

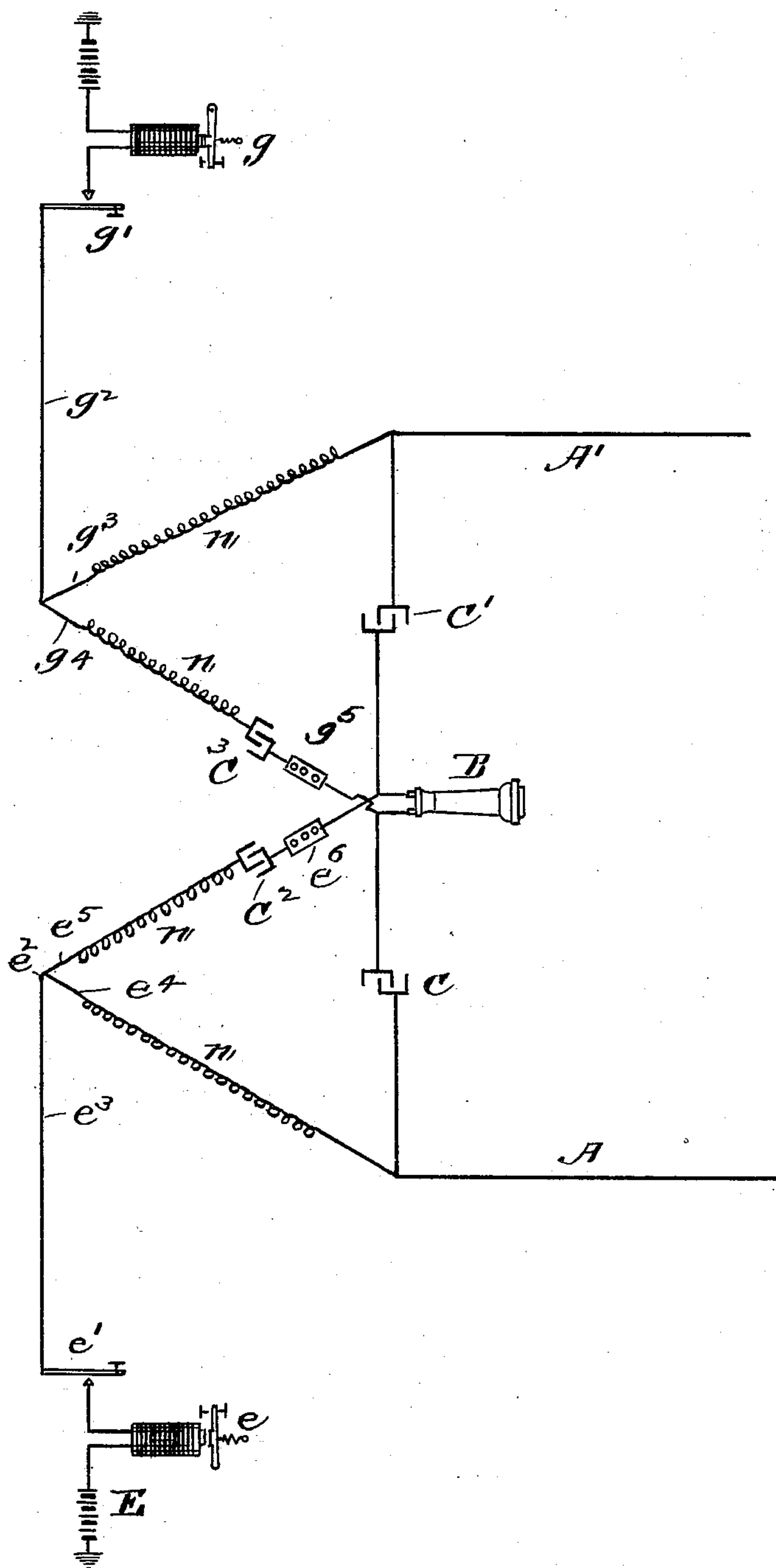
(No Model.)

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## COMBINED TELEPHONIC AND TELEGRAPHIC SYSTEM.

No. 533,967.

Patented Feb. 12, 1895.



~~WITNESSES~~

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# UNITED STATES PATENT OFFICE.

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## COMBINED TELEPHONIC AND TELEGRAPHIC SYSTEM.

SPECIFICATION forming part of Letters Patent No. 533,967, dated February 12, 1895.

Application filed July 30, 1892. Serial No. 441,741. (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 Telephonic and Telegraphic System, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming a part of this specification, in explaining its nature.

