May 15, 1923. 1,454,895

G. G. JONES

ELECTROLYSIS MITIGATION

Filed Sept. 24, 1920

Fig. 1

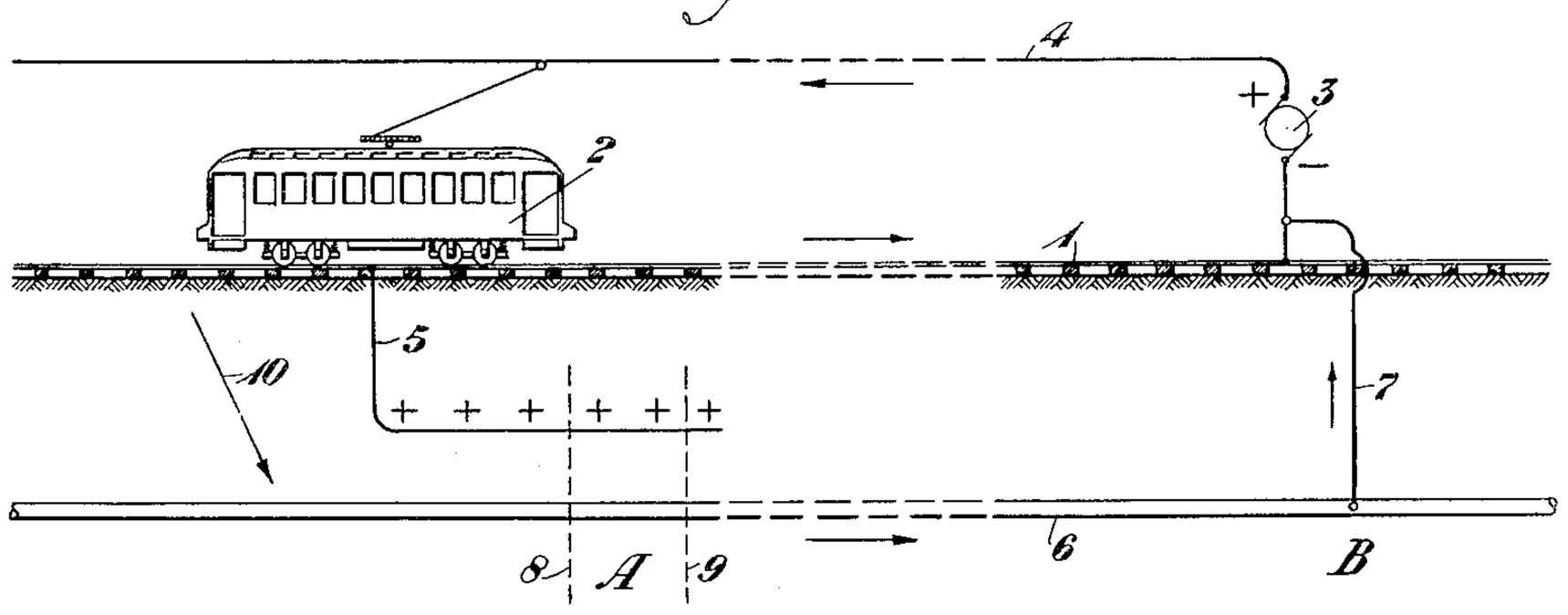
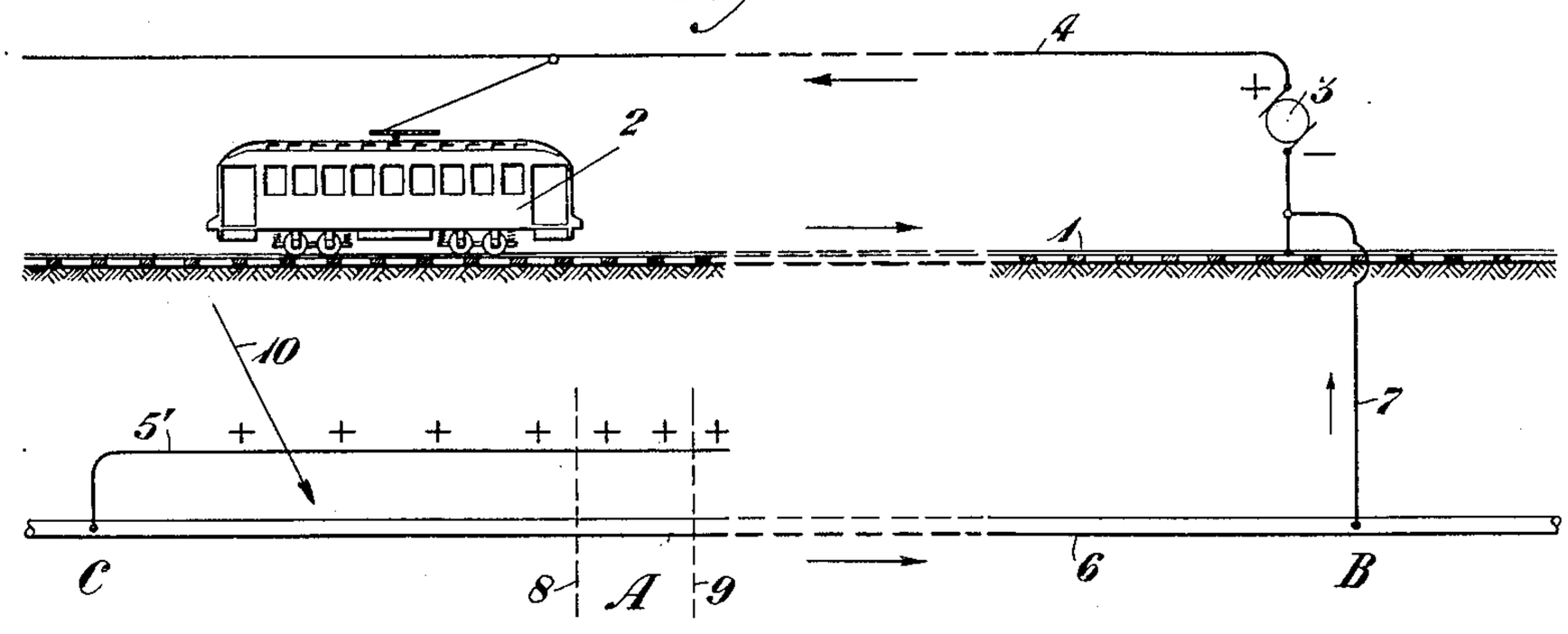


