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User Handbook

For

AERIAL ARRAY

YAGI No. 2

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CONTENTS

<u>Section</u>		<u>Page</u>
CHAPTER I - GENERAL DESCRIPTION		
1	Purpose and facilities	1
2	Description	1
3	Weights and dimensions	3
CHAPTER II - ERECTION		
4	Assembly of Aerial Array Yagi No. 2	5
5	Mounting the Aerial Array on a Mast	9
6	Mounting the Aerial Array on a Telegraph Pole	11
CHAPTER III - DISMANTLING		
7	General	16
8	Lowering and dismantling Aerial Array mounted on a Mast	16
9	Lowering and dismantling Aerial Array and support assembly mounted on a Telegraph Pole	16

ILLUSTRATIONS

<u>Fig. No.</u>		<u>Page</u>
1	Aerial Array Yagi No. 2 - General View (Horizontal)	ii
2	Aerial Array Yagi No. 2 - General View (Vertical)	2
3	Aerial Array Yagi No. 2 - Components	3
4	Pole mounting components	4
5	Fitting support mounting to Dipole (Excitor)	5
6	Fitting the Boom to support mounting	6
7	Mounting Director and Reflector on Boom	7
8	Array mounted horizontally on Mast	8
9	The 36-ft. mast	10
10	Fitting cable clamp to Dipole assembly	11
11	Fitting support assembly to Telegraph Pole	12
12	Array mounted vertically on Telegraph Pole	14



FIG. 1 - AERIAL ARRAY YAGI No. 2 - GENERAL VIEW (HORIZONTAL)

USER HANDBOOK

for

AERIAL ARRAY YAGI No. 2

CHAPTER I GENERAL DESCRIPTION

1. Purpose and Facilities

The Aerial Array Yagi Co. 2 has been designed for use with Army Wireless Sets working in the frequency band of 50 Mc/s to 100 Mc/s where narrow-beam VHF transmission and reception is required.

The array can be erected to give either horizontal or vertical polarization characteristics and fittings are provided for mounting the array on a 36 ft. steel mast or on a telegraph pole.

The three elements of the array, excitor, reflector and director, are easily adjustable for setting up to function on any desired frequency in the 50-100 Mc/s band.

Connection between the array and the wireless set will normally be made by a 100 ft. coaxial feeder thus allowing the array to be erected at approximately 60 ft. from the vehicle, building or tent in which the wireless set is housed.

2. Description (Figs. 1, 3 & 8)

The Aerial Array Yagi No. 2 is a lightweight assembly consisting of a folded half-wave dipole (excitor) with a director, a reflector, a spacing boom, a support mounting, brackets and clamps with captive screws. The dipole element, which has a built-in coaxial terminating plug assembly, is affixed to the support mounting by two captive screws. The spacing boom is also attached to the support mounting and is secured in position by means of two clamping brackets with captive screws. The director and reflector elements are attached to the spacing boom by clamping brackets, one on each element. The spacing boom and the element bracket channels are oval shaped to ensure that, when assembled, the elements retain their correct horizontal or vertical alignment. The boom support and element bracket channels are fluted in order that they act as a guide for a spigot at each end of the boom to ensure correct assembly. The fluting is irregular for each element so that it is not possible to confuse the positions of the elements in the array.

The three elements are made up of telescopic tubing, the moving portions of each being marked with a graduated scale showing megacycle settings between 50 - 100. The spacing boom is tubular also and is similarly marked off with graduated scales at each end. The complete array can, therefore, have its various elements accurately spaced and adjusted to function on any particular frequency within the band of 50 to 100 Mc/s. The procedure for setting up the array on the required frequency is outlined in Section 4, para.(5) of this handbook.

CHAPTER I - Section 2

The dipole (exciter) is fitted with insulated spreaders to ensure that the dipole retains its symmetrical form.

The elements, mountings and clamps of the aerial array are constructed from a light alloy which is highly resistant to extremes of climatic conditions likely to cause expansion, contraction or corrosion, such that the array can be subjected to severe arctic or tropical temperatures, high humidity, salt spray, etc.

The socket of the support mounting, together with its clamp and captive screws enables the array to be mounted horizontally to the top of a 36 ft. Mast (Fig. 9), or vertically on a telegraph pole (Fig. 12).

For mounting the array, on a telegraph pole, to give vertical polarization a special fitment has been designed. (Fig. 4). This comprises a supporting arm, cross members, eyebolts, nuts, bracing wires and cable cleat. The supporting arm fits into the socket of the support mounting and is securely clamped to the pole by means of bracing wires as shown in Fig. 11.

The method of mounting the array on a 36 ft. mast for horizontal polarization is described in Section 5, below, and that for mounting the array on a pole for vertical polarization is given in Section 6 of this handbook.

The connection between the aerial array and the wireless set is made by means of a co-axial feeder whose length of 100 ft. enables the array to be set up at a distance of approximately 60 ft. from the set. A co-axial feeder engages with a terminating plug on the exciter and is secured in position by means of a locking ring.

