Constructing The

8 JK BEAM

The most difficult part in constructing the highly effective 8JK beam antenna is the mechanical support. This thorough description of a simple and easy method of construction will be of interest to newcomers and oldtimers alike

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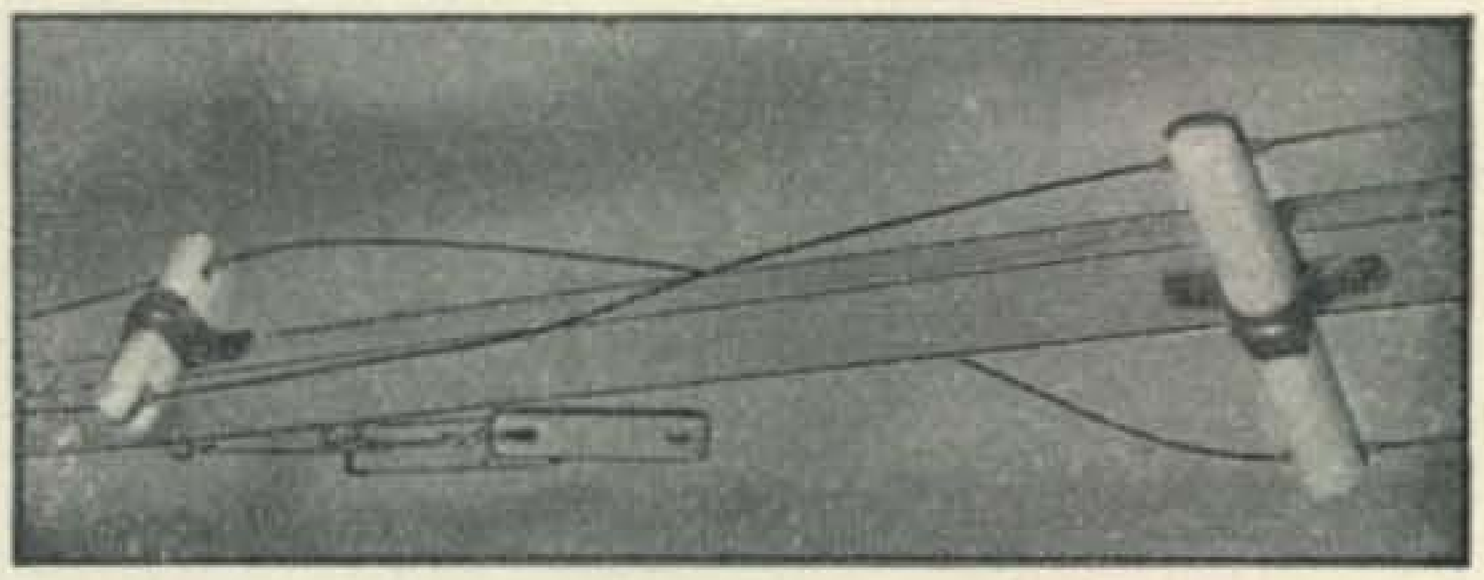
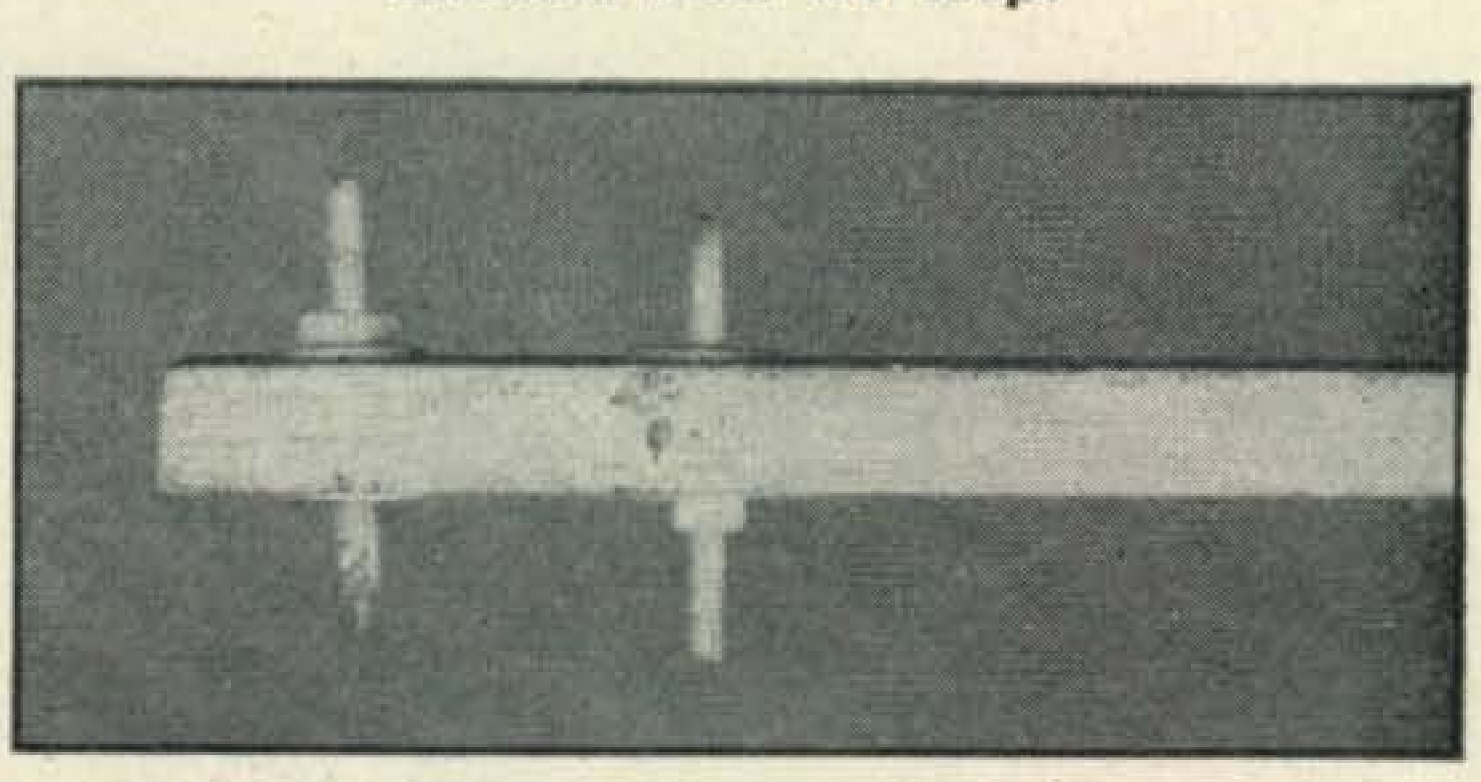
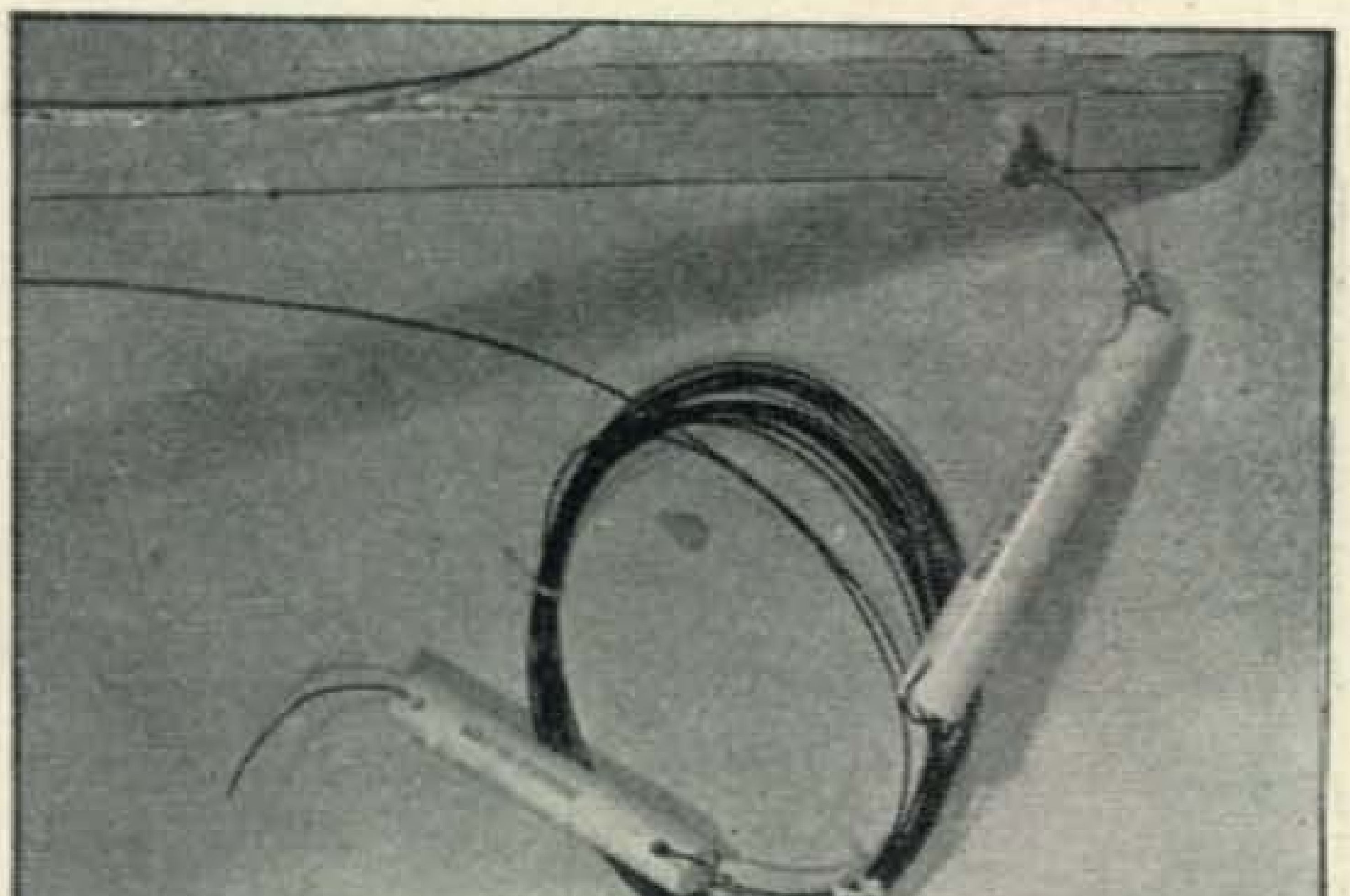
WITH THE OPENING of all bands envisioned in the near future, amateurs are again faced with the problem of efficient antennas. Undoubtedly many amateurs have changed their QRA during the war or have disassembled antenna systems, necessitating new installations. In the past, much emphasis was placed upon the importance of a properly designed radiator from an electrical standpoint, but relatively little consideration was given to correct mechanical construction. War-time engineering and manufacturing have accentuated the importance of rugged mechanical and efficient electrical design—actual experience revealing that one without the other will not suffice. It was with this in mind that the following antenna system and method of installation came into being.



