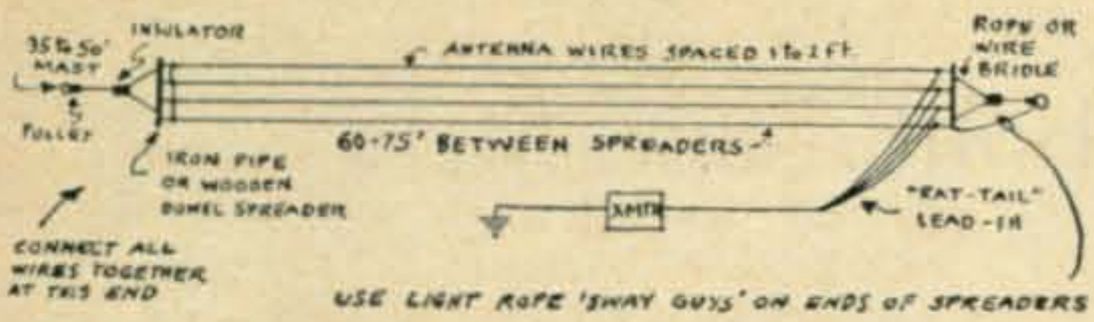


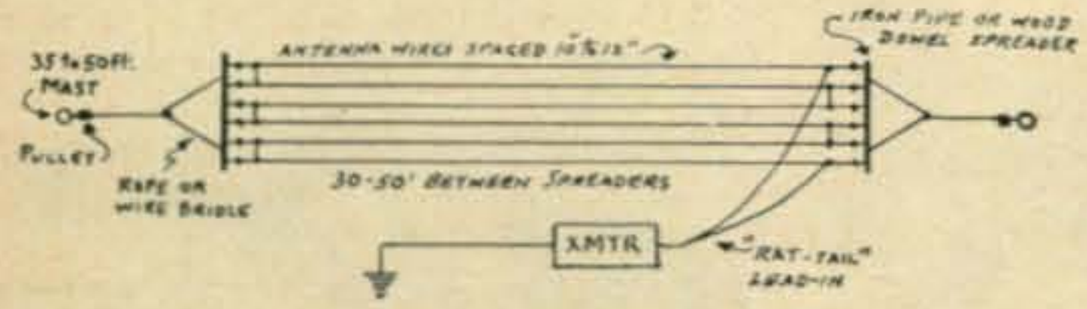


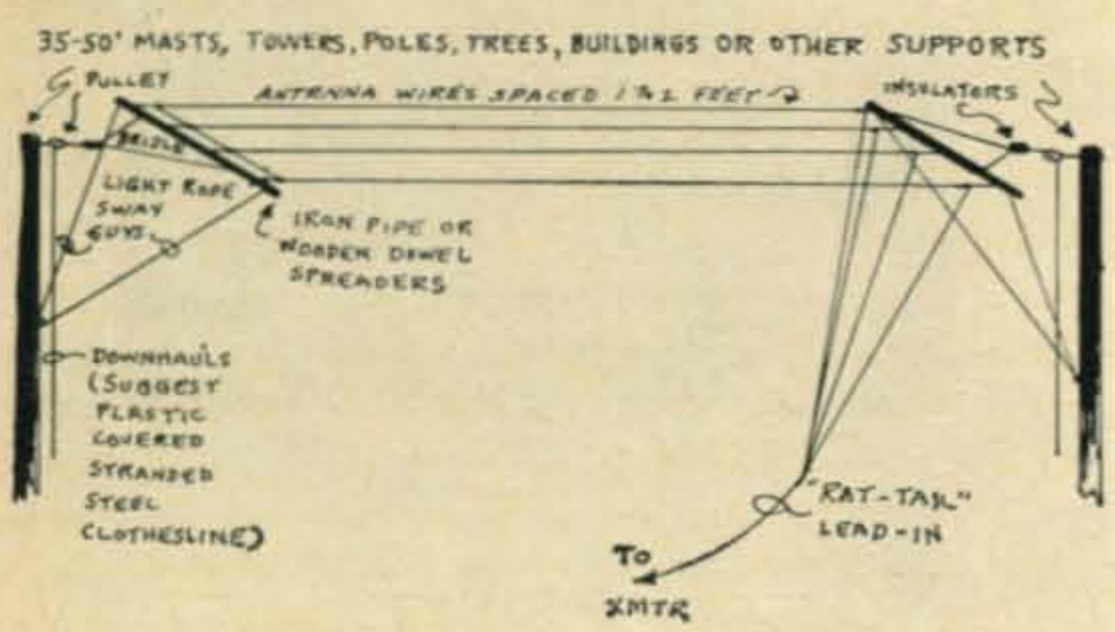


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# More on 'Restricted Space' Antennas

**It seems that once again** we are back on the subject of antennas for use in the 75/80 meter band, where space restrictions prohibit a half-wave long wire. Regardless of how many articles, suggestions and letters appear in various ham publications, the old question . . . "How can I erect a half-wave antenna for 75/80 meters on a 100 foot lot?" continually recurs.

Face it—you CAN'T! Not in a straight line; maybe diagonally if your lot is wide enough and you don't have to use guyed masts or poles. You'll find a number of solutions in the various handbooks, manuals and current periodicals. You can cut a half-wave wire and bend it around on a horizontal plane to fit the space. You can keep it a half-wave long and 'droop' the ends, or you can use a vertical in one of its various forms, with or without a loading arrangement. In spite of these many answers, the cry STILL goes up—"What to do?"

Far be it from me to set myself up as an antenna "expert". I've probably built and used more different types of antennas for the lower frequencies in my fifty years of ham and commercial experience than the majority of my readers. Nevertheless, I have always felt, and still do, that antennas for the 75/80 and 160 meter bands are merely incidental adjuncts to the transmitter. Sure, I'll get a howl from the antenna theorists, but my shoulders are broad. Say what you please about 'standing waves', 'current loops', 'voltage nodes', 'impedance match' etc. Is THAT what you're after or is it COMMUNICATION you want?