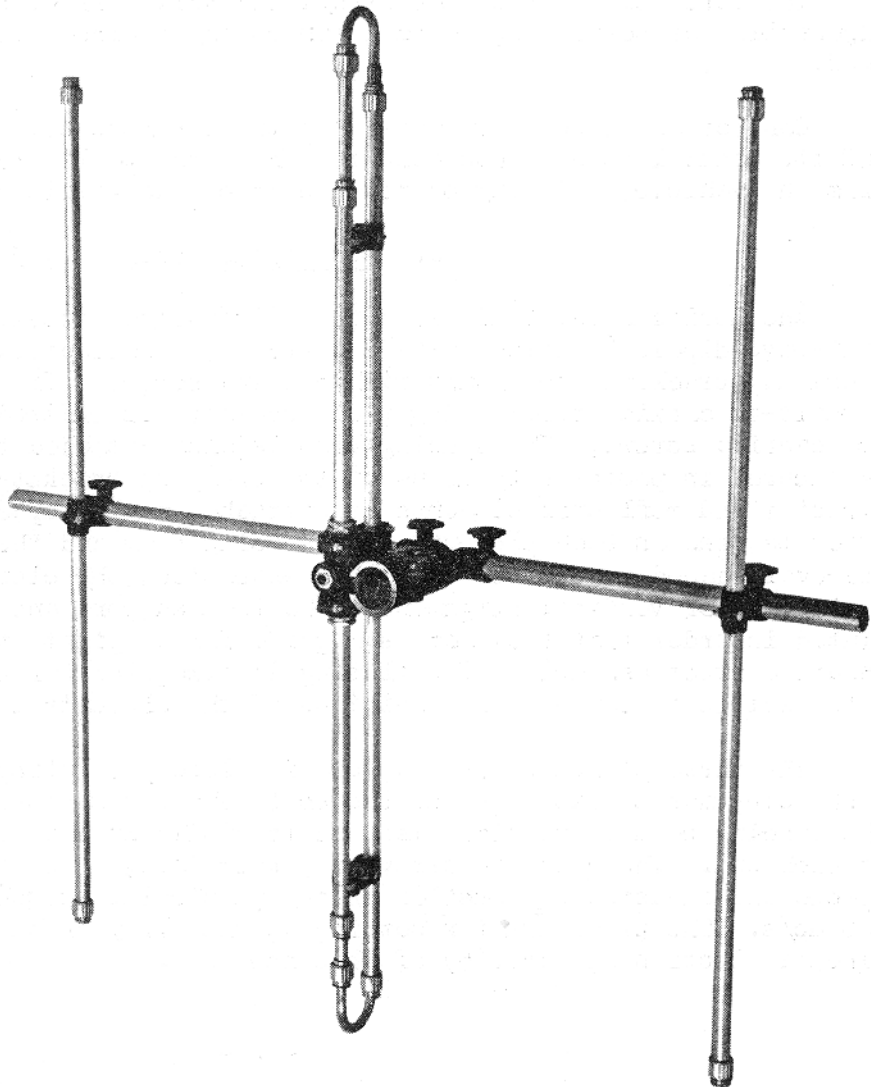


FIG. 2 - VERTICAL VIEW

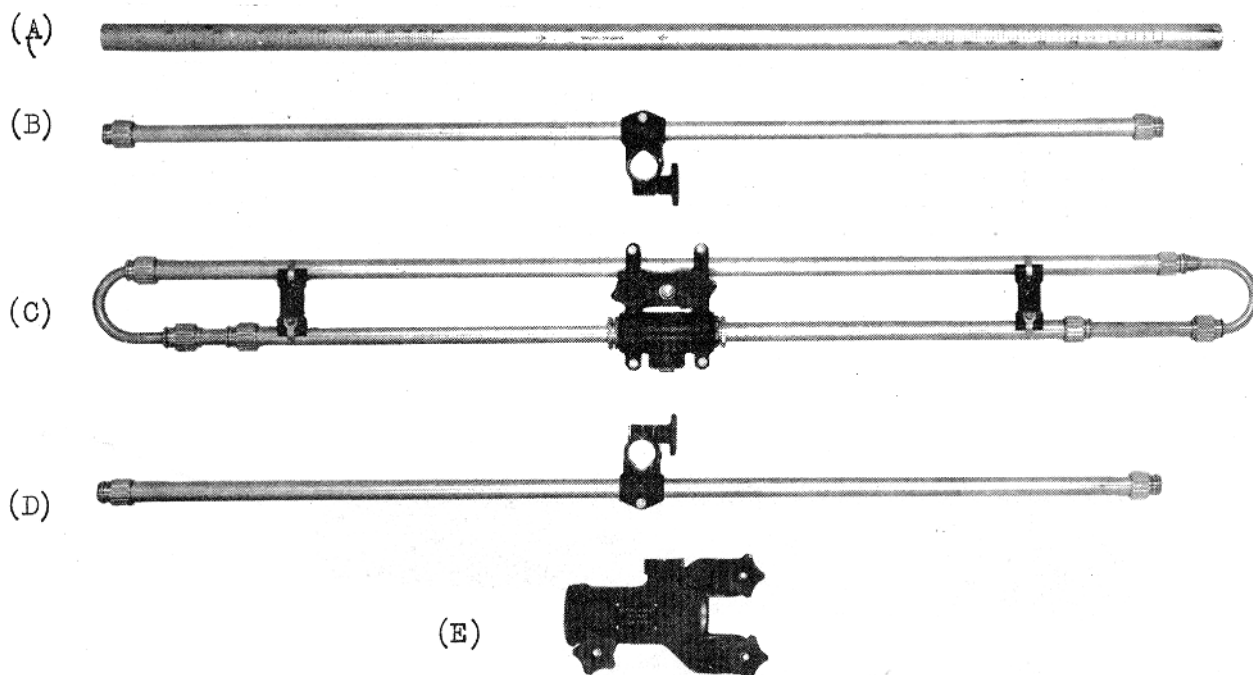


FIG. 3 - AERIAL ARRAY YAGI NO.2 - COMPONENTS

3. Weights and dimensions (Figs. 3 & 4)

The weights and dimensions of the items comprising the aerial array are as given in Table 1, below, and those for the special fittings for the mounting of the array on a telegraph pole are as given in Table 2, below:-

TABLE 1 - AERIAL ARRAY YAGI No.2

Fig.3 Ref.	Item	Length in inches (overall)			Weight lb.
		Normal	at 100 Mc/s	at 50 Mc/s	
(C)	Exciter	53	57	114	5½
(F)	Support Casting Assembly	9	-	-	2½
(D)	Reflector with clamp	48½	62½	125	1½
(B)	Director with clamp	48½	54½	107½	1½
(A)	Boom assembly	51½	-	-	1
Total weight :					12

CHAPTER I - Section 3

TABLE 2 - TELEGRAPH POLE MOUNTING

Fig.4 Ref.	No.	Item	Length in.	Width in.	Depth in.	Weight lb.
(A)	1	Support channel with Spigot	19½	3	2½	7½
(B)	2	Cross bearers	12	2½	2½	5
(C)	4	Eyebolts with nuts and thimbles	4½	-	-	±
(D)	2	Bracing wires	34	-	-	±
(E)	1	Cable cleat assembly	2	½	1	½
(G)	4	Bull-dog grips	1½	1½	½	½
						Total weight : 23½