Photographic description of the cross-over and suspension insulators. Sponge rubber cushions the insulators from the straps



Eye bolt arrangement on both ends of all three wooden spreaders



Method of fastening antenna to eye bolts. Note that the insulator separates the antenna wire from the bolt itself

Ten and Twenty Meters

Operation was desired on the twenty and ten-meter bands, and a beam was designed that would give satisfactory operation on both spectra. As only limited space was available, the antenna system had to be as small as possible, exhibit maximum efficiency, and be mechanically rugged. A bi-directional end-fire array—known in amateur circles as the "Kraus flat-top or 8 JK Beam," was selected (*Fig. 1*). As this system is fully described in most amateur hand books only a brief resumé of its electrical characteristics will be given here.

Essentially, this antenna consists of two dipoles closely spaced. It is possible, because of the close spacing, to obtain proper phase relationship by crossing the wires of the flat-top at the voltage loops rather than utilizing phasing stubs. The bi-directional gain of this array is 6 db on its fundamental frequency. It can also be used on the second and fourth harmonics with a tuned

[*Photos by Jack Gelblicht*]

open-wire line. When operating on harmonics, the radiation pattern has four main lobes. If only twenty-meter operation is desired, a matching stub may be employed to obtain the proper impedance match between an open-wire line of 600 ohms impedance and the flat-top. This will allow the use of an untuned line of any desired length with negligible losses if the standing-wave ratio is kept to a minimum.

Constructional Data

In order that the finished product be mechanically rugged the best of materials should be used in its construction. The following lists the materials and tools necessary to complete the job.

