

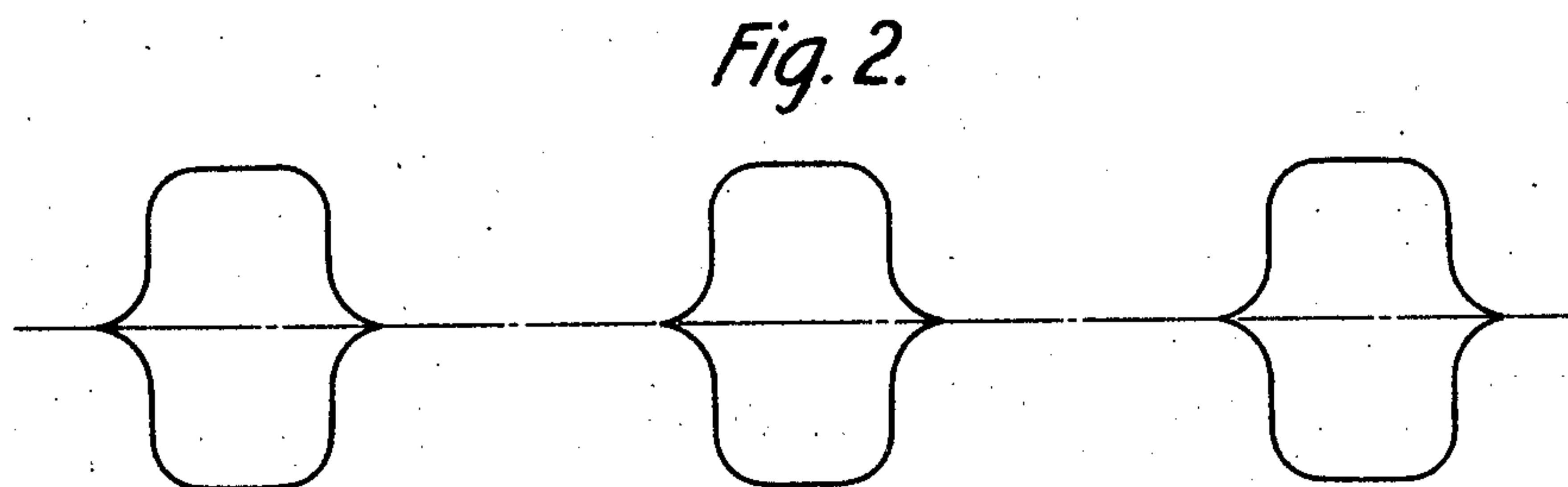
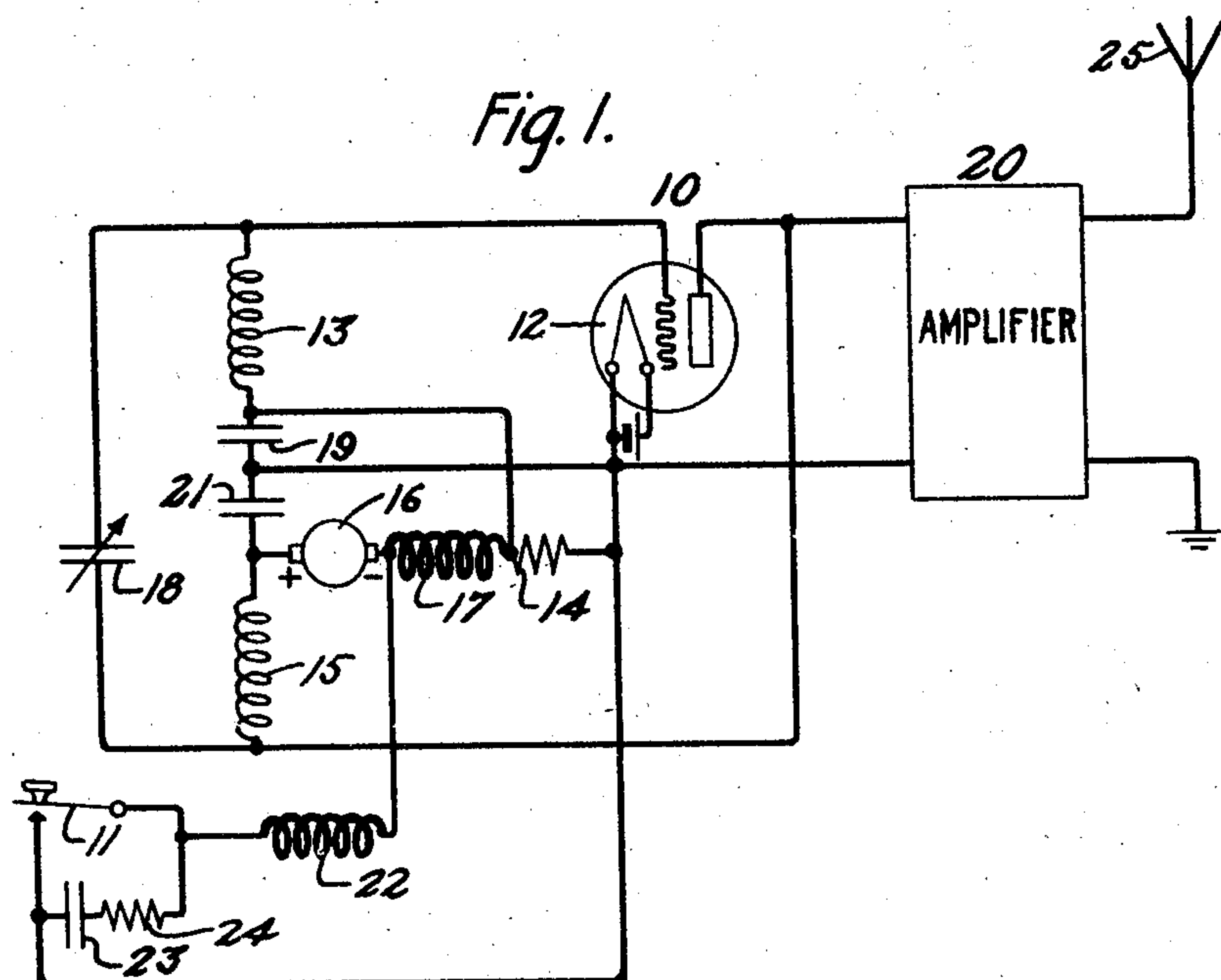
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ELECTRIC WAVE SIGNALING SYSTEM

