No. 711,444. Patented Oct. 14, 1902.

H. SHOEMAKER.

SIGNALING SYSTEM.

(Application filed July 9, 1902.)

(No Model.)

Fig 1.

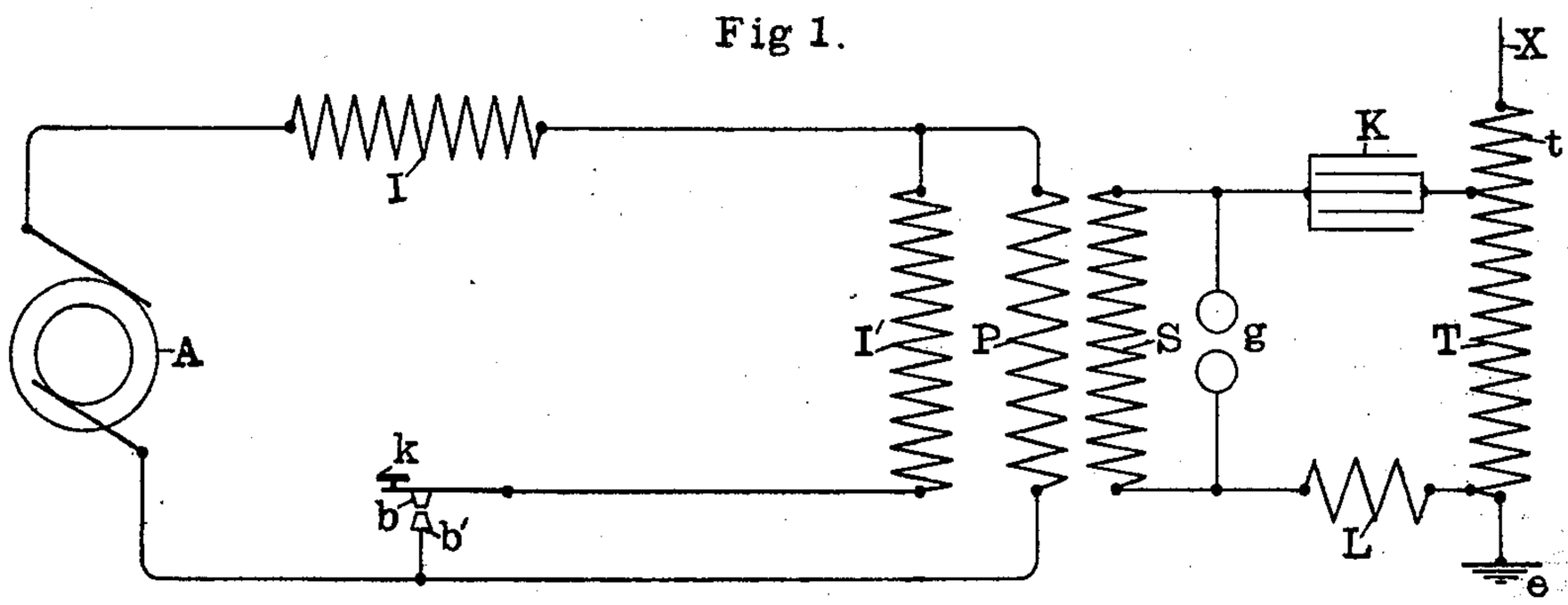


Fig 2.

