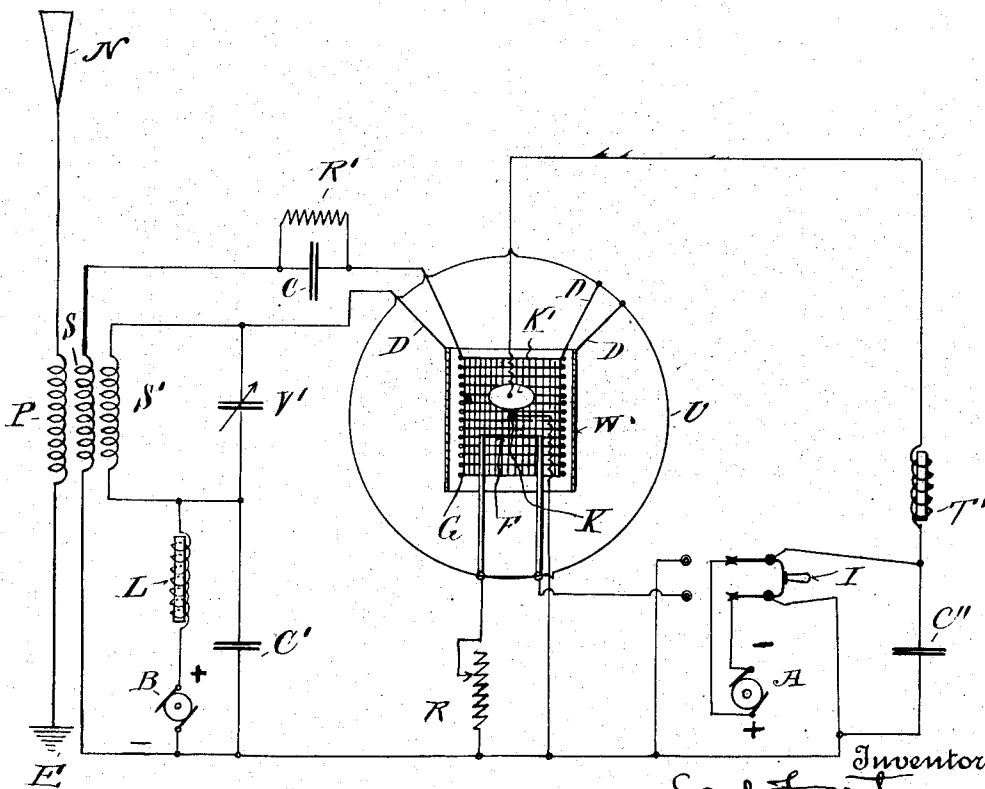


L. DE FOREST.
 APPARATUS FOR USE IN TELEGRAPHY OR TELEPHONY.
 APPLICATION FILED FEB. 3, 1916.

1,365,157.

Patented Jan. 11, 1921.



Inventor
L. de Forest
 By his Attorney
Samuel C. Darby

UNITED STATES PATENT OFFICE.

LEE DE FOREST, OF NEW YORK, N. Y., ASSIGNOR TO DE FOREST RADIO TELEPHONE AND TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

APPARATUS FOR USE IN TELEGRAPHY OR TELEPHONY.

1,365,157.

Specification of Letters Patent.

Patented Jan. 11, 1921.

Application filed February 3, 1916. Serial No. 75,928.

To all whom it may concern:

Be it known that I, LEE DE FOREST, a citizen of the United States, residing at New York, in the county of Bronx, State of New York, have made a certain new and useful Invention in Apparatus for Use in Telegraphy or Telephony, of which the following is a specification.

This invention relates to apparatus for use in telegraphy or telephony.

The object of the invention is to provide apparatus for use in telegraphy which is simple in structure, economical of manufacture and efficient in operation.

A further object of the invention is to provide a construction of audion that may be used as a detector, amplifier, or a generator of alternating currents in which an electric arc replaces the usual filament electrode.

Further objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location, relative arrangements of parts and circuits associated therewith all as will be more fully hereinafter set forth, as shown by the accompanying drawing, and finally pointed out in the appended claims.

Referring to the drawing:—

The figure diagrammatically illustrates a structure and arrangement embodying my invention.

The same part is designated by the same reference numeral wherever it occurs throughout the several views.

U generally designates a vessel partially or totally exhausted of air, or it may contain nitrogen gas at a pressure approximately two thirds of the atmospheric pressure.

I have shown my present invention as applied to a larger type of audion wherein the audion is employed with suitable well known circuit arrangements, for generating alternating currents and which has become known in the art as an "oscillation," but I do not desire to be limited to this particular type or use.

