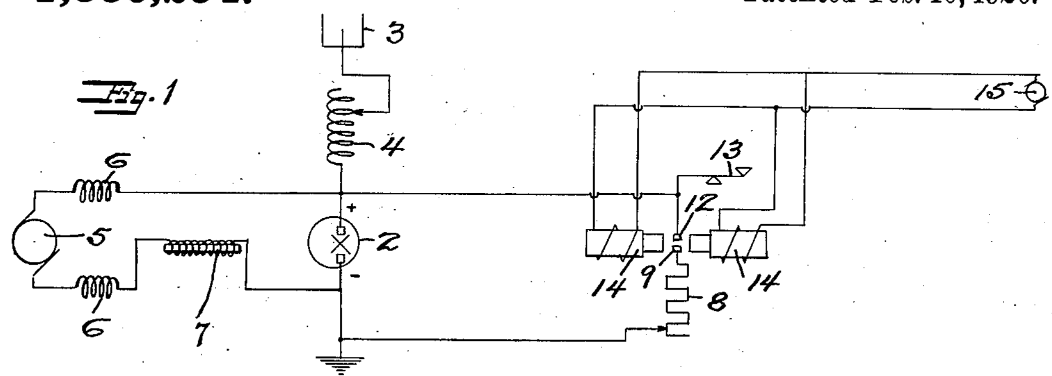
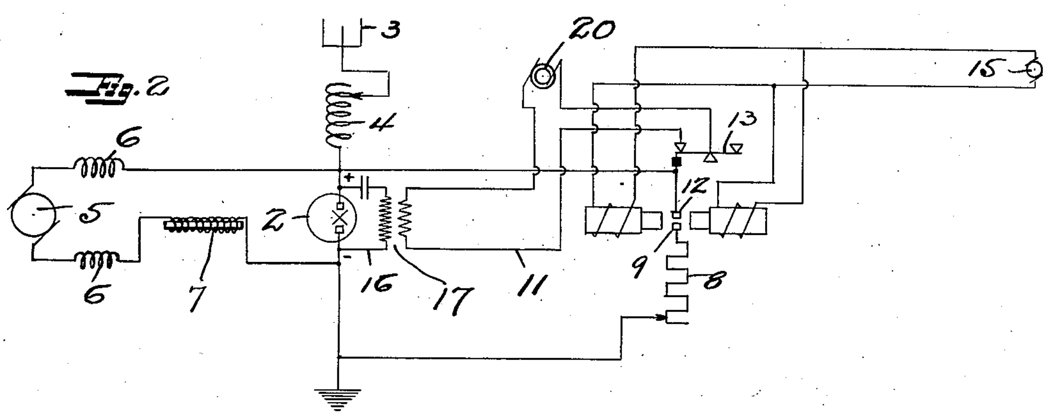
L. F. FULLER.

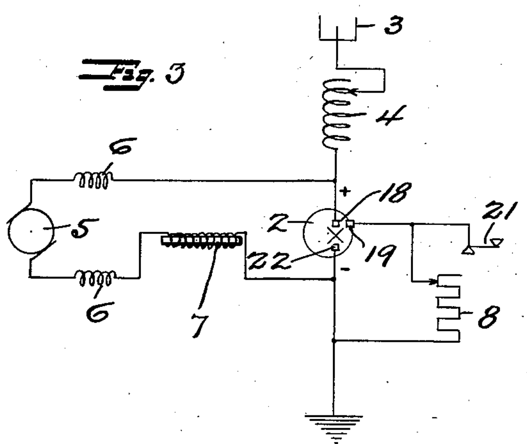
RADIOTELEGRAPHY.

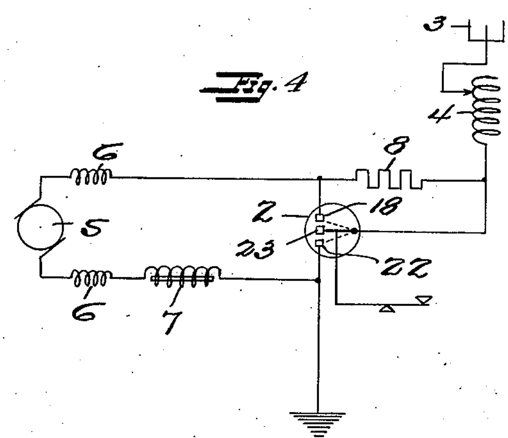
APPLICATION FILED APR. 23, 1917.