Materials

- 12 staple plates, 2" x 2" with 1/8" staple loops, 4 mounting holes. Brass or galvanized steel.
- 2 pipe-straps, two-hole mounting type for clamping 1"-diameter pipe. Brass, copper or galvanized steel.
- 24 8-32 x 1½" round-head machine screws, —nickel-plated brass.
- 24 8-32 x 5/16" hex nuts, nickel-plated brass.
- 24 8-32 split lock-washers.
- 4 1" round-head wood screws, nickel-plated brass.
- 9 7" glazed-porcelain insulators, 1" diameter, 800 lbs. break-strength.
- 4 4" glazed-porcelain insulators, 1" diameter.
- 200 ft. of #12 steel core, copperclad, enamel-covered wire.
- 2 eye-screws, ½"-diameter eye.
- 3 lengths seasoned oak 2" x 1" x 9'.

Tools

- 1 large pair of cutters.
- 1 pair of mechanic's pliers.
- 1 hand drill with a #19 drill.
- 2 sheets of moderately rough sandpaper (about #1 grit).
- 1 100-watt soldering iron.
- Solder.
- Screwdriver.

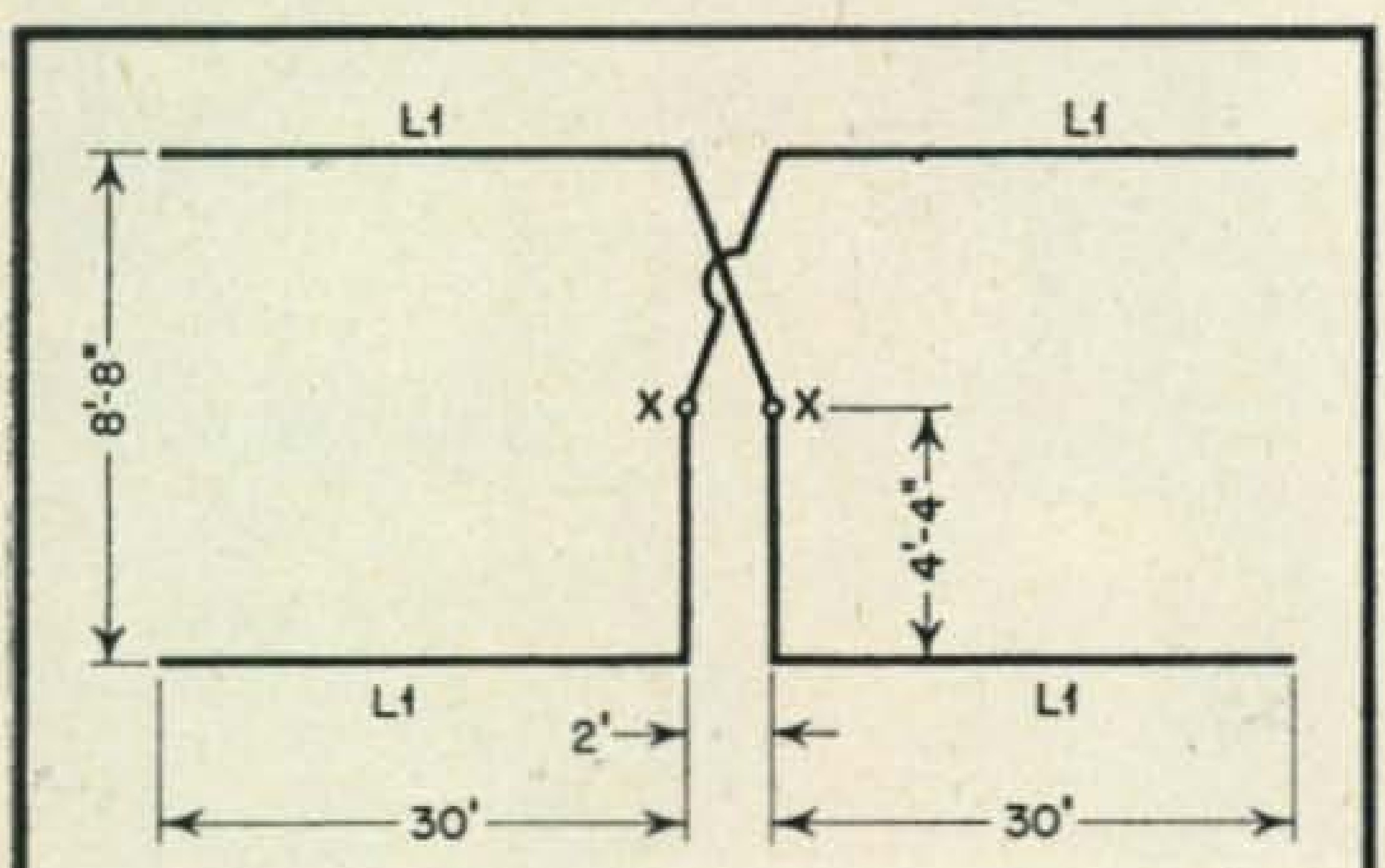


Fig. 1. Diagram of the 8JK beam. Feeders are attached to points X and X

