

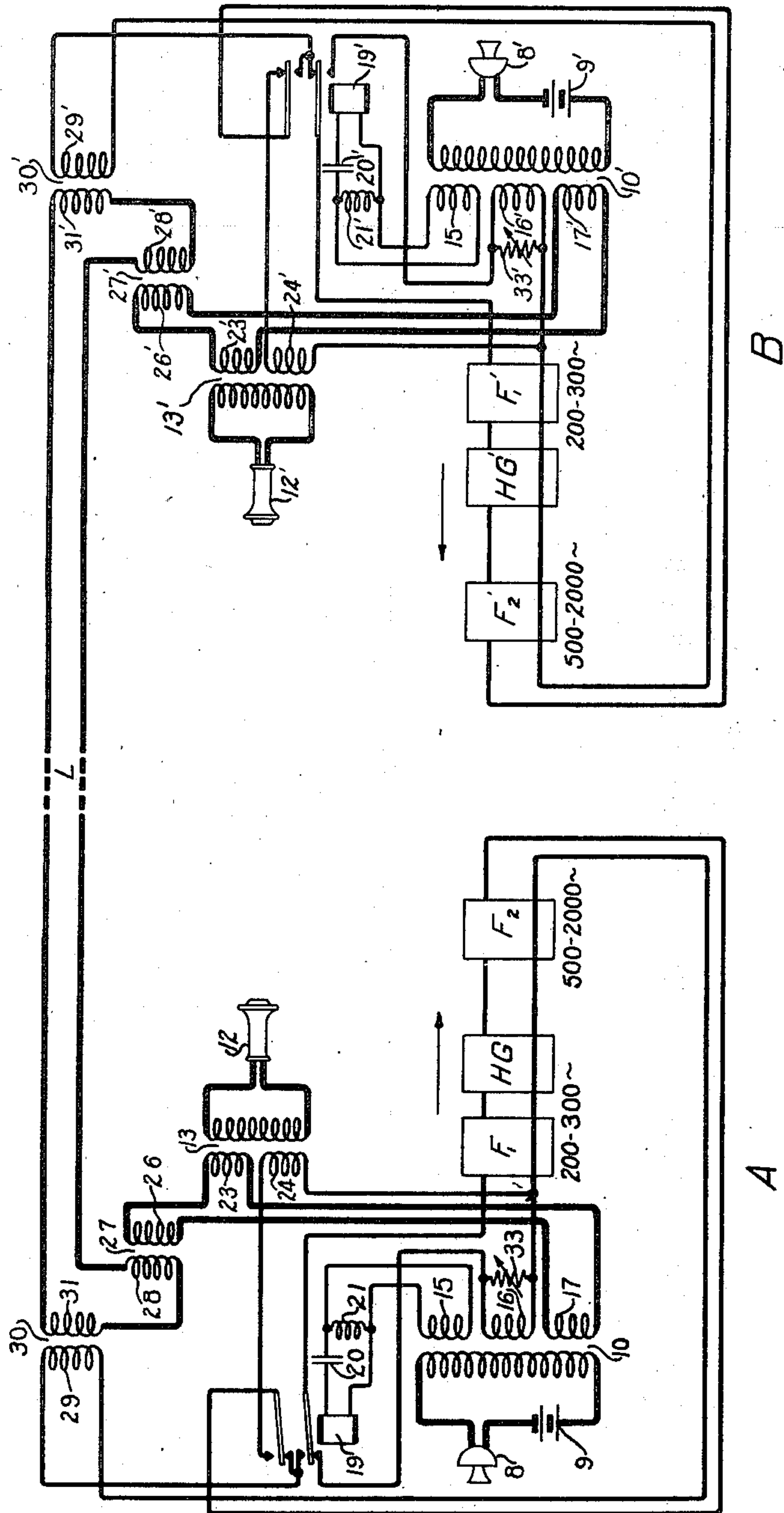
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ELECTRICAL SYSTEM FOR SECRET TRANSMISSION

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ELECTRICAL SYSTEM FOR SECRET TRANSMISSION

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This invention relates to transmission systems and particularly to the method of and means for providing secrecy in the transmission of messages over said systems.

5 Systems for obtaining secrecy in signaling have heretofore been devised wherein the messages are obscured or rendered unintelligible, when received in the usual manner, by combining therewith noise frequencies.

10 This invention is based on this general principle, but the method of and means for generating the noise frequencies and their application to the message waves is accomplished in a novel manner.

