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SYSTEM FOR THE TRANSMISSION OF ELECTROMAGNETIC WAVES WITH SOUND REGULATED FREQUENCIES.

APPLICATION FILED APR. 3, 1908.

948,156.

Patented Feb. 1, 1910.

2 SHEETS—SHEET 1.

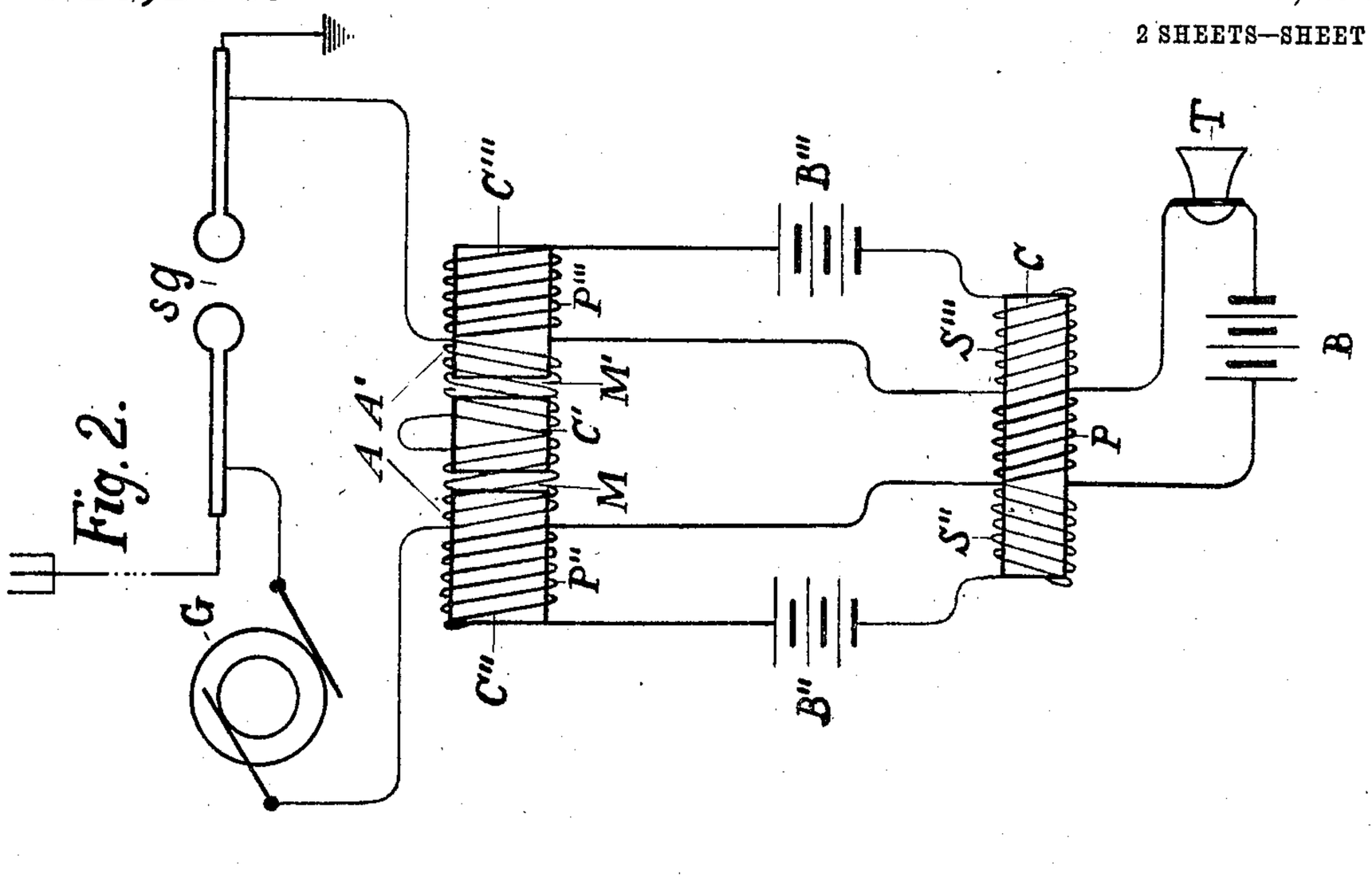

Fig. 2.

