

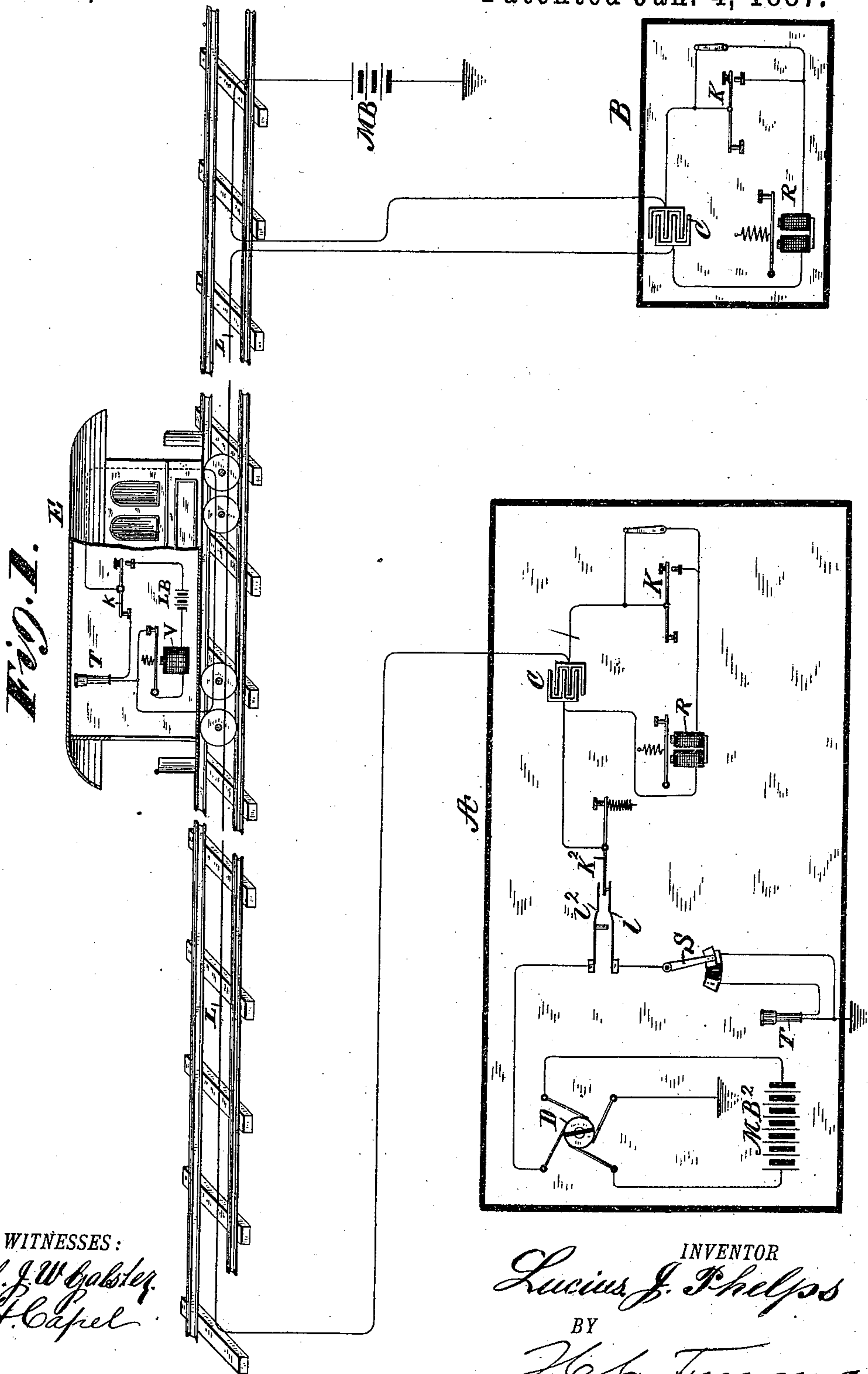
(No Model.)

