(No Model.)

I. W. HEYSINGER.

FRICTION APPLIANCE FOR ELECTRIC CARS.

No. 549,642. Patented Nov. 12, 1895.

Fig. 1.

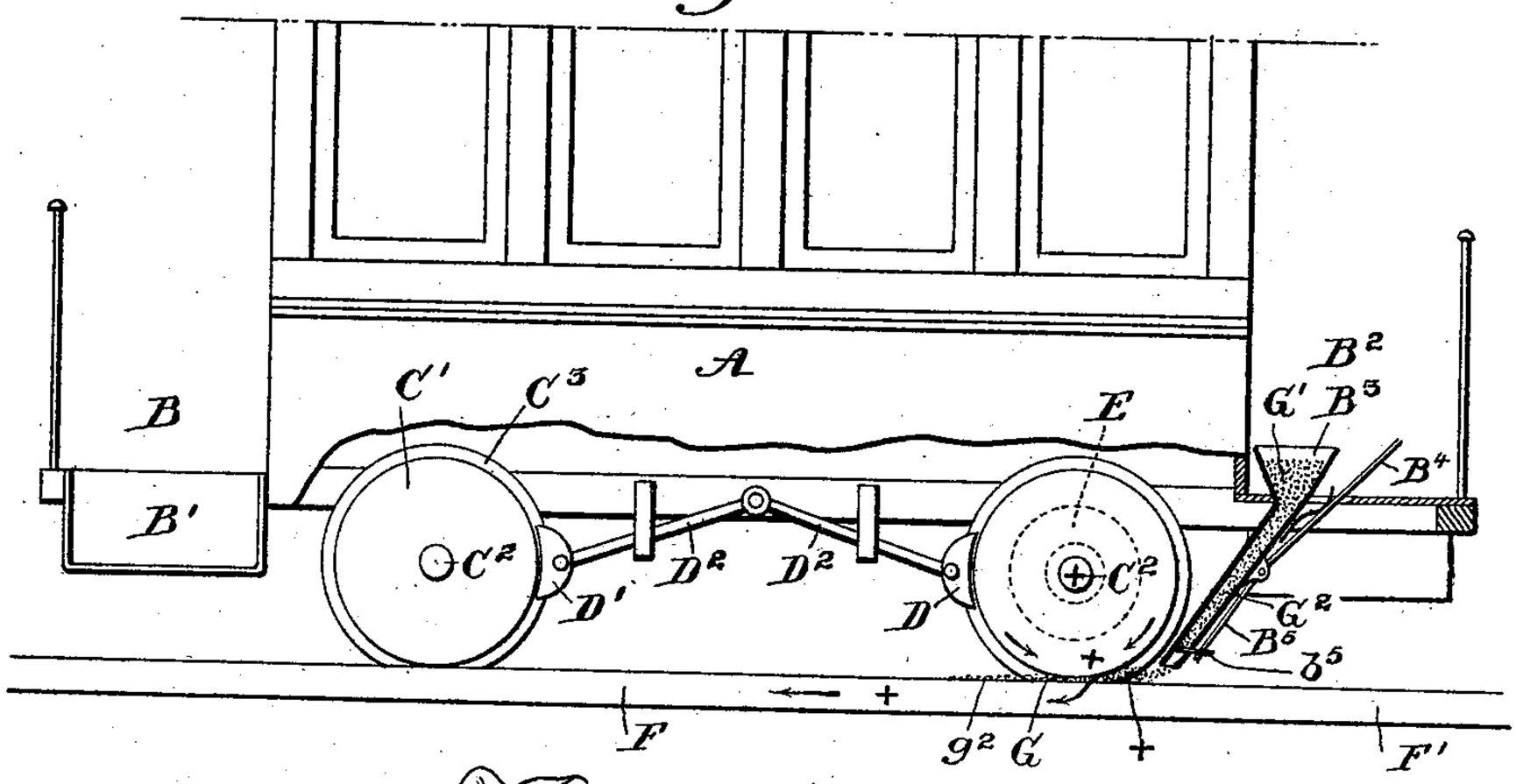


Fig. 2.