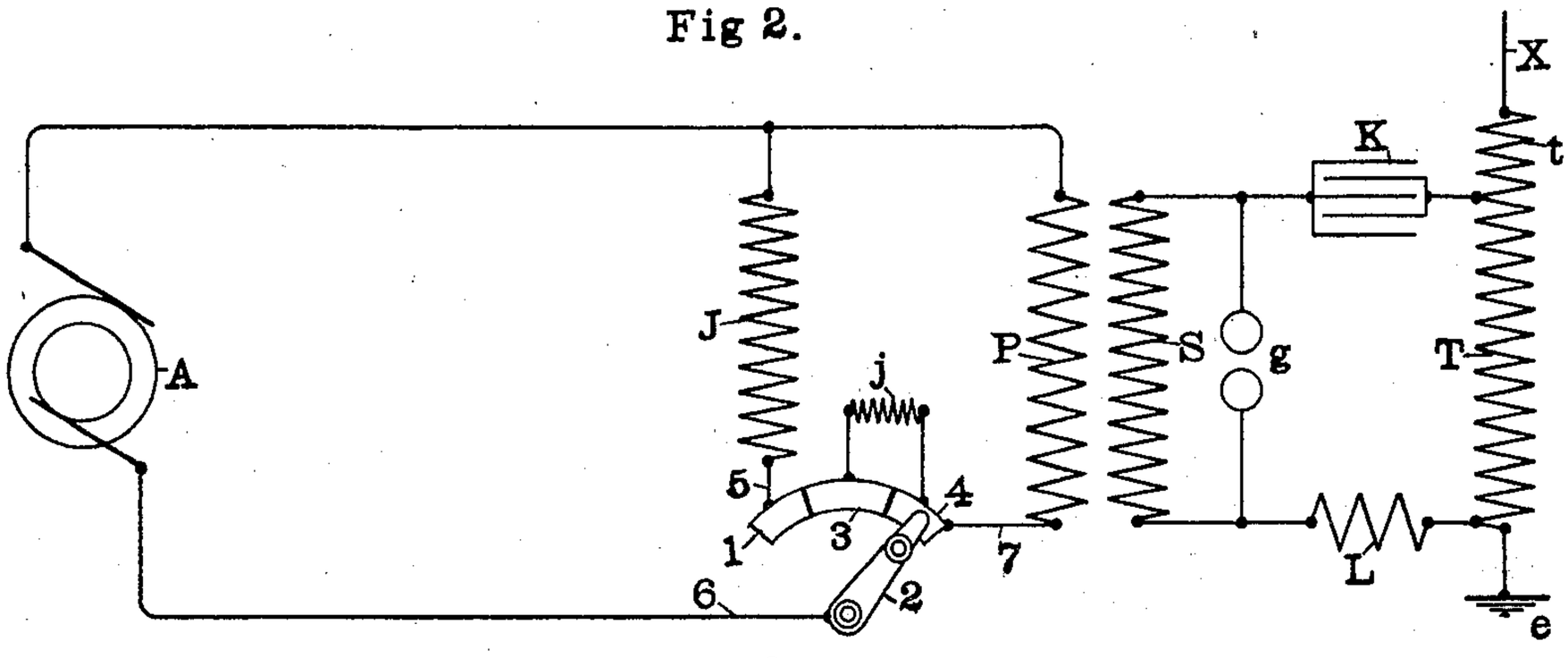
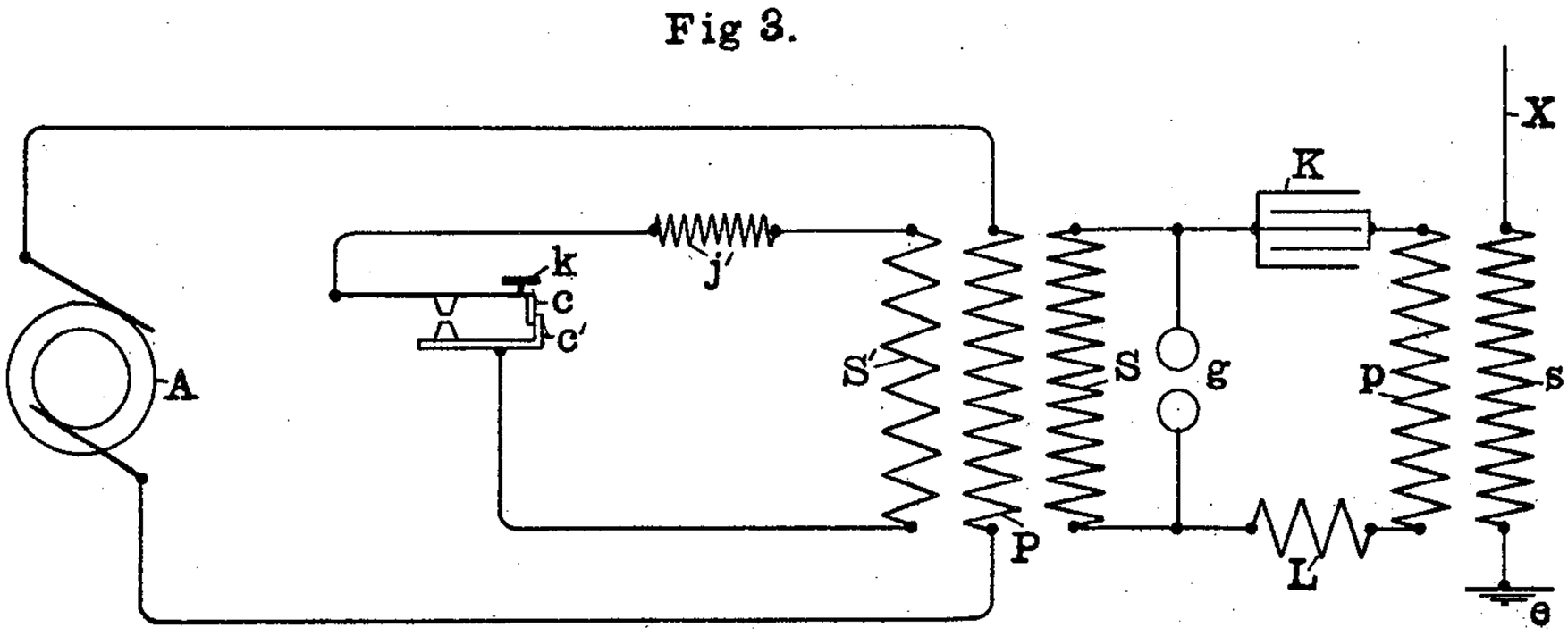


