

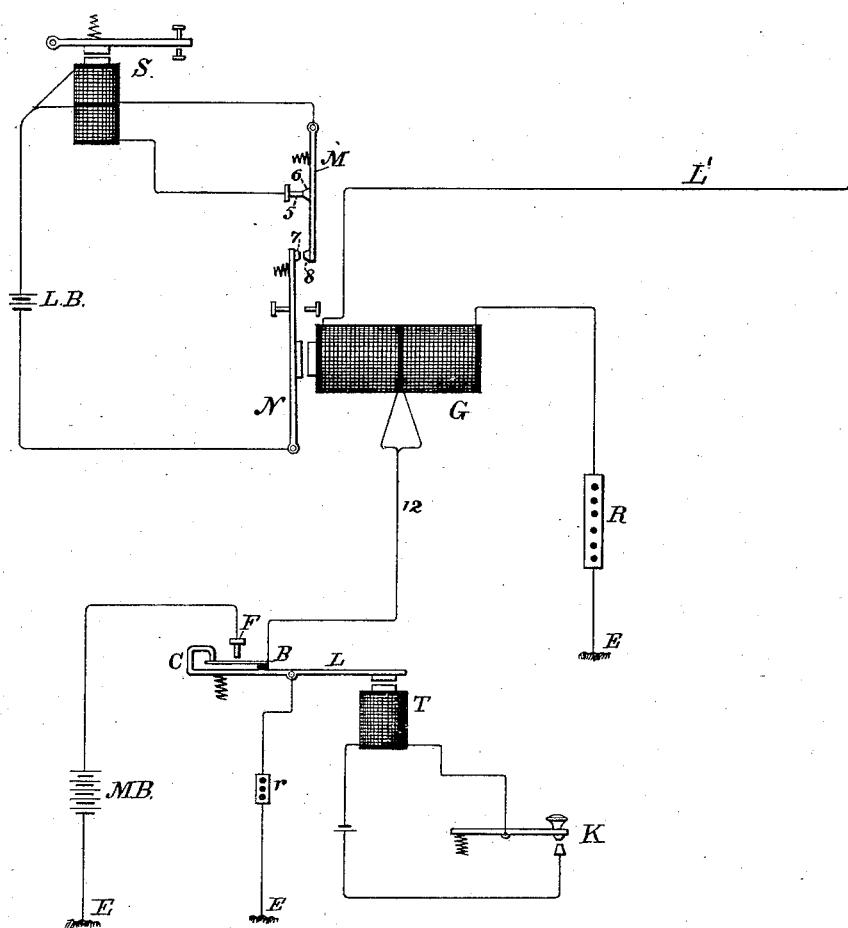
(No Model.)

B. THOMPSON.

DUPLEX AND MULTIPLEX TELEGRAPH.

No. 264,372.

Patented Sept. 12, 1882



ATTEST:

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DUPLEX AND MULTIPLEX TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 264,372, dated September 12, 1882.

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To all whom it may concern:

Be it known that I, BENJAMIN THOMPSON, a citizen of the United States, and lately a resident of Toledo, in the county of Lucas and State of Ohio, but now a resident of Buffalo, Erie county, New York, have invented certain new and useful Improvements in Duplex and Multiplex Telegraphs, of which the following is a specification.

My invention relates to telegraphic apparatus designed for the simultaneous transmission of messages in opposite directions over the same wire; and the object of my invention is to obviate the disturbing effects upon the receiving-instruments which accompany the charge and discharge of the main line.

In all duplex and multiplex telegraphs in which the outgoing signals are prevented from affecting the receiving-instruments at the home station by the employment of an artificial line the resistance of which is adjusted to correspond to that of the main line, so that the currents for outgoing signals shall divide equally between said lines, an obstacle to correct working arises from the fact that at the beginning of the outgoing signal more current flows to the main line than through the artificial line, although after the current is fully established it will flow in properly-proportioned quantities. Owing to this momentarily greater flow to line the receiving-instruments at the home station are often caused to give a false signal. A greater difficulty is that caused by what is known as the "static discharge of the line," which also causes false signals.

My aim is to overcome the above difficulties by a simple arrangement of the receiving-instruments, and without recourse to condensers and artificial arrangements for producing in the artificial line a static capacity and static discharge resembling that of the main line.