The first step in constructing the array is to mount the staple plates on the two-inch side of the oak spreaders. Locate the plates with the staple in the vertical position exactly two inches from each end on the three nine-foot pieces of oak, and scribe the mounting holes with a pencil. Drill a hole with a #19 drill through the center of all scribed points. Next place a staple plate on each side of the oak spreader and insert the 1½" machine screws through the four mounting holes (*Fig. 2*). Apply the lock-washers and hex nuts and draw up as tightly as possible with a screwdriver. The distance between the centers of the staple plates at each end of the oak spreader will be exactly 8', 8" (the desired spacing) if the staples are 2" from each end before mounting. This spacing constitutes the necessary distance between the antenna dipoles.

At this point, it is advisable to apply a coat of varnish or paint to the oak lengths to protect them from the weather. Spar varnish is strongly recommended as its weather-resistant properties are excellent. If desired, two coats may be applied for longer protection.

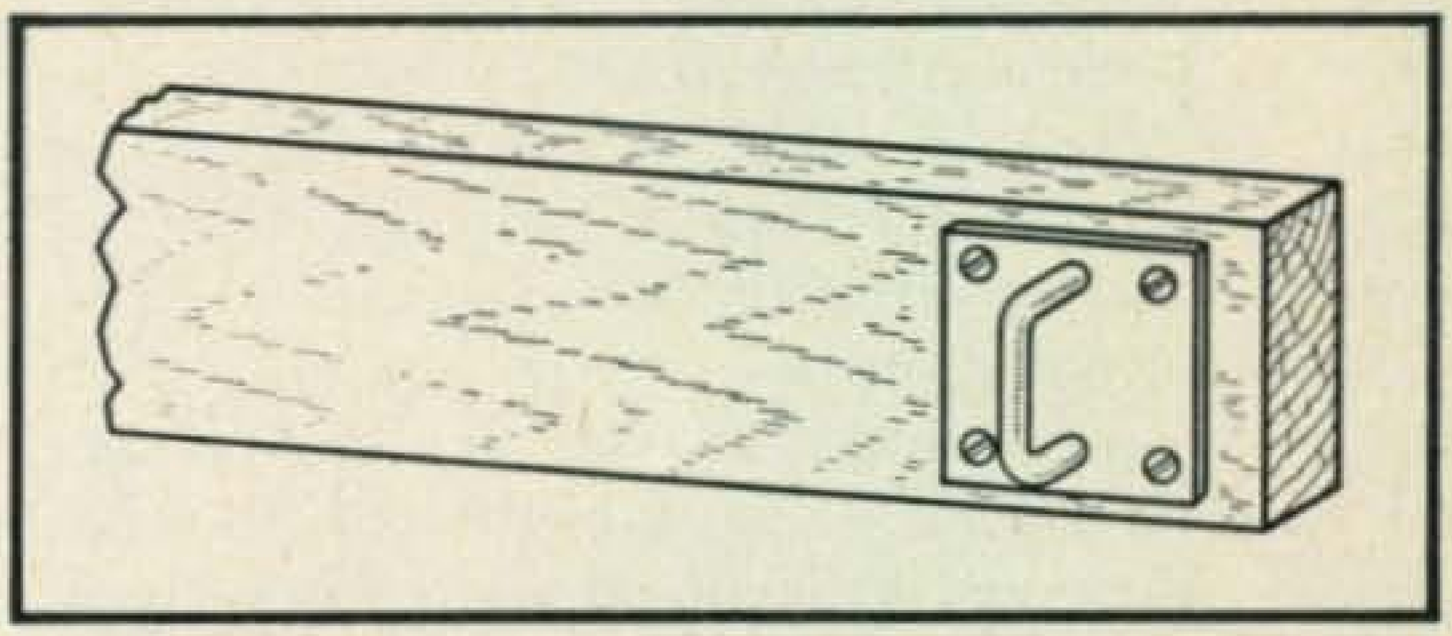


Fig. 2. Showing the staple plate mountings on the three 9-foot lengths of seasoned oak

