

(No Model.)

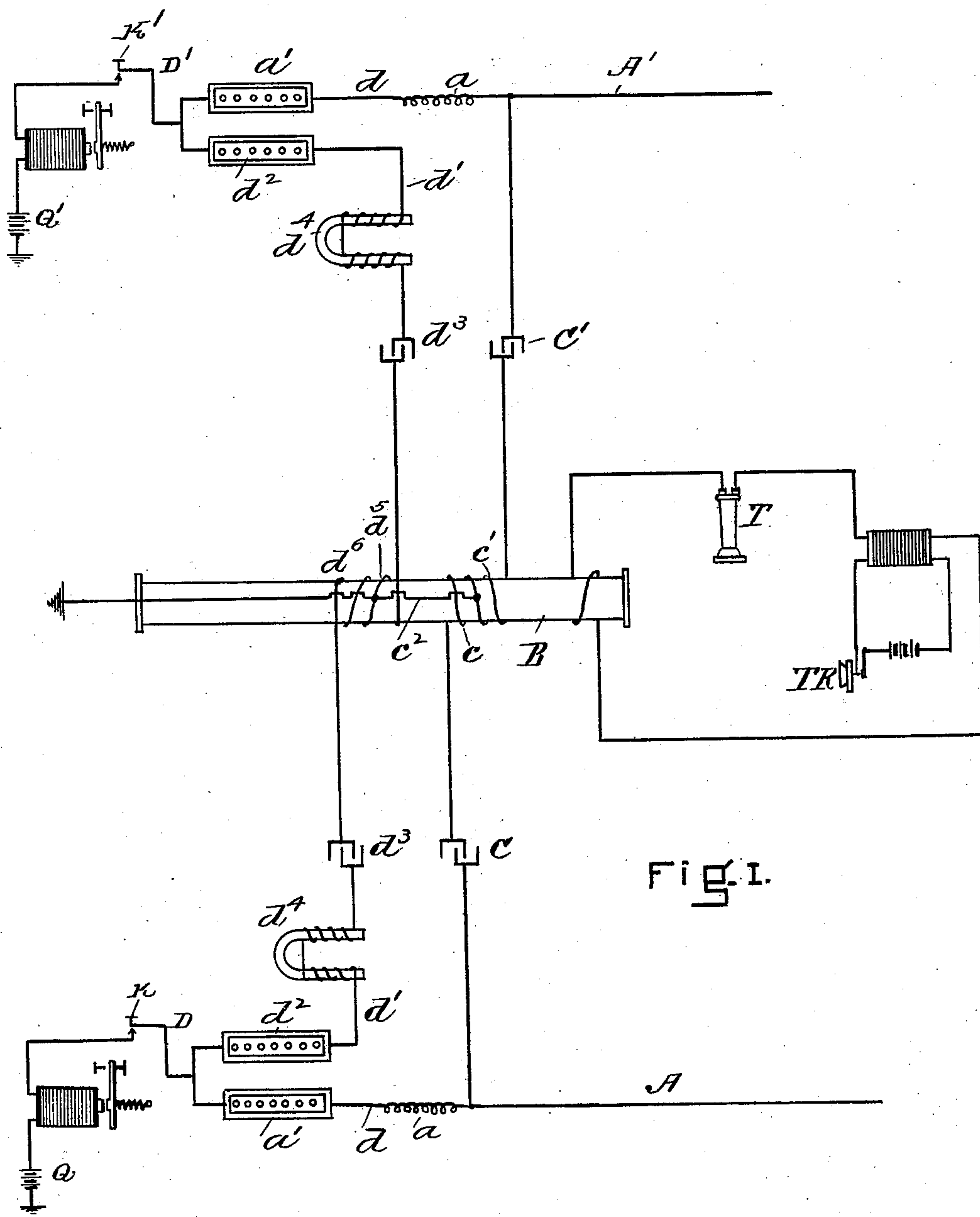
2 Sheets—Sheet 1.

C. A. SHEA.

COMBINED TELEPHONE AND TELEGRAPH SYSTEM.

No. 534,084.

Patented Feb. 12, 1895.