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UNITED STATES PATENT OFFICE.

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ELECTRIC WAVE SIGNALING SYSTEM.

Application filed September 1, 1925. Serial No. 53,784.

This invention relates to electrical wave signaling systems, and more particularly to improved means for controlling electric waves for telegraph signaling.

5 In space discharge tube systems wherein signaling is effected by successively starting and stopping the oscillations in a space discharge tube, the envelope of the resultant waves is ordinarily substantially rectangular
10 in form. This wave form results because the impedance of the path traversed by the oscillations including the space path of the tube is ordinarily non-reactive and is varied in an abrupt manner between its normal value and
15 infinity.

The nature of a train of oscillations which have been broken up into elements of rectangular envelope is well known. An oscillation train of this character may be considered, in its effects, as comprising a normal wave of the oscillator frequency and a whole series of waves of various frequencies extending through the range at each side of the normal wave and being spaced therefrom at intervals dependent upon the rate and the duration of the interruptions. If the corners of the rectangular envelopes of the train elements are rounded off, many of the side frequencies most remote from the normal wave
30 disappear. As a result the effective wave band utilized for signal transmission is narrowed.

35 It is an object of this invention to control electric waves in accordance with signals and to cause the envelope of the controlled waves to have a form such that certain undesired side frequencies are eliminated without substantial distortion of the signals.

40 Another object is to interrupt electrical oscillations in accordance with signals and to reduce the width of the band of frequencies necessary for the transmission of intelligible signals.

