

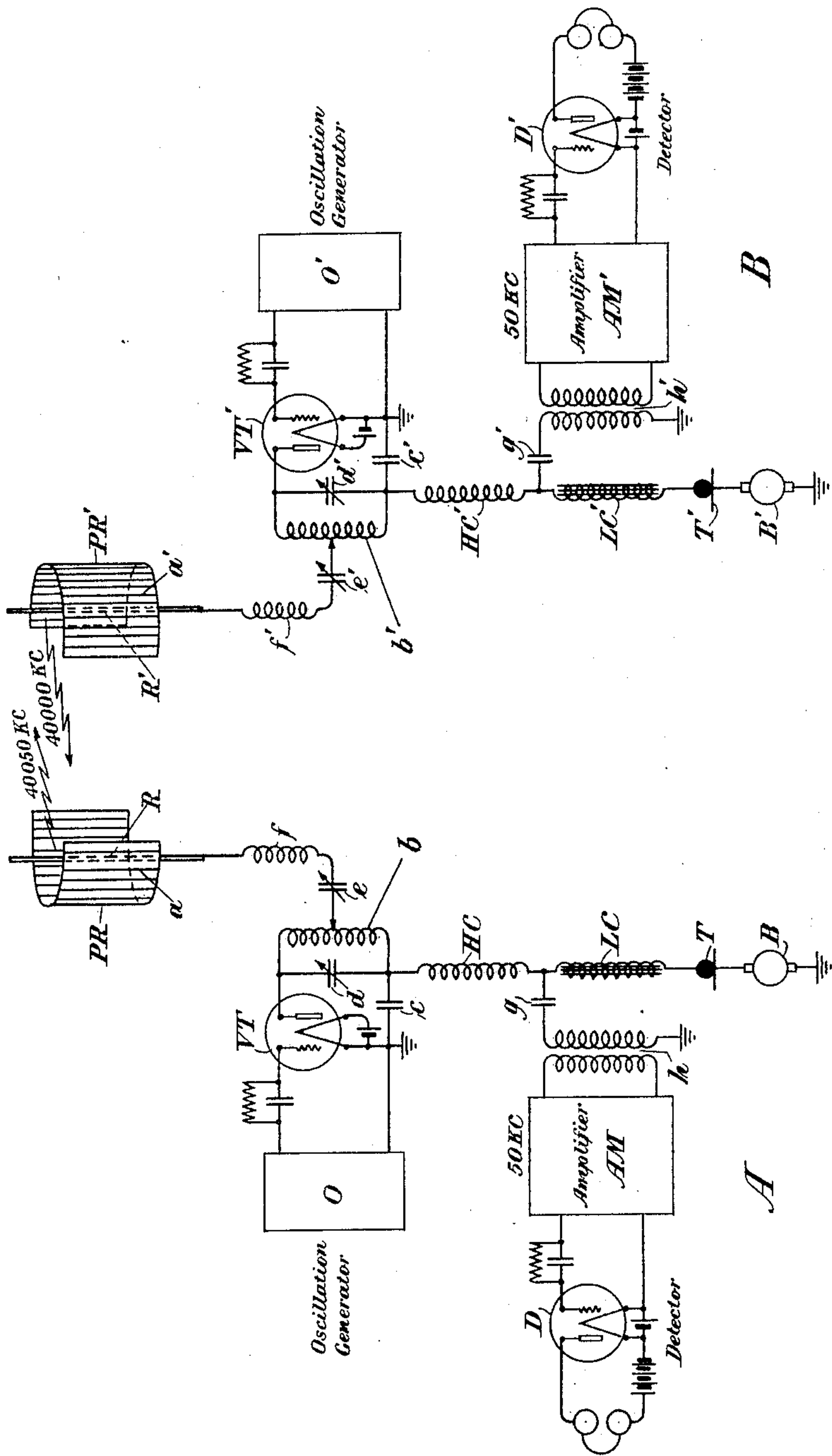
Nov. 12, 1929.

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1,735,053

RADIO SIGNALING SYSTEM

Filed Sept. 23, 1925



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RADIO SIGNALING SYSTEM

Application filed September 23, 1925. Serial No. 58,164.

