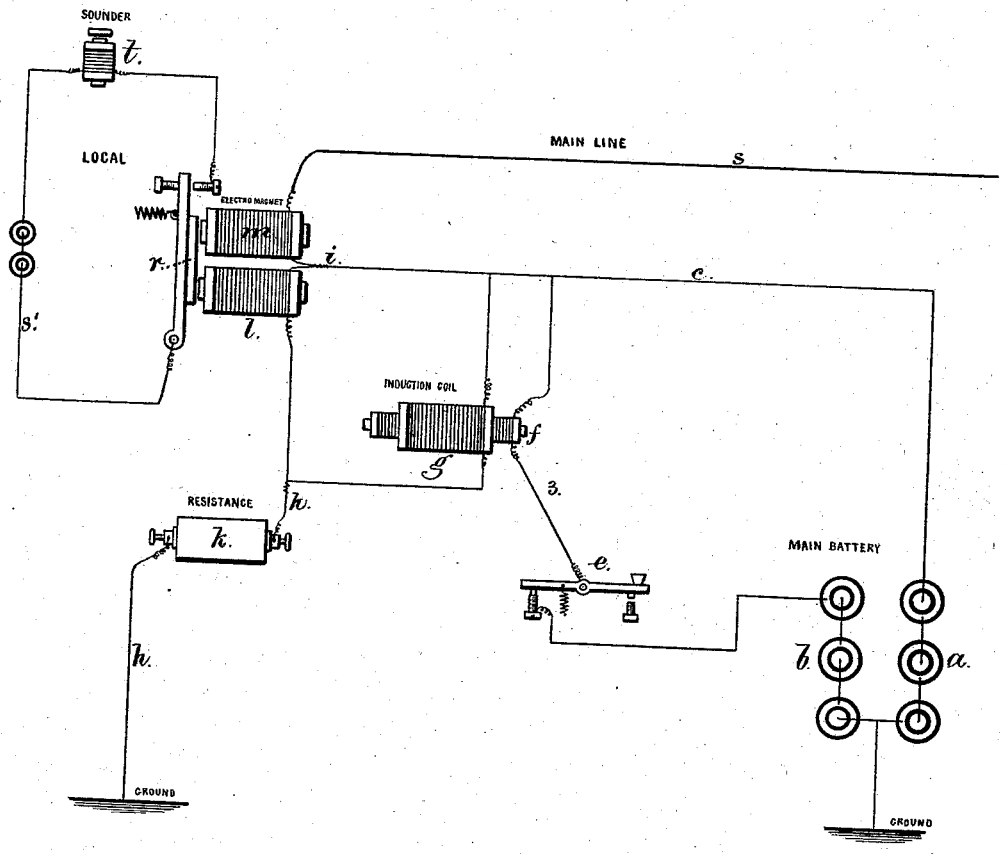
T. A. EDISON.

DUPLEX TELEGRAPH.

No. 178,222. Patented May 30, 1876.



Witnesses

Chas. H. Smith

Harold Serrell

Inventor

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per Lemuel W. Serrell

atty.

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. **178,222**, 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:

A balanced battery is used for transmitting when the balance is disturbed. An electro-magnet is used, through which both the received and transmitted pulsations pass, and the connections are made so that the action of the current sent is balanced, while that coming from the distant station is operative, to work a balanced relay and local circuit or sounder.

In the accompanying diagram drawing, the battery *a b* is connected at an end to the line-wire *c*, at the other end to the closed key *e*, and in the middle to the ground. The connection 3, from the key *e* to the line *c*, passes through the induction-coil and core *f*, and there is a second induction-coil, *g*, around the coil *f*, that is in a shunt between the line-connection *c* and the branch *h* to the ground, in which branch *h* there is a resistance, *k*, that is adjustable.

The line-connection *c* bifurcates at *i*, passing one way through the helix *l* to the ground-branch *h*, and the other way through the helix *m* to the main line *s*. The electro-magnet *l m*, being wound in the usual way, will not respond when the connection is made in the middle, because the current passing from *c* goes one way through one helix, and the other way through the other, polarizing the cores, so that the armature *r* is not attracted.

It is important that the resistance of the branch *h* and rheostat *k* should be about the same as that of the main line *s*, so as to cause the current to divide equally at *i*.

It will now be understood that any current from the distant station passing through the magnet *m*, in the usual direction, will cause the armature to respond, whether there is any current passing through the helices or not from the sending-station, and this electro-magnet *m* and armature act as a relay to operate the local circuit *s'* and sounder *t*.

The main battery, it will be seen, is in a local circuit when the key *e* is closed; hence, if both sides are equal, there is no current passing upon the main line; but when the key *e* is open the local circuit is broken, and the portion *a* of the battery sends the pulsation through *l* and *m*, and upon the line *s*, to the distant station, where the pulsation passing through *m* operates the local and sounder or receiver, the portion through *l* returning to *a* through the branch *h* and ground.

When the key *e* is closed the induction-coil *f* is charged, and it discharges when the key *e* is opened. The helix *g*, that has been charged by induction, also discharges, and sets up in *l* a current that equals that resulting from the static charge of the line, and the reverse currents are produced in the induction-coils as the circuit is closed at *e*. Thus such induction-coils serve to neutralize or balance the effect of the static charge, and prevent any false pulsation on the main line resulting from the return static charge acting in *m*.

It will be apparent that the closing of the key *e* and the connecting of the battery *b* with the line tends to set up in the line and to earth currents of opposite polarity to those resulting from the battery *a*, because the positive of the one and the negative of the other are to the ground and line, respectively, and this local circuit (*c a 3 e b*) serves to maintain an unbroken connection, that offers but little resistance to the pulsation from the distant instrument passing to the earth, and the resistance is nearly uniform to the current received, whether there is a current that is being sent or not.

I claim as my invention—

The battery *a b* in a local circuit, connected to the line, in which is a circuit-breaker, a finger-key, in combination with the magnet *l m*, branch *h*, and resistance *k*, and the induction-coils *f g*, the parts operating substantially as set forth.

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

THOS. A. EDISON.

Witnesses:

CHAS. H. SMITH,

GEO. T. PINCKNEY.