J. B. TAYLOR.

NEUTRALIZING INDUCTIVE DISTURBANCES.

APPLICATION FILED NOV. 19, 1908.

1,010,982.

Patented Dec. 5, 1911.

Fig. 1.

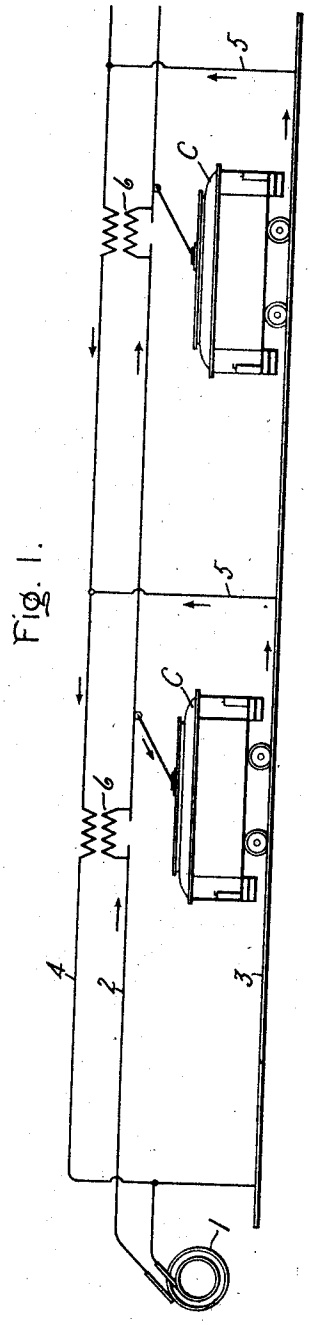
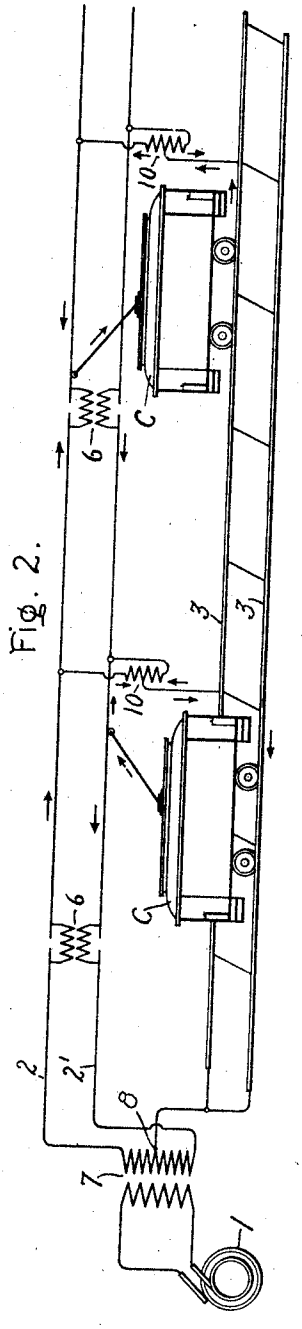


Fig. 2.



Witnesses:

George W. Tilden

J. Ellis Glen.

Inventor:

John B. Taylor,

by Albert G. Davis

Att'y.

UNITED STATES PATENT OFFICE

JOHN B. TAYLOR, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

NEUTRALIZING INDUCTIVE DISTURBANCES.

1,010,982. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed November 19, 1908. Serial No. 463,409.

To all whom it may concern:

Be it known that I, JOHN B. TAYLOR, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Neutralizing Inductive Disturbances, of which the following is a specification.

My invention relates to electric railway systems, and more specifically to electric railway systems which employ alternating current for their operation, and has for its object the neutralization of the inductive disturbances which often arise from such systems and affect electric conductors which may be in proximity to them, and thus, in the case of telegraph or telephone conductors are a source of considerable annoyance.

I accomplish the object of my invention by providing means for causing a current of equal and opposite intensity to the current flowing in the regular outgoing conductor to flow in proximity to this, thus neutralizing the effect of the current in it upon any conductors in its vicinity.

The novel features of my invention are pointed out more specifically in the appended claims.

For a further understanding of my invention reference may be had to the accompanying drawing, where—

Figure 1 shows diagrammatically an electric railway system equipped with my new invention; and Fig. 2 shows a modification of the same.

Referring first to Fig. 1, 1 is a source of current, such as a single-phase electric generator with one terminal connected to an outgoing conductor 2, and the other terminal connected to the rails 3 which are electrically connected to one another so as to form a continuous conductor. 4 is a return conductor, which is connected at intervals by conductors 5 to the rails 3. While I have called one of these conductors an outgoing conductor, and the other a return conductor, it is obvious that with an alternating current, the current will change its direction in each conductor, and hence either conductor may be termed the "outgoing" conductor, but I have used these terms for the purpose of convenience. Transformers 6 have two sets of windings, one connected in series with the outgoing conductor 2, and the other connected in series with the return conductor 4, and I prefer to make these transformers with the same number of turns in each winding, so that they will maintain substantially the same current in both the outgoing and the return conductors. Cars C, which may be of any of the usual types, are shown, but other forms of railway apparatus may be used on the system employing an alternating electric current for driving them.

