The Tuned Doublet

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This antenna, also known as the Center Fed Hertz or the Center Fed Zepp, has been out of favor since the introduction of coaxial cable. The author dusts off this old antenna, couples it to a tuner and finds out that the old timers might have had something after all.

If-and-when you finally become dissatisfied with your present restrictive or not-too-efficient wire antenna which periodically winds up sulking in great snarls on the lawn after anything but the mildest of zephyrs, you might consider the "Tuned Doublet" with open wire feeders (also known in certain circles, for Heaven's sake, as the "Center-Fed Hertz" or the "Center-Fed Zepp"). As background, this high efficiency, all band coppered cat's cradle was a standby in the 1930's before World War II inflicted coaxial cable upon the long suffering Hams with the result that the term "plug-in coils" became akin to a social disease, such as bad breath, or Yaws, and were summarily banished from the business end of transmitters. Reinforcing this demise was the first stirrings of television and its associated interference-prone public.

An early approach to TVI was to tightly button-up the transmitter cabinet on the hazy assumption that the "bad" signals could be bottled in. This "locking-the-door" technique, together with the pi-coupler, banished tuned feeders and their associated antenna couplers into limbo. Actually, that extra tuned circuit between the transmitter output and the antenna would have probably solved a number of problems with TVI. Pi-couplers were used to feed dipoles, folded-dipoles (those miraculous antennas which, at one time, were cloaked with the supposed ability to eradicate TVI), random-length wire, metal downspouts, and a growing family of coaxial cable fed devices, to the extent that today those few gray-beards still using Tuned Doublets, while ridiculed for their old-fashioned stubbornness, wear their spreader insulators as a badge of the "old timer". This almost forgotten antenna then, and its installation, is the subject of this article.

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The Tuned Doublet

What exactly is a Tuned Doublet? It is a dipole antenna, cut for the lowest frequency on which you wish to operate (or have room for), fed in its exact center with a very low-loss open two-wire line. The common two-inch "Ladder Line" used in some low-loss TV installations is suitable for transmitter powers up to several hundred watts, while for kilowatt rigs, four- to six-inch spaced line

	Open Wire Line			RG-8A/U	300Ω TWINLEAD
Band	Line Attenuation In db (if matched)	Plus attenuation in db added due to 5:1 v.s.w.r.	Total Attenuation In db	Total Matched Attenuation In db	Total Matched Attenuation In db
3.75 mc	.032	Negligible	.032	.30	.18
7.15 mc	.051	.08	.13	.46	.29
14.20 mc	.072	.13	.2	.67	.43
21.20 mc	.084	.16	.24	.84	.53
29.00 mc	.13	.22	.35	1.0	.63

Fig. 1—Comparison of transmission line attenuation characteristics for a one hundred foot length.

