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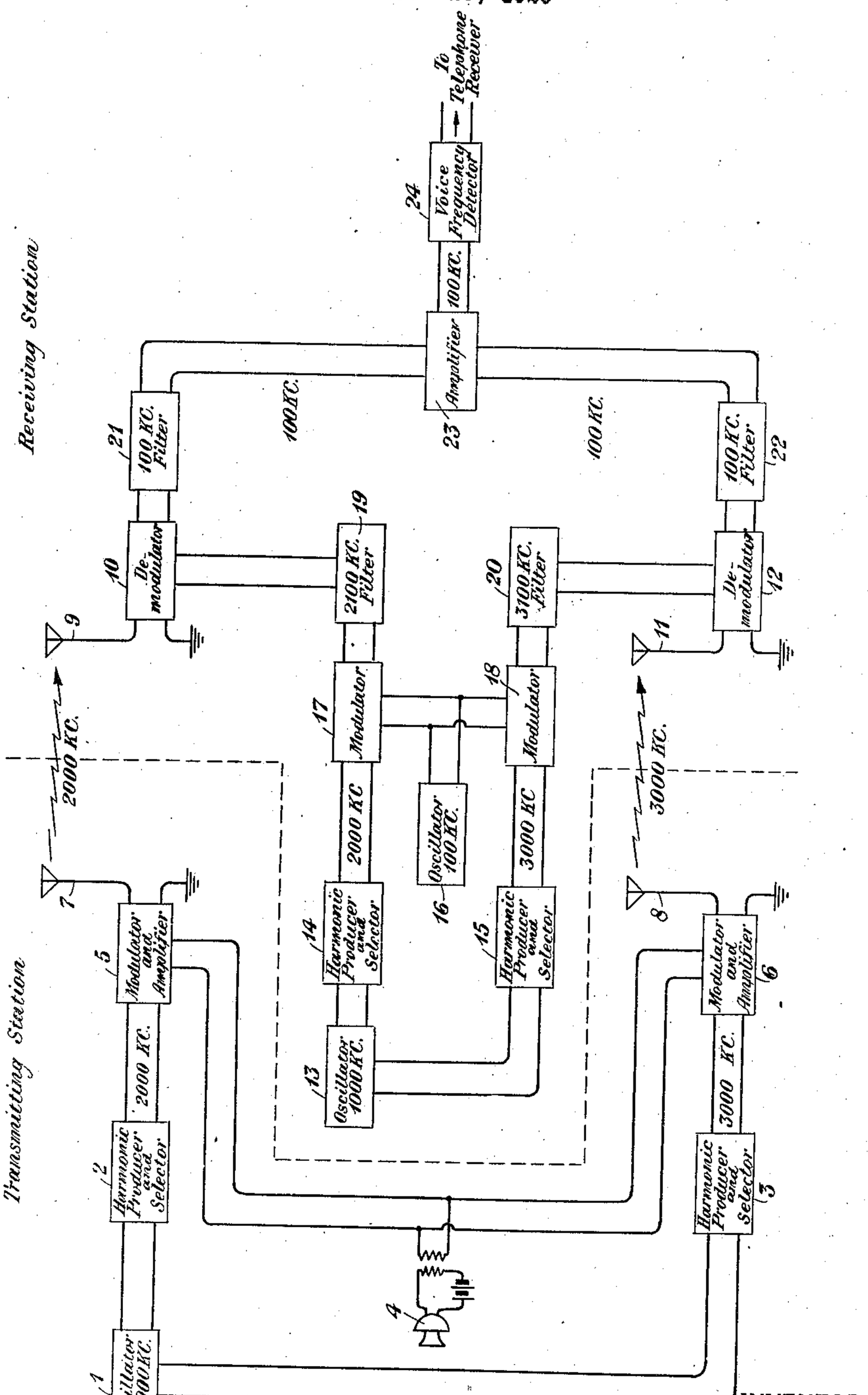

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RADIO SIGNALING SYSTEM.

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This invention relates to radio signaling systems, and has as its principal object the reduction of fading and distortion effects in the transmission and reception of signals by radio.

When radio signals are transmitted and received on a single wave length, the undesirable fading and distortion effects are considerable. Applicant proposes to send and receive the signals on a plurality of wave lengths simultaneously, as explained below.

