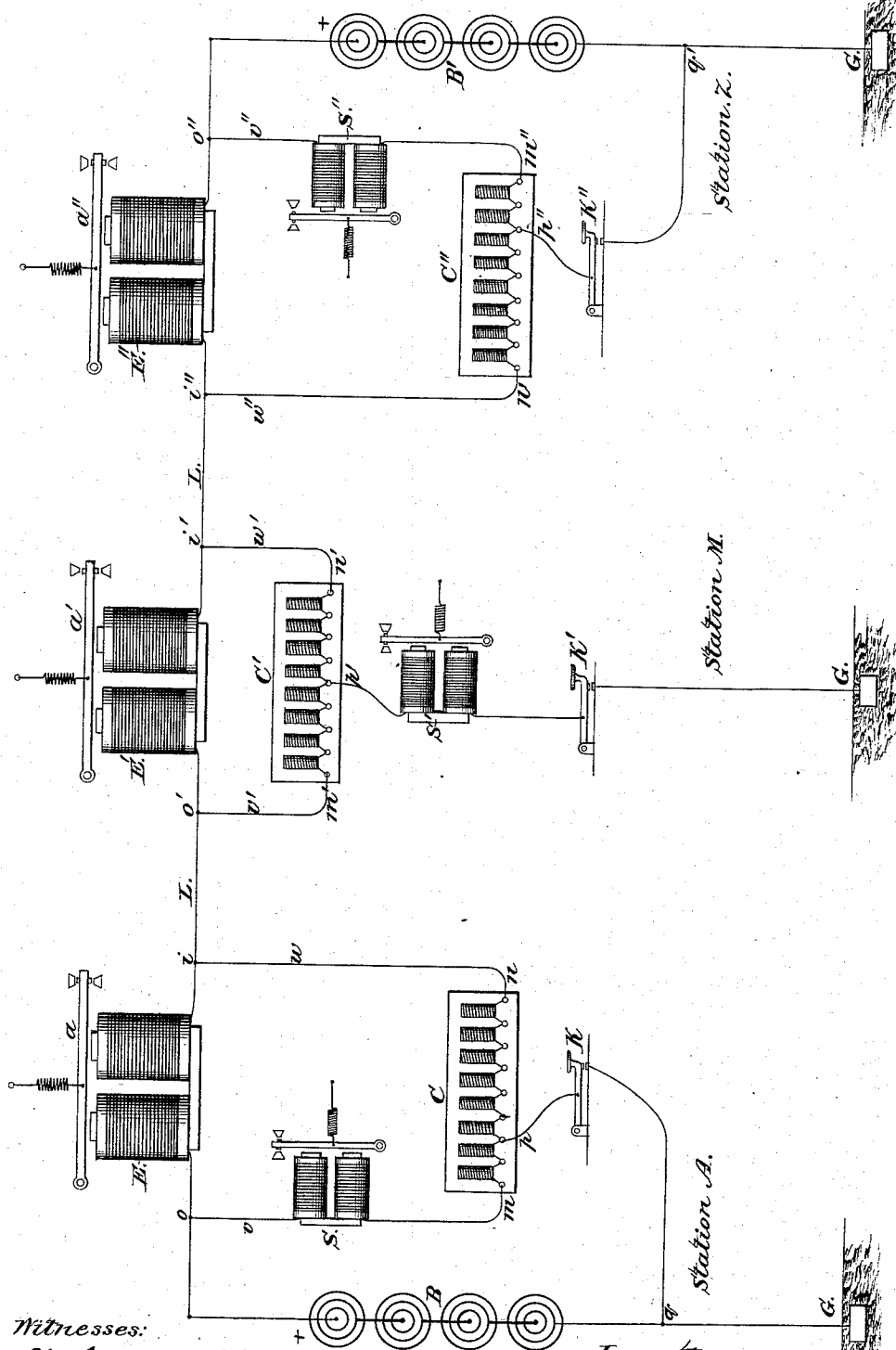


G. D'INFREVILLE.
Duplex Telegraphs.

No. 157,469.

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Witnesses:
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GEORGES D'INFREVILLE, OF NEW YORK, N. Y.

IMPROVEMENT IN DUPLEX TELEGRAPHS.

Specification forming part of Letters Patent No. 157,469, dated December 8, 1874; application filed July 13, 1874.

To all whom it may concern:

Be it known that I, GEORGES D'INFREVILLE, residing at the city of New York, in the State and county of New York, have invented a new and simple Method of adapting Duplex Transmission to an ordinary Telegraphic Line, of which the following is a specification:

The object of this invention is to send two messages over the same wire in opposite directions by using any kind of receiving-instrument for duplex transmission, and also to avoid the effect of static electricity on long or buried lines.

My invention requires the following arrangements: First, opposing to each other the similar poles of terminal batteries; second, at each station a single contact-key, the anvil of which connects with the ground, while its lever connects with a wire, at the end of which is a plug, the use of which will be explained hereafter; third, series of bobbins, of suitable resistances, forming a continuous circuit of unvariable resistance; their purpose will also be explained; fourth, exposing the parts of wire which connect these resistances to each other. Each of these exposed parts is connected with a pin, and these pins are fixed in succession on the cover of a box containing the bobbins, so that the plug may cover any one of the pins.