WITNESSES

J. W. Dolan

INVENTOR

Christopher A. Shea

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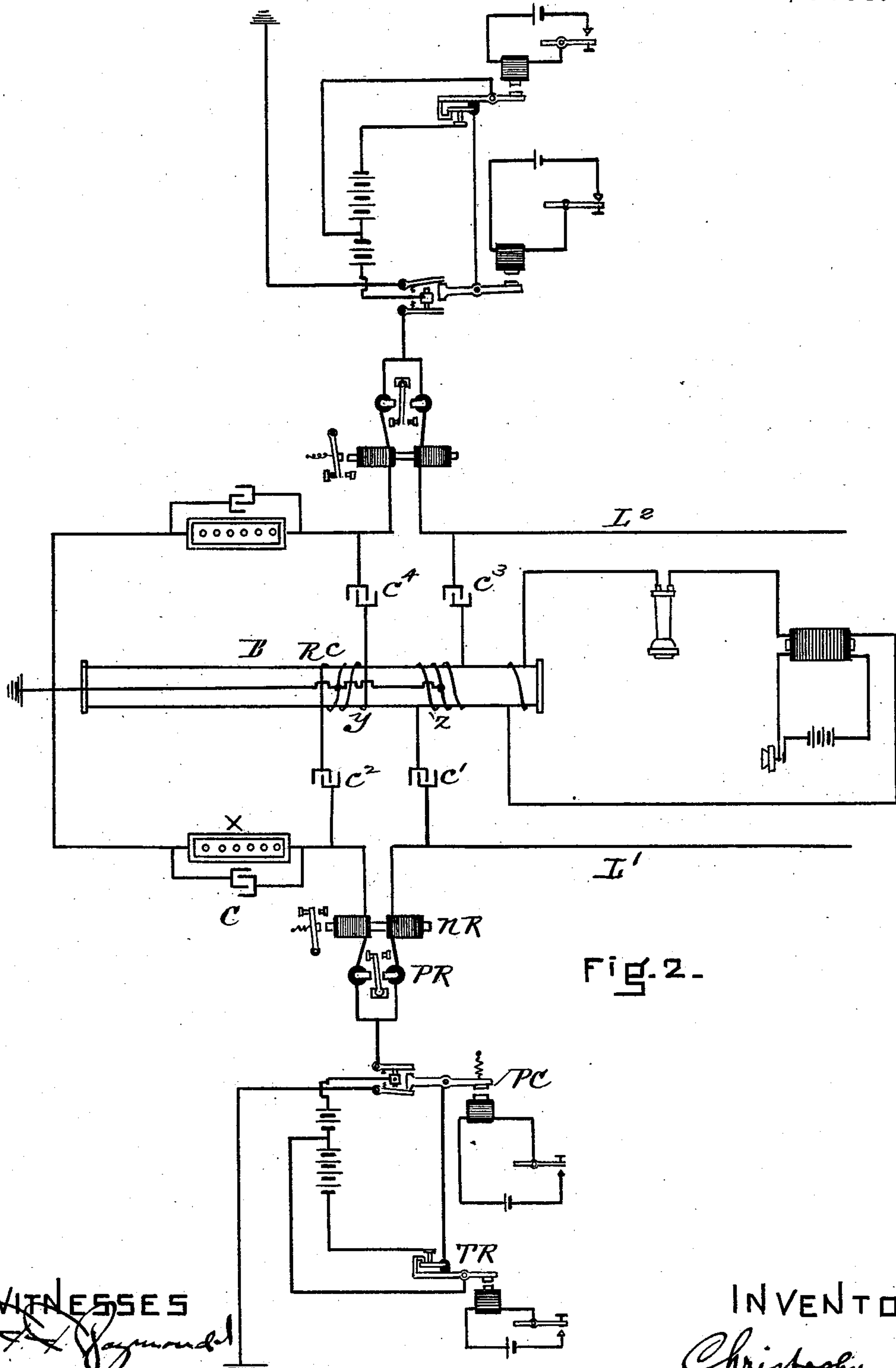
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UNITED STATES PATENT OFFICE.

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COMBINED TELEPHONE AND TELEGRAPH SYSTEM.

SPECIFICATION forming part of Letters Patent No. 534,084, dated February 12, 1895.

Application filed July 30, 1892. Serial No. 441,743. (No model.)

To all whom it may concern:

Be it known that I, CHRISTOPHER A. SHEA, a citizen of the United States, residing at Boston, in the county of Suffolk, State of Massachusetts, have invented a new and useful Improvement in a Combined Telephone and Telegraph System, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

This invention relates to the telephone systems employing a metallic circuit of two lines, which, while reciprocally inductive to each other do not constitute a metallic circuit in the ordinary sense, in that each line is grounded at each end through its telephone or converter coil, and in that the telephones or telephone converters with which the lines are connected are doubly wound.

This telephone system is described and claimed in an application for Letters Patent of the United States of even date herewith, (Case B,) Serial No. 441,742. The lines and telephone converters are connected with the telegraph lines, batteries, and instruments in such a manner that the telegraph currents are neutralized or silenced in the telephones or converters, the tendency of telegraph currents to produce noise in a telephone or telephone converter being overcome by the passing at the same time to the telephone or telephone converter of telegraph currents from the same source, but in an opposite direction, one telegraph current thus neutralizing or killing the effect of the other in the telephone or telephone converter.

