10-ounce pressure.

30. It is probable that operators who have been trained on a standard key will take a little time to become accustomed to the new key. With practice, however, good working speeds will soon be attained.

31. Grooves at the base of the key, and a corresponding guideway on the side of the transmitter enable the key to be attached to the set.

Cases, spares, A510.

32. This small tin contains the crystals (Crystal units, Style DE) which are obtained from Signals, and the spare dial illumination lamps (Lamps, pilot, 1.5V, G.E.C. type 112). A small plastic pouch (Pouches, style D crystal units) is provided as additional protection for the crystal units. The pilot lamps screw into holders on one side of the tin.

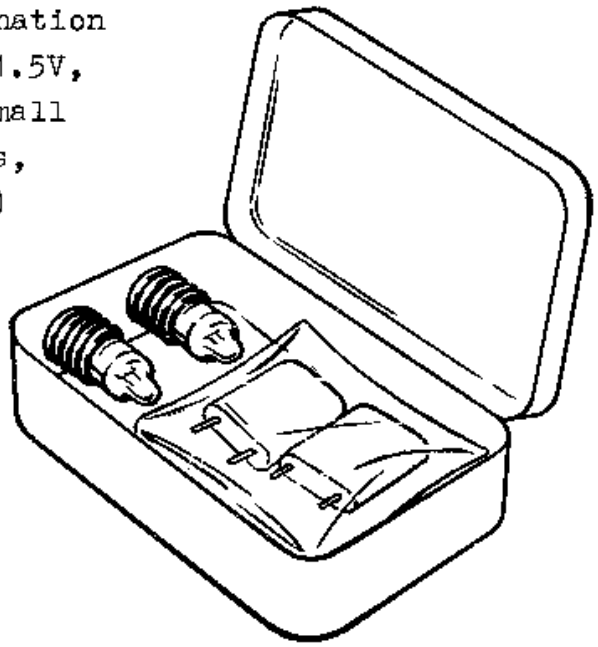


FIG.11 - CASES, SPARES, A510

SECTION 6 — TRANSIT AND CARRYING EQUIPMENT.

Cases, transit, A510. (Fig.12)

33. A wooden transit case is provided for transporting the complete station. It is intended for vehicular transportation of the station, not by troops on foot.

34. When received from Ordnance the case contains all the items shown in Fig. 14, except the batteries and crystal units which are issued separately.

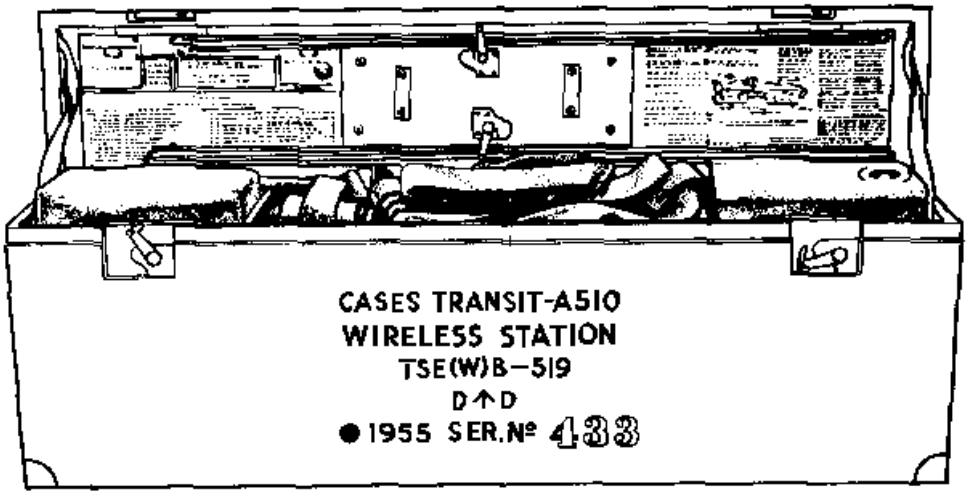


FIG.12.

35. The inside face of the lid bears plates which show packing details and operating instructions.

Webbing carrying equipment.(Fig.13)

36. The following items of webbing equipment are provided for man-carriage of the A510 set, its aerials and accessories :-

Cases, carrying,flexible aerial (also carries the rod tuner and the handset).

