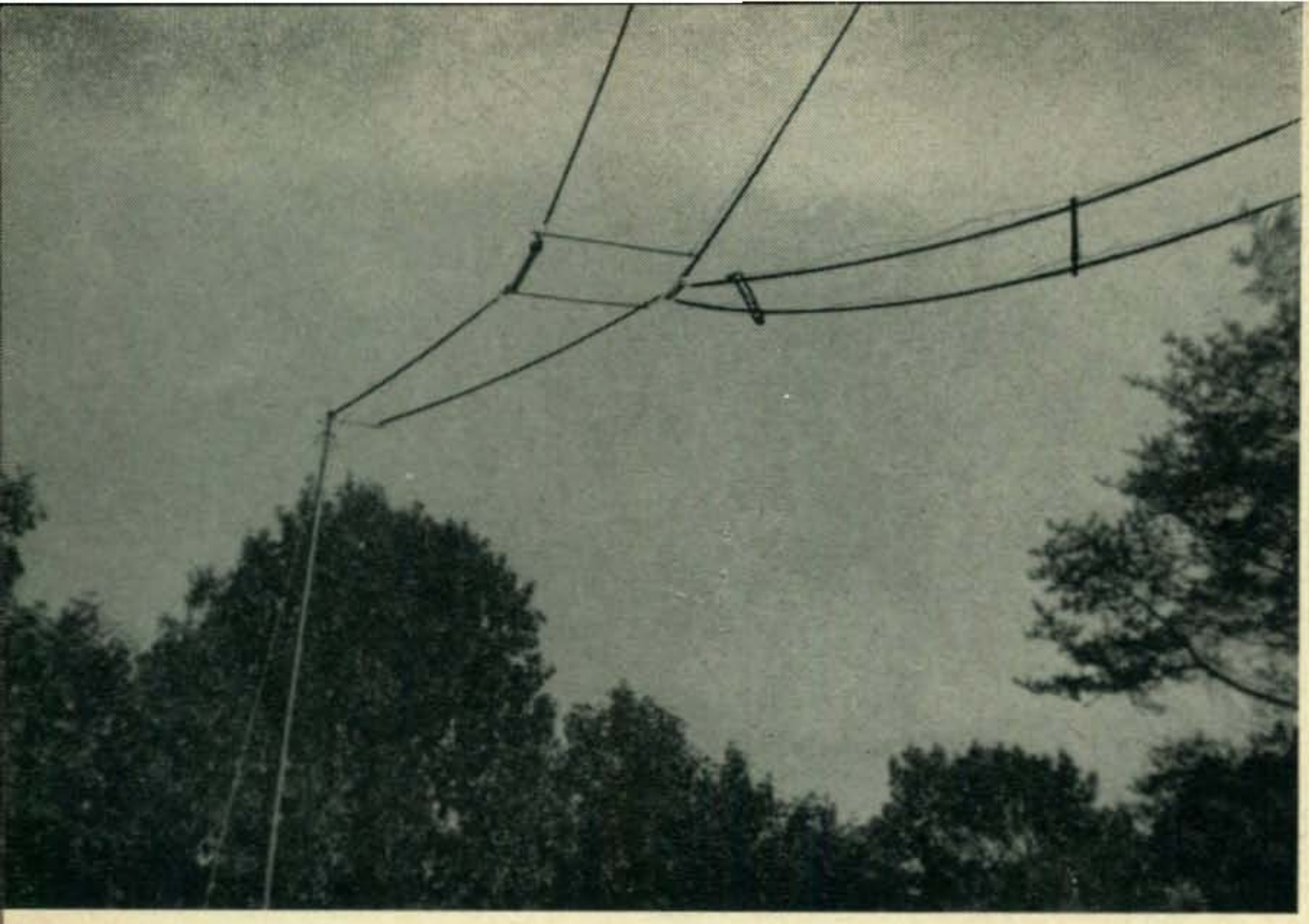

There is certainly nothing fancy or difficult in erecting a T2FD. This is the author's antenna. The peculiar photographic angle is due to the slope (coming towards the reader) of the antenna.

More on the T2FD

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309 Windsor Street, Silver Spring, Maryland

While the average citizen walking down the street thinks and talks a lot about the weather, the average amateur radio operator is generally most concerned about his antenna. It, like another invaluable item, comes in an infinite variety and will probably never cease to attract interest and discussion.