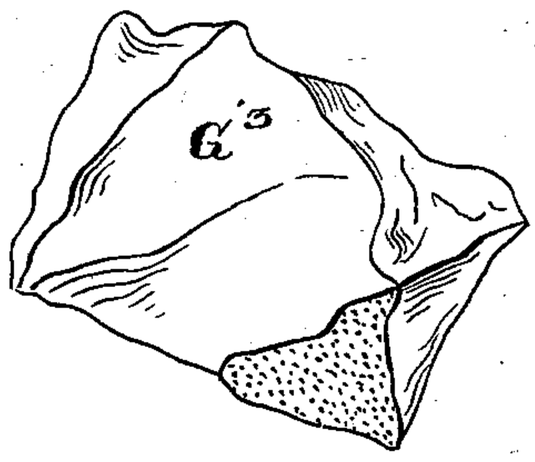


Fig. 2a.

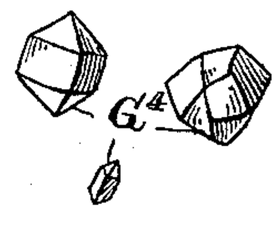


Fig. 3.

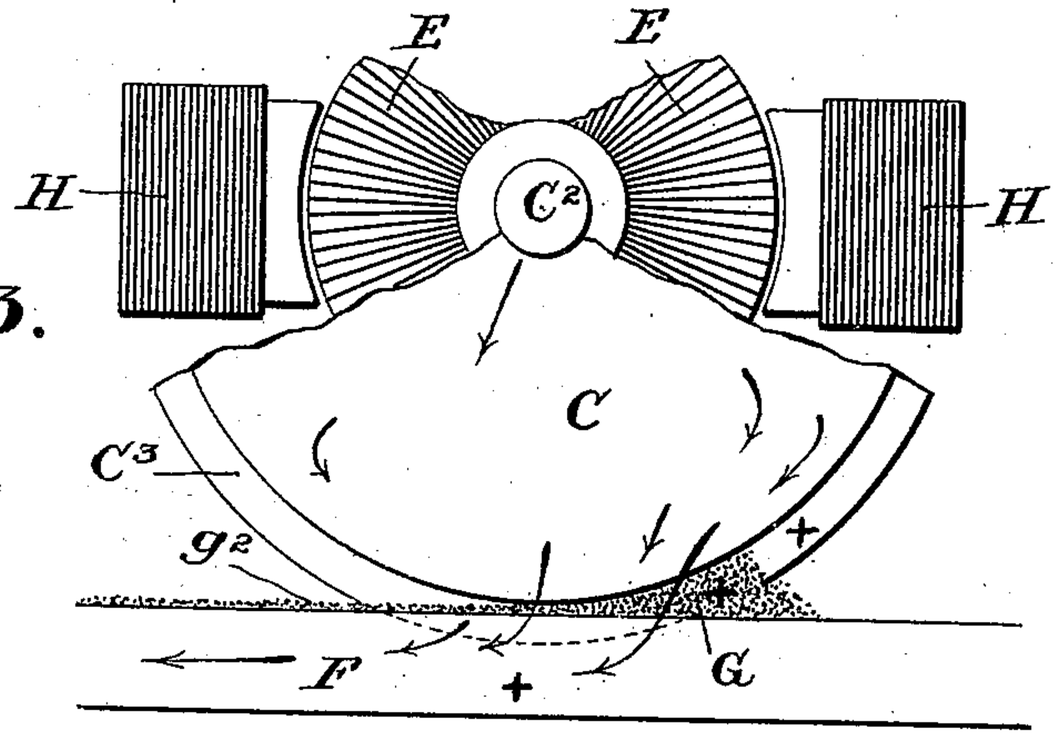


Fig. 4.

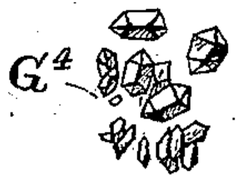
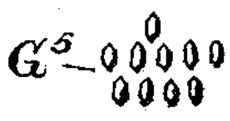


Fig. 4a.



