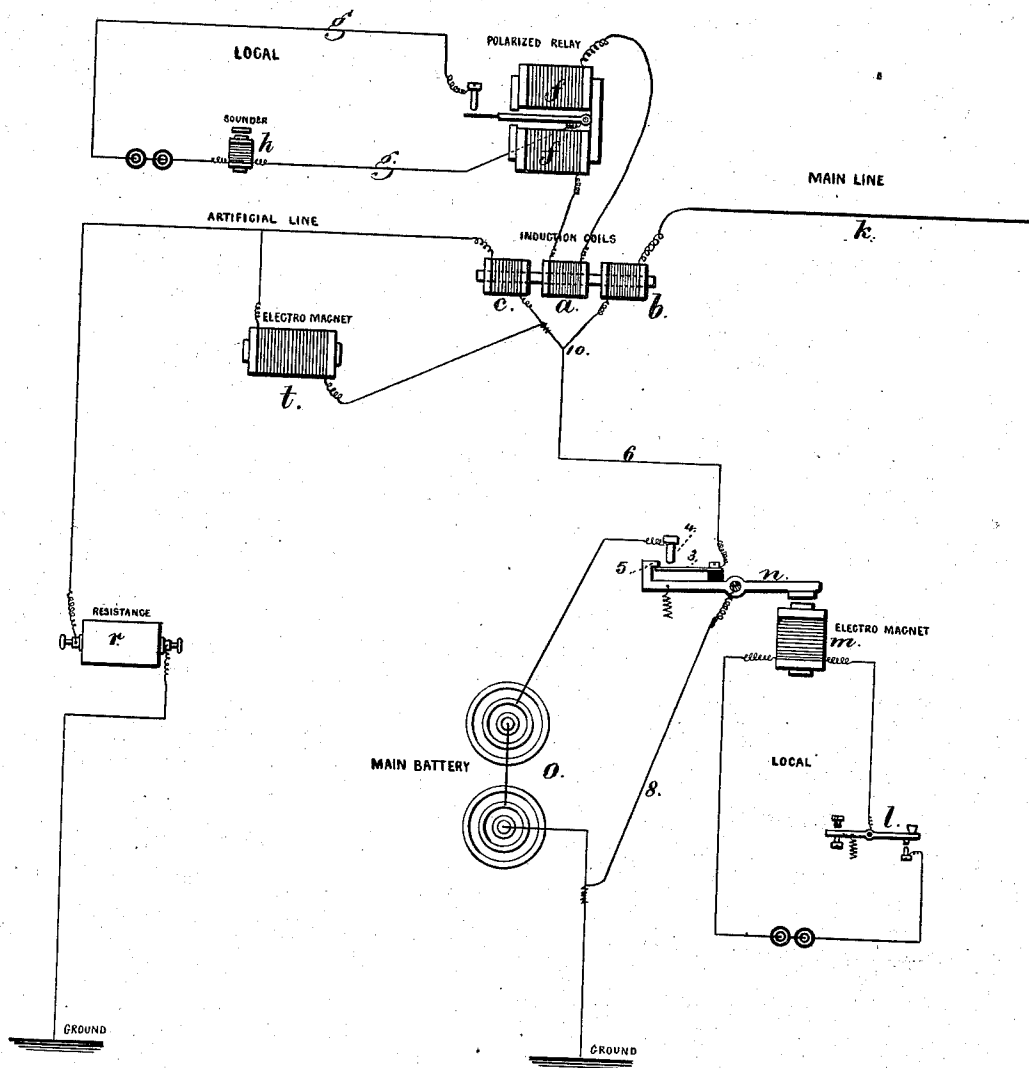


T. A. EDISON.
 DUPLEX TELEGRAPH.

No. 178,221.

Patented May 30, 1876.



Witnesses

Charles Smith
 Harold Snell

Inventor

Thomas A. Edison.
 per Lemuel W. Snell

att'y.

