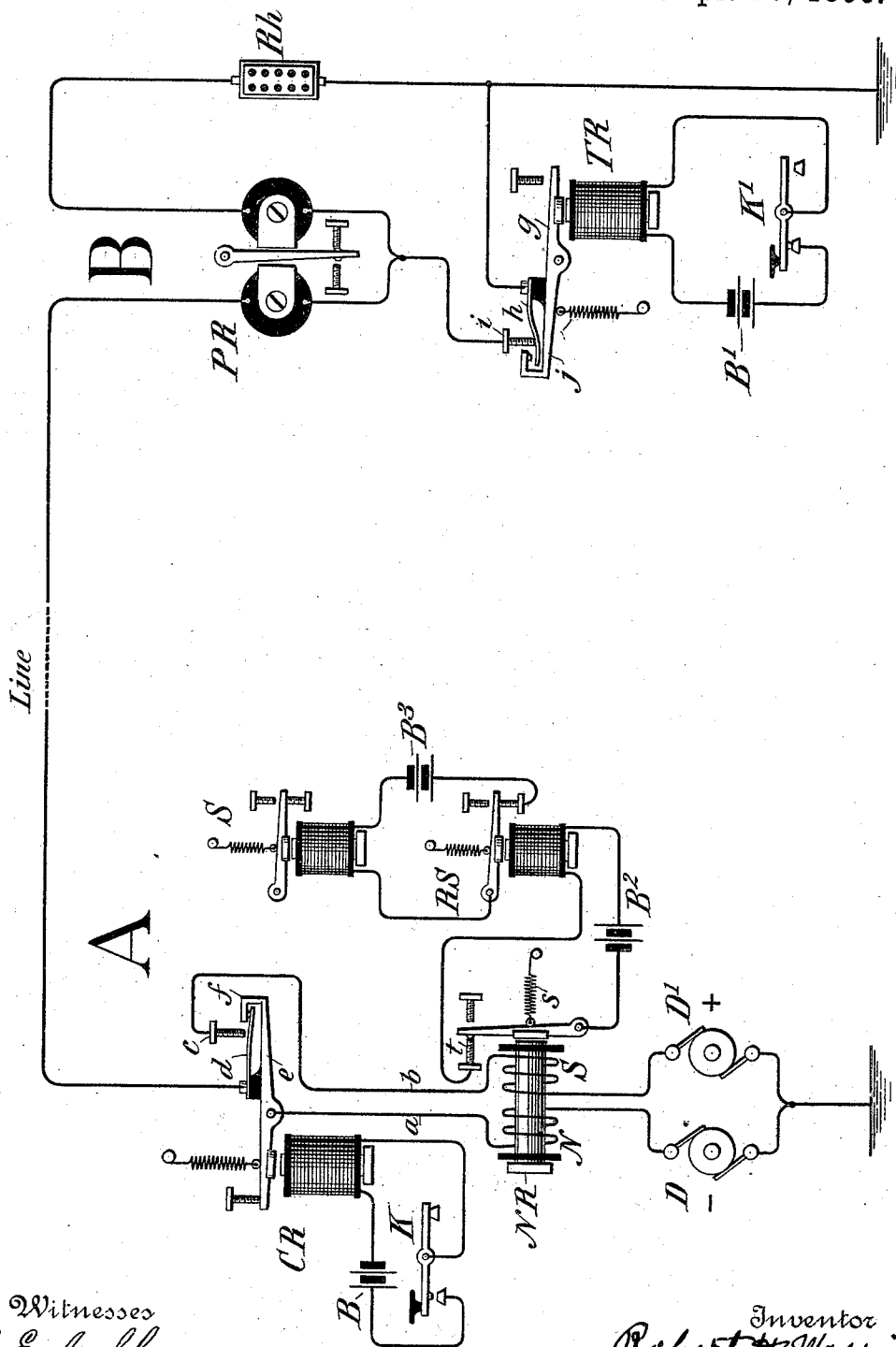


(No Model.)

R. H. MORRIS.
TELEGRAPHY.

No. 537,644.

Patented Apr. 16, 1895.



Witnesses
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TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 537,644, dated April 16, 1895.

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To all whom it may concern:

Be it known that I, ROBERT H. MORRIS, a citizen of the United States of America, residing at Roselle, county of Union, and State of New Jersey, have made a new and useful Improvement in Telegraphy, of which the following is a specification.

