July 30, 1935. C. C. ABBOTT 2,009,979

ELECTRIC HEATER

Filed Jan. 16, 1934

Fig. 1.

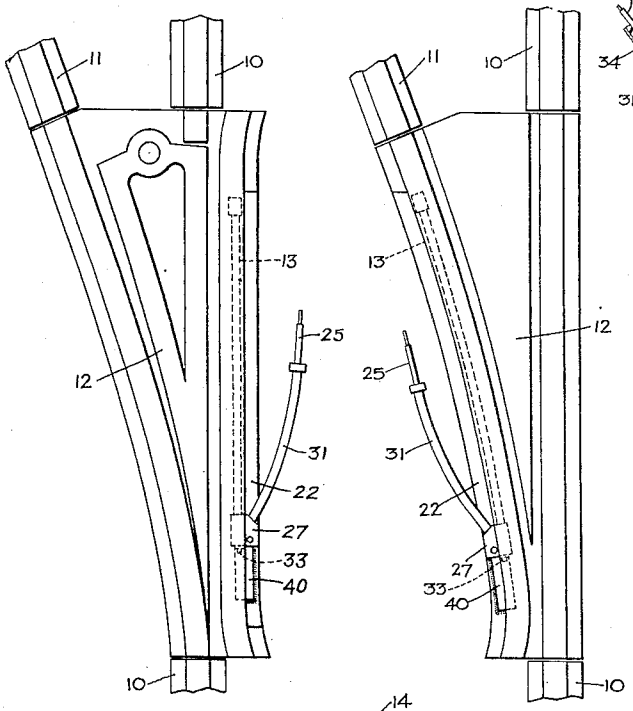


Fig. 4.

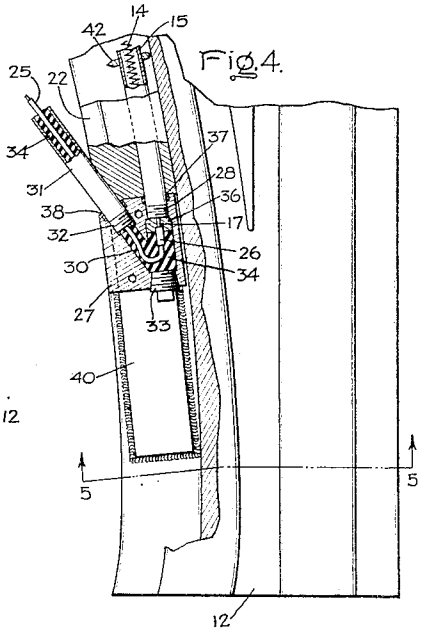


Fig. 5.

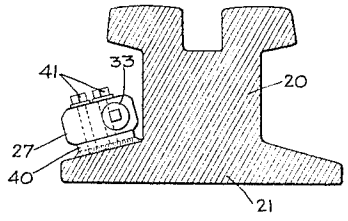


Fig. 2.

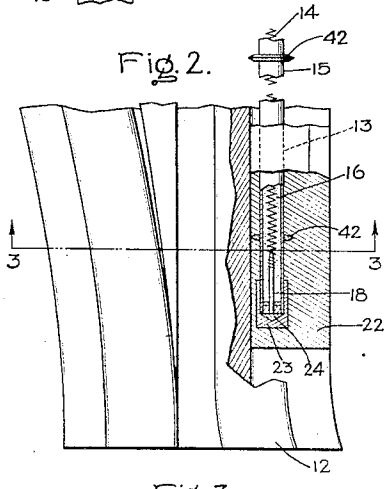


Fig. 6.

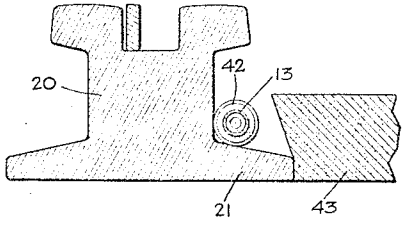
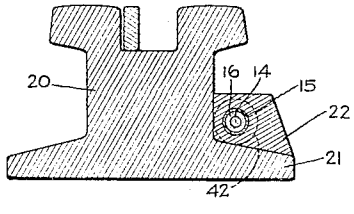


Fig. 3.



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UNITED STATES PATENT OFFICE

2,009,979

ELECTRIC HEATER

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Application January 16, 1934, Serial No. 706,856

6 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 like devices where it is important to prevent freezing of snow and ice, and it has for its object the provision of an improved electric heater of this character, and method of making it.

