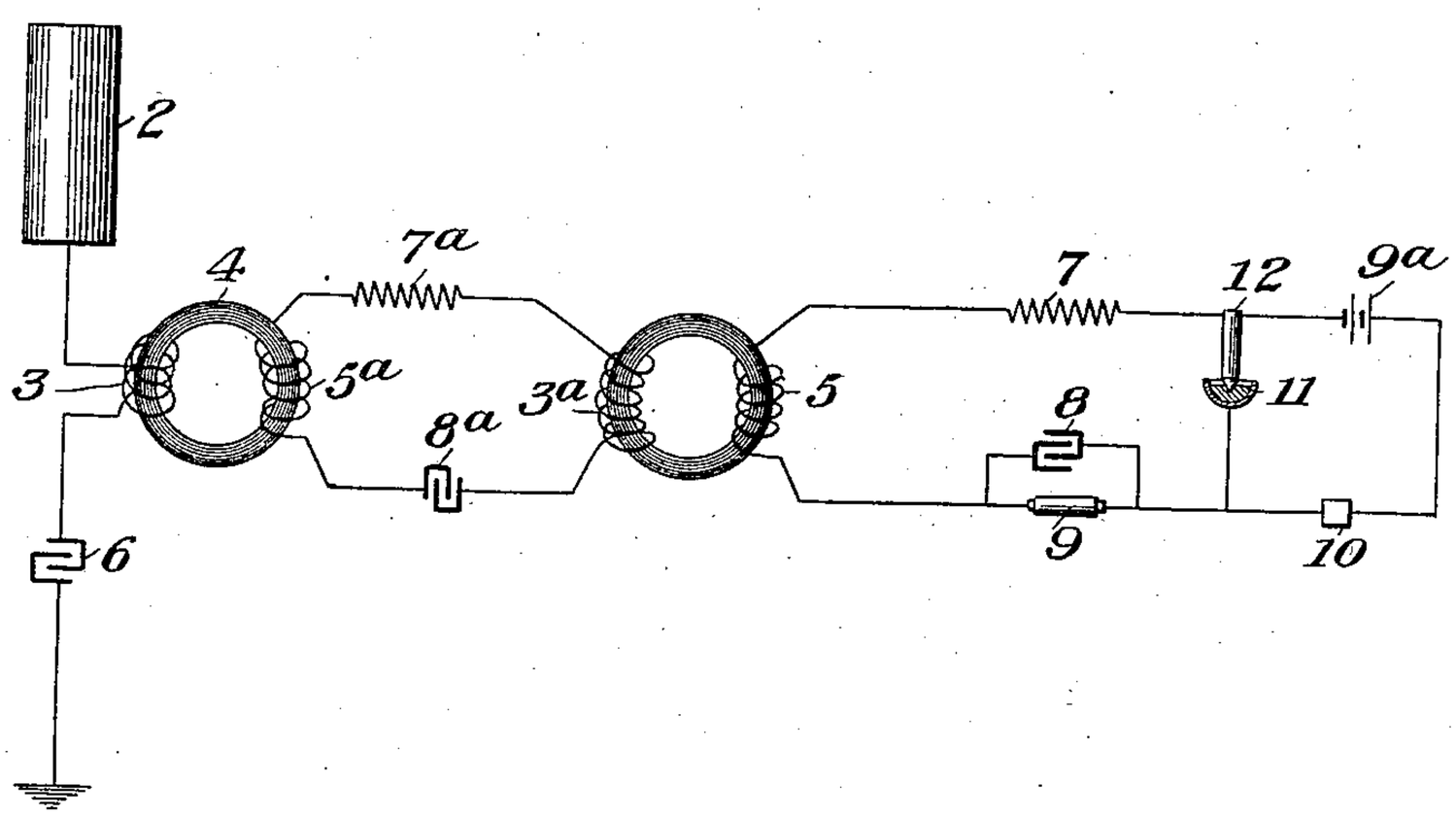
No. 742,779. PATENTED OCT. 27, 1903.

R. A. FESSENDEN.

SIGNALING BY ELECTROMAGNETIC WAVES.

APPLICATION FILED AUG. 8, 1903.

NO MODEL.



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No. 742,779. Patented October 27, 1903.

UNITED STATES PATENT OFFICE.

REGINALD A. FESSENDEN, OF FORT MONROE, VIRGINIA.

SIGNALING BY ELECTROMAGNETIC WAVES.

SPECIFICATION forming part of Letters Patent No. 742,779, dated October 27, 1903.

Original application filed May 29, 1901, Serial No. 62,302. Divided and this application filed August 8, 1903. Serial No. 168,796. (No model.)

To all whom it may concern:

Be it known that I, REGINALD A. FESSENDEN, a citizen of the United States, residing at Fort Monroe, in the county of Elizabeth City and State of Virginia, have invented or discovered certain new and useful Improvements in Signaling by Electromagnetic Waves, of which improvements the following is a specification.

