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2,091,849

ELECTRIC HEATER

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Fig. 1.

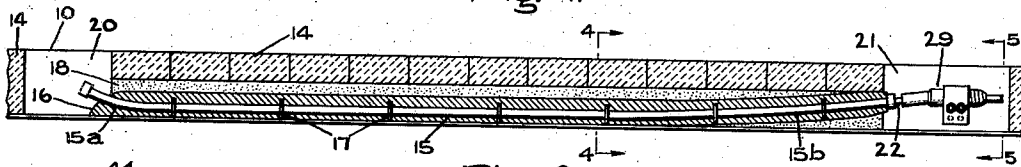


Fig. 2.

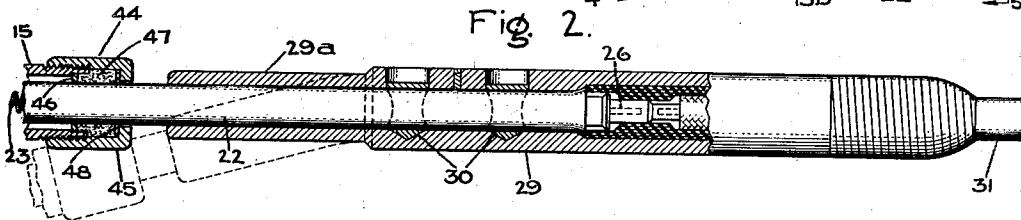


Fig. 3.

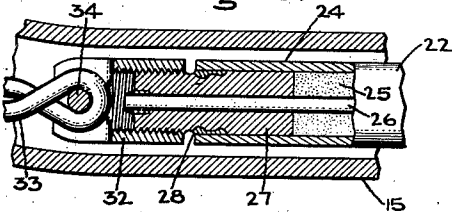


Fig. 4.

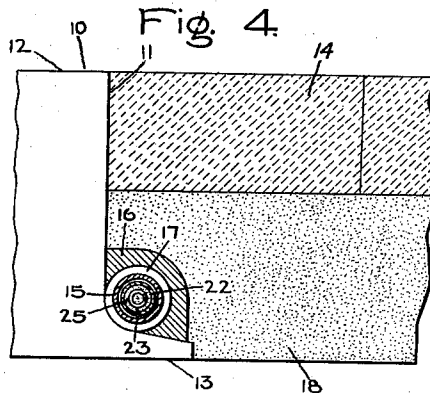
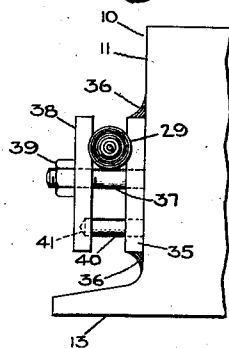


Fig. 5.



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UNITED STATES PATENT OFFICE

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ELECTRIC HEATER

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Application August 29, 1936, Serial No. 98,499

4 Claims. (Cl. 219—19)

This invention relates to electric heaters, more particularly to electric heaters intended to be used for the melting of snow and ice in the vicinity of railway switches, frogs and the like where it is important to prevent the collection of snow and ice, and it has for its object the provision of an improved electric heater of this character.

More specifically, this invention relates to electric heaters of the type described and claimed in the United States patent to C. C. Abbott No. 2,009,979, dated July 30, 1935. As there described, an elongated electric heating element of the sheathed type is arranged longitudinally of the rail of the switch and is supported in thermal relation with the rail by a mass of heat conducting material embedding the element and adhering to the rail. The embedding mass functions to conduct heat from the heating element to a large portion of the rail area, and further functions to secure the heating element to the rail.

This arrangement has the disadvantage that it is at times almost impossible and in all cases is very difficult to replace or repair the heating unit in the event of failure. This is particularly true where the heating unit is under the street paving of an electric street railway. It is possible to remove the unit in certain cases by tearing up the street paving and removing the embedding mass and heating element as a body from the rail. At busy street intersections where four or five cars a minute pass over the switch location, the workmen can spend but a small portion of their time on the actual job of removing the unit. This makes replacement and repair of a unit very expensive.