Witnesses.

Andrew B. Graham

D. P. Tales

Inventor.

Isaac W. Heysinger.

UNITED STATES PATENT OFFICE.

ISAAC W. HEYSINGER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO WILLIAM G. STEELE, OF SAME PLACE.

FRICTION APPLIANCE FOR ELECTRIC CARS.

SPECIFICATION forming part of Letters Patent No. 549,642, dated November 12, 1895.

Application filed May 18, 1895. Serial No. 549,789. (No model.)

To all whom it may concern:

Be it known that I, ISAAC W. HEYSINGER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Friction Appliances for Electric-Railway-Car Wheels and in the Preparation and Methods of Use of the Same; and I do hereby declare that the following is a full, clear, and exact description of the invention, reference being had to the drawings which accompany and form a part of this specification, which will enable others skilled in the art to which it appertains to use the said invention.

Figure 1 is a side view of an electric railway and car upon the track, the latter partially broken away to show the mechanism more clearly, and in which my invention is applied between the forward wheel and the railway-track, said wheel and track forming a portion of the return-circuit from the motor-dynamo of the said car to the generating-station. Figs. 2 and 2ª show the rock substance from which I prefer to form my friction appliances and the granules or crystals of which the said rock is composed. Fig. 3 is an enlarged view of a portion of the wheel shown in Fig. 1, and the adjacent and coacting parts in enlarged side view, partially broken away, so as to show the armature and magnets of the motor-dynamo. Fig. 4 shows the irregularly-shaped masses of crystals and the larger crystals as first produced by crushing the rock shown in Fig. 2, and Fig. 4ª the same after having been screened to uniform size and prepared for the market to be used for the purposes of this invention.

The lettering in all the figures is uniform.

The object of my invention is to produce a friction material adapted to be used to retard or arrest the slipping of car-wheels upon the railway-tracks of an electric railway in which the trackway forms the return-conductor, the current passing thereto through the wheels of said car, which themselves are in circuit with the motor-dynamo, and, through the said track, with the generating-dynamos along the said line of railway, or that which supplies the said railway with electric energy, and when the brakes are applied to said wheels to retard their rotation by the friction thereof, the said friction material which I use being a granular material the granules or crystals of which are composed of a material substance which is capable of freely transmitting the electric current, being a good electric conductor, whereby the current is not interrupted by the interposition of such friction material, which thus may be used in sufficient quantity and under both the driving-wheels, or all of them, simultaneously, so as to produce a greater friction between the arcs of the wheels in contact with the track than between the said arcs and the brake-shoes applied thereto, whereby slip of the wheels and the consequent flattening are avoided, and also the loss of current and consequent need of greater pressure of electricity to overcome it, as when ordinary silicious sand is used, which is a high insulator, are avoided.

The material which I prefer to use for this purpose is magnetic iron rock, known as "magnetic iron ore" or "octahedral iron ore," and which usually consists of about seventy-two per cent. of iron and twenty-eight per cent. of oxygen. It has a hardness of above five in the scale, being nearly as hard as crystallized quartz. It forms a hard granular black-colored rock, which when pulverized reveals the characteristic octagonal crystals more or less perfect. It also occurs, disintegrated by the elements, in the form of what is known as "magnetic iron sand," intermingled with silicious and other sandy materials. Its peculiar quality is that it is an excellent conductor of electricity, as good, in fact, as iron in metallic form, so that when interposed between the wheels of a moving car and the metal track beneath it offers no impediment to the flow of the electric current from the wheels to the track, while at the same time it furnishes a friction material quite as efficient as the insulating material used heretofore, and the use of which was greatly restricted by reason of its interruption of current and the necessity of increased voltage to overcome it (thus acting irregularly) and the liability by its enforced economy in use and usually upon only one side of the trackway to permit the brake-shoe to hold the wheel fixed, thus permitting its contact-surface

with the track to plane its way along the interposed sand, leaving a flat portion to produce shock at every rotation of the wheel and necessitating its removal from the track in order to have it turned down to a circle again. These accidents are of constant occurrence in slippery weather on such electric railways and entail large expense for repairs and also increased expense in operating.