15 This invention operates upon the principle that message waves may be masked or rendered unintelligible by applying to the ear of the listener at the proper instant, noise waves of the proper frequency and amplitude. To provide the proper frequency and instant of application of the noise waves, they are generated by the action of the message currents and impressed upon the transmission medium simultaneously with the message
20 currents. No message waves can, therefore, be impressed on the transmission medium without their accompanying noise frequency waves, the latter varying in amplitude in substantially direct proportion with the amplitude of the message waves.

30 It is an object of this invention to simplify the means for rendering messages unintelligible to persons unauthorized to receive them and simplify intelligible reception of messages by authorized persons.

35 A feature of this invention is the generation of the noise frequencies by the action of the message waves for combination with the message waves.

40 Another feature of the invention is the varying of the amplitude of the noise frequencies in direct proportion to the amplitude of the message waves.

45 These objects and features and various advantages of this invention will be more fully understood in the following detailed description taken in connection with the accompanying drawing, the single figure of which shows a two way system embodying the invention.

The drawing shows two stations, A and B, the stations comprising identical apparatus and circuits. Each station may be a subscriber's set independent of the other station. The difference in stations A and B, however, is
55 that the apparatus and circuit of station A is operated for transmitting, while that of station B is operated for receiving. In describing this drawing identical numbers will indicate identical elements, the prime numbers
60 applying to the station operated for receiving.

In the secrecy apparatus of this invention, as shown in the drawing, is a transmitter 8, the circuit of which is through energizing
65 battery 9 and the primary of a four-winding transformer 10. Signals are received on a receiver 12 in circuit with the secondary of a three-winding transformer 13. The transformer 10 has three secondary windings, 15,
70 16 and 17, the secondary winding 15 being connected to the actuating winding of a voice operated relay 19. In series with this latter circuit is a condenser 20, and in shunt thereto an inductance 21 for the purpose of making the relay more sensitive to the average
75 voice frequency currents.

The secondary winding 17 is in circuit with a winding 23 of transformer 13 and a winding 26 of transformer 27. The secondary
80 winding 16 is in circuit with the lower armature of relay 19, filter F_1 , harmonic generator HG, filter F_2 , winding 29 of transformer 30, and the upper armature of relay 19. Message and noise frequency currents are impressed on, and received from a line L through
85 winding 31 of transformer 30 and winding 28 of transformer 27. Across secondary 16 is shunted a variable resistance element 33 for varying the input into the harmonic generator HG. This harmonic generator may be
90 a vacuum tube rectifier such as disclosed in Patent No. 1,446,752, February 27, 1923, and the filters F_1 and F_2 may be of the well known unbalanced type such as shown in Patent No.
95 1,227,113, May 22, 1917.

The operation of station A, the apparatus of which is set for transmitting is as follows: Voice frequency currents from transmitter 8 are impressed on secondary wind-
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ings 15, 16 and 17. The energy impressed on winding 15 operates the relay 19 and places the armatures thereof in the position shown in the drawing. The energy impressed on winding 17 passes onto the line L through transformer 27. The energy impressed on winding 16 passes by way of the lower armature of relay 19 to the filter F_1 . This filter is constructed to pass only frequencies between 200 and 300 cycles per second. It is known that within this frequency range the fundamental of the female voice and the second harmonic of the male voice are to be found, so that this voice frequency reaches the harmonic generator HG. The energy of this frequency wave depends upon the amplitude of the voice waves but it is always large enough to generate sufficient harmonics to mask the voice waves. As filter F_2 has a range of 500 to 2000 cycles, only those harmonics lying within this range are passed onto the line L through transformer 30 by way of the upper armature of relay 19.

This combination of voice and noise frequency currents in unintelligible form may be transmitted between the two stations shown in any well known manner, for example, by the line L directly or by modulating a high frequency carrier wave with the lower frequencies for radio or wired transmission. In the case of radio transmission the line L would not of course, extend between the two stations but may be considered as leading from each station to suitable radio transmitting and receiving apparatus.

The operation of station B which is shown in condition to receive is as follows: The combination of message and voice frequencies is received on line L either directly in the case of radio or carrier transmission, or, from a suitable receiver, and impressed on transformers 27' and 30'. From transformer 27' the unintelligible voice and noise frequency currents are impressed on transformer 13' through windings 26' and 23'. However, part of the energy from the line L passes through transformer 30' by way of the lower armature of relay 19' to filter F_1' . Since the filters used in this system are of the unbalanced type, the lower terminal of winding 29' is common with one input terminal of filter F_1' , so that the output of transformer 30' is impressed directly on filter F_1' . From this part of the received energy only the first harmonic of the male or the fundamental of the female voice frequency currents is passed by the filter F_1' to the harmonic generator HG' as in the case of F_1 at station A. This generator produces the same harmonics as generator HG at station A and the filter F_2' passes the same number of harmonics as filter F_2 so that we have the same output waves at filter F_2' as at filter F_1' . The output of filter F_2' is then impressed on winding 24' of the transformer 13' by way