This invention relates to short wave signaling systems.

It has been found desirable in short wave signaling systems to use a beam of waves for the transmission and reception of signals. In order to set up a beam of waves a parabolic reflector may be employed therefor, the parabolic reflector consisting of a plurality of elements arranged on a parabolic surface around a transmitting or receiving aerial as a focus, each element being tuned to the frequency of the aerial. The length of each element is preferably about half a wave length, but the length may be made greater or less than this by including either a condenser or an inductance therein.

But when a parabolic reflector is used for the transmission of a beam of waves, it is customary to employ another parabolic reflector for the reception of a similar beam of waves. Such reflectors are large and expensive, and it therefore seems necessary to provide a system whereby a single reflector may be employed for both the transmission and reception of a beam of waves.

Accordingly, it is an object of this invention to provide a pair of parabolic reflectors, one at each station, each being suitable for both the transmission and reception of a polarized beam of waves.

While the nature of this invention will be pointed out with particularity in the appended claim, the invention itself, both as to its objects and features, will be more clearly understood from the detailed description hereinafter following when read in connection with the accompanying drawing representing one embodiment of the invention. The apparatus at the two stations shown in the drawing are similar and therefore the same reference characters have been employed in connection with each station, except that at one of the stations the reference characters are primed.

Referring to the drawing, two stations A and B are shown. At station A there is a parabolic reflector PR consisting of a plurality of elements a all arranged on a parabolic surface around an aerial R, sometimes called a resonator. An oscillation generator

O is shown in the drawing for generating a very high frequency, for example, 20,025 kilocycles, the frequency being constant within very narrow limits. This may be a piezo-electric oscillator, or a vacuum tube oscillator controlled as to frequency by means of a piezo-electric device, or a low frequency oscillator having connected thereto in tandem a plurality of harmonic generators, or frequency multipliers, so as to change the low frequency oscillations to high frequency oscillations.

A harmonic generator, or a frequency multiplier, is connected to the oscillation generator O including a vacuum tube VT having an input circuit and an output circuit. The output circuit of this vacuum tube includes the anode and cathode of the vacuum tube VT, the inductance b and condenser c . A variable condenser d is employed for tuning the output circuit of the vacuum tube VT to any frequency, preferably a harmonic of the frequency in the input circuit thereof, for example, 40,050 kilocycles. Another variable condenser e and an inductance f are connected to the output circuit of the vacuum tube VT for impressing the frequency of the output circuit on the aerial R.

The reference character T represents a device which is employed for superimposing signals on a high frequency current supplied to the aerial R. This device may be a microphone, an alternator, or any device capable of transmitting signals which may be superimposed on a high frequency current. A source of potential B supplies the necessary space current to the anode of the vacuum tube VT. Current from the source of potential B flows through choke coils LC and HC and the inductance b , the choke coil HC being employed for preventing the transmission of frequencies of 40,000 kilocycles or more, and the choke coil LC being employed for preventing the transmission of a frequency of 50 kilocycles. However, current of a frequency of 50 kilocycles passes through the condenser g and is impressed on the primary winding of the transformer h . Due to the coupling existing between the primary and secondary windings of the transformer

h, this current is also impressed on the secondary winding thereof, and thereafter upon the input circuit of an amplifier AM. This amplifier AM may be any amplifier well known in the art, preferably a vacuum tube amplifier.

The output circuit of this amplifier is connected to a detector D which has a receiving device connected in the output circuit thereof. This receiving device receives the signals which are superimposed on the current of the frequency of 50 kilocycles which are detected by D.

The apparatus at station B is similar to the apparatus at station A, the reference characters for the apparatus at station B being the same as the reference characters at station A except that they are primed.

The arrangements of this invention operate in the following manner:

The oscillation generator O transmits a high frequency, for example, 20,025 kilocycles, to the input circuit of the vacuum tube VT. The output circuit of this vacuum tube is tuned by the variable condenser c to a harmonic of the frequency in the input circuit, for example, 40,050 kilocycles. For the transmission of signals from the station A to the station B the transmitter T transmits signals through the choke coils LC and HC, and these signals are superimposed on the high frequency current in the output circuit of the vacuum tube VT. This high frequency current, modulated in accordance with the signals, is then transmitted through the condenser e and inductance f to the aerial R. By virtue of the relation of the elements of the parabolic reflector PR to the aerial R, a beam of polarized waves of the frequency of 40,050 kilocycles modulated in accordance with signals is transmitted from station A to the parabolic reflector at station B.