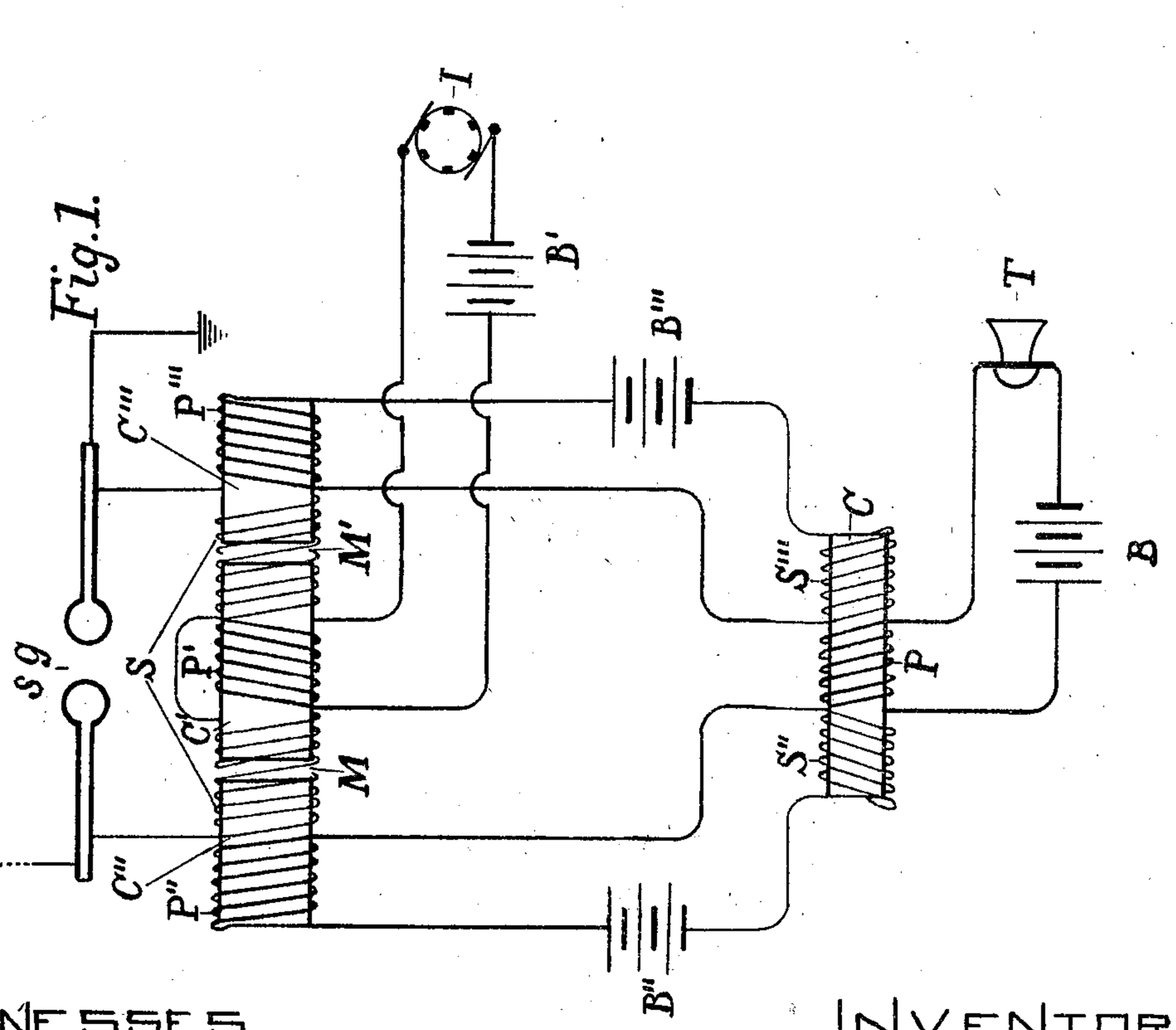

Fig. 1.

