

E. E. RIES.

APPARATUS FOR REMOVING ICE FROM RAILWAY TRACKS.

No. 390,619.

Patented Oct. 2, 1888.

Fig. 1.

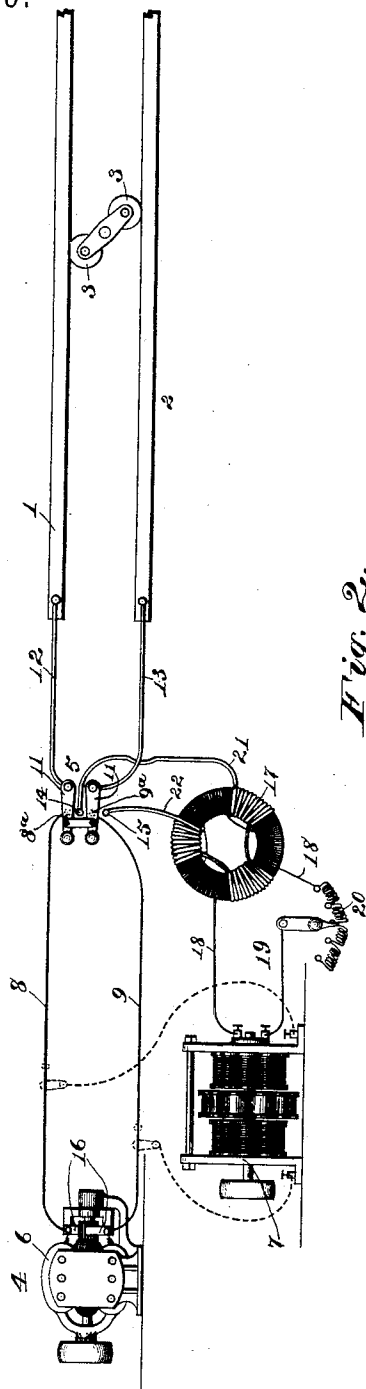
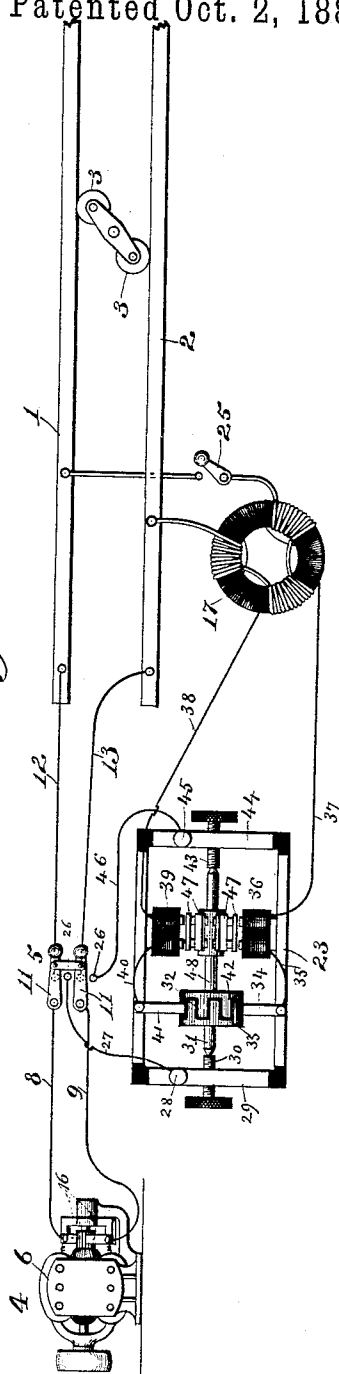


Fig. 2.



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Fig. 3.

