The "Drooping Doublet" Antenna

Richard F. Van Wickle, W6TKA

1161A Irving Avenue,
Glendale 1, California

It's comparatively easy these days to build a transmitter, measure its output, reduce the harmonic content, then get on the air. Transmitter performance is something that can be visibly and aurally determined with relative accuracy, right in the shack.

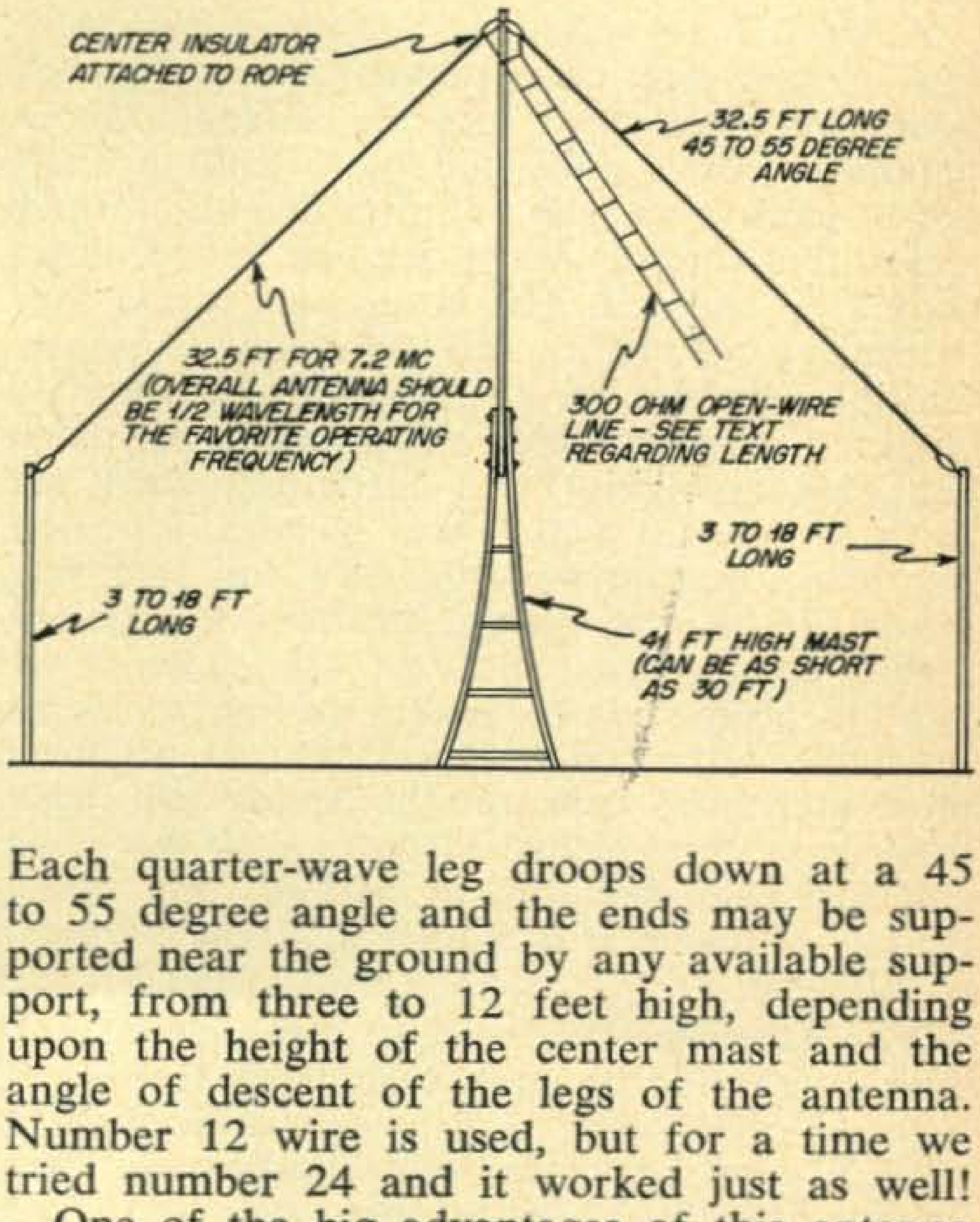
Antennas, however, present the problem of dealing with a great number of variables. Angle of radiation, ground wave, skip and radiation efficiency are all variables, and sometimes unknowns. A dipole, for example, may produce excellent results at a given distance. A vertical, or other low-angle radiator, may give good results locally and at distances greater than those covered by the dipole. For this reason it is generally useless to compare your vertical with some near-by ham's dipole, when both in QSO with the same station. One of you will generally get a better signal report, primarily due to the difference in angle of raidiation and directivity, thus leading one of you to believe that the other has a better antenna. True, it may be better for a given distance, but here again antenna work is all relative. It depends upon what contacts you want to make, and at what DX you are shooting.

Enough of this philosophy. Let's get down to cases. The antenna to be described falls into the vertical, low-angle-of-radiation category. It is simple to erect, requires very little space, will operate quite well on its harmonics, may be fed with 300-ohm open-wire or solid-dielectric line, and does not require radials.

It is commonly known as the "Inverted V." This is something of a misnomer, since "Inverted V" actually refers to another and older type of antenna, a sort of "half-rhombic." Just to confuse the issue, we might even call it the "Upside Down, Tilted, Double Vertical." But lets not . . . lets just call it the "Drooping Doublet."

This antenna has been in use, in one form or another, here at W6TKA since April, 1954. It is not original with me. Some time ago I worked another ham, whose call has since been forgotten, who was using a version of this antenna. I put one up, tried different designs and talked it up on the air. Now, at least in the West, there are a lot of them in use. Not that their popularity is all my doing, but I like to feel that I did have something to do with it. The "Drooping Doublet" was originally erected here as a "compromise," when space problems made any other type of antenna out of the question. But it has turned out to be anything but a compromise, particularly on its fundamental frequency—and my particular antenna, cut for forty meters, exhibits excellent performance on eighty, seventy-five and twenty as well.

