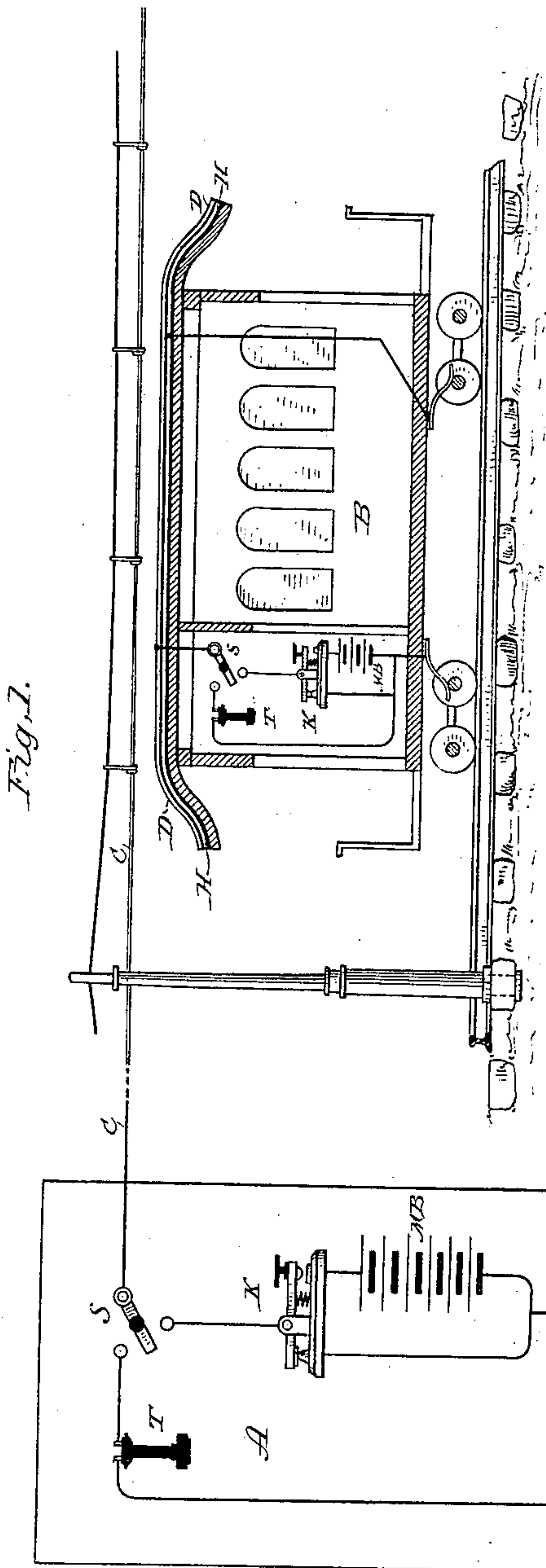


(No Model.)

