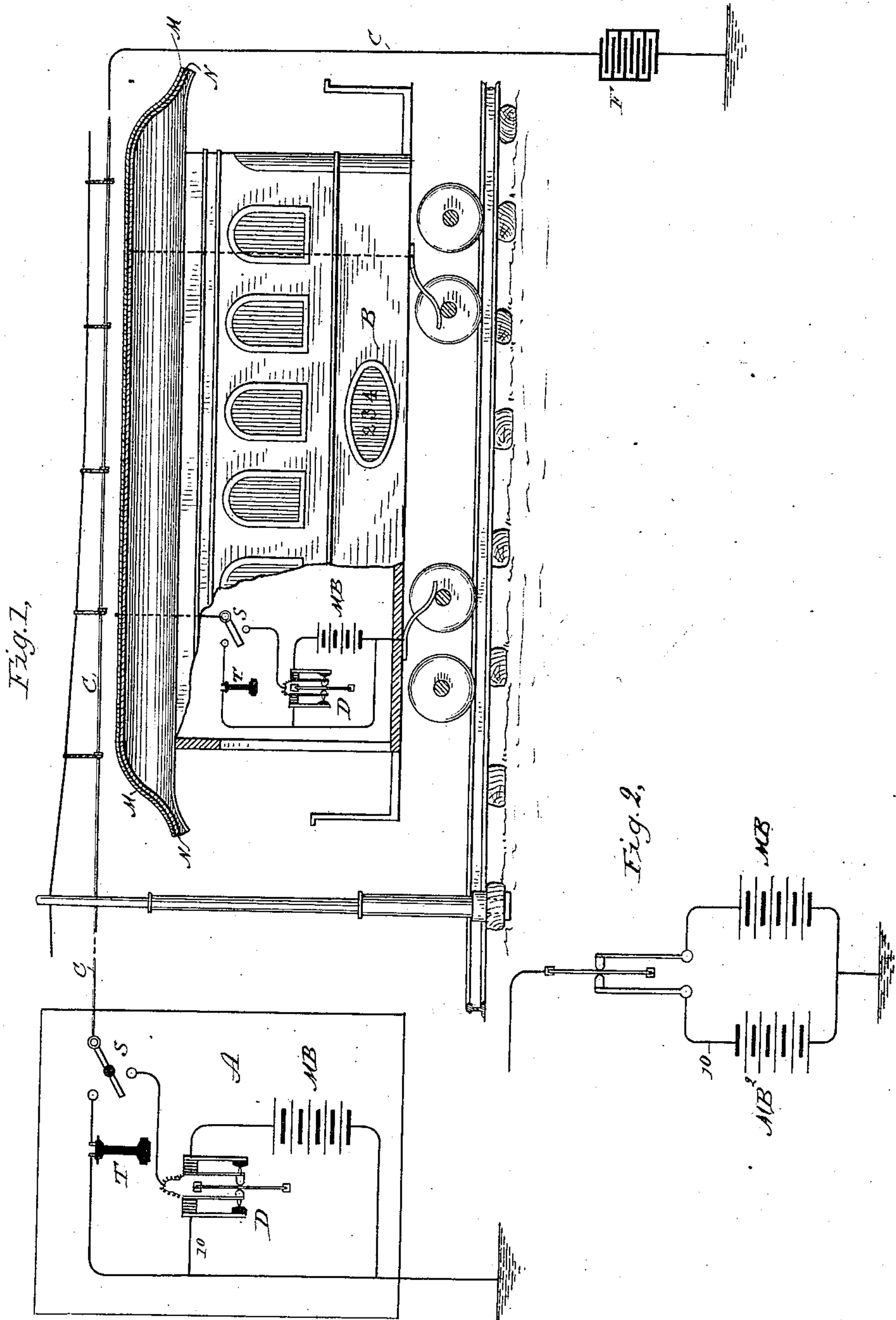


(No Model.)

L. J. PHELPS.  
RAILWAY CAR TELEGRAPH.

No. 334,188.

Patented Jan. 12, 1886.



WITNESSES  
Ernest Abshagen  
Chas. Dromey

INVENTOR  
Lucius J. Phelps  
By his Attorney  
H. B. Townsend

# UNITED STATES PATENT OFFICE.

LUCIUS J. PHELPS, OF NEW YORK, N. Y., ASSIGNOR TO THE RAILWAY TELEGRAPH COMPANY, OF SAME PLACE.