This beam of polarized waves strikes the inner surface of the parabolic reflector PR' at station B. Thus, this beam of high frequency waves modulated in accordance with signals is transmitted by the aerial R' at station B to the output circuit of the vacuum tube VT' through the inductance f' and the condenser e' . There are also impressed on the output circuit of the vacuum tube VT' the oscillations of a harmonic of the frequency of the oscillation generator O'. The frequency of this harmonic may be 40,000 kilocycles.

Thus the high frequency oscillations, for example, 40,050 kilocycles, received at station B, modulated in accordance with signals, and the oscillations of the frequency of the harmonic of the oscillation generator O', for example, 40,000 kilocycles, beat in the output circuit of the vacuum tube VT' to produce, among other frequencies, a difference frequency, for example, 50 kilocycles. This difference frequency, for example, 50 kilocycles,

is impressed on the primary winding of the transformer h' , the choke coil HC opposing the flow of current of the frequency of 40,000 kilocycles, or of higher frequencies, and the choke coil LC' opposing the flow of current of the frequency of 50 kilocycles in order to permit this latter frequency to be transmitted to the primary winding of the transformer h' . This difference frequency, or intermediate frequency, also has the signals transmitted from station A impressed thereon and is amplified by the amplifier AM'. After amplification by the amplifier AM' this frequency is transmitted to the detector D' so that the signals may be derived therefrom.

Similarly, signals from the transmitter T' superimposed on the locally generated high frequency, for example, 40,000 kilocycles, are transmitted by the parabolic reflector PR' at station B to the parabolic reflector PR at station A. This high frequency upon which signals are superimposed is beaten with the high frequency generated at the station A in the output circuit of the vacuum tube VT at station A, for example, 40,050 kilocycles, so that an intermediate frequency, for example, 50 kilocycles, results which is amplified by the amplifier AM and impressed on the detector D after being amplified by the amplifier AM so that the signals may be derived therefrom.

It will be understood that in the arrangements of this invention, as disclosed, signals cannot be transmitted simultaneously from station A and station B by reason of the fact that there will be intermodulation of the signals and neither signal will be understood. But the invention is not so limited, for arrangements may be provided to permit the simultaneous transmission and reception of signals between two or more stations without intermodulation.

It will be understood that the frequencies referred to herein are merely illustrative and that other frequencies may be employed in practice as conditions necessitate.

While the invention has been disclosed in one particular embodiment which is deemed desirable, it is to be understood that it is capable of embodiment in other and varied organizations without departing from the spirit and scope of the invention as defined in the appended claim.

What is claimed is:

A system for signaling between two stations, in which each station includes, in combination, a low frequency oscillator, a vacuum tube system having a grid circuit and a plate circuit, said vacuum tube system being employed for locally producing a predetermined harmonic of the current of said oscillator of a frequency suitable for transmission through space, a source of voice frequency signals connected to the plate circuit of the vacuum tube system and modulating

the high frequency oscillations derived there-
from, a parabolic reflector coupled to the
plate circuit of the vacuum tube system, said
parabolic reflector being employed for trans-
mitting as a polarized beam said high fre-
quency oscillations modulated by said voice
frequency signals, said parabolic reflector
also receiving from a distant station a similar
polarized beam of different high frequency
oscillations modulated by voice frequency sig-
nals, said received high frequency oscillations
modulated by voice frequency signals and
said locally generated high frequency oscilla-
tions produced by the vacuum tube system
being beaten together in the plate circuit of
the vacuum tube system so as to produce
oscillations of an intermediate frequency well
above the range of audibility and which is
modulated by the received voice frequency
signals, means for amplifying the interme-
diate frequency and its modulated voice fre-
quency signals, and means for detecting said
received voice frequency signals.

In testimony whereof, I have signed my
name to this specification this 21st day of
September, 1925.

RUSSELL S. OHL.