About a year ago, CQ printed a little article on a type of folded dipole called the "T2FD." It was, in every sense of the word, a "sleeper." Those who put it up were amazed by its ability to load on three or more amateur bands. Others acclaimed its omni-directional properties, while a third group insisted that it radiated most of its energy at the most favorable vertical angles of radiation. Oddly enough, there still seemed to be some theory-bound skeptics who insisted that it couldn't work. For the benefit of those few, and for the fellows who haven't tried this unusual antenna, we append a few comments.—Editors.

"While looking for a compact antenna for my small backyard . . . I decided to give it a try.

"I put one up for 40 meters and the first night I worked all but the 6th district. Next night I thought I would see what would happen if I tried to load it on 80 meters. On first CQ I got a 579X report with only 40 watts input!"

W8IKB

"Saw your antenna just as I was about to put up the Zepp I use during the winter. Gave your plan preference and the next day . . . I casually asked for a report . . . and got 40 over S9 with doubts about my 450 watts. They said that the kilowatts were generally S6. This was on 75-meter phone.

"Next morning I tried 10-meters and heard more DX than on a beam at this location. In general, the T2FD surpasses anything I have used on 75-meter phone which included long wires up to 500 feet, center-fed and end-fed Zepps, and shortened center-fed Zepps with long feeders."

WØMIO

"I assisted VE1UL while erecting a T2FD and he found it to be one of the best antennas he had used."

VE1KQ

Several years ago the author experimented with a terminated, tilted, folded dipole that offered possibilities for ham use. The initial data appeared in *QST* for June 1949 on page 54. Apparently very few hams read the article, or, if they did, skimmed over it lightly. Certain communication services took it seriously, however, and the author continued to have excellent results with the system. Another article made its appearance in the November 1951 issue of *CQ*, and there is no doubt that this article was not only read, but that many brother hams went to the trouble of erecting a T2FD, and reporting its excellent performance.

Since then, more than a year has elapsed, and the mail continues to roíl in. This article is now being published in self defense, as there is no time to answer the many letters. Most of these fall into two categories. First are the letters reporting excellent results with this "all-wave" omnidirectional antenna. Next come the questions, and they all follow a general pattern. Here are the answers to the questions most frequently asked:

Question: Is the use of a non-inductive terminating resistor necessary?

Answer: No. However, if you use a wire wound resistor, the antenna is not aperiodic and will resonate at some frequency. The difference is that with a wire-wound resistor it will be necessary to use some form of antenna coupler depending on your installation, and the coupling will probably be different for the various bands. With a non-inductive resistor the system is aperiodic and one coupling method will be satisfactory for all bands. This advantage is offset to some extent by the fact that the resistance value is fairly critical and it is convenient to adjust a wire-wound resistor with slider. Sprague makes a non-inductive "Kool-Ohm" in a 120-watt size that will handle an input to the final of 350 watts. Rhombic non-inductive terminating resistors in larger wattage ratings are still available, now and then, at surplus outlets.*

T2FD Basic Design Data
(See Fig. 4)

1. The length of each leg from the center is equal to 50,000 divided by the lowest desired operating frequency (in kc.) and then multiplied by 3.28. The answer is in feet.
2. The spacing between radiating wires is equal to 3000 divided by the lowest desired operating frequency (in Kc.) and then multiplied by 3.28. The answer is in feet.
3. The sloping angle for a nondirectional pattern should be of the order of 30 degrees.
4. The terminating resistor should be non-inductive and have a rating equal to 35% of the transmitter input power. For further details see the text.

Question: Must the resistor be exactly the same resistance as the feed line impedance?

Answer: No. The value of the resistor is quite critical for optimum results, especially as the impedance of the feeder decreases. For example, with a 600-ohm line (No. 12 wire spaced 6 inches), a value of about 650 ohms seems best although operationally a 600-ohm resistor appears to be entirely satisfactory. When using 300-ohm twin-lead, the optimum resistance is 390 ohms, which results in a tremendous gain, approximately 30 db, over a 300-ohm resistor, although any value from 375 to 400 ohms gives excellent operational results. With 450-ohm line, a 500-ohm terminating resistor will be satisfactory. With lines of lower impedance including coaxial cable, reports indicate that for optimum results the value of the resistor is critical within about 5 ohms, although the author has used only open lines and twin-lead in his work.

* The PHOTOCON SALES (417 N. Foothill Blvd., Pasadena 8, Calif.) have advised us that they have the following available from stock, as this is being written.
300-ohm G.E. globar resistor (200-watt rating) new at $1.50 each.
600-ohm G.E. globar resistor (100-watt rating) new at $1.00 each.

