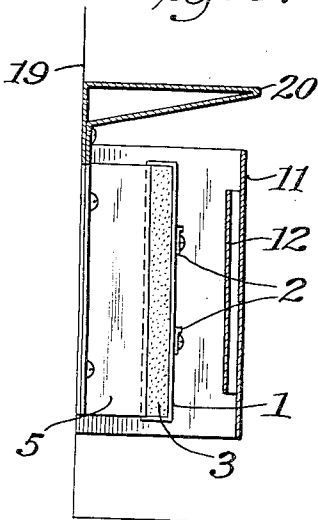


Fig. 6.

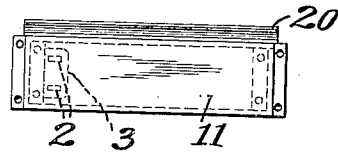


Fig. 7.

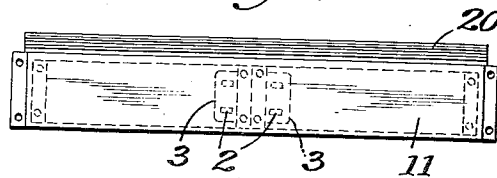
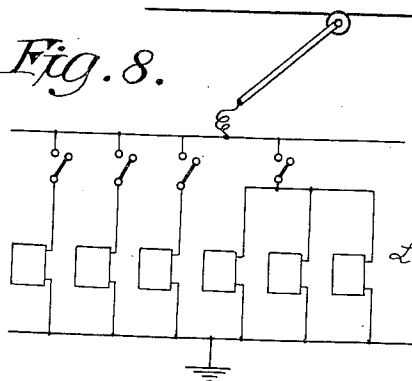


Fig. 8.



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UNITED STATES PATENT OFFICE.

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ELECTRIC CAR-HEATING SYSTEM.

1,398,521.

Specification of Letters Patent.

Patented Nov. 29, 1921.

Application filed July 2, 1919. Serial No. 303,150.

To all whom it may concern:

Be it known that I, LEE P. HYNES, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Electric Car-Heating Systems, the following being a full, clear, and exact disclosure of the one form of my invention which I at present deem preferable.

For a detailed description of the present form of my invention, reference may be had to the following specification and to the accompanying drawings forming a part thereof, wherein—

Figure 1 is a plan and

Fig. 2 a side elevation of a heater element;

Figs. 3 and 4 show the mounting of the heater elements in a transverse-seat car;

Figs. 5, 6 and 7 show the heaters applied to the truss-planks;

Fig. 8 is a circuit diagram.

In the system of electric car heating in universal use the heater element consists of a bare-wire coil which is laid in a spiral groove formed on the outer surface of a cylindrical porcelain core. One end of the coil is usually connected electrically to a rod extending back through the porcelain core to the opposite end where the two ends of the wire are connected to binding posts on a terminal block attached to the box in which the element is inclosed.

Owing to the necessary size and shape of such a heater its bulk presents obstructions to the flow of air through the casing in which it is inclosed under the car seat and the radiation is from the wire surface which is limited in area and not well disposed with respect to the air flow. That casing is also in the nature of a covered box with perforated sides for the entrance and exit of air, and, since the wire is bare and exposed, the perforations in the cover are necessarily of restricted size, about sixty per cent. of the area being occupied by the metal around the openings. That is required for the protection of passengers who might otherwise thrust umbrella sticks against the wires or bring articles of clothing like ladies' dresses, into contact with them when hot. It also prevents contact with stray metal such as pieces of wire inserted accidentally or mischievously against

the heater wire. As a further difficulty the wire of the coil must be of comparatively large size in order to maintain its upstanding, coil form on the porcelain core. Hence the wire is of such low resistance that five to ten such heater elements must be connected in series across the trolley-line voltage in order to keep down the current to a value that will not give to the coils more than the low degree of wire temperature which the system requires. The regulation and adjustment of the heating effect is therefore dependent on the grouping of these heater elements in series in different circuit combinations which will provide for each degree of heat a certain number of elements of the right size and resistance to give when in series the required value of heating current for each degree of car-heating effect.