2 Sheets—Sheet 1.

L. J. PHELPS.
RAILWAY TELEGRAPHY.

No. 355,469.

Patented Jan. 4, 1887.



WITNESSES:

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(No Model.)

2 Sheets—Sheet 2.

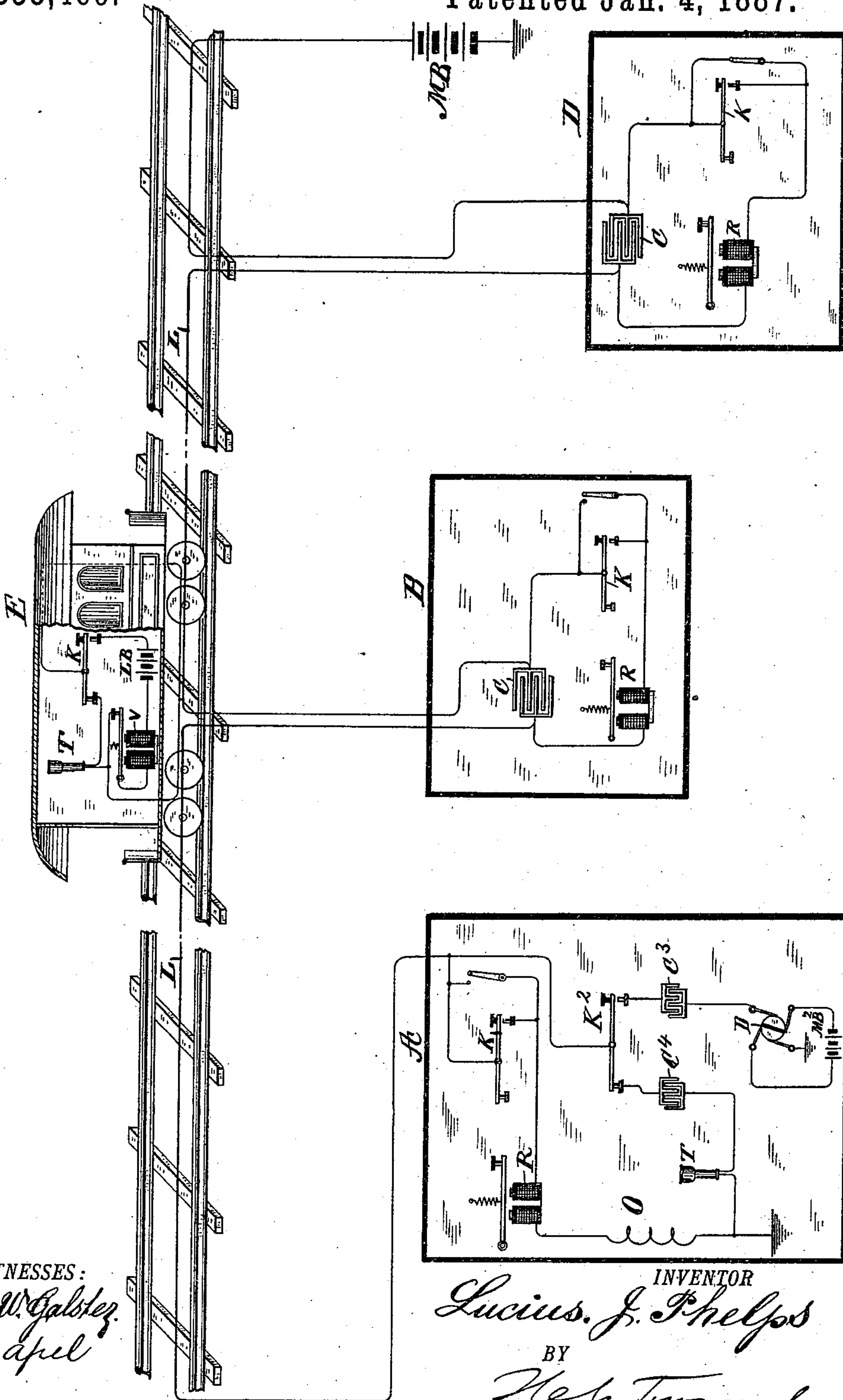
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Fig. 2.