## RAILWAY-CAR TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 334,188, dated January 12, 1886.

Application filed March 3, 1885. Serial No. 157,626. (No model.)

*To all whom it may concern:*

Be it known that I, LUCIUS J. PHELPS, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Apparatus for Maintaining Electrical Communication with Vehicles in Motion or at Rest, of which the following is a specification.

My invention relates to an apparatus for communicating with vehicles in motion or at rest on the principle of static electrical induction, and is designed more especially to provide an efficient means for holding oral communication between an operator upon a moving vehicle—such as a railway-car—and an operator at a fixed station, such as a train-dispatcher's office.

My present invention is designed also as an improvement upon the apparatus described in another application for patent filed by me, and of even date herewith, in which I have shown a line-conductor stretched parallel to the path over which the vehicle moves, in combination with an extended plate or sheet of metal, or similar inductive surface, carried upon the vehicle in inductive proximity to the line-conductor, and electrically connected with the earth or a metallic return-conductor; and a further object of my invention is to heighten the static induction of said line upon the plate or inductive surface carried by the car or vehicle.

My invention consists, first, in the combination, with the line-conductor, or with the plate or inductive surface carried by the car or vehicle, of a telephone-transmitter and a battery or other source of electricity connected to the line or to the plate, the transmitter being suitably constructed to alternately charge the line with electricity from the battery and then to discharge the line in whole or in part through a connection between the same and the earth.

My invention consists, further, in the combination, with the line-conductor, of a condenser interposed at some portion thereof for the purpose of heightening the inductive effects.

Referring to the accompanying drawings, Figure 1 is a diagram illustrating an appara-

tus whereby my invention may be carried into effect. Fig. 2 illustrates a modification.

At A is shown apparatus located at a fixed station—as, for instance, at a train dispatcher's office—while B indicates a vehicle—such, for instance, as a railway-car—carrying devices similar to those located at the station A.

C indicates the conductor, supported parallel to the path over which the vehicle B moves in any suitable way—as, for instance, by posts located beside the track—so that the conductor shall be in as close proximity as practicable to a plate of sheet metal, M, located upon the car-roof or upon any other suitable portion of the vehicle, and connected by suitable conductors with the car-wheels, the rails, and earth, or with any other return-conductor leading to the source from which the line receives its charge. The plate M may consist of a thin sheet of metal tacked upon the car-roof and suitably insulated therefrom by a sheet of non-conducting material—such as rubber cloth—or the metallic car-roof itself may be used for the same purpose, suitable provision being made for insulating the same from the portions of the car frame-work that are in connection with the wheels. The conductor C is not directly connected with earth or with a metallic return; but is in effect open-circuited, and is by this means made capable of receiving a much higher static charge than would be the case if it were connected to earth, as has heretofore been the practice, and may therefore produce by induction higher changes of electrical condition in the plate M, and in any apparatus connected therewith.

For the purpose of still further amplifying the static changes of condition in the line-conductor C, I interpose the condenser F therein, one pole of said condenser being connected to the conductor and the other to the earth. By this means I find in practice that the effect of any battery or electric source at the station A upon the apparatus in the vehicle is markedly increased.

At station A, S indicates a switch of any desired kind, which may be employed for connecting the conductor C either to an ordinary telephone-receiver, T, or to a telephone-trans-



mitter, D, and a main battery, M B. The transmitter D is here shown as in the circuit from the line to earth through the battery; but it is suitably constructed to vary the charge of the line C by first charging the same from the battery M B, and then, on the reverse movement of its diaphragm or other vibratory portion, discharging said line by forming a good conducting-path from the same to earth. Various forms of transmitter might be employed to effect this result. A simple form is shown, and consists, essentially, of an ordinary Blake transmitter, formed with two sets of contacts, one of said sets of contacts being in the circuit from the line through the battery M B, and the other located upon the opposite side of the diaphragm from the first, being connected in a circuit from the line through the conductor 10 to earth. The effect of this arrangement, obviously, is that as the diaphragm moves in one direction, the resistance in circuit 10 will be increased, and upon the opposite side of the diaphragm a good connection from the battery M B to the line C will be formed, thus causing the line to acquire a charge from the battery. Upon the opposite movement of the diaphragm the resistance in circuit 10 is diminished, while that in the circuit to the battery M B is correspondingly increased, so that the line is permitted to discharge itself through circuit 10 to a greater or less extent. By this means changes of static condition are produced in the line which will correspond in their number and amplitude to movements of the diaphragm under the effect of spoken words, and, on well-known principles of condenser action, corresponding changes of static electrical condition will be produced in the plate M so as to correspondingly effect any electrical apparatus connected therewith.