WITNESSES

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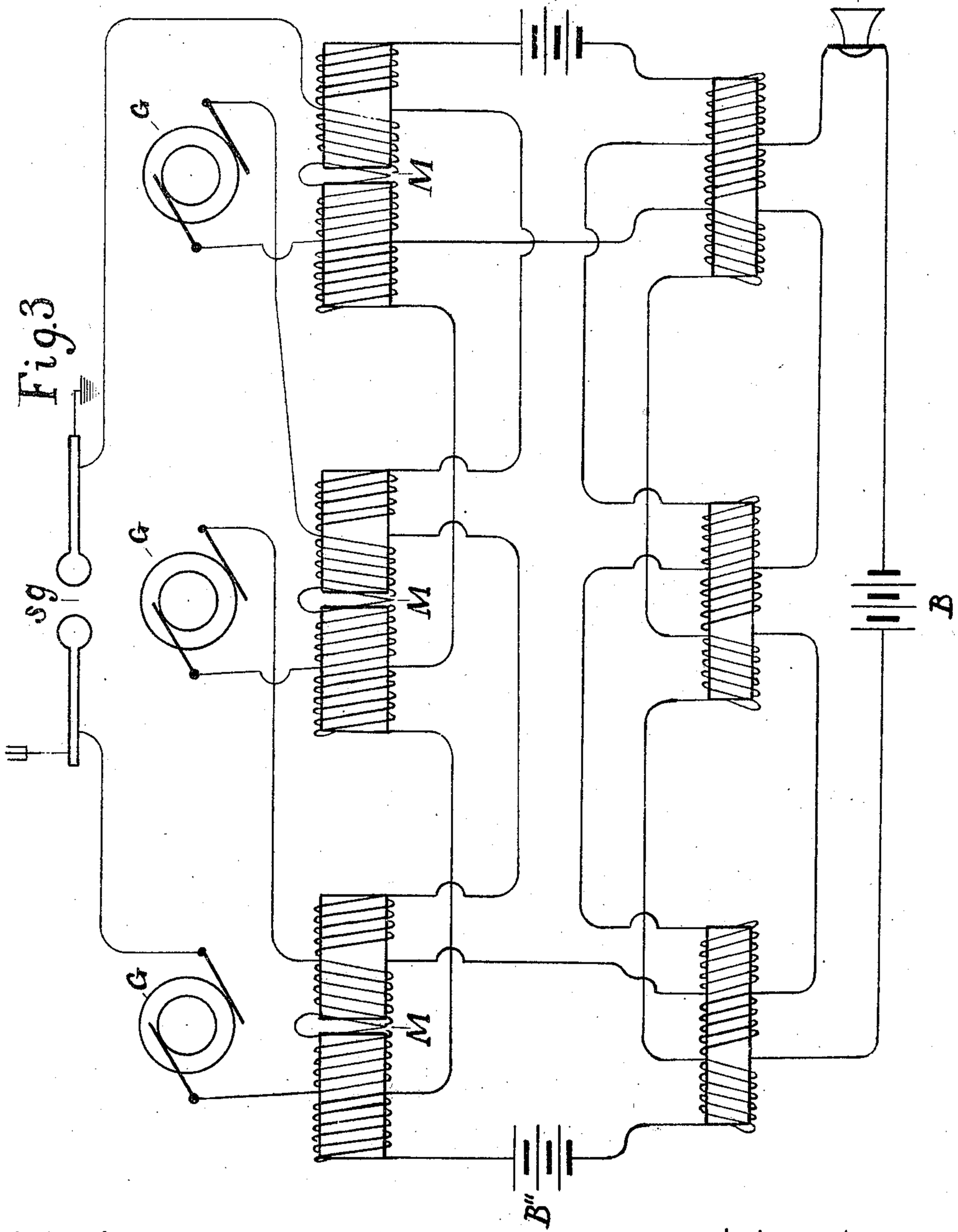
Fig. 3



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SYSTEM FOR THE TRANSMISSION OF ELECTROMAGNETIC WAVES WITH SOUND-REGULATED FREQUENCIES.

948,156. Specification of Letters Patent. Patented Feb. 1, 1910.

Application filed April 3, 1908. Serial No. 424,921.

To all whom it may concern:

Be it known that I, WALTER H. BATHRICK, a citizen of the United States, residing at Somerville, in the county of Middlesex and State of Massachusetts, have invented a new and useful System for the Transmission of Electromagnetic Waves with Sound-Regulated Frequencies.