My invention also consists in the preparation of the said friction and magnetic material from the ore, in separating the conducting from the non-conducting material, when impure ores are used, by magnetic separators, and the subsequent screening of the pulverized and separated ore, so as to secure a friction material having its granules or crystals of nearly equal size and suitable for the purpose, and supplying this as an article of manufacture for use in combination with the wheels and trackway of electric railways and between the same; and my invention also consists in the method of preventing interruption of current, when a friction material is interposed between the wheels and trackway of an electric railway, by providing with this friction material an electric conducting material, either in whole or part constituting the said friction material, which shall maintain the current when thus interposed.

When it is not deemed necessary to use the conducting friction material in its pure state, I commingle with it a proportion of bar or other sand, such as may be desired, retaining, however, sufficient of the conducting material to insure the free passage of the electric current at all times; and I do not confine myself exclusively to the use of the natural magnetic rock crushed and screened, but, if desired, I commingle metallic iron with furnace-slag in the process of manufacture, which I granulate by flowing, when molten, into water, as is done in making ordinary granulated slags, or use metallic iron in other forms with silicious or other oxides to produce the friction material which I use, and which is thus a good metallic conductor of electricity; but on account of the great hardness of the magnetic oxide and its angularity of crystallization and facility of being worked, as well as its very high electrical conducting quality, I prefer to use this material, either pure or commingled with other friction materials, as above described.

A brief reference to the drawings will elucidate my invention and its method of use.

In Fig. 1, A is the body of an electric car, having platforms B B^2, steps B′, and supporting-wheels C C′. D D′ are brake-shoes which rest against the inner periphery of the wheels C C′, within the flanges C^3. D^2 D^2 represent the brake mechanism. E shows in dotted outline the armature upon the axle C^2 of the wheel C, which by its rotation against the faces of the magnets H H, Fig. 3, converts the electric current carried by the feed-wires (not shown) into motor energy and propels the car along. The current passes from the armature to the wheels C, and thence through their points of rolling contact with the trackway F into the said track and back to the generating-station. B^3 is a hopper on the front platform of the car, from which extends downward and backward the spout B^5, and a check-slide b^5 closes the spout at its extremity, which is just in front of the contact of the wheel C with the track F. A hand-lever (or foot-lever) B^4 controls this slide, which, when open, permits the contents of the hopper B^3 and spout B^5 to run out upon the track just in time to be caught by the advance of the wheel C, and thus be ground up between the said wheel and said track-rail, and G′ is the electrical conducting friction material in the hopper B^3, which thus passing down, as shown at G^2, is emptied in front of the wheel C, as before stated. When the brakes D D are applied and the slide b^5 is opened, the material pouring out from the spout B^5 is interposed and produces a powerful friction between the wheel C and the track-rail F, the wheel being raised from the track thereby; but the friction material G′ being a perfect electrical conductor, the current continues to pass, as shown in Figs. 1 and 3, without the slightest impediment.

In Fig. 2 I show a rough piece of magnetic ore rock as it is blasted in the mine. I only use the hard rock thus blasted out and not the weathered or partially-decomposed surface rock frequently encountered, and it should have a surface as granular and hard looking as fractured emery rock. This I crush in a rock-crushing mill to a granular form, averaging in size medium-sized bird-shot, or larger, if desired. If necessary, I now pass this granulated material through a magnetic ore-separator, which will take up the conducting-grains and leave behind those which are not affected by the magnet; but with good rock this is frequently quite unnecessary, as the intermingled materials do not sensibly diminish the conductivity of the mass and are good and hard friction materials of themselves. My next step is to screen the granular product, so as to have the resulting friction material of a nearly uniform size, as such uniformity makes it run more evenly through the hopper and spout and also insures better friction and electrical contact between the wheels and the track. As shown in Figs. 3 and 4^a, these particles of substantially uniform size form a bed of conducting material between the wheel and the track-rail and in advance of the wheel upon the track-rail, which affords increased facility for the passage of the current from said wheel to said track-rail over that afforded by the circumscribed contact of the solid wheel with the solid rail, so that in ascending heavy grades or making sudden stoppages under reversal of current the use of this bed of conducting friction material will greatly increase the efficiency of the motor-dynamo; but if these