You know as well as I do that the 75/80 meter frequencies are NOT a part of a "DX" band. If you want to work there, you presumably accept the fact that communication range versus power input is considerably less than at the higher frequencies. So, if you want to work "DX", you choose an appropriate "DX" band, erect an elaborate multi-element rotary beam or equivalent and 'the world is your oyster'. BUT, if you want RELIABLE communication over a REASONABLE distance (traffic nets, for instance) in the 75/80 meter range, why worry about theoretically 'precise' antennas, transmission lines, trick coupling devices, etc?

Certainly I'll grant that there is a considerable difference in RADIATING efficiency through use of such "gadgetry" but I still fail to recognize the NEED for 'ultra-efficient radiation' to cover the usual area for which the bands under discussion are most reliable. No doubt but what a single wire, cut to half-wave for the frequency being used and fed by coax or twin-lead line, tuned or untuned, is highly efficient. The so-called "Windom" antenna, or "off-center Hertz" is another excellent and

highly efficient radiator if you have the space for a half-wave wire. If you have, USE one of them.

The major concern of those of you to whom this article is 'beamed' is with achieving reasonably efficient communication on 75/80 within restricted space. Actually, anything metallic that will load at all, will radiate. How well, of course, depends on a number of factors but radiate it will.

I have had mighty good success on 80 CW with a rusty barbed wire fence of random length—perhaps 150 feet—and 15 watts input. Up to 1200 miles shows up authentically in my log! I've worked better than 600 miles using a seven foot whip standing in the corner of a motel room and fed with a random length (about 15 feet) of RG/58-U coax line! NO 'trick' antenna loaders—just the tapped series loading coil in a little BC-474 transceiver running at ten watts input! As an experiment, I increased the loading to 15 watts by merely hanging an aluminum stew-pan on the top of the whip for a "top-hat" loader! Test signals with the same stations showed not one iota of difference in signal strength, with or without the "top-hat"!