Fig 3.



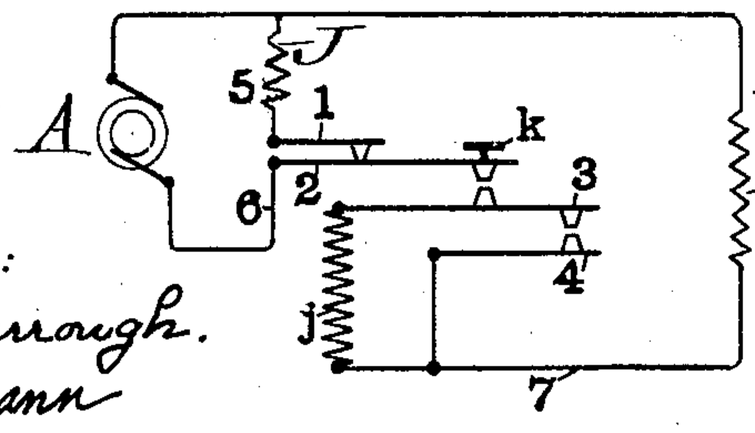


Fig. 2a

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HARRY SHOEMAKER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO AMERICAN WIRELESS TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF ARIZONA TERRITORY, AND MARIE V. GEHRING, OF PHILADELPHIA, PENNSYLVANIA.

SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 711,444, dated October 14, 1902.

Original application filed January 11, 1902, Serial No. 89,248. Divided and this application filed July 9, 1902. Serial No. 114,864. (No model.)

To all whom it may concern:

Be it known that I, HARRY SHOEMAKER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Signaling System, of which the following is a specification.

My invention relates to a system of transmitting intelligence to be applied in those systems in which the modified electrical energies representing the signal or message are impressed upon the natural media.

It comprises a system of generating and transmitting through or impressing upon the natural media a large amount of energy, many horse-power in some cases, for the purpose of long-distance communication.

It comprises, further, a system of generating the energy at low pressure and low frequency and stepping it up or transforming it to energy of high pressure and very high frequency.

It comprises, further, apparatus in addition to that for transforming of energy to high pressure and high frequency for further transforming the energy to supply it to the radiating-conductor, this being done by a simple transformer or an autotransformer.

It comprises, further, apparatus for modifying the energy at will while such energy is in the low-pressure form or for robbing the radiating-conductor of energy by and in accordance with the intelligence to be transmitted, which consists of means for controlling the low-frequency energy in the secondary of a transformer wound for a pressure still lower than that of the main generator, whereby objectionable sparking is avoided in the case where a complete rupture of circuit is made by the apparatus controlling the energy in accordance with the message sent.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view of the circuits employed in transmitting messages in which the controlling device is in the circuit of the main generator and controls an impedance-circuit in parallel with the primary of the transformer. Fig. 2 is a diagrammatic view similar to that in Fig. 1 with a different arrangement of the impedance device in its relation to the primary of the transformer. Fig. 2^a is a detail view of the controller shown in Fig. 2 and in a form more suitable for manipulation. Fig. 3 is a diagrammatic view showing a further and preferred arrangement of the controlling means.