friction and conducting particles consist of fragments of irregular size they will present themselves in front of the advancing wheel as a series of insufficient conducting-points and will be rapidly raised to incandescence and destroyed, with the consequent blazing and sputtering, irregularity of action, and loss of economy now manifested when the wheels are raised from their track-rails and the current is broken by the interposition of non-conducting material. The particles which do not pass through the proper-sized screen are repulverized, while the impalpable powder is cast aside. The granular material I then put up in bags or kegs and ship the same to any point desired.

In Fig. 4 I show the crystals adherent together and of unequal size. This is after the first series of crushings. In Fig. 4ª I show the crystals or granules of nearly uniform size and such as I prepare for the purposes hereinabove set forth.

I do not restrict myself to the precise stages of manufacture set forth in the above description or use my material with the precise appliances shown in the figures, but vary them to meet special requirements, as would be done by any skilled mechanic having my invention before him.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an electric railway having a track-rail for return conductor, a generating station and a supply line in circuit through the motor-dynamo of a traveling car upon said trackway, and through the wheels thereof with said track-rail, a layer of comminuted friction material interposed between said wheel and said track-rail, composed substantially of a substance which is a good conductor of electricity, the contiguous particles thereof adapted to maintain the passage of the electric current from said wheels to said track-rail without increase of resistance or retardation and at the same time produce friction between said wheels and said trackway, substantially as described.

2. In combination with an electric motor-car, adapted to be propelled by electricity along the trackway of an electric railway, and having a return conductor composed of one or both of the track-rails thereof, and the return current adapted to pass from the motor dynamo of said car through the wheels thereof and thence directly into the said track-rail, the layer of granular or crystalline friction material interposed intermittently between the said wheels and the said trackway, the particles thereof adapted by their hardness and angularity to produce friction against slip of the said wheels thereupon, and by their electrical conducting quality to form vertical lines of electric conductor through said friction material and between said wheels and said trackway, so as to maintain the same closed circuit, substantially as described.

3. In combination with the wheels of an electro-motor car adapted to convey the current from the motor dynamo thereof, and a trackway for said wheels adapted to convey the said current from said wheels to an electric generating station, an interposed friction and electric-conducting material composed of magnetic iron-ore in a comminuted and granular or crystalline condition and commingled therewith silicious particles adapted to increase the friction between said wheels and said trackway, substantially as and for the purposes described.

4. In combination with the wheels of an electric motor-car, and the trackway of an electric railway, in electric circuit with each other a friction and conducting material adapted to be interposed between said wheels and said trackway composed of a series of contiguous particles of a comminuted substance adapted, by its electrical conductivity to form vertical lines of electric conductor between said wheels and said trackway, and commingled therewith separate silicious particles adapted to increase the friction between the same, substantially as and for the purposes described.

5. As a composition of matter a friction and conducting material for the wheels of electric railways consisting of a granular or crystalline and comminuted magnetic iron rock, the particles thereof substantially uniform in size, and commingled with silicious and non-conducting friction particles, substantially as and for the purposes described.

6. As a composition of matter a comminuted friction material for the car-wheels of an electric railway consisting of an admixture of an electrically conductive, and a harder and electrically non-conductive material combined in such proportions, and graduated in relative sizes of particles, as when applied between the car-wheels and trackway of an electric railway, and in the circuit between said wheels and trackway, will maintain the said circuit, and produce friction between the said wheels and said trackway, substantially as described.

7. A composition of friction sand for electric railways consisting of a comminuted rock-mass of electrically conductive material, and combined with said comminuted material a hard, crystalline or granular silicious sand, in such graduated proportions, and such intimate admixture, as will provide a free electric conduction through said mass when interposed between the wheels and trackway of an electric railway, and by its silicious particles produce increased friction between the same, substantially as described.

ISAAC W. HEYSINGER.

Witnesses:
ANDREW T. GROUPE,
JOHN R. NOLAN.