So, if you're so concerned about working 75 or 80 because you have no room for a half-wave long wire—forget it. Maybe there's a galvanized iron chimney on the roof of your apartment building; probably guyed with 3 or 4 rusty wires; try it! It will probably make a pretty good "umbrella antenna" which was the U. S. Army Signal Corps standard in early days and did right well! Don't worry about rusty joints—chances are the rf will burn right through them, but better to bond them for the tiny spark created can DO things to neighborhood TV's! If the thing will load at all, it will RADIATE!

Or perhaps it's just a 3 or 4 wire clothesline in your backyard; hook on to it—you might be surprised! Connect all the lines in parallel if they aren't a continuous loop but warn your XYL not to hang wet wash on the line when you're working "DX" (?)!

Another good bet is the metal rain gutters around the roof—just be sure that the downspouts are not in direct contact with ground—most are not.

However, if you are a really serious-minded student of theory and the above suggestions simply 'horrify' you, because you cannot find, nor can you evolve, any equation which will substantiate that "Maxwellton's Braes are Bonny" or whatever they prove, try this; dip into the past and pull out the good old "multi-wire" antenna of early days!

Ever hear of one? No? All right, I'll let you in on a little early "wireless" lore. Back in those 'hoary' days, antennas weren't 'such a much' from the technical standpoint. They presented a bit more physical construction than our present single wires, but not nearly approaching that of a modern beam. An antenna was simply a 'necessary evil' then, if you wanted to get out farther than across town. With NO antenna at all, most of the old sparks were good for several miles if the other guy had a good hunk of carborundum in his crystal detector stand! Stick a bunch of wire up in the air and hook it to the "helix" (or "oscillation transformer" if you were the envy of neighborhood hams) and, oh, boy! did you work out!

Remember, all of the work done then was on 200 meters and under. No one even DREAMED of going LOWER; most of the transgressions were the other way and it was every ham's dream to get the "special experimental license" authorizing him to use 375 meters! Can you imagine a HALF-WAVE long wire at THAT wavelength on a city lot? Change that to frequency and figure it out for yourself!

Were we, who had never heard of 'half-waves', 'standing waves' etc., stumped? Not by a long shot! We simply followed current commercial and military practice on their ships and shore stations and used MULTI-wire antennas of whatever random lengths would fit the space we had available! Transmission lines—what were they? We used "lead-in wires" taken off the antenna proper at whatever point was most convenient to reach our shack! Most popular was to take the lead-in from either one end of the antenna array, or from the approximate center thus forming what were commonly dubbed as either an "inverted L" antenna or a "T" type.

Did we work out? The LEGAL power then, as now, was one Kilowatt maximum input. So with anything from a Model T Ford spark-coil to a one KW transformer, we blindly moved clips around on our helixes or oscillation transformers until the pointer on the old hot-wire ammeter in the antenna or ground lead shimmied its way to the highest reading. If we didn't get a lot of amps, we made a tentative guess whether the antenna was too long or too short. If too long, we simply stuck a Leyden jar fixed condenser in the antenna lead-in and re-adjusted the clips on the coil; if too short, we inserted a copper tubing multi-turn loading coil instead, tuned for the highest reading and—there we were!

Remember, we worked across the Atlantic and from coast-o-coast with such crude rigs, using 200 meters and with an almost complete lack of knowledge of the finesse of proper adjustment!

Theoretically, those old antennas can be easily explained. What determines the resonant frequency (or wave-length) of a wire in free space? Not only its length, but its capacity (to ground). Lacking space in early days for a single wire several hundred feet long, just as you do today for 125/135 feet, the practice then was to increase the NUMBER of wires, shortening them to fit the space available. The

number of wires varied from two to eight usually, separated one or two feet. Connections likewise varied, according to individual whims. The accompanying drawings in fig. 1 show several methods.

### Multi-Wire

With such multi-wire arrangements, a larger metallic surface suspended above the earth and forming one 'plate' of the condenser, increased the capacity to earth (the other plate) by reason of increased area. At the same time, the parallel proximity of the antenna wires to each other established a capacity effect between adjacent wires. So—we increased 'capacity' in our radiating system thereby lowering its resonant frequency. The other element establishing frequency being 'inductance', we could if need be (in the case of extremely short antennas) increase inductance by connecting every other pair of wires together at opposite ends, thereby forming a single length of wire in a "grid" formation.

