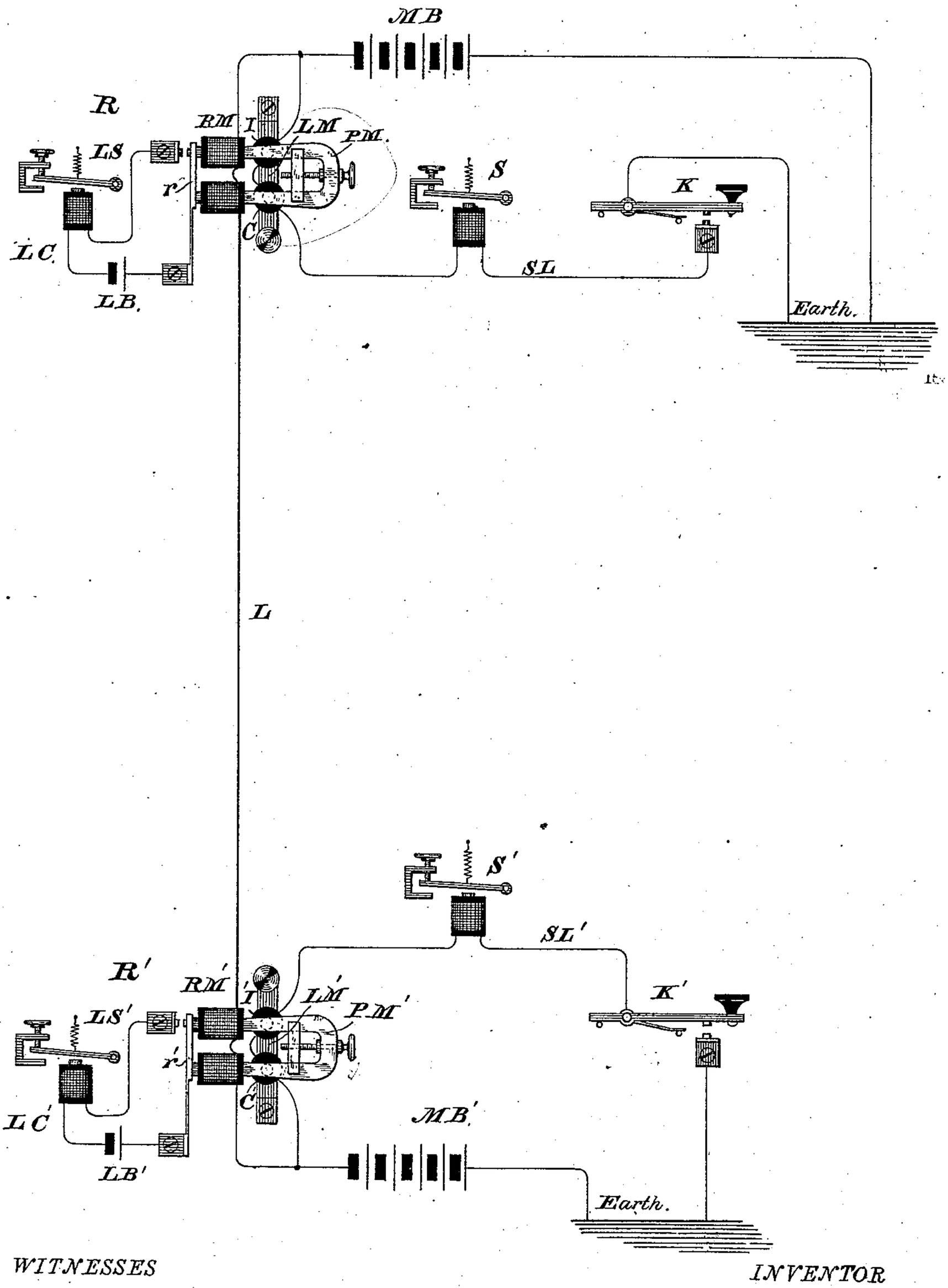
H. VAN HOEVENBERGH.

Duplex-Telegraph.

No. 227,079. Patented April 27, 1880.




WITNESSES

Wm A Skinkle.

Geo W. Breck.

INVENTOR

Henry Van Hoevenbergh.

By his Attorneys

Baldwin, Hopkins & Peyton

# UNITED STATES PATENT OFFICE.

HENRY VAN HOEVENBERGH, OF ELIZABETH, NEW JERSEY.

## DUPLEX TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 227,079, dated April 27, 1880.

Application filed February 6, 1880.

*To all whom it may concern:*

Be it known that I, HENRY VAN HOEVENBERGH, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in the Art of Duplex Telegraphy and in Duplex-Telegraph Apparatus, of which art and apparatus the following is a specification.