The next step is to mount a 4" insulator exactly in the center of one of the oak spreaders which will be the center spreader of the array. This insulator is used as a separator for the two dipole wires where they cross over for proper phasing (*Fig. 3*). It is at this point that the feeders or matching stub are connected. To mount the insulator, measure 4½' from one end. Place the insulator horizontally at right angles to the spreader and against the 1"-side of the wood. Hold it there by placing one of the pipe-straps over the center of the insulator. Mount the strap with the 1" wood screws. This will affix the insulator securely in a horizontal position. A small piece of sheet rubber 1/16" thick may be placed between the clamp and the insulator before mounting the clamp. This will insure tight clamping action and also protect the procelain insulator against cracking when pressure is applied to the screws holding the clamp.

Two eye-screws are mounted directly beneath the insulator. The center-to-center spacing of the eye-screws must be 4" and 2" each side of the center insulator. These are used to suspend in-

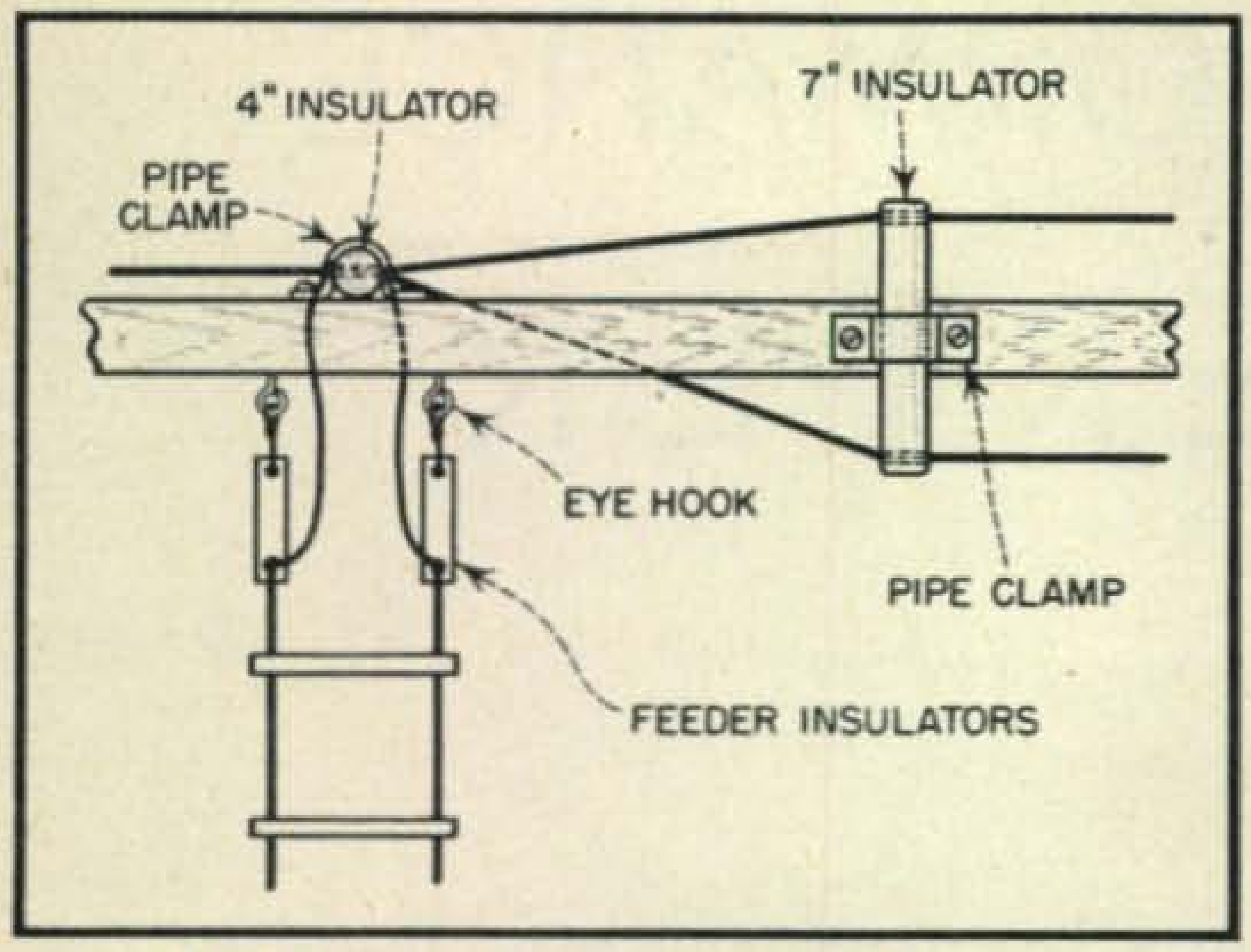


Fig. 3. Wiring detail explaining feeder support and connections

sulators which will support the open wire line or matching stub, if the latter is used. Mount a 7″ insulator against the 2″ side of the spreader in a vertical position two feet from one end of the spreader. The method of mounting is the same as described for the cross-over insulator. This insulator separates the dipole wires just before they cross over at the center insulator.

Dipole Wires

Measure and cut the #12 copperweld wire for the antenna dipoles. Looking at the antenna from the top in *Fig. 1*, it consists of two parallel wires that cross over at the center, forming a four-legged figure. The length of each dipole is 60′ plus 9′ for the cross-over or a total of 69′. This will make the length of L-1 exactly 30′ per leg. The overall length of the antenna is 60′ which is quite small for a beam capable of six db gain broadsides. The dimensions given will allow efficient operation on any frequency between 14000 and 14400 kc or on harmonics therefor.