It is essentially a center-fed doublet, a half wave in length for the lowest frequency to be used. However the forty-meter job will work on eighty and seventy-five. Although those bands are worked only occasionally, the antenna has given a good account of itself. The center insulator is supported at the top of a mast, anywhere from 30 to 50 feet above the ground.



Each quarter-wave leg droops down at a 45 to 55 degree angle and the ends may be supported near the ground by any available support, from three to 12 feet high, depending upon the height of the center mast and the angle of descent of the legs of the antenna. Number 12 wire is used, but for a time we tried number 24 and it worked just as well!

One of the big advantages of this antenna is its meager space requirements. Like most vertical antennas, it is a happy answer for those with small yards. It is one jump ahead of the ground plane, since it requires no radials. An efficient radial system would have been quite difficult in my case when you consider that the complete yard is only 40 by 40 feet, with the house right smack in the middle and occupying at least 75 per-cent of that space. Also, unlike the ground plane, it may be operated on its second, third, fourth and even "sub" harmonics. This is just what was wanted, since space limitations and the landlord's patience precluded the possibility of more than one really efficient antenna.

In spite of what you might think about the impedance of a center-fed half-wave doublet, this antenna is fed with 300-ohm open-wire line and the standing wave ratio is fairly low. Elementary measurements using the Twin-Lamp method of measurement show the SWR on this particular installation to be between 2 and 3 to 1, which is certainly acceptable. This is the same reading gotten while checking a temporarily-erected dipole constructed of 300 ohm solid-dielectric line. The "drooping" apparently increases the impedance.

No loading problems have been experienced on any of the bands used and there is no RF floating around the shack. Using only 55 and 90 watts input, forty meter 'phone contacts have been made with stations in Hawaii, Canada, and on the east coast of this country as well as many intermediate east, south and central points. This was in the fairly crowded evening and week-end afternoon hours, too. As for twenty meters, equal DX 'phone contacts have been made.

A word here about the length of the feedline. If you refer to a popular antenna handbook and then to a popular amateur radio handbook, both published by a leading amateur organization, you will find that the former states that quarter-wave lengths in feedlines should be avoided. The latter publication says to use, by all means, quarter-wavelengths and multiples thereof for feedlines for "harmonic" antennas, one of which this antenna seems to be. This ambiguity was intriguing so I set forth to see just which was correct. I started out using quarter-wave feeders and had fine results. I am now using a 45-foot feedline and having equally good success. Neither length of line has presented any undue loading problems or changed the SWR appreciably. It becomes more and more apparent the deeper you delve into these things that there can be no hard and fast rules for this, or perhaps any other, type of antenna. It is a little different for each installation.

For example, I've worked a couple of fellows using this antenna who were feeding it with 52-ohm coax, one who was feeding it with 72-ohm coax, and still another who was feeding it with 450-ohm open wire line. And they all reported excellent results. Of course, I like my own installation the best but if you are experimentally inclined here is your chance to have a little fun.

Figure 1 shows the antenna as it is today. The support is an "A-Frame" mast, 41 feet high, constructed of good quality 2" x 2" lumber. A metal TV mast could have been used but, believe it or not, it would have been more expensive than the A-Frame. Its total cost was right around $5.00, including hardware and paint. Also, I wanted to stay clear of all metal objects as much as possible, to avoid resonance and directive effects. The usual "flagpole" (continuous) rope-and-pulley arrangement is used, with the center insulator of the antenna secured to the rope. The ends of the antenna were brought out at approximately 50-degree angles and attached to convenient supports. These turned out to be the corner of the garage on one side and a 15-foot 2 by 2 secured to the incinerator on the other.

Incidentally, for the top guys of the mast 300-pound test plastic clothesline with a rayon core was used.* This plastic line is available in several weights at, among other places, Safeway stores and Sears & Roebuck, at nominal cost. Use of this line obviated the nuisance of placing strain insulators in guy wire at the necessary intervals, since the plastic itself is an insulator and no resonance problems are encountered. When the cost of the clothesline is figured against the cost of guy wire and insulators, you come out even. And if your time is worth anything, you've *saved* money there! However, remember that this is California and although the mast has withstood several heavy winds with ease, I do not know how the line would react in severe winter climates. So perhaps some caution and research is in order for your own particular area.

Conclusion

Only the surface has been scratched in the work with this antenna. It is an outstanding performer just the way it is now, but there is probably a lot more research that can be done. Among other things, I believe that there is some definite relationship between the angle of the quarter-wavelength legs of the antenna and the angle of radiation, as well as various effects of the overall height above ground. Further work is planned along these lines, including tests to determine: (a) if a counter-poise beneath the antenna, running horizontally from one low end of the antenna to the other, would effect any improvement and (b) if leaving one low end of the antenna fixed and varying the height of the other low end would have any effect on the directivity of the antenna. Preliminary investigation has not disclosed any improvement or change from either of the above arrangements, but further tests will be conducted.

As you can tell, I am quite enthusiastic about this antenna, simply because of its excellent results. I would appreciate hearing from any one else who has done work with this antenna and might be conducting experiments either in a similar direction or divergent from mine.

Let me emphasize again that I do not claim credit for "inventing" or discovering this antenna. It had seen limited use for some time before I heard of it. I simply took the idea, played around with it, and have recommended it highly for all those interested in working "out of their backyards." It's easy to build, so why not give it a whirl?

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*See *Guys and Halyards*, CQ April, 1955, p. 24