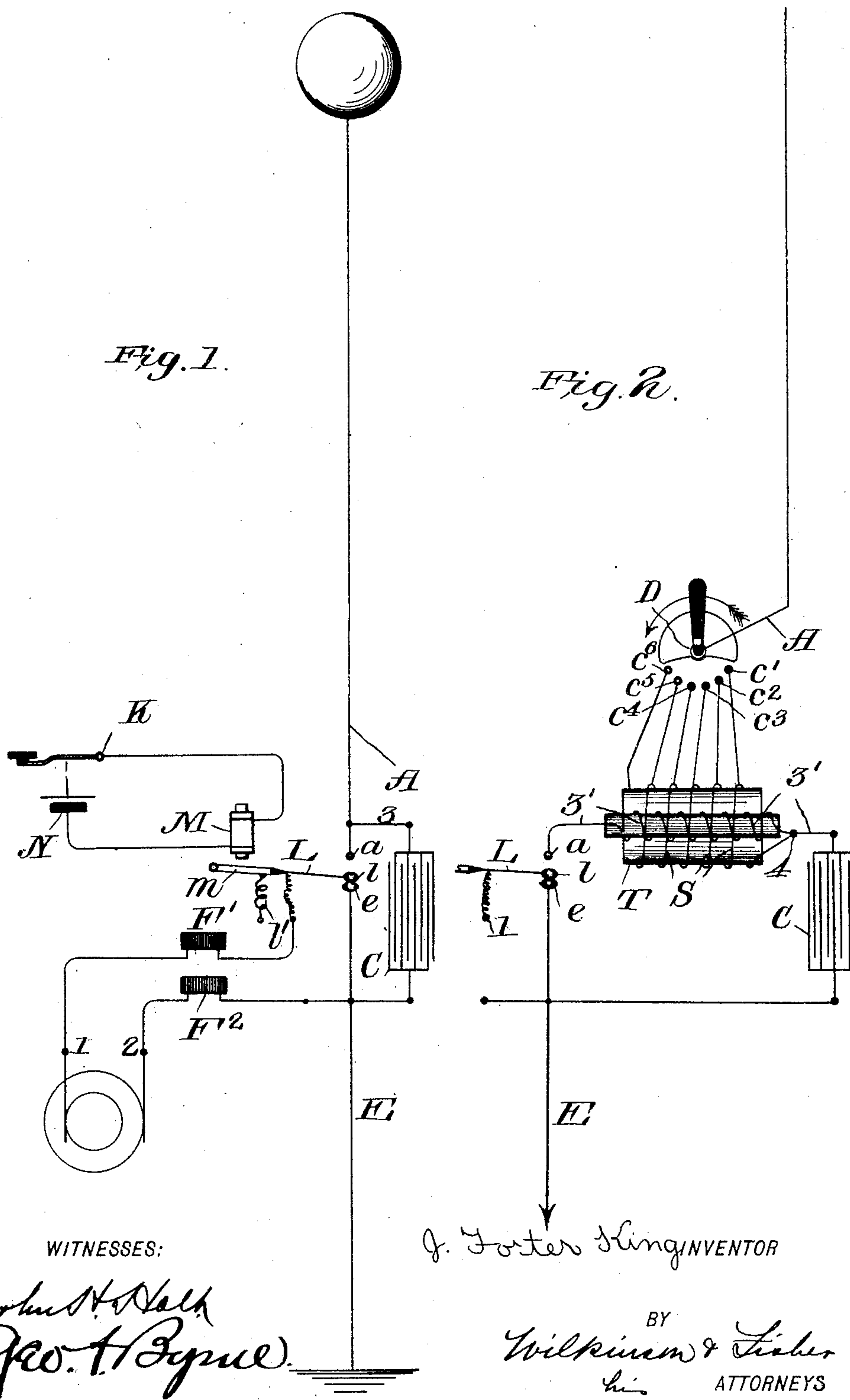


J. F. KING.
AERIAL TELEGRAPHY.
APPLICATION FILED JUNE 23, 1903.

Fig. 1.