Applicant's methods of and means for radio signaling of the nature indicated above in general provide for the sending of the signal on a plurality of frequencies, the reception of the several modulated radio frequencies separately, and the beating of the received frequencies to a common intermediate frequency so that the signals may be united and passed through the same intermediate frequency amplifier without trouble from frequency changes on any one of the channels. In order that this may be accomplished, two conditions must be met, (1) that the relation between the frequencies of the several channels be constant, and (2) that the same intermediate frequency be used for amplification.

Applicant's invention will be more clearly understood when the following detailed description is read with reference to the accompanying drawing. The specific arrangement shown and described contemplates the sending of the signal on two frequencies. The drawing shows diagrammatically the circuits of the transmitting station and the receiving station. Such apparatus as is well known in the art is shown symbolically in cases in which such a showing serves to simplify the diagram. The radio frequencies and the intermediate frequency indicated are chosen arbitrarily for purposes of specific description.

With reference to the details of the drawing, at the transmitting station there is a master oscillator 1 which produces a frequency of 1,000 kilocycles (kc.), for instance. In one channel this frequency is multiplied to 2,000 kc. by means of the harmonic producer and selector 2, while in the second channel the basic frequency is multiplied to 3,000 kc. by the harmonic producer and selector 3. The 2,000 kc. frequency is fed into the modulator-amplifier 5, and the 3,000 kc. frequency is fed into the modulator-amplifier 6. The telephone transmitter 4 is inductively connected to these two modulator-amplifiers, and each high frequency is modulated with the signal, the 2,000 kc. frequency in the modulator-amplifier 5, and the 3,000 kc. frequency in the modulator-amplifier 6. Thus there are two high frequencies modulated with the same signal. The 2,000 kc. frequency, modulated, is sent out from the antenna 7, and the 3,000 kc. frequency, likewise modulated, is sent out from the second channel on antenna 8.

At the receiving station the antenna 9 receives the modulated 2,000 kc. carrier frequency, and from this antenna this frequency is fed into the demodulator 10. Likewise the modulated 3,000 kc. carrier frequency is received on the antenna 11, and the frequency fed into the demodulator 12.

At the receiving station there is a second master oscillator 13 producing, for instance, 1,000 kc. The requirement is that the frequency produced be a sub-multiple of both the transmitting carrier frequencies, here taken to be 2,000 kc. and 3,000 kc., for the purpose of illustration. This frequency is multiplied in one channel to 2,000 kc. by the harmonic producer and selector 14, and to 3,000 kc. in the second channel by the harmonic producer and selector 15. A third oscillator 16 is caused to produce the frequency of 100 kc., which frequency is added to the 2,000 kc. frequency and to the 3,000 kc. frequency in the modulators 17 and 18, respectively. In the first channel, the result of this modulation is passed through the 2,100 kc. filter 19, and the 2,100 kc. component is fed into the demodulator 10. Likewise, in the other channel the result of the combination of the 3,000 kc. frequency and the 100 kc. frequency is passed through the 3,100 kc. filter 20, and the 3,100 kc. component is fed into the demodulator 12.

Thus, in the first channel, the 2,000 kc. frequency, modulated with the signal, is beaten with a frequency of 2,100 kc., and in the second channel the received frequency of the 3,000 kc., modulated with the signal, is beaten with the frequency of 3,100 kc. The filter 21 in the first channel of the receiving station selects the 100 kc. component upon which is superimposed, of course, the signal frequency. Also in the second channel of the receiving station the filter 22

selects the intermediate frequency of 100 kc. with the signal frequency superimposed thereon. From the filters 21 and 22, the two channels of the receiving circuit are united in the intermediate frequency amplifier 23. It is seen that the two intermediate frequencies each modulated with the signal, which are passed into this amplifier, are equal. From the amplifier 23, the intermediate frequency current carrying the signal is passed into the voice frequency detector 24, where the signal is detected, as is the case in the ordinary radio signaling system.

Applicant thus provides means for transmitting simultaneously oscillations of two radio frequencies each modulated with the signal, means for receiving separately the two modulated radio frequencies and beating them with frequencies of such values that there is produced a common intermediate frequency, means for uniting and amplifying the intermediate frequency currents, and the usual means for detecting the signal.

