

J. R. CARSON.
METHOD OF AND MEANS FOR TRANSMITTING SIGNALS.
APPLICATION FILED JAN. 26, 1916.

1,243,705.

Patented Oct. 23, 1917.
2 SHEETS—SHEET 1.

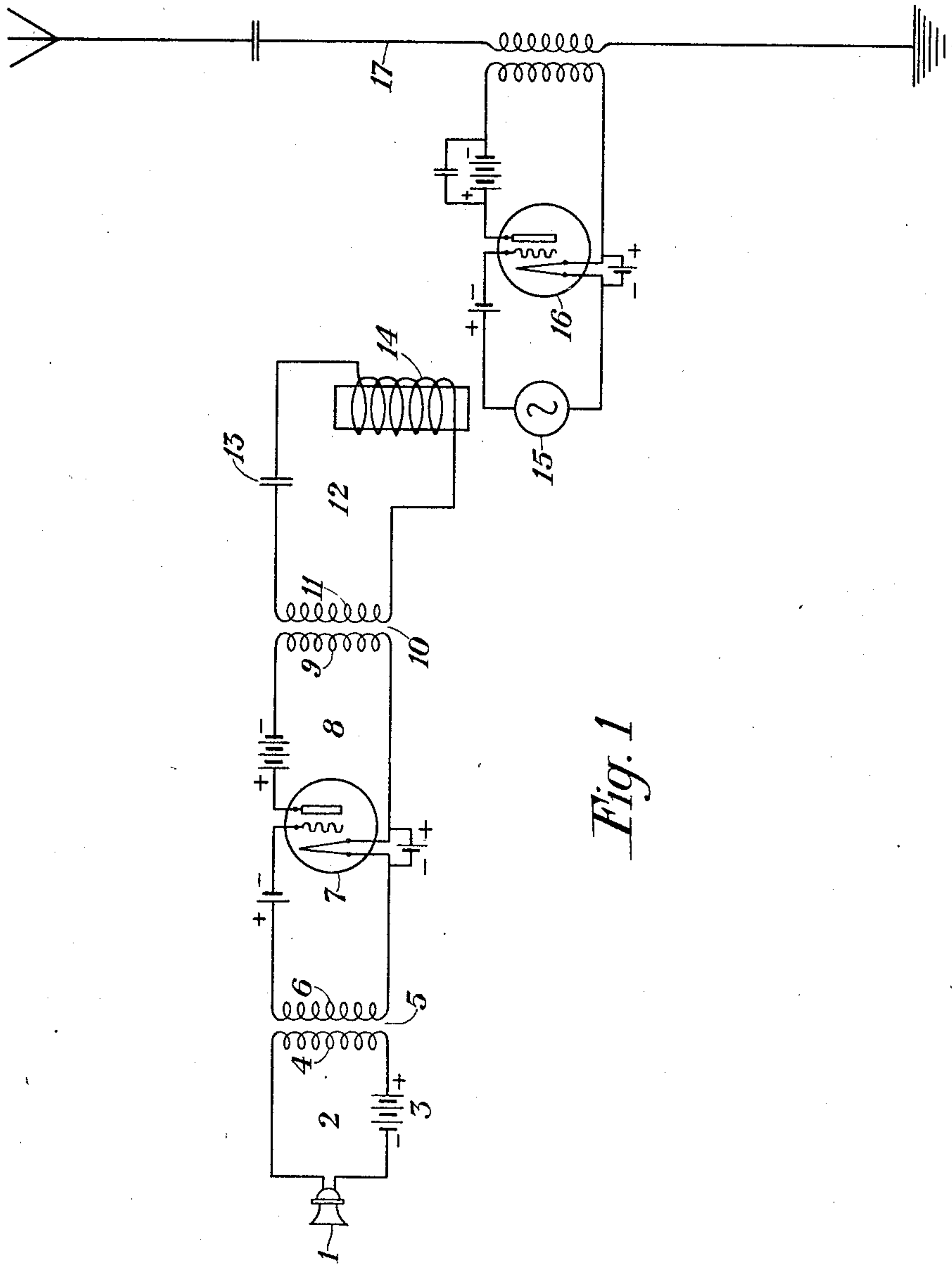


Fig. 1

Inventor:
