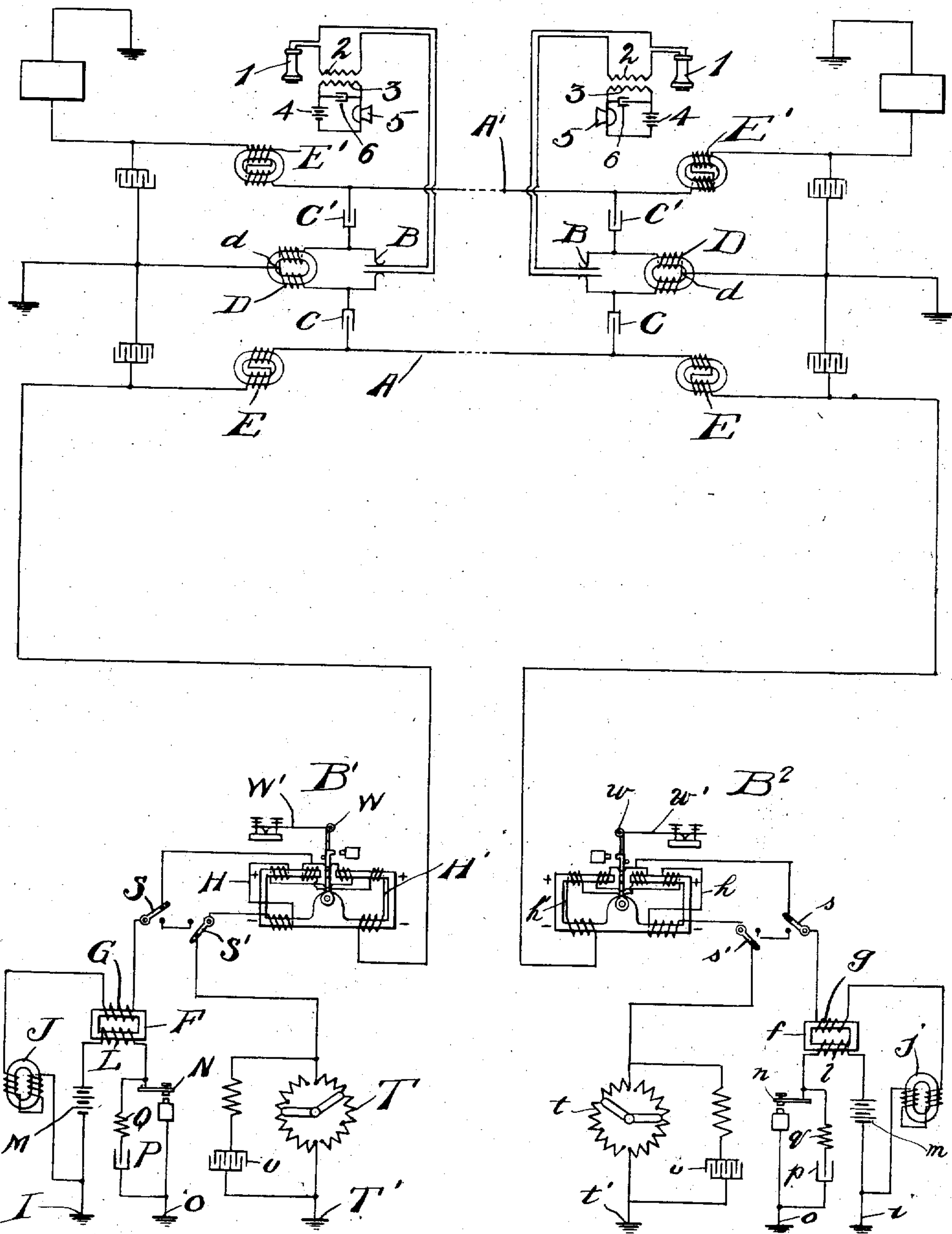


G. E. HINES.  
 COMBINED TELEPHONE AND TELEGRAPH SYSTEM.  
 APPLICATION FILED MAY 15, 1908.

954,734.

Patented Apr. 12, 1910.



Witnesses:

*Chas. A. Rand*  
*Fred M. Dammeyer*

Inventor

G. E. HINES

*By his Attorneys*  
*Barrett, Howell & Mendenhall*



# UNITED STATES PATENT OFFICE.

GEORGE E. HINES, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO WILLIAM T. DALEY, OF BROOKLYN, NEW YORK.