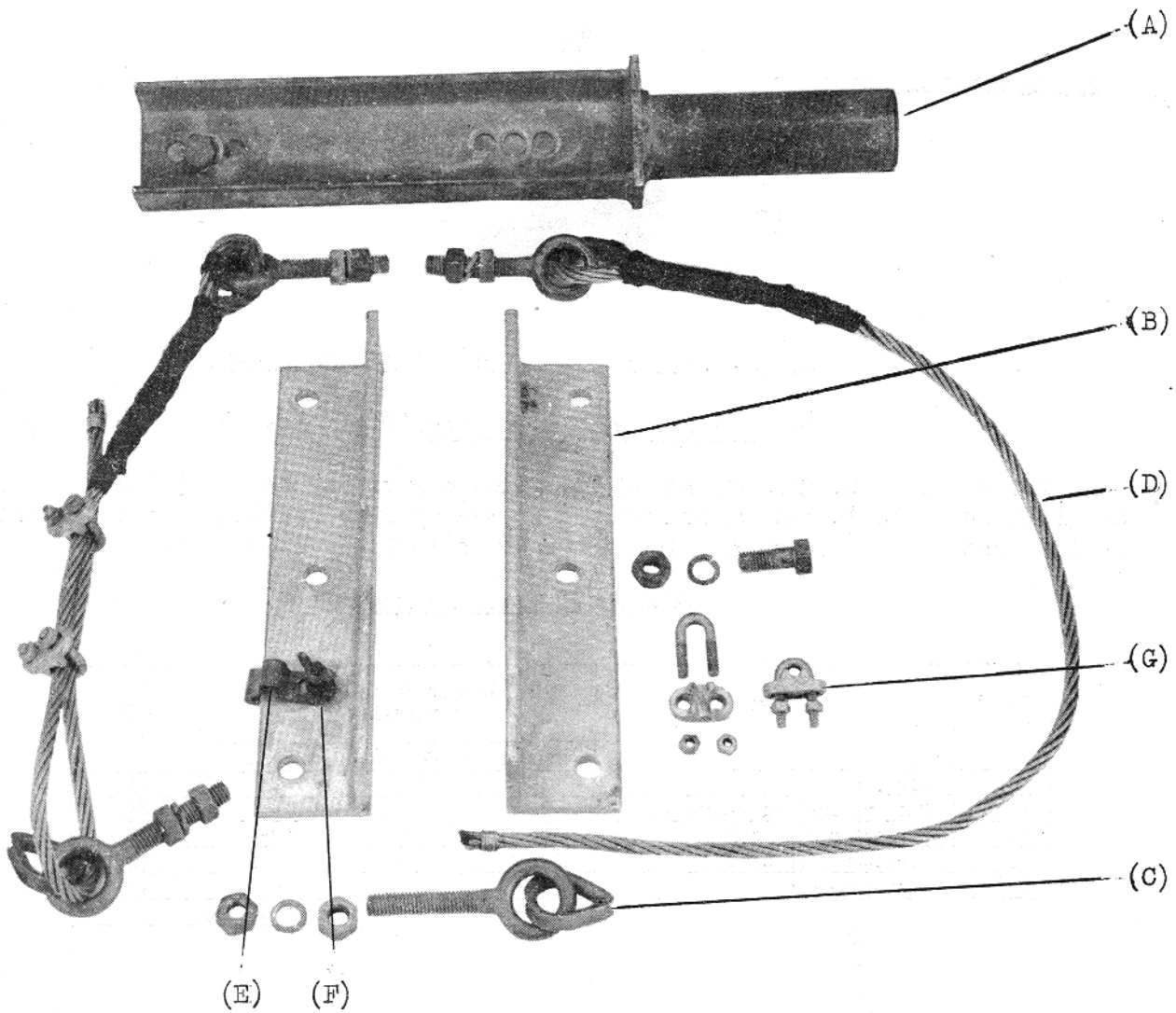


FIG. 4 - POLE MOUNTING COMPONENTS

4. Assembly of Aerial Array Yagi No. 2

(1) Preliminary

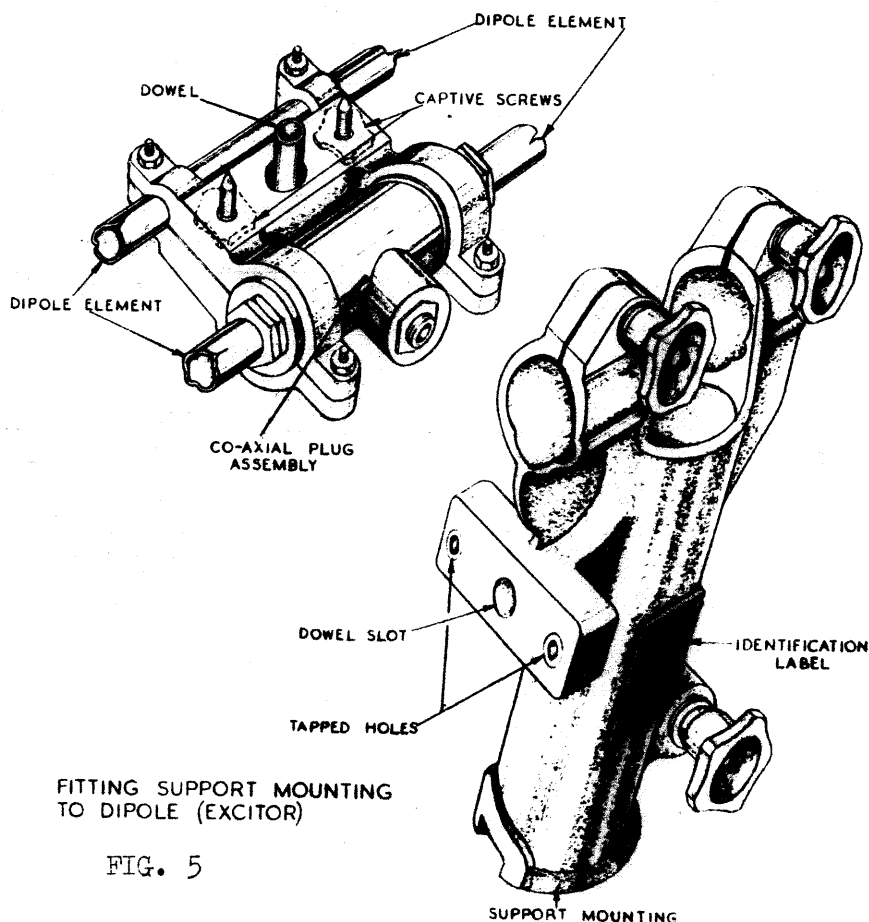
Check all items of the array (Fig.3 and Table 1) and ensure that they are complete and in good order, i.e. tubing is not bent or damaged, telescopic portions work smoothly, all captive screws and locking rings function correctly and that all nuts and washers are snug and tight.

Arrow heads ($>$ $<$) are engraved at various points on the elements and mountings to safeguard the correct alignment and frequency setting. Care should be taken when assembling the array to ensure that elements, etc., are positioned according to the arrows.

(2) Fitting the Support Mounting to the Dipole (Excitor) (Fig. 5)

(a) Lay the dipole element flat with the coaxial plug assembly towards you and with the two captive screws to the rear. With the identification label on the support mounting facing towards the left-hand side, place the mounting in position on the dipole so that the dowel

mates smoothly in the slot on support mounting and so that the tapped holes on either side of the dowel are aligned on the two captive screws on the dipole.



(b) Engage the two captive screws in the holes in the mounting by turning both in a clockwise direction and, by a few turns given to each alternately, continue turning until a firm connection is made between the dipole and the mounting.

FIG. 5

(3) Fitting the Spacing Boom to the Support Mounting (Fig. 6)

- (a) The boom is engraved in the centre thus, " > SUPPORT CASTING < " and because of the irregularly spaced spigots at each end of the boom it can only be engaged into the clamp channels from one direction. This ensures that the boom is always correctly positioned.
- (b) Holding the boom with the " > SUPPORT CASTING < " sign facing upright, engage the spigot on the left-hand end of the boom in the fluting of the right-hand clamp channel "A" and continue the passage of the boom through the second (left-hand) clamp channel "B" until the " > SUPPORT CASTING < " sign is positioned centrally between the two clamps as shown in Fig. 6.
- (c) Securely fasten the boom in position by turning the two captive screws in a clock-wise direction.