One object of this invention is the provision of improved means for mounting an electric heater in thermal relation with the switch, whereby the thermal flow of heat from the heater to the switch is materially improved.

It is another object of this invention to provide suitable means for protecting the heater from corrosion.

Still another object of this invention is the provision of improved terminal connections for the heater.

In accordance with this invention, an elongated electric heating element, preferably of the sheathed type, is arranged longitudinally of a rail of the switch in spaced relation with the vertical web and the lower horizontal flange of the rail. The heater is supported in this relation to the rail by a mass of heat conducting material which completely embeds the heating element and which contacts a material area of the web and flange. This mass of material functions, therefore, to conduct heat from the heating element to a large portion of the rail area over which the heat is distributed substantially uniformly. Furthermore, the mass of heat conducting material rigidly secures the heating element to the rail.

This heat conducting mass further serves to protect the heating element from corrosion, which has been very difficult to do heretofore, especially when the heater is installed on surface lines of street railways where the track is buried so that its wheel surfaces are substantially even with the pavement.

The mass embedding the element preferably will be formed of a suitable heat conducting metal, such as lead.

One terminal of the resistance conductor of the electric heater is grounded to the rail through the heat conducting mass, while its other terminal is connected to a suitable electrical supply lead. The supply lead is electrically connected with the terminal in a suitable terminal housing which, like the heater, is secured directly to the rail of the switch. Preferably, the housing will be secured to the rail by means of a grounding strip which is mechanically connected to the housing and which is rigidly secured to the rail in any suitable manner, as by welding. The terminal housing is closed and is rendered moisture proof by means of suitable electrically insulating sealing compound which fills the housing.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which Fig. 1 is a plan view illustrating a railway switch provided with electrical heating means embodying this invention; Fig. 2 is a plan view of a portion of the switch shown in Fig. 1 taken on an enlarged scale and having portions shown in section and parts broken away so as to illustrate certain details of construction; Fig. 3 is a sectional view taken through the line 3—3 of Fig. 2 looking in the direction of the arrows; Fig. 4 is a fragmentary view of a portion of the switch shown in Fig. 1 taken on an enlarged scale and having portions broken away and portions shown in section so as to illustrate certain details of construction; Fig. 5 is a sectional view taken through the line 5—5 of Fig. 4 looking in the direction of the arrows; and Fig. 6 is a view similar to Fig. 3, but showing an additional element used in making the heater for the switch shown in Fig. 1.

Referring to the drawing, this invention has been shown as applied to a switch of a street railway. The switch, as shown, comprises straight rails 10, deflected rails 11, and switch points 12 arranged to switch the cars from the rails 10 to the rails 11, and vice versa.

Electrical heating means for heating the switch connecting the rails 10 and 11 preferably will be arranged to apply heat to the inner sides of the switch points 12, as shown in Fig. 1. The electrical heating means, arranged in accordance with this invention, comprises two elongated electrical heating elements 13, one for each rail, and each preferably of the sheathed type, such as described and claimed in my United States Patent No. 1,367,341, dated February 1, 1921. Briefly, this heater comprises a helical resistance element 14 mounted within a metallic sheath 15 and embedded in and supported in spaced relation with respect to the sheath by means of a suitable powdered heat refractory insulating material 16, such as powdered magnesium oxide. The heating elements 13, as shown in Fig. 1, extend through a material length of each of the switch points 12.

One end of each resistance coil of each heater terminates in a terminal 17 (Fig. 4), while its other end terminates in a terminal member 18 (Fig. 2).

Each heating element 13 is supported in spaced

relation with the vertical web 20 and the lower horizontal base flange 21 of its rail section by means of a heat conducting mass of metal 22. The mass of metal 22, as shown in the drawing, completely embeds the heating element 13 and functions to support the heating element in its proper relation with respect to the rail. Each mass of metal 22 preferably will contact the web 20 and the horizontal flange 21 through a length sufficient to completely cover the associated length of the heater, and as shown, will contact a material area of the inner face of the web 20 and substantially the entire width of the upper face of the lower flange 21 of the associated rail.

Preferably, the masses of metal 22 will be formed of lead.

These lead masses 22 embedding the heating elements 13 perform the important function of conducting heat from the heating elements, and distributing it to a material area of the surface of the vertical webs 20 and the horizontal flanges 21 of the switch.

The lead 22 in addition to acting as a thermal conductor for the heating elements also, as has been pointed out previously, supports the heating elements directly on the switch rails and in proper relation with respect to the webs 20 and the flanges 21.