## COMBINED TELEPHONE AND TELEGRAPH SYSTEM.

954,734.

Specification of Letters Patent.

Patented Apr. 12, 1910.

Application filed May 15, 1908. Serial No. 432,971.

*To all whom it may concern:*

Be it known that I, GEORGE E. HINES, a citizen of the United States, residing in the city, county, and State of New York, have  
5 invented certain new and useful Improvements in Combined Telephone and Telegraph Systems, of which the following is a full, clear, and exact description.

My invention relates to improvements in  
10 combined telegraph and telephone systems, and has for its object to produce a new and improved combined telegraph and telephone system in which the various difficulties heretofore found to exist in such sys-  
15 tems are avoided.

My invention also has for its object to produce a combined telephone system and duplex telegraph system.

Heretofore one of the great difficulties  
20 in connection with the combination of telegraph and telephone systems, that is, in connection with such a combination that the same conductors are used for transmitting both telephonic and telegraphic messages,  
25 has been that the telegraph signals may not only be detected in a telephone but are so audible that they greatly interfere with the telephonic service. This is due to the fact that in the ordinary telegraph system as  
30 heretofore used in connection with combined telephone and telegraph systems, whenever the circuit is opened in sending a telegraph message, a static discharge from the coils in circuit takes place, which forms a peak of  
35 electromotive force which affects the diaphragm of the telephone. I have discovered that this difficulty can be eliminated by eliminating the static discharge, and I accomplish this end by impressing upon  
40 the telephone conductors telegraphic impulses which are of rounded wave form, there being one such wave for each impulse. On account of this wave form the impulses upon the telephone lines are in effect shaded  
45 at both the beginning and at the ending, and are in effect single waves of an alternating current and are of such low frequency as compared with telephonic currents as to produce no effect upon the dia-  
50 phragms of the telephones.

The following is a description of my system, reference being had to the accompanying drawing, which represents diagrammatically the circuits and elements of my  
55 system.

The upper part of the drawing represents a "composite" used in combined telephone and telegraph systems. In this composite A—A' are the leads of an all-metallic telephone circuit. B—B are telephone switches  
60 connected thereto through condensers C—C'. D—D are impedance coils connected in multiple to said switches and having their windings connected at an intermediate point  $d$  to the ground. E—E' are other im-  
65 pedance coils each differentially wound, which are in series with the telegraphic transmitting and receiving apparatus. A separate set of telegraphic receiving and transmitting apparatus can be connected to each  
70 lead. For the purpose of illustration, however, I have shown in detail but one such set connected to one lead.

I will describe in detail the system and arrangement at one station or terminal only.  
75 The connections and the telegraphic apparatus at the opposite end are identical.

Referring now to the telegraphic apparatus, F is a transformer having a laminated closed magnetic circuit having its secondary  
80 G in series with the main conductor A and with windings H—H' on a relay B'. One terminal of this secondary G is connected to ground at I, preferably through an inductance coil J.  
85

L is the primary of the transformer in series with an ohmic resistance Q, and the transmitting key N, one contact of which is grounded at O. The transmitting key is shunted by a small condenser P in  
90 series with an ohmic resistance Q.

The far station of the telegraph system is in all respects the same as the home station, and the parts similar to the home station parts have similar small letters of reference  
95 applied thereto.

The telephone, transmission and receiving devices are arranged in any suitable way. For purposes of illustration, a simple battery arrangement is shown, in which 1—1  
100 are telephone receivers in series with the line and secondaries 2—2, respectively.

3—3 are primaries in series with batteries 4—4 and transmitters 5—5, the primaries being shunted by condensers 6—6.  
105

The telephonic system is used and operated in the same manner as any ordinary telephone. The frequency of the currents employed in transmitting the telephonic messages is so great that they easily pass  
110



through the condensers C—C' but will not pass through the differentially wound impedance coil E.