This invention contemplates the provision of a switch heater arranged so that the heating element can be easily removed and a new or repaired unit applied to the switch within a comparatively short time and with little expense. This invention further comprehends an improved electric heater arranged so that the heating element may be removed for replacement or repair without removing the street paving.

In accordance with this invention, an elongated tube preferably formed of metal is arranged longitudinally of the rail and adapted to slidably receive the heating element. Arranged at the ends of the metallic tube are connection boxes into which the ends of the tube open, and which in turn open to the surface of the street. The ends of the metallic tube are curved upwardly on such radii that the heating element can be inserted in the tube from above the street surface

through the connection boxes without removing any portion of the street paving whatsoever.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which Fig. 1 is an elevation in section of an electric heater arranged in accordance with this invention; Fig. 2 is an enlarged elevation of a portion of the heater of Fig. 1, parts being shown in section so as to illustrate certain details of construction; Fig. 3 is an enlarged fragmentary view in section of a portion of the heater of Fig. 1; Fig. 4 is a fragmentary sectional view taken through the line 4—4 of Fig. 1 and looking in the direction of the arrows; and Fig. 5 is a fragmentary sectional view taken through the line 5—5 of Fig. 1 and looking in the direction of the arrows.

Referring more particularly to Figs. 1-5, this invention has been shown in one form as applied to a switch of a street railway. It is to be understood, however, that the invention is applicable equally as well to electric and steam railways, and the like, and is particularly useful in these applications where the rails are buried beneath the surface of a street or roadway. The switch, as shown, comprises a metallic rail 10 having an upright web 11, a head or bearing surface 12 and a base flange 13. The rail is buried in the ground below the level of the street so that the head or tread surface 12 upon which the wheels of the vehicle bear lie substantially in the street level of the pavement 14. Arranged longitudinally of the rail 10 above the base flange 13 and at one side of the web 11 is an elongated metallic tubular member 15. The tubular member 15 is supported in spaced relation with reference to the vertical web 11 and the flange 13 of the rail by means of a heat conducting mass 16. The mass 16, as shown, completely embeds the metallic member 15, except the very end portions of the tube, and it functions to support the tube in proper relation with reference to the rail. The mass of metal 16, as shown, covers a material area of the web 11 and flange 13. The mass 16 preferably will be applied to the tube and rail by pouring it about these members in a molten state, and it may be formed of any suitable heat conducting metal, capable of being cast or molded, such as lead.

The tubular member 15 may be conveniently embedded in the mass of heat conducting material 16 by threading on the tube a plurality of metallic washers 17 and securing these washers to the tube at spaced intervals, as shown in Fig. 1. The

metallic washers 17 are formed of a suitable metal such as brass, although they may be formed of lead, as are the washers 42 of the above-mentioned Abbott patent. The washers 17 function to support the tube in proper relation with reference to the rail while the lead mass 16 is poured and while it is solidifying. When the tube with its washers has been assembled with the rail, as shown in Figs. 1 and 4, the mass of metal 16 in molten state will be poured around and about the tube and washers, and subsequently permitted to solidify to form a mass substantially of the shape shown in Figs. 1 and 4. It will be understood that suitable molds (not shown) may be used to assist in molding the mass 16.

It will be understood that in applying the heater to a section of the rail, the street paving 14 will be removed before any attempt is made to cast the tube 15 within the mass 16. After the tube has been embedded in the mass 16 the paving surface above the tube will be restored. As shown in Fig. 1, a layer 18 of sand or similar material is laid in above the mass of metal 16 above which the finished paving bricks or blocks are laid.

Arranged at the ends of the tube 15 are connection boxes 20 and 21.