John R. Carson
per Thomas D. Lockwood
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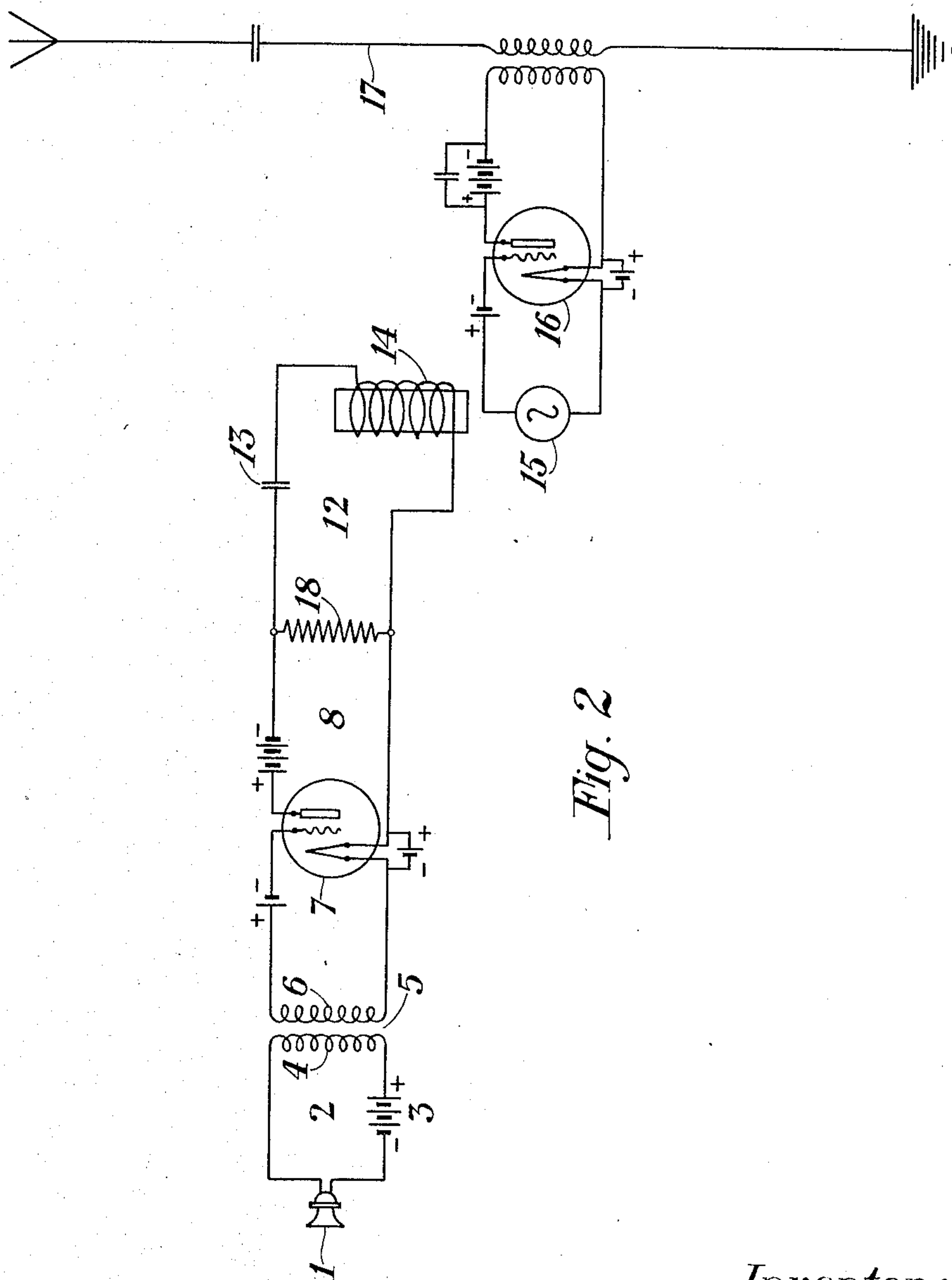


Fig. 2

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UNITED STATES PATENT OFFICE.