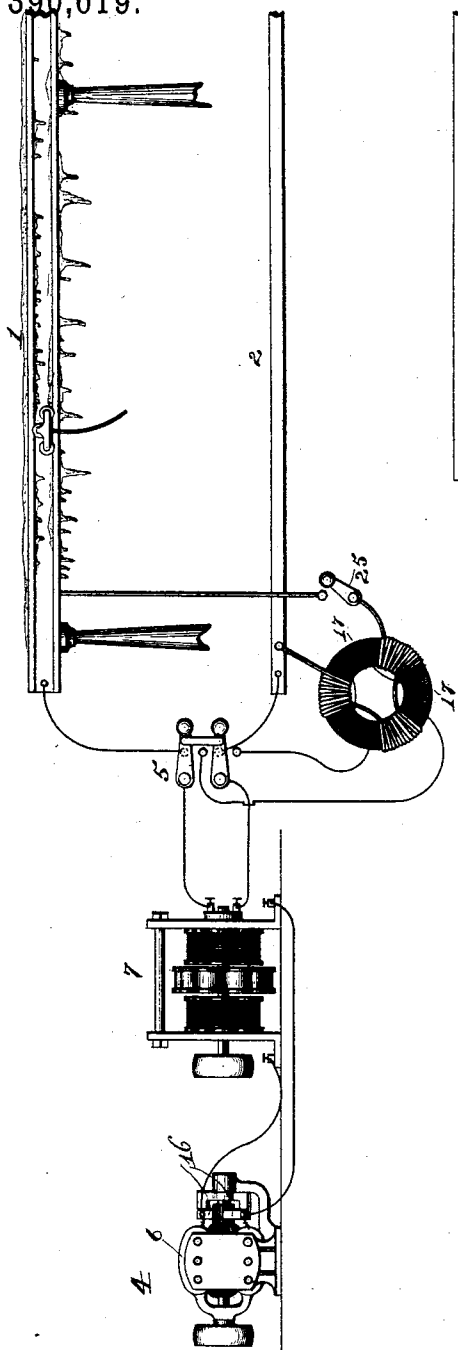
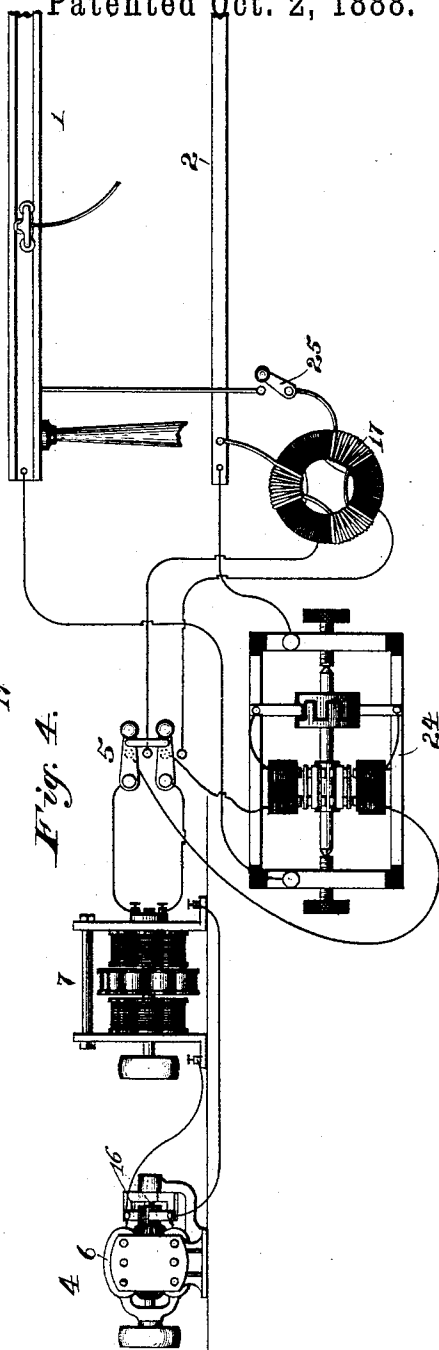


Fig. 4.



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UNITED STATES PATENT OFFICE.

ELIAS E. RIES, OF BALTIMORE, MARYLAND, ASSIGNOR TO RIES & HENDERSON, OF SAME PLACE.

APPARATUS FOR REMOVING ICE FROM RAILWAY-TRACKS.

SPECIFICATION forming part of Letters Patent No. 390,619, dated October 2, 1888.

