The V-Doublet Noise-Reducing Receiving Antenna

By H. A. Crossland*

RESULTS of many experiments and calculations in developing antenna systems for trans-oceanic and trans-continental communication show that the doublet antenna with a proper transmission line fills most requirements for efficient short-wave reception. The ordinary doublet antenna consists of a straight wire divided at the center by an insulator, from which point a two-conductor, transposed or twisted transmission line runs to the receiver. Properly designed, this type of doublet gives ideal efficiency at a frequency determined by its length, but not for a continuous range of frequencies covered by the short-wave bands.

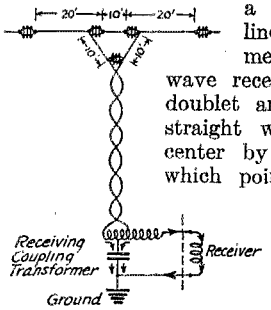


FIG. 1

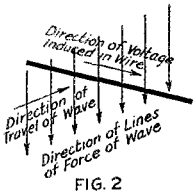
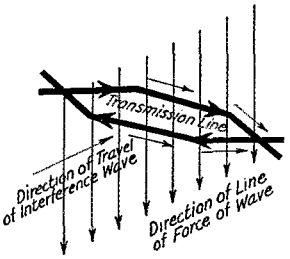


FIG. 2

The newly designed "V-doublet" antenna system illustrated in Fig. 1 differs from the elementary doublet which tends to favor certain frequencies and reject others. The antenna is coupled to the low-impedance transmission line by the converging "V." This makes the doublet respond uniformly to a wider range of short-wave signals, and at the same time matches the doublet more properly to the transmission line so that the signal transfer is more uniform over a relatively wide frequency range. The explanation is simple. At the top of the V, where the spacing is wide, the characteristic impedance is high and comparable to that of the doublet; at the bottom where the wires are close together, it is lowered to match the low impedance of the transmission line.

One of the most valuable features of such a system is its ability to exclude interference from outside sources when the doublet is erected out of the field of interference. Fig. 2 illustrates how the signal voltage is induced when a radio wave sweeps across a conductor. In the same way interference radiation induces interference voltage in any conductor within its field. The balanced transmission line of the "V-doublet" prevents such interference from reaching the receiver, as shown in Fig. 3. Since the direction of travel in each conductor is the same, these voltages are in-phase; while the signal currents conducted from the doublet, having opposite directions in each wire, are out-of-phase. Fig. 4, showing the system with the transmission line terminated in a coil, illustrates how a transposed lead-in can conduct a signal from the doublet to the receiver through interference. Arrows drawn on the line represent the signal, while arrows drawn alongside represent induced interference. The interference currents on the line are in opposition through the coil and the receiver is not affected. The signal current, however, flows through the coil. If it is properly coupled to the receiver it will reproduce the signal in the loudspeaker.



Heavy Arrows – SIGNAL
Light Arrows – INTERFERENCE
FIG. 3

The receiver-coupling transformer circuit is also illustrated in Fig. 1. The transformer is a balanced-primary auto-transformer which matches the transmission line to the antenna coil of the receiver and permits in-phase interference to flow to ground through the condenser. The small capacitance of this condenser makes it relatively ineffective at broadcast frequencies. This permits the system to operate automatically as a conventional "T" antenna system on broadcast signals and as a "V-doublet" on short waves.

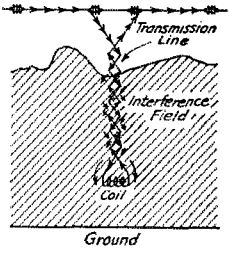


FIG. 4

The design of the V-doublet antenna lends itself readily to various methods of suspension and is simple to install. Only two points of support are required. Ordinarily the antenna will be erected on the roof of a building or suspended between the roof and nearby tree or pole. If it is inconvenient to erect masts, the doublet can be suspended between two chimneys, or from the eaves

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The V-Doublet Antenna

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of a building. Where sufficient ground space is not available to provide the normal span of 51 feet, the doublet may be shortened, with a slight sacrifice of efficiency in the region of the 49-meter band only. The directional effect of the doublet is advantageous where a source of interference is unavoidably near. Least interference is intercepted by the doublet when the horizontal wire points toward the source of interference.

If desired, the transmission line can be extended as far as 500 feet from the receiver. This permits wide latitude in choosing a noise-free location for the doublet. At least 100 feet of line should be used to maintain correct electrical matching. Excess line of the first 100-foot section can be coiled at the end nearest the receiver and after the initial 100 feet, the line may be spliced or cut as desired.

Experimenters' Section

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An Antenna Mast Without Guy Wires

How many times have you wished you could erect an antenna mast without a maze of guy wires to keep it up? Many times we want to run the antenna right up to the pole, especially when the back yard is small and every inch is needed. This often results in the guy wires acting as reflectors.

Here is the solution: Two "2 by 4's" bolted together with "U" bolts as shown in Fig. 5, making a "T"-shaped section. Up to a length of forty feet (or possibly more) this pole will require no guy wires, if set in cement. A 60-foot pole may require several guy wires about 20 feet up the pole.

The "2 by 4's" are alternated so no two splices come together. In order to do this it is only neces-

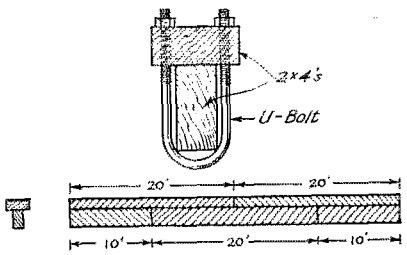

FIG. 5

sary to start out making the pole with one 10-foot and one 20-foot 2" by 4" and use 20-foot pieces thereafter to the required length, then finish off the last one-half piece with another 10-foot length.

The "U" bolts should be placed closely enough so that the pole is rigid and will *not* bend *either* way. If you do not go in for permanent construction, the "2 by 4's" simply might be spiked to-

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