of the upper armature of relay 19'. These noise frequencies are, however, impressed on this winding 180° out of phase with those arriving in winding 23'. This is accomplished by winding the turns of winding 24' in the opposite sense to those of winding 23'. There is, therefore, a neutralization of the noise components in the transformer 13' and the only energy impressed on the secondary winding of this transformer is that of the message frequency waves generated in transmitter 8. The message is thus impressed on receiver 12' in intelligible form. Delay networks may also be employed in the output circuits of filters F_2 and F_2' to obtain the necessary phase opposition for neutralizing the masking noise frequencies.

The invention is also susceptible to various other modifications and adaptations and accordingly is not to be considered as limited in any way by this particular disclosure.

What is claimed is:

1. In a signaling system, a source of message waves, means for generating from said message waves noise waves having harmonics of said message waves, means for combining said noise waves with said message waves, and means at a distant receiving point for neutralizing said noise waves while retaining the message waves.

2. In a signaling system, a source of message waves, a source of noise waves, a common output path for both of said sources, said output path being connected to said source of message waves, means included in said source of noise waves for producing said noise waves from said message waves, and means for combining said noise and message waves, said last means comprising a relay operated by said message waves.

3. In a signaling system, a source of message waves, a source of noise waves, a common output path for both of said sources, said output path being connected to said source of message waves, a harmonic generator for producing harmonics as noise waves from said message waves, said generator being included in said source of noise waves interposed between said source of message waves and said output path, and means at a distant receiving point for eliminating the effect of said noise waves and receiving the message waves.

4. In a signaling system, a source of message waves, an output path connected to said source of message waves, a source of noise waves interposed between said source of message waves and said output path, said source of noise waves comprising a harmonic generator for producing noise waves which are harmonics of one of said message waves, and a relay associated with said source of message waves for connecting said source of message waves to said source of noise waves.

5. In a secrecy system, a source of message

frequency currents, a source of noise frequency currents, a harmonic generator controlled by the impression of said message frequency currents thereon included in said source of noise frequency currents, an output path common to said noise frequency currents and said message frequency currents, and a voice operated relay actuated by said source of message frequency currents for making said system adaptable for combining and transmitting said message and noise frequency currents in unintelligible form and for controlling the impression of said message frequency currents on said harmonic generator.

6. In a secrecy system, in accordance with claim 5 in which said voice operated relay makes said system adaptable for receiving said combination of noise and message frequency currents or adaptable for combining said message and noise frequency currents and transmitting said combination thereof.

7. In a secrecy system, a source of message frequency currents, a source of noise frequency currents, means for combining said message and noise frequency currents, and means included in said source of noise frequency currents for selecting one frequency of the message currents, for generating from said one frequency, harmonics thereof for masking said message frequency currents, and means for eliminating the effect of said harmonic frequency components from the message waves after transmission of the message waves and the noise waves to a distant point.

8. A method of masking intelligible message waves, comprising first, selecting a component of said waves, second generating harmonics from said component, and third combining said harmonics and said message waves in a common output path.

9. In a transmission system, an incoming line in which there is an unintelligible combination of message and noise frequency currents, receiver means on which said combination is impressed, and a second means on which said combination is impressed, said second means generating from said message currents the same noise frequencies as contained in said combination and impressing them on said receiver means in phase opposition to said noise frequency currents in said combination.

10. In a transmission system, an incoming line in which there is an unintelligible combination of message and noise frequency currents, receiver means on which said combination is impressed, filter means for selecting certain of the message currents of said combination of frequency currents, a harmonic generator for generating noise harmonics from said selected frequency currents, and means for impressing said noise harmonics on said receiver means for neutralizing said noise frequency currents in said combination.

11. A transmission system in accordance with claim 10 in which said receiver means comprises a three winding transformer, said combination being received on one winding thereof, and said noise harmonics being received on a second winding thereof, said second winding being reversed with respect to said first mentioned winding.

12. In a signaling system, a source of message waves, means for generating noise waves under control of said message waves, and a common output path for said message and said noise waves, said generating means including a harmonic generator for producing noise representing harmonics of a component of said message waves, the amplitudes of said harmonics being proportional to said component of said message waves, and means for removing the harmonic frequency waves from the message waves.

In witness whereof, I hereunto subscribe my name this 17th day of October, A. D., 1927.

JOHN C. STEINBERG.