The heat conducting material 22 further performs the important function of protecting the metallic sheaths 15 from corrosion. This has been a very difficult problem heretofore, especially with heating elements applied to street railway switches, such as disclosed, where it is necessary that the rails be buried in the ground to bring their upper surfaces, that is, their wheel bearing surfaces, substantially to the level of the pavement. It will be appreciated that in such an arrangement, rain water, melting snow, etc., carrying salts and like corroding agents with them find their way down to the bottom of the rails where they most likely would contact the heaters, if they were exposed, and corrode them.

The terminal 18 of each heater (Fig. 2) is grounded to the associated switch point 12. For this purpose, the terminal is mechanically connected to a metallic cup member 23 formed of any suitable material, such as brass. This cup member 23, as shown, is completely embedded in the mass of metal 22, and hence, is grounded to the adjoining rail section 12 through the lead mass. Preferably, the terminal will be integrally united to the cup member 23. For this purpose, a small amount of solder 24, or a suitable brazing material, will be placed in the bottom of the cup 23 before it is applied to the sheath and then the cup will be heated until the solder is rendered molten. Then the cup will be applied to the sheath with the solder in its molten state. When the assembly is allowed to cool, the solder will mechanically and electrically unite the cup 23 to the terminal 18.

The terminal 17 at the other end of each heater is electrically connected with a suitable electrical supply lead 25. The terminal is electrically connected with the lead by means of a suitable connector member 26 which preferably will be compressed on the exposed ends of the lead and terminal.

The terminal 17 and the connector member 26 are received in a suitable terminal housing 27 which, as shown, is provided with a threaded connection 28 with the adjacent end of the metallic sheath. The housing 27 is provided with a passageway 30 having a distorted V-shape, as shown in Fig. 4. The right-hand leg of this passageway, as viewed in Fig. 4, receives the terminal 17 and the connector member 26, while the left-hand leg receives the lead 25. The lead 25 is conducted to the terminal housing through a suitable conduit member 31 which has a threaded connection 32 with the housing. The housing is closed by means of a suitable pipe plug 33. Preferably, the housing will be formed of brass.

The terminal housing 27 is completely sealed to the admission of moisture by means of a suitable electrically insulating material 34 substantially filling the housing and the conduit 31 carrying the lead member 25 to the housing. The material 34 may be any suitable electrically insulating sealing material, such as a suitable asphaltum compound. A layer 36 of powdered heat refractory insulating material, such as magnesium oxide, will be interposed between the sealing material 34 and the adjacent end of the sheath, as clearly shown in Fig. 4. In order to insure a fluid-tight housing, it is preferable to braze the housing to the sheath 15 as indicated by the numeral 37, and likewise, to braze the housing to the conduit 31, as indicated by the numeral 38.

The housing 27, as shown, is mounted directly upon the inner flange 21 of the associated rail. For this purpose, the housing is mechanically connected to a grounding strip 40 by means of bolts 41 (Fig. 5), and the grounding strip 40 in turn is welded to the flange 21, as shown in Figs. 4 and 5. The strip 40, therefore, functions not only to rigidly secure the terminal housing 27 to the rail, but it also functions to ground it to the rail. It will be observed that the resistance element 14 is grounded to the strip 40 through the sheath 15 which connects the resistance with the strip.

This arrangement of the terminal housing mounted directly on the rail with the heating element is a very important feature of this invention, because it prevents relative movement between the terminal housing and the heater due to the vertical movement of the rail when cars pass over the rail. It will be understood that it is practically impossible to prevent the rail from springing or jumping as the street cars pass over it. If the terminal housing, instead of being supported directly on the rail with the heating element, as shown, were supported adjacent to the rail, but off of it, the spring or jump of the rail necessarily would be taken by the heating element. This would flex the element and would cause crystallization with the result that the element eventually would break. In my arrangement, the terminal housing must move with the unit, and hence, will prevent flexure in the unit itself.

Each conduit 31 preferably will be covered by a metallic pipe (not shown) which will be embedded in concrete and which supports the paving blocks, also not shown. The diameter of this pipe will be sufficiently large to permit the conduit 31 to move with the terminal housing 27 as the latter moves with the rail.

Each heating element 13 may be conveniently applied to the switch so as to be supported in spaced relation to the rail section, as previously described, in the following manner: The grounding cup 23 will be secured to its terminal 18 in the manner previously described. Then the terminal housing 27 will be assembled to the conduit 31 and then brazed to it to form the joint 38. Then the housing will be threaded upon the end of the sheath 15 and brazed to it to form the joint 37.