My invention relates to that class of duplex telegraphs in which relay-magnets at terminal stations are unequally affected. This has heretofore, so far as my knowledge extends, usually been accomplished in one of four ways: first, by the differential or bridge system; second, by the split-battery system; third, by reversing the polarity of the current; fourth, by neutralizing or re-enforcing a current of one polarity by another current of the proper polarity, all of which methods involve apparatus of more or less complexity or nicety of adjustment.

The object of my invention is to send messages simultaneously in opposite directions through the same telegraphic circuit by a simple and effective apparatus which shall avoid objections incident to the systems hereinbefore recited.

The first part of my invention relates to the method of working my improved apparatus, and constitutes a novel art, method, or system of working a balanced or normally-closed telegraphic circuit (in which are included duplicate main batteries and relay-magnets permanently charged electrically and having armatures balanced or adjusted by permanent magnets) by compensating for the electric charge placed upon the line by manipulating a key by the action of auxiliary inducing-coils shunting the relay-cores acting upon the permanent magnets at the transmitting-station, thus leaving the armature of the relay of the transmitting-station unaffected while actuating that of the receiving-station.

The next part of my invention relates to the organization of apparatus at a single station. Its object is to compensate the increase of magnetism in the relay-magnet caused by manipulating the transmitting-key, which end I attain by combining, in a telegraphic circuit, a main battery, a relay-magnet included in the circuit, an armature controlled or actuated thereby, and a permanent magnet balancing, compensating, or adjusting the action of the relay-magnet, with auxiliary inducing-coils acting on the permanent magnet, and a key, both inducing-coils and key being included in a short circuit, thereby, when the transmitting-key is closed, compensating or neutralizing the disturbance in the adjustment or balance of the relay-armature caused by manipulating the key.

The next part of my invention relates to the organization of apparatus at both the sending and receiving stations to adapt it to transmit simultaneously a single message in each direction without interference, which ends I attain by combining at each station, in a balanced or normally-closed telegraphic circuit, a main battery, a relay-magnet included in the circuit, an armature controlled or actuated thereby, and a permanet magnet balancing, compensating, or adjusting the action of the relay-magnet, with auxiliary inducing-coils near the permanent magnet, and a key, both inducing-coils and key being included in a short circuit shunting the relay-magnets, whereby the closing of the key neutralizes or compensates the disturbance in the balance or adjustment of the relay at the sending-station, caused by closing its key while leaving the receiving-relay uncompensated, and thus capable of responding to the signal transmitted.

The accompanying drawing represents diagrammatically all my improvements embodied in a duplex telegraphic apparatus in the best way now known to me.

I contemplate the use in such apparatus of the most improved instruments of the present day; but as their construction is well understood, and forms no part of the subject-matter herein claimed, it is unnecessary to describe them in detail.

The diagram represents an organization adapted for transmitting simultaneously a single message in each direction between two stations, and as the arrangements at each station are identical a description of that of one station will be sufficient.

Each station is shown as provided with a main battery, M B M B′, a key, K K′, relays R R′, local batteries L B L B′, local sounders

L S L S′, a permanent magnet, P M P M′, preferably of the ordinary horseshoe shape, mounted on a suitable support and provided with proper adjusting mechanism, relay-magnets R M R M′, the cores of which terminate near, and, in fact, constitute, the pole-pieces of the permanent magnets, and are included in the main-line circuit, and are suitably adjusted relatively to the relay-armatures *r r′* and auxiliary inducing-coils I C I C′, arranged near the permanent magnet, preferably intermediately of its length, and provided with suitable adjusting mechanism to vary their relation thereto, the various parts being united on circuit by suitable connecting-wires, the arrangement shown being that of a normally-closed telegraphic circuit with the keys, local sounders, and inducing-coils in short circuits S L S L′, shunting the relay-cores.

The main batteries M B M B′ are each connected with the same terminals to the line L—for instance, both zincs or both coppers. The two batteries, having the same number of cells in each and being of the same strength, neutralize each other, and normally no current flows over the line, although it is electrically charged. The relays R R′ consequently normally remain inactive. The armatures *r r′* of these relays are, however, held against the cores of the relay-magnets R M R M′ by induced magnetism, leaving the local circuits L C L C′ open.

S S′ are sounders of low resistance, placed in the short circuits S L S L′, in order that the operators transmitting by means of keys K K′ may hear their own sending.