Slidably mounted in the tube 15 is a sheathed heating element 22. The heating element 22 may be of any suitable type, but preferably will be of the metallically sheathed type, such as described and claimed in the United States patent to C. C. Abbott No. 1,367,341, dated February 1, 1921. Briefly, this element comprises a helical resistance conductor 23 (Figs. 2 and 4) mounted within a metallic sheath 24 and supported in spaced relation with reference to the sheath by a suitable powdered heat refractory electrically insulating material 25, such as powdered magnesium oxide.

Arranged in the end portions of the sheath 24 are terminal members 26 secured to the ends of the resistance conductor 23. The terminal 26 at the left-hand end of the heater, as viewed in Figs. 1, 2 and 3, is secured to a grounding and anchoring plug 27 which fits tightly in the sheath and which is secured thereto by any suitable joint 28, such as a brazed joint. The opposite terminal 26 is received in a terminal housing 29 which is fitted on the end of the sheath 24 and is secured thereto in any suitable manner, as by brazed joints 30. A suitable supply lead 31 is provided for the heater entering the terminal housing 29. The arrangement of the terminal housing 29, the means for securing the terminal housing to the heater and the arrangement of the lead 31 entering the terminal housing, together with the connection means between the lead and terminal 26 form no part of this invention, but are described and claimed in the copending application of Charles C. Abbott, Serial No. 93,213, filed July 29, 1936, and which application is assigned to the same assignee as this invention.

It will be understood that heating elements of this character are flexible and can be bent rather easily. This characteristic of the element is utilized in providing means whereby the heating element can be readily assembled with the metallic tube 15 without removing any of the surface paving 14. The element is inserted in the tube through the connection boxes 20, 21. To facilitate the insertion of the heater into the metallic tube, the ends 15a and 15b of the tube 15 are curved upwardly, as shown in Fig. 1. That

is, the end portions of the tube 15 approaching the connection boxes 20, 21 are curved upwardly, and on such radii that the heating element may be inserted in either end of the tube through the associated connection box 20, 21, and without unduly extending the length of the connection box. The radius of curvature of the ends of the tube will depend somewhat upon this dimension of the connection boxes. The longer the connection box is, the greater the radius of curvature may be. In most installations, however, it is imperative that the connection boxes be made as small as possible, and in such cases, the radius of curvature should be rather short.

In the specific heater shown in Figs. 1-5 the terminal end of the heating element is arranged at the right, as shown, and in this case the element will be inserted through this end of the tube 15. It will be understood that the left-hand end of the heating element will be caused to enter the connection box 21 and will be passed through this box and into the right-hand end of the tube, the heater being slid inwardly until it assumes the position shown in Fig. 1.

Instead of pushing the heater in, it may be more convenient to pull the heater through, and for this purpose a suitable anchor member 32 is provided on the left-hand end of the heating element arranged to anchor a draw wire 33. The anchor 32, as shown, is of plug form and is threaded on the grounding plug 27 which has a portion projecting from the sheath for the purpose of receiving the anchor. The anchor 32 is provided with an anchor pin 34 about which the draw wire 33 is passed. It will be understood that the draw wire may be fed through the tube 15 in any suitable manner either after or before the tube is assembled with the rail. In either case, the draw wire is attached to the anchor 32 and then withdrawn from the left-hand end of the tube to draw the heater in through the right-hand end.

After the heating element has been drawn into the tube, the terminal housing 29 is rigidly secured to the rail 10. For this purpose a suitable base plate 35 is rigidly secured to the web 11 of the rail in any suitable manner, as by a welded joint 36. The base plate 35 carries a pair of studs 37 threaded on their ends and directed through apertures provided for them in a clamping plate 38. The terminal housing 29 is sandwiched between the base plate 35 and the clamping plate 38 and is secured thereto by nuts 39 threaded on the studs 37, as shown in Fig. 5. Preferably, the base plate will be provided with a pair of dowel or like pins 40 received in recesses 41 provided for them in the clamping plate.