1,330,254. Patented Feb. 10, 1920.









WITNESS.

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UNITED STATES PATENT OFFICE.

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RADIOTELEGRAPHY.

1,330,254. Specification of Letters Patent. Patented Feb. 10, 1920.

Application filed April 23, 1917. Serial No. 163,793.

To all whom it may concern:

Be it known that I, LEONARD F. FULLER, a citizen of the United States, and a resident of the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Radiotelegraphy, of which the following is a specification.

The invention relates to means of signaling and particularly to means for signaling with arc radio transmitters.

An object of the invention is to provide a signaling apparatus for high powered stations.

Another object of the invention is to provide means of signaling by manipulating the direct current circuit.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description, where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. It is to be understood, however, that the invention as expressed in the claims is not limited to the specific embodiments shown in the drawings.

Referring to said drawings:

Figure 1 is a diagrammatic representation of one form of the system.

Fig. 2 is a diagrammatic representation of a modified form of the system.

Figs. 3 and 4 are diagrammatic representations of other forms of the system, showing other means of reigniting the arc.

Heretofore, as far as I am aware, it has been considered essential in arc radio transmitters, to keep a practically constant radiofrequency load on the arc converter, when signals are being sent out. This has been accomplished in two ways; first, by the compensation method in which the arc is constantly loaded upon the antenna and the inductance in the antenna circuit varied and second, by the absorbing circuit method, in which a local non-radiating oscillatory circuit provided with a key is shunted around the arc, the constants of the circuit being so adjusted that when the key is closed, the arc would prefer to oscillate upon the local circuit or the antenna circuit, to the complete neglect of the other circuit. Both of these methods have proven satisfactory for medium-powered stations, but they have shown certain disadvantages for high-powered stations, mainly because each requires the handling of radio-frequency currents at telegraphic speed.

My present invention provides a means of signaling which necessitates the handling at telegraphic speed of only the current which feeds the arc, which may be direct current or alternating current, and this current may be easily handled. In Fig. 1 I have shown one form of apparatus for signaling by manipulating the arc feeding current, which in this instance is direct current. The transmission system comprises a Poulsen arc oscillation generator 2 capable of producing continuous oscillations, which is grounded on the negative side and connected on the positive side to the antenna 3 through the variable antenna-inductance 4. Direct current is supplied to the arc by the generator 5, in the leads of which choke-coils 6 are placed. The arc is subjected to a strong transverse magnetic field produced by the winding 7 arranged in the negative lead. Shunting the arc is a circuit containing a variable resistance 8 and a make and break device comprising the stationary electrode 9 and the movable electrode 12, the movable electrode being connected to a suitable lever or key 13, which is used for signaling. A powerful transverse magnetic field is set up across the gap between the electrodes 9 and 12 for the purpose of quickly blowing out the D. C. arc formed as the electrodes are separated, by the electromagnets 14 which are energized from a direct current supply 15. When the electrodes 9 and 12 are brought together, the arc 2 is short-circuited by the resistance 8, which is so adjusted that the load on the generator 5 remains the same as when the electrodes 9 and 12 were separated, and the arc was burning and setting up radio-frequency oscillations in the antenna. Thus the current in the arc magnet winding 7 is held constant, a feature which is necessary on account of the large inductance of the winding. This large inductance sets up a large voltage across the arc gap and this voltage or inductive-kick, is sufficient to reignite the arc when the shunt circuit is opened. When the arc electrodes are cold, however, and there is no ionization of the gap due to the red-hot carbon, the arc will not usually be reignited and some auxiliary means are usually employed to accomplish this reignition.