Pouches, receiver, A510.

Pouches, transmitter, A510.

Satchels, signals, No.1, or Satchels, signals, No.1, Mk. 1/1.

37. It will not always be necessary to carry a complete station when operating on foot, but should this be required, the complete station can be accommodated in the items illustrated in Fig. 13.

SECTION 7 — WEIGHTS AND DIMENSIONS.

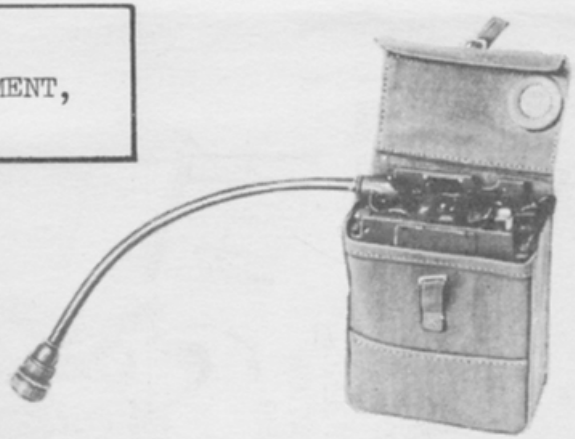
38. The weights and dimensions of all items comprising the complete working station are shown in Table 1. Of these, items 2, 5,and 17 are not received in the initial issue but are demanded separately. All items listed are illustrated in Fig.14.

FIG. 13

WEBBING CARRYING EQUIPMENT,
WS A510.

POUCHES, RECEIVER, A510
WITH RECEIVER.

SATCHELS, SIGNALS, NO. 1
WITH CONTENTS



POUCHES, TRANSMITTER, A510
WITH TRANSMITTER.

CASES, CARRYING, FLEXIBLE AERIAL, WITH TWO
ROD AERIALS, ROD TUNER AND HANDSET.

