Ground Radials for Beam Antennas

BY KEN "JUDGE" GLANZER,*
K7GCO

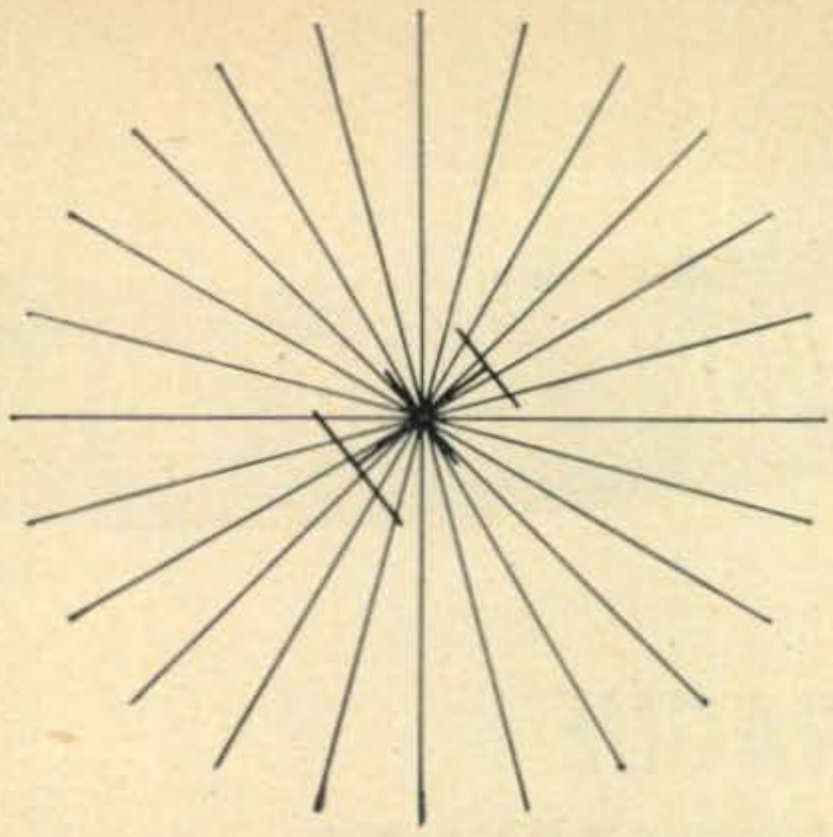

Fig. 1—Radials extending outward from a horizontally polarized beam have little effect on the pattern. The radials will have some effect on the beam impedance as there are always wires of the same polarity under the beam.

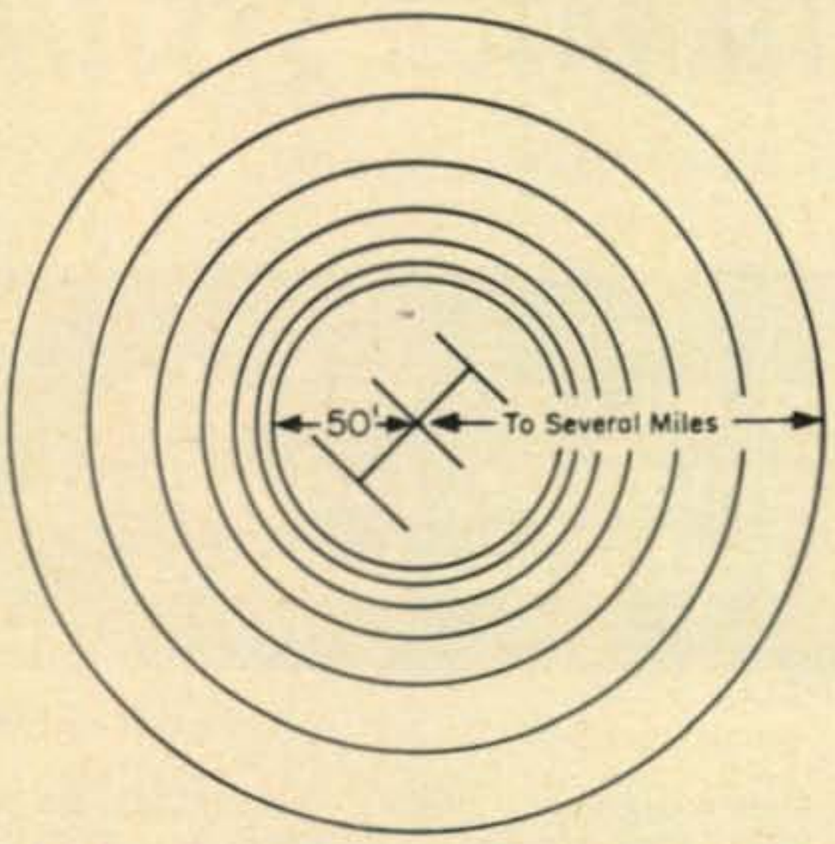

Fig. 2—The only way to get beneficial effects from radials for a horizontal beam is to place them in a circular pattern. They will always have the same polarization as the beam regardless of the direction. To be effective the radials must be from 50 feet to a couple of miles in radius. Tapered spacing of radials gives the best distribution of wire and balance of pattern. Although the wires farthest out are the widest spaced from each other they still maintain a constant spacing in reference to the angle of the energy directed at them. A reverse taper of the radial spacing shown will tend to reduce high angle radiation lobes and increase energy in the lower angles, possibly lower it a bit.