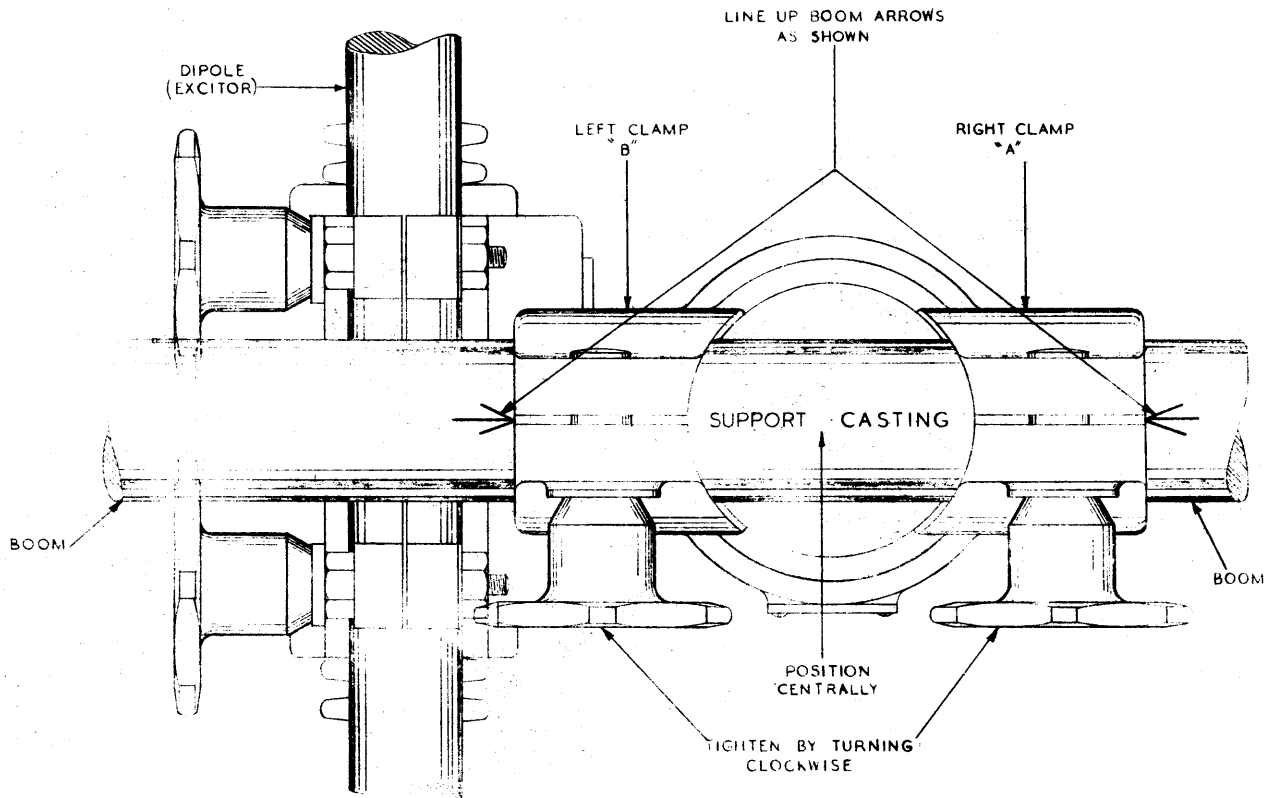


FIG 6 FITTING THE BOOM TO SUPPORT MOUNTING

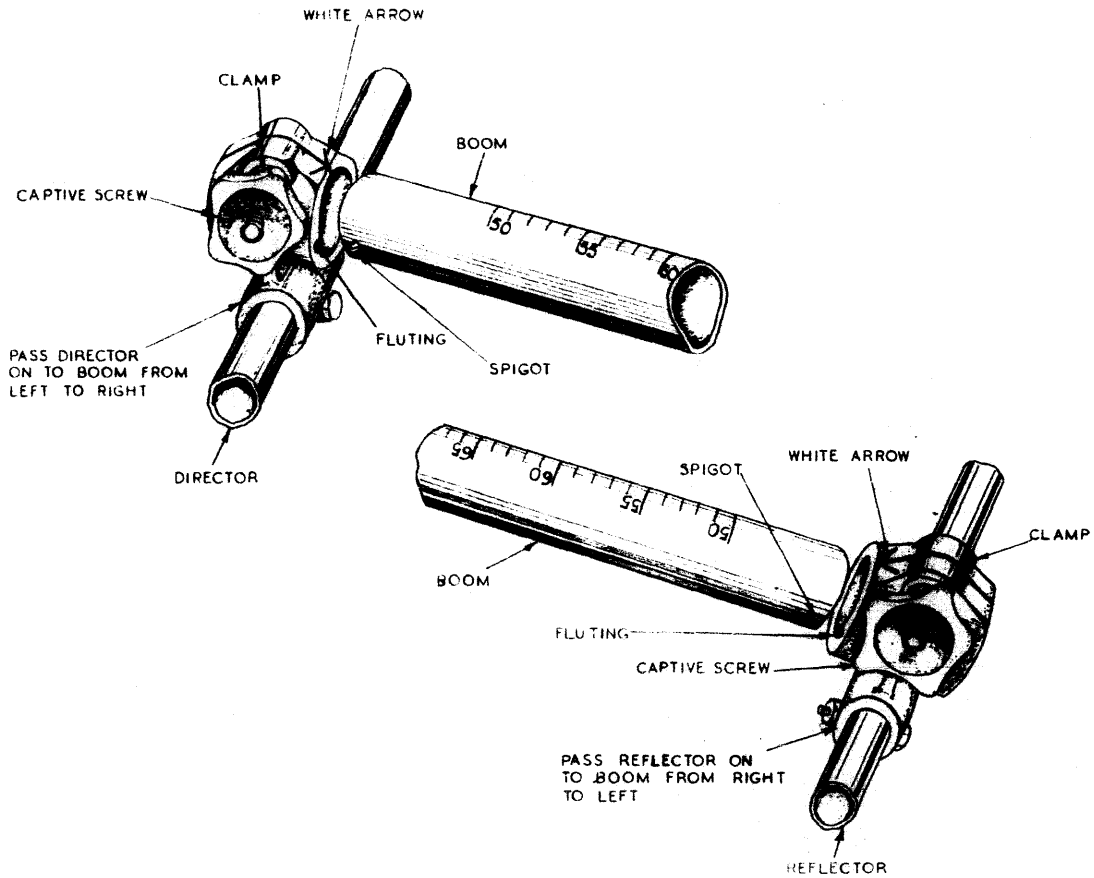


FIG. 7 MOUNTING DIRECTOR AND REFLECTOR ON BOOM

(4) Fitting the Director/Reflector Elements to the Boom (Fig. 7)

(a) The Director and Reflector elements are normally supplied with their boom clamps affixed but these should be examined before fitting to the boom to ensure that the clamps are exactly centred between the two arrows stamped on the element tube.