For example; in 1921, as 8DAG at Cincinnati, I was restricted to an antenna length of thirty feet with which to work on 200 meters! So what? Eight 30 foot wires, equally spaced on six foot spreaders and the wires used in the "continuous grid" formation gave me 240 feet of wire in a 30 foot stretch PLUS the capacitance between wires and a large area 'condenser plate' above ground!

I didn't even need a loading coil—the secondary of the oscillation transformer had sufficient turns to permit tuning to resonance (I guess! Anyway the hot-wire ammeter read 10 or 12 amperes with my quarter kilowatt spark!) AND I consistently worked all over the East Coast and on a number of occasions worked the Seefred Bros., 6EA of Los Angeles!

Let's say then, that you fellows with a 'space' problem have an exciting field of experiment open to you. Right now I have no space problem and use a half-wave, off-center fed Hertz. I don't have the time to experiment with short, multi-wire antennas but probably many of you do; why don't YOU try it? You may even come up with an "Edison Award" if you can 'dig up the bones of the past' and make it work in the present!

Here's my suggestion then; get yourself enough antenna wire to constitute a half-wave antenna. Cut it to two, four, six or eight equal lengths which will fit your available space. Attach both ends to 'spreaders' of pipe or wooden curtain rod. If the wire lengths are very short (30-45 feet) I'd suggest an insulator in each end of each wire so that you can use the "grid" arrangement shown in an accompanying sketch. If only 2 to 4 wires of 50-75 feet each are required for your span, you need not insulate them from the spreader but put an insulator in each 'bridle' to which you attach the downhaul. Take your lead-in wire from either end or the middle; if you use plain antenna wire for this, remember that it will radiate also, all the way to the shack—so will your ground wire! If you use coax or twin-lead, radiation from it will be pretty well attenuated.

Forget all the 'monkey-business' about 'impedance match', 'antenna couplers', 'standing waves' etc., use your initiative and meet your problems as they arise. WORK at it—you've got just as much chance of coming up with some new ideas in radiating systems as had experimenters in other lines. Marconi, Edison, deForest and other radio 'greats' needed only a hint! Catch on?

Just remember that what you are striving for is the best possible communication you can achieve with the equipment you have in spite of what YOU consider an antenna space handicap—I don't. ANYTHING metallic that will load at all will radiate—remember? The antenna can't keep it—it's GOT to go SOMEPLACE.

### A Few Tips

Let me add a couple of tips. First check your neighbor's TV! I haven't the least idea of what the 'marconi' type antennas described will do to it, theoretically nothing—but CHECK!

Second—DON'T write a long letter to the Editor or to me and ask for more information and/or suggestions. You've got ALL of the basic 'meat' here—you 'chaw' on it—let's see if ham initiative is equal to what it was in the "tin-can days" of amateur wireless! Good luck and 73! ■

*AUTHORS NOTE*: For more detailed information on 'multi-wire' flat-top antennas, consult your local library; inquire particularly for "RADIO TELEGRAPHY & TELEPHONY" by Alfred Powell Morgan (1915) and for "OPERATOR'S WIRELESS TELEGRAPH and TELEPHONE HANDBOOK" by Victor H. Laughter (1909). Early issues of QST, RADIO, MODERN ELECTRICS and early HANDBOOKS will also assist materially.

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## HIDDEN XMTR [*from page 57*]

transmit on 75 meters from the house and have the command 3-6 *mc* receiver feed audio into the 20A? The 20A would take the audio and turn itself on and then put out a signal on 10 meters. I could listen to myself and the mobile hunters on the 10 meter receiver back at the house. It was no sooner thought up than done. The necessary wiring of the 20A and the command receiver did not take long. We buried the 20A and the command receiver under a wood pile about 5 blocks from the house with the 75 meter transmitter. The *ac* line to the 20A and receiver was buried under ground and ran off about 100 feet to a nearby source of 110 volts *ac*. The receiving and transmitting antennas were also under the board and boxes. The pictures tell the story. ■