UNITED STATES PATENT OFFICE

THOMAS A. EDISON, OF NEWARK, NEW JERSEY, ASSIGNOR OF ONE-HALF
HIS RIGHT TO GEORGE B. PRESCOTT, OF NEW YORK CITY.

IMPROVEMENT IN DUPLEX TELEGRAPHS.

Specification forming part of Letters Patent No. 178,221, dated May 30, 1876; application filed
September 1, 1874.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Duplex Telegraphs, of which the following is a specification:

I make use of a compound induction-coil, through which the currents pass, and those from the sending-station are balanced, but the current from the distant station is operative.

The helix *a* surrounds the central part of the core that passes through the electro-magnets *b* and *c*; hence a secondary or induced current is set up in the helix *a* only when there is an excess of current in one of the helices *b* or *c*, because if the current acting in *b* is equal to that acting in *c*, and the helices are properly wound, the magnetizing actions of the helices on the core will neutralize each other, and there will not be any secondary or induced current in *a*; but when the current in one helix is greater than that in the other, the core will be magnetized, and a secondary current set up in the helix *a*.

I avail of this feature of the compound differential induction-coil to operate a duplex-telegraph instrument, by causing the current at the sending-station, where this compound differential instrument is placed, to divide and act equally in both *b* and *c*; but when the current from the distant station increases the energy of the helix *b*, then the induction or secondary current set up in the helix *a* magnetizes the core sufficiently to set up a current in *a*.

The current in *a* operates in the polarized magnet *f* to open and close the local circuit *g*, in which is placed the receiving or sounder instrument *h*.

When the pulsation passing along the line *k* from the distant station ceases, the core of the helix *b* demagnetizes, and in so doing sets up a second induced current in *a* of opposite polarity to the first, and that acting in the polarized magnet *f* instantly throws the contact-point of the armature the other way and opens the local circuit.

These operations in the compound differential induction-coil being borne in mind, it now becomes necessary to explain the manner of sending through such coils without producing any action on the helix *a*.

The key *l* in the local circuit to the magnet *m* operates the lever *n*, that contains an insulated spring-closer, 3, acting against the circuit-point 4, and the hook end 5 of the lever *n*, so that when the key *l* is closed, the lever *n* moves the spring 3 into contact with 4, closing the circuit from the battery *o*, through 4 3 and the wire 6, to the helices *b* and *c*, and at the same time breaking the contact of 3 and 5, and hence cutting out the ground-wire 8 from the lever *n*; but the moment the lever *n* returns to its normal position by the demagnetizing of *m*, the spring 3 closes the circuit at 5, just before separating from 4; hence there is always a metallic circuit complete for the pulsation coming from the distant station, whether the circuit of the sending-battery *o* is opened or closed.

In order to balance the action of the sending-current, that divides at 10, and passes through *b* and *c*, I introduce, in connection with the helix *c*, an artificial line equal in resistance and conditions to the line *k*, hence compelling an equal current to pass through *b* and *c*. To effect this the resistance *r* is placed in the ground-connection from *c*, which resistance should be adjustable, so that the rheostat or resistance *r* equals the line; and in order to set up in *c* a counter magnetism equal to that set up in *b* by the static from the line, I make use of the electro-magnet *t*, placed in a shunt that passes around *c*.

By this construction of compound differential induction-coil, and the arrangement of the connections, the inductive effects of pulsations from the sending-instrument are balanced and neutralized, while the pulsations from the distant station operate the receiving-instrument.

I claim as my invention—

1. The compound differential induction-coils *a b c*, in combination with the polarized relay *f* and the circuit-connections, substantially as set forth.

2. The artificial line, composed of the rheostat *r* and magnet *t* and ground-connection, in combination with the compound induction-coil and line-connections, substantially as set forth.

Signed by me this 19th day of August, 1874.
THOS. A. EDISON.

Witnesses:

CHAS. H. SMITH,
GEO. T. PINCKNEY.