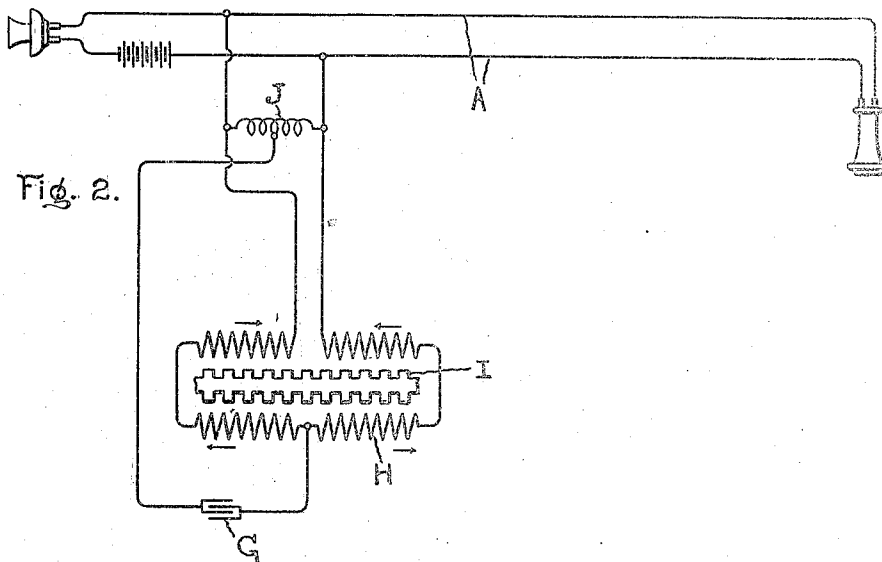
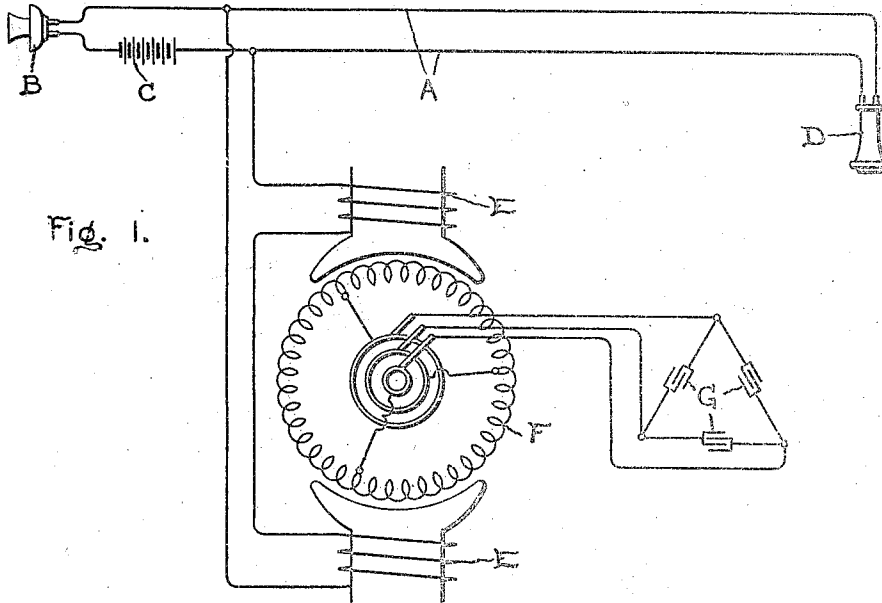


E. F. W. ALEXANDERSON.
 REINFORCER FOR TELEPHONE CIRCUITS.
 APPLICATION FILED JAN. 6, 1910.

996,391

Patented June 27, 1911.
 2 SHEETS—SHEET 1.



WITNESSES:

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996,891.

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2 SHEETS—SHEET 2.

Fig. 3.

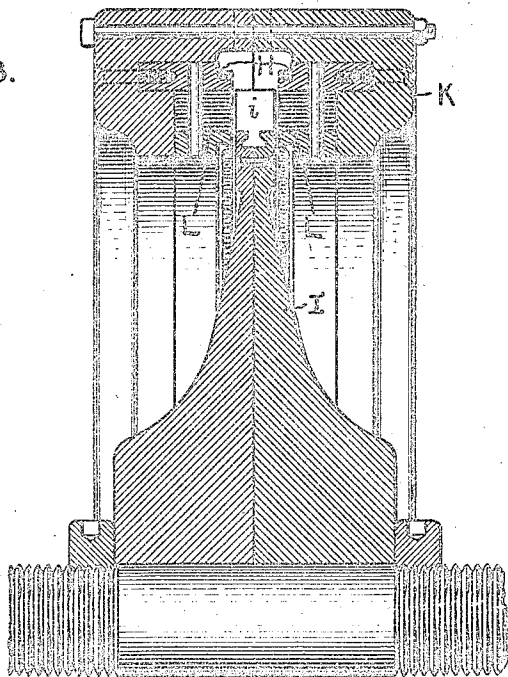
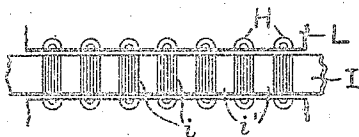


Fig. 4.



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UNITED STATES PATENT OFFICE.

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REINFORCER FOR TELEPHONE-CIRCUITS.

996,391.

Specification of Letters Patent. Patented June 27, 1911.

Application filed January 6, 1910. Serial No. 536,655.

To all whom it may concern:

Be it known that I, ERNST F. W. ALEXANDERSON, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Reinforcers for Telephone-Circuits, of which the following is a specification.