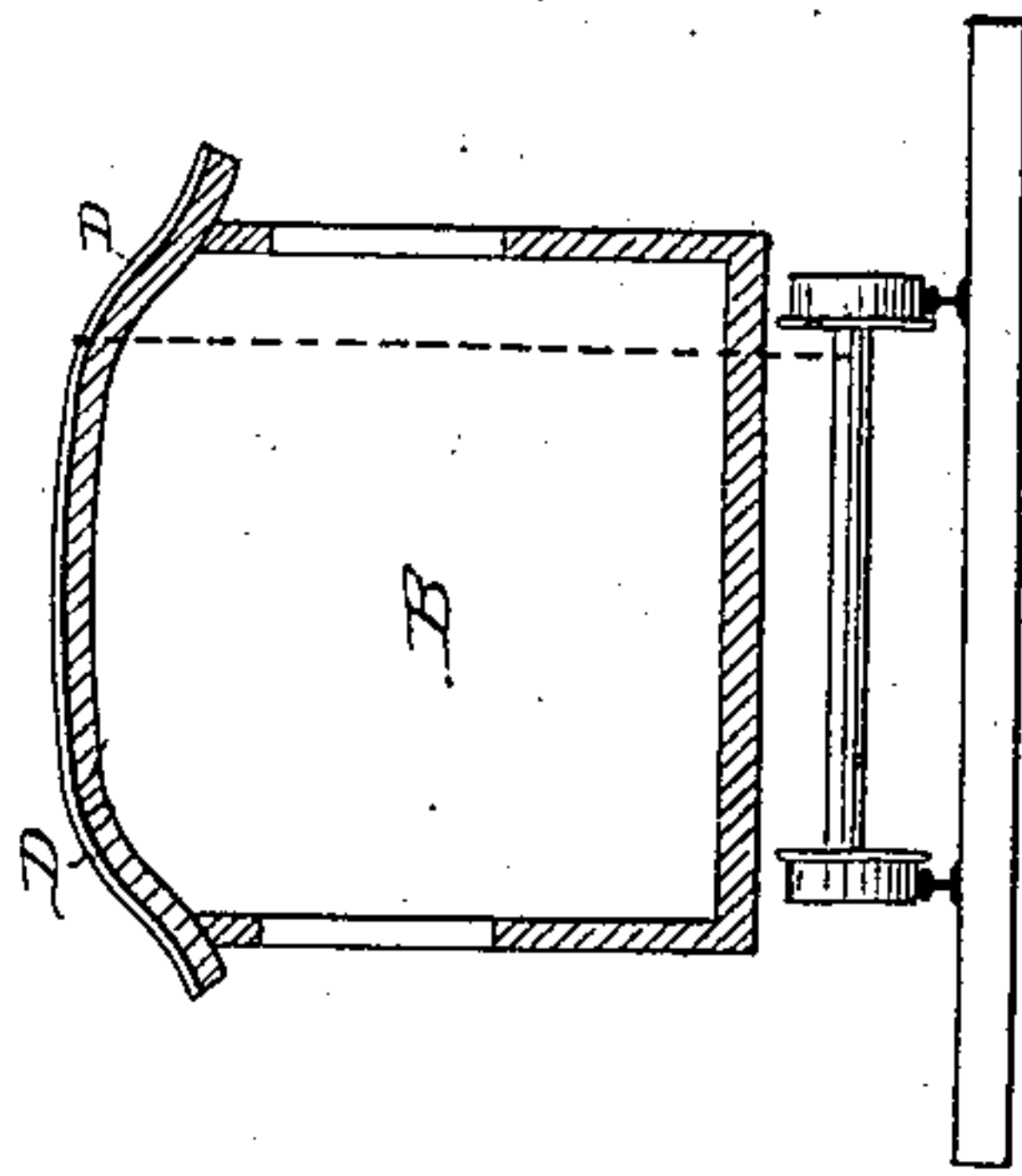
L. J. PHELPS.  
RAILWAY CAR TELEGRAPH.

No. 334,187.