In this illustration, however, I show a structure of electrodes within the oscillion U, in which the wing or plate electrode W is in the form of an open ended cylinder, shown in central longitudinal section, suitably supported within the bulb by rods or

wires, D, sealed in the wall thereof. Within the plate electrode is the grid electrode G, formed in a similar cylinder open at its ends, and composed of intermeshed wires as shown. The electrodes K and K' form the respective electrodes of the arc gap which is to replace the usual filament in the oscillion and are preferably made of highly refractory material, i. e., tungsten, or mixture of tungsten with zirconia, yttria, thoria, or other refractory materials.

The usual regenerative oscillating circuits are shown connecting the wing and grid electrodes with the negative terminal of the arc electrode K. B is the high voltage source of flux current, preferably a direct current generator of from 500 to 1500 volts. L is the impedance coil in circuit with the source B and the anode electrode W. C' is the bridging condenser in shunt around the impedance and the source B. V' and S' are the inductance and capacity connected in parallel in the wing circuit, which is connected to the positive terminal of the source B. S is a similar inductance, in series with the grid electrode G and is connected to the negative side of the current source B, as shown. A stopping condenser C is also connected in this circuit, preferably with a high resistance R', shunted thereabout to form a leak path thereabout. The coils S, S', are preferably inductively associated with each other and with P of the output circuit, which, for illustrative purposes, is shown as an antenna earth system N E.

In this arrangement the method of starting the arc between the electrodes K, K', is as follows: The source of current A to arc gap, which in this instance is shown as a direct current generator, is connected to the terminals of a hand switch I. This switch is thrown to the left hand position thereby connecting the positive terminal of current source A, in series with a filament F positioned immediately below the electrode K within the cylindrical grid electrode G through a regulating resistance R. The filament F is shown in this arrangement as a straight wire supported by two standards. An ionization current then passes from the negative hot filament to the originally cold anode K forming an arc therebetween which rapidly heats the tungsten electrode K to incandescence, whereupon the switch I is thrown to the right hand position shown in

the drawing, thereby making the electrode K' positive and the electrode K negative, relative to the current source A and the arc passes from the cold electrode K' to the hot electrode K as long as the system continues in operation, thereby eliminating the filament from the active operation of the oscillation once the system is set in operation. If desired, a stopping condenser C'' may be connected across the terminals of the generator A, and an impedance coil T' may be connected between the negative terminal of the source, and the electrode K' as shown.

The operation of the system is similar to my oscillating audion system, which is shown and described in many of my co-pending applications, as for example, see application Serial No. 825,954, filed March 20, 1914.

By employing the arc instead of the filament in the bulb U, I secure much higher cathode temperature and greater concentration of the action within the bulb and also I eliminate the obvious objection of having the filament give out or become broken thereby greatly increasing the life of the bulb.

Having now set forth the objects and nature of my invention, and having shown and described various arrangements embodying the principles thereof, what I claim as new and useful and of my own invention and desire to secure by Letters Patent, is,

1. An audion comprising a plurality of cold electrodes and three arc electrodes, circuits therefor, means for striking an arc between two of said arc electrodes, to set the audion in operation, and means for cutting out one of said electrodes and cutting in the third arc electrode.

2. In a radio signaling system, an audion comprising a plurality of cold electrodes and three arc electrodes, circuits associated therewith, means for striking an arc between two of said arc electrodes, and means to cut in the third arc electrode and to simultaneously cut out one of said electrodes, said means reversing the polarity of the arc electrode common to both arcs.

3. In a radio signaling system, an audion comprising a plurality of cold electrodes and three arc electrodes arranged in line with each other, circuits associated there-

with, means for striking an arc between the middle electrode and one of the end electrodes, and means for transferring the arc to extend between the middle electrode and the other end electrode.

4. In a radio signaling system, an audion comprising a plurality of cold electrodes and three arc electrodes arranged in line with each other, said arc electrodes being respectively a filament, a tungsten electrode and a plate, means for striking an arc between said filament electrode and said tungsten electrode, and means for transferring said arc to extend between said tungsten electrode and said plate electrode and to simultaneously cut out said filament electrode.

5. In a radio signaling system, an audion comprising a plurality of cold electrodes and three arc electrodes arranged in line with each other, said arc electrodes being respectively a filament, a tungsten electrode and a plate, means for striking an arc between said filament electrode and said tungsten electrode, to heat the same, and means for transversing said arc to extend between said tungsten electrode and said plate electrode after said tungsten electrode becomes heated and to simultaneously cut out said filament electrode.

6. An audion comprising an anode and a filament, a conducting body interposed between said anode and said filament, a pair of separated electrodes positioned adjacent to said filament, means for initially supplying current to said filament, and means for cutting off said current supply to said filament and supplying current across said separated electrodes.

7. An audion comprising an anode and a filament, a conducting body interposed between said anode and said filament, a pair of separated electrodes positioned adjacent to said filament, means for initially supplying current to said filament, and a switch for cutting off said current supply to said filament, and supplying current across said separated electrodes.

In testimony whereof I have hereunto set my hand on this 25th day of January, A. D. 1916.

LEE DE FOREST.