It is generally preferable that the terminal housing 29 be arranged substantially horizontally in the connection box 21, and hence, it is generally necessary that the terminal housing have an angular relation with reference to the heater 22. The terminal housing is bent, as indicated in dotted lines in Fig. 2, to provide this angular relation. The bend, as pointed out in detail in the above-mentioned copending application of C. C. Abbott, will occur in an extension 29a provided on the terminal housing.

The right-hand end of the tubular member 15 is closed by a stuffing box 44 (Fig. 2) comprising a top 45 threaded on the end of the tube and having a centrally arranged aperture receiving the heating element 22. Arranged in a counterbore

in the end of the tube 15 is a washer 46 also provided with an aperture receiving the heating element. Arranged within the top 45 above this washer 46 is a mass of packing material 47
5 formed of any suitable material, such as asbestos wicking. Arranged between this packing and the outer end of the top is a second washer 48. This stuffing box functions to seal the end of the tube.

10 It will be understood that when the heating element 22 is energized it will impart heat to the walls of the tube 15 which in turn will impart heat to the embedding mass 16. The embedding mass
15 16 functions to conduct and distribute the heat generated to the walls of the rail 10 associated with the mass 16.

It will be observed in view of the foregoing description that I have provided an electric heater for street railways and the like arranged so that
20 the heating element can be readily applied to the rail or removed therefrom without disturbing the street or the rail structure. The heating unit can be conveniently inserted in the tube 15 as previously described. In order to remove the
25 unit it is merely necessary to remove the clamping plate 38 loosen the stuffing box 44 and withdraw the heater through the box 21.

While I have shown particular embodiments of my invention, it will be understood, of course,
30 that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

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

1. In combination with a railway switch and the like provided with a rail having its web and flange below the level of the roadway, a heater
40 for said switch comprising an elongated tubular member below the level of said roadway arranged in thermal relation with said web, a sheathed heating element inserted in said tubular member, said tubular member having an end
45 curved upwardly to facilitate the insertion of said heating element and the heating element being sufficiently flexible to bend to the curvature of said end while being inserted.

2. In combination with a railway switch and the
50 like provided with a rail having its web and

flange below the level of the roadway, a heater for said switch comprising an elongated metallic tube below the level of said roadway arranged
lengthwise of said rail above its flange, a metallic heat conducting mass embedding said tube to
5 unite it thermally with the flange and web of said rail, connection boxes at the ends of said tube, a metallicly sheathed heating element slid into said tube, the ends of said tube being
10 curved upwardly into said connection boxes to facilitate the insertion of said heating element into said tube and said element having an anchor at one end adapted for attachment of a draw
15 wire, whereby said unit can be pulled into said tube.

3. In combination, a street railway and the like having a rail, a metallic tube rigidly secured to said rail below its surface, a paving about said
20 metallic tube defining a street surface substantially level with the surface of said rail, a connection box at one end of said tube into which one end of said tube enters and said box opening to the street surface, a metallicly sheathed heating element slid into said tube, the end portion
25 of the tube adjacent said box curving upwardly into the box in such a radius that said heating element can be readily inserted into said tube from above the street surface through said connection box, a terminal housing for said
30 heating element in said connection box, and means securing said housing to the rail portion in said box.

4. In combination, a railway and the like having a rail, a metallic tube rigidly secured to said
35 rail below its surface, a paving above said metallic tube defining a roadway surface substantially level with the surface of said rail, a connection box at one end of said tube into which one end of said tube enters and said box opening to the
40 roadway surface, a metallicly sheathed heating element slid into said tube, the end portion of the tube adjacent said box curving upwardly into the box on such a radius that said heating element can be readily inserted into said tube from above
45 the roadway surface through said connection box and a stuffing box on the end of said tube fitted tightly about said heating element to seal said tube at the end.

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