(No Model.)

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APPARATUS FOR COMPOSITE TRANSMISSION OF INTELLIGENCE.

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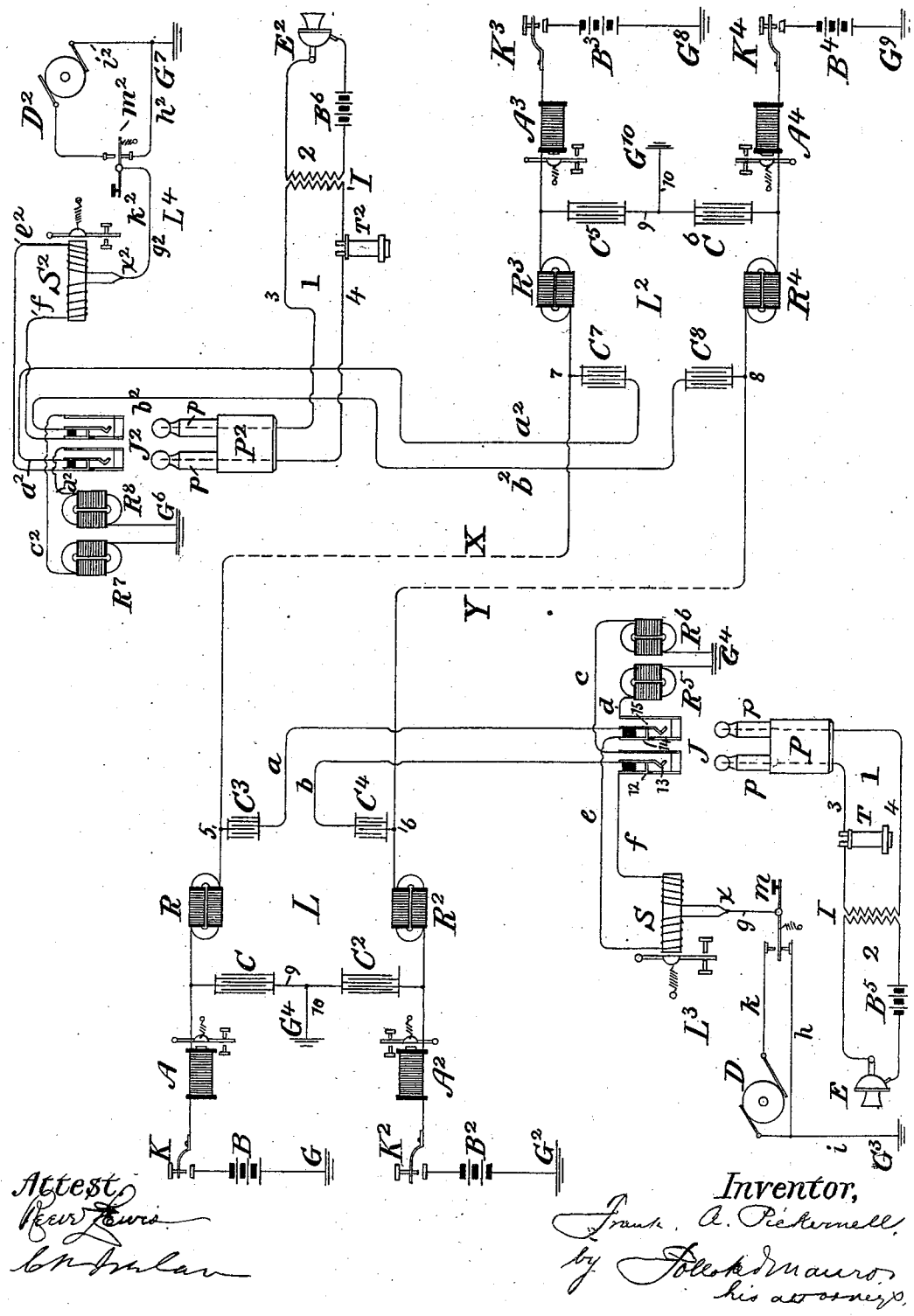

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APPARATUS FOR COMPOSITE TRANSMISSION OF INTELLIGENCE.

SPECIFICATION forming part of Letters Patent No. 558,310, dated April 14, 1896.

Application filed October 17, 1894. Serial No. 526,223. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. PICKERNELL, residing at Newark, in the county of Essex and State of New Jersey, have invented certain Improvements in Apparatus for Composite Transmission of Intelligence, of which the following is a specification.

This invention relates to circuits for the simultaneous transmission of telegraphic and telephonic signals or messages, in which each of the two associated conductors forming the circuit between two distant points is organized to constitute the main line of an independent earth-completed telegraphic circuit, and in which the two associated conductors constitute together a metallic or wire-completed telephonic circuit, so that while one telephonic message is being transmitted over the two conductors arranged to form the two sides of a circuit two telegraphic messages may be sent, one over each of the separate grounded circuits.