Fig. 2.



UNITED STATES PATENT OFFICE.

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AERIAL TELEGRAPHY.

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To all whom it may concern:

Be it known that I, JAMES FOSTER KING, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Aerial Telegraphy; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The principal object of my present invention is to effect an improvement in the excitation and propagation of oscillating currents for the transmission of aerial messages; and it is also an object of this invention to effect an improvement in the tuning of circuits and apparatus for such purposes. To these ends my present invention consists in the novel features herein described, and particularly pointed out in the claims.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a diagram illustrating one form of my invention; and Fig. 2, a diagram illustrating another form thereof, in which latter case the circuits and apparatus are tuned.

Similar letters and numerals refer to similar parts in both diagrams, where A represents the vertical wire, and C a condenser, connected in series between the vertical wire and the earth-conductor E. The lower end of the vertical wire terminates in a spark terminal-contact *a*, preferably in the form of a point or very small ball. This contact in the case shown is fixed. Connected to the upper end of the earth-wire E is an enlarged spark terminal-contact *e*, larger than the contact *a* and preferably flattened on its upper surface, as shown. This contact *e* in the case shown is also fixed.

The electrical energy is derived from an alternator G or other source of alternating currents capable of supplying sufficient energy to maintain the radiation. The terminals 1 2 of the alternator are connected, respectively, to inductive resistances *F' F''*, which are in turn connected, respectively, to a charging-lever L and earth-wire E. This charging-lever L

is mechanically connected to a pivoted armature *m* of an electromagnet M and carries at its free end a sparking contact *l*, consisting of a metallic enlargement, preferably similar in shape to the contact-terminal *e*. The contact *l* is adapted to normally engage the contact *e* and by means of the charging-lever L to be moved between the contacts *a* and *e*.

Obviously I may make contact *l* stationary and move contacts *a* and *e* and secure the same result as by the arrangement shown; but this is a constructional detail to which my invention is not limited. I may employ any desired means for securing relative movement between the several contacts.

The charging-lever is operated by the magnet M through the medium of the battery N and telegraph-key or other suitable transmitting instrument K. Contact *l* will be rapidly drawn to contact *a* when the circuit of battery N is closed by the key K. The contact *l* may then be returned to its normal position in contact with terminal *e* by the spring *l'* or by gravity or any other suitable means.

Normally—that is, when the key is not operated—the current from the alternator passes through the inductive resistances *F' F''*, charging-lever L, contacts *l e*, and that portion of the earth-wire between the resistance *F''* and the terminal *e*. Interposing these non-inductive resistances in series with the power-wires avoids the danger in short-circuiting the generator.

To obtain the full benefit of resonance, the time constant of the vibration-circuit should be some submultiple of that of the exciting or generator circuit.

The operator in sending a message depresses his key, and this, through the action of the magnet M and charging-lever L, causes the contact *l* to be drawn from the earth-contact *e* toward and finally into engagement with the contact *a*. The moment the contact *l* is drawn from the earth-contact *e* a great rise of potential is manifested by the flaming-arc formed between said contacts, which continues until the charging contact *l* meets contact *a*, when the character of the discharge is abruptly changed, owing to the greater part of the cur-

rent jumping into the vibration-circuit, (vertical wire, condenser, and earth-wire.) It is seen that the discharge until it has reached contact *a* is a unidirectional one, direct to the earth. When, however, contact *l* is in contact with *a*, the current first charges the condenser C and subsequently discharges the current back into E, thereby creating an oscillatory discharge. By this sudden acquisition of relatively large capacity C it is apparent that there will be an instantaneous advancement of the current phase until absolute synchronism exists between it and the electromotive-force wave. Each subsequent discharge will find an easy path to earth through the pierced air-gap between the under surface of contact *l* and the upper surface of contact *e*.

The shape of contact *a* (preferably a point as compared with contact *e*) facilitates the discharge between said contact *a* and contact *l*, when the latter is returning to its normal position upon the release of the transmitting-key.