Application filed December 9, 1887. Serial No. 257,359. (No model.)

To all whom it may concern:

Be it known that I, ELIAS E. RIES, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Apparatus for Removing Ice from Railway-Tracks, &c.; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In ordinary systems of distribution of electrical energy to electric motors mounted on a traveling railway-vehicle the actuating or motive current generated at a central station is conducted either by the track-rails or by separate conductors arranged parallel and in close proximity to the line of travel, and is distributed directly to the motor or motors mounted upon the wheeled vehicle by suitable current-collectors traveling in electrical contact with said conductors and arranged to supply a propelling electric motor with the electrical energy derived from the line-circuit. Thus it will be apparent that the said conductors, whether overhead or underground, must necessarily be in an exposed condition for contact with the aforesaid collectors; consequently they cannot be insulated with such care as the advanced state of the art would permit if electrical contact with the same were not required. As these conductors constitute the direct path of and are constantly charged with the electric current, their naked or unprotected condition, due to the extent of their exposed linear surface, renders them quite susceptible to unfavorable exterior influences from the weather, or to a rise or overflow of water in the conduit-channel of an underground line, or to a condensation of moisture either upon the conductors or their insulation, thereby providing a possible contingency in the shape of an interruption, leakage, or short circuit of the line, which would seriously impede the efficient operation of the system.

In the winter season it has been found, both in conduit and overhead lines, but particularly in overhead systems of operating electric railways, that after a fall of rain, snow, or hail the moisture necessarily deposited or accumulated upon the conductors would freeze and incase the same with a crust of ice and de-

pendent icicles, which latter would prevent electrical contact of the current-collectors with the supply-conductors, since the heating effect of the high-potential current usually employed for the propulsion of electric-railway motors was found to be insufficient to eradicate the ice or snow from the surface of the conductors.

Therefore, from the foregoing preamble, it will be divined that the object of my invention is to provide adequate and effective apparatus, whereby all superposed moisture, ice, or other foreign matter may be evaporated or eradicated from the exposed surface of the electric conductors forming the supply-circuit of the electric railway at any desirable time in an expeditious and efficient manner and without great cost of installation and maintenance.

For the attainment of this object my invention consists, essentially, in equipping the central or supply station with a source of electricity, furnishing currents of comparatively low tension and heavy heating capacity, and connecting said source of currents in the supply-circuit extending from the generator or generators producing the normal actuating-current, so that the source normally supplying the high-potential motive-current may be periodically disconnected from the line and the source furnishing the heating-current may be placed in circuit with said line, for the purpose as aforesaid.

My invention consists, further, in providing means for regulating and controlling the strength of the low-potential current admitted periodically to the supply circuit.

My invention consists, further, in certain circuit-controlling mechanism, connections, and arrangement of parts of apparatus, all of which will be more fully described hereinafter, and the specific points of novelty in which will be designated in the appended claims.

In the accompanying drawings I have shown certain appliances for adequately carrying out my invention. However, I desire it to be understood that only a few of the many forms it may assume are herewith illustrated, and that many departures may be made from them without deviating from the fundamental idea which underlies my invention.

Figure 1 is a diagrammatical view showing a central station provided with a continuous-

current generator normally supplying the working-circuit with high-potential currents, and an alternating-current generator in circuit with the primaries of an inductional transformer, which latter is arranged to have the terminals of its secondary circuit thrown, respectively, in circuit with the outgoing and return conductors of the said working-circuit. Figs. 2, 3, and 4 are similar views showing three different arrangements for accomplishing the same purpose.

Like numbers of reference indicate like or corresponding parts in the several views of the drawings.