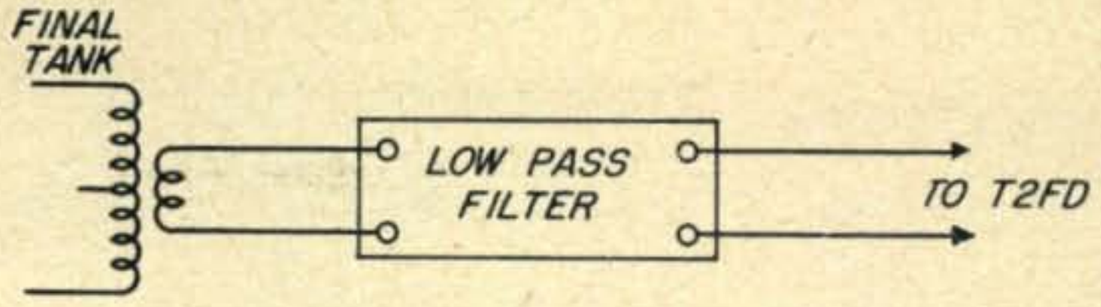


Fig. 1. The T2FD may be coupled to the final with a simple link. The use of a low-pass filter to prevent TVI is recommended.

Question: Is the antenna equally good on receiving and transmitting?

Answer: Definitely, provided the optimum resistance value is established and used. Rush Drake, W4ESK, reported that during the 1951 CQ DX Contest he "couldn't hear 'em on 80" with a hastily erected T2FD, but he had made no effort to establish an optimum value for the terminating resistor, and used the antenna only a few hours. (It's interesting to note that he won the contest!)

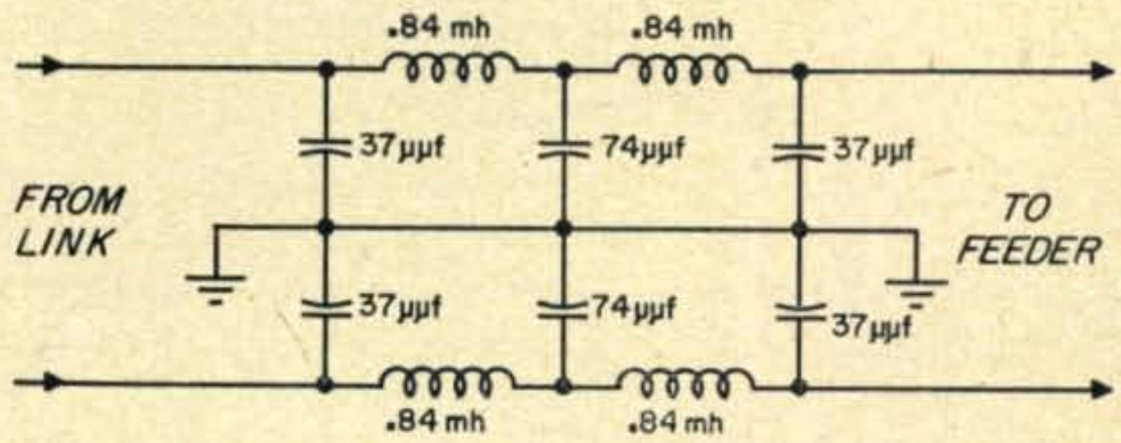


Fig. 2. This simple filter, when inserted as shown in Figure 1, has worked very well with 600-ohm lines.

Question: How is the transmission line coupled to the final amplifier?

Answer: If a non-inductive resistor is used, a simple link *(Fig. 1)* is all that is required. Remember that you must couple at your line impedance, otherwise your antenna will not load properly. For a 600-ohm line, a 3-turn link should be used for 20 meters and a 6-turn link will be a good match at 40 and 80. The B & W plug-in links are perfect in this application.

Question: How about TVI?

Answer: That's a good question! The usual precautions regarding parasitics, shielding, feedback into the a-c line, etc. should be taken. A low-pass filter in the line is best for all-band operation. If you operate on one band the half-wave "Harmoniker" type is better, but if you are on only one band, why worry about the T2FD? *Figure 2* shows a simple low-pass filter satisfactory for 300- to 600-ohm lines. Low-pass filters are available commercially for all line impedances.

Question: Should the two antenna wires be side-by-side or one over the other?

Answer: This is immaterial, although it usually is easier to erect them side-by-side, in the same plane as the surface of the earth.