The method in which my invention works is as follows: Referring to the figures, I have shown arrows which point out the direction in which the currents flow on the system at a certain instant of time. In referring to these arrows, it will be seen that when the current is flowing outward in the outgoing conductor 2, it will return by the return conductor 4, and will be of substantially the same intensity in each conductor, due to the action of the transformers 6. In the position in which I have shown the cars, there will be a slight difference in certain portions of the conductor between the strength of current in the outgoing and return conductor, currents theoretically equal flowing in both conductors only when the cars are at the points where the connections 5 connect the rails to the return conductor 4, but it will be obvious that with a system having a number of connections 5 between the rails and the return conductors, and operating a number of cars, the disturbing effect of the differences in currents in the outgoing and return conductors will be very small. It will be obvious that the return current in the conductor 4 will neutralize the inductive disturbances due to the outgoing current in the conductor 2, and hence any disturbing effect upon conductors in proximity to the system, due to current in one of the conductors, will be neutralized by the disturbing effect due to the other, and thus, conductors, such as telegraph or telephone conductors for the transmission of intelligence, may be operated satisfactorily in close proximity to a railway equipped with my invention.

In Fig. 2 I have shown a modification of Fig. 1, for neutralizing both the electrostatic and the electromagnetic effects due to

the conductors of a railway system upon conductors of adjacent systems. The connections shown in Fig. 1 only neutralize the electromagnetic effects as the return conductor 4 is at the potential of the earth, and hence will not neutralize the electrostatic disturbances due to the conductor 2, which is not at earth potential. I have shown a single-phase alternating-current generator 1, which is connected to one winding of a transformer 7, the terminals of the other winding being connected to conductors 2 and 2^1. My invention is shown as applied to a double-track road, with rails 3 connected to the central point 8 of the winding of a transformer whose terminals are connected to conductors 2 and 2^1. Transformers 6 are shown, having one winding connected in series to one conductor, and the other winding connected in series to the other conductor, and I preferably make these transformers with the same number of turns in each winding, so as to cause the same current to flow in each of the conductors. I have also shown compensators or transformers 10 having a winding with its terminals connected to the conductors, and its center point connected to the rails, and I prefer to make these compensators or transformers so that the same current will be made to flow between each conductor and the rails. I have shown cars C as being operated on the system to which my invention is applied.

The method of operation of my invention will then be as follows: Referring to Fig. 2, the arrows show the direction of the current at any one instant in the system, and it will be seen that the outgoing current in conductor 2 is neutralized by the return current in the conductor 2^1, the currents being of substantially equal value because of the transformers 6. It will be obvious that perfect neutralization will only occur when the cars are substantially at points of connection of transformers 10, but that with a large system and a number of transformers a practically perfect neutralization will occur. This neutralization between the conductors 2 and 2^1 will be a neutralization of both electromagnetic induction and electrostatic induction upon any conductors in proximity to a system equipped with my invention; the neutralization between these two conductors for any electrostatic disturbances which would occur if only one conductor were used arising from the fact that I impress upon the conductors voltages of substantially like value, but of different sign. This I accomplish by connecting the rails to the central point of the transformer winding which feeds the outgoing and the return conductors, to the terminal points of which winding I connect the outgoing and return conductors.

It will be obvious that while I have illustrated my invention as applied to a two-track electric railway system, if I so desire, I may apply it to a single-track system by omitting one set of rails.

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

1. An electric railway system comprising in combination rails forming a continuous conductor, devices to be operated, an outgoing conductor making direct contact with said devices, a return conductor, and means for neutralizing inductive disturbances due to said system comprising connections at intervals between the rails and the return conductor and electro-magnetic means for maintaining substantially the same amount of current in both the outgoing and the return conductors.

2. An electric railway system comprising in combination rails forming a continuous conductor, devices to be operated, an outgoing conductor and a return conductor one of said conductors making direct contact with the devices to be operated, and means for neutralizing inductive disturbances due to said system comprising connections at intervals between the rails and the return conductor and transformers having their primary windings connected in series to one conductor and their secondary windings connected in series to the other conductor.

3. An electric railway system comprising in combination rails forming a continuous conductor, devices to be operated, an outgoing conductor making direct contact with said devices, a return conductor, and means for neutralizing inductive disturbances due to said system comprising connections at intervals between the return conductor and the rails and transformers having their primary and secondary windings of substantially the same number of turns one of said windings being connected in series with one conductor and one of said windings being connected in series with the other conductor.

4. Means for neutralizing inductive disturbances from an electric railway system, comprising outgoing and return conductors one of which makes direct contact with the devices to be operated having impressed upon them voltages of substantially the same value but of different sign, transformers having primary and secondary windings of substantially the same number of turns, having their primaries connected in series with one conductor and their secondaries connected in series with the other conductor, and compensators so connected to the conductors and the rails as to cause an equal flow of current between each conductor and the rails.

5. The combination in an electric railway system, of an electric generator, an electric transformer having one winding connected to the generator and a second winding with

its terminals connected to an outgoing and a return conductor, one of which conductors makes direct contact with the devices to be operated, and the central point of the winding connected to the rails, transformers with substantially the same number of turns in their primary and secondary windings having one winding connected in series with one conductor and the other winding connected in series with the other conductor, and compensators with their terminals connected between the conductors and the central point of their windings connected to the rails.

6. The combination in an electric railway system having two tracks and a conductor for each track, the conductors making direct contact with the devices to be operated, of an electric generator, an electric transformer having one winding connected to the generator and a second winding with its terminals connected to the conductors and its central point connected to the rails, transformers connected with one winding in series with one conductor and the other winding in series with the other conductor, and compensators with their terminals connected between the conductors and the central point of their windings connected to the rails.

In witness whereof, I have hereunto set my hand this 18th day of November, 1908.

JOHN B. TAYLOR.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.