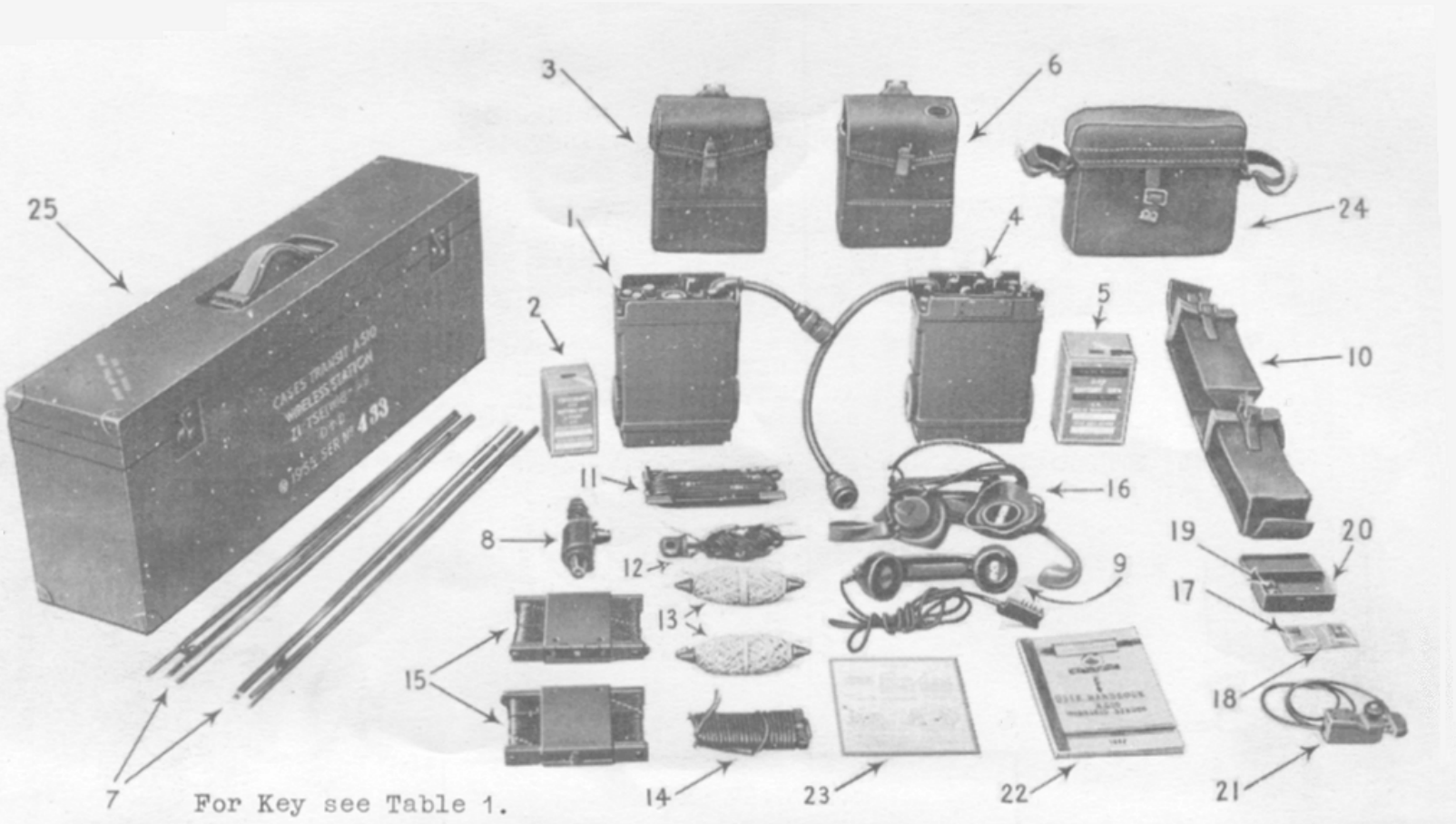


FIG.14 - LAY-OUT OF COMPLETE A510 STATION.

TABLE 1 - WIRELESS STATION A510 - WEIGHTS AND DIMENSIONS

Item No. (See Fig. 14)	No. per Station	Ordnance Nomenclature	Weight lb.	Weight oz.	Dimensions Inches	Remarks
1	1	RECEIVERS, A510	7	6	8½x6½x3½	
2	1	BATTERIES, dry, L.T., 1.5-volt	1	4	4x2½x2½	Issued separately.
3	1	POUCHES, receiver, A510		15	10x7¼x4	Holds items 1 and 2. Filled weight 9 lb. 9 oz.
4	1	TRANSMITTERS, A510	7	0	8½x6½x3½	
5	1	BATTERIES, dry, H.T. bias, 90/7.5-volt	2	13	5⅜x3½x2¾	Issued separately.
6	1	POUCHES, transmitter, A510		14	10x7¼x4	Holds items 4 and 5. Filled weight 10 lb. 11 oz.
7	2	AERIALS, flexible, 8-ft. (Aust.)	(each) 4		26¼ (each section)	
8	1	INDUCTORS, tuning, 8-ft. flexible aerial		10	6¾ long	
9	1	TELEPHONES, hand, SI, No.4A (Aust.)		10	8½ long	With 72-in. of cord.
10	1	CASES, carrying, flexible aerial		11½	27½ long	Holds items 7,8,9. Filled weight 2 lb. 7½ oz.
11	1	AERIALS, end-fed, adjustable, 135-ft.		13	7⅛x3¾ *	*Dimensions of aerial bobbin.
12	1	COUNTERPOISE ASSEMBLIES		3½	7¼ *	*Length of counterpoise spike.
13	2	CORDS, aerial, weighted	(each) 7		6¼ *	*Length of bobbin.
14	1	FEEDERS, aerial, 70-ohms		8	5¼x2¾x1	
15	2	AERIALS, lightweight, 68-ft.	(each) 12		6⅛x4½x1*	*Dimensions of aerial bobbin.
16	1	MICROPHONE AND RECEIVER HEADGEAR ASSEMBLIES, SI, lightweight		11	8½ span	With 72 inches of cord.
17	10	CRYSTAL UNITS, style D.E.			-	Issued separately.
18	1	POUCHES, style D crystal units		2½	-	Holds item 17.
19	2	LAMPS, pilot, 1.5-V., G.E.C. type 112			-	
20	1	CASES, spares, A510			3⅝x2⅝x1¼	Holds items 17,18,19.
21	1	KEYS, telegraph, lightweight, (Aust.), No.1		5	2½x1⅞x1	
22	1	USER HANDBOOK, A510 wireless station		4	8½x5½	Early stations issued with "PROVISIONAL NOTES".
23	1	CHARTS, instruction, A510		1½	6⅞x5⅞	
24	1	SATCHELS, signals No.1, or No.1 Mk. 1/1	1	4	11x9x3	Holds items 11 to 23.
25	1	CASES, transit, A510	15	14	30⅝x11x6¼	When received from Ordnance contains all items except 2, 5, and 17. Filled weight= 41 lb. 3 oz.