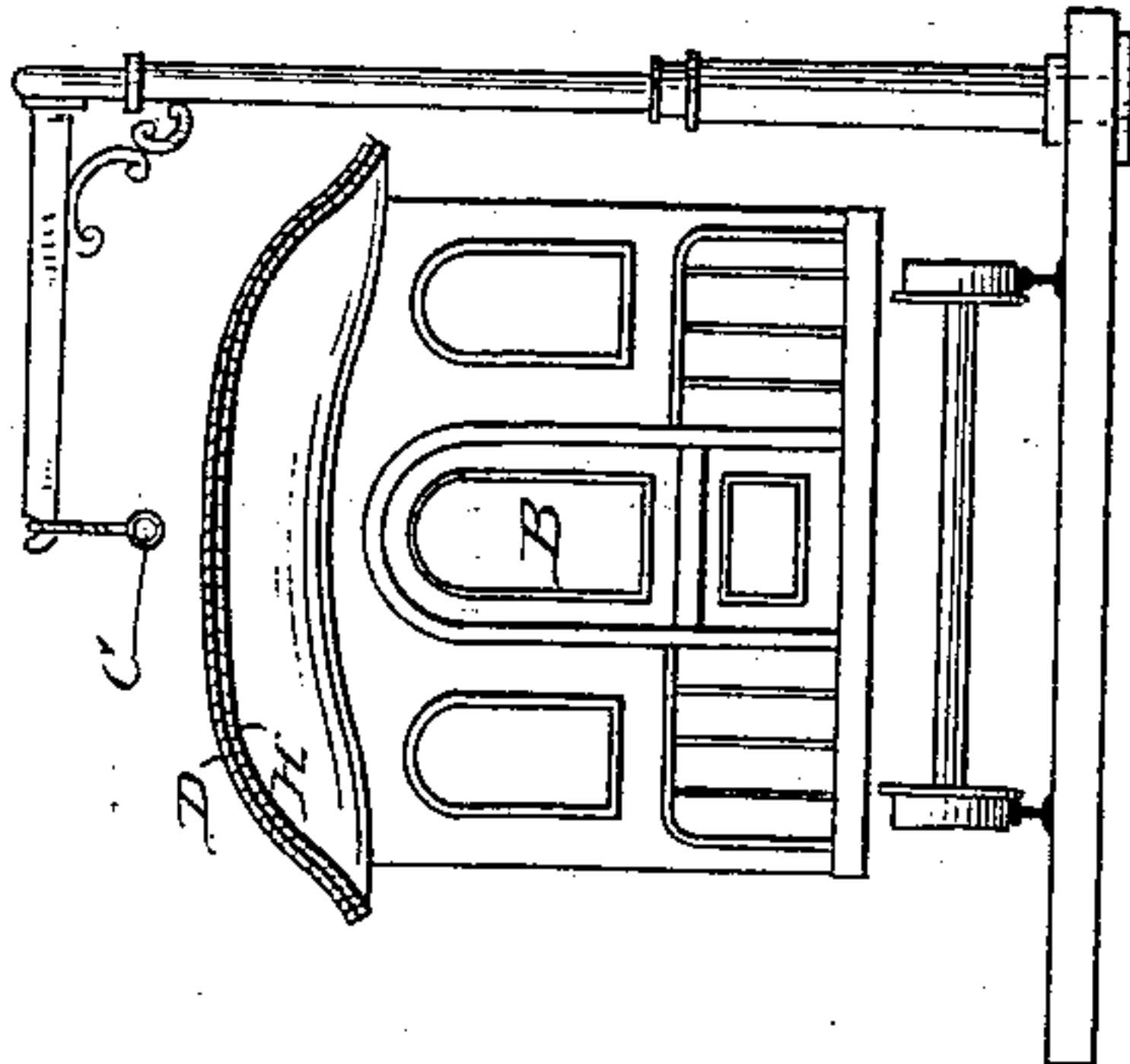
Patented Jan. 12, 1886.



*Fig. 3.*



*Fig. 2.*



WITNESSES

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By his Attorney

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# 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. 334,187, dated January 12, 1886.

Application filed March 3, 1885. Serial No. 157,025. (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 apparatus for communicating with a railway or other vehicle in motion or at rest by the principle of static induction utilized through the agency of a conductor parallel to the path or way over which the vehicle moves, and a plate or conducting-surface located upon the vehicle and carried thereby in inductive proximity to the said conductor, said plate being connected to earth or to a suitable return-conductor leading to the source of the electricity connected to the line.

My invention is designed to increase the efficiency of the above class of apparatus; and it consists, first, in the employment of a line-conductor having no earth or metallic return-connection in combination with a plate upon the vehicle having an earth or metallic return.

My invention consists, secondly, in the application to the line, open-circuited, as described, of transmitting apparatus constructed to alternately charge and discharge said line in the process of communication by alternately connecting said line to a source of electricity and to the earth or return conductor to which the plate or conducting-surface upon the vehicle is connected.

My invention consists, further, in combining with the plate or surface on the vehicle one or more auxiliary plates or surfaces connected with the earth or metallic return-conductor and arranged on the opposite side of the main inducing-surface upon the vehicle, as will be hereinafter described, so as to assist in transmitting from the car or vehicle to a fixed station.