In carrying out my invention I employ a differentially-wound reading-sounder, and for the front contact of the relay-armature lever I use a supplemental lever connected to one of the differential coils of the reading-sounder and normally resting against a stop connected to the other differential coil. Said supplemental lever is held against its stop by a spring applied so as to resist the action of the armature-lever when drawn forward by the relay electro-magnet,

while the armature-lever itself is connected to one pole of the local battery for the reading-sounder, and in its position of rest does not complete the connection of either differential coil. When said lever is drawn forward it first comes into contact with its supplemental lever, and if the force drawing it forward be not sufficiently strong or prolonged it will fail to separate said supplemental lever from its stop, so that the only effect will be to close a circuit through both coils of the differentially-wound sounder, which latter will therefore be unaffected. If the current in the relay-magnet be sufficiently strong and prolonged, the tension of the springs on the armature-lever and the supplemental lever will be overcome, and the supplemental lever will be carried away from its stop, so as to break the circuit of one differential coil, whereupon the other coil, the circuit to which is already closed, will immediately act and cause the sounder-lever to be attracted. The movements of the armature-lever, caused by abnormal action of the relay-magnet, due to the disturbing influences before mentioned, although sufficient to bring the armature-lever into contact with its front contact supplemental lever, are insufficient, when the spring of the latter is properly adjusted, to carry said lever away from its stop. Incoming or signaling currents, however, which should cause the sounder to operate, act with sufficient strength to cause said supplemental lever to break the circuit of one of the differential coils, whereupon the current flowing through the other, and which began to flow at the moment that the armature-lever made contact with the supplemental lever, will cause the operation of the sounder.

Having described the general principles of my invention, I will proceed to describe one construction of apparatus for carrying the same into effect, and for the sake of simplicity shall show it applied to the receiving-instrument of a differential duplex telegraph, operating upon the plan commonly attributed to Frischen and Siemens-Halske, although it is to be understood that the invention is not limited in its scope and is applicable to the receiving-instruments of duplex, quadruplex, or multiplex telegraphs of all kinds in which the effects of static discharge from the main line upon the

receiving-instrument are a source of confusion, or in which the difference of static capacity of the main and artificial lines causes a false signal from outgoing currents.

5 G represents a relay electro-magnet, having two coils wound in opposite directions—one of which coils is in the circuit from the transmitter and battery to earth at the transmitting-station, through an artificial resistance, R, adjusted to
10 equal the resistance of the main line, while the other coil is in the main-line circuit L'. These circuits and connections are clearly indicated in the diagram 12, being the wire connected to the transmitter.

15 L indicates the lever of the transmitter, which is operated in the usual manner by an electro-magnet, T, in a local circuit with a key, K, and a local battery. Said transmitter-lever carries a spring, B, insulated from the lever and connected to wire 12, and is provided with a hook,
20 in contact with which the spring B normally rests, so as to complete a connection to earth for incoming currents through a resistance, r, connected to lever L, and of approximately
25 equal resistance to the main-line battery MB.

F is the contact-stop for spring B, connected to the battery M B, so that when the lever L is operated by electro-magnet T the spring B, coming into contact with the stop F, completes
30 the circuit from wire 12 to the main battery, the contact between B and C being simultaneously broken.

S represents the reading-sounder, which responds to signals from the distant end of the line. It is wound differentially, in a well-known
35 manner, with two separate coils of wire connected at one end to one pole of the local battery LB and separately connected at their other ends, the one to a circuit-closing point,
40 6, through a lever, M, which carries and operates said point 6, and the other to a contact-stop, 5, with which the point 6 normally makes contact, the lever M being drawn toward said stop by a spring applied as indicated.

45 Upon the end of lever M is another circuit-closing point, 8, which forms in effect the front contact for the armature-lever N of relay G, said lever being provided with a circuit-closing point, 7, adapted to come into contact with
50 the point 8 on M, thus completing an electric circuit between the local battery L B, connected to N, and that coil of the differentially-wound sounder that is connected to M, and also with the other coil through circuit-closer 5 6.

55 Armature-lever N is provided with the usual retracting-spring, as indicated, and also with the ordinary adjustable stops.