Referring to the drawings by numbers, 1 and 2, respectively, indicate the outgoing and return supply-conductors of a round metallic circuit, which may be carried overhead or underground, according to the demands of the system, and are arranged for contact with the current-collector wheels 3 3, conventionally shown, and designed to also represent a traveling motor-vehicle in the said circuit. The said supply-conductors 1 and 2 may be of any approved or desired construction, and are, as shown, arranged parallel and in an exposed condition, either in an underground conduit or overhead upon uprights or posts placed along the line of way. If placed in the manner first mentioned—that is, in the collector-channel of an underground conduit—the traveling contact-wheels 3 3 are dependent from the vehicle by a downwardly-projecting bar, which passes vertically through the opening between the slot-rails. Thus it will be conceded that the supply-conductors so arranged in a conduit are liable to be coated with moisture or ice, finding lodgment thereupon either by a rise of water in the conduit in low-lying districts or by the passage of the same between the slot-rails. If such conductors are placed overhead in the manner before stated, the collector-wheels are above the traveling vehicle, and the supply-conductors are more exposed to the influences of the weather than when arranged in a conduit. However, in either instance it will be found in practice that in order to have the line-circuit free from interruption, &c., in the winter season, especially in rigorous climates, it will be absolutely necessary and essential to eradicate the accumulated ice, snow, and moisture adhering to the conductors in some efficient and inexpensive manner. In order to attain this end by utilizing the heating effect of electric currents, I have found that the employment of the high-tension propelling-currents would be unavailable for this purpose, as the same do not furnish the required heating effect to melt the adherent foreign matter from the conductors; but, on the other hand, by sending a current of low tension and large volume having a slight electro-motive force over the line for a moment or so, all accumulated ice and moisture will be entirely eradicated from the surface of the supply-conductors. Furthermore, it is preferable to use alternating currents for this purpose, since they

can be used more advantageously for conversion in inductional transformers, and furnish a larger heating capacity than continuous currents, as is well known. Accordingly, at every central or generating station 4, I locate a source of low-tension currents and connect the same in the main-line circuit 1 2 by a suitable current-controlling switch, 5. This low-tension source may be entirely independent of the generator normally supplying the actuating-current, or may be derived therefrom and converted into the required volume and tension by inductional transformers.

Referring now to Fig. 1, the generating-station 4 is equipped with two generators, 6 and 7, the generator 6 being of the continuous type, furnishing high-potential currents, and the generator 7 producing currents alternating in character and also of high potential.

8 and 9, respectively, designate the conductors connecting the commutator-brushes of the dynamo 6 with the terminal switch-contacts 8^a 9^a of the switch 5, which latter consists of two pivoted levers, 11 11, respectively in circuit at their rear extremities with the conductors 12 13, and arranged to move in unison and to severally make contact with either set of switch-terminals 8 9 or 14 15.

The commutator-brushes 16 16 of the alternating generator 7 are respectively connected to the terminals of the primary circuit of the inductional transformer 17 by the conductors 18 19; and 20 is an adjustable resistance-switch or rheostat, included in one branch or conductor, 19, for the purpose of gradually regulating the strength of current admitted to the primaries of the transformer 17. The transformer 17 is so constructed as to convert high-tension currents of small quantity into low-tension currents of increased quantity, and consequently the primary coils thereof are formed of layers of fine wire, while the secondaries are of coarser wire. The terminals 21 22 of the secondary circuit of the inductional transformer 17 are in circuit with their respective switch-terminals 14 15. Thus, should it be necessary to evaporate ice or moisture from the conductors 1 2 at any time, the motive-current is cut off from the line by a single movement of the switch 5 from the position shown in Fig. 1 over to the terminals 14 15, thereby closing the secondary circuit of the inductorium 17 with the line through the conductors 12 13. Now the generator 6 being idle, the switches and connections shown in dotted lines in Fig. 1 can be so adjusted as to connect the generator 6 as an exciter for the alternating dynamo 7, and the flow of high-tension alternating currents generated by the latter can be gradually regulated by the rheostat 20. By thus converting the alternating currents into corresponding low-tension currents of large volume and transmitting the same over the supply-circuit the heating capacity thereof will be amply sufficient to evaporate all adherent moisture or ice almost instantaneously without affecting or passing

through any of the motors along the line of way, since the latter are of much greater resistance than the conductors 1 2. This process can be repeated periodically without materially interrupting the traffic of the line, inasmuch as the space of time occupied is very small, and the respective generators 6 and 7 may be rapidly and conveniently connected and disconnected with the supply-circuit. However, it is feasible to transmit the low-potential heating-current over the line contemporaneously with the distribution of the high-tension motive-current; but as such method involves a somewhat different arrangement the same will be reserved for a future application.