CHAPTER TWO
AERIALS AND COMMUNICATION DETAILS

SECTION 8 — GENERAL.

Definitions.

39. The two methods of communication used, "Ground Wave" and "Sky Wave", are defined below :-

(a) Ground Wave communication means the transmission of radio energy along the earth's surface. It is more reliable than Sky Wave communication but can only be used over short distances, and is useless in dense scrub and jungle.

(b) Sky Wave communication is used for long distance communication, and is the only practical method when working in dense scrub or jungle. In this method, radio energy, transmitted skywards, is reflected earthwards by a "ceiling" called the ionosphere. The height of this "ceiling" is changing continually, and this is one of the causes of signals fading in strength, a common fault in sky wave communication.

Ground wave communication with WS A510.

40. Despite the low output of the A510 wireless set, the following communication distances are typical of those that can be achieved under average conditions, when using ground waves :-

	"VOICE" Miles	"CW" Miles
(a) Rod aerial to rod aerial -		
Sets on men	2	4
Sets on ground	3	6
(b) Wire aerial to wire aerial	5	10

41. In order to achieve these distances, it is necessary to observe carefully the instructions which follow. Where conditions are below average, (poor

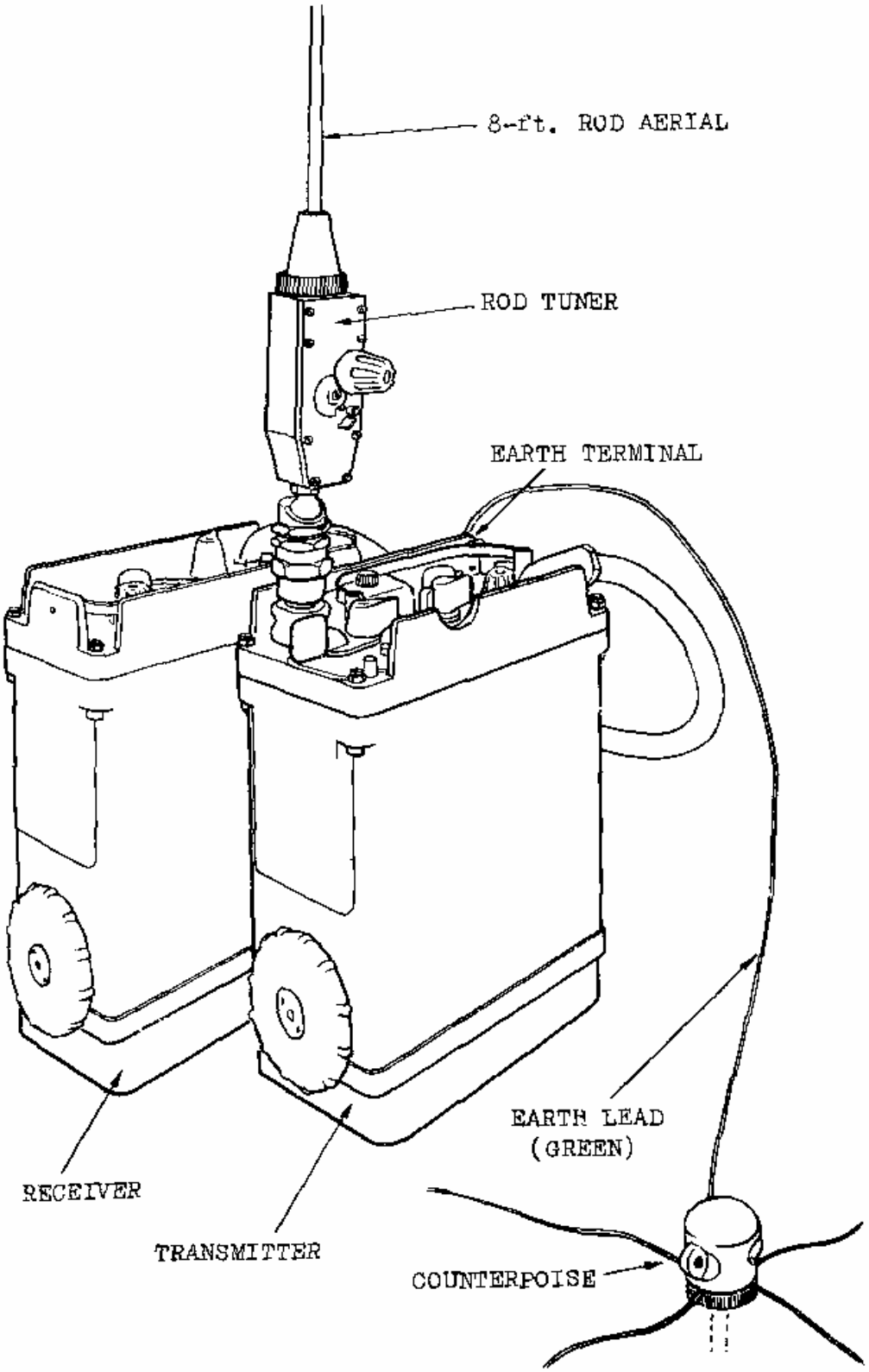


FIG.15 - ROD AERIAL GROUND STATION

siting or terrain, unsuitable frequency, etc.), further measures are suggested to assist operators to obtain better results. If these measures are taken under good conditions, distances in excess of those shown may be achieved. (Communication up to 7 miles has been made with rod to rod, and with sets on the ground.)

Sky wave communication with WS A510.

42. It is not possible to predict accurately the ranges obtainable when using sky wave communication as these will vary with locality, time of day and year, weather conditions, etc. However, if the aerials are set up correctly, and correct frequencies are chosen, it should generally be possible to achieve 40 miles communication on "VOICE", and about 120 miles on "CW".