Fig. 2



INVENTOR

George G. Jones

BY

ATTORNEY

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UNITED STATES PATENT OFFICE.

GEORGE G. JONES, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

ELECTROLYSIS MITIGATION.

Application filed September 24, 1920. Serial No. 412,433.

To all whom it may concern:

Be it known that I, GEORGE G. JONES, residing at New York, in the county of New York, and State of New York, have invented certain Improvements in Electrolysis Mitigation, of which the following is a specification.

This invention relates to the method of and means for protecting articles from the electrolytic action of earth currents.

Metallic articles, which are embedded in the ground, such as pipes, telephone and telegraph cables, building foundations, and other articles, are exposed to destruction by the chemical action of the soil and the electrolytic action of roving or stray electric currents, sometimes known as earth currents. This destructive action is particularly apparent when the metallic articles are located in the vicinity of electric railway or power systems, as the currents utilized on such systems will flow from a grounded part, such as the track, of such a system, through the earth and enter the metallic article, such as the pipe at a point where its potential is negative with respect to that of the earth. At other points the potential of the article or pipe may be positive with respect to earth and the roving or stray earth currents will escape from the article at these points and flow back into the earth. The current flowing from the earth into the article in general causes no damage and in some cases even protects the article it enters, whereas the current escaping from the article into the earth sets up an electrolytic action on the article from which it escapes. This action caused by the escaping current is known as electrolytic corrosion and will cause considerable destruction of the metallic article.

