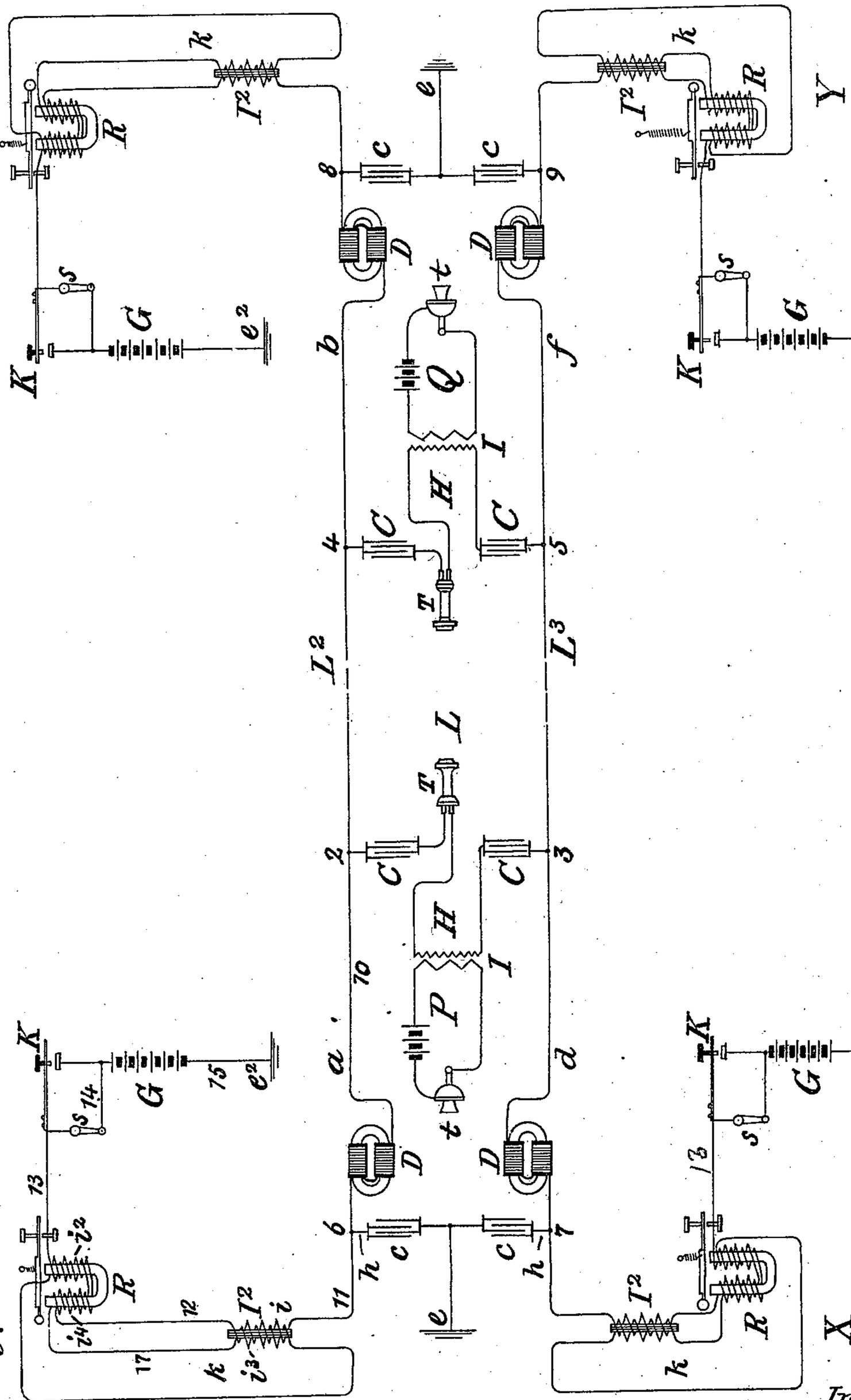
(No Model.)

E. E. BACKUS.

COMPOSITE TELEGRAPHIC AND TELEPHONIC TRANSMISSION.

No. 553,605. Patented Jan. 28, 1896.



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UNITED STATES PATENT OFFICE.

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COMPOSITE TELEGRAPHIC AND TELEPHONIC TRANSMISSION.

SPECIFICATION forming part of Letters Patent No. 553,605, dated January 28, 1896.

Application filed June 17, 1895. Serial No. 553,072. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. BACKUS, residing at New York city, in the county of New York and State of New York, have invented certain Improvements in Composite Telegraphic and Telephonic Transmission, of which the following is a specification.

This invention relates to a system of composite telegraphic and telephonic transmission.

Composite transmission is the name now technically assigned to systems in which telegraphic and telephonic messages are or may be transmitted simultaneously upon the same circuit.