A represents a generator or source of alternating currents of comparatively low frequency and low potential—such, for example, as a transformer or dynamo furnishing alternating current at one hundred and ten volts and at a periodicity of one hundred cycles per second. The current derived from the source A passes normally through the impedance I and the primary P in series. At the terminals of the secondary S there exists a very high potential—in the neighborhood of one hundred thousand volts or more—and the current derived from the secondary charges the condenser K until there exists across the terminals of the condenser a potential sufficiently high to break across the spark-gap *g*, when there occurs throughout the circuit K T L *g* a very high-frequency oscillatory current, whose frequency is independent of the frequency of the source A and depends upon the capacity inductance and resistance of the circuit K T L *g*. The frequency of this high-period current is one hundred thousand per second or more.

X represents the radiating-conductor of the transmitter and which connects through the windings *t* T to earth-plate *e*. The proportions *t* and T coöperate as an autotransformer, and there exists, therefore, upon the radiating-circuit oscillatory energy of a frequency one hundred thousand per second or more and of a potential still higher than that across the terminals of T. The electrical constants of X, *t*, and T may be so proportioned as to render them resonant with the frequency of the energy in the circuit K T L *g*. To control the radiated energy, there is placed across the

terminals of the primary P an impedance I' in series with a key *k*, having the terminals *b b'*, shown here and in the remaining figures as large and massive, for the reason that they must carry currents of considerable volume, and upon the depression of key *k* the transformer P S is robbed to a greater or less extent of its energy, and there ceases during such period to be developed to any considerable extent the high-frequency oscillations in the circuit K T L *g*. The impedance I is simply a restraining means to prevent overloading to a dangerous point the source A.

In Fig. 2 the disposition of the apparatus is the same as in Fig. 1, with the exception that the impedance I is omitted and the impedance J substituted for I' in combination with a different form of controlling-switch. In the position shown with the switch-blade 2 upon the segment 4 the total current of source A is passing through the primary P and exciting the secondary and the associated circuits, as described above. To send a message, the switch-arm 2 is moved in a counter-clockwise direction into contact successively with segments 3 and 1, and after having made one such journey and returned to its position, as shown, it has transmitted either a dot or a dash, depending upon the time of contact. In passing from segment 4 to 3 the impedance *j* is thrown into circuit with primary P which diminishes the energy in the secondary and associated circuits and a further travel to contact with segment 1 the primary P is entirely out of circuit and the current from the generator passes through impedance J only with a resulting deënergization of the transmitting-conductor.

In Fig. 2ª I have shown a more practical arrangement of the transmitting device, in which similar reference characters designate similar elements and connections. Upon depressing the key *k* in Fig. 2ª the contact on flexible spring 1 follows the key-blade, and said blade 2 contacts with blade 3 through the contact-points carried thereby. At this moment contact with 1 is entirely interrupted, and during the further pressure of key *k* the spring 3 is depressed to come in contact with 4, thereby throwing impedance *j* entirely out of operation.

In Fig. 3 the secondary S of the transformer supplies a circuit K *p* L *g*, as in the cases above, except that *p* now forms the primary of a transformer and does not form a part of the conductor-circuit, as in the case of T. *s* is a winding in the circuit of the conductor X and which forms a secondary for the primary *p;* otherwise the operatiion of the secondary circuit is the same as in Figs. 1 and 2, and it is to be understood that the form in Fig. 3 may be used in either Figs. 1 and 2 or that the form in Figs. 1 and 2 may be used in Fig. 3.

S' represents a very coarse secondary associated with the primary P and which delivers, therefore, through impedance *j'* and key *k* a current of very low potential and of large volume. The object of this is to enable the control of the messages by means of a key in a very low potential circuit to obviate sparking.

c c' are the carbon shunt-contacts of the key *k* and which are adapted to rupture the circuit after the separation of the main contacts for the purpose well known in electric switches to prevent arcing at the contacts. In the position shown the key *k* is just on the point of rupturing the circuit of the secondary S', the current at this instant being very small, due to the resistance of the carbons *c c'*.

