

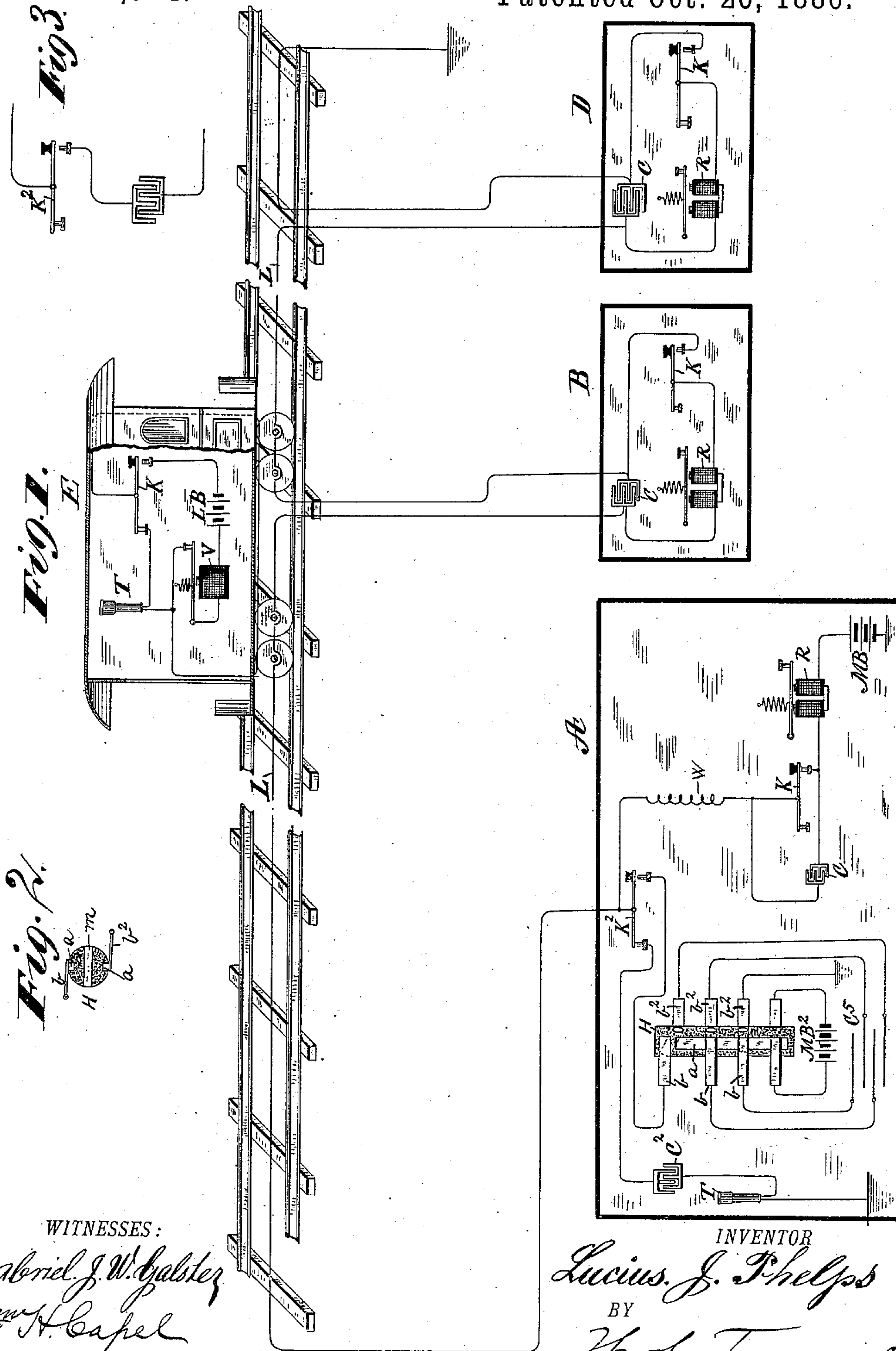
(No Model.)

L. J. PHELPS.

DUPLEXING RAILWAY TELEGRAPHS.

No. 351,524.

Patented Oct. 26, 1886.



WITNESSES:

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LUCIUS J. PHELPS, OF NEW YORK, N. Y.

DUPLEXING RAILWAY-TELEGRAPHS.