In the drawings illustrating my invention and the best methods known to me of applying my system, Figure 1 is a diagrammatic view of the method of vocally controlling the electro-magnetic waves from an induction coil generator, with a high frequency interrupter. Fig. 2 presents a modification, showing diagrammatically the manner of applying my system to a dynamo generator of a continuous series of high frequency electro-magnetic waves. Fig. 3 is another slight modification of the same, showing two or more dynamo generators of electro-magnetic waves arranged in series.

Primary windings are represented by heavy lines; secondary windings and connections by light lines. The light lines merging into the heavy lines indicate the connection in series between the secondary and primary windings in each separate circuit. Right and left sloping lines (either light or heavy) denote windings with normal differences in field polarity.

In Fig. 1 the electro-magnetic waves are produced primarily from a large induction coil or inductorium consisting of one or more cores of soft iron wire C′, C″, and C‴, and a primary coil P′ in the circuit of a source of electrical energy B′ with a current of frequent interruptions from an interrupter I, and a secondary S, with its spark gap *s g*, and aerial and ground connections. Two other primary coils P″ and P‴ are placed in position to influence the same field. All three primaries, P′, P″, and P‴, may be wound upon the same soft iron wire core, but to lessen the inductive effect of one primary coil upon another, the secondary coils S are wound between each of the primary coils P′, P″, and P‴ with gaps in the magnetic continuity of the core at M and M′ of air or non-conducting material. The secondary coils S are influenced by the mutual induction and resultant fields of all the primaries P′, P″, and P‴, thereby controlling and governing said secondary in the circuit of electrical oscillations. The primary coil P″ is connected to the secondary coil S″ in the conducting circuit of an independent generative source of constant potential, (preferably of low resistance) B″, while the primary coil P‴ is connected in like manner to the secondary coil S″ in the conducting circuit of another independent source of constant potential B‴. It is advisable to have the said two circuits balance, with equal constant differences of potential in each circuit (when not in operation), and practically the same resistance in each circuit, and the same number of windings in each primary coil P″ and P‴, and also corresponding windings in each secondary coil S″ and S‴. The primaries and the secondaries are so connected each in its own circuit, that the said primaries P″ and P‴ have opposing fields (preferably canceling or neutralizing the effect of each other), while the secondaries S″ and S‴ also have opposing fields (preferably neutralizing). The proportional relation between the ampere turns in the primary windings P″ and P‴ and the ampere turns in the secondary windings S″ and S‴ is dependent upon the ratio of the cross section of the field C″ and C‴ to the cross section of the smaller field core C, and upon the amount of constant E. M. F. and the resistance in each independent circuit. The said secondaries S″ and S‴ are wound upon the ends of a core C of the soft iron wire, and the transmitter primary P is wound on the middle portion of the same core. While it is desirable to have many turns of winding in the secondaries S″ and S‴, the resistance of each secondary coil must be kept low in comparison with the rest of the circuit, with the necessary cross-section to each secondary's magnet wire to safely carry the current in the circuit.

In the mode of operation of my system, waves of sound or speech impinge upon a diaphragm, varying the resistance in a transmitter T, and synchronously varying the current strength in a primary P, producing concomitant fluctuations in the magnetic field of the core C and inducing an electromotive force in both secondary coils S″ and S‴. As herein described, the secondaries (each in an independent circuit with its source of electrical energy of constant potential) are so connected to oppose in their fields, consequently the induced E. M. F. will

act in opposition to the constant E. M. F. in one circuit, and will act in conjunction with the constant E. M. F. in the other circuit. Variable opposing potentials produce variable decreases in current strength in one primary, while the coincidence of variable induced potential with constant potential, produces variable increases in current strength in the other primary. Opposition and coincidence of induced potentials synchronously in each circuit, S'' B'' P'' and S''' B''' P''', are variable, alternating, and in accordance with the fluctuations of current in the sound-controlled transmitter primary P. The fluctuations of current strength in both primaries P'' and P''' cause fluctuations in the fields C'' and C''', which in turn modify and intensify the field C' of the interrupted primary P'. The resultant fields generate electrical oscillations in the secondary S, corresponding to the waves of sound or speech.