Referring to the drawings: the diagram marked Figure 1 illustrates one end of my composite system, each of the lines of which is adapted to be telegraphically employed, and is connected with the telegraph battery, &c. Fig. 2 is a diagram representing each telephone line as connected with the quadruplex system.

A represents one side or line of a two-wire telephone circuit or system of the character specified, and A' the other.

B is a telephone converter. Between it and the line A is a condenser C, and there is also a condenser C' between it and the line A'.

The converter is represented as having two coils or windings, the coil *c* connecting with the line A through the condenser C, and the coil *c'* connecting with the line A' through the condenser C', and each coil at its inner end is connected with the earth wire *c*², which preferably passes through the center of the converter. The converter is connected by the usual loop with the telephone T and transmitter T R.

D is a line connecting the main line, A, with a telegraph apparatus K and battery Q which may be of any usual form and operating over the main line A.

D' is a line or branch connecting the main line A' with a telegraph apparatus K' and battery Q' of any usual form operating over it.

The telegraph line D is connected with the line A, and with the converter B. It is connected with the line A by the line *d*, in which is a telephone current inductive resistance *a*, and if desired a rheostat *a'*. In the branch line *d'* connecting the telegraph line D with the converter there is a rheostat *d*², a condenser *d*³, and an adjustable inductive resistance *d*⁴. The line D' is similarly connected with the line A' and converter B, and the resistances, &c., in the branch lines are correspondingly lettered.

The two branch lines *d'* are wound about the converter B to form a double coil, each section of which is of the same number of convolutions as the section of the telephone double coil *c c'* which it balances, and the coil is grounded at its center or midway its length by the ground wire *c*². The section or coil *d*⁵ is wound about the converter in a direction the reverse of the winding of the coil section *c'*, and the section *d*⁶ of the coil is also wound about the converter core in a direction opposite that of the winding of the coil section *c*.

The system acts as follows: First, as to the outgoing telegraph circuit, upon depressing the key of the home telegraph instrument, the current flows through wire D, rheostat *a'*, line *d*, inductive resistance *a* to line A, and thus to the distant station. Simultaneously with this impulse the condensers *d*³ and C are charged, the charges being rendered equal by adjusting the rheostat *d*², and inductive resistance *d*⁴, to balance the rheostat *a'*

and inductive resistance α . The further plates of the condensers d^3 and C are thereby simultaneously discharged, and electric impulses from these condensers are sent around the converter core in opposite directions, neutralizing each other, and thence to earth by wire c^2 . Thus disturbance in the telephone from the outgoing telegraph current is eliminated. The incoming telegraph signals will not affect the telephone because by the time they reach the end of the line they are not of sufficiently high potential, being moreover intercepted by the condensers C, C' , the effect of which is to diminish the amplitude and round off the abruptness of the signals. Since the connection from the coils c, c' , to earth is from the middle point of these windings, and since the potential of the middle point of a coil round a core is unaffected by any variation in the magnetization of the core, although the potential of the coil at one end is raised and at the other end lowered by such variation of the magnetization, no current will pass to earth from such middle point, due to such variation, and no difference will be made in the operation of the telephone circuit by the introduction of such line from such middle point to earth. Each telephone converter will therefore operate precisely the same as if it were entirely disconnected from the earth. The inductive resistances α will prevent the telephone currents from entering the lines d' .

In the diagram marked Fig. 2 the system is represented as embodied with quadruplex telegraph apparatus, and R C represent a telephone converter; T, an ordinary telephone. $C C' C^2 C^3 C^4$ are condensers. X is the artificial line of a quadruplex circuit.

The condenser C neutralizes the static charge of the line both in the quadruplex sets and the telephone converter.

It is a well known fact that the artificial line of a quadruplex circuit can be made exactly the same as the actual line by means of condensers. Now, assuming the quadruplex system to be balanced we will note its effect on the telephone. The currents from T R, the telegraph transmitter or P C, the pole charger, or both, flow through P R, the polar relay, and N R, the neutral relay, to line 1 and the artificial line X with even amounts of current on both sides. As these equal amounts flow past the condensers $C' C^2$ they charge them with a certain potential at the same instant, and these condensers discharge around the telephone converter in opposite directions and produce no effect in the telephone. Since the connections to earth are from the middle points of the coils, the operation of the telephone circuit will be precisely the same as if there were no connection at all to earth; that is, the telephonic impulses will travel by line L' , condenser C' , converter coil, condenser C^3 , and line L^2 to the distant station. The telephone currents will not shunt by the way of N R and P R on account of the inductance presented; but

if necessary adjustable inductive resistances can be used between N R and line L' and X. Neither quadruplex circuit will interfere with the other through the medium of condensers $C' C^2 C^3 C^4$ as the charges all go to earth. The ground in the converter coils will not make the line noisy as it is in the center of the coil. The coil Y of the telephone converter is wound thereabout, and is divided, so as to balance the coil Z.

