

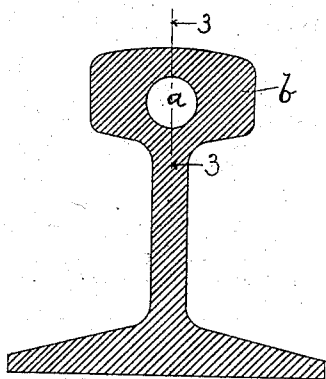
(No Model.)

2 Sheets—Sheet 1.

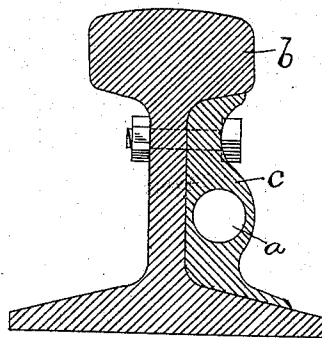
C. S. SMITH & E. E. KNOWLES.  
RAIL HEATING DEVICE.

No. 505,135.

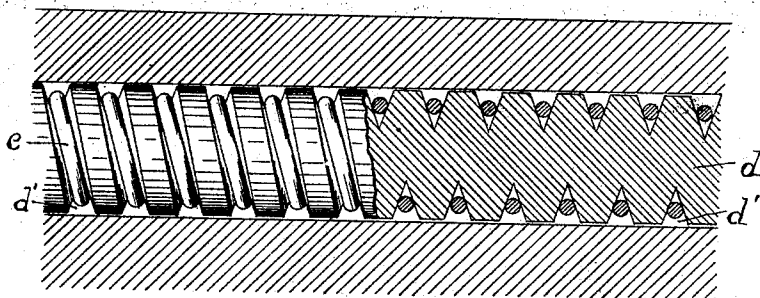
Patented Sept. 19, 1893.



*Fig. 1.*



*Fig. 2.*



*Fig. 3.*

Witnesses:

*W. Clyde Jones.*

*George L. Cragg.*

Inventors:

*Charles S. Smith.*

*Elmer E. Knowles.*

By *Barton & Brown* Att'ys.

(No Model.)

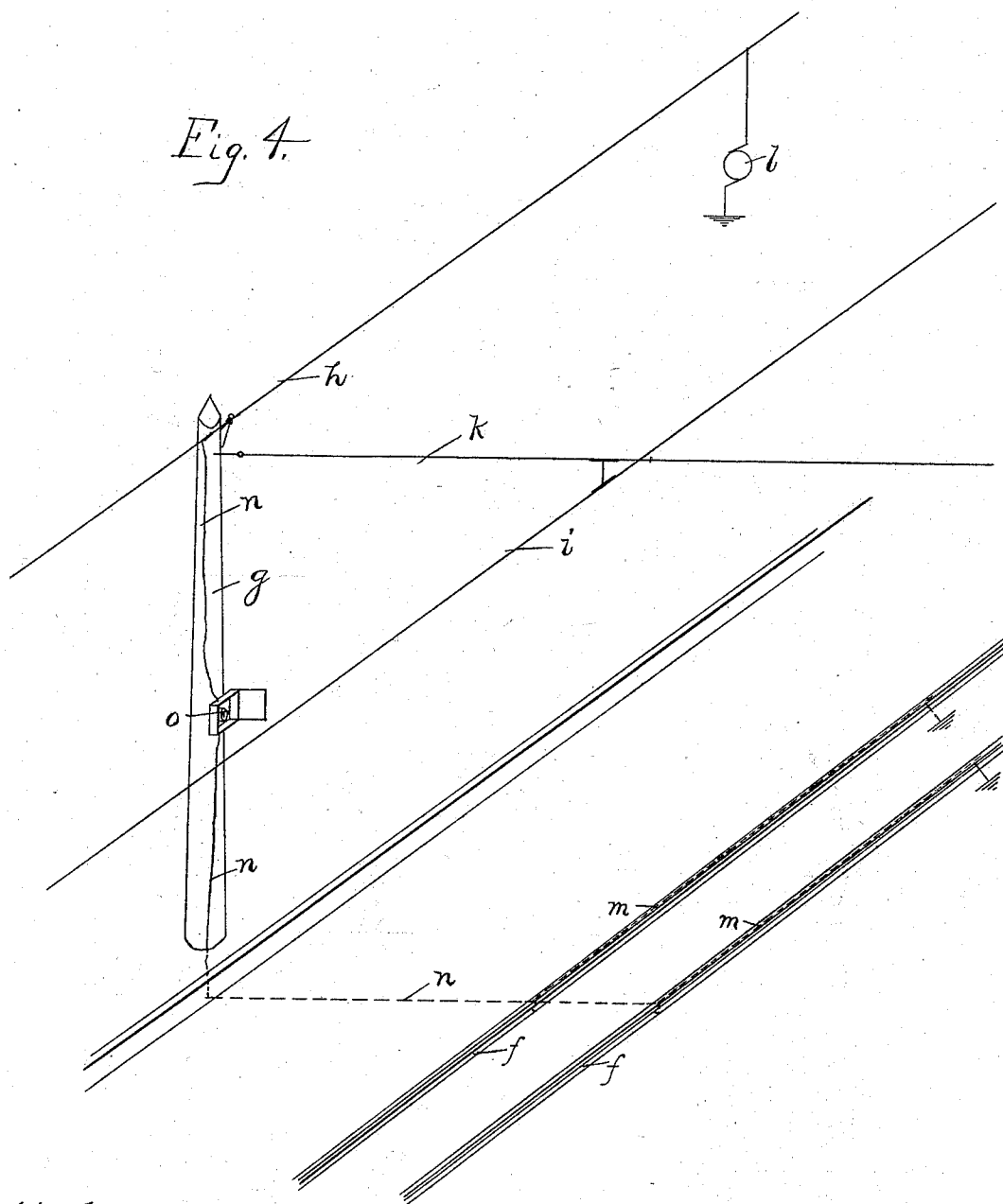
2 Sheets—Sheet 2.