Because #12 steel core wire is rather difficult to handle, the following method of measuring and cutting was used by the author. Fasten one end of the wire securely around a tree or post. Reel off about 32′ and fasten that end to the bumper of a car. Push the car slowly until the wire is taut and then apply the brake. This method will allow accurate measuring and cutting of the four 30′ and two 9′ lengths. When cutting allow sufficient excess for tying to the antenna insulators.

After the wires are cut, attach each end of the 30′ lengths to the eight remaining 7″ insulators. Remove the enamel coating with sandpaper for a distance equal to the excess length allowed for insulator tying. Slip the ends of the wires through the holes in the insulators and wrap around the antenna wire at least five times and solder. Make sure a good soldered connection is obtained. Attach one end of each wire to a staple plate on each of the two end oak spreaders. Use #12 copperweld as the tie wire between the insulators and the staple plates. Next fasten the free ends of the four wires to the center oak spreader. The length of the tie wires between the insulators and the staple plates should be exactly 4 inches. This will allow a distance of two feet (lengthwise) between the L-1 legs. Now that all four lengths are attached to the three spreaders, the cross-wires are attached. Sandpaper the ends of the two 9′-lengths of wire. Wrap around and solder one end to L-1 where it is fastened to the insulator at the center spreader end. Slip the free end through the upper hole of the separator insulator, through one hole of the center insulator and out to the diagonal leg of the antenna and solder securely. Repeat this operation with the other 9′ length using the remaining two legs, L-1, and the remaining holes in the spreader and center insulators. The cross-over wires may be attached to