My invention relates specially to circuits and apparatus for ringing bells or operating signals over the telephonic circuit by means of generators which produce alternating currents of electricity.

Prior to my invention much confusion and interference has arisen from false signals, given by the bells or signal-receiving apparatus, by reason of static discharges or induced currents passing from the telegraphic circuits when the current was made or broken by the transmitting-key; and the object of my invention is to obviate this trouble by rendering the signal-receiving apparatus inoperative to such induced charges and discharges.

In carrying out my invention I provide means whereby the telegraphic induced currents are prevented from causing the telephonic signal-receivers from giving false signals in the normal circuit or when the telephonic circuit is not in use, and I also provide a path whereby such currents are discharged to earth when the said circuit is in use for talking purposes.

The telephonic apparatus at each terminal is connected by branches, each including condensers, to the two main conductors which constitute the independent telegraphic circuits, and the grounded telegraphic apparatus is connected to the terminals of the said main conductors, with interposed retardation-coils, the two conductors being connected to each other through condensers provided with a ground branch, in the usual way.

I dispense with the ordinary telephonic signal-bell or call-receiving appliance and substitute therefor a relay or an annunciator or visible signal, the helices of which are wound differentially with insulated wire upon an iron core. The inner ends of the coils are joined together and connected with the ground normally, or when in a condition to receive a signaling-current, but when a signal is to be sent the ground is taken off and connection is made by a circuit-changing key to a grounded electrical alternating current generator. In signaling the current from the generator divides at the center of the helices and passes through the convolutions thereof in the same direction, and by both conductors of the telephonic circuit to the opposite terminal, and through the helices of the signal there to ground. The signaling-circuit has for its main conductor the two conductors of the telephonic circuit connected in parallel, and the signal-receiving instrument has its two windings included in parallel in the circuit.

In the system of signaling in use prior to my invention the current passes in series through the main conductors of the telphonic circuit and their interposed condensers, the signaling-current traversing four condensers in series, while by my improvement the signaling-current divides at the helices of the signaling apparatus and passes along the said conductors in multiple or parallel, and through the condensers, two in multiple or parallel, and two in series, making the condenser capacity of the circuit four times as great, and thus reducing the resistance of the signaling-circuit one-half and quadrupling its capacity.

When the telephones are substituted at each terminal for the signaling apparatus, by means of plugs and spring-jacks, and a talking-circuit is formed, a path of escape for the telegraphic induction-charges is created from

the telephonic conductors through the plugs and frames of the spring-jacks to ground through electromagnetic obstruction-coils, which allow the passage to ground of such induction-charges, but prevent the passage of voice-currents.

The accompanying drawing is a diagram showing schematically the circuits and apparatus of a simultaneously-operated or composite telegraphic and telephonic system embodying my invention.

L and L^3 represent the terminals of the telegraphic circuit connected together by the main conductors X Y, and L^3 and L^4 represent the terminals of the telephonic circuit which are connected to each other by the main conductors X Y and the branch conductors *a b* and a^2 b^2.

The circuits and apparatus at the telegraph-terminals are of the usual kind, each main conductor being grounded through an obstruction-coil, as R, R^2, R^3, and R^4, the impedance of which will hereinafter be referred to; a relay, as A, A^2, A^3, and A^4; a key, as K, K^2, K^3, and K^4, and a battery, as B, B^2, B^3, and B^4. At each end of the main circuits the two conductors X Y are connected by a bridge 9 between the relays A and retardation-coils R, including condensers C C^2 and C^5 C^6, between which a branch 10 extends to ground.

The circuits and apparatus at the telephonic terminals are as follows: Branches *a b* a^2 b^2 extend from points 5 6 and 7 8 on the main conductors X Y through condensers C^3 C^4 and C^7 C^8 to double spring-jacks J at each terminal; and, referring to terminal L^3, the branch *a* terminates at spring 15 of one jack of the double jack J in contact with pin 14, from which the wire *e* extends to one helix of the signal apparatus S. The other branch *b* terminates at spring 13 of the other jack, which is in contact with pin 12, from which a wire *f* extends to the other helix of signal S. The two helices are wound differentially around an iron core and are united at their inner ends at a point *x*, from which a wire *g* extends to the key *m*. Normally the key *m* is connected to ground G^3 through wires *h* and *i*, but to send a call-signal it can be operated to connect the wire *g* to ground G^3 through wire *k*, generator D, and wire *i*.

P is a double connecting-plug provided with the plug-connectors *p p* for insertion into the double spring-jack J. The connectors or plugs *p p* are connected by wires 3 4 with the secondary of induction coil I, and include the telephone-receiver T, forming the circuit 1. The primary of the coil I includes the transmitting-telephone E and battery B^5 and forms the circuit 2.

Extending from the frame of each half of the double spring-jack J are grounded wires *d* and *c*, which include in circuit the respective electromagnetic or retardation coils R^5 and R^6.