It cannot be too strongly emphasised that the use of local frequency prediction charts is necessary to get the best possible sky wave communication from your A510.

43. When using sky wave communication the area above the aerial should be clear. Improvement can often be effected by adjusting the height of the aerial, particularly the horizontal dipole aerial. Generally speaking, such an aerial 30 feet above earth will provide satisfactory operation for ranges up to 30 miles. When necessary, increase in aerial height will usually improve transmission and reception, and the rule here is "the lower the frequency, the higher the aerial". The best height of aerial is roughly equivalent to the length of wire unwound from one aerial bobbin for a given frequency (maximum 68 feet), but this is an ideal which will not often be possible in jungle conditions.

In emergencies, when orthodox methods have failed to improve sky wave reception, lower-

ing of the aerial to approximately 2 ft. above the earth may often make signals heard more clearly above background noise. Changing direction of aerial may also improve conditions.

SECTION 9 — THE ROD AERIAL.

(2-10 Mc/s)

General.

44. This aerial [Aerials, flexible, 8-ft. (Aust.)] is by far the easiest to set up. A trained operator can assemble a rod aerial station in less than 2 minutes, and have it "on the air" in a further 2 minutes. However, its use limits the operator to ground wave operation, and it is therefore only suitable for short distance communication. The WS A510 and its rod aerial can be used in any of the following roles :-

	Expected range in miles	
	VOICE	CW
(a) Set on man ..	2	4
(b) Set in mobile vehicle	2	4
(c) Set on ground, and using counterpoise ..	3	6

45. The rod aerial has a nylon cord running through its four mating sections. Near one end (the thickest end of the rod) the cord has a button affixed to it. At the opposite end is a small ferrule. The cord is primarily intended to prevent loss of the rod sections, *NOT* for their complete assembly, except in certain circumstances when conditions are more difficult; at night, for example.