My invention relates to that form of duplex telegraph in which signals are produced from one station by a reversal of current, and from the opposite end by changes in line resistance produced by a key at such station. I am aware of United States patent of T. A. Edison, No. 162,633, dated April 27, 1875, and do not therefore wish to claim broadly a duplex system of this character.

The object of my invention is to adapt the more familiar form of telegraph instruments to the organization of such a system; and to thus render it possible to obtain from standard instruments usually found at the larger telegraph offices or for sale by dealers in telegraph supplies sufficient parts to equip a line with this desirable form of duplex. By this means a duplex may be organized, when needed, from instruments at hand to form a system of great simplicity, which is not only inexpensive owing to the omission of many parts that are indispensable in the ordinary differential forms, but is practically independent of those adjustments that in the other types are difficult and beyond the skill of the usual operator at small stations.

Referring to the accompanying drawing, which illustrate a diagram of the circuits a neutral differential relay NR is employed at station A in place of the double relay shown in the Edison patent. The differential coils are respectively joined to dynamos D, D', from which issue positive and negative currents, and are continued by wires *a*, *b*, to the transmitter CR. When the key K is open as shown, hook *f* upon lever *e* withdraws spring *d* from stop *c* and the circuit is completed through wire *a* to the dynamo D, giving a minus current. When K is closed, dynamo D' directs a positive current through the other relay coil and thence through the wire *b* to line. In both positions of key K, equal currents flow through the coils of NR, and no signal is given, inasmuch as the negative cur-

rent from D passes in such a direction through the relay coil with which it is joined that the same magnetic polarity in the core is produced as by the positive current in the oppositely wound coil from dynamo D'. The operation of key K at station A therefore produces no effect upon relay NR, but its action does reverse the main-line current and thereby actuates the polar relay PR at station B, causing it to reproduce messages sent from A. Relay NR is only responsive to reproduce signals sent from B, and this is done by key K' and transmitter TR, which by the movement of the latter inserts and removes from line the rheostat R/h. When key K' is depressed, R/h is short-circuited, thus causing the current from station A to be increased and to operate relay NR. When K' is not depressed, the shunt branch is broken, since hook *j* of lever *g* withdraws spring *h* from contact *i*.

Obviously, with the arrangement shown at station A, while the two batteries or dynamos D, D', are alternately connected to line to effect a reversal of current for operating a polarized relay at station B, there is no interference with NR as the magnetism produced in its core is always of the same polarity. It is also clear that what is generally known as the kick in a neutral relay during current reversals must be practically avoided. At station B it will be seen that PR is so arranged with reference to rheostat R/h that, when K' is closed the increased current has a path through only one of the two differential coils. When, however, K' is open and RH is in line and the current correspondingly diminished the circuit is completed through both coils. Thus the polar relay is caused to operate with substantially equal strength whether the current on the line is weak or strong. For convenience of illustration relay PR is shown as two oppositely acting magnets with one interposed tongue. The relay, however, is of the ordinary form in which the differential windings are wound side by side upon both cores.

In this system relay PR is of the ordinary polarized form, and it, like NR of station A, may be taken from the apparatus employed in the various quadruplex or duplex systems.

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

1. In a duplex telegraph system in which signals are transmitted from one end by current reversals, and from the other by changes in line resistance, the combination of a differential relay having a single core, two batteries of different polarity at the same station, a key for changing from one battery to the other, a polar relay at the other station, and a rheostat and transmitting key at the same station, as and for the purpose set forth.
2. In a telegraph system the combination of a neutral relay and a current-reversing key at the same station, said neutral relay being provided with oppositely-wound coils which are joined, one with a positive and the other with a negative generator, as and for the purpose set forth.
3. In a telegraph system the combination of

a differentially-wound relay, two generators one positive and the other negative, a main line, and a key for connecting said main line alternately to said generators, as and for the purpose set forth.

4. In a duplex telegraph as described, a current reverser at one station, a polar relay at the other provided with differential windings, the two coils of which are normally in series, a rheostat also normally in series with said differential windings, and a key and bypath or shunt for short-circuiting one of the differential coils of said relay and said rheostat during the transmission of signals, as and for the purpose set forth.

ROBERT H. MORRIS.

Witnesses:

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