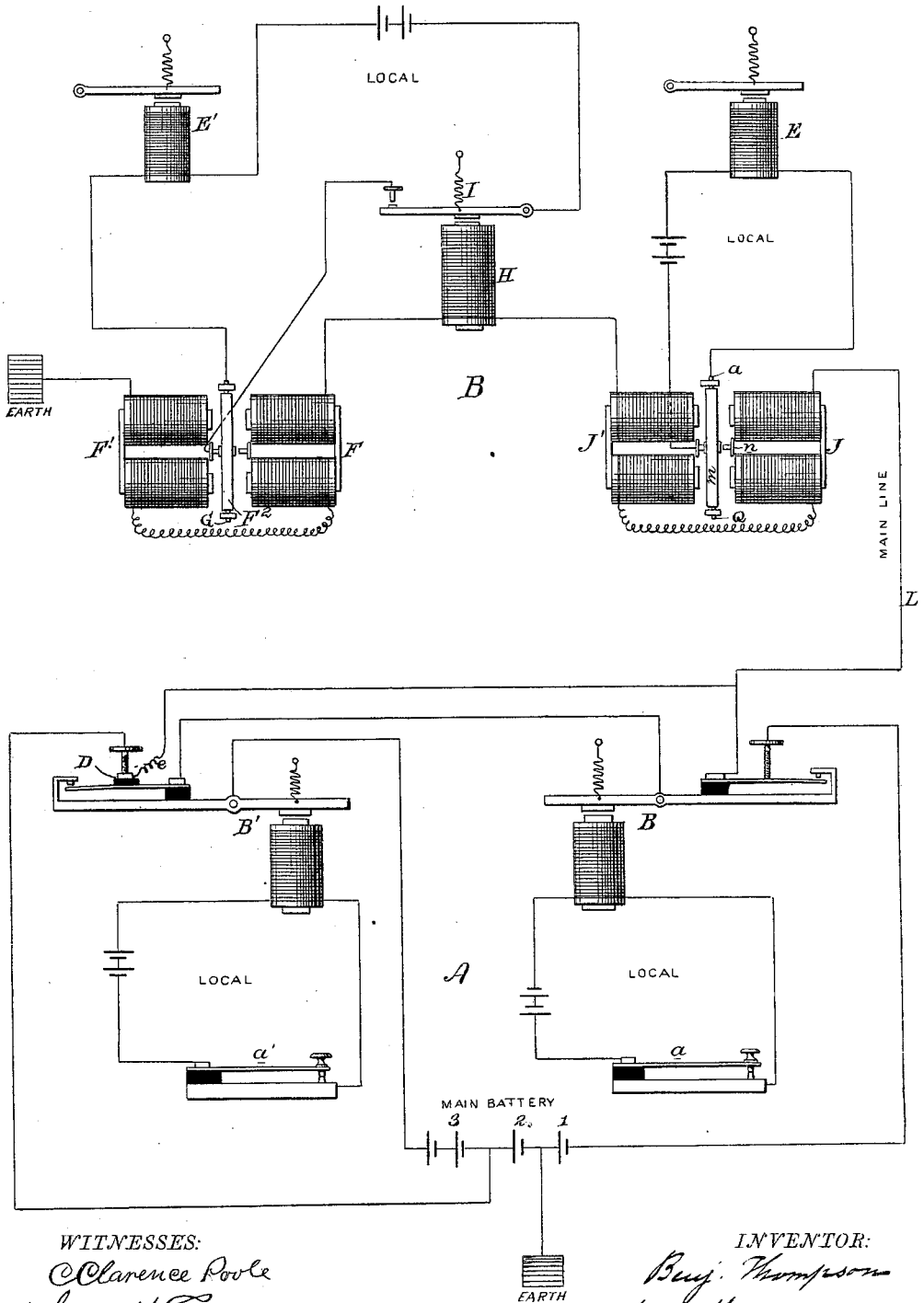
B. THOMPSON.

Quadruplex Telegraphs.

No. 196,057. **Patented Oct. 9, 1877.**



WITNESSES:

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UNITED STATES PATENT OFFICE.

BENJAMIN THOMPSON, OF TOLEDO, OHIO.

IMPROVEMENT IN QUADRUPLEX TELEGRAPHS.

Specification forming part of Letters Patent No. **196,057**, dated October 9, 1877; application filed November 25, 1876.

To all whom it may concern:

Be it known that I, BENJAMIN THOMPSON, of Toledo, in the county of Lucas and State of Ohio, have invented a new and useful Improvement in Telegraphing; and I do declare that the following is a true and accurate description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, and being a part of this specification, in which are shown the two ends of a line, with the transmitters and receiving-relays and sounders only.

The nature of this invention relates to certain improvements in the art of telegraphy, by means of which two messages may be simultaneously transmitted over a single wire in the same direction; and it consists in the peculiar arrangement of batteries and transmitters at the home-station, substantially as hereinafter described, in combination with the relays at the opposite end of the line.

In the drawings, *a* and *a'* are ordinary Morse keys, of the usual construction. B is an ordinary duplex transmitter, and B' is a similar instrument, with the addition of a spring, *c*, which is insulated from the spring below it by means of the insulator D. 1, 2, and 3 represent a main battery, placed permanently to earth at E. This battery is divided into three parts, of different intensities, 1 being a positive battery, and 2 a negative, and both being of equal intensity, but of opposite polarity, while 3 is a negative battery of double the intensity of part 2. A line connecting the stations marked "station A" and "station B" is indicated by the letter L. At station B, E and E' are ordinary Morse sounders. F and F^1 is a polarized relay, its armature F^2 being a permanent magnet, which is poised in a pivot at G. H is an ordinary Morse relay, except that its local points are run through the back of the tongue of the relay instead of on the front, as in the ordinary Morse relay. I is a spiral spring, which is attached to the armature of the relay H to regulate its adjustment. J and J' is a polar relay, of the same pattern as the relay F and F^1.