45 A further object is to transmit signals by interrupting electrical oscillations in such a manner that the resultant wave envelope has in general a rectangular form with rounded corners as illustrated.

50 An additional object is to control electrical oscillations by variably impeding the oscillations at a rate such that a number of side frequency components are eliminated.

A feature of the invention is a space discharge oscillation generator adapted to be controlled by a telegraph key and having 55 choke coils of suitable inductance and suitably arranged to control the oscillations so as to eliminate certain side frequency components produced when signaling, and a path in shunt to the inductance, including another 60 inductance and a key.

The invention comprises a space discharge oscillation generator including a space discharge tube and means for varying the tube impedance, which means includes reactive 65 elements designed to cause the amplitude of the waves to increase and decrease at a rate such that the number of side frequency components is reduced.

More specifically, the invention may include a space discharge tube oscillation generator adapted to be controlled by a telegraph key for stopping and starting the oscillations in accordance with signals. The key is so arranged that when closed it short-circuits an impedance a portion of which is included in both the input and output circuits of the space discharge tube, thereby reducing the negative potential on the grid of the tube and causing oscillations to be generated. The 80 impedance includes an inductance element for controlling the rate of decay of the oscillations when the key is open. Another inductance element is also included in series with the key to reduce the rate of building up 85 of the oscillations when the key is closed.

The oscillation generator may form a part of a radio transmitter or a wire signaling system.

The reduction in number of side frequency 90 waves generated in the oscillator reduces the width of the band of frequencies occupied by the signals and hence reduces the likelihood of interference with other signal channels or systems operating on different wave lengths 95 or carrier wave frequencies. The number of possible signal channels within a given range of frequencies is also increased.

In the drawings, Fig. 1 represents a radio telegraph transmitting system embodying 100 the invention.

Fig. 2 represents approximately the form of waves produced by applicant's invention.

The following is a detailed description of

the system illustrated in Fig. 1. The system includes an oscillation generator 10 adapted to be controlled by a telegraph key 11 to supply signal waves to an amplifier 20 connected
5 to an antenna 25.

The oscillation generator 10, which is of the general type disclosed in Patent 1,356,763, to R. V. L. Hartley, October 26, 1920, includes a space discharge tube 12 having an
10 input circuit, including inductance 13 and resistance 14, connected between its control electrode and cathode. Tube 12 is also included in a space current circuit, comprising inductance 15, direct current generator 16,
15 inductance 17 and resistance 14, connected between its anode and cathode.

The resistance 14 is included in both the input and the output circuits of tube 12. These circuits are coupled by an adjustable con-
20 denser 18 connected to terminals of coils 13 and 15, adjacent to the control electrode and anode, respectively, of tube 12. The opposite terminals of inductances 13 and 15 are each connected to the cathode of tube 12 by
25 condensers 19 and 21, respectively.

The circuit, formed by inductances 13 and 15 and condensers 18, 19 and 21 is tuned to the frequency at which waves are to be gen-
30 erated in oscillator 10, the condensers 19 and 21 being preferably of such large capacity as to have negligible effect upon the tuning of the circuit.

The condenser 19 serves as a low impedance path for the oscillations in the input circuit of tube 12, in shunt to resistance 14, and
35 condenser 21 provides a similar low impedance path for oscillations in the output circuit, in shunt to generator 16, inductance 17 and resistance 14.

A path, including telegraph key 11 and an inductance 22, is adapted to be closed in shunt to the resistance 14 and inductance 17 upon
40 the closure of the key. The telegraph key is shunted by condenser 23 in series with resistance 24, for preventing sparking at the contacts.

The cathode and anode of tube 12 are also connected to the input terminals of amplifier 20, which may be of any well-known type
50 such, for example, as a space discharge tube amplifier. The output terminals of the amplifier 20 are connected, respectively, to the antenna 25 and to ground.

In the operation of the system, for the transmission of signals, the key 11, being suc-
55 cessively closed and opened, alternately connects and disconnects the path, including inductance 22, around the resistance 14 and inductance 17.