A duplex system or any other kind of multiplex telegraph system can be put on the line just as well as the quadruplex without interfering with the telephone.

Thus it will be seen that each quadruplex circuit or both can be worked to its full capacity without interfering with the telephone circuit, every pulsation being neutralized in the telephone, the telephone conversation being at the same time carried on between this and the distant end, each system working independently of the other.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The combined telephone and telegraph system herein described comprising the lines A A', the telephone converter or telephone, the telephone coils $c c'$ wound on the converter, as specified, grounded midway their length, one of which is connected with the line A through a condenser, and the other of which is connected with the line A' through a condenser, the telegraph batteries and instruments connected with the main lines A A' respectively and by branch lines with the telephone converter or telephone, and a coil on the telephone or converter core connected at its ends with the said branch lines and grounded at its center, and suitable resistances and balancing devices, as and for the purposes described.

2. In a combined telephone and telegraph system, the combination of a line wire, telegraph and telephone instruments connected therewith, a branch wire from the main line to the telephone core, and thence to earth, and an inductive resistance interposed to stop the passage along said branch wire of telephonic impulses between the telephone core and main line, substantially as described.

3. In a combined telegraph and telephone system, the combination of a line wire, telegraph and telephone instruments connected therewith, a line from the telegraph instrument to the telephone or converter core and thence to earth, and an inductive resistance to telephonic currents interposed to stop the passage along said line of telephonic impulses, substantially as described.

4. In a combined telephone and telegraph system of the character specified the combination of the main lines, the telephone or telephone converter core, the oppositely wound coils thereon connected at their center with the earth and at one end with one of the main lines and to the other end with the other of

the main lines, and a quadruplex or other multiple telegraph apparatus connected with the telephone or converter coils as described, as and for the purposes described.

5 5. As a means of neutralizing the noise of telegraph currents in a telephone converter or telephone connected with a line used for both telephonic and telegraphic purposes, a connection with earth to a point in the coils
10 of the telephone converter or telephone, in combination with an auxiliary or neutralizing coil wound round the converter or telephone in the opposite direction to the telephone coil, connected to earth from one point
15 therein and from another point to the telegraph line, and a telephone inductive or other resistance interposed in the wire or wires between the neutralizing coil and the point of juncture of the telephone loop with the main
20 line, substantially as described.

6. The combination of two line wires, independent telegraph instruments therefor, a telephone loop between the wires, having therein coils about the telephone core, and a
25 neutralizing loop between the wires having therein coils about the telephone core, the latter coils being wound in the opposite direction to the former, substantially as described.

7. The combination of two line wires, a telephone loop broken by condensers, between
30 said wires, a connection to earth from said loop between said condensers, a telegraph instrument at the end of one of said line wires, neutralizing coils around the telephone core
35 in the opposite direction to the telephone coils, a line, broken by a condenser, from the telegraph instrument to the neutralizing coils, and a connection to earth from the neutralizing coils, substantially as described.

8. The combination, with two main lines 40 and independent telegraph instruments therefor, of a telephone or telephone converter in a loop between the main lines, a neutralizing loop between the main lines so arranged with
45 reference to the telephone or converter that like impulses along the loops neutralize each other in the converter, and means for stopping the telephonic impulses along the neutralizing loop, substantially as described.

9. In a combined telephone and telegraph 50 system, the combination of the main lines, telegraph instruments therefor, a telephone or telephone converter, coils oppositely wound about the converter, the middle point of each
55 of the coils being connected to earth and the ends of the coils being connected by wires to the main lines, and condensers interposed in said wires, substantially as described.

10. In a combined telephone and telegraph system, the combination with two main lines 60 and independent telegraph instruments therefor, of a telephone or telephone converter in a loop between the main lines, said loop being grounded in the center of the coil, and a condenser between each main line and said
65 ground, a neutralizing loop between the main lines and connected around the telephone or converter and grounded in the center of the coil and a condenser between each main line and said ground, and means for stopping the
70 telephonic impulses between the telegraph instruments and main line, substantially as described.

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Witnesses:

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