Heretofore there have been attempts to use upon the same electric circuit simultaneously telephonic impulses or currents and telegraphic impulses or currents. The best results in this direction of which I have knowledge have been obtained in a telephonic metallic circuit, comprising an outgoing and return wire. With metallic circuits of this description it has been possible to telephone and telegraph simultaneously, but not without interfering with the services of both systems. The telephonic system has suffered from the noise created or occurring in the telephones due to the telegraphic currents which cause the telephone diaphragm to throb and render hearing difficult. To diminish the effect upon the telephone of these disturbing currents it has been necessary to reduce the capacity of the telephone condensers, thereby correspondingly reducing and weakening the telephone current. To use the same circuit for telephonic purposes at the same time that it is being used for telegraphic has required that there be used in the telegraphic circuit retardation coils. These are used for the purpose of retarding the flow of the telegraphic currents, as well as to prevent the telephonic currents from being diverted from their paths; and even with these instrumentalities it has been practically impossible to employ a telephone metallic circuit for more than one telegraph service on each side line at one time; and this limits the capacity of the telephone metallic circuit for telegraph purposes to two lessees or users. It is desirable that the telegraph service of the telephonic metallic circuits be increased so that each wire or line of the circuit may give more than one telegraphic service at the same time that it is be-

ing used for telephonic service; or, in other words, to give each side of the metallic telephonic circuit the same capacity for telegraphic purposes it would have if it were used for telegraphic purposes only—in other words to permit each line to be used for a duplex, quadruplex or sextuplex or printing telegraph system. In order that this may be accomplished it is, of course, absolutely essential that there be no disturbances to the telephonic system, and my invention relates to the organization of a combined telephone and telegraph system, whereby while the metallic circuit may be used continuously for telephonic purposes each line of it may be simultaneously used for as many telegraphic services as each line would carry if used for telegraph purposes alone.

To carry this system into effect I neutralize the induced telegraphic impulses in the telephone by sending at the same time equal induced telegraphic impulses into the telephone loop and through the telephone in the opposite direction to the disturbing impulses. These neutralizing induced impulses I derive from the direct impulses from the instrument by leading a branch wire from the telegraph wire near the instrument to the far side of the telephone loop, and in such branch wire interposing a condenser. Then, upon the operation of the telegraph key, so that a current is transmitted along the line wire, while such current actually traverses a circuit along a single path only, namely, along the line wire to the distant station, and thence back by earth, it likewise charges the branch line and the telephone loop and the condensers in these wires and thereby generates at the opposite plates of such condensers induced currents, which induced currents travel from said plates and arrive at the telephone in opposite directions and there neutralize each other.

Combined telegraphic and telephonic systems have already been devised in which the induced telegraphic impulses through the telephone are neutralized by equal induced impulses entering the telephone from the opposite direction, but such systems are defective in this respect, that the condenser at which such neutralizing induced impulses are gen-



erated is in the telephone loop itself. The direct impulses from which they are generated therefore enter the loop from the other line wire. Hence such direct impulses necessarily travel along such second line wire, so that the second line wire in such a system is incapacitated from carrying an independent message; but, in my system, by generating the induced impulses outside the telephone loop, and in a branch line electrically separated from the other line wire, so that currents in such branch line do not travel along the second line wire, the latter is entirely free to carry any telegraphic message independent of the first line wire.

By referring to the drawing my invention may be better understood.

A represents the outgoing line of a telephone metallic circuit; A', the incoming line of such metallic circuit, and B, the home telephone. One terminal of the telephone B is connected with the outgoing line A, through a condenser C. The other terminal of the telephone is connected with the incoming line A', through a condenser C'.

E is the battery of one telegraphic system using the side A of the line.

e represents the relay; e', the key of the telegraphic instrument.

At  $e^2$  or any suitable point the telegraph line  $e^3$  is divided, one branch  $e^4$  running to the outgoing line A, and the other branch  $e^5$  running through a condenser C<sup>2</sup> to the telephone B. It will thus be seen that the current of battery E besides traveling along the outgoing line A, travels along two other lines, one  $e^4$  to the condenser C, and the other  $e^5$  to the condenser C<sup>2</sup>. These condensers are simultaneously charged, and thereby at the condenser C is generated an induced current traveling to the telephone in one direction, and at C<sup>2</sup> is generated an induced current traversing the rheostat  $e^6$ , and traveling to the telephone in the opposite direction, and at the telephone these induced currents meet and neutralize each other. It is desirable that these induced currents enter the telephone balanced and a rheostat is used for this purpose. I have shown it in the branch  $e^5$ , but if necessary it may be used for any other or all branches.