C. S. SMITH & E. E. KNOWLES.  
RAIL HEATING DEVICE.

No. 505,135.

Patented Sept. 19, 1893.

Fig. 4.



Witnesses:

George L. Bragg.  
W. Clyde Jones.

Inventors  
Charles S. Smith.  
Elmer E. Knowles.  
By Barton & Brown  
Attys

# UNITED STATES PATENT OFFICE.

CHARLES SIDNEY SMITH AND ELMER E. KNOWLES, OF SPOKANE,  
WASHINGTON.

## RAIL-HEATING DEVICE.

SPECIFICATION forming part of Letters Patent No. 505,135, dated September 19, 1893.

Application filed April 24, 1893. Serial No. 471,647. (No model.)

*To all whom it may concern:*

Be it known that we, CHARLES SIDNEY SMITH and ELMER E. KNOWLES, citizens of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented a certain new and useful Improvement in Rail-Heating Devices, (Case No. 2,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Our invention relates to rail heating devices, and its object is to prevent the formation of ice upon the rails of a street railway or other railroad system, and to remove ice, snow or sleet that may have formed thereon.

In all railroad systems the formation of ice upon the rails has been a source of serious trouble in reducing the traction between the wheels and the rails, and, in particular, upon street railway systems in which the cars are not sufficiently heavy to crush the ice from the rails. In electric railway systems in which the rails form a part of the electric circuit, an additional difficulty is encountered as the formation of ice upon the rails materially increases the resistance of the circuit, if not completely insulating the wheels from the rails and preventing the passage of the current through the motor.

Our invention consists in an electrical heating device adapted to be placed in the body of the rail or to be applied to the rail in such a manner that the heat produced by the passage of an electric current will be conducted to the tread of the rail to melt or prevent the formation of ice.

Our invention further consists in novel means for supplying such heating devices with current from the supply conductors of an electric railway system.

Our invention will be more readily understood by reference to the accompanying drawings in which—

Figure 1 is a cross section of a rail provided with a longitudinal opening through its head adapted to receive one of our heating devices. Fig. 2 is a sectional view of a rail to which is attached a heating plate which is adapted to contain and transmit by conduction the heat derived from one of our

heating devices. Fig. 3 is a partial sectional view of a rail such as is shown in Fig. 1 on a line 3—3, the heating device being shown in place, partially in section. Fig. 4 is an isometric view of a portion of an overhead electric railway system, illustrating the method of supplying current to the heating device from the supply conductor.

