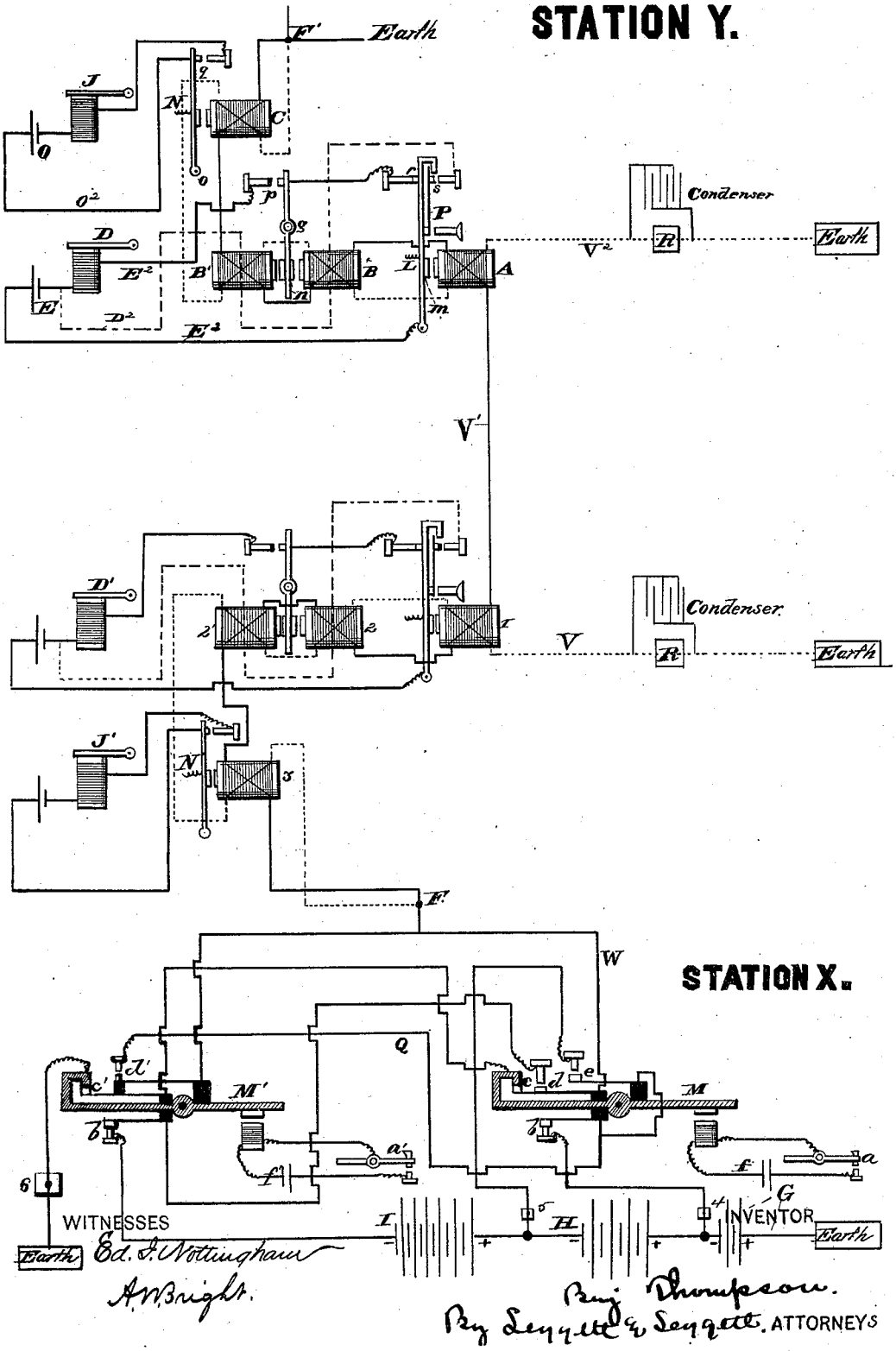
B. THOMPSON.

QUADRUPLEX TELEGRAPHS.

No. 195,055. Patented Sept. 11, 1877.



UNITED STATES PATENT OFFICE.

BENJAMIN THOMPSON, OF TOLEDO, OHIO.

IMPROVEMENT IN QUADRUPLEX TELEGRAPHS.

Specification forming part of Letters Patent No. **195,055**, dated September 11, 1877; application filed January 5, 1877.

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 certain new and useful Improvements in Quadruplex-Telegraph Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to improvements in quadruplex-telegraph apparatus; and consists in the combination, with a series of batteries arranged for different intensities, of a peculiar construction and arrangement of transmitters, and a new combination of differentially-wound magnets and armatures, operating on the principle of the increase and decrease of electro-motive force of the same polarity, so that four separate telegrams can be transmitted on a single wire simultaneously, two messages each way, as will hereinafter be more fully specified and claimed.