In Fig. 2, a modification employing the same system of vocal control, the generator of electro-magnetic waves is a high-frequency dynamo G, preferably of high potential, and into its circuit of electrical oscillations are interposed two conducting coils A and A' arranged in series in said circuit, and connected to oppose and neutralize their own magnetic fields in the core C'. The two primaries P'' and P''' are disposed on the outer ends of the coils A and A' and upon the cores C'' and C'''. The iron wire magnetizing field may have one or more breaks or air spaces, preferably between the centers of the coils A and A'. M and M' represent these gaps in the magnetic continuity rendering the primaries P'' and P''' less susceptible to their own respective fields. The secondaries S'' and S''' are arranged with opposing fields as in Fig. 1, but the primaries P'' and P''' are arranged with coinciding fields, otherwise the modifying influence on one would cancel that of the other in the two coils A and A', regulating the electrical oscillations, radiating as electro-magnetic waves.

In Fig. 3, a modification, utilizing the same system, is a series of dynamo generators, or a single generator, with a series of modifiers or controllers, (with gaps in their fields at M), interposed between each generator in the circuit as illustrated in the diagram. The several pairs of primaries and the several pairs of secondaries may be arranged in separate independent circuits for each modifier or controller, or in two independent circuits with only two generators of constant potential B'' and B''' as shown in the drawing.

What I claim, and desire to secure by Letters Patent, is—

1. In a system for the transmission of sound-controlled electro-radiant energy, a pair of secondaries of a sound-controlled primary, a pair of primaries connected with the said secondaries, a primary generator of high frequency currents, a secondary connected with the conductors of electrical oscillations, all substantially as set forth.

2. In a system for the transmission of sound-controlled electro-radiant energy, pairs of secondaries of sound-controlled primaries, pairs of primaries connected with the said secondaries, a primary generator of high frequency currents, secondaries connected with the conductors of electrical oscillations, all substantially as set forth.

3. In a system for the transmission of sound-controlled electro-radiant energy, the combination of means for the continuous generation of successive electro-magnetic waves of high frequencies, and a means of modifying the radiations in accordance with sound waves, consisting of two vocally controlled secondaries, each in an independent circuit with a primary, and each of said primaries modifying the field of the high frequency alternating current coils, whereby induced variations of potential in said secondaries vary the current in said primaries, which govern the field of the high frequency alternating current coils, all substantially as set forth.

4. In a system for the transmission of sound-controlled electro-radiant energy, the combination of means for the continuous generation of successive electro-magnetic waves of high frequencies, and a means of modifying the radiations in accordance with sound waves, consisting of two primaries modifying the fields of the high frequency alternating current coils, each primary in the circuit of a vocally controlled secondary; and each of said circuits so connected by an independent source of constant potential to maintain coinciding fields in the two modifying primaries and opposing fields in the two transmitter secondaries, all substantially as set forth.

5. In a system for the transmission of sound-controlled electro-radiant energy, the combination of means for the continuous generation of successive electro-magnetic waves of high frequencies, and a means of modifying the radiations in accordance with sound waves, consisting of pairs of primaries modifying the fields of the high frequency alternating current coils, each primary in the circuit of a vocally controlled secondary, and each circuit so connected by an independent source of constant potential to maintain coinciding fields in the pairs of modifying primaries and opposing fields in the pairs of transmitter secondaries, all substantially as set forth.

6. In a system for transmission of sound-controlled electro-radiant energy, the combination of means for the continuous generation of successive electro-magnetic waves of

high frequencies, and a means of modifying the radiations in accordance with sound waves, consisting of pairs of primaries modifying the fields of the high frequency alternating current coils, each primary in the circuit of a vocally controlled secondary, and each circuit so connected by an independent source of constant potential to maintain opposing fields in the pairs of transmitter secondaries, all substantially as set forth.

7. In a system for the transmission of sound-controlled electro-radiant energy, the combination of means for the continuous generation of successive electro-magnetic waves of high frequencies, and a means of modifying the radiations in accordance with sound waves, consisting of a primary coil in an electrically energized telephone-transmitter circuit inducing variable currents, in a pair of secondary coils, each of said secondaries connected by an independent source of electrical energy of constant potential to one of a pair of primaries modifying the secondary connected with the conductors of electrical oscillations, all substantially as set forth.

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Witnesses:
HERBERT A. COLLIER,
FREDERICK C. FULLER.