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UNITED STATES PATENT OFFICE.

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RAILWAY TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 355,469, dated January 4, 1887.

Application filed July 3, 1886. Serial No. 207,005. (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.

The object of my invention is to provide a means whereby telegraphic communication may be maintained with a vehicle in motion or at rest—such, for instance, as a railway-car—over a circuit upon which transmitting and receiving apparatus of ordinary character—such, for instance, as Morse keys and transmitters—are simultaneously employed.

My present invention involves more especially the employment of the inventions heretofore patented by me for maintaining communication with the train by the principle of induction, the circuit being formed over a line carried parallel to the path of the vehicle and to apparatus on the vehicle through a device moving in inductive proximity and relation to the line.

The object of my present invention is more especially to provide a means whereby the communication with the train can be kept up by what I term “vibration-signals”—that is to say, by signals whose elementary portions are made up each of a series of vibrations of greater or less rapidity, but preferably of sufficient rapidity to give the sensation of a musical tone.

The object of my present invention is also to provide a means for producing vibrations of an alternating character—that is to say, vibrations which are successively of opposite polarity.

My invention consists in the novel combinations of apparatus that will be described in connection with the accompanying drawings, and then more particularly specified in the claims.

Figure 1 is a diagram of circuits and apparatus embodying my invention. Fig. 2 illustrates another arrangement of the devices.

Referring to Fig. 1, L indicates a line-wire carried parallel to the vehicle and in suitable inductive proximity to apparatus thereon, as described in my prior patent, No. 312,506.

The apparatus on the car is herein shown as

similar to that of said patent, but might be of any other character adapted to permit the operator on the car E to receive signals by inductive transfer from the line to the circuit or conductor on the car, or transmit signals by inductive transfer in the opposite way.

The devices on the vehicle are herein shown as consisting of an ordinary Morse key, K, controlling the circuit of the battery L B and vibrator V through the conductor on the car moving in inductive proximity to the line. The vibrator V simply serves to throw the battery-current into vibrations or pulsations, and is shown as consisting of an ordinary electromagnet, whose armature makes and breaks the circuit of the battery, while its coils are included in the circuit, so as to produce the automatic vibration.

The receiver T for the vibration-signals is an ordinary telephone-receiver, and is placed in the circuit from the back contact of the key, so that it is in condition to receive signals when the key is at rest.

The devices described are merely typical of any adapted to the same purpose.

The line L is supposed to be the line or circuit for ordinary Morse relays and transmitters or keys connected directly into said circuit.

At the station A, which is the terminal station of the line, and is provided with the apparatus for communicating with the vehicle, I have shown such a Morse key, K, and relay R. This apparatus is shunted by the condenser C, which provides a path for the vibration-signals when the key is open, and also serves in a measure to shunt or cut off the vibration-signals from the relay when the key is closed. A way-station, B, on the circuit L is provided with similar apparatus, so that communication may be held between stations A and B in the ordinary way by means of the keys K and receivers R. Other way-stations obviously, may be connected into circuit in the same way. The battery by which messages are thus transmitted is indicated at M B, and is connected into the direct-line circuit, as shown, so that the operation of any key may serve to change the tension of the current on the line and produce an operation of the relays.