JOHN R. CARSON, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

METHOD OF AND MEANS FOR TRANSMITTING SIGNALS.

1,243,705.

Specification of Letters Patent.

Patented Oct. 23, 1917.

Application filed January 26, 1916. Serial No. 74,329.

To all whom it may concern:

Be it known that I, JOHN R. CARSON, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Methods of and Means for Transmitting Signals, of which the following is a specification.

This invention relates to a signaling system wherein signals are transmitted by means of a modulated high frequency carrier wave, and more particularly it relates to the transmitting means embodied in said system. Its object is to provide a transmitting system whose characteristic is such that the amplitude of the high frequency carrier wave is directly proportional to the amplitude of a low frequency signal wave so that the transmission of unmodulated waves is at all times prevented and further that the transmission of energy automatically ceases with the cessation of said low frequency signal wave.

This invention while hereinafter described in terms of a wireless telephone system is not so limited in its scope but finds its application in any signaling system wherein signals are transmitted by means of a high frequency carrier wave, modulated in accordance with said signals. A further example of a signaling system in which my invention may be embodied is that commonly known as the Squier high frequency telephone system.

My invention consists broadly in providing a system in which the generator of the high frequency carrier wave is so controlled by a low frequency signal wave that the amplitude of said high frequency carrier wave is at all times directly proportional to the amplitude of said low frequency signal wave.

My invention is best understood by reference to the accompanying drawings in which Figures 1 and 2 are diagrams of wireless transmitting systems embodying the arrangements of my invention. Referring to Fig. 1, telephonic signal waves are generated by the variations of a transmitter 1 in a circuit 2 containing a source of direct current 3 and a winding 4 of a repeat coil 5. A second winding 6 of said repeat coil is connected to the input side of an amplifier 7 whose output circuit 8 contains a winding 9 of a second repeat coil 10. A second winding 11 of repeat coil 10 is included in a circuit

12 which also includes a condenser 13 and the field winding 14 of a high frequency alternating current generator 15, preferably designed to generate currents of radio frequency. Said generator may be of the form described in Fessenden Patent #793,649 of July 4, 1905; its specific structure is not essential to my invention. Coupled to the armature of said generator is a high frequency amplifier 16 preferably of the vacuum tube type whose output circuit is coupled to an antenna 17. While only one amplifier is shown it will be understood that a plurality of amplifiers in parallel with amplifier 16 may be employed when a large output is required. When a plurality of amplifiers are employed they may be connected as shown in Fig. 1 of the drawings accompanying Arnold Patent No. 1,129,943. The advantage of employing amplifiers is obviously that a low power generator may be employed instead of a generator capable of giving the total output of energy required by the antenna.

My invention will now be readily understood. Since the circuit 12 including field winding 14 is inductively coupled through amplifier 7 to transmitter 1, it will be clear that alternating current alone flows in said circuit; there is no direct current component in field winding 14. Further alternating current flows in said field winding only when transmitter 1 is actuated, so that the high frequency carrier wave is generated by generator 15 only when transmitter 1 is actuated. When transmitter 1 is actuated telephonic currents flow in circuit 2, and therefore by means of repeat coil 6 an alternating voltage of signaling or telephonic frequency is impressed on amplifier 7. Amplified copies of the signaling currents therefore flow in circuits 8 and 12. By means of condenser 13 circuit 12 may be tuned to offer a low impedance to said signaling currents. Generator 15 is excited by an alternating current of signaling frequency; it therefore generates a wave of carrier frequency whose amplitude is directly proportional to the signaling or telephonic current flowing in field winding 14. As a consequence a high frequency carrier wave is radiated from antenna 17 whose amplitude is directly proportional to the low frequency signal wave. Such a wave may be properly termed a pure modulated wave in contra-

distinction to a modulated wave having an unmodulated component.

It will be clear that if direct current as well as alternating current were to flow in winding 14, as is the case when the transmitter is inserted in series with said winding, the carrier wave generated would have an unmodulated component which would be independent of the variations of said transmitter and which would be radiated independently of said variations. In my present invention by means of inductive coupling between transmitter 1 and field winding 14, a pure alternating current flows in said winding when said transmitter is actuated and no current when said transmitter is not actuated. As a consequence radiation of energy automatically ceases with the cessation of the voice actuating transmitter 1.