SPECIFICATION forming part of Letters Patent No. 351,524, dated October 26, 1886.

Application filed July 3, 1886. Serial No. 207,008. (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 Duplexing Railway-Telegraphs, of which the following is a specification.

My invention relates to means for maintaining telegraphic communication with a vehicle in motion or at rest—such, for instance, as a railway-car—over an ordinary telegraph line or circuit provided with ordinary telegraphic apparatus—such, for instance, as Morse relays and keys—located at two or more stations on said line.

The special object of the invention is to provide a means, whereby messages may be sent from a station connected with the line to the vehicle by means of vibration-signals without interference with or from the simultaneous use of the ordinary telegraph apparatus, such as the Morse relays and keys. By “vibration-signals” I mean signals whose elementary portions consist each of a series of electrical currents, either pulsatory, intermittent, or undulatory, and successively of the same polarity or of opposite polarity. The electric waves or pulsations may recur with any desired degree of frequency, and, if desired, may be sufficiently rapid to produce the sensation of a musical tone. According to this system messages sent by the Morse alphabet would be transmitted by dots and dashes, each consisting of a musical tone corresponding in its duration to the length of the dots or dashes.

My invention consists, mainly, in the means for producing the rapid electrical vibrations or pulsations to be employed in sending messages by vibration-signals, and also in the novel combinations of devices and circuits whereby communication may be maintained with the vehicle by vibration-signals over an ordinary Morse circuit without interfering with the simultaneous transmission of messages between any two stations equipped with Morse telegraph apparatus.

The particular combinations and devices forming my invention will be described in connection with the accompanying drawings, and then more particularly recited in the claims.

The drawings illustrate in Figure 1 a dia-

gram of circuits and apparatus embodying my invention. Fig. 2 is a cross-section of the commutator or vibrator employed in producing the electrical vibrations or pulsations used in transmitting messages to the vehicle. Fig. 3 shows a modified connection of the apparatus.

Referring to Fig. 1, L indicates a telegraph-line, upon which are two or more stations, B D, having transmitting and receiving apparatus connected into the circuit of said line in the ordinary way. The line L is carried parallel to the path over which the vehicle with which communication is to be held moves, and on said vehicle is located any suitable device whereby the electric pulsations or vibrations on the line L may be inductively transferred to the vehicle and to a circuit thereon containing any suitable receiving apparatus. E indicates a vehicle equipped with apparatus for this purpose.

I have herein shown devices for maintaining the inductive connection in the way described in my prior patent No. 312,506, though other devices—such, for instance, as that shown in my prior patent No. 334,187—might be employed in their place. This portion of the apparatus may be varied indefinitely, the only requirement being that there should be a means whereby, through inductive action, the signals may be transferred from the line to the vehicle, or, vice versa, from the vehicle to the line.

Transmitting and receiving apparatus suitable for use on the vehicle is herein shown as consisting of a telephone-receiver, T, connected to the circuit of a conductor carried parallel to the line L, as described in my prior patent No. 312,506. In addition to the telephone T is a generator of electricity, L B, a key, K, and a vibrator, V, for throwing the current of the generator into vibration on the car-circuit. These vibrations are controlled by the key in obvious manner, and on circulating on the car-circuit are inductively transferred to the line to be received on a telephone-receiver, T, or other suitable device, located at station A or at other portion of the line L.

The telephone T on the vehicle may be replaced by any receiver sensitive or responsive to the vibration-signals or currents on the line, and the means for producing the vibrations on the car-circuit may be varied indefinitely.

At the stations B D the Morse apparatus is shown consisting of ordinary transmitter, K, and receiver R. This apparatus is shunted by the condenser C, which serves to provide a circuit for the vibration-signals on the line when the line is broken through the contacts of the transmitter K. The condenser C also serves the purposes of preventing disturbance in the telephone through the sudden changes of tension on the line-circuit L, produced by the operation of the key at the stations B D. Its action in this respect may be termed a "graduating" action, inasmuch as it serves to gradually lower the tension on the circuit when the key K is opened, and to permit the tension to rise gradually when the key is closed. By this means the sudden changes of tension necessary to the production of induced currents on the vehicle-circuit sufficient in their tension to be heard in the receiver are prevented.