The damage caused by electrolytic corrosion has in many instances assumed large proportions and many arrangements and methods have been devised and utilized to mitigate its effect. One method utilized has been to provide arrangements for lowering the potential of the article at such points, where it was positive to earth and the current would escape therefrom into the earth, until the potential at such points would be negative with respect to that of the earth and the electrolytic corrosion at such points might be avoided. Another method utilized has been to provide arrangements for raising the potential of the earth about the article, such as the pipe, so that the article at all points in the vicinity of the railway or power system would be of a lower potential than the earth and the earth currents would not have a tendency to escape therefrom and cause electrolytic corrosion.

It is the purpose of this invention to provide improved arrangements for raising the earth potential in the vicinity of parts of the metallic articles at which electrolytic corrosion is apt to take place and to thereby mitigate or avoid damage at such parts. Other purposes and objects of the invention will appear more fully from the following detailed description of the invention.

In the drawing Fig. 1 represents a diagrammatic view of one form of the invention, while in Fig. 2 is illustrated diagrammatically a modified form of the invention. Like reference characters have been utilized to denote like parts in both figures of the drawing.

In Fig. 1 is shown a track 1 of an electric railway; a car 2 is mounted on the track and receives current from the feed wire 4, which is shown connected to the positive bus of a generator 3, the negative bus of which is connected with the track 1. A metallic article, such as the pipe or cable 6, is shown imbedded in the earth in the vicinity of the track 1. The path of the current from the power plant would normally be from the positive bus of generator 3, over wire 4, through the car 2, and back over the rails 1, to the negative bus of the generator 3. A portion of the current thus returning over the rails would leak off of the rails into the earth at points where the rails were of a higher potential than, or positive to the earth and thus give rise to so-called earth currents. These earth currents will flow through the earth, as shown by arrow 10, and on to the pipe or cable 6 at points where the pipe is of a lower potential or negative to the earth. If all sections of the pipe 6 are negative to earth, these earth currents would then flow along the pipe and then leave the pipe over the conductor 7 by which it is bonded to the negative bus of the generator 3 at the power house. However, all sections of the pipe 6 may not be negative to earth and a section of the pipe, such as A, between dotted lines 8 and 9, may be positive or of higher potential than the earth.

If such were the case the earth currents, which had entered the pipe at other sections thereof and were flowing along the pipe, would, when they reached section A, escape from the pipe and flow back into the earth. Accordingly there would be a tendency for electrolytic corrosion to take place at section A. In accordance with this invention a wire such as 5, is bonded to the rails 1 at a point, where the rails are positive in potential to earth, and this wire is buried in the ground in the vicinity of that section of the pipe 6, such as section A, which is positive to earth. As the wire 5 is bonded to the tracks 1 at a point where they are positive to earth, or at least where they are positive to the pipe at A, it will tend to pull up or raise the potential of the earth along section A of the pipe; in other words it will keep the earth around the pipe at section A of a potential positive with respect to that of the pipe at section A and accordingly the earth currents will not leave the pipe at this point but will remain on the pipe and eventually leave it by way of conductor 7.

In the arrangements shown in Fig. 2 the earth currents would come from the rails in the direction as shown by the arrow 10 and enter the pipe at a point at which its potential was lower than earth. As has been pointed out with respect to Fig. 1, if all sections of the pipe from the point where the earth current entered it to the point where the pipe is bonded to the negative bus of the generator 3 were of lower potential than the earth, then these earth currents would flow along the pipe and over conductor 7 to the generator and cause no damage. However, if a section of the pipe, such as section A between dotted lines 8 and 9, were of a potential positive with respect to earth, the current would tend to flow back into the earth at this point and electrolytic corrosion would take place. In accordance with the arrangements of this invention the wire 5′ is bonded to a section, such as C, of the pipe, which is of positive potential with respect to that of the pipe at A and is then buried in the ground in the vicinity of section A. At section B the pipe 6 may be bonded by conductor 7 to the negative bus of generator 3 and accordingly at section B the pipe will be of a negative potential with respect to the earth. As the pipe is bonded to the negative bus of the generator 3, the earth currents which accumulate on the pipe at points beyond A, such as between C and A, will tend to flow towards B. In other words there will be a potential drop between C and B, and a point, such as C, as it is farther along the pipe than point A will have a higher potential than or be positive with respect to A. Accordingly the wire 5′ will have a potential higher than or positive with respect to the pipe at A and when buried in the earth at A it will have the effect of pulling up or raising the potential of the earth in which it is buried to a potential higher than or positive with respect to the pipe at A. In other words it will have the effect of raising the earth potential at A to approximately that of the pipe at C, which, as has been pointed out, is higher than at A. This will result because the fall of potential from section C to section A will be greater along the pipe than along the wire 5′. Accordingly as the potential of the earth at A is now positive with respect to or higher than that of the pipe at A, the earth currents will not escape from the pipe at A but will remain on the pipe and will return over conductor 7 to the generator 3. In this manner electrolytic corrosion at section A may be prevented.