The important advantages of the system above disclosed will be readily appreciated. In ordinary systems there is continuous radiation of energy in the form of an unmodulated carrier wave even when no signals are being transmitted. This transmission of the unmodulated carrier wave, besides involving energy waste, constitutes a serious bar against the operation of duplex systems. With the arrangement of my invention energy transmission or radiation automatically ceases when signal transmission is discontinued. A neighboring receiving system would therefore suffer interference from the transmitting system only when signals are actually being transmitted, and the arrangements of my invention, therefore, possess ideal characteristics for embodiment in a duplex system. Further only energy modulated in accordance with the signals to be transmitted is at any time transmitted.

Referring to Fig. 2 an organization similar to that illustrated in Fig. 1 is shown, corresponding component parts being designated by the same numerals. The only difference between the two arrangements is that in the arrangement of Fig. 2 circuit 12 is connected across an impedance element 18, preferably a non-inductive resistance in output circuit 8. The function of condenser 13 is not only to render circuit 12 responsive to the low frequency waves generated by transmitter 1, but also to prevent the flow of direct current in circuit 12. Alternating current alone therefore flows in said circuit and the arrangement is equivalent to that of Fig. 1, since circuit 12 is traversed by current only when transmitter 1 is actuated and the magnitude of said current is proportioned to the magnitude of the low frequency waves generated by said transmitter.

I do not desire to limit my invention to the specific arrangement shown in the accompanying drawing. My invention is directed to the broad idea of providing a trans-

mitting arrangement in a high frequency signaling system such that a high frequency wave is exclusively generated whose amplitude is directly proportional to a low frequency signaling and which is therefore a pure modulated wave without an unmodulated component.

What is claimed is:

1. In a high frequency signaling system, the method of transmission which consists in generating a low frequency modulating signal wave, generating, to the exclusion of other high frequency waves, a high frequency carrier wave whose amplitude is directly proportional to said low frequency modulating wave and which is damped by the modulating wave only and in transmitting said carrier wave.
2. In a high frequency signaling system, the method of transmission which consists in generating a low frequency modulating signal wave, generating, to the exclusion of other high frequency waves, a pure modulated high frequency carrier wave in accordance with said low frequency modulating wave and which is damped by the modulating wave only, and in transmitting said pure modulated carrier wave.
3. In a high frequency signaling system, the method of transmission which consists in generating a low frequency modulating signal wave, controlling by means of said signal wave the generation of a high frequency wave and thereby generating, to the exclusion of other high frequency waves, a carrier wave whose amplitude is directly proportional to said low frequency modulating wave and which is damped by the modulating wave only, and in transmitting said carrier wave.
4. In a high frequency signaling system the combination of a source of low frequency signal waves; a high frequency alternating current generator comprising an exciting means and an armature; connections between said exciting means and said source of low frequency signal waves, means preventing the flow of direct current in said exciting means and an outgoing circuit connected to said armature.
5. In a high frequency signaling system the combination of a source of low frequency signal waves; a high frequency alternating current generator comprising an exciting means and an armature; a circuit including said exciting means, electrical connections between said circuit and said source of low frequency signal waves, and an outgoing circuit connected to said armature whereby said exciting means is excited exclusively by the inductive action of said low frequency signal waves.
6. In a wireless telephone system, the combination of a high frequency alternating current generator comprising an armature

and a field winding; a telephone transmitter; a vacuum tube amplifier connecting said transmitter and said field winding; means preventing the flow of direct current in said
5 field winding; an antenna, and a second vacuum tube amplifier connecting said antenna with said armature.

7. In a high frequency signaling system the combination of a source of low frequency
10 modulating signal waves; a high frequency alternating current generator adapted to generate sustained undamped oscillations;

and means to control the action of said generator so that the oscillations generated shall have an amplitude directly proportional to 15 said low frequency modulating waves.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this twenty-second day of January 1916.

JOHN R. CARSON.

Witnesses:

FRED'K S. ROBINSON,
RALPH W. WOLF.