The result is that the heating of each type of car presents a special problem requiring for each type of car a special set of heater elements and special circuit combinations. This compels both the manufacturer and the user of car heater to keep in stock many different forms and sizes of heater elements for the many different types of cars in use. It should also be added that besides the use of small perforated casings great care must be exercised in other ways to prevent contact with the heater wires by the passengers who might be injured and also by stray metal which might ground the heaters and burn them out by a short circuit, while dust, moisture and dirt are occasionally sufficient to cause such a ground.

It is my purpose to overcome all of the aforesaid difficulties in car heating and I accomplish this by using heater elements of a form which, in the first place, can be connected individually across the trolley line voltage. These elements can therefore be all of one and the same size and construction regardless of the particular type, size and arrangement of the car which is to be heated. The total amount of heat for any given car will depend merely on the number of these identical heaters which are needed, and the regulation will depend merely on the number of such elements that are connected to the circuit at any given time. In the second place, since the voltage employed for electric cars is some five times that used in

house service, I form such identical heater elements of comparatively fine resistance wire, which can not be shaped into upstanding, self supporting coils like those in the present car heater. I also operate them at a much higher temperature. In consequence I embed them in a refractory insulating substance which will give support to the wire mechanically and not be injured by heat and will at the same time protect the wire from oxidization when in its heated condition. This insulating substance is made in a thin layer and is preferably inclosed in a skin or coating of metal. Thus the heat will be conducted from the wire to the metal skin and from the metal skin to the air at a rate adequate to avoid a melting temperature in the wire itself. This affords a flat radiating surface of an area greater than that of the wire and over this radiating surface is distributed the heat that was concentrated in the wire. The temperature of this separate radiating surface is lower than that of the wire itself by reason of the distribution of the heat over a greater area of surface.

Thirdly, I eliminate the perforated boxing and substitute therefor simple guard-sheets on either side of the heater element, so spaced therefrom that ample capacity for air flow is afforded on either side. These guard-sheets lie parallel to the flat radiating surfaces of the heater element and the outlet from between the guard-sheets into the car is of a sectional area not less than that of the internal free space between the heater and the guard sheets. Across this outlet bars may be extended as a precaution but the usual plate with small perforations is unnecessary. By this means I secure a far better heating effect than has been possible heretofore, together with a material simplification of the wiring and of the heater construction as well as an arrangement standardized for all types of car.

Referring to the drawing, particularly to Figs. 1 and 2, which show the details of the heater-element, 3 represents a thin sheet of insulating cement in which is embedded a long length of fine wire coiled in a helix that is laid back and forth within the cement. This wire is of such length that its terminals may be connected to the trolley line having the usual voltage of 550, and the resulting current will be no greater than the wire will stand under the conditions of radiation afforded by the arrangements to be hereinafter described. The ends of the coil are connected to the terminal plates 2, 2, mounted on the outside of the cement 3. The cement with the wire embedded therein is inclosed in a thin sheet or skin 1 of metal and the ends of the metal are turned down to form feet 5, 5 by which the element may be mounted on but spaced away from the base of support. The metal skin 1 is also

cut away on the top side for a distance around the terminals 2, 2 which are covered by a detachable shield 4. Referring to Figs. 3 and 4, the front and back corner beams of a transverse car seat are shown at 6, 6. Between these beams is extended a deflector-sheet 8 bent down at the middle. To the under side of sheet 8 are secured two depending bars 9, 9, which are stiffened by angle plates 10, 10. On opposite sides of depending bars 9, 9 are bolted the feet 5, 5 of two heater elements such as are shown in Figs. 1 and 2. Thus the flat heater elements stand vertically with their upper edges presented to the deflector plate 8 and their lower edges to the floor of the car and spaced apart from each other a distance equal to about twice the offset length of the feet 5, 5. Outside of the two heater-elements are guard-sheets 11, 11, which are also vertical and parallel to the radiating surfaces of the heater-elements, and have their ends turned outward and bolted to the aforesaid depending bars 9, 9. The guard sheets 11, 11, are spaced away from the adjacent parallel radiating surfaces and on the inside of each is a separate plate 12 spaced slightly from the side of the guard sheet to keep the latter cool. The ordinary foot-rests are shown at 7, 7. A plan view of the arrangement thus described is shown in Fig. 4 with those parts that are above the heater indicated by dotted lines. It will be manifest that the space between the two guard sheets is open at top and bottom and that the sectional area of these openings is equal at least to the sectional area of the flow-space around the heater-elements. This allows for an air flow between the parallel radiating surfaces of the heater-elements and between said surfaces and the parallel guard-sheets which is fully adequate to deliver into the car (by aid of the deflector plate 8, 8) all of the heat generated in the heater wires and distributed from those wires to the radiating surfaces which lie parallel to the course of the air current. By virtue of the deflector-plate 8, 8, the hot air can not become pocketed under the seat but is directed outward into the car.