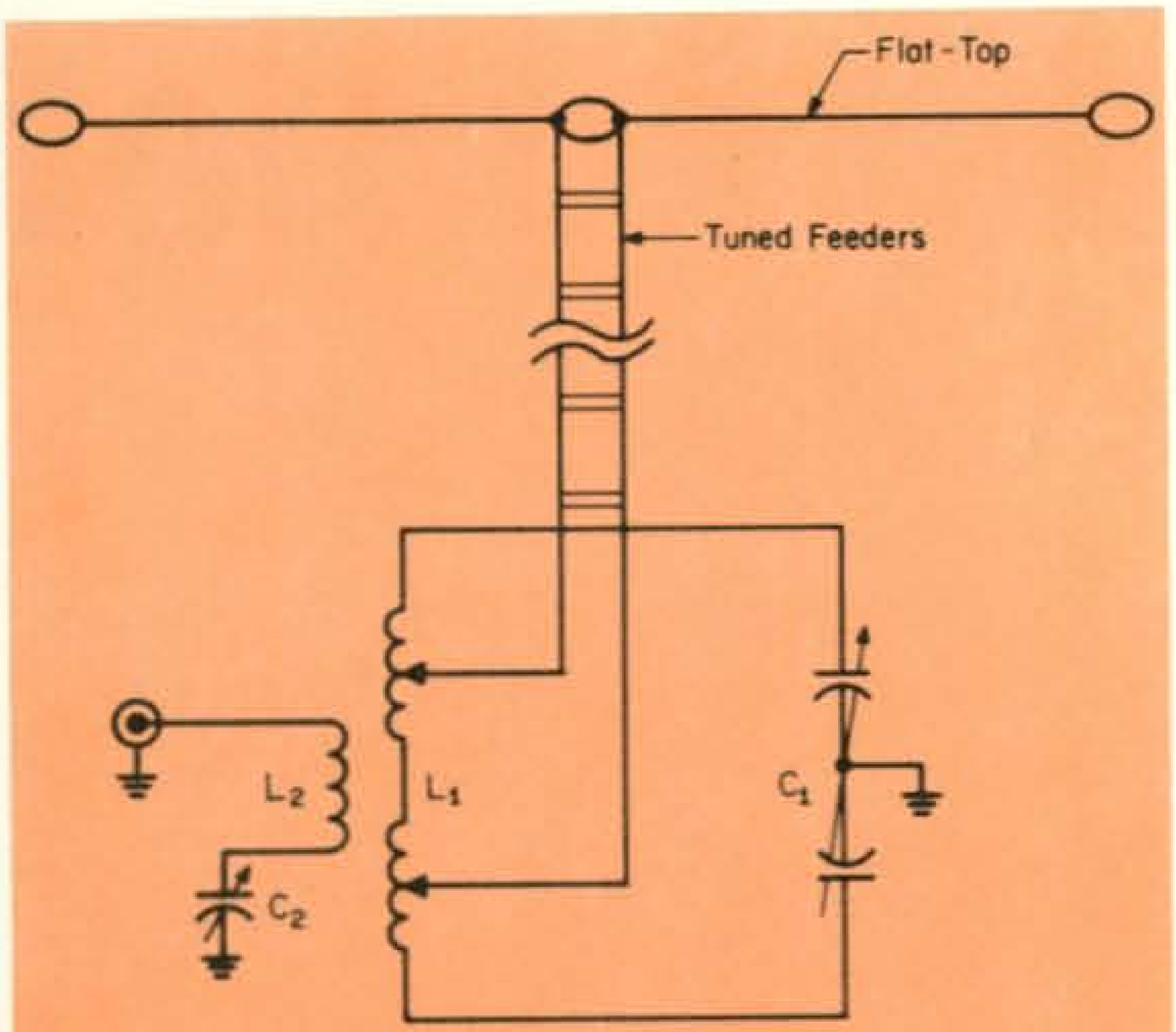

Fig. 2—Basic circuit of a parallel tuned antenna coupler connected to a tuned doublet antenna. Construction details for the tuner may be found in any one of the many antenna handbooks.

is recommended. Note that besides referring to the wide-spaced line by its generic name of "600 ohm" line, there has been no mention of the nominal impedance of open wire line. For a Tuned Doublet, the line spacing is chosen to handle the *voltage* developed across the line, not to match the antenna. The higher the transmitter power, the wider the line spacing.

One loudly-voiced objection, often heard, about a Tuned Doublet is that the feeders are lossy due to the necessary high s.w.r. Well, the latter part of that statement is often true. The s.w.r. on the feeders may run as high as 5:1 or more. So what? The feed-line has negligible radiation if it is properly symmetrical, and a reasonably high s.w.r. on an open wire line creates no problems. Refer to fig. 1 and compare the losses in a hypothetical 100 foot length of 600 ohm open wire feeders against a like length of RG-8A/U coaxial cable or 300 ohm ribbon line. s.w.r., remember, merely *adds loss to the existing matched line loss.* Since open wire feeders have the lowest initial loss, the high s.w.r. will add a very small amount of additional loss, and this sum will still be a fraction of the loss of matched coaxial cable.

Feeder Length

How long should these feeders be? Paraphrasing Abe Lincoln, long enough to reach from your antenna to the antenna coupler in the shack. Assuming an antenna flat-top length of, say, 135-feet (c.w.) or 125-feet (phone), up in the air about 40-50 feet, and the shack somewhere in the immediate vicinity, the feedline length will be very close to the recommended 75-80 feet set forth by the tables on the Tuned Doublet in the antenna books. In this case, then, parallel feed can be used on all bands and, by and large, with most amateur antenna locations and feedline lengths, a parallel-fed antenna coupler is the easiest to tune and to build.

What do I mean "parallel feed"? The coupler is built so that the tank capacitor is parallel to the coil, with the feeders tapped across a portion of that coil. In a series feed situation, a special capacitor for each feeder leg, gang-tuned, would be used. If the end of your feedline has a reasonably high impedance on all bands, you will use parallel feed.