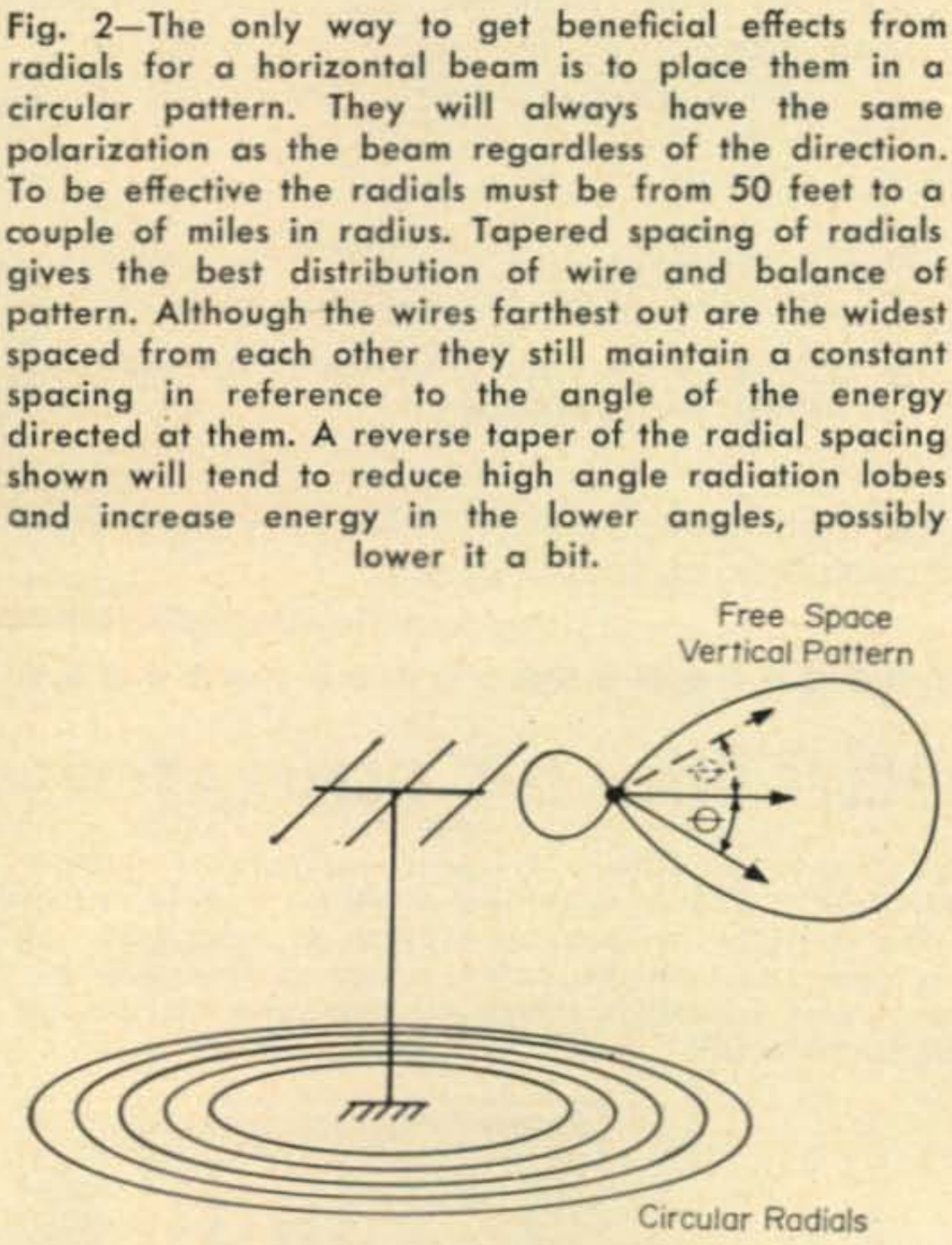

Fig. 3—Angle θ is where the r.f. of the highest amplitude is concentrated and which forms the major lobe. A perfect ground (no reflection losses) will add 6 db gain to the free space pattern.

SOME amateurs have made the mistake of running radials out from a tower (as illustrated in fig. 1) that supports horizontally polarized beam antenna. The hope is to improve the ground reflections. Unfortunately, the radials will be of little value at the far reflection points as the radials will be vertically polarized while the beam's pattern is horizontally polarized. Since the beam has a free space vertical pattern directed at the horizon there is only a small percentage of the energy directed straight down. The energy that is radiated straight down will have some effect on the final impedance although the parasitic elements have the greatest control. The component directed straight down will find some radials of the same polarization and therefore, be reflected with little loss and have some effect on the final impedance but little effect on the pattern.

The correct way to utilize radials for a horizontally polarized beam is shown in fig. 2. These circular radials will have the same polarization as the beam regardless of the direction in which the beam is pointed. However, to be in the main field of the beam's free vertical space pattern the circular radials must be located no closer than about 50 feet to the base of the tower and extend outward for up to a couple of miles. This is obviously impossible for most installations and too costly where possible.

It should be obvious at this point that the ground conductivity of your neighbor's lot, his house wiring, hot air ducts and anything else metallic will control the reflection of the beam's energy and determine its angle of radiation and what you receive.

The best location is where the surface is flat and has a very high conductivity; this is salt water. Many live near or right on a salt water beach and so have the ultimate antenna location. An added advantage of a beach front location is that there are no factories or other houses on the waterfront which contributes greatly to noise free operation. In the salt water direction these locations are often better than a high hill. ■

*202 South 124, Seattle, Washington.