P M is a horseshoe or permanent magnet, with its poles in contact with the ends of an electro-magnet, R M. Another electro-magnet, L M, of light resistance is arranged with its poles in contact also with the arms of the permanent magnet P M, the coils of this magnet being what I term "inducing-coils" I C. The permanent magnet thus exerts an influence on the armature *r* through the cores of the magnet R M. This influence may be wholly or partially overcome by connecting a battery to the magnet R M. Should this battery be too strong, so as to more than effect its object, the magnetism thus induced may be regulated by withdrawing the magnet R M farther from the permanent magnet until the desired adjustment is obtained. Should the permanent magnet P M be too strong its magnetism may be regulated by sliding its adjusting-armature to and fro until the right point is reached.

The armatures *r r′* of the relays are ordinarily so adjusted that the magnetism induced in the cores of the magnets R M R M′ holds them up to the cores against their springs with suitable force. Should key K, for instance, now be depressed, battery M B will be short-circuited through the inducing-coils I C of the electro-magnet L M, wire S L, sounder S, and key K. This withdraws or overcomes the influence of the permanent magnet upon the cores of the relay-magnet, as the magnet L M is arranged with its poles dissimilar to those of the permanent magnet P M, at the same time allowing the current from the main battery M B′ to flow through the relay-magnet R M′, neutralizing the magnetism induced in its cores by the permanent magnet P M′, and thus allowing the armature *r′* of the receiving relay-magnet R M to be pulled back by its spring, closing local circuit L C′. The current flows thence through line L to the transmitting relay-magnet R M, which it will not affect, as the current merely induces magnetism in this magnet, which replaces exactly that withdrawn by magnet L M and permanent magnet P M. Thus whatever signals are made on key K will be reproduced on relay R′ and its local circuit without affecting relay R and local circuit L C, which are left free to receive the signals made on key K′. Should key K′ be depressed while key K is closed both main batteries, M B M B′, will be removed from the line by being short-circuited through keys K K′, sounders S S′, circuits S L S L′, and inducing-coils I C I C′ of electro-magnets L M L M′. Both relay-magnets, R M R M′, being thus left without magnetism, will release their armatures, closing local circuits L C L C′. If key K′ is closed while key K is open relay R will be operated, while relay R′ will remain quiescent, the operation then being precisely that already described. Independent messages may thus be sent in opposite directions simultaneously.

It is evident that the magnets of the inducing-coils I C may be placed in different positions with regard to the permanent magnet P M without materially affecting its proper operation.

The system, as will readily be seen, will operate effectively with unlike battery-poles connected to the line, as with like, though, for sake of simplicity, the latter has been shown.

I am aware that the use of a main battery for neutralizing the effect of the outgoing current on the home-relay is not new, and do not claim it. Some device of the nature of an adjustable rheostat or resistance has always, however, so far as my knowledge extends, been necessary with such systems. I do not use an adjustable resistance or any equivalent device.

I am also aware that duplex telegraphs operated by short-circuiting opposing batteries are not new, and I make no claim of such an arrangement.

I claim as of my own invention—

1. The hereinbefore-described improvement in the art of duplex telegraphy, which improvement consists in working a balanced or normally-closed telegraphic circuit (in which are included duplicate main batteries, and relay-magnets permanently charged electrically and having armatures balanced or adjusted by permanent magnets) by compensating or substituting for the electric charge placed on the

line by manipulating a key, by the action of auxiliary inducing-coils shunting the relay-cores, but acting on the permanent magnet at the transmitting-station, thus actuating the receiving-relay without affecting the sending one.

2. The combination, substantially as hereinbefore set forth, of a telegraphic circuit, a main battery, a relay-magnet included in the circuit, an armature controlled or actuated thereby, and a permanent magnet balancing, compensating, or adjusting the action of the relay-magnet, with auxiliary inducing-coils near the permanent magnet, and a key, both inducing-coils and key being included in a short circuit shunting the relay-magnets, to neutralize or compensate disturbances in the adjustment or balance of the relay-armature caused by manipulating the key.

3. The combination, substantially as hereinbefore set forth, of a balanced or normally-closed telegraphic circuit, and at each station thereof a main battery, a relay-magnet included in the circuit, an armature controlled or actuated thereby, and a permanent magnet balancing, compensating, or adjusting the action of the relay-magnet, with auxiliary inducing-coils near the permanent magnet, and a key, both inducing-coils and key being included in a short circuit shunting the relay-magnets to neutralize or compensate disturbances in the balance or adjustment thereof at the sending-station caused by manipulating its key, while leaving the disturbance of balance at the receiving-station uncompensated.

In testimony whereof I have hereunto signed my name this 4th day of February, 1880.

HENRY VAN HOEVENBERGH.

Witnesses:
WM. D. BALDWIN,
WM. J. PEYTON.