Referring to Fig. 2 of the drawings, it will be seen that instead of employing two generators at a central station, 4, the continuous-current dynamo 6 is used for the dual purpose of furnishing both the high-potential actuating-current and the high-potential alternating current supplied to the inductional transformer 17. This is accomplished simply by placing an ordinary current-interrupter, 23, in a shunt or derived circuit from the working or supply circuit, and thereby changing the continuous currents into those of alternating character, and then converting and utilizing the latter in a similar manner and for the identical purpose, as before explained.

In order that the construction and operation of the current interrupter 23 may be clearly understood, I will now trace the path of the current therethrough, the switch 5 being adjusted on the proper set of switch-terminals 26 26. (See Fig. 2.) The current passes from one switch-terminal 26 by conductor 27, binding-post 28, frame 29, bearing 30, and shaft 31 to one side, 33, of the commutator-drum 32. The current is carried off from the side 33 by the commutator-brush 34, and traverses the conductor 35 through the magnets 36, the wire 37, primary coils of the inductional transformer 17, back by wire 38, magnets 39, wire 40, commutator-brush 41 to the other side, 42, of the commutator-drum. From thence the current traverses the shaft 48, bearing 43, frame 44, binding-post 45, conductor 46, back to the other switch-terminal 26. Thus it will be seen that the current in its passage over its path energizes the magnets 36 and 39, causing the circularly-arranged armatures 47 47 to be attracted, thereby rotating the shaft 31, and consequently the commutator-drum 32, which serves to interrupt the current. The commutator-drum 32 is divided into two mutually-insulated portions, 33 and 42, the portion 33 being rigidly attached to the shaft 31, while the portion 42 is keyed to the shaft 48. The two shafts are kept out of electrical contact, in any suitable manner, by separating the two by an intervening block of insulation. (Not shown.) The binding-posts 28 and 45 are also insulated from each other by the insulation of the frame-work. Thus there is no path for the current to pass from one binding-post to the other, since any electrical communication

is prevented by the insulated shafts 31 48 and the insulated frame-work.

From the foregoing description of the circuits and connections any one skilled in the art will clearly understand that by means of the device 23 the current will be interrupted when it reaches the transformer 17, and it will also be understood that any other approved current-interrupter may be substituted for the form shown.

Fig. 3 shows an arrangement of generators, &c., substantially similar in operation to that shown in Fig. 1, with this difference, however, that instead of furnishing a normal motive or actuating current of continuous character the traveling vehicles are supposed to be equipped with alternating-current motors, and accordingly the line-circuit is normally supplied with motive-current from the alternating dynamo 7, which latter is excited by the continuous-current machine. Furthermore, this view shows the outgoing conductor 1 arranged overhead upon elevated supports, and one track rail acting in the capacity of the return-conductor 2. In all other arrangements the construction and operation of the apparatus is substantially similar to that shown in Fig. 1.

The apparatus illustrated in Fig. 4 is intended to show an inverse construction and operation to that of Fig. 2—that is to say, the line-circuit in this figure is normally supplied with continuous motive-current primarily derived from an alternating dynamo, 7, and passed through a suitable current-straightener, 24, and the current periodically necessary for evaporating the moisture or ice from the conductors is taken directly from the alternating dynamo 7 through the inductional transformer 17 to the line.

The current-straightener 24 is substantially the same in construction and operation as the current-interrupter shown in Fig. 2, it being understood that the function of the commutator drum and brushes is to straighten the alternating current passing through the device 24.

No further description of this construction is deemed necessary, since a mere inspection of the figure will show its character.

As shown in Figs. 2, 3, and 4, there is an ordinary switch, 25, placed in one branch, 21, of the secondary circuit from the transformer to connect or disconnect the same with the supply-circuit.