In Figs. 5, 6 and 7 I have shown the same form and disposition of a heater-element applied to the truss-plank type of mounting. In this case the heater elements are mounted, singly or in pairs, on the truss-plank 19, being spaced from said plank by the feet 5, 5. Outside of the heater-element is the guard-sheet 11. In place of the deflector-plate 8, 8, of Figs. 3 and 4 I employ a horizontal deflector 20 secured to the truss-plank and projecting into the car above the heater to form a side foot-rest. In Fig. 6 a single element and in Fig. 7 two such elements are included within a single guard-sheet.

In Fig. 8 I have illustrated the direct connection of the separate heater-elements with

the trolley-line voltage and the switches that cut off the individual heaters, or multiple groups of heaters from the trolley line.

This arrangement enables me to use but one size and shape of heater-element for all sorts of cars and all positions in those cars, whereas it has heretofore been necessary to build heaters of different sizes and arrangements for each special type of car. For instance, in one car the heaters would require a certain size of wire in order that a certain number of them, when grouped in series, could be made a regulating unit, while in a smaller car a smaller size of wire would be required in order that a less number would give the resistance necessary to constitute a regulating unit. Moreover, a heater-element in my system 10 inches in length develops the same amount of heat energy as a 22-inch heater of the present type and is also but 1/2 inch in thickness in contrast to a 2-inch diameter of the present form, being also cheaper to manufacture.

In event of the trolley-voltage being doubled I can still use the same heaters, merely employing two of them in series as sections of a single heater-element adjusted to trolley-voltage whereas with the present heaters a double trolley-voltage requires a new and different construction with reduced voltage and a duplex casing having staggered holes that still further obstructs the outflow of heat.

I do not limit my invention to the specific form of embedded heater herein shown; the wire, for instance, may be embedded between mica sheets or in a vitreous material instead of the cement or the device made somewhat thinner or thicker so long as it is in a flat form lying parallel to the air flow and the guard sheet provides an adequate free passage of the air currents at top and bottom.

What I claim as new and desire to secure by Letters Patent is:

1. A car heater of the character described comprising a heater element provided with a flat body formed of a thin sheet of insulating material having a heater wire embedded therein, and an imperforate guard sheet inclosing the ends and one side of said heater element, the sides of the guard sheet being parallel with and spaced from the flat sides of said heater element, whereby an unobstructed air flue is provided, open at both ends.

2. A car heater of the character described comprising a heater element provided with a flat body formed of a thin sheet of insulating material having a heater wire embedded therein, a metal skin inclosing said body and having means whereby the heater element may be supported, and an imperforate guard sheet inclosing the ends and one side of said heater element, the sides of the guard sheet being parallel with and spaced from the flat

sides of the heater element, whereby an unobstructed air flue is provided, open at both ends.

3. A car heater of the character described comprising a heater element provided with a flat body formed of a thin sheet of insulating material having a heater wire embedded therein, a metal skin inclosing said body, and an imperforate guard sheet inclosing the ends and one side of said heater element, the sides of the guard sheet being parallel with and spaced from the flat sides of said heater element, whereby an unobstructed air flue is provided, open at both ends, said heater element and said guard sheet having feet positioned to be secured to a common support.