Construction Notes

Now for some helpful hints. The best connectors for the round end terminals of a resistor approxi-

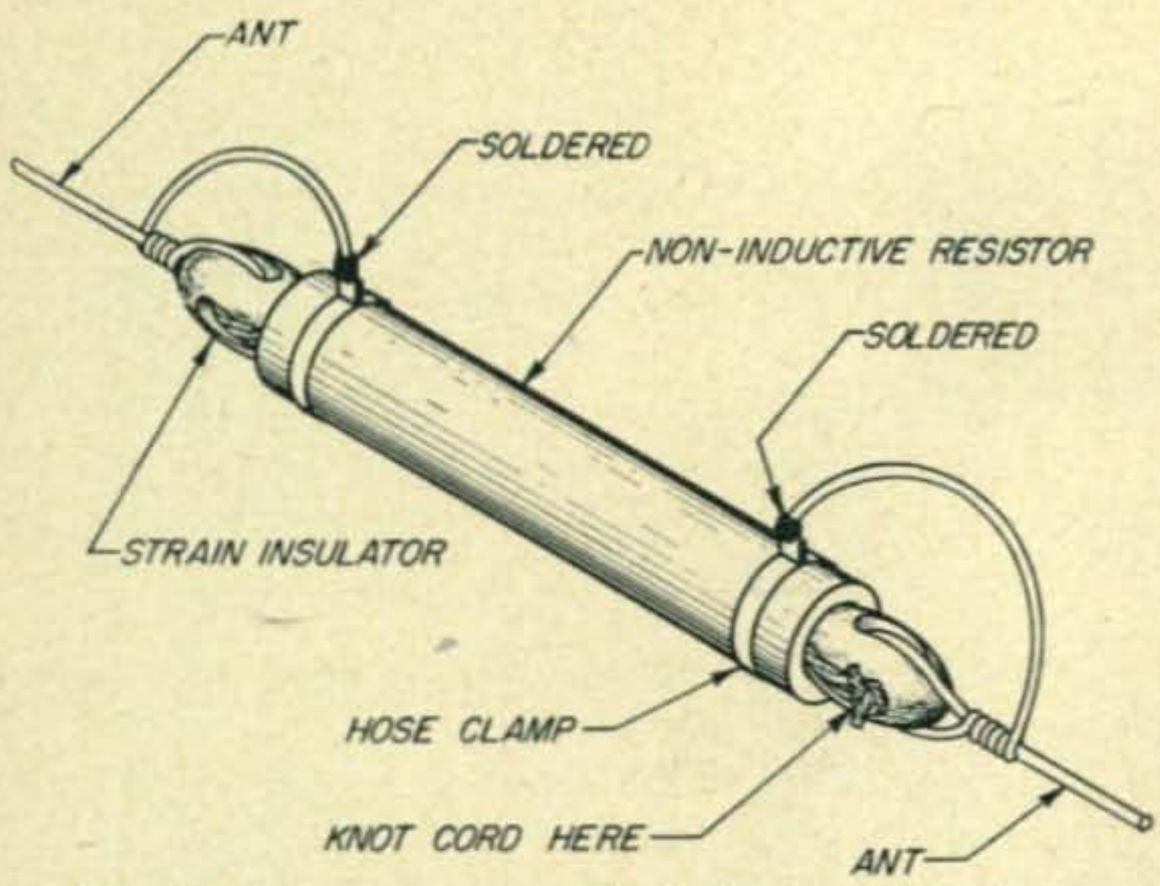


Fig. 3. A very easy method of mounting the terminating resistor is shown above. Note that two egg type insulators are tied together with a short length of heavy cord. This cord runs down the hollow center of the terminating resistor. The radiating wires are attached to the insulators and short jumpers brought over to the resistor terminals.

mating one inch in diameter are ordinary hose couplings, available in any hardware store for a dime. They won't rust and no soldering to the resistor is necessary, although the antenna should be soldered to the connectors.

No strain should be placed on the resistor. If it is hollow, and it usually is, a stout cord, similar to a venetian blind cord can be passed through it and a strain insulator used at each end, as shown in *Fig. 3.* Use spreaders at each end of a heavy resistor. A 3/8-inch diameter wood dowel is fine. Wipe them with oil before installing. A threaded 3/16-inch diameter brass rod is ideal for the high end and it serves both as a spreader and connector for the two antenna legs. At the low end it is usually easier to attach insulators to a short pole or building (far enough apart to give the proper separation) and solder a connecting wire between the two antenna legs.