When my invention is applied to electric railways, or is utilized in any analogous capacity involving the employment of line-conductors for carrying the actuating-current to the point or points of translation or distribution, the process herein described of eradicating the moisture or ice from said conductors is completed before the regular operation of the system is commenced. Thus, for example, in electric street-railways, where the line of way is practically idle from midnight until the traffic begins in the morning, the low-po-

tential heating-current can be transmitted over the line early in the morning preparatory to charging the supply-circuit with the normal motive-current for the day. However, as before stated, should the travel of the current-collectors over the conductors not be sufficiently constant to prevent the line from being again coated with objectionable moisture, &c., the process may be periodically repeated through the day, as occasion requires, without interrupting the operation of the system for any appreciable length of time.

Having thus fully and accurately described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination, with an electric circuit charged normally with currents from a suitable source of electricity, of another source of electricity furnishing currents of large heating capacity differing in tension from those of the former source and feeding into the same electric circuit, and circuit-controllers for alternately connecting both sources of electricity in the said electric circuit, for the purpose set forth.

2. The combination, with a round metallic circuit charged with current from a suitable stationary source of electricity, of suitable traveling electric motors deriving current from said circuit, an additional source of electricity feeding said circuit with currents of large heating capacity differing in tension from the currents furnished by the former source, and circuit-controlling mechanism for alternately connecting both sources of current with the said circuit, for the purpose set forth.

3. The combination, with an electric circuit, of a source of electricity for normally charging said circuit, an additional source of electricity for charging the same circuit with currents of large volume and different tension from those of the former source, circuit-controlling mechanism for alternately connecting both sources with the same circuit, and a current-regulator for gradually increasing the strength of the heating-currents admitted to said electric circuit, for the purpose set forth.

4. The combination, with a round metallic circuit comprising exposed conductors, of traveling contacts for said conductors, a source of electricity for normally charging said circuit, an additional source of electricity for charging said circuit with currents of large heating capacity, differing in character from those of the former source, and circuit-controllers for alternately connecting both sources with the same circuit, for the purpose set forth.

5. The combination, with an electric circuit consisting of exposed outgoing and return conductors, of two sources of electricity for severally feeding currents into the said circuit, one source furnishing currents of high potential and the other source producing currents

of low potential and large volume, and circuit-controllers for alternately connecting both sources with the said circuit, for the purpose set forth.

6. The combination, with an electric circuit consisting of exposed conductors, of two sources of electricity for severally feeding currents into said circuit, one source furnishing continuous currents of high potential and the other source producing alternating currents of low potential and large quantity, circuit-controllers for alternately connecting both sources with said circuit, and a current-regulator for controlling the strength of the alternating currents admitted into the said circuit, for the purpose set forth.

7. The combination, with an electric circuit consisting of exposed conductors, of two sources of electricity, one source furnishing continuous currents of high potential and the other producing alternating currents of high potential, an inductive transformer for converting the high-potential alternating currents into low-potential alternating currents of increased volume, and circuit-controllers for alternately feeding the said electric circuit with both high-potential continuous currents and with low-potential alternating currents, for the purpose set forth.

8. The combination, with an electric circuit, of a source of electricity feeding said circuit with continuous high-tension currents, and an auxiliary source feeding the same circuit with low-tension alternating currents.

9. The combination, with an electric circuit charged with currents of high tension, of one or more traveling electric motors deriving high-potential currents from said circuit, and a source of electricity feeding low-tension currents into said circuit, for the purpose set forth.

10. The combination, with an electric circuit comprising one or more exposed conductors, of translating devices fed by said circuit, a source of electricity for feeding said circuit with currents for the translating devices, and a source of electricity for feeding said circuit with heating-currents for subjecting said exposed conductors to the influence of heat.

11. The combination of two sources of electricity differing in electro-motive force and volume, a circuit containing translating devices arranged in multiple arc, and means for alternately connecting both sources with said circuit, so as to influence, respectively, the line and the translating devices, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ELIAS E. RIES.

Witnesses:

LEOPOLD RIES,
JNO. T. MADDOX.