(b) Director

With the " \gt SUPPORT CASTING \lt " sign facing upwards and the white arrow on the clamp pointing inwards, engage the left-hand spigot on boom in the clamp channel fluting and slide the director on to the boom, i.e. from left to right.

(c) Reflector

The reflector is mounted on the right-hand side of the boom by the method described in (b) above, except that action is from right to left.

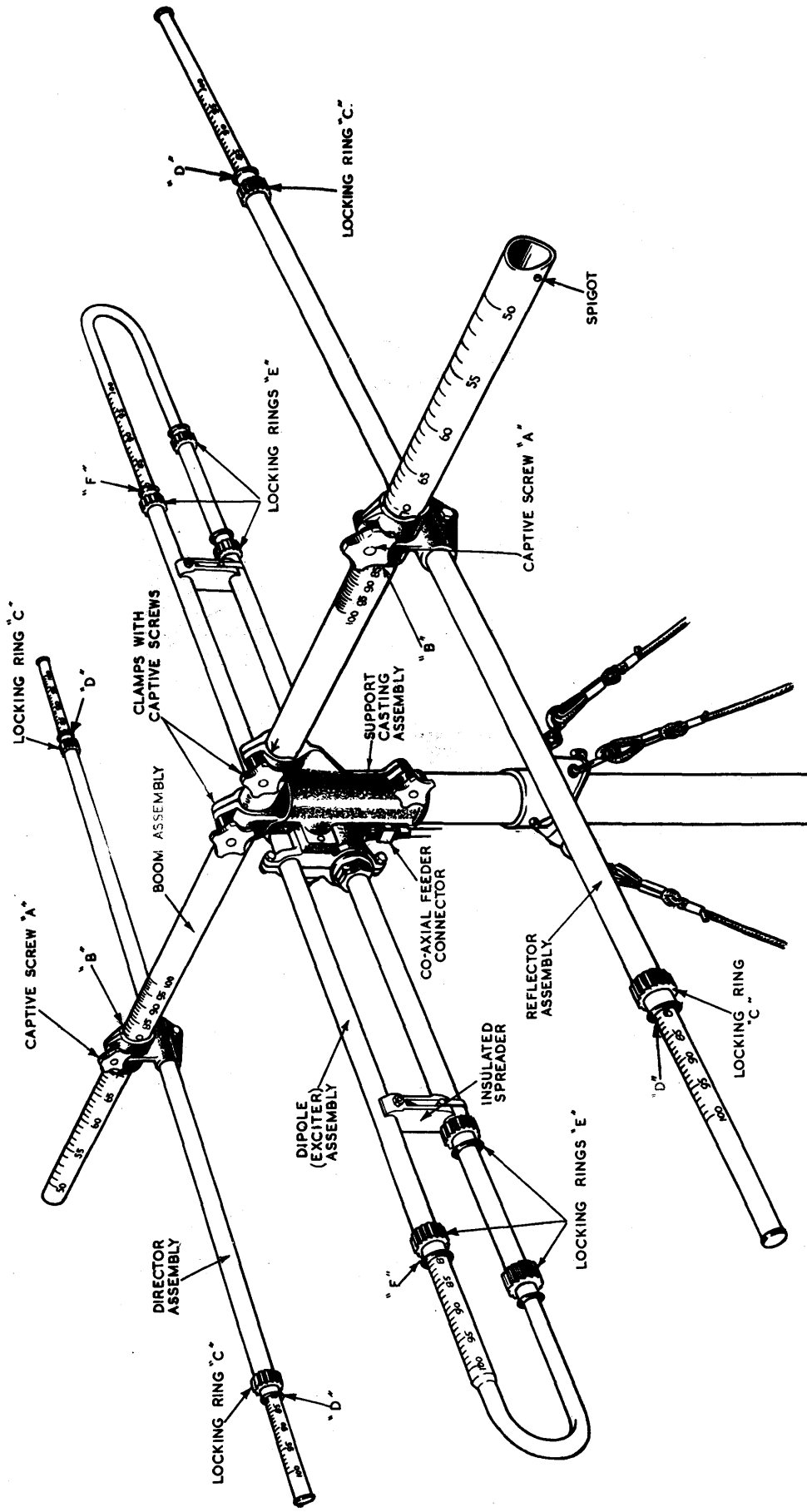


FIG 8 ARRAY MOUNTED HORIZONTALLY ON MAST (SET UP TO 80 MC/S)

CHAPTER II - Sections 4 & 5

(5) Setting up the Aerial Array to the desired frequency (Fig. 8)

- (a) For the purpose of illustration a frequency of 80 Mc/s is used to provide a typical example in the following instructions for setting up the array.
- (b) Director and Reflector elements
 - (i) Loosen (anti-clockwise) the captive screw "A" on the clamp and slide the director or reflector element along the boom until the arrowhead exactly points to the desired frequency mark (80 Mc/s), as shown at "B" in Fig. 8. Clamp the element in position by tightening (clockwise) the captive screw "A".
 - (ii) Loosen (anti-clockwise) the locking rings "C" at each end of the director or reflector tube and slide out the telescopic portions until the desired frequency mark (80 Mc/s) is exactly flush with the inner lip of the tube aperture, as shown at "D". Tighten the locking rings "C".
- (c) Dipole (Exciter)

Loosen (anti-clockwise) the locking rings "E" at the end of each tube and slide out the trombone extensions until the desired frequency mark (80 Mc/s) is exactly flush with the inner lip of the tube aperture, as shown at "F" in Fig. 8. Tighten all locking rings "E".
- (d) The aerial array is now ready for mounting on a mast or telegraph pole and instructions for this follow in Sections 5 and 6 below.

5. Mounting the Aerial Array on a Mast (Figs.1,8,9 & 10) (Horizontal polarisation)

(1) Erection of Mast

Instructions for the fitting and erection of the mast are contained in a separate handbook (User Handbook for Masts, 36 ft., Steel, Lightweight D.F. No. 1, W.O. Code No. 10747).

(2) Fitting Aerial Array to the Mast (Fig. 10)

After the aerial array has been assembled and set up to the desired frequency, as outlined in Section 4 above, it should be mounted horizontally at the top of the first mast section when the erection of the mast proper has reached the stage detailed at the end of Section 6, para. (4), of the User Handbook quoted in para. (1) above. To mount the array loosen the captive clamping screw on the support casting assembly and insert the spigot of the top mast section into the channel of the support assembly ((E) in Fig. 3). Tighten the clamping screw.

At this stage the coaxial feeder cable should be connected to the terminating plug on the dipole element and secured in position by tightening the locking ring on the socket.(F).