At the station A a main battery, M B, is shown, which constitutes the battery for the continuous line-circuit L and the telegraph apparatus thereof. At station A is also located, if desired, the Morse apparatus K R, the key K at the latter point also being shunted by a condenser, C, whose function is that just described.

The key which controls the vibration-signals sent from station A to the vehicle is indicated at K². From the back contact of this key connection is made to ground through the condenser C² and a receiver, T, for vibration-signals sent from the car. The receiver here shown consists of an ordinary speaking-telephone receiver, T.

The key K², when operated, closes the contact connected with the generator of the vibration-signals. In order to prevent the diversion of the electrical vibrations thus placed on the line, a resistance, W, may be interposed between the normal earth-connection of the line L and the point of attachment of the branch leading to the key K².

The apparatus for developing the vibration-currents controlled by key K² consists of the following devices: a battery or other generator of electricity, M B², a condenser, C³, to be charged by current from said battery, and a commutating device, H, of any suitable character, which is operated by any suitable power, and serves to alternately and rapidly connect the condenser first to the battery M B², to receive a charge, and then to the connections leading to the transmitter, to be discharged over the line L in case the connection to line be closed by the key.

The rheotome or commutator H here shown is of a form that has sometimes heretofore been employed in the art. It consists of a cylinder, H, rotated by any suitable power, and carrying two longitudinal conducting-strips, *a a*. Bearing upon the cylindrical surface of the commutator are pairs of springs *b b*², arranged in such position that each pair will make contact simultaneously with the two conducting-

strips *a a*. One pair of said brushes is connected to the terminals of the generator, as shown. Another pair of brushes are connected one to line and the other to a terminal of the condenser C³. The opposite terminal of the condenser is connected to a brush, *b*², while the intermediate plates are connected alternately to the brushes *b b*², as indicated. Opposite to the brush *b* connected to the latter terminal of the condenser is a brush, *b*², connected to ground. Mounted also on the commutator-cylinder H are connecting-pieces *m m*, arranged to complete the connection between all pairs of the commutator-brushes *b b*², excepting that pair connected to the battery at certain points in the revolution of the commutator when the brushes are out of connection with the strips *a*.

By examining the diagram it will be seen that through contact of the brushes with the blocks *a* the battery or generator M B² serves to charge the plates of condenser C³ in multiple arc. If, now, the commutator be turned further, so that the connection is broken with the generator and the brushes are brought to bear on the conducting-pieces *m*, then the plates of the condenser will be in series between the ground and the terminal brush *b* connected to the transmitter, the circuit being from the brush *b*² connected to ground, through a block *m*, brush *b*, terminal of condenser, second plate of condenser, a brush *b*², a block *m*, a spring *b*, a third plate of the condenser, the fourth plate and terminal of the condenser, a spring *b*², a diagonal block *m*, and spring *b* connected to the key. The condenser will therefore discharge in series through the key and over the line in case the key be closed. By operating the commutator with sufficient rapidity a series of pulsations will flow to line during each closure of the key, and if the commutator revolve with sufficient rapidity the pulsations produced through the discharge of the condenser or accumulator will give the sensation of a musical tone on the receiver of the vehicle, being taken up from the line by induction through the apparatus carried thereon. I deem it desirable to employ a commutator in which the condenser shall be first charged in multiple and then discharge in series, but do not limit myself to such particular arrangement.

I have described the employment of a condenser as the means for momentarily accumulating current from the generator and discharging the accumulated electricity over the line. I do not limit myself to the employment of this particular kind of accumulator, as there are other devices known in the art adapted to receive a charge from a source of electricity and to discharge when disconnected from said source and connected to a circuit.

The apparatus described would be employed in the following manner: The devices being in the position shown in the drawings, the accumulator or condenser and commutator are disconnected from circuit at the contacts of

the key K^2 , while the telephone-receiver T at the station A is in a branch connection from the line through the back contact of the key. The apparatus at the stations B and D may be employed at any time in transmitting messages over the circuit formed from ground at the distant point over the line through the resistance W and battery M to ground at the station A . When the line-circuit is closed through the telegraph apparatus at the stations B and D , the vibration-signals placed on said line either by the operation of the key K^2 or by induction from the vehicle-circuit flow in the ordinary manner. If the circuit be open at any station B or D through the opening of a transmitter, K , the condenser C at such station preserves the circuit of the vibration-signals. When the key K^2 at station A is against its back stop, the condenser C^2 in the branch prevents the battery-current from M to B from short-circuiting to ground, while if the key K^2 be closed the condenser C^5 cuts off such current in the same manner. In the operation of transmitting messages from station A to the train the key K^2 is used in the ordinary way, and serves at each depression to introduce upon the line L a series of pulsations corresponding in the rapidity with which the accumulator or condenser C^5 is charged and discharged. These pulsations or vibrations are prevented from short-circuiting to earth at the station A by means of the resistance W .