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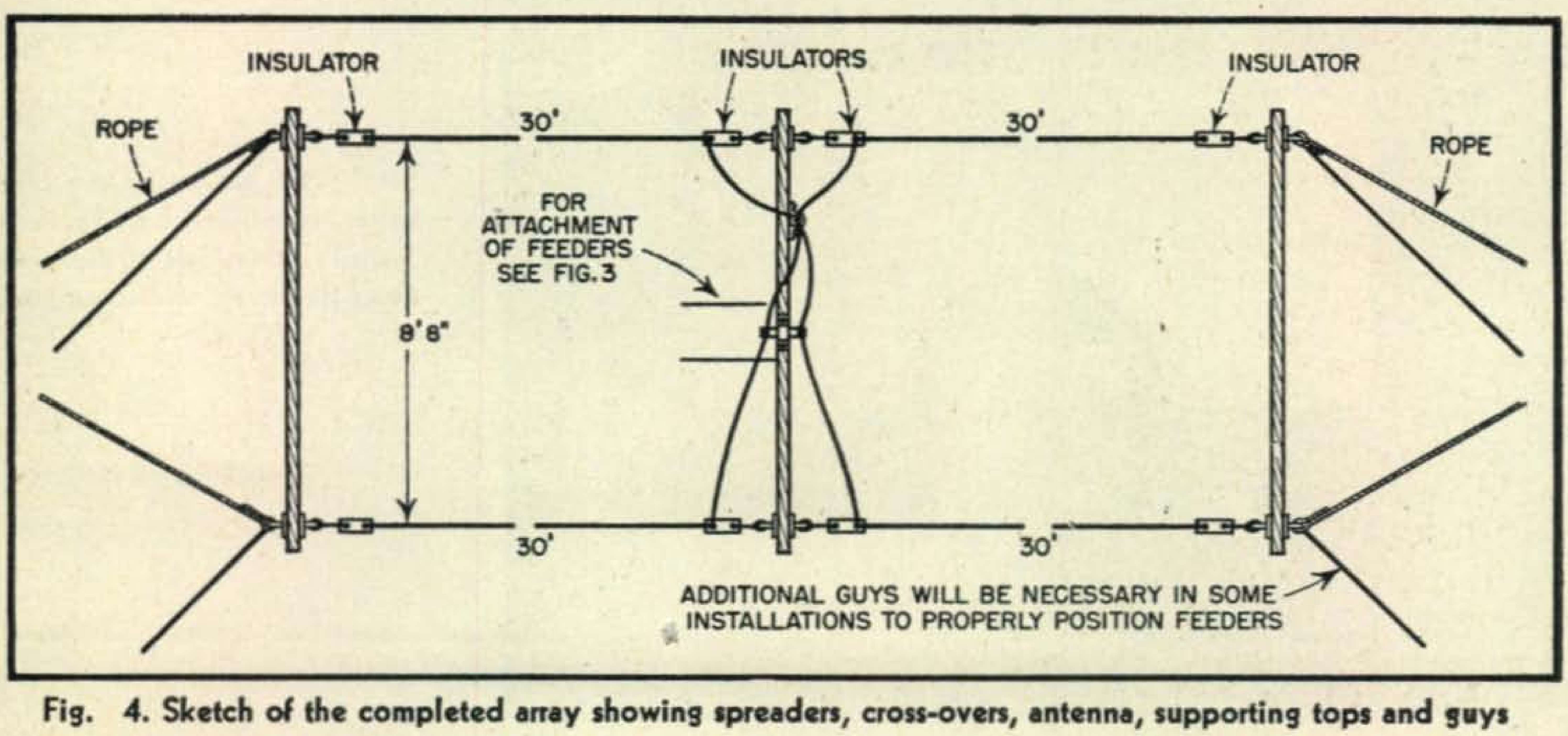

Fig. 4. Sketch of the completed array showing spreaders, cross-overs, antenna, supporting tops and guys

and see what is required for the final amplifier. As the most expensive item of the rig this is of particular interest. The final amplifier is operating under Class C telegraphy conditions and the plate current is always constant, so a conventional type of condenser input power supply could be used to F.M. modulate. If we were to plate modulate the final amplifier a power supply of excellent voltage regulation with additional components would be required.

The obvious saving in modulation equipment, coupled with the high efficiency of frequency modulation makes it a natural for ham use. Rather than cover the subject in its entirety at one time, this article has attempted to point out certain basic facts and advantages. March *CQ* will describe a complete 360 watt narrow band F.M. transmitter for ten meter operation employing all the features emphasized this month. An analysis of individual circuits will make it possible to try F.M. for yourself. Following this transmitter, several modulators will be thoroughly described, the series extending to cover elementary and advanced theory through construction of F.M. equipment.

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the spreader and center insulator with #14 soft copper wire. The only remaining operation is to attach the two 4″-feeder suspension insulators to the eye hooks mounted on the center oak spreader. A jumper consisting of #12 soft drawn-copper wire is connected from the feeders to each side of the center insulator, wrapped around three times, and soldered.

In order to suspend the array, 3/8″ manilla hemp rope should be used to provide strength. Two 14′ pieces are cut and each end tied to the staple plates located on the back of the two oak end spreaders. The main tie ropes can now be tied to the exact center of the two 14′ lengths and the entire array hoisted into the air. It is desirable that the antenna be raised at least ½ wave or 33′ above ground, and in the clear, in order that the radiation pattern will not be distorted.

Guys should be used when necessary. Further constructional details are shown in *Fig. 4* and the photographs.

The author, using a duplicate of the antenna system described here, was rewarded with three-hundred Asiatic contacts during the first year of operation from a Long Island location which is notoriously poor for the reception from that part of the world. The effort and time consumed in its construction will be compensated by an array which is highly efficient and mechanically rugged.