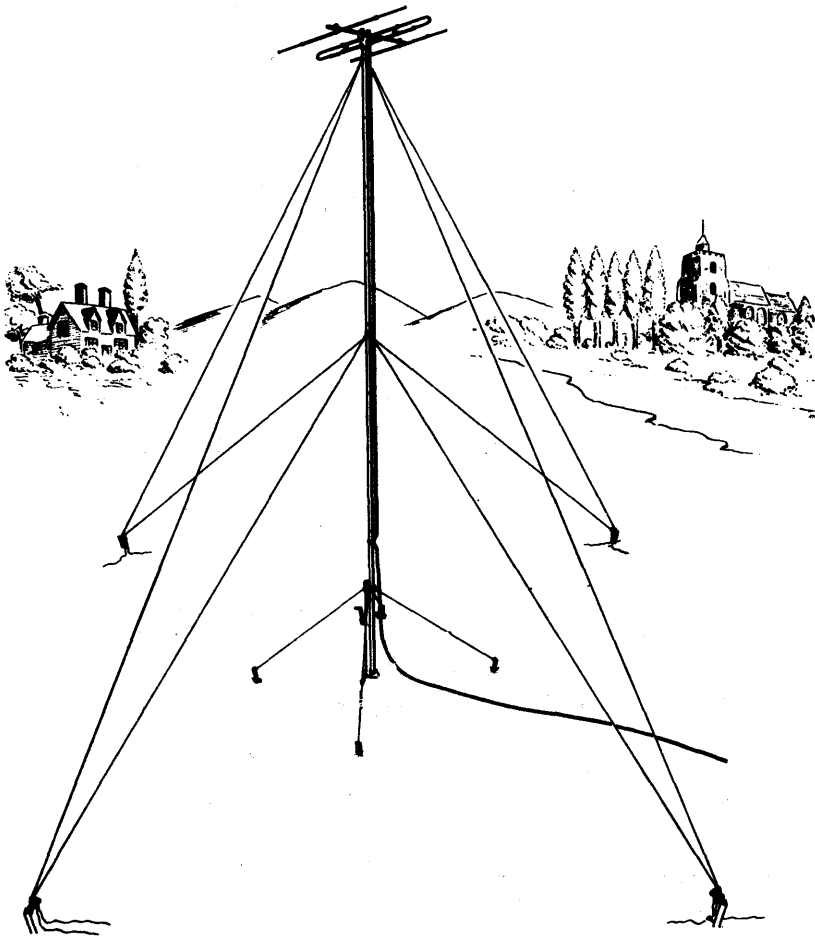


FIG. 9. THE 36 FT. MAST

If not already attached fit the cable clamp in position on the dipole assembly as follows. Referring to Fig. 10, remove the nut (A) from bolt (B) and with the wing nut (C) uppermost pass the bolt (B) through the hole (D) in the flange of the clamp. Replace and tighten the nut (A). Unscrew wing nut (C) until the hinged outside arm (E) of the clamp can be opened to its fullest extent. Form a loop in the cable, as shown in Fig. 10 and, at a point approximately 15 inches from the terminating socket (F), place the cable in the clamp. Close the hinged arm (E) and clamp the cable in position by tightening the wing nut (C). During the erection the coaxial feeder should be securely lashed to the mast at suitable intervals.

(3) Alignment of Aerial Array

- (a) After the mast, with the aerial array attached, has been completely erected (i.e. the stage reached to the end of Section 10, para. (5) of the User Handbook quoted in para. 1 above) (See also Fig. 9), the aerial should be aligned with the aerial at the distant station. If the aerial at the distant station can be seen then the local mast should be rotated by means of a tommy bar inserted through a hole in the bottom mast section. Loosen the erector clamping screw and rotate the mast by hand until the director element of the aerial array is nearest to and the reflector element is farthest away from the aerial at the distant station.

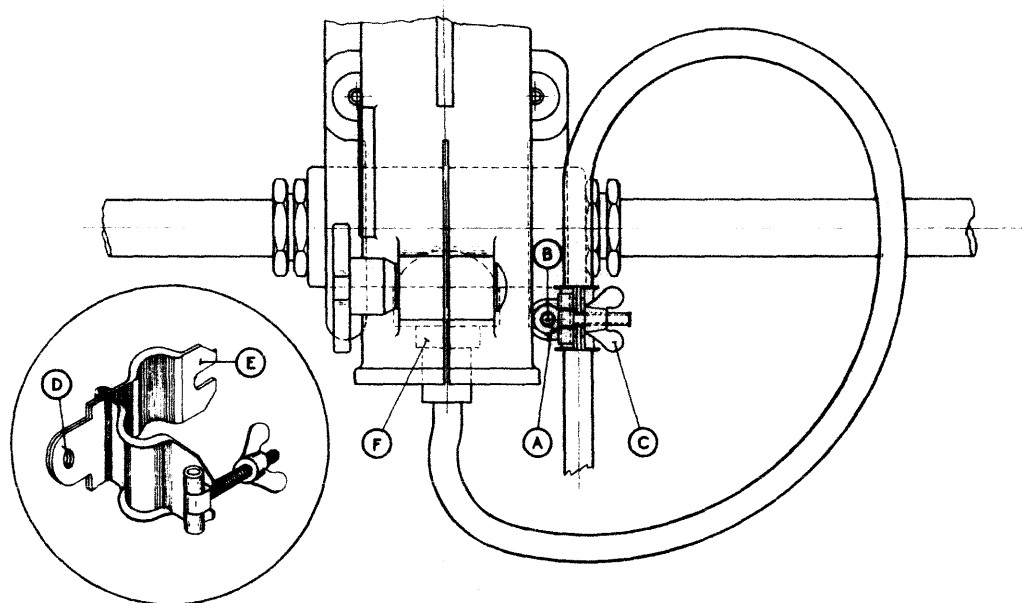


FIG. 10. FITTING CABLE CLAMP TO DIPOLE ASSEMBLY.

- (b) If the distant station cannot be seen then the local aerial must be aligned on the distant aerial by means of a compass and a map. It is important that the director (the shortest) element must always be the nearest towards the distant station.
- (c) The final orientation of the aerial may be obtained by slowly rotating the mast slightly clockwise and anti-clockwise, in turn, until a point is fixed where a maximum amplitude of signal is received. When the final orientation has been completed tighten the erecting clamping screw.

6. Mounting the Aerial Array on a Telegraph Pole (Figs. 4, 11 & 12)
(Vertical polarisation)

(1) Preliminary

- (a) The following instructions for fitting the support assembly on a telegraph pole are detailed on the assumption that the telegraph pole is already erected on the site. It is probable that many sites will not have a convenient pole available and consequently a pole may be issued for the purpose of mounting the aerial array. In this case, the support mounting can be fitted to the top of the pole, either before or after the pole is erected, by following the instructions given below.

CHAPTER II - Sections 5 & 6

- (b) Referring to Figs. 4 and 11, the support assembly for mounting the Aerial Array Yagi No. 2 on a telegraph pole consists of a support channel with spigot (A), two cross bearers (B), four eyebolts with thimbles (C), two bracing wires (D), a cable cleat (E) with wing nut (F) and four 'bull-dog' clips (G).
- (c) If no climbing steps are fitted on the telegraph pole, the components mentioned in sub-para. (b) above can be assembled and attached to the pole at ground level and, after a slight loosening of the nuts on the eyebolts, the whole assembly can be moved up to its position on the pole. The method of raising is done with the aid of a rope by two men on ladders using safety belts. After hauling the assembly into position, it is secured by tightening the nuts on the eyebolts.