When the telegraph system is operated for the sending of messages by the key N, a current is first caused to pass through the primary L, which in turn induces a current in the secondary G. This current in the secondary rises gradually and falls gradually, this being due to the fact that the transformer is a closed magnetic circuit transformer having high impedance in the primary so that the primary current itself rises somewhat slowly, and to the fact that a transformer having a magnetic circuit of this type loses its magnetism somewhat slowly after the primary circuit is opened. There will be one rise and one fall in the secondary current for every closing of the transmitting key N and for every opening of the transmitting key, and the impulses produced by each closing as well as by each opening of the transmitting key are used for impressing different telegraphic signals over the line which are received by the receiving relays, the armatures of which are actuated by each impulse. The impulses due to the closings of the transmitting key are in one direction, and the impulses due to the openings of the transmitting key are in the opposite direction, and all being of the wave-like form above described and being of lower frequency than the telephonic frequency, pass through the windings of the differentially wound impedance coil E and do not encounter opposition in the impedance coil other than that due to the ohmic resistance of its windings, or noticeably affect the diaphragms of any telephones which may be in circuit, the sudden static discharge heretofore found objectionable being entirely eliminated and the frequency of the wave-like telegraphic impulse being such as not to produce any audible sound.

The relay B' has windings in series with the secondary G of the transformer. This relay is one which by changing the connections can be used for either single transmission or duplex transmission. With the switches S—S' in the positions shown, it is connected up for duplex transmission, in which case the windings in the relay are connected in multiple, one half being connected to the ground through a suitable resistance T and capacity U, and the other set being connected in series with the line A. These two sets of windings are equal when opposite, so that when they are both traversed by equal currents derived from a common source, the relay is not energized. Thus, for instance, in duplex operation when a signal is sent from the left hand station the current at the relay B' is divided, part passing through the windings H to the ground at T', and the other part passing through

the other windings H' to the line A, the relay itself not being energized by currents. When the impulse reaches the relay at the farther end B<sup>2</sup>, the current would in part pass through all the coils of the relay in series to the ground at i, and in part would pass through half of the coils in series to the dividing point, from which it would pass to the ground at i'. The currents in all the coils would cooperate in energizing the relay and causing its armature to be moved.

It is to be noted that the device described requires no pole changers, and that for that reason duplex operation can be obtained and is obtained without having a continuous current passing through the relay or through any other circuit, except when a signal is being produced. It is further to be noted that the system requires but one source of current at each end, thereby eliminating the second source of current, which has heretofore been found to be necessary in duplex operation.

On account of the impulses which are liable to be impressed upon the line by electrical discharge of parallel conductors, which will produce currents of greater or less strength in the telegraphic circuit, and therefore interfere with the proper action of the relay, I provide for the armature of the relays jockey wheels W—w supported by springs W'—w' bearing upon the upper end of the armatures X—x which maintains the armature at rest from such false currents at either limit of its movement, but is so adjusted as to yield when the currents used in transmitting the telegraphic impulses are sent over the line. When the switches S—S', s—s' are moved so as to engage the other contact points the coils in the relay are disconnected from the grounds at T'—t' and are all placed in series, in which case the system works as a single system.

My invention permits of various modifications and various changes in the means for employing the principles and improvements above described without departing from its spirit.

What I claim is:

1. In a combined telephone and telegraph system, the combination of a main conductor, telephonic apparatus connected therewith, means for impressing upon said line telegraphic signals each due to a single induced electrical impulse of rounded wave form, and an impedance coil in series with said conductor and said telegraphic apparatus and located between said telegraphic apparatus and the point at which the telephonic apparatus is connected successive impulses being of opposite direction.

2. In a combined telephone and telegraph system the combination of a main conductor, telephonic apparatus connected therewith, said conductor being grounded at each



end, a coil in series with said conductor, a second coil in inductive relation to said first coil, a telegraph key and battery in series with said second coil, a closed magnetic circuit common to said two coils receiving relays and jockeys for the armatures of said relays.

3. In a combined telephone and telegraph system the combination of a main conductor, telephonic apparatus connected therewith, said conductor being grounded at each end, a coil in series with said conductor, a second coil in inductive relation to said first

coil, a closed magnetic circuit common to said coils, a telegraph key and battery in series with said second coil, an impedance coil located in the ground connection between said first coil and the point to which the telegraphic apparatus is connected receiving relays and jockeys for the armatures of said relays.

GEO. E. HINES.

Witnesses:

D. F. MALLIN,  
J. T. EWING.

Correction in Letters Patent No. 954,734.

It is hereby certified that in Letters Patent No. 954,734, granted April 12, 1910, upon the application of George E. Hines, of New York, N. Y., for an improvement in "A Combined Telephone and Telegraph System," an error appears in the printed specification requiring correction as follows: Page 1, line 87, the words "an ohmic resistance  $Q$ " should be stricken out and the words *a source of constant current  $M$*  inserted instead; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of May, A. D., 1910.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.

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