My apparatus is constructed and operated upon the combination of two distinct principles: First, the depressing the key of home-station, whereby the current of home-battery is localized, and current from distant battery is drawn through the line to home-station and through home-key; and, second, the proper use of a rheostatic balance placed around the home receiving-instrument.

By this arrangement, so much of the current of the home-battery as tends to pass through the receiving-instrument in one direction balancing so much of the current from the distant battery which tends to pass through the instrument in an opposite direction, an equilibrium is maintained in the receiving-instrument.

The drawing represents a view of the system.

A is a terminal and M is a way station. Z is another terminal station. B is the main

battery at station A. B' is the main battery at station Z. The way-station does not bare, and requires no battery. E, E', and E'' are the receiving-instruments at stations A, M, and Z. On the Morse system, as here exhibited, they are each electro-magnets, provided with armatures *a*, *a'*, and *a''*. K, K', and K'' are single contact-keys for working the line. G is the ground-wire, and L is the line. C and C' are boxes, which hold the coils of resistances. Wires *v* and *w* connect, respectively, the screw-posts *o* and *i* of the relay with the extremities *m* and *n* of the resistances C at station A. The same disposition is made at stations M and Z. The sounder *s* records the sender's own message. It also serves in long or buried lines to so dispose of the extra current of magnetization or demagnetization from the home-battery as to counteract the effect of static discharge or charge-currents in the relay E at A. At station M, when there is little or no effect from static electricity to be counteracted, it can be placed as shown in *s'*. Station Z has a sounder, *s''*.

I will now describe the operation of my system. When at rest and the keys not depressed, the terminal batteries, being opposed, practically neutralize each other. The armature-springs will resist any variations resulting from leakage when no key is depressed. Let key K be depressed at station A. At once two independent and distinct circuits are created, one from each terminal battery. The circuit of the home-battery is localized at station A by means of the circuit through *o* to *q*, passing through key K, as follows: From *o* to plug *p* through two courses—first, through branch *o*, relay E, wire *w*; thence through *n* *p*, largest part of resistances of C; and, secondly, through *o*, wire *v* *m* *p*, and smaller part of resistances in C, through key K to *q*. Both circuits are in common. The circuit of the distant battery B' is through line L, working all the instruments E'' and E' in the main circuit to screw-post at *i* of relay at station A, and from *i* to plug *p*, through two courses—first, through branch *i*, relay E *o*, wire *v*, sounder *s* *m*, and smaller part of resistances of C, to plug *p*; and, secondly, from *i* through wire *w'* *n*, and larger part of resistance-coils of C, to plug *p*. At *p* the branch currents

unite and pass through key K to *q* and ground G. The depression of the key at A completes the circuit of the battery at Z, and destroys the neutralization of currents theretofore existing. The armature of relay at Z is attracted and records message sent from A; but the neutralization in relay E still continues, so that there is no record of the message sent. The plug *p* is so placed that the resistances from *o* to *p* through one branch, and from *i* to *p* through the other branch, bear an inverse ratio to the intensities of current in the receiving-instrument between *o* and *i*. The plug *p* in practice, however, should be placed so that there will be an excess of current from home-battery through *o*, relay E, to *i*, equal to the amount of current produced by leakage when no key is depressed. If, now, while key K is depressed, the key K' should be depressed at station Z, at once current of battery B' becomes localized, and the balance at E destroyed. That part of the current from B tending to move from *o* to *i* is now unopposed by current from B', tending to move from *i* to *o*, in consequence of its localization. The armature at E is therefore attracted and records signal from distant station by this withdrawal of the electric balance.

The working at way-station M is done in a similar way, excepting this only, that the way-station requires no main battery, as it uses the terminal batteries. M working with A will use battery at Z.

I claim as my invention, and desire to secure by Letters Patent—

1. The combination, with opposing terminal batteries, of a rheostatic balance, connected to the line on both sides of a receiving-instrument and to the ground, substantially as set forth.

2. In a duplex or multiple telegraph, the method of causing the relay at the sending station to be unaffected by the operations at that station, by using certain amounts of the currents of terminal opposing batteries to neutralize each other, such amounts being controlled by a rheostatic balance, substantially as and for the purpose set forth.

3. The method of operating a duplex or multiple telegraph by arranging terminal batteries opposed to each other, and localizing the battery at the sending station partly through the instrument at that station, and partly through a circuit outside of such instrument, the portion through the instrument being neutralized, when necessary, by a portion of the current of the distant battery, the relations of these portions of one or both currents being determined by a rheostatic balance, and the signals at either terminal station being given by the withdrawal from such station of the current of the battery of the other station, substantially as described.

4. In a duplex or multiple telegraph, as described, the combination, with the main battery, receiving-instruments, and key, of the series of resistance-coils, for the purpose set forth.

5. The combination, with the rheostatic balance, of the sounder *s*, for the purpose of recording the sounder's own messages, and of counteracting the effect of the momentary current in the receiving-instrument due to the static charge and discharge in long or buried lines at each movement of the key, substantially as described.

GEORGES D'INFREVILLE.

Witnesses:

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