No. 793,760. PATENTED JULY 4, 1905.

M. O. ANTHONY.

ART OF TELEGRAPHY.

APPLICATION FILED NOV. 22, 1902.

Fig. 1.

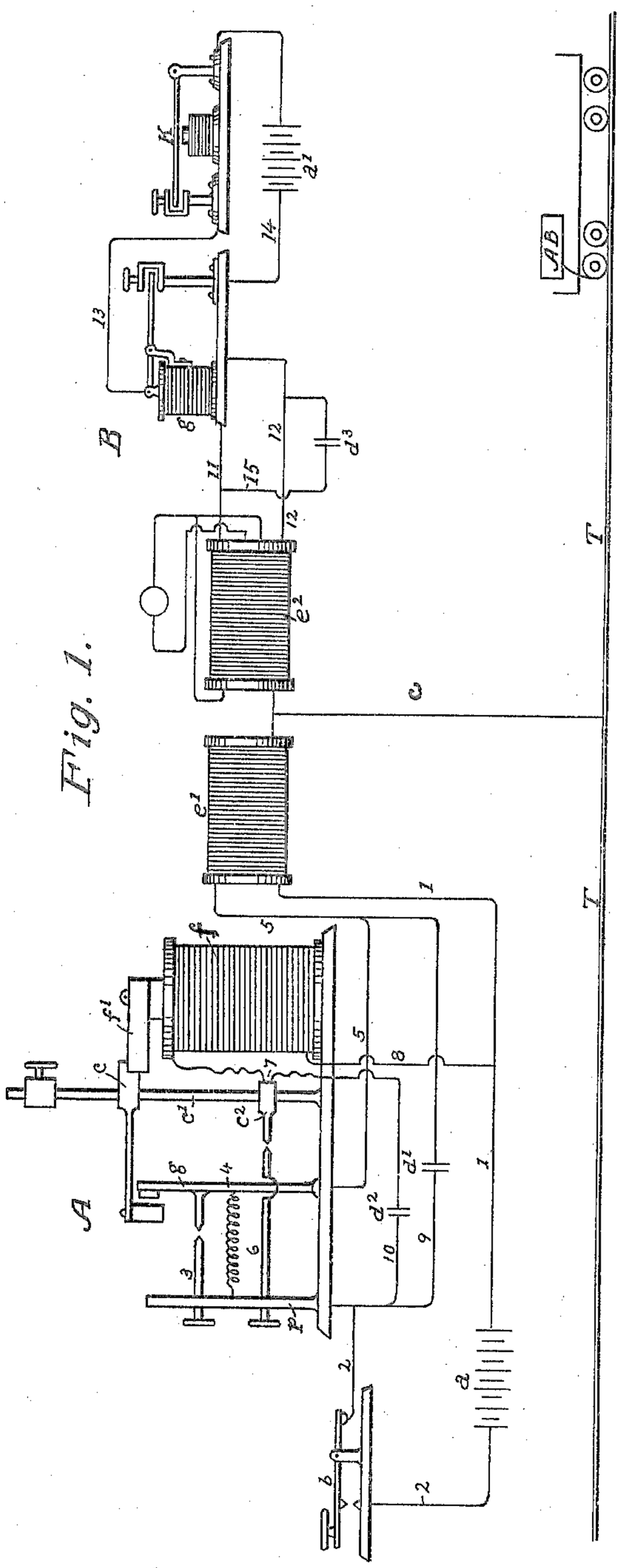
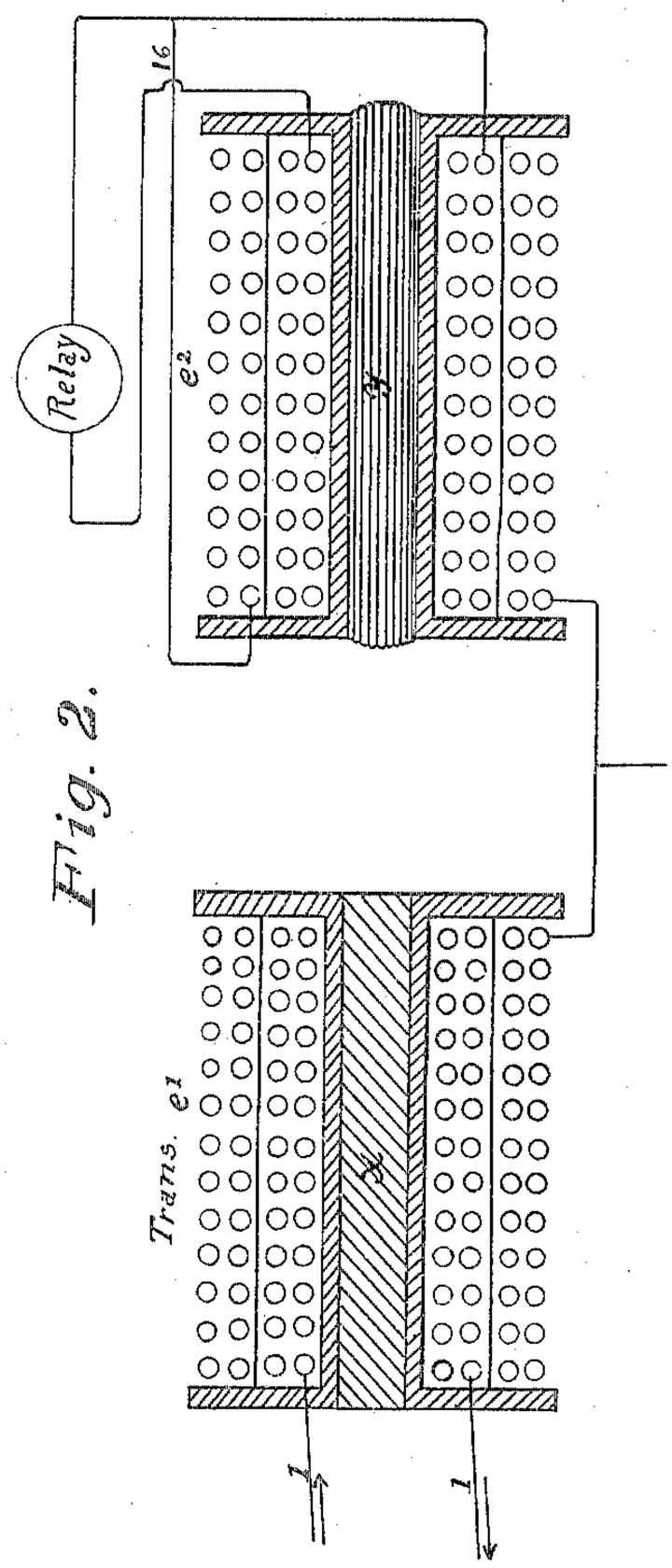