In the accompanying drawing, G, H, and I are batteries, which may be all of the same intensity or of different intensities, one, two, or all of which can be brought into line, according to the intensity of current required, and are all of the same polarity. M and M′ are two transmitters, the former of which is provided with three upper contact-points, *c d e*, and lower contact-points *b*, the latter with two upper points, *c′ d′*, and lower point *b′*. Each has its key and local battery *a f* and *a′ f′*, respectively.

The relay at station X comprises the differentially-wound magnets 1, 2, 2′, and 3, for sounding the signals at D′ and J′, each wound with two coils of fine wire of equal size and resistance, so that two currents passing through the same in opposite directions will produce no effect on the cores thereof.

Magnets 2 and 2′, the cores of which are, of course, of soft iron, so as to be perfectly neutral or free from permanent magnetism, are, in addition, wound with a third or outer coil of coarser wire, or what is known as ordinary "sounder-wire," the purpose of which will hereinafter appear.

The relay at station Y, or receiving-station, is in every respect an exact duplicate of that at station X, as shown in the drawing.

The arrangement of batteries and transmitters is also the same at both stations, that at station X only being shown.

The magnet A, like C, is an ordinary differential relay, except that it is provided with local points *r* in the back of the relay-tongue, as well as with the points *s* in the front thereof, and its armature *m* is of soft iron. It is also provided with the spring P, the purpose of which will hereinafter be explained. *n* is a polarized armature, pivoted at *g*, and provided with contact-points *p*. It is arranged between the two relay-magnets B and B′, and adjusted nearer to the latter than to the former, so that points *p* will be open when there is no battery on the line. D and J are sounders, and E and O are the local batteries, respectively, of said sounders. L and N are springs of different tension, the former of greater tension than the latter.

When the operator at station X closes key *a* contact is broken at points *b* and *c* and made at points *d* and *e* of the transmitter M, and main battery G, H, and I is therefore placed to line by way of *b′* of transmitter M′ and *d* of transmitter M. Thus the entire electro-motive force, all of the same polarity, of the three said batteries is obtained. This battery, by line W, divides at binding-post F, and passes by lines V and V′ through magnets 1, 2, 2′, and 3, in opposite directions, producing no effect on the cores of the home-relays, the rheostat R on line V being adjusted to oppose the same resistance to the current as the main line V′ from station X by station Y to earth does. Thus no signal is sounded on sounders D′ and J′ of the home-station X. This current, on reaching station Y by line V′, being of great intensity, overcomes the tension of springs L and N, and attracts armature *m* of relay-magnet A, armature *n* of relay-magnets B and B′, and armature *o* of relay C, sounding the signal at sounder J; but it does not affect sounder D, as the current of local battery E is broken at back contact-points *r* of relay A before it is made at points *p* of relay B and B′. At the same time that the current is broken at points *r* contact is made at the points *s* of

the relay-tongue A, and the current of local battery E is therefore shunted through the third or outer coils of B and B′. This current, passing through said relay B and B′ in an opposite direction to the main current, renders the relay B B′ neutral, and therefore the signal is sounded only at sounder J. The spring P of the relay-tongue of magnet A is intended to control the duration of the current of local battery E through the third coil of magnets B and B′, so as to render the relay neutral slightly longer while the large battery I, H, and G is on the line, thus allowing the line time to discharge before the current of local battery E has discharged through the third or outer coils of magnets B and B′.

When the operator at station X closes key a' points d' of transmitter M′ are brought in contact, and contact at points b' and c' is broken. This places only battery G to line through points b of transmitter M and d' of transmitter M′, cutting out of line batteries H and I. The current from this battery passes through the coils of relay-magnets 1, 2, 2′, and 3 in opposite directions, as hereinbefore described, and produces no sound at the home-station X, but, on reaching station Y, excites relay-magnets B and B′ sufficiently to cause armature n to connect points p, thus completing the circuit of local battery E, and sounding the signal on sounder D. It does not, however, affect relay-magnets A and C sufficiently to overcome the tension of springs L and N, thus the local battery E is not shunted, as in the case before described, neither is signal sounded at sounder J.

When the operators at station X close both keys a and a' simultaneously, batteries G and H are placed to line through points e of transmitter M, wire Q, and points d' of transmitter M′, thus cutting out battery I, as contact at b' is broken. This current divides at binding-post F, as before described, producing no signal at the home-station, but on reaching station Y is sufficiently powerful to overcome the tension of spring N of relay C, but not of spring L of relay-magnet A. Thus the signals are sounded on both sounders D and J.

