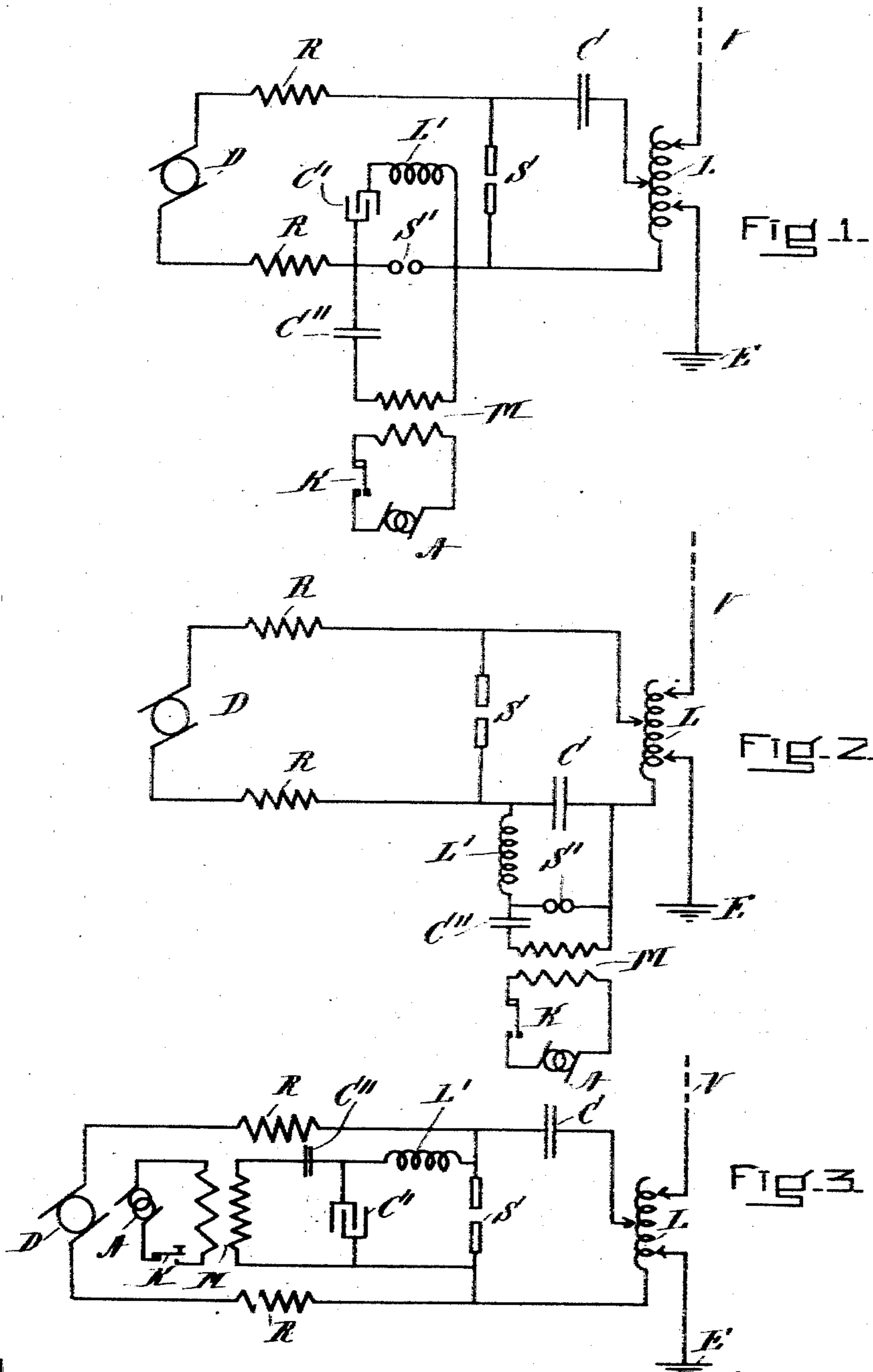


L. DE FOREST.
 SPACE TELEGRAPHY.
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926,936.

Patented July 6, 1909.



WITNESSES:
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UNITED STATES PATENT OFFICE.

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SPACE TELEGRAPHY.

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To all whom it may concern:

Be it known that I, LEE DE FOREST, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented a new and useful Improvement in Space Telegraphy, of which the following is a specification.

My invention relates to space telegraphy and more especially to transmitting systems therefor.

The object of my invention is to provide a more efficient means for controlling the operation of continuously oscillating circuits than exists to-day in this art.

My invention broadly stated consists in the combination of a source of practically-continuous high-frequency electrical oscillations and an oscillatory circuit, energized by a source of vibratory current and so associated therewith as to break up the waves radiated by said oscillations into groups of waves having a rate of emission within the limit of audibility and each group consisting of a large number of waves.

Several embodiments of my invention are illustrated diagrammatically in the drawings which accompany and form a part of this specification.

In the drawings, Figure 1 represents a space telegraph transmitting system constructed in accordance with the present invention. Figs. 2 and 3 are modifications of the system shown in Fig. 1.