Fig. 2.



Witnesses.

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No. 793,760. Patented July 4, 1905.

UNITED STATES PATENT OFFICE.

MARCUS O. ANTHONY, OF BARBERTON, OHIO.

ART OF TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 793,760, dated July 4, 1905.

Application filed November 22, 1902. Serial No. 132,382.

To all whom it may concern:

Be it known that I, MARCUS O. ANTHONY, a citizen of the United States, residing at Barberton, in the county of Summit and State of Ohio, have invented new and useful Improvements in the Art of Telegraphy, of which the following is a specification.

My invention relates to the art of telegraphy; and it consists in a novel method of producing, sending, and receiving telegraphic signals, whereby the construction, maintenance, and operation of telegraph systems may be simplified and cheapened and the capacity of transmission enlarged by simultaneous transmissions in opposite directions with entire independence.

The essential principle or characteristic of my invention lies in translating the telegraphic intermittent impulses of a direct or primary electric current into corresponding waves or impulses of a secondary or induced current upon and over a suitable transmitting-conductor, which in some cases may be the earth. As supplementary to this it consists, further, in receiving and reconverting the secondary impulses so transmitted into sounds or other intelligible reproductions of the original primary impulses constituting the telegraphic signals.

Stated in terms more particularly suggestive of the means employed, it consists in producing the make-and-break signals of telegraphy in a local battery-circuit, including the primary winding of an induction-coil, and delivering the corresponding secondary impulses thus created in the secondary winding of said coil to a conductor of which the said secondary winding constitutes the receiving-terminal and in receiving and reconverting said secondary impulses by similar means in substantially reverse order.

The nature and mode of operation of my invention will be understood in detail from the subjoined description in connection with the accompanying drawings, showing in diagrammatic form the apparatus employed, said apparatus being the subject of a divisional application, Serial No. 106,780, filed May 10, 1902.

In the drawings, Figure 1 is a diagrammatic view of the system, showing the local circuits, operative instruments, and main conductor, the latter being a railway-track; Fig. 2, an axial section of the sending and receiving coils, showing the circuit connections.

It should be premised that the essential features of apparatus are the local circuits for sending and receiving, with suitable devices for controlling and operating same, and the oppositely-wound induction-coils branched into the same main conductor. The controlling and operating devices in the local primary circuits may be varied at will.

Referring now to the drawings herewith illustrating the apparatus, A designates the sending, and B the receiving, apparatus or portions of the general apparatus, respectively, as used upon a railway. Duplicates of the same are located at stations and upon moving trains and connect electrically with the lines of rails of the trackway T as a main conductor.