The signaling device or apparatus S may be a relay, an annunciator, or any form of visible signal, and is operated by alternating currents from the generator D.

The operation of the signaling apparatus is as follows: We will suppose that one or both of the independent telegraphic circuits are being operated while the telephonic circuit is not in use and that Morse signals are being sent from both ends or from either end. It is well understood that the coils R R^2 R^3 R^4 serve as graduators and modify the natural abruptness of the current changes to prevent disturbances in the telephone-circuit and that the condensers C C^2 C^5 C^6 aid in individualizing the two systems, as do also the condensers C^3 C^4 C^7 C^8. Now whenever the telegraphic current is made or broken in the act of sending Morse signals a parasitic current or impulse is developed in the branches *a* a^2 *b* b^2, its location depending upon the main conductor X or Y, which is traversed by the original current. Supposing the said original current to circulate in the former, X, then the induced current will appear upon the branch *a* and will find a path by which it is dissipated via spring 15, wire *e*, left helix of signal S, wires *g*, *h*, and *i* to ground G^3, and, if the induced current or impulse appears upon the branch *b*, its escape will be by spring 13, wire *f*, right helix of signal S, wires *g*, *h*, and *i* to ground G^3. As the signal S is adjusted to operate only when fully energized by two coils, the telegraphic discharge through one coil alone will not cause its operation to give a false signal.

The path of the signaling-circuit from one terminal of the telephone-circuit to the other is as follows: The key *m*, being in contact with wire *k*, the circuit will be from ground G^3, wire *i*, generator D, wire *k*, key *m*, wire *g* to point *x*, where the current splits, one half going out by wire *e*, branch *a*, and conductor *x* to point x^2 of signal S^2, the other half going by wire *f*, branch *b*, and conductor Y to the said point x^2 of the signal S^2, where the current unites and passes to ground G^7 by wires g^2 and i^2, passing along both conductors X and Y in multiple or parallel and through the condensers C^3 C^4 C^7 C^8, two in multiple and two in series, making a circuit of great capacity and of low resistance. The obstruction or retardation coils R R^2 R^3 R^4 should have an impedance not less than five times that of the double-wound signals S.

When a talking-circuit has been formed by the insertion of the double plugs P into the double jacks J at each telephonic terminal and the switching out of the signal apparatus S and D and the introduction of the telephones T and E, the path for the induced charge from the telegraphic circuits is as follows: The tip of the plugs *p p* passes under the springs 15 and 13, respectively, cutting off the signaling apparatus, and the sleeves of the plugs come in contact with the frames of the jacks, and making a circuit from either conductor X or Y by way of either branch *a* or *b* to the springs and frames of the jacks

through plugs *p*, and to ground through either retardation-coil R^5 R^6 at the telephone-terminal L^3, over which the disturbing telegraphic current passes, the line being thereby freed therefrom. The retardation-coils R^5 R^6 R^7 R^8 in the ground branches at each telephonic terminal provide means for escape of the telegraphic currents whether one or both of the mains X Y are in use.

I claim—

1. In a system for the simultaneous transmission of telegraphic and telephonic messages, the combination of independent telegraph-circuits, a talking-circuit formed by branches, including condensers, connected respectively to the two main conductors of the telegraphic circuits, and a signaling-circuit of low resistance and great capacity, having for its main conductor the two conductors of the telephonic circuit, and including the said interposed condensers at each terminal thereof two in parallel and two in series, with a signal-receiving instrument at each terminal of the said circuit, having two windings connected respectively in the conductors of the said main conductor, an earth connection extending from a point between said windings; and means for impressing a signaling-current upon said circuit at either terminal thereof.

2. In a system for the simultaneous transmission of telegraphic and telephonic messages, as herein set forth, in which the telephonic circuit is composed of the two main conductors with branch continuations through condensers at each terminal and provided with receiving and transmitting telephonic apparatus, means for preventing induced telegraphic currents from disturbing the telephonic signaling-circuit consisting of one or more ground branches from the said circuit with which are included alternatively-electromagnetic retardation-coils or equivalent differentially-wound signal-instrument windings as set forth.

3. In a system of composite transmission in which the conductors of a metallic telephone-circuit form respectively independent telegraphic circuits, the combination with such telephonic and telegraphic circuits at each station, of a normal circuit connection with a signal instrument having two windings differentially included between the two line conductors and the earth to serve as normal obstruction-coils; means for disconnecting the said signal instrument and substituting telephones therefor; and independent earth connections for the said two conductors respectively including equivalent obstruction-coils arranged to be united thereto by the act of connecting the said telephones whereby the telephone and signal circuits are protected from parasitic telegraphic currents, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 12th day of October, 1894.

FRANK A. PICKERNELL.

Witnesses:
EDW. E. BACKUS,
A. N. MANSFIELD.