The lead 25 which will have been connected to the terminal 17 by means of the connector 26 before the housing 27 was assembled with the sheath, will then be threaded through the conduit 31. Then the terminal housing will be bolted to the grounding strip 40 which subsequently will be arc-welded to the switch point 12. The housings 27 are bolted to their grounding strips 40 so that the heating units can be assembled to either the right or the left-hand rail.

The sheaths 15 are held in spaced relation with the vertical webs 20 and the flanges 21, as shown in Figs. 4 and 6, by means of a plurality of lead washers 42 spaced at intervals along the lengths of the sheaths. These washers are applied to the sheaths before the housings 27 are applied. In a particular application, the washers 42 have such a diameter as to hold the associated heating element approximately one quarter of an inch both from its rail web and the flange. When the heating element has thus been positioned by the washers, dams or barriers 43 are built along the edges of the associated rail, as shown in Fig. 6. These barriers may be formed of sand. After the barriers have been built along the edges of the rail and transversely across the end of the heater so as to form a closed channel in which the heater is received, molten lead is poured in so as to completely fill the space defined by the barriers 43 and the rail. Preferably, the washers 42 will be beveled at their outer edges, as clearly shown in Figs. 2 and 4, so that when the molten lead is poured in, the thin portions will melt away and will unite with the lead poured in about the unit.

While I have shown a particular embodiment of my invention, it will be understood, of course, 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.

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

1. A heater for railway switches and the like provided with a rail comprising an elongated metallically sheathed heating element arranged longitudinally of said rail adjacent the vertical web and the lower flange thereof, a terminal for said heating element, a mass of lead cast about said heating element so as to firmly adhere thereto and to said web and flange and a metallic member connected with said terminal and embedded in said mass so as to ground said heating element to said rail.

2. A railway switch heater provided with a rail comprising an electrical heating element having a metallic sheath arranged longitudinally of the lower flange of said rail, a metallic heat conducting mass cast to said lower flange and the vertical web of said rail embedding said heating element and supporting it adjacent said lower flange and said vertical web of said rail, a terminal housing secured to one end of said heating element, a grounding strip mechanically and electrically connected with said terminal housing and integrally united with said rail so as to support said housing on and to ground it electrically to said rail, a lead for one end of said heating element entering said housing, means for sealing said lead where it enters said housing and means grounding the other end of said heating element to said heat conducting mass and thence through it to said rail.

3. An electric heater for railway switches and the like provided with a rail comprising an electrical heating element, means mounting said heating element on said rail in thermal relation with it, a terminal housing secured to said heating element mounted on said rail, a grounding member for said housing electrically connected with it and welded integrally with said rail so as to secure said housing to said rail and so as to electrically ground it to said rail, an electrical supply lead entering said housing, means electrically connecting said lead with a terminal of said heater, a conduit for said lead secured to said housing and electrically insulating sealing material within said housing and said conduit.

4. An electric heater for railway switches and the like provided with a rail comprising an elongated metallic sheath arranged longitudinally of said rail in spaced relation with the vertical web and the bottom horizontal flange of said rail, a mass of lead supported on said flange contacting said web and embedding said sheath, a resistance conductor in said sheath, a terminal for one end of said conductor, a closed terminal housing secured to said sheath at said end, a metallic supporting and a grounding strip for said housing welded to said rail, a conduit communicating with said housing, an electrical supply lead passing through said conduit to said housing, means connecting said lead to said terminal, an electrically insulating sealing material within said conduit and said housing and means for grounding the other end of said resistance conductor to said rail.

5. An electric heater for railway switches and the like provided with a rail comprising a resistance conductor, a metallic sheath encasing said conductor, terminals connected to the ends of said resistance conductor, means supporting said sheath upon said rail, a metallic cup-shaped member connected with one of said terminals closing one end of said sheath, a terminal housing for the other of said terminals connected with the other end of said sheath, an electrical supply lead entering said housing and connected with said other terminal, means electrically connecting said cup-shaped member with said rail and means electrically connecting said housing with said rail.

6. The method of making a heater for railway switches and the like provided with a rail comprising supporting a heating element in spaced relation with the vertical web and horizontal flange of said rail by placing upon said heater a plurality of metallic washers having relatively thin outer edges and placing said heating element upon said flange with said edges in contact with it and with said web, embedding said heating element and said washers in molten material formed of the metal of which said washers are made whereby said thin edges melt to integrally unite with said molten metal and then allowing said molten metal to cool.

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