While applicant's invention has been disclosed in one specific embodiment, which is deemed desirable, it is to be understood that it is capable of embodiment in many other and different forms without a departure from the true scope of the invention as defined in the appended claims.

What is claimed is:

1. The method of reducing fading and distortion effects in the transmission of signals by radio, which consists in transmitting a given signal on a plurality of wave lengths, beating the several received frequencies to a common intermediate frequency, uniting and amplifying the resultant currents, and detecting the signal.

2. The method of reducing fading and distortion effects in the transmission of signals by radio, which consists in transmitting a given signal on a plurality of wave lengths simultaneously, beating the several received frequencies to a common intermediate frequency, uniting and amplifying the resultant currents, and detecting the signal.

3. The method of reducing fading and distortion effects in the transmission of signals by radio which consists in transmitting oscillations of a plurality of radio frequencies each modulated with the signal, receiving separately the several modulated radio frequencies, beating the several received frequencies to a common intermediate frequency, uniting and amplifying the resultant currents, and detecting the signal.

4. The method of reducing fading and distortion effects in the transmission of signals by radio, which consists in transmitting simultaneously oscillations of a plurality of radio frequencies each modulated with the signal, receiving separately the several modulated radio frequencies, beating the several received frequencies to a common intermediate frequency, uniting and amplifying the resultant currents, and detecting the signal.

5. The method of reducing fading and distortion effects in the transmission of signals by radio, which consists in producing at the transmitting station oscillations of a plurality of radio frequencies, modulating each radio frequency with the signal, transmitting each modulated radio frequency separately, receiving each modulated radio frequency separately, beating the received frequencies with carrier frequencies of such values that a common intermediate frequency is produced, uniting and amplifying the intermediate frequency currents, and detecting the signal.

6. In a radio signaling system, means for transmitting oscillations of a plurality of radio frequencies each modulated with the signal, means for receiving separately the several modulated radio frequencies, means for beating the several received frequencies to a common intermediate frequency, means for uniting and amplifying the intermediate frequency currents, and means for detecting the signal.

7. In a radio signaling system, means for transmitting simultaneously oscillations of a plurality of radio frequencies each modulated with a signal, means for receiving separately the several modulated radio frequencies, means for beating the several received frequencies to a common intermediate frequency, means for uniting and amplifying the intermediate frequency currents, and means for detecting the signal.

8. In a radio signaling system comprising a transmitting station and a receiving station, means at the transmitting station for producing oscillations of a plurality of different high frequencies, means for modulating said oscillations with signal, means for sending out separately the modulated oscillations, separate means for receiving the several modulated high frequency waves, means at the receiving station for beating the modulated high frequency oscillations to a common intermediate frequency, means for uniting and amplifying the intermediate frequency currents, and means for detecting the signal.

9. In a radio signaling system, the combination of a transmission station and a receiving station; said transmitting station comprising a signal transmitter, means for producing oscillations of a plurality of different high frequencies, means for modulating said oscillations with the signal transmitted, and means for sending out separately and simultaneously the modulated high frequencies; and said receiving station comprising separate means for receiving the several high fre-

quencies, means for beating the several received frequencies to a common intermediate frequency, means for uniting the intermediate frequency currents, means for amplifying said currents, and means for detecting the signal.

10. In a radio signaling system, the combination of a transmitting station and a receiving station; said transmitting station comprising a signal transmitter, means for producing oscillations of a plurality of different high frequencies, means for modulating said oscillations with the signal transmitted, and means for sending out separately and simultaneously the modulated high frequencies; and said receiving station comprising separate means for receiving the several high frequencies, means for producing oscillations corresponding in frequency to those produced at the transmitting station, means for superimposing a common intermediate frequency upon said oscillations to produce beating frequencies, means for combining each of said beating frequencies with the nearest received frequency, means for selecting from the resultant oscillations the intermediate frequencies with the signal superimposed thereon, means for uniting the frequencies selected, means for amplifying the resultant current, and means for detecting the signal.

In testimony whereof, I save signed my name to this specification this 20th day of November, 1925.

RUSSELL S. OHL.