As long as the generator G can develop enough energy to supply the vibration-circuit and simultaneously maintain the discharge between contacts *l* and *e*, it has been found that the amplitude of the vibrations in the aerial circuit are extremely regular, as there is no irregular building up of current caused by compound harmonics. In other words, the frequency of the wave propagated in the vibration-circuit is not dependent on that of the generator-circuit, the effects obtained by their association being those of impressed potential differences.

The principle upon which the initial stress is given to the vertical antenna is that the resistance values of the generator-circuit, which possesses a high coefficient of self-induction, are lowered by suddenly connecting to the vibration-circuit a condenser which should possess enough capacity to regulate the wave of current discharge, so that it approximates the wave of diminishing potential.

There is no lag of the current behind the electromotive-force wave in the vibration-circuit, which is a great advantage, since the vibration-circuit can receive its full charge when necessary at the very beginning of the initial surge, and consequently will develop its available energy in a most suitable form, or, in other words, instantaneously.

Reference will next be had to Fig. 2, which represents a resonant or tuned system, in which tuning is possible in the case shown to six different wave lengths by adjusting the switch D, provided for such purpose. In this case the wire 3 of the system shown in Fig. 1 is replaced by the primary 3' of a high-frequency coil placed in series between contact *a* and condenser C.

The sections c' , c^2 , c^3 , c^4 , c^5 , and c^6 of the secondary S of this coil are wound on a glass

or other dielectric tube T, placed in inductive relation to the coil 3', and when sufficiently energized will subdivide in the vibration-circuit, the impulse passing through coil 3' to the condenser into any combination of simple harmonics by correctly proportioning the size and shape of this high-frequency coil and having the condenser of correct capacity. It is seen that the inside end of coil S makes direct connection with coil 3' at the point 4. Current in coil S therefore equalizes with the primary current through the condenser and spark-gap to earth.

Any increase from the ratio of one to one between the number of turns in the primary and the number of turns in the secondary will add an appreciable value to the general efficiency, as an increase of potential of the final wave in this case will not be offset by any diminishing current, which would occur as a core loss if an iron-core transformer were used.

Another advantage in this system is that when any particular sections are cut out of the vibration-circuit they will be short-circuited, thereby precluding all possibility of a compound wave being reflected, which, if generated, would cause interference with the natural vibrations.

Having herein fully described my invention, what I claim is—

1. In aerial telegraphy, a vibration-circuit having capacity connected therein, of a normally closed generator-circuit, and means for creating an arc in said normally closed circuit and connecting the said arc in the oscillation-circuit in multiple with the capacity.

2. In aerial telegraphy, the combination with a vibration-circuit having capacity connected therein, of a normally closed generator-circuit, and common means for both creating an arc in said generator-circuit and connecting the said arc in the vibration-circuit in multiple with the capacity.

3. In aerial telegraphy, the combination with a vibration-circuit having capacity connected therein, of a normally closed generator-circuit, and means comprising a movable contact adapted to create an arc in said generator-circuit and connect the said arc in the vibration-circuit in multiple with said capacity.

4. In aerial telegraphy, the combination with a vibration-circuit having capacity connected therein, of a normally closed generator-circuit, and means comprising an electromagnetically-operated movable contact adapted to create an arc in said generator-circuit and connect the said arc in the vibration-circuit in multiple with said capacity.

5. In aerial telegraphy, the combination with a vibration-circuit having capacity connected therein, of a normally closed generator-circuit, means comprising a movable

contact adapted to create an arc in said generator-circuit and connect the said arc in the vibration-circuit in multiple with said capacity, and a transmitting-key and means operating in conjunction therewith for operating said-movable contact.

6. In aerial telegraphy, a vibration-circuit having capacity connected therein, of a normally closed generator-circuit, means for creating an arc in said normally closed circuit

and connecting the said arc in the oscillation-circuit in multiple with the capacity, and means for tuning said vibration-circuit.

In testimony whereof I affix my signature in presence of two witnesses.

JAS. FOSTER KING.

Witnesses:

GERALD KELLER,
CHAS. H. COOKE.