The object of the invention is, broadly, to effect the more perfect practical operation, under all working conditions, of the two classes of transmission, and more particularly to so construct and arrange the telegraphic apparatus that while the independence of the telegraphic and telephonic signals is maintained as effectually as heretofore discharges of static accumulations from the line-conductor shall not affect the relays or confuse or interfere with the telegraphic signals, and to accomplish this result without detriment to the practical integrity and successful commercial operation of the telephone circuit and apparatus.

When a metallic or double-wire telephone-circuit extends between any two stations, it is well known that by associating therewith certain auxiliary appliances and conductors, and by arranging these in a special manner, the said circuit can readily be adapted for the transmission of telegraphic messages simultaneously with the telephonic messages for which it was originally designed. In pursuance of such methods, each of the two conductors of the double-wire telephonic circuit constitutes the main-line portion of an independent earth-completed telegraphic circuit, so that while one telephonic message is in process of transmission over the two conductors arranged in sequence to form the two sides of an inductively neutral double-conductor telephonic circuit, two telegraphic messages may be sent over the said two conductors severally, each being arranged to form a part of a different and independent earth-completed telegraphic circuit. Such an organization involves the application of condensers to the double-wire telephone-circuit and of suitable electromagnetic resistances or choking-coils to each telegraphic circuit at both ends thereof, these being placed at points between the telegraphic apparatus and the junction of the telephone-apparatus connection. The choking-coils are so made as to offer a high impedance to the passage of vibratory or wave currents, such as those involved in the transmission of speech, and they are here employed to oppose the passage of the voice-currents in the undesired direction of the telegraphic apparatus, so that the said currents shall not be short-circuited between the neighboring earth terminals of the two main conductors, and also to so modify and tone down the Morse signals that they will not interfere with or disturb the telephonic transmission. An auxiliary condenser for each main conductor is also supplied at each station, and is connected in a branch conductor which extends to earth from a point between the said obstruction-coils and the telegraphic apparatus. They are so provided and placed for the purpose of aiding the obstruction-coils in graduating and modifying the character of the telegraphic currents, and they also assist in neutralizing or absorbing the parasitic currents due to the dissipation of the static charge of the line. This system, so far as I have described it, is not new, and I find in practice that while it is operative and commercially successful it is not wholly free from defect, and that in it the neutralization or absorption of the said dissipative discharges is not complete, so that when the telegraphic keys are closed there frequently ensues so strong a back current, due to the discharge of the line, that the magnetism of the relays is momentarily nullified and they are made liable to give untrustworthy and confused signals. It is this practical imperfection that my invention is designed to overcome.

To this end the invention consists in placing at each telegraph-station a local compensating circuit, a repeating induction-coil, and a double-wound relay, and in the association of these elements with the telegraphic circuits of a composite system in such a way that

the main telegraphic circuit shall include between its junction with its auxiliary condenser and its terminal earth connection one winding of the repeating induction-coil and one winding of the double-wound relay, the other winding of said induction-coil and the other relay-winding being sequentially connected in the short or local closed compensation-circuit. The two windings of the induction-coil are alike, as are also the two windings of the relay, and the connections of the several windings are to be so made that the discharges of the line accumulations in passing through the line-helix of the induction-coil will induce in its associated local helix a current which, flowing in the compensation-circuit, will circulate in the auxiliary relay-winding in the same direction as does the legitimate working current, and which therefore will aid in maintaining the magnetism of the cores due to the said working current. Since this induced current is of opposite sign to the discharge current and approximately equal thereto, it is evident that while the latter tends to demagnetize the relay-core the former will equally tend to maintain the magnetization, and the action of each being thus nullified by the other the relay-cores remain entirely under the control of the sending-key and are responsive to the presence and absence of the line-current alone.

It is of course true that the moment the telegraphic key is closed and the battery-current connected to the line the first impulse through the line-winding of the induction-coil induces an impulse of opposite sign in the secondary winding, which, passing to the short-circuit relay-winding, tends to neutralize the magnetizing effect upon the relay-cores of the battery-current; but I have found experimentally that the time of such partial neutralization as actually occurs is so incomparably small in comparison to the time required to close and open a key that its effect upon the telegraphic signals is inappreciable, and the same is true with respect to induction-currents attributable to the opening of the key and the consequent withdrawal of the battery-current.

The drawing which accompanies this specification is a diagram of a composite transmission system in which my invention is incorporated.

In the drawing the terminal telegraph-stations A and B are united by the line conductor L^2, and the telegraph-stations X Y by the line conductor L^3, the said conductors at one end having telegraphic terminal extensions marked respectively *a* and *d*, while their similar extensions at the other end are marked *b* and *f*, all of which extensions connect with an earth return at e^2, so that when associated with their respective terminal extensions *a* and *b* and *d* and *f* the two conductors L^2 and L^3 constitute separate and independent telegraphic circuits. The two conductors L^2 and L^3 form also the outgoing and return conductors of a double-wire telephonic circuit L uniting two telephone-stations P and Q and made inductively complete by bridges H, including condensers C, which bridges connect with the main conductors at points 2, 3, 4 and 5. Each bridge H is shown as containing the receiving-telephone T and the secondary winding of the transmitter induction-coil I, the transmitter *t* and its battery being included in the primary winding of the said coil.