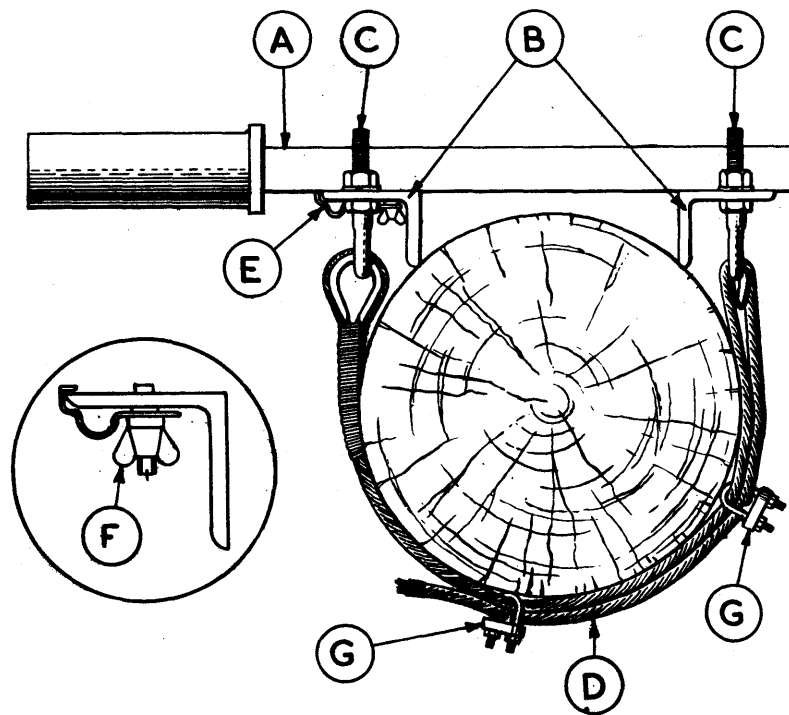
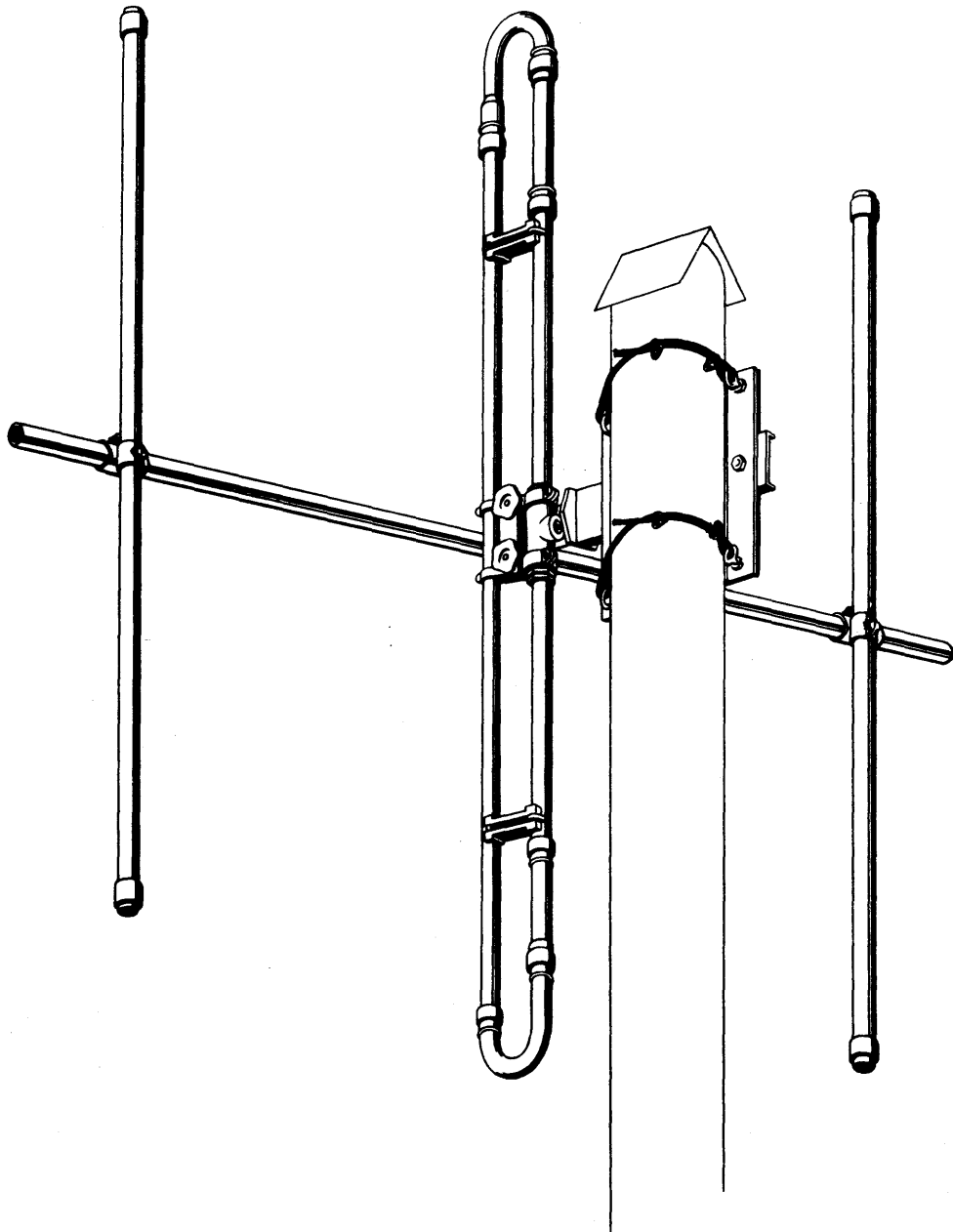


FIG. II. FITTING SUPPORT ASSEMBLY TO TELEGRAPH POLE.