In Letters Patent No. 706,738 I have claimed a complete sending and receiving system, including a sending system adapted to radiate persistent oscillations or wave-trains and a receiving system comprising two or more circuits inductively or otherwise operatively connected with reference to obtaining sharp tuning and good selectivity. The invention described and claimed in this application, which is a division of said patent, has for its object the changing of the voltage at a station by the employment of two or more circuits arranged to produce the desired change.

It is a further object of the invention to provide for selective signaling by so tuning a receiving apparatus that it will respond solely to waves of one periodicity and is the result of a full appreciation of the principle about to be explained.

Heretofore in tuning systems but a single transformer has been used, tuned to the periodicity desired, and with this arrangement it is impossible to obtain any desired ratio of transformation on account of the fact that only a given length just sufficient to permit the oscillation to travel it in the time occupied by a half-wave can be used. If the periodicity of the electromagnetic waves employed is one million eight hundred thousand, then an electric oscillation can only travel a tenth of a mile during a single wave period or a twentieth of a mile during a single oscillation period, because an electric impulse cannot travel faster than the velocity of light, and along a wire which always has inductance and capacity the velocity must be less. The oscillation must travel back and forth over the wire every period, and obviously it cannot do this within the available time unless the length be not greater than one-twentieth of a mile. If the primary has a considerable number of turns, this length may not allow of sufficient turns to give as high a rate of transformation as is desired. Moreover, the tuning will not be as sharp as with the arrangement hereinafter described.

In the accompanying drawing, forming a part of this specification, the figure shows a diagrammatic view of my invention as applied to a receiving-station.

Here 2 is a conductor or aerial, grounded, either directly through the primary 3 or, in addition, through the condenser 6.

5^a is the secondary of a transformer of which 3 is the primary. The transformer may be an air-core transformer, or a core of magnetic material, such as finely-laminated iron 4, may be used.

3^a is the primary, and 5 the secondary, of another transformer. The circuit containing the secondary 5^a and the primary 3^a is tuned, preferably, to the period of the aerial, as is also the circuit containing the secondary 5. This tuning may be done by means of inductances, as at 7 7^a, or capacities, as at 8 8^a.

9 is a receiver, which may be a coherer.

12 is a polarizing-cell, as described in United States Patent No. 706,738.

9^a is a local battery, and 10^a an indicating mechanism.

An advantage peculiar to this construction is that it permits high ratios of transformation to be obtained, for since the length of the secondary should not be greater than the length of the receiving-conductor, as commonly constructed, (though with different constructions the length may vary,) and a considerable length of wire—say twenty or thirty feet—should preferably be used in the primary in order to obtain sufficient magnetizing effect, as is well known in the art, a ratio of transformation approximately greater than one to five cannot be obtained with a single-tuned secondary; but by employing several transformers in series it is evident the stepping-up process can be repeated a number of times and the ratio between the final and primary voltages may be made large.

When this device is used for transmitting or for transforming down, the benefits obtained from its use arise from the same cause—*i. e.*, that by its use it is possible to

obtain any desired ratio, either up or down, in spite of the fact that only a limited length of wire can be used in a single circuit.

When the primary of one transformer, as 3^a, is actuated by the secondary of another transformer, as 5^a, the transformers are said to be in sequence.

What I claim is—

1. In a system of signaling by electromagnetic waves the combination of two or more transformers connected in sequence and transforming in the same direction, a transformer at one end of said sequence being operatively connected to an aerial, and the transformer at the other end of said sequence operatively connected to a receiver for electromagnetic waves.

2. In a system of signaling by electromagnetic waves the combination of two or more transformers connected in sequence and transforming in the same direction, a transformer at one end of said sequence being operatively connected to an aerial, and the circuits of the transformers being tuned to the periodicity of the electromagnetic waves.

3. In a system of signaling by electromagnetic waves the combination of two or more transformers connected in sequence and transforming in the same direction, a transformer at one end of said sequence being operatively connected to an aerial.

4. In a system of signaling by electromagnetic waves the combination of two or more circuits in sequence, an end circuit of said sequence being operatively connected to an aerial, and each of said circuits having a length less than that of the sending-conductor.

5. In a system of signaling by electromagnetic waves the combination of two or more circuits in sequence, an end circuit of said sequence being operatively connected to an aerial, and the first circuit operatively connected to a receiver for electromagnetic waves, each of said circuits having a length less than that of the sending-conductor.

6. In a system of signaling by electromagnetic waves the combination of two or more circuits in sequence, an end circuit of said sequence being operatively connected to an aerial, each of said circuits being tuned to the aerial.

7. In a system of signaling by electromagnetic waves the combination of two or more circuits in sequence so arranged as to have a high ratio of transformation, an end circuit of said sequence being operatively connected to an aerial.

In testimony whereof I have hereunto set my hand.

REGINALD A. FESSENDEN.

Witnesses:
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