In the figures, D is a source of unidirectional electromotive force, R R are resistances, inductive or non-inductive, C C' C'' are condensers, L, L' are inductances, S represents a gap in which an arc may be created, S' is a spark-gap, A is a source of vibratory electromotive force, K is a key, M is a transformer, and V is an antenna connected to earth at E.

In all the figures, the circuit S C L constitutes a source of practically continuous electrical oscillations when connected with the generator D through the resistances R R. The circuit S' C' L' is an oscillation circuit capable of developing intermittent trains of electrical oscillations of much lower frequency than the continuously oscillating circuit S C L, and with this end in view the condenser C' may be of very large capacity and the inductance L' may be made quite large in comparison with that portion of the inductance L which is included in the circuit

S C L. For example, the circuit S' C' L' may be constructed to develop oscillations having a frequency of the order ten thousand per second. However, the circuit S' C' L' may be designed to develop oscillations of any frequency, for example, one million per second, and in this case the generator A preferably will be one having a relatively high frequency, so that the spark-frequency of the oscillation in the circuit S' C' L' will be relatively high.

In Fig. 2 the circuit S' L' C is an oscillation circuit which may have the characteristics above set forth in connection with the circuit S' C' L'.

In Fig. 3 the oscillation circuit is connected up in series with the arc S, and contains the inductance L', and condenser C'', this circuit being bridged by the condenser C', and being suitably connected inductively or otherwise through the transformer M, with the circuit of generator A.

The condenser C'' may be employed to prevent the flow of direct current from the generator D through the secondary of the transformer M.

The adjustable contacts of the circuit S C L with the inductance L and of the antenna with said inductance permit the adjustment of the natural periods of the continuously oscillating circuit and the antenna system.

The systems may be used as follows: First, the arc gap S may be set so that the potential developed at its terminals will not produce an arc therein until the key K is closed; or, second, the arc gap may be so adjusted that an arc is produced therein at all times. In both cases the oscillation circuit is so associated with the source of continuous electrical oscillations that the energization of said oscillation circuit will control the said source of continuous electrical oscillations. There results therefore the radiation of electromagnetic waves in groups having a rate of emission substantially equal to either the rate of vibration of the oscillation circuit or else equal to twice the frequency of the generator A or, more generally speaking, to the spark frequency of the oscillations in the oscillation circuit. For example, if the oscillations developed in the circuit S C L have a frequency of one million per second and the circuit S' C' L' or the circuit S C' L' has a period of one ten-thousandth second, there

will be radiated from the antenna V electromagnetic waves having a wave-train frequency of ten thousand per second, each wave-train consisting of one hundred complete oscillations having a frequency of one million per second. Or, if the circuit S' C' L' or the circuit S' C L' has a period of one-millionth second or, in general, is constructed to develop oscillations having a frequency above the limit of audibility, and if the generator A develops currents of a frequency of five hundred per second so that the spark frequency of the oscillations in the oscillation circuit is one thousand, then there will be radiated from the antenna V electromagnetic waves having a wave-train frequency of one thousand per second, each wave-train consisting practically of one thousand complete oscillations per second.

By means of the system above described, I am able to effectively control the development of oscillations in a continuously oscillating circuit, and to dispense with the devices commonly employed in the receiving system for commutating the oscillations developed in such system by continuous trains of electromagnetic waves. Furthermore, by designing the oscillation circuit S' C' L' or S' L' C, so as to have a rate of vibration of the order of ten thousand per second, the sounds produced in the telephone at the receiving station will be characteristic and readily distinguishable from those produced therein by simultaneously transmitted waves having the more usual wave-train frequencies.

It will be understood that I do not limit myself to the particular systems which I have herein set forth for the purpose of more fully disclosing my invention, inasmuch as said systems may be subject to a wide range of variation without departure from the principles involved.

I claim:

1. In a space telegraph system, a source of practically-continuous high-frequency electrical oscillations, a radiating conductor associated therewith, an oscillation circuit as-

sociated with said source and arranged to control the same, a source of vibratory electrical energy associated with said oscillation circuit and means for controlling said source of vibratory electrical energy.

2. In a space telegraph system, a circuit capable of developing a practically-continuous train of high-frequency electrical oscillations, a radiating conductor associated therewith, an oscillation circuit capable of developing intermittent trains of electrical oscillations of much lower frequency and associated with the first mentioned circuit, a source of vibratory electromotive force associated with said oscillation circuit and means for controlling said source of vibratory electromotive force.

3. In a space telegraph system, a circuit capable of developing a practically-continuous train of high-frequency electrical oscillations, a radiating conductor associated therewith, a source of electrical energy, connections from said source to said circuit, spark electrodes in said connections, an oscillation circuit including said spark electrodes, a source of vibratory electromotive force for said oscillation circuit and means for controlling said source of electromotive force.

4. In a space telegraph system, a source of practically-continuous electrical oscillations of frequency higher than the limit of audibility, a radiating conductor associated therewith, an oscillation circuit capable of developing electrical oscillations of frequency lower than the limit of audibility and associated with said source, a source of vibratory electrical energy associated with said oscillation circuit and means for controlling said source of electrical energy.

In testimony whereof, I have hereunto subscribed my name this 17 day of June 1907.

LEE DE FOREST.

Witnesses:

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