Further experimenting indicates that formulas for length and spacing previously published for the lowest frequency to be used remain the best. However, with negligible operational loss an antenna cut for 40 meters will, for example, load perfectly on 80. *Figure 4* shows the installation the author has used for some time on 20, 40 and 80 with excellent results. On 40, the band for which the antenna is cut, the T2FD is definitely superior to a "center-fed Zepp" for DX. Reports average two S-figures higher from Europe, South Africa and Australia even though the loading to the final amplifier is slightly less than with the tuned-feeder current-fed antenna used as a "standard."

There is a "mental hazard" with the T2FD that is hard to overcome. Upon seeing an antenna with one end only six feet from the ground (in contrast to the usual "higher the better" skywire), one experiences a natural reaction to the effect that "It won't get out." Don't be fooled. The T2FD will hold its own with other omni-directional antennas and normally out performs any of them when properly loaded.

This may be a good place to mention that the long-haired gents still cast a jaundiced eye at the "squashed rhombic." Admittedly it is theoretically inferior but it may be time to overhaul some of our theory! The U. S. Air Force finds it acceptable at Pacific Bases; the British RAF are well satisfied; our Navy uses it at certain locations; Japanese domestic communications on Kyushu use it exclusively, and some 200 Hams have taken the trouble to express to the author the excellent results they have obtained. It's not a "cure all" but if you want a simple unostentatious skywire, which requires little space, that will put out in commendable fashion on 3 or 4 ham bands and is omni-directional, you can't do better than put up a T2FD some Sunday afternoon.