4. A car heater of the character described comprising a heater element provided with a flat body formed of a thin sheet of insulating material and having a heater wire embedded therein, a metal skin inclosing said body, and a guard sheet extending around said heater element, projecting supports for mounting the heater element in the space formed by said guard sheet in a position separated from the walls of said space, the said space communicating with the space to be heated through an opening having an area equal at least to the sectional area of the space between the heater and the walls surrounding it.

5. A car heater of the character described comprising a heater element provided with a flat body formed of a thin sheet of insulating material having a heater wire embedded therein, and an inclosing guard sheet in which the flat heater element is placed in a position to permit an upward air current along its flat sides but spaced away from said guard sheet, said heater element and said guard sheet having laterally disposed supporting means positioned to be secured to a common support.

6. A car heater of the character described comprising a heater element provided with a flat body formed of a thin sheet of insulating material and having a heater wire embedded therein, a guard sheet extending around said heater element and having sides parallel with and spaced from the flat sides of said heater element, and a deflector above the said guard sheet separated therefrom to permit free air flow from the space within the guard sheet to the space to be heated.

7. A car heater of the character described comprising a heater element formed of a thin sheet of insulating material having a heater wire embedded therein, said heater element being adjusted in resistance to the trolley line voltage, an imperforate guard sheet inclosing the ends and one side of the heater element, the sides of the guard sheet being parallel with and spaced from the flat sides of the heater element, whereby an unobstructed air flue is provided, open at both

ends, and means for supporting said heater element below a car seat in position to permit free air flow along the flat surfaces of said element.

5 8. A car heater of the character described comprising a heater element provided with a flat body formed of a heater wire embedded within insulating material, whereby a radiating surface is provided which operates
10 at a lower temperature than that of the heating wire, an imperforate guard sheet inclosing the ends and one side of the heater element, the sides of the guard sheet being
15 parallel with and spaced from the flat sides of the heater element, whereby an unobstructed air flue is provided, open at both ends, and an inclined shield above the heater element for directing the air flow into the space to be heated.

20 9. A car heater of the character described comprising a flat body formed of a thin sheet of insulating material having a heater wire embedded therein, and imperforate
25 guard sheets forming a compartment inclosing the ends and sides of the heater element, said compartments being open at the bottom for the entrance of relatively cool air, and open at the top for the passage of relatively
30 heated air, said openings being not less in area than the internal air space surrounding the heater element itself.

10 10. A car heater of the character described comprising a support, a flat heater element secured to said support with its sides parallel therewith, and an imperforate guard
35 sheet also secured to said support, said guard sheet inclosing the ends and one side of said heater element, the sides of the guard sheet being parallel with and spaced from the flat
40 sides of the heater element, whereby an unobstructed air flue is provided, open at both ends.

11. In a car heater, the combination with a car seat having depending supports, a flat

heater element having means at its ends for
45 engaging said supports, and an imperforate guard sheet also having means at its ends to engage said supports, said guard sheet inclosing the ends and one side of the heater
50 element, the sides of the guard sheet being parallel with and spaced from the flat sides of the heater element, whereby an unobstructed air flue is provided, open at both ends.

12. A car heater of the character described
55 comprising a heater element formed of a thin body of insulating material having a heater wire embedded therein, a shield covering the terminals of said wire, and an external guard sheet spaced away from the
60 heater and forming a compartment opened at the top and the bottom.

13. A car heater of the character described comprising a thin body of insulating material having a heater wire embedded therein,
65 the terminal posts of said wire being seated on the insulation, a detachable shield covering said terminal posts, and an external guard sheet spaced away from the heater and forming a compartment open at the top and
70 the bottom.

14. An electric heater comprising a plurality of heater units of uniform capacity, a source of electrical energy, and means
75 whereby the several units may be individually and independently placed in circuit with said source.

15. An electric heater comprising a plurality of heater units of uniform capacity, certain of said elements being arranged in
80 series, a source of electrical energy, and means for independently placing said series of units and the remaining individual units in circuit with said source.

Signed at Albany, county of Albany and
85 State of New York, this 27th day of June, 1919.

LEE P. HYNES.