If the operators at station A have their keys closed, no battery passes to the line, as batteries 1 and 2 are short-circuited at the home-station, the relays at station B being adjusted so that the armature of the polar relays F and F^1 and J J' shall, by their own attraction, close the circuits of the batteries which operate sounders E and E'. This is accomplished by placing armature F^2 nearer the core of F^1 than F; the relay J J', being adjusted the same, remains closed. Now, if the operator at station A opens the key *a'*, which discharges transmitter B', (B being closed,) plus battery 1 is placed to line. This battery, on reaching station B, causes armature F^2 of relay F F^1 to fall back on its insulated point, breaking the local circuit of sounder E', and it instantly opens without affecting relay H, as the spring I is adjusted above its influence; nor does it affect sounder E, as it induces an effect on the armature of relay J J' which tends to hold its local points closed. Now, if the operator at key *a'* at station A closes his key, the batteries 1 and 2 are instantly short-circuited, and the main line discharged. This being the case, armature F^2 instantly moves toward F^1 and closes local sounder E'.

When the operator at key *a* at station A opens his key the transmitter B is instantly discharged, and battery 2 is placed to the line through transmitter B'. It being closed, this battery, on reaching station B, and being of an opposite polarity, causes relay J J' to repel its armature *m* to the insulated point *n*, which breaks the circuit of sounder E, but does not affect sounder E', as it produces an effect on relay F F^1 which tends to hold armature F^2 quiet. This battery not being of sufficient strength to overcome the tension of the spring I of relay H, the circuit of local battery through sounder E' is not affected. Now, if the operator at the home-station A, at key *a*, closes his key, batteries 1 and 2 are instantly short-circuited, and the main line discharged. The armature *m*, balanced on pivot Q, being adjusted nearer J' than J, instantly closes the circuit of sounder E.

When both operators at home-station A open their keys *a* and *a'*, the same instant batteries 2 and 3 are placed to line through the back contact-points at 4 and 5. This battery, on reaching station B, opens the circuit of sounder E by repelling armature *m* of relay J J', and also opens the circuit of sounder E' by overcoming the tension of spring I of relay H,

said spring being adjusted for this purpose, the local of sounder E′ being run through the back contact-points of relay H, as well as through local points of F F¹, when this latter relay and H are worked together to produce signaling on sounder E. Now, if both operators at home-station A close their keys together at the same instant, the line is instantly discharged by the breaking of main batteries 2 and 3, and the short-circuiting of batteries 1 and 2 and sounders E and E′ instantly close.

When the operator working transmitter B′ is working alone, while transmitter B is open, relay J J′ does not affect sounder E, as the minus parts 2 and 3 tend to always hold armature *m* against insulated point *n;* but as parts 2 and 3 combined pass to line when the operator at key *a′* opens, spring I being overcome by this combined force of 2 and 3, the local circuit of sounder E′ is broken, and the sounder opens. Now, if the same operator closes his key, he places battery 2 to line; this not being sufficiently strong to hold spring I, it falls back and closes the circuit of sounder E, as before described. Relay F F¹ is not excited by a plus-battery, no matter how great the intensity. This arrangement goes on so long as the operator at key *a′* is working alone and key *a* is open.

When the operator at key *a* is working alone, and key *a′* is open, the instant that the operator at key *a* opens his key the combined force of parts 2 and 3 pass to line, overcoming the tension of the spring I of relay H, and holds circuit of sounder E′ open, and at the same time opening the circuit of sounder E. Now, if the same operator closes his key, parts 2 and 3 are detached, and part 1 placed to line. Relay H, being longer in the core than relay F F¹, is slower in discharging than relay F F¹. This allows time enough for part 1 to have repelled the armature F² against its insulated point before relay H has released its armature and fallen back and connected with the local points. Therefore the sounder E′ is never affected by the operator at key *a*.

It will readily be seen that by extending the arrangement which I have described, so that by neutralizing the currents from the home-office, not only may two messages be sent from, but may be received at, the same office simultaneously with each other.

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

1. The combination, with the line-battery 1 2 3, of the transmitters B and B′, having connections substantially as shown, whereby, when B and B′ are both open, they shall provide a path for sections 3 and 2 to line; when B alone is closed, it shall cut out 3 and 2 and throw 1 to line; when B′ alone is closed it shall cut out section 3 and provide another path for 2 to line; and when B and B′ are both closed, sections 2 and 1 shall be short-circuited, section 3 being at the same time cut out.

2. The herein-described system of duplex working, embodying at the transmitting end of the line two transmitters, which, when open, shall throw upon the line a normal current of determinate strength and polarity; when closed separately, a current of diminished strength, and of a polarity depending upon the key operated; and when closed simultaneously, shall short-circuit, or cut out all the sections of the battery; and at the receiving end of the line a neutral relay, adjusted to respond only to the normal current, and two oppositely-polarized relays, adjusted to respond to both the normal and diminished currents of proper polarity, with sounders and local batteries having connection to the back stops of said neutral and polarized relays.

3. The combination of polarized relays F F² and J J′ and neutral relay H, adjusted to respond only to the current normally upon the line, with sounders E and E′ and their local batteries, one connected to the back stops of relays H and F F¹, and the other to the back stop of relay J J′, substantially as and for the purpose set forth.

BENJAMIN THOMPSON.

Witnesses:
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JOHN D. DENISON.