When key 11 is closed, the negative potential upon the control electrode of tube 12 is reduced and when key 11 is opened the negative potential is increased to the extent of the drop in potential along resistance 14. The
60 change of potential is affected by the induc-

tance 17 in such manner as to tend to cause the envelope of the oscillations to have a form approximately like that illustrated in Fig. 2.

The inductance 22 affects the space current of tube 12 in such manner as to tend to
70 assist the coil 17 in producing the form of envelope illustrated in Fig. 2. Without the coil 22 the space current might surge in the following path: anode of tube 12, inductance 15, generator 16, key 11 or resistance 24 and
75 condenser 23 to the cathode of tube 12. Inductance 15, being merely a radio frequency choke coil, has negligible effect upon low frequency surges in the space current. The inductance 22 is provided for preventing an
80 abrupt change of space current when the space path impedance is varied by key 11. When the negative potential on the grid is reduced, the oscillations in the system build up gradually from small amplitude to large
85 amplitude and when the negative potential on the control electrode is increased the oscillations die out gradually.

Resistance 14 preferably is of such value as to supply sufficient negative potential to
90 the control electrode to increase the impedance of the space path of tube 12 sufficiently to stop the oscillations. It may, however, be of such value as to merely reduce the oscillations to very small amplitude or to complete-
95 ly block the space current in the tube.

The effect of inductances 17 and 22 upon the envelope of the oscillations, that is, upon the shape of the curve representing change in amplitude of the oscillation is illustrated
100 in Fig. 2.

The waves illustrated are, in general, of rectangular form, but have the corners rounded off. The rounding off is produced by the action of inductances 17 and 22 in
105 changing the rate of increase and decrease of the amplitude of the oscillations as already explained.

The amplitude of the oscillations is not affected directly by inductances 14 and 22, because the oscillations are prevented from
110 traversing these inductances by condenser 21, but the amplitude is affected indirectly through the effect of the inductances upon the impedance of the space current circuit
115 of the tube 12 in the manner set forth.

Although this invention has been illustrated and described as embodied in a specific circuit, it is capable of more general application and it is intended that it should
120 be limited only by the appended claims.

What is claimed is:

1. In combination, a space discharge tube, input and output circuits for said tube, an impedance included in both said circuits, an
125 inductance in series with said impedance in one of said circuits, and a path adapted to be connected in shunt to said impedance and inductance including another inductance.

2. In an oscillation generator, a space dis- 130

charge tube, input and output circuits for said tube, said circuits having a common impedance element included therein, a choke coil included in said output circuit, and means
5 for short-circuiting said impedance and choke coil.

3. In an oscillation generator, a space discharge tube, including an input and an output circuit, a resistance included in one of said
10 circuits, and an inductance included in the other of said circuits, and means for substantially short-circuiting said resistance and inductance.

4. In a telegraph transmitting system, a
15 space discharge repeater having an output circuit, a resistance and an inductance included in series in said output circuit, and a path including a second inductance, and a telegraph key adapted to connect said second
20 inductance in shunt to said resistance and said first named inductance.

5. In an oscillation generator, a space discharge tube, input and output circuits for said tube, a resistance included in both said
25 circuits, an inductance included in said output circuit, and means for short-circuiting said resistance.

6. In an oscillation generator, a space discharge tube, input and output circuits for said tube, an impedance included in both said
30 circuits, and a path including a choke coil adapted to be connected in shunt to said impedance.

7. In an oscillation generator, a space discharge tube, input and output circuits for
35 said tube, a resistance included in both said circuits, and means for short-circuiting said resistance, said means including two inductances, one of said inductances being included in said output circuit.
40

8. In an oscillation generator, a space discharge tube, input and output circuits for said tube, said output circuit including a path comprising an inductance and a resistance,
45 and a path, including a condenser, in parallel with said first path, said condenser having low impedance for oscillations, and means for connecting a third path including an inductance in parallel with said first two paths
50 for producing signals.

In witness whereof, I hereunto subscribe my name this 28th day of August A. D., 1925.

LEWIS M. CLEMENT.