At the station A the devices for producing

the vibrations or pulsations on the line-circuit consist of a battery, M B², or other generator of electricity, combined with a rapidly-operating pole-changer, D. This pole-changer is kept in operation by any suitable means, and serves by its action to connect the battery or other generator of continuous current to the circuit L, first in one direction and then in the other, in a manner well understood in the art, so as to cause an alternating current from said battery to flow over the line-circuit L. The rapidity of the alternations is obviously controlled by the rapidity by which the pole-changer moves. The pole-changer shown is a rotating pole-changer—that is, one whose contact-surface moves always in the same direction. It consists of two conducting segments or blocks mounted in any suitable manner upon a shaft, so as to be rotated thereby, but insulated from one another. On the cylindrical surface formed by said blocks bear the four springs connected, as shown, two to the opposite poles of the battery respectively, and two to the line and ground. In the position of the parts shown current will flow in one direction to the line; but when the changer turns sufficiently to bring the line-spring under the other conducting-segment current will then flow from the battery in opposite direction. The electrical pulsations or vibrations thus produced are controlled by the transmitter K², which is to be employed in communicating with the operator upon the vehicle or induction-station E.

The transmitter K² is provided with continuity-preserving contacts for its back and front stops, connected so that there shall be at all times a circuit for the battery M B and the Morse telegraph apparatus, whether said key K² be against its front or back stop, or moving from one of its positions to another.

The normal or back stop of the key K² consists of a spring, l, connected to a switch that serves to complete the connection to ground either directly or through a telephone-receiver, T, used in receiving vibration-signals from the vehicle. The opposite spring, l', corresponds to the front contact of the key, and is connected with the pole-changer D.

The key K² is itself connected directly to the line L. The springs are so arranged and adjusted that the key shall always be in contact with one or the other of them—that is to say, in passing from a point where it connects the line to the switch S to a point where it connects the line with the pole-changer there shall be no interruption of the flow of current from battery M B over the line and to ground at station A.

It is obvious that the key K² may be varied indefinitely so far as concerns its mechanical construction, while preserving the essential characteristic—to wit, the preserving of the continuity of the line-circuit for the battery M B and the Morse apparatus.

The switch S is to be employed in the ordinary way, either to connect the receiver T

into circuit or to throw it out of circuit when not in use.

The telephone T might be kept in circuit at all times; but by the employment of the device shown I am enabled to eliminate from the line L the unnecessary resistances of the telephone T when the operator A is engaged in simply transmitting the message to the vehicle. The contacts of the switch are so near together that the line-circuit will not be broken when the switch is thrown from either of its positions to the other.

The manner of using the apparatus will be obvious to any one skilled in the art. In the normal position of the apparatus—that is to say, when communication is not taking place with the train—the transmitter K² is against its lower stop, and the switch S is turned to connect in the telephone T, or any other device to be employed in receiving a call from the train. In this position of the parts there is a continuous circuit for the Morse apparatus and the battery M B.

Signals may be received on the telephone T by the vibrations set up on the line-circuit when the apparatus on the train is operated.

To send to the train, the operator at A simply operates his key K² in the ordinary way, and the pole-changer D, being in action, will obviously, by this means, produce on the line-circuit L electrical vibrations of alternately-opposite polarity and of a duration corresponding to the dots and dashes of the Morse alphabet. When the key is depressed fully, the Morse apparatus at A and B finds circuit through the pole-changer D to ground. The vibrations from the pole-changer do not affect the relays R, inasmuch as the latter are shunted by the condensers C. When the key returns to its normal position it makes connection with the lower spring, l, before it breaks connection with the spring l' and the pole-changer, so that there is no interruption of the line-circuit.

In Fig. 2 I have shown the same apparatus at way-stations; but the alternator or pole-changer D is connected with the line L through a condenser, C³, which obviously prevents the current from the main battery used in the Morse signaling from passing directly to earth. In a branch-connection to ground, taken from the line at a point as shown, is placed the Morse apparatus at station A. In the same connection is also placed an artificial resistance, O, the function of which, in conjunction with the relay R at station A, is to prevent the vibration-signals controlled by the key K² from being short-circuited to earth. In the connection from the back contact of the key K² to ground is another condenser, C⁴, and in the same connection is placed the receiver T for the vibration-signals sent from the train. The condenser C⁴ prevents the current from battery M B from passing directly to ground when the telephone T is in use.