My invention relates to reinforcing means for the currents in telephone circuits, and its object is to provide a simple and efficient device for greatly reinforcing telephone currents without altering the wave shape, or, in other words, for increasing the intensity without affecting the quality of the sound.

My invention consists in the combination with a telephone circuit, of a reinforcer comprising an alternating current dynamo-electric machine having its field circuit connected to the telephone circuit and its armature circuit tuned approximately to resonance. This may be accomplished by connecting the armature in a local closed circuit containing a proper amount of capacity.

The principle of the device depends upon the fact that any alternating current generator having a small initial field magnetization may be brought up to full field strength without any field winding if the armature is connected to a suitable condenser so that the armature reaction of the condenser current magnetizes the field. If the generator could be conceived as without saturation, the field strength produced in this way would rise indefinitely. If the condenser is tuned so that the circuit is approximately at resonance, the field strength will be proportional to the original or residual magnetism but many times as great. Now if a machine with the armature circuit thus tuned by a condenser has its field circuit connected to the telephone circuit, the voltage in the telephone circuit, due to the telephone current, will be impressed upon the field circuit of the machine, producing therein the initial magnetization. This is increased by armature reaction many fold, and the increase in field flux reacts inductively upon the field circuit. The result is that the electro-motive force returned by the generator field to the telephone circuit is many times greater than the electro-motive force originally impressed upon the field from that circuit. The alternating currents flowing in the high

frequency armature circuits and the condensers have nothing to do with the telephone current, except that their armature reaction amplifies the field strength, and so, indirectly amplifies the telephone current.

My invention will best be understood by reference to the accompanying drawings, in which—

Figure 1 shows diagrammatically the general case of an alternator used, in accordance with my invention, as a reinforcer for a telephone circuit; Fig. 2 shows diagrammatically the connections when the preferred form of alternator is employed; Fig. 3 shows a side elevation in cross-section of the upper half of an alternator of preferred construction for this use, and Fig. 4 is an explanatory detail view.

In Fig. 1, A represents a telephone circuit containing the usual transmitter B, source of current C and receiver D. E represents the field winding of an alternating current dynamo electric machine and F the armature winding. The field winding is connected across the telephone circuit while the armature winding is connected in a local closed circuit containing the condensers G adjusted so as to tune the armature circuit approximately to resonance. The armature reaction on the field magnetization, by increasing the field flux, induces in the winding E a voltage many times greater than that impressed upon it by the telephone circuit A, as has already been explained, and the telephone currents are accordingly increased in intensity without their wave shapes being affected.

In Fig. 2 I have indicated diagrammatically the connections of a preferred form of alternator. This machine is the same as that described in my prior application, Serial No. 527,362, filed November 11, 1909, in which a single winding H is common to both the field and armature circuits. This machine has two advantages as a telephone reinforcer when compared with other machines, first, there is no magnetic leakage between the armature and field circuits, since a single winding and its connections form both circuits; second, the machine is of a type which can be constructed with almost no residual magnetism which is an advantage in telephone work. This is due to the arrangement of the magnetic circuit of the machine which is such that the field flux is

not constant, as in the ordinary inductor alternator, but varies with the movement of the inductor.

The construction of the machine is shown in Figs. 3 and 4, in which K represents the stator frame carrying two concentric laminated magnetic rings L. The coils of the winding H are placed in slots in the opposite faces of these rings, as is best shown in Fig. 4. The inductor I carries at its periphery, between the rings L, laminated pole pieces *i* separated by blocks *i'* of non-magnetic material. When the poles *i* are opposite the coils H, as shown in Fig. 4, the path of the field flux is of comparatively low reluctance, but when the poles are midway between two adjacent coils the reluctance of the path of the field flux is very great. The movement of the poles of the inductor, by varying the reluctance of the flux path, varies the flux and, consequently, induces an electro-motive force in the same coils H which produce the flux. This induced voltage, which may be termed the armature voltage, is impressed on the condensers suitably connected in a local closed circuit with the winding H so as to obtain the armature reaction intensifying the voltage of the field circuit, as heretofore explained.

The connections for the armature and field circuits are shown in Fig. 2. The field circuit comprises all the coils of winding H but the halves of this winding are so connected that the voltages induced in them by the movement of the inductor are in opposition with respect to the field circuit. This is indicated by the arrows placed adjacent the winding H in Fig. 2. The armature voltage produced by the movement of the inductor, therefore, has no direct effect whatever on the field circuit. The armature circuit is led off from the point at the middle of the winding H and from a point at the middle of a reactance J connected

across the terminals of the field circuit. These points are thus equi-potential with respect to the field terminal voltage but are at the points of maximum voltage with respect to the induced armature voltage, as will be seen by inspecting the directions of the arrows. The two halves of the winding H are in parallel in the armature circuit, which is closed through the condenser G which is properly adjusted for tuning the armature circuits approximately to resonance. The reaction of the armature on the field circuit and the reinforcing of the telephone currents thereby are precisely the same as has been explained in connection with Fig. 1.

I do not desire to limit myself to the particular construction and arrangement of parts shown and described, but aim in the appended claims to cover all modifications which come within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In combination with a telephone circuit, a reinforcer therefor comprising an inductor alternator having a winding common to its field and armature circuits, the field circuit being connected to the telephone circuit and the armature circuit being tuned approximately to resonance.

2. In combination with a telephone circuit, a reinforcer therefor comprising an inductor alternator having a winding common to its field and armature circuits, the field circuit being connected to the telephone circuit and the armature circuit being a local closed circuit containing capacity.

In witness whereof, I have hereunto set my hand this 5th day of January, 1910.

ERNST F. W. ALEXANDERSON.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.