The sending mechanism A consists of a battery-circuit including a battery or generator *a*, the primary winding of an induction-coil *e'*, herein termed the "sending-coil," a telegraphic sending-key *b*, and preferably a vibrator apparatus C, all connected in circuits traced as follows: from one pole of the battery *a* through conductor 2, through sending-key *b* to post *p* of the vibrator mechanism C, thence through make-and-break contact 3 and line 5 to the primary or inner winding (inner layer) of sending-coil *e'*, thence from the opposite terminal of said inner winding (outer layer) back to the battery by direct line 1. The magnet-circuit for vibrator apparatus C and contacts beginning at post *p* is thence through make-and-break contacts 6 and 7 and extending line 10 through magnet-coils *f* and line 8 to conductor 1. Condenser-shunts are employed for the make-and-break contacts as follows: for contact 3 a line 9 connecting across from lines 2 to 5 through condenser d' and for contact 6 a line 10 connecting across from lines 2 to 7 through condenser d^2.

The sending-coil *e'* has its primary winding interposed between the terminals of con-

ductors 1 and 5 of the battery-circuit. Its secondary winding has one "blocked" terminal, (that is, having no electrical outlet,) and the other terminal is connected to a service conductor *c*, extending to earth or other natural conductor or to an artificial conductor, such as the track T, of a line of railway, as in the present illustration. These primary and secondary windings are in relatively opposite directions about a permanent magnet-core *x* of hardened steel.

The receiving mechanism B consists of a coil e^2, which is disposed proximate to the coil e' and whose primary and secondary windings are in relatively opposite directions and are arranged oppositely to those of coil e'. The primary winding of coil e^2 is a closed circuit 11 and 12 through a permanent magnet-relay *g*, having a condenser d^3 interposed in shunt connection 15 between the branches 11 12 of the circuit. The relay *g* operates an outer circuit 13 14 through a local battery a' and sounder *k* in the usual manner. The secondary winding of coil e^2 has a cross connection 16 from the inner terminal of the secondary winding to the line 11 of the primary winding. The coil e^2 is fitted with a core *y* of soft-iron wires bundled.

The sending and receiving portions A and B above described constitute a joint apparatus A B, which, as already stated, is duplicated at stations and on moving trains and connected to the track or earth in multiple. In trains of cars moving on railways the connection may be made through the running-gear to and through the wheel-contacts with the rails. Where used in field service—as, for example, in military campaigning—the earth alone may be used as the main conductor through metallic rods driven into the soil or otherwise as temporary connections with the earth. In permanent railway service the track conduction may be rendered more perfect by bonding the rails, as in electric-railway service; but satisfactory results are obtained for considerable distances where rails are united by ordinary fish-plate joints. Wherever a perfect earth contact can be obtained, as by metallic rods driven deep enough to reach moist earth or by buried metallic plates or by attachment to buried water or gas pipes, &c., the earth alone may be utilized as the sole conductor.

In the apparatus employed the sending and receiving coils must be substantially duplicates as to windings, but used in reverse one with the other, as indicated in the foregoing description and in the figures of the drawings.

It will be observed that the main conductor (considered as a line connecting two terminal stations) terminates at each end in two branches, each branch terminating in the outer winding layer of an induction-coil. The inner coils in each case connect with the local circuits of the sending-key and receiving sounder or relay, respectively. I may dispense with a relay and sounder direct where a telephone-receiver is used; but in railway service and the like the separate circuit and the relay are preferable.

This method of communication can be used in building operations and in fire-fighting, &c., in which case a single wire can be embedded in the hose without danger of short-circuiting, as is the case with a two-wire circuit.

In transmitting over long distances I find it advantageous to place the sending-key in the circuit between the vibrator and the coil; but the arrangement shown gives good results for ordinary local use.

As shown in the drawings, the aforesaid coils e' and e^2 are placed relatively close together end to end. The object of this is to prevent the existence of a magnetic flux of the same polarity, and this is effected by providing each coil with its opposite windings and arranging the primary and secondary wingings of one coil relatively opposite to the corresponding windings of the other coil, resulting in current from one coil—say the sending-coil—being largely diverted and sent through the service conductor to the main conductor whatever the character of the latter.

I claim as my invention and desire to secure by Letters Patent of the United States—

The improvement in the art of telegraphy consisting in generating a primary current in the sending apparatus and producing make-and-break impulses of the current, generating from this current two induced secondary currents of opposite rotative forces and combining said induced secondary currents and sending them through a common service conductor.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

MARCUS O. ANTHONY.

Witnesses:
L. M. HOSEA,
CHAS. HERBERT JONES.