Like letters refer to like parts throughout the several figures.

The primary object of our invention is to heat the tread of the rail to remove or prevent the formation of ice, and, obviously, this result may be accomplished in a variety of ways, and we, therefore, do not wish to limit ourselves to any specific manner of accomplishing this result, but desire to claim the invention broadly. For the purpose of this application, however, we will describe only the preferred method of accomplishing the result.

In the preferred embodiment of our invention, a longitudinal opening *a* is provided in the rail *b*, as, for instance, in the head, as shown in Fig. 1; or the longitudinal opening *a* may be provided in a heating plate *c* adapted to be secured to the rail. The exact position of the opening is immaterial so long as heat applied to the material surrounding said opening can be transmitted to the tread of the rail, though the nearer the opening is to the tread of the rail the more efficient will be the device. Within this opening is inserted a rod *d* of porcelain, fire-clay, or other insulating and non-combustible material, provided with a helical groove *d'*, thus giving to the rod the appearance of a screw. Around the bar and in the grooves is wound a wire *e* adapted to be included in an electric circuit and when so included to be sufficiently heated to radiate considerable heat. The grooves are made sufficiently deep so that the conductor when wound therein will lie within the outer periphery of the rod. When the construction is as thus described the conductor may be wound upon the porcelain rod without being provided with insulation. The rods *d* may be of any convenient length and placed end to end and the conductor *e* wound continuously from one to another.

Instead of the rods *d* provided with the

helical groove it is obvious that rods of other forms may be used about which the conductor may be wound; in fact, our invention is susceptible of an innumerable number of modifications in matters of detail, and we, therefore, do not wish to limit ourselves to the precise construction illustrated.

Referring to Fig. 4 *ff* are the rails of an electric street railway system, *g* one of the poles upon which is supported the supply conductor *h*, and between which and a similar pole upon the opposite side of the street is suspended in the usual manner the trolley wire *i* by means of the cross suspension wire *k*. The supply conductor *h* is connected to one pole of a generator *l* whose other pole is grounded. The dotted lines *m m* represent the heating devices placed in heat conductive relation with the treads of the rails. The current carrying conductors of the heating devices are grounded at one end and at the other end are connected by means of wire *n* with the supply conductor *h* after passing through a circuit breaking switch *o* placed in a convenient position upon the pole *g*. When it is desired to heat the rails the switch *o* is turned to complete the connection between the supply conductor *h* and the conductor of the heating device. Circuit will thus be completed from the generator *l* through the supply conductor *h*, wire *n* and switch *o*, conductor *e* of the heating device, to ground and back to the generator. The adjustment between the voltage of the generator and the resistance of the conductor *e* is such that the conductor *e* will be heated to such a temperature that sufficient heat will be radiated to the walls of the opening *a* to heat by conduction the tread of the rail sufficiently to prevent the formation of ice thereon or to melt such as may be already formed thereon. By the above described arrangement the heating device may be thrown into or out of opera-

tion as required, and if the heating devices be arranged in sections only such portions as require the application of heat need be thrown into operation, other sections at the time remaining idle.

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

1. In a rail heating device, the combination with a longitudinal opening or passage, the walls of which are in heat conductive relation with the tread of the rail, of an electric conductor within said passage adapted to carry a heat producing current; whereby the tread of the rail is heated, substantially as described.

2. The combination with a rail, of a heat conducting plate secured thereto, said plate being provided with a longitudinal opening or passage, and an electrical conductor within said passage adapted to carry a heat producing current; whereby the tread of the rail is heated, substantially as described.

3. The combination with the supply conductor of an electric railway system, of an electric rail heating device, and means for connecting the electrical conductor of said rail heating device with said supply conductor, substantially as described.

4. The combination with the supply conductor of an electric railway system, of an electric heating device arranged in sections, and means for connecting the electrical conductor of one or more of said sections with said supply conductor; whereby the rails along one or more sections of the track may be heated, substantially as described.

In witness whereof we hereunto subscribe our names this 15th day of April, A. D. 1893.

CHARLES SIDNEY SMITH.

ELMER E. KNOWLES.

Witnesses:

W. H. BURTT,

GEO. C. HUYTON.