The Rod Tuner (Inductors, tuning, 8-ft. flexible aerial).

46. The rod tuner is part of the aerial system of the rod aerial station, and is, in effect, a variable inductance designed to tune the rod aerial. It is attached to the transmitter unit by a bayonet plug and socket, and above that, a ball and socket joint enables movement of the aerial to the position required by the operator. Above the ball and socket

joint is a tuning knob which controls the variable inductance. A small indicator, which revolves when the tuning knob is turned, gives *APPROXIMATE* indication of tuning only; *correct tuning of the rod aerial is achieved by watching the aerial tuning meter on the transmitter unit.* (See Drill in FIG.30.) A locking switch is provided to lock the tuning knob when the correct position has been found. The other end of the rod tuner is prepared to take the bottom section of the rod aerial.

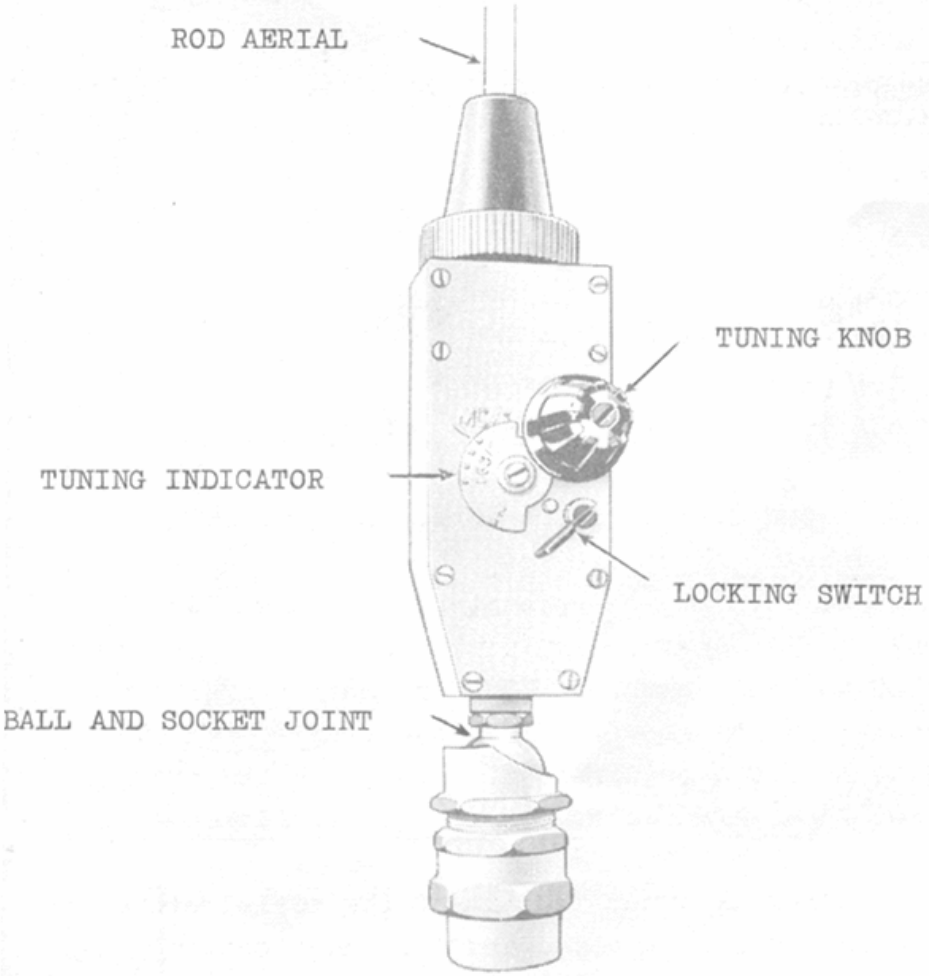


FIG.16 - THE ROD TUNER
(Inductors, tuning, 8-ft. flexible aerial)