The car B being provided with telephone receiver, transmitter, battery, and switch similar to that at the station A, it is obvious that by suitably operating the switch thereon to connect in the telephone-receiver T words spoken at the station A may be heard upon the vehicle B.

In transmitting from the vehicle B to the station A, it is only necessary to connect to the plate M the transmitter and the battery located upon said vehicle, and, by producing changes of electrical condition in the plate M through a similar action to that which takes place when the transmitter at station A is employed, to inductively produce in circuit C and the telephone T at the station A the variations of electrical condition, which will permit speech to be transmitted and received.

I sometimes find it advisable to heighten the capacity of the plate M to receive or hold the charge of static electricity by employing a supplementary plate, N, similar to a plate of a condenser, which plate underlies the plate M, and is separated therefrom by a thin sheet of rubber or similar insulating material. The plate N is electrically connected in any suit-

able way with the car axle or wheel and the earth, and serves, in obvious manner, to heighten the static charge that the plate M will receive from the battery upon the car.

Any desired calling apparatus may be employed; or in the practical operation of the devices the operators may be required to keep the telephone-receivers held to the ear.

In order to heighten the differences of static condition on the line C, it may be sometimes advisable to interpose in connection 10 a battery of a polarity the reverse of battery M B. Such an arrangement is illustrated diagrammatically in Fig. 2, where the diaphragm of a transmitter is indicated with two spring-contacts pressing upon its opposite sides and connected one with the battery M B and the other with the battery M B<sup>2</sup>, the diaphragm itself being connected to the line-circuit. The batteries have opposite poles connected to the springs, and when the diaphragm is at rest no current will pass to the line; but when the diaphragm moves in one direction or the other, so as to increase the resistance for one battery and diminish that for the other, the line will receive a charge corresponding to the polarity of the battery connected to the side having the least resistance, and upon the reverse movement the line will be discharged or receive the contrary charge from the other battery.

I do not limit myself to the form of transmitter or the arrangement of circuits, the essence of the invention consisting in the employment of a battery or other source of electricity, in combination with a transmitter connected to the inducing-circuit C or plate M and having connections such that it may operate to alternately charge and discharge the line or the plate positively.

The supplemental plate N, arranged as herein described, forms the subject of claims in another application for patent filed by me, and is therefore not specifically claimed herein.

I do not limit myself to the location of the condenser F at the remote end of the conductor C, as it may be found that approximately the same beneficial effects may be secured by placing it at other portions of the circuit, even near the station A.

What I claim as my invention is—

1. The combination, substantially as described, of a line-conductor parallel to the path over which the vehicle moves, a condensing plate or surface carried upon the vehicle, a line battery or batteries, a telephone-transmitter, and contact devices and connections for producing on the line a positive alternate static charge and discharge by first putting a battery to line and then discharging the line through a separate connection to earth, as and for the purpose described.

2. The combination of a vehicle, a line-conductor parallel to the path over which the vehicle moves and in static inductive proximity to a plate or sheet of conducting material upon the vehicle, a telephone-receiver in a circuit



from said plate to earth, and at a fixed station a telephone-transmitter having two sets of contact-surfaces, one adapted to form connection between said line and a battery for imparting to said line a charge, and the other having a separate connection to earth for producing a positive discharge of said line on the reverse movement of the operating parts of the transmitter.

10 3. The combination of a line-conductor parallel to the path over which the vehicle moves, a condensing plate or surface upon said vehicle moving in inductive proximity to the line, and a condenser, as F, interposed in the  
15 line.

4. The combination, with the line-conductor, of a conducting plate or surface carried upon the vehicle in static inductive proximity to said line, a battery or batteries upon the vehicle placed in connections from the plate or

surface to the earth, and devices controlled by the vibratory portions of a telephone-transmitter for producing in said plate an alternate static charge and discharge by direct battery action, as and for the purpose described.

5. The combination, substantially as described, of a line-conductor, a condensing plate or surface upon a vehicle carried in inductive proximity to said conductor and connected with the earth, telephone-transmitting apparatus at a fixed station, and a condenser interposed between said transmitting apparatus and the distant ground.

Signed at New York, in the county of New York and State of New York, this 2d day of March, A. D. 1885.

LUCIUS J. PHELPS.

Witnesses:

THOS. TOOMEY,  
GEO. H. EVANS.