If, due to flat-top or feeder length, you have a low impedance in the shack, you could use series feed. However, construction is simpler if only one type of antenna feed is required. Using parallel feed only, with a Tuned Doublet, you may find that on one band the feeders must be tapped rather close to the coil center. This results in a more sharply-tuned circuit which would have to be retuned more often than if the feeders were tapped out from the center of the coil. If you find that the feeder taps must be practically together at the center of the parallel tank coil, you have a current loop at this end of the feeders, and a series feed situation would be normally required. However, by decreasing or increasing the feeder length from five to twenty feet (called "pruning the feeders"), the impedance at the end of the feeders can be raised so that the taps can be moved out on the parallel tank coil. If the feeder length cannot be changed the antenna can be lengthened a few feet. Remember, such "pruning" or lengthening will shift the coil taps for the other bands, too, one way or the other. The point is, that a feeder length can usually be found which will work with a parallel antenna coupler on all bands.

Tuning

For discussion purposes, fig. 2 shows a typical parallel tuned antenna coupler. "Judge" Glanzer's *Antenna Handbook* Volume 1, describes several excellent antenna couplers, so we won't present any here.

Once you have the antenna up and the

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the Tuned Doublet *[from page 68]*

antenna coupler installed, initial tuning would be as follows:

1. Attach feeders about half-way between the center of the coil and the ends. A small "L" of wire can be tack-soldered to a turn and the feeders clipped to it.

2. Turn on the transmitter and resonate the final. Keep initial loading light.

3. Adjust C_1 and C_2 for lowest reflected s.w.r.

4. If 1:1 s.w.r. cannot be obtained, move the feeder taps a few turns at a time, symmetrically, and repeat the above steps.

It should be easy to obtain almost a perfect 1:1 s.w.r. for each band by locating the taps on each plug-in or switched-in coil. Once these taps have been found, a small tab of sheet copper can be wrapped around the selected turn and soldered or, in the case of the tighter-turned, lower-frequency coils, the turns on either side of the tap can be pushed into the coil, thus leaving the turn to be tapped standing in the clear.

Should it happen that a 1:1 s.w.r. still defies attainment, the number of turns of the link (L_2) or the amount of capacity of C_2 may have to be adjusted. But once the coil and capacitor combination for each band has been found by cut-and-try, you are finished with experimentation. The number of link turns, or the extra amount of fixed capacity required to tune a band with a given switchable or plug-in coil can be switched in, the tank resonated, and you are ready to operate with a highly efficient antenna.

Another bonus often forgotten by the average Ham is that almost all antennas reflect the atmospheric and/or ground conditions about them. This means that an antenna will react one way during August, when the earth and surrounding objects are dry and electrical ground is somewhere deep beneath your location, and yet be entirely different after a long soaking rain. The tuning parameters of a fixed dipole, folded dipole, or the like, will even vary appreciably during a rainstorm. With a Tuned Doublet, you automatically *tune* the antenna system for each environmental change that occurs and operate at the peak of efficiency at all times. Try *that* on your trapped, "all-band" fan-doublet. I have personally seen the resonant point of one of these trapped horrors change 70 kc from 9 o'clock in the evening to 9 o'clock the following morning because of heavy dew. This is not to say that a Tuned Doublet won't change with atmospherics, but only the antenna coupler will know—or care.

Having decided upon a wire antenna, putting it up and keeping it up is quite another problem. This will be discussed in a subsequent article. ■

Compressor *[from page 21]*

value of the 25 mf filter capacitor. The values of the other circuit components should be retained. The placement of the compressor between stages which have tuned circuits may cause some detuning to occur and the circuits should be realigned.

Summary

The use of the compressor in r.f. circuits should probably not be attempted unless one has the proper test equipment to determine proper alignment of the stages between which the compressor is used. However, as an audio compressor no special test equipment is required and this application should appeal to many amateurs who would like to improve their transmitter's audio effectiveness. The components comprising the unit are so few in number that they can be placed almost anywhere in an existing transmitter. The components can be simply wired on a miniature terminal strip, for instance. Leads should be kept as short as possible, especially in the case of an r.f. compressor, but aside from this, no special construction techniques need be used.

The compression effectiveness depends to a great deal on proper level adjustment and to some degree with matching diode characteristics to the signal levels used. A compression range of about 15 db should be possible. This is not as great as the 30 db or more, possible with an elaborate tube or transistor circuit, but still very useful, especially in a transmitter which does not have any other form of a.l.c.

Adjustment of either the audio or r.f. compressor can be accomplished by means of on-the-air or oscilloscope checks. If one has the proper equipment to perform the latter, they are, of course, the most reliable. If on-the-air checks are made for adjustment purposes, the receiving station should operate the receiver being used without a.v.c. and with the r.f. gain control and not the a.f. gain control used to adjust the receiver for a just barely readable signal. The purpose is to simulate an actual weak-signal condition. If the receiver is used with a.v.c. and the r.f. gain fully operative, the a.v.c. action of the receiver will mask the effectiveness of the compressor action on a strong signal. ■

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