The operation of this system is as follows: Upon depressing the key a low-potential current begins to flow through the secondary S', impedance *j'*, and the carbon contacts *c c'*. Upon further travel the main contacts *b b'* of the key come into contact and a very heavy current flows through the circuit. This robs the secondary circuit S K *p* L *g* of its energy so long as the key is held depressed. Upon release of the key the secondary S again receives its amount of energy. In this manner the radiated energy may be controlled at the will of the operator.

It is to be understood that in place of the make-and-break devices herein shown microphonic contacts may be used, whereby every increase or decrease of pressure between the contacts will influence accordingly the energy radiated from the conductor X. It is to be understood; furthermore, that the energy radiated from the conductors may be of any predetermined frequency, so as to secure selectivity between the transmitting and receiving stations; furthermore, that in place of energy of a single frequency being transmitted the combination of several energies of different frequencies may be controlled in the same manner as herein described. It is to be understood also that I do not limit my system to the transmission from a grounded radiating-conductor, but I may also use a plurality of such conductors without earth connections or with a single earth or with double earth connections for each conductor.

This application is a division of my application filed January 11, 1902, and bearing Serial No. 89,248.

What I claim is—

1. In a wireless signaling system, a source of fluctuating electric energy, a transformer, a circuit connected across the terminals of a winding of said transformer, a key in said circuit, an oscillating circuit supplied with energy by the secondary of said transformer, and means for impressing the energy of the oscillating circuit upon the natural media as electroradiant energy.

2. In a wireless signaling system, a source of electric energy of low potential and low frequency, a transformer, a circuit connected across the terminals of a winding of said transformer, a key in said circuit, a circuit

oscillating at high frequency and supplied with energy at high potential by the secondary of said transformer, and means for impressing the energy of the oscillating circuit upon the natural media in electroradiant form.

3. In a wireless signaling system, a source of fluctuating electric energy, a transformer, a circuit connected across the terminals of a secondary of said transformer, a key in said circuit, an oscillating circuit supplied with energy by a secondary of said transformer, and means for impressing the energy of the oscillating circuit upon the natural media in electroradiant form.

4. In a wireless signaling system, a source of fluctuating electric energy of low potential and low frequency, a transformer, a circuit connected across the terminals of a secondary of said transformer, a key in said circuit, an oscillating circuit supplied with energy by a secondary of said transformer, and means for impressing the energy of the oscillating circuit upon the natural media in electroradiant form.

5. In a wireless signaling system, a source of fluctuating electric energy, a transformer, a circuit connected across the terminals of a secondary of said transformer, an impeding device in said circuit, an oscillating circuit supplied with energy by said transformer, and means for impressing the energy of the oscillating circuit upon the natural media in electroradiant form.

6. In a wireless signaling system, a source of electric energy of low potential and low frequency, a transformer in circuit with said source, a circuit connected across the terminals of a secondary of said transformer, a circuit oscillating at high frequency and supplied with energy at high potential by a secondary of said transformer, and means for impressing the energy of the oscillating circuit upon the natural media in electroradiant form.

7. In a wireless signaling system, a source of electric energy of low potential and low frequency, a transformer in circuit with said source, a circuit connected across the terminals of a secondary of said transformer, a key and impeding device in said circuit, a circuit oscillating at high frequency and supplied with energy at high potential by a secondary of said transformer, and means for impressing the energy of the oscillating circuit upon the natural media in electroradiant form.

8. In a wireless signaling system, an alternating-current generator, a transformer in circuit with said generator, a circuit connected across the terminals of a winding of said transformer, a key controlling said circuit, a circuit oscillating at high frequency and supplied with energy at high potential by said transformer, and means for impressing the energy of the oscillating circuit upon the natural media in electroradiant form.

9. In a wireless signaling system, an alternating-current generator delivering current at relatively low potential and relatively low frequency, a transformer in circuit with said generator, a circuit connected across the terminals of a secondary of said transformer, an impeding device in said circuit, a key controlling said circuit, a circuit oscillating at relatively high frequency and supplied with energy at high potential by a secondary of said transformer, and means for impressing the energy of the oscillating circuit upon the natural media in electroradiant form.

10. In a wireless signaling system, a source of fluctuating electric energy, a transformer in circuit with said source, a circuit connected across the terminals of a low-potential secondary of said transformer, a key and impeding device in said circuit, a circuit oscillating at high frequency and supplied with energy at high potential by a secondary of said transformer, and means for impressing the energy of the oscillating circuit upon the natural media in electroradiant form.

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