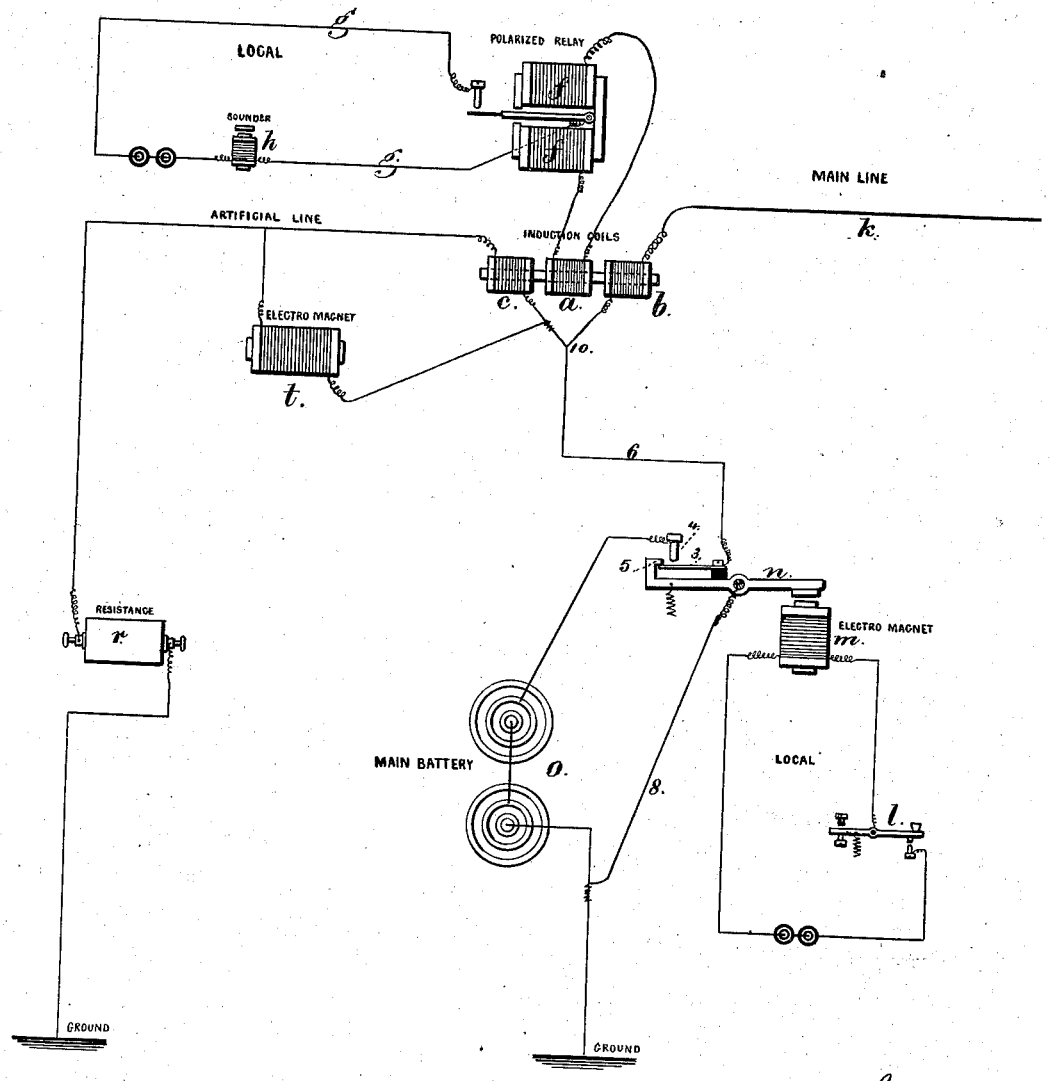
T. A. EDISON.

DUPLEX TELEGRAPH.

No. 178,221. Patented May 30, 1876.



Witnesses

Chas. H. Smith

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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.