The operation of the apparatus shown is as follows: Signals sent by key K do not energize relay G, because the currents from battery
60 MB circulate through its two coils in opposite directions. If, through the difference in the charge capacity of the main and artificial lines, the current in the coil connected to line (being
65 momentarily greater than that in the coil connected to the artificial line) cause the core of the relay to be energized and to attract lever

N, the armature-lever will be momentarily drawn forward; but, even if it make contact with M, no effect will be produced in the sounder
70 S, since the further movement of lever N will be prevented by the retracting-spring applied to M, which is adjusted sufficiently high for that purpose, so that the latter cannot break the connection at 5 6, and the only result there-
75 fore will be the closing of the local-battery circuit of L B through both coils of the differential sounder, which will obviously not produce any attractive influence in its core. So, also, the only effect of the static discharge from
80 line, which flows whenever the main battery M B is removed, will be to close the circuit through both coils of the sounder, the spring applied to M being adjusted so high that, even if the momentary discharge-current cause le-
85 ver N to make contact with M, it will not break the contact at 5 6, since it is not sufficiently prolonged to bring the lever N fully forward, nor of sufficient strength to overcome the tension of the springs applied to both N and M.
90 When, however, the core of the relay is energized in the well-known manner through the operation of the transmitting-key at the distant end of the line the armature-lever N is drawn forward into contact with M, thus, as
95 before, closing the circuit through both differential coils of the sounder S, but upon a continuation of its forward movement, owing to the prolongation and greater strength of the attraction, breaking the circuit through one
100 coil of the differential sounder by breaking the contact at 5 6, so that the current in the coil connected to M, being free to act unopposed, will energize the sounder-magnet and cause its armature-lever to be attracted. When the
105 armature-lever N recedes the circuit through both differential coils is broken and the sounder-lever falls against its back-stop. The retractor-springs applied to M and N are made adjustable in the well-known way. The re-
110 tractor applied to N is set to a moderate degree of tension, sufficient to hold said lever firmly against its back-stop. The retractor applied to M is to be adjusted according to the varying conditions of the main line. Any de-
115 sired proportional adjustment may be, however, given to the springs, provided their combined strength be insufficient to prevent the breaking of contact at 5 6 when the armature-lever is drawn forward in response to the oper-
120 ation of the key at the distant end of the line.

My invention is not limited to any particular construction of the circuit-closing devices, and others may be used in connection with the supplemental lever and armature-lever for
125 causing the latter to complete the circuit of both differential coils when it is borne against the supplemental lever and to break the circuit of one of said coils when it is carried forward so as to overcome the tension of the
130 spring applied to the supplemental lever. Other mechanical devices may be used in place of the lever M.

It is obvious that my invention is applicable

to the receivers of other systems of duplex and multiplex telegraphs, and that it may be used with any duplex or multiplex telegraph-receiver which is so placed as to be affected 5 by the difference in charge capacity of the main and artificial lines or by static discharge from the main line.

What I claim as my invention is—

1. The combination, substantially as described, with a duplex or multiplex telegraph receiving-instrument, of a differentially-wound reading-sounder, both coils of which are normally broken, a supplemental lever connected to one of said coils, a contact-stop for said lever, connected to the other coil, and an armature-lever for completing the circuit between both differential coils and the local battery when it is drawn forward against the supplemental lever and breaking the circuit of one 20 coil when it overcomes the tension of the spring acting upon the supplemental lever.

2. The combination, substantially as described, of a differential sounder-circuit closing and breaking points in circuit with one of its coils, a supplemental lever connected to the other coil, an armature-lever for completing the circuit between both coils and the local battery when it makes contact with the supplemental lever, and springs applied to both 30 levers in the manner described, so as to oppose the movement of the armature-lever, so that the circuit-closing points controlled by the supplemental lever can be broken only when the attractive force is sufficient to overcome the tension of both springs.

3. The combination, substantially as described, of a differentially-wound receiver, ar-

mature-lever therefor, supplemental lever, with which said armature-lever makes electrical contact when it is attracted, a stop for the supplemental lever, connected to one coil of a differentially-wound sounder, a connection from the other coil of said sounder to the supplementary lever, a spring tending to keep the supplemental lever in contact with the stop 45 connected to the sounder when the lever is acted upon by the armature-lever, and connections from the local battery to the armature-lever, so that when it is drawn forward against the supplemental lever it completes 50 the local circuit of both coils at the moment of making contact with said lever.

4. The combination, substantially as described, of a differentially-wound sounder and local battery, a relay-armature and supplemental lever therefor, a contact-stop for the lever, connections from the local battery to the sounder, and the supplemental lever, as set forth, so that when the lever is disconnected from its stop the circuit of one differential coil 60 is broken and a retractor applied to the supplemental lever and adjusted, in the manner described, to prevent the removal of said lever from its stop when the armature-lever is drawn forward against the same by the action 65 of a static charge or discharge current.

Signed at Buffalo, in the county of Erie and State of New York, this 8th day of May, A. D. 1882.

BENJAMIN THOMPSON.

Witnesses:

GEO. O. M. BUCKNER,
JAS. SWEENEY.