Another telegraphic circuit over the line A' is presented by battery G, relay g, telegraph instrument g', line  $g^2$ , branch line  $g^3$  to the line A', branch line  $g^4$  to the telephone B, condenser C<sup>3</sup> and rheostat  $g^5$ . I have shown each line as having one telegraphic connection, but such systems as are used for increasing the simultaneous service such as the duplex, quadruplex, sextuplex, &c., may be introduced to the line A, through the telegraphic line  $e^3$  or to line A' through the telegraphic line  $g^2$ .

It is essential, whatever system may be employed, that balancing induced currents be brought together in the telephone.

I do not of course confine myself to the ex-

act arrangement described, but may use in lieu thereof any mechanical or electrical equivalent for accomplishing the same result.

In the lines  $e^4$ ,  $e^5$ ,  $g^3$  and  $g^4$  there are shown inductive resistances at n. These are for the purpose of preventing telephonic currents entering the telephone in any other path than through the condensers C C', or, in other words, to prevent the telephone currents from traversing lines  $e^4$ ,  $e^5$ ,  $g^3$ ,  $g^4$ .

Of course it will be understood that the induced telegraphic currents may be caused to meet in a telephone converter instead of in the telephone itself.

In the claims I have spoken of the means for creating the electric currents in the system by the generic term "battery." It will be understood that under this term I include not only a voltaic battery, but a dynamo, or any other desirable source of electrical energy.

For the sake of brevity, I have throughout the claims used the singular number only in speaking of the telegraph instrument. It will be understood, however, that this will include the case where two instruments are used, as in quadruplex telegraphy.

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

1. In a metallic circuit for simultaneous telephonic and telegraphic service the combination of the main line or circuit connected on one side through a condenser with one terminal of the telephone or telephone converter, and with the telegraph battery and instrument by a line having an inductive resistance to telephone currents, and a branch line having a telephonic current resistance and condenser connecting the line to the telegraph instrument and battery with the other terminal of said telephone or telephone converter, the said telephone or telephone converter being also connected with the other line of the metallic circuit through a condenser, as and for the purposes described.

2. In a metallic circuit for simultaneous telephonic and telegraphic service, the combination of the main line or circuit connected on one side through a condenser with one terminal of the telephone or telephone converter, and with the telegraph battery and instrument by a line having an inductive resistance to telephone currents, and a branch line having a telephonic current resistance and condenser connecting the line to the telegraph instrument and battery with the other terminal of said telephone or telephone converter, the said telephone or telephone converter being also connected with the other line of the metallic circuit through a condenser, and also by a branch line with the telegraph battery and instrument of the other line of the circuit, substantially as described.

3. In a combined telegraph and telephone system, the combination of the main line or circuit connected on one side through a con-



denser with one terminal of the telephone or telephone converter, and with the telegraph battery and instrument by a line having an inductive resistance to telephone currents, and a branch line having a telephonic current resistance and condenser connecting the line to the telegraph instrument and battery with the other terminal of said telephone or telephone converter, the main line of the telephone circuit being continued from the latter terminal independently of said branch line, substantially as described.

4. In a combined telephone and telegraph system, the combination, with the line wires of a metallic circuit, and independent telegraph instruments for each line wire, of a telephone or telephone converter, each terminal of which has a separate connection, outside the telephone coils, capable of transmitting electric impulses, with each line wire, substantially as described.

5. In a combined telephone and telegraph system, the combination, with the line wires of a metallic circuit, and independent telegraph instruments for each line wire, of a telephone or telephone converter, each terminal of which has a separate connection, outside the telephone coils, capable of transmitting electric impulses, with each line wire, and means for balancing the electric impulses from either home telegraph instrument along

such connections to the telephone or converter terminals, substantially as described.

6. In a combined telephone and telegraph system, the combination, with the line wire of a metallic circuit, and a telegraph instrument therefor, of a telephone or telephone converter, in a loop, broken by condensers, of the main line, and a shunt, broken by a condenser, around the telephone, from one branch of the loop at a point between the condenser therein and the telephone, to the line wire with which the other branch of the loop connects, substantially as described.

7. In a combined telephone and telegraph system, the combination, with the line wire of a metallic circuit, and a telegraph instrument therefor, of a telephone or telephone converter, in a loop, broken by condensers, of the main line, a shunt, broken by a condenser, around the telephone, from one branch of the loop at a point between the condenser therein and the telephone, to the line wire with which the other branch of the loop connects, and means for balancing the electric impulses from the telegraph instrument to the terminals of the telephone or telephone converter, substantially as described.

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Witnesses:

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