Thus the closing of key a operates a relay with a large battery, the closing of key a' operates a relay with a small battery, and the closing of both keys a and a' simultaneously operates two relays with a battery of electromotive force between the two extremes.

K is a condenser, which is used to neutralize the static charge of the main line. The small resistances 4, 5, and 6 are used for the purpose of equalizing the resistances of the different batteries, and also when the batteries are off and the earth on the line, through points c of transmitter M, points c' of transmitter M′, and resistance 6.

In the drawing, V^1 represents the main line, which passes through all the relay-magnets, both at the sending and receiving station. V represents the ground-wire, which passes through all the relay-magnets at the home or transmitting station, and by which a current is sent through said magnets in an opposite direction to the current which passes over the main line. V^2 is the ground-wire at the receiving-station, which passes through all the relay-magnets at said station, and serves the same purpose as the ground-wire at the home-station. E^2 and O^2 represent the local-battery circuits, by which sounders D and J are operated. D^2 represents the shunt-circuit, which, when closed, prevents the sounding of sounder D. The contact-point of armature o is represented by q. Beyond the binding-post F′ of the receiving-station, which corresponds to the binding-post F at the transmitting-station, are placed the transmitters (not shown) of said receiving-station, which are, in every respect, like those at the home-station.

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

1. In a quadruplex-telegraph apparatus, a line wire, ground-wire, and shunt-circuit for a local battery, in combination with a set of magnets, their cores wound with three coils of wire, and a polarized armature pivoted between said magnets, and relatively so placed as to cause its contact-point to be open when there is no current on the line, substantially as and for the purpose described.

2. In a quadruplex-telegraph apparatus, a line-wire, ground-wire, local-battery circuit, and a shunt-circuit for local battery, in combination with a set of magnets, their cores wound with three coils of wire, a polarized armature pivoted between the same, and relatively so placed as to cause its contact-point to be open when there is no current on the line, and a magnet or set of magnets wound with two coils of wire, which operate an armature provided with front and back contact-points, and with a spring of sufficient tension to be overcome only by the united action of all the batteries, substantially as and for the purpose described.

3. In a quadruplex-telegraph apparatus, a line-wire, ground-wire, local-battery circuit, and shunt-circuit, in combination with a set of magnets, their cores wound with three coils of wire, a polarized armature pivoted between the same, and relatively so placed as to cause its contact-point to be open when there is no current on the line, and a magnet or set of magnets wound with two coils of wire, which operate an armature provided with front and back contact-points, with a spring of sufficient tension to be overcome only by the united action of all the batteries, and with a contact-controlling spring, whereby the duration of the local-battery current through the shunt-circuit is controlled, substantially as and for the purpose described.

4. In a quadruplex-telegraph apparatus, a line-wire and ground-wire, in combination with a set of magnets, their cores wound with three coils of wire, a polarized armature pivoted between the same, and relatively so placed as to cause its contact-point to be open when there

is no current on the line, a magnet or set of magnets wound with two coils of wire, which operate an armature provided with front and back contact-points, and with a spring of sufficient tension to be overcome only by the united action of all the batteries, and a magnet or set of magnets, wound with two coils of wire, which operate an armature provided with a suitable contact-point, and controlled by a spring of sufficient tension to be overcome by the united action of batteries G and H, substantially as and for the purpose described.

5. The combination, in a quadruplex-telegraph apparatus, with the line-wire V^1, ground-wire V^2, shunt-circuit D^2, and local-battery circuit E^2, of the magnets A B B′, wound as described, and the armatures *m* and *n*, provided with contact-points *r*, *s*, and *p*, substantially as and for the purpose described.

6. The combination, in a quadruplex-telegraph apparatus, with the line-wire V^1, ground-wire V^2, local-battery circuit E^2, shunt-circuit D^2, and local-battery circuit O^2 of the magnets A, B, B′, and C, wound as described, and the armatures *m*, *n*, and *o*, provided with contact-points *p*, *q*, *r*, and *s*, substantially as and for the purpose described.

7. In a quadruplex-telegraph apparatus, the transmitter M, provided with contact-points *b*, *c*, *d*, and *e*, substantially as and for the purpose described.

8. In a quadruplex-telegraph apparatus, the combination of the transmitter M, having contact-points *b*, *c*, *d*, and *e*, with the transmitter M′, provided with contact-points *b′*, *c′*, and *d′*, substantially as and for the purpose described.

9. In a quadruplex-telegraph apparatus, the combination of transmitter M, having contact-points *b*, *c*, *d*, and *e*, and transmitter M′, provided with contact-points *b′*, *c′*, and *d′*, with a battery arranged to give three different intensities, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

BENJAMIN THOMPSON.

Witnesses:
JAMES KELLEY,
W. J. KELLEY.