By the arrangement described it is apparent that the discharges of the accumulator might be connected to the key K^2 through a second condenser, after the manner indicated in Fig. 3, such an arrangement forming an inductive connection instead of a direct electrical connection between the accumulator or condenser and the line. The general operation would be the same, however, under such circumstances.

What I claim as my invention is—

1. The combination, substantially as described, of a telegraph line or circuit, L , provided with apparatus at two or more stations, connected into the direct circuit thereof, condensers shunting said apparatus, and vibration-signal apparatus composed of an accumulator, a generator, a rapidly-operating commutator or vibrator for connecting the accumulator alternately to the generator and to the line, and a transmitting-key controlling the electrical vibrations or pulsations from said accumulator.

2. The combination, with a telegraph line or circuit carried parallel to the path of a vehicle, of two or more stations provided with Morse telegraph apparatus connected into the direct circuit of the line, telegraph apparatus on the vehicle carried in inductive proximity to said line, as described, and at a station connected to said line a generator of electricity, a condenser, the commutator for alternately charging and discharging the condenser, and a key whereby vibration-signals may be put on the

line to be taken up therefrom by induction from the vehicle.

3. The combination, substantially as described, of a condenser, a generator of electricity, a commutator for alternately connecting the condenser to the generator to receive a charge and to external circuit to permit it to discharge, and a key or transmitter controlling the circuit, as and for the purpose described.

4. The combination, substantially as described, of a generator of electricity, a condenser having conducting surfaces and points for connecting the condenser in multiple arc to the generator, and having also conducting springs or surfaces for connecting the condenser to an external circuit, and a transmitter controlling such external circuit, for the purpose of sending messages by vibration-signals whose elementary portions are made up of a series of discharges from the condenser or accumulator.

5. The combination, substantially as described, with a telegraph line or circuit, L , of telegraph apparatus connected into the direct circuit thereof, a battery, M , on such circuit, condensers in branches around the transmitters of the telegraph apparatus, a branch connection from said circuit leading to a condenser and commutator, by which the condenser alternately receives a charge from the generator of electricity and is permitted to discharge to the branch, and a key controlling the discharges of the condenser, as and for the purpose described.

6. The combination, substantially as described, of a line carried parallel to a vehicle, apparatus thereon for taking up pulsations or vibrations from the line by induction, a telephone connected with the circuit on the vehicle, and at a station connected with said line a condenser or accumulator, a generator of electricity, a rapidly-operating commutator for charging and discharging the condenser, and a transmitting-key whereby messages may be sent over the circuit by vibration-signals, and may be received upon the vehicle by induction from said circuit.

7. The combination, in a railway-telegraph apparatus, of a line, a vehicle carrying a receiver of vibration-signals, a station connected to the line and provided with a generator of electricity, the condenser or accumulator for rapidly and alternately connecting the condenser or accumulator to the battery and to the line, and a transmitter for controlling the electric discharges from the condenser or accumulator, as and for the purpose described.

Signed at New York, in the county of New York and State of New York, this 2d day of July, A. D. 1886.

LUCIUS J. PHELPS.

Witnesses:

WM. H. CAPEL,

WM. HENRY GARDINER.

Correction in Letters Patent No. 351,524.

It is hereby certified that Letters Patent No. 351,524, granted October 26, 1886, upon the application of Lucius J. Phelps, of New York, New York, for an improvement in "Duplexing Railway Telegraphs," was erroneously issued to said Phelps; that the said Letters Patent should have been issued to *The Railway Telegraph Company of New York*, the said Railway Telegraph Company being the assignee of the entire interest in said invention; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 16th day of November, A. D. 1886.

[SEAL.]

D. L. HAWKINS,
Acting Secretary of the Interior.

Countersigned:

R. B. VANCE,

Acting Commissioner of Patents.