The arrangements of this invention present many improvements over former arrangements, which are designed to mitigate electrolytic corrosion and which operate on the principle of raising the earth potential about the article rather than by lowering the potential of the article itself. The auxiliary conductors, such as 5 and 5′, which are buried in the earth and serve to raise the earth potential at points where it is desired to prevent the earth currents from escaping from the article, may be bonded either to the rails, as shown in Fig. 1, or to a positive section of the article, such as the pipe, as in Fig. 2; and in neither case is it necessary to supply a separate source of current and to connect the wires 5 and 5′ to the positive pole of this source. The pipe, or metallic article, may be bonded as shown by conductor 7 directly to the negative bus of the generator, such as 3, at the power house. In this instance too the provision of a separate source of current to which the pipe may be bonded is avoided. The earth potential, in other words, may be raised at desired points by the arrangements of this invention without the provision of a special protective circuit for this purpose but rather by means which are much simpler in construction, of a great deal less expense, which are adapted to be installed with ready facility, and which are more efficient than former arrangements. The device of this invention presents the further advantages that the auxiliary wires, such as 5 and 5′ need only be buried in the particular localities where it is desired to prevent electrolytic corrosion and need not be installed at all points where the metallic article is in the vicinity of the track. Furthermore the point at which the article or pipe may be bonded to the negative bus of the power house, as shown by 7, may be arbitrarily chosen, without regard to the location of the positive areas of the pipe. This presents the advantage that this point may

be conveniently chosen in a locality close to the power plant.

While the metallic article, which is embedded in the ground and subject to electrolytic corrosion, has been illustrated as a pipe or cable, it is understood that the invention may operate equally well with other types of articles which are subjected to the electrolytic effects of earth currents. Accordingly while the invention has been disclosed in certain specific forms which are deemed desirable, it is understood that it is capable of embodiment in many and widely varied forms without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. An electrically operated railway system, a metallic article buried in the ground in the vicinity of the tracks of said system, means to connect said article to the negative pole of the generator of said system, and a conductor buried in the ground in the vicinity of a section of said article which would normally have a potential positive to earth, said conductor being connected to a section of the tracks having a potential positive to the potential of said section of said article.

2. A metallic article buried in the ground in the vicinity of an electric railway system, a section of said article being subject to electrolytic corrosion, and means for preventing said electrolytic corrosion, which consists of a conductor bonding said article to the negative pole of the generator of said railway system and a conductor buried in the ground in the vicinity of the section of the article subject to electrolytic corrosion and connected to the rails of said railway system at a point of higher potential than the potential of the metallic article at said section.

3. An electrically operated railway system including a source of electrical power and a system of conductors for distributing the power from said source to the various parts of said system for the operation of said system, a metallic article buried in the ground in the vicinity of the tracks of said system, means to connect said article to the negative pole of the generator of said system, and a conductor buried in the ground in the vicinity of a section of said article which would normally have a potential positive to earth, said conductor being connected to a part of said system of conductors having a potential derived from said source and positive to the potential of said section of said article.

In testimony whereof, I have signed my name to this specification this 23rd day of September, 1920.

GEORGE G. JONES.