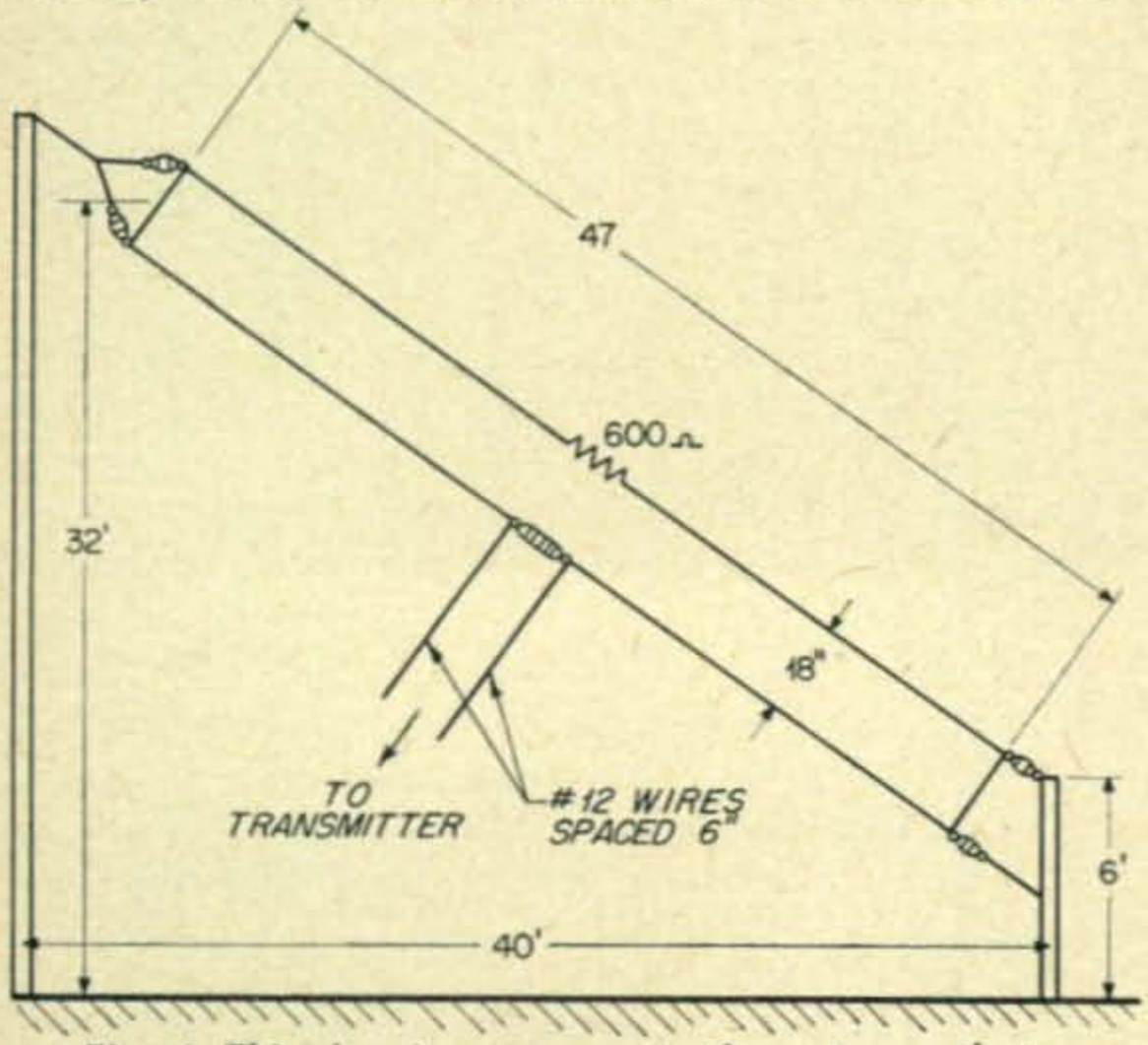
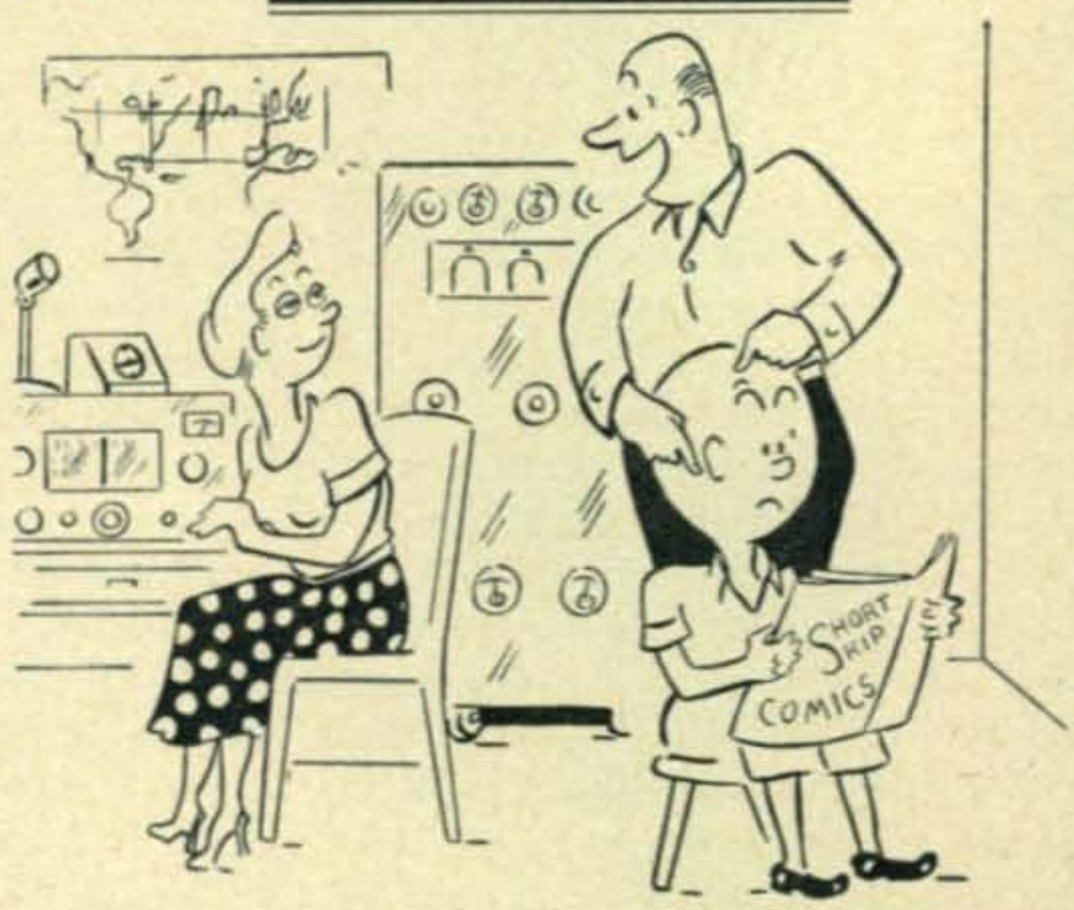


Fig. 4. This drawing represents the antenna that appears on the opening page of this article. Although it was cut for the 40-meter band it has been used on 80 meters with only a small power loss.



"No, look here, dear. Here we are in the U.S.A. We must beam further to the south hit the VKs down here."