- (d) If climbing steps are fitted to the telegraph pole the support assembly can be prepared to a certain extent at ground level, lifted up to its position on the pole and then secured by inserting and tightening the eyebolts only.
- (2) Fitting the Support Assembly to a telegraph pole already erected, not provided with climbing steps (Figs. 4 and 11)
- (a) Referring to Fig. 4, three holes are provided at each end of the support channel (A) to allow the cross bearers (B) to be adjusted in accordance with varying pole diameters.
- (b) Hold the flat face of support channel (A) against the pole and estimate which holes are suitable to take the bolts clamping the cross bearers (B). The latter should be bolted to the support channel with the cross bearer carrying the cable cleat (E) nearest to the spigot.
- (c) Insert the four eyebolts (C) through the holes in the cross bearers (B) as shown in Fig. 11 and screw up the nuts until approximately one inch of each bolt protrudes beyond the nut.
- (d) Place the cross bearers against the pole so that the cable cleat is below the support channel. Take the free end of each bracing wire (D) around the pole and thread its end through the relevant thimble of an eyebolt. Draw the bracing wire as tight as possible and bend it back on itself around the thimble and secure the two portions of the wire together by fitting and clamping the two 'bull-dog' grips (G) as shown in Fig. 11.
- (e) Slacken off the nuts on the eyebolts to an extent that allows the whole assembly to be freely lifted to the position where it is to be clamped to the pole. The lifting may be done with the aid of a rope by two men on ladders using safety belts.
- (f) At the selected position screw up (temporarily) the nuts on the eyebolts tight enough to hold the support assembly until the aerial array has been fitted (See para. (4) below).
- (3) Fitting Support Assembly to a telegraph pole already erected provided with climbing steps
- (a) Proceed as instructed in paras. (2)(b), (c) and (d) above.
- (b) Unscrew and remove the two eyebolts from one of the cross bearers. Detach the support assembly from the pole.
- (c) The support assembly is now lifted and placed in its selected position on the pole. The lifting may be done with the aid of a rope by a man on a ladder or using the steps and a safety belt.

CHAPTER II - Section 6



- (d) Replace and screw up (temporarily) the two eyebolts into the cross bearer tight enough to hold the support assembly until the aerial array has been fitted. (See para. (4) below).
- (4) Fitting the Aerial Array to the Support Assembly (Fig. 12)
- (a) Assemble the aerial array and set it up to the selected frequency, as instructed in Section 4 of this Handbook.
- (b) Using the method of a man on a ladder, or climbing steps, and with the aid of a rope, lift the aerial array up to the support assembly already fitted and insert the support channel spigot into the socket of the aerial support casting assembly ((E) in Fig. 3). After ensuring that the aerial array is truly vertical tighten the socket clamping screw.
- (c) At this stage the coaxial feeder cable should be connected to the terminating plug on the dipole assembly and secured in position by tightening the locking ring on the socket ((F) in Fig. 10).
- (d) The aerial array should now be aligned with the aerial array at the distant station. If the aerial array at the distant station can be seen then the local array and its support mounting assembly must be turned until the director (the shortest) element is the nearest to, and the boom assembly on the aerial is pointing directly towards, the distant station. To do this slightly loosen the nuts on the eyebolts.
- (e) If the distant station is not visible from the local station then the bearing of the distant station must be plotted with the aid of a compass and a map and the local station aerial array aligned on this bearing. It is important that when aligning the aerial the director (the shortest) element should always be placed nearest to the distant station and the boom of the aerial pointing directly along the compass bearing.
- (f) When the aerial array has been correctly aligned tighten up all nuts on the eyebolts, until the cross bearers bite firmly into the pole, making sure that the aerial alignment is not disturbed in any way during the tightening of the nuts.
- (g) The coaxial feeder should now be secured to the cable clamp. Referring to Fig. 11 unscrew the wing nut (F) to its fullest extent. Lift the metal cleat (E) clear of the cross bearer (B) and insert the coaxial feeder cable beneath the cleat. Hook cleat back in position on the cross bearer and tighten the wing nut (F).
- (h) Securely lash the coaxial feeder to the pole at suitable intervals.
- (j) The fitting of the aerial array to the pole mounting is now complete.

NOTE: All screw threads of nuts, bolts, clamping screws, etc. must be lightly greased and the sliding portions of the aerial elements lightly lubricated with a thin oil, at all times. This will facilitate erection and dismantling and prevent rust and corrosion.

7. General

- (1) In general the lowering and dismantling of the aerial array, the mast and pole mounting support assemblies should be carried out in the reverse order to that in which they were erected.
- (2) Care must be taken at all times to ensure that coaxial feeder cables are not damaged in any way. Avoid sharp bends, abrasions and puncturing of the insulation.
- (3) When dismantling aerial array or pole mounting support assemblies do not drop components from the top of the pole to ground level. Lower each item by means of a rope.

8. Lowering and dismantling aerial array mounted on a mast

- (1) Proceed as instructed in Section 11 of the User Handbook for Mast 36 ft., Steel, Lightweight D.F., No. 1, (W.C. Code No. 10747) and when dismantling has reached the stage outlined in Section 11, para. (2)(c) of the handbook, loosen the captive screw that clamps the support casting assembly to the mast spigot and detach the aerial array. (See Fig. 8).
- (2) Referring to Fig. 10, unscrew to its fullest extent the cable clamp wing nut (C), lift the hinged arm (E) and remove the coaxial feeder cable from the clamp. Replace hinged arm and tighten the wing nut.
- (3) Loosen (anti-clockwise) the locking ring (F) on the coaxial feeder socket and detach the feeder from the coaxial termination on the dipole element mounting. Neatly coil and secure the feeder cable, avoiding sharp bends or kinks, and stow.
- (4) Referring to Fig. 8, unscrew (anti-clockwise) the locking rings "C" and "E" on the director, the reflector and the dipole elements, slide the extensions back inside tubing and tighten the locking rings.
- (5) Loosen the captive clamping screws "A" on the director and reflector elements and slide each element clear of the boom assembly.
- (6) Loosen the two boom assembly captive clamping screws on the support casting and remove the boom.
- (7) Strap, or bind, the three elements and the boom assembly into a neat bundle and stow.

9. Lowering and dismantling aerial array and support assembly mounted on a telegraph pole

- (1) Referring to Fig. 11, unscrew the wing nut (F) and lift the metal cleat (E) clear of the cross bearer (B). Remove the coaxial feeder cable from the clamp. Hook the cleat back into position on the cross bearer (B) and tighten the wing nut (F).

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CHAPTER III - Section 9

- (2) Loosen (anti-clockwise) the locking ring on the coaxial feeder and detach the feeder from the coaxial termination on the dipole element mounting. Lower the end of the feeder cable to ground level. Neatly coil and secure the feeder cable avoiding sharp bends or kinks and stow.
- (3) Referring to Fig. 12 loosen the captive screw that clamps the aerial support casting assembly to the support channel spigot.
- (4) Detach aerial array from the pole mounting support assembly and, by means of a rope, lower the aerial array to ground level.
- (5) Dismantle and stow the aerial array as instructed in Section 8, paras. (4) to (7) above.
- (6) Referring to Fig. 11, unscrew the nuts and remove two eyebolts (C) from one of the cross bearers (B) and, by means of a rope, lower the whole pole mounting support assembly to ground level. Replace nuts on eyebolts.
- (7) Unscrew the nuts and remove the two eyebolts from the second cross bearer. Replace the nuts on eyebolts.
- (8) Unscrew nuts and detach the two cross bearers from the support channel (A). Replace the nuts on the bolts in the support channel.
- (9) Strap, or bind, the two cross bearers, the two bracing wires (with eyebolts and bull-dog grips attached) and the support channel in a neat bundle and stow.

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