The pole-changer D operates in obvious manner to produce pulsations of alternately-

opposite polarity on the line L, so long as the key K² is depressed, and these alternations are by inductive transfer reproduced on the vehicle and in the receiving apparatus thereon.

5 What I claim as my invention is—

1. The combination, with a telegraph-line circuit, L, provided with telegraph transmitting and receiving apparatus, as described, of a railway-car having a railway signaling, transmitting, and receiving apparatus operating to transmit and receive signals by induction to and from the telegraph-wire, a station having transmitting and receiving instruments for such signals, a generator of electricity, M B, and a pole-changing vibrator controlling the connection of said battery with the line-circuit, so as to set up on said circuit vibrations of alternately-opposite polarity when the signal-transmitter at the station is operated, as and for the purpose described.

2. The combination, with the line-circuit L, provided with Morse telegraph apparatus in its direct circuit, of a vehicle, E, carrying a railway signaling, transmitting, and receiving apparatus in inductive proximity to said line, whereby signals may be inductively transferred from the line to the vehicle, and vice versa, and a station having apparatus for communicating with the vehicle, and consisting of a generator or source of continuous current, M B², a rapidly-operating pole-changer in the circuit of said generator, and a key controlling a circuit of said battery and pole-changer over the line, whereby messages may be sent to the vehicle by vibration-signals produced by the rapid alternations or reversals of the generator-source on the line-circuit.

3. The combination, with the line circuit L, having Morse transmitters and receivers, of condensers in shunts around the Morse transmitters, a vehicle carrying suitable apparatus, as described, in inductive proximity to the line, operating to send and receive vibration-signals by induction, and at a station railway vibration-signal apparatus consisting of a generator of electricity, a rapidly-operating pole-changer, and a transmitting-key for controlling the alternating pulsations produced through the reversals of connection of the battery, as and for the purpose described.

4. The combination, with the line circuit and a battery, M B, for charging the same, of apparatus for transmitting and receiving signals by changes of the tension of said battery, a vehicle carrying railway signaling, transmitting, and receiving apparatus in inductive proximity to said line and operating to receive and transmit vibration-signals by inductions to and from the vehicle, and a station provided with a transmitter controlling the pas-

sage of vibration-signals to said line, and having continuity-preserving contacts, as described, whereby the circuit may be preserved for the generator M B in all positions of said transmitter.

5. The combination, with a line, L, equipped with Morse transmitters and receivers, and a vehicle, E, having railway signaling instruments upon which signals are received and transmitted through induction from and to the line, of a continuity-preserving transmitter connected into the line-circuit for transmitting messages to the vehicle from a fixed station.

6. The combination, substantially as described, with a telegraph-wire, L, of a vehicle carrying apparatus in inductive proximity thereto, means on the vehicle for transmitting and receiving signals by induction to and from the line, apparatus for communicating over the direct-line circuit between way-stations, condensers in branches around the transmitters at said stations, and a station having a source of continuous current, M B², a pole-changer controlling the connections thereof, and a transmitter governing the flow of reversed currents to the line for transmitting messages to the vehicle.

7. The combination, with the Morse telegraph-line L, of a vehicle, E, having railway signaling, transmitting, and receiving apparatus operating to transmit and receive signals by induction-vibrations through devices carried in constant inductive proximity to said line, and a station having a generator of electricity with direct connections to the line, means for throwing the continuous current from said generator into pulsations or vibrations over the line-circuit, and a transmitter controlling the passage of the vibrating-generator-current to line, whereby messages may be sent to the vehicle by vibration-signals.

8. The combination, with the telegraph-wire L and its instruments, of a railway-vehicle having transmitting and receiving apparatus operating to transmit and receive signals produced by induction-vibrations, and acting inductively upon or from the telegraph-wire, a station on the wire having a generator of the electricity connected to the line, a pole-changing vibrator connected to the battery, a transmitting-key at the station, and means for preserving the circuit for the vibration-signals at the instruments of the telegraph-wire.

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.