In each of the telegraphic extensions *a*, *b*, *d* and *f* is placed an electromagnetic resistance, choking-coil, or obstruction-coil D to prevent the short-circuiting of the voice-currents and also to graduate and modify the telegraphic currents and thereby minimize their disturbing action upon the telephonic circuit. From the points 6 and 8 at the two ends of L^2 and 7 and 9 at the ends of L^3 branch circuits *h* lead to earth at *e* through condensers *c*. These also aid in graduating telegraphic signal-currents and also aid in the innocuous dissipation of static charges.

At each telegraph-station K is the manipulating-key, *s* its circuit-closing switch, and G its current-generator, a suitable voltaic battery ordinarily being employed. Each telegraphic station is also provided with a receiving-relay R, which may control a local sounder-circuit in a manner well understood and not shown.

As will presently be made manifest, the relay R is double wound, and an induction-coil I^2, together with a short local compensating circuit *k*, is also provided at each telegraph-station. As all of the telegraph-stations are alike, it will be sufficient to trace but one of the extensions leading through them to earth.

I will trace the telegraph branch *a*, leading from the point 2 through the station A, and then briefly describe the compensation-circuit *k*.

The branch *a* starting at the junction 2 of the telephone-loop passes by wire 10, through the helix of the obstruction-coil D to 6, where it is joined by the condenser earth branch *h*, then to wire 11, through one winding *i* of the induction-coil I^2 to wire 12, winding i^2 of the relay R to wire 13, and by way either of the key K or its cut-out switch *s* and wire 14 to the battery G, wire 15 and earth at e^2.

The compensating circuit *k* is closed on itself and includes the wire i^3 of the induction-coil I^2 and the wire i^4 of the relay R, comprising also the connecting-wires 16 and 17.

As already stated, the two windings of the induction-coil I^2 are alike, and the one in the compensation-circuit is so connected with the extra winding of the relay that when the main line discharges through the sending-station, producing a back current through the main-line winding of the relay tending to destroy the magnetism thereof, such disposition will be nullified and counteracted by an impulse of induced current, developed by the said back current in the compensation-

circuit, and acting against its originating-current in the relay-coils, so as to destroy, or at all events to materially weaken and abbreviate, the adverse effects of the discharge. Thus by such counteraction in the relay R, the dissipation of the static charge of the line, or its discharge through the relay, is deprived of its harmful effects, and a composite system of telegraphy and telephony is greatly improved, and its operation materially facilitated.

I claim—

1. The combination substantially as specified herein, of a telegraphic circuit main line constituting one conductor of a double wire telephone circuit, with a double wire relay, and an induction coil, one winding of both being serially included in the main circuit, and the other winding of the said relay and induction coil being joined up serially in a short closed circuit; whereby the effects of dissipative discharges passing from the line to earth through one winding of the relay, may be nullified by induced currents developed by such discharges and passing through the other winding of the said relay.

2. The combination with a telegraphic circuit main line constituting one conductor of a double wire telephone circuit, and its telegraphic relay included therein; of an induction coil having one of its windings also included in said main circuit, an auxiliary winding for the said relay; and a compensation circuit containing the said auxiliary relay winding, and the other winding of the said induction coil; substantially as and for the purposes specified.

3. In a system of composite telegraphic and telephonic transmission, the combination with two main telegraphic lines serving respectively as the two conductors of a double wire telephonic circuit; and the telegraphic instrument extensions of each main line, containing the standard and appropriate impedance and capacity; of an induction coil, and a double wound relay, for each extension, both having one of their helices or windings in circuit with one another in the main conductor, and their remaining helices or windings similarly connected in a closed local circuit, in such manner that a current induced in the local circuit winding of the induction coil by a discharge from the line will circulate in the local circuit relay winding in a direction opposite to that of the said discharge, substantially as described.

4. The combination with an earth completed telegraphic circuit main conductor constituting one side of a double wire telephone circuit, an obstruction coil included therein, and a condenser branching to earth therefrom at each telegraph station, and a relay located between the said condenser branch and the main earth terminal; of an induction coil having one of its windings also in said main circuit between the condenser branch and the relay, an auxiliary winding for the said relay, and a compensation circuit closed through the said auxiliary relay winding, and the other winding of the induction coil, substantially as described and for the purposes set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 12th day of June, 1895.

EDWARD E. BACKUS.

Witnesses:

ALFRED E. HOLCOMB,

ARTHUR A. MARSTERS.