In Fig. 2 I have shown a system embodying one form of auxiliary means for reigniting the arc. Shunting the arc is a circuit 16 containing a condenser and the secondary of a step-up transformer 17. The primary of the transformer is included in a circuit 11, which is connected to the generator 20 which may be a 500-cycle alternator. The circuit 11 is connected to the key 13 in such manner that the circuit 11 is closed, producing a spark across the arc as the resistance circuit is opened. In this construction the electrode 12 is insulated from the key so that the resistance circuit and the ignition circuit are not connected.

In Fig. 3 I have shown a modified form of the system in which the resistance circuit is made and broken within the arc generator and the arc produced by the opening of the resistance circuit is employed for reigniting the main arc. In this arrangement, the resistance circuit is completed by contact with the positive electrode 18 of the arc, of the electrode 19 in the resistance circuit, and the electrode 19 is moved to open and close the resistance circuit by the key 21. As the resistance circuit is opened, an arc is produced between the electrodes 18 and 19 and this arc bows out and is blown by the magnetic field into contact with the negative electrode 22, thereby reigniting the main arc. In Fig. 4, the movable electrode 23 in the resistance circuit is arranged to be moved from the electrode 18 to the electrode 22, and vice versa, thereby breaking or making the main arc. When the electrode 23 is in contact with the electrode 22, the direct current flows through the resistance circuit and the arc is extinguished. As the electrode 23 moves from electrode 22 to electrode 18, an arc is drawn which reignites the main arc, and short-circuits the resistance.

The system possesses the further advantage that when the main arc is short-circuited, there are no high-frequency oscillations being set up about the station and consequently a sensitive receiving device will not suffer from interference due to such oscillations. With the absorbing circuit method of signaling which I have previously described, it is not possible, in practice, to receive while the arc is oscillating upon the local absorbing circuit for the reason that the circuit radiates sufficient energy to disturb the sensitive receiver.

I claim:

1. An arc system for radio signaling, comprising an arc, a current supply and an antenna circuit connected to the arc and means for interrupting the arc while maintaining the load on the current supply substantially constant.

2. An arc system for radio signaling comprising an arc, an antenna circuit connected to the arc and a resistance circuit shunted across the arc, a source of current supply connected to the arc and means for causing the current supply to traverse the resistance circuit and thereby extinguish the arc.

3. An arc system for radio signaling, comprising an arc, an antenna circuit connected to the arc, and a resistance circuit shunted across the arc, a source of current supply connected to the arc, and a switch in the resistance circuit, the resistance in said circuit being such that when the switch is closed, the arc is extinguished and the load on the current supply remains substantially constant.

4. An arc system for radio signaling, comprising an arc, an antenna circuit connected to the arc, and a resistance circuit shunted across the arc, a source of current supply connected to the arc, and means for varying the current in the resistance circuit to extinguish the arc while maintaining the current supply substantially constant.

5. An arc system for radio signaling comprising an arc, an antenna circuit connected to the arc and a resistance circuit shunted across the arc, a source of current supply connected to the arc, and means for closing the resistance circuit to transfer the load from the antenna circuit to the resistance circuit, the resistance of the resistance circuit being such that the closing of said circuit extinguishes the arc and maintains the load on the current supply substantially constant.

6. An arc system for radio signaling comprising an arc, an antenna circuit connected to the arc and a resistance circuit shunted across the arc, a source of current supply connected to the arc, a key for opening and closing the resistance circuit, means for producing a magnetic flux across the opening in the circuit, and means connected to the key for igniting the arc as the resistance circuit is opened.

7. An arc system for radio signaling, comprising an arc, a current supply and an antenna circuit connected to the arc, and means for extinguishing and reigniting the arc while maintaining the load on the current supply substantially constant.

8. The method of producing radio signals with an arc supplied with current, which consists in interrupting the arc and maintaining the load on the current supply substantially constant.

9. The method of producing radio signals

with an arc supplied with current, which consists in shunting the current around the arc and maintaining said current substantially constant.

10. The method of producing radio signals with an arc supplied with current, which consists in shunting the current around the arc to extinguish the arc while maintaining said current substantially constant and opening the shunt circuit and reigniting the arc.

In testimony whereof I have hereunto set my hand at San Francisco, California, this 16th day of April, 1917.

LEONARD F. FULLER.

In presence of—
H. G. PROST.