One of the arrangements of apparatus that may be used for carrying out my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a diagram of circuit and appa-

ratus. Fig. 2 is a cross-section of the car or vehicle. Fig. 3 is a cross-section of a car in which the metallic covering is utilized as a plate or conducting-surface to form an element constituting in effect one plate of a condenser, the opposite plate or surface of which latter consists of the open-circuited line.

In describing my invention I have set out an apparatus whereby signals or communications may be sent and received by the Morse system, but do not limit myself thereto, as the particular devices shown are herein employed only for the purpose of illustrating the broad principles of my invention.

Referring to the drawings, at A is shown apparatus located at a fixed station—such, for instance, as a train-dispatcher's office—and consisting of any apparatus for transmitting signals to or receiving signals from a conductor, C, which latter extends from the office A to any desired distance, and has its remote terminal disconnected from earth or from any return-conductor during the operation of signaling or communicating from the station A to the movable station B, consisting of a vehicle—such, for instance, as a railway-car. The vehicle B carries a plate or sheet of conducting material D, consisting of thin sheet metal, which is supported in convenient proximity to the conductor C, and is connected to the earth or to a metallic return-conductor. The plate D is supported in the present instance upon the car-roof, and is properly insulated by any desired means. Such means might be a sheet of rubber cloth tacked upon the car-roof. The sheet metal of the car-roof itself might form the plate D, as indicated in Fig. 3; but suitable provision should be in such case made for insulating the metallic covering from any portion of the car-frame that is in electrical connection with the car-wheels. The conductor C is supported in any suitable manner—as, for instance, by posts located beside the track, as shown, so that the plate D shall move in inductive proximity to and beneath the conductor. It is desirable to have the plate and the conductor in as close proximity as practicable, in order to get the strongest inductive effects.

At the station A a receiving-instrument, 100



consisting in the present instance of an ordinary telephone-receiver, is indicated at T. By a switch, S, the conductor C may be connected through said receiver with the earth or a metallic return from the plate D, while at K is indicated the transmitter, consisting in the present instance of a key for sending Morse signals. The back stop of said key is connected to earth or a metallic return, and its front stop is connected to a battery, M B, or other source of electricity. By turning the switch S the conductor C may be connected to the key K. Upon the car B is placed similar apparatus located in the connection from the plate D to the car-wheels and thence to the rails. The connection to the wheels is made by attachment of the conductor to the car-truck iron-work or to a spring bearing on the car-axle, the rails, or the earth form the necessary connection to the transmitting-battery, by which signals are sent from the station A. The plate D is preferably of the full size of the car-top. Beneath the plate D, but insulated from it by a layer of insulating material of any desired kind, as thin as possible, is a second plate, H, connected, as indicated, directly with the car-wheels and the earth. This plate is of service in transmitting from the car B to the fixed station, since by it the plate D is made to take a much heavier static charge from the battery upon the car than it otherwise would, and to thus produce much greater effects upon the conductor C. The plates D H, as thus arranged, form in themselves a two-plate condenser. The plate D, in conjunction with the conductor C, forms also in effect a condenser, and the static charging of either will obviously, and on well-known principles, induce a static charge in the other. Similarly the discharging of either will induce a change of electric condition in the other, which will be felt in any apparatus connected to the latter.

In the operation of transmitting from a fixed station, as A, to the station B, the beginning of the signal is produced by the charging of the conductor C and the ending of the signal by the discharging thereof, each such charge and discharge acting upon the surface D with the effect of producing a click in the telephone T upon the car. The charge of the line C is produced by the depression of the key K at station A, such depression putting the main battery M B into connection with the conductor C. Upon the return of the key to its back stop the battery is disconnected, and the conductor C is connected to earth and immediately discharges. A similar and obvious operation occurs when signals are transmitted from the car B. The plate H might be dispensed with.

Other receivers than telephones T may be employed for receiving the signals sent by a Morse key or such like transmitting apparatus designed to be employed with an arbitrary code. I do not limit myself in this respect,

but employ a telephone-receiver merely because of its simplicity and its well-known sensitiveness to induced currents.

The key K is merely typical of any device whereby the conductor C may be alternately charged and discharged in the operation of communicating between the fixed and the movable station, or vice versa, by connecting the conductor C or plate D alternately to a source of electricity and to the earth or metallic return-conductor.

It is obvious that the conductor C, while in one sense it is a line-conductor, inasmuch as it is stretched parallel to the line of progress of the vehicle B, is in fact simply a condensing-surface, adapted to receive a high static charge much greater than it would be capable of attaining at all points in case it were an ordinary line-conductor, and hence connected at its distant end to earth. If it were connected to earth at its remote end, the effective mutual inductive capacity of said line and the plate D would gradually decrease toward the remote end, owing to the decreasing difference of potential between the portion of the conductor C, beneath which the plate D should be for the time being located, and the earth at such point.

By my invention it is possible to produce much higher static effects than would be possible if C were a line-conductor in the ordinary sense and to thus attain economy in the consumption of battery-power.

I am aware that it is not new in submarine telegraphs to connect the distant end of a line to a condenser, thereby virtually producing a break in the conducting-path. In my invention, however, such device is used for an entirely different purpose, the object being to secure the effect of a practically constant strength of induction between the line and the vehicle at all points along the path over which the vehicle travels, whether such points be near to or remote from the battery or generator. If the line-conductor were at the distant end connected directly to earth, there would be near such end very little difference of potential between the conductor and the plate or surface on the vehicle, and therefore comparatively little inductive action, although at the end of the line near the generator the inductive action would be nearly a maximum. By the expedient of inserting in the line-conductor a very high resistance—such as would be interposed by the air when the line is severed—the electrical potential at all points along the line is practically the same, and the inductive effects upon the vehicle do not diminish as the vehicle gets farther away from the station at which the generator is placed.

What I claim as my invention is—

1. The combination, substantially as described, of a conductor parallel to the path over which a vehicle moves, and having its terminal disconnected from earth or a metallic return, and a conducting plate or surface



located upon the vehicle in suitable inductive proximity to said conductor and connected to earth or a metallic return.

2. The combination, as described, of an open-circuit line-conductor, a fixed station having apparatus for transmitting signals by alternate charge and discharge of said conductor, and a conducting plate or surface carried upon a vehicle in inductive relation to the open-circuit conductor and connected to earth.

3. The combination of an open-circuit line-conductor, a plate or surface upon the vehicle movable on a line parallel with the conductor and connected to earth, and a transmitting apparatus whose back or normal and front or transmitting stops are connected one with the earth directly and the other to earth through a source of electricity, whereby signals may be transmitted through the charge and discharge of the line-conductor effected by connecting the same to the source of electricity to receive a charge and then to earth to be discharged.

4. The combination, substantially as described, of a line-conductor, a vehicle moving parallel thereto and carrying apparatus whereby electric currents may be set up in the line or on the vehicle by the principle of static induction, a battery or other generator at a fixed station, and a Morse key or other manual transmitter having two sets of contacts, one connected to earth through a battery and the other to earth to a separate connection, as and for the purpose described.

5. The combination, with the conducting plate or surface D, connected to earth and constituting one element of a static-induction apparatus, the other element of which is composed of a conductor parallel to the path of the vehicle, of a telephone-receiver in the

earth-connections from D, and at a fixed station a transmitting apparatus provided with connections to battery and to earth, whereby the conductor may be first connected to battery to receive a charge and then to earth to be discharged.

6. The combination of the line-conductor, the conducting plate or surface located on the vehicle and connected to earth, and a transmitter having two contacts, one connected to battery and the other to earth, whereby said plate or surface may receive a charge and may then be discharged, as and for the purpose described.

7. The combination, in an apparatus for telegraphing by static induction to a vehicle in motion or at rest, of a plate or other suitable inductive surface carried by the vehicle, and a line-circuit whose end distant from the generator is open-circuited, so as to have an abnormally high resistance and to cause said conductor to manifest a high inducing action at and near such distant end, as and for the purpose described.

8. The combination, with the conducting plate or surface upon the vehicle, of one or more condensing plates or surfaces, as H.

9. The combination of the two thin metal plates or surfaces D H upon the car-roof, separated from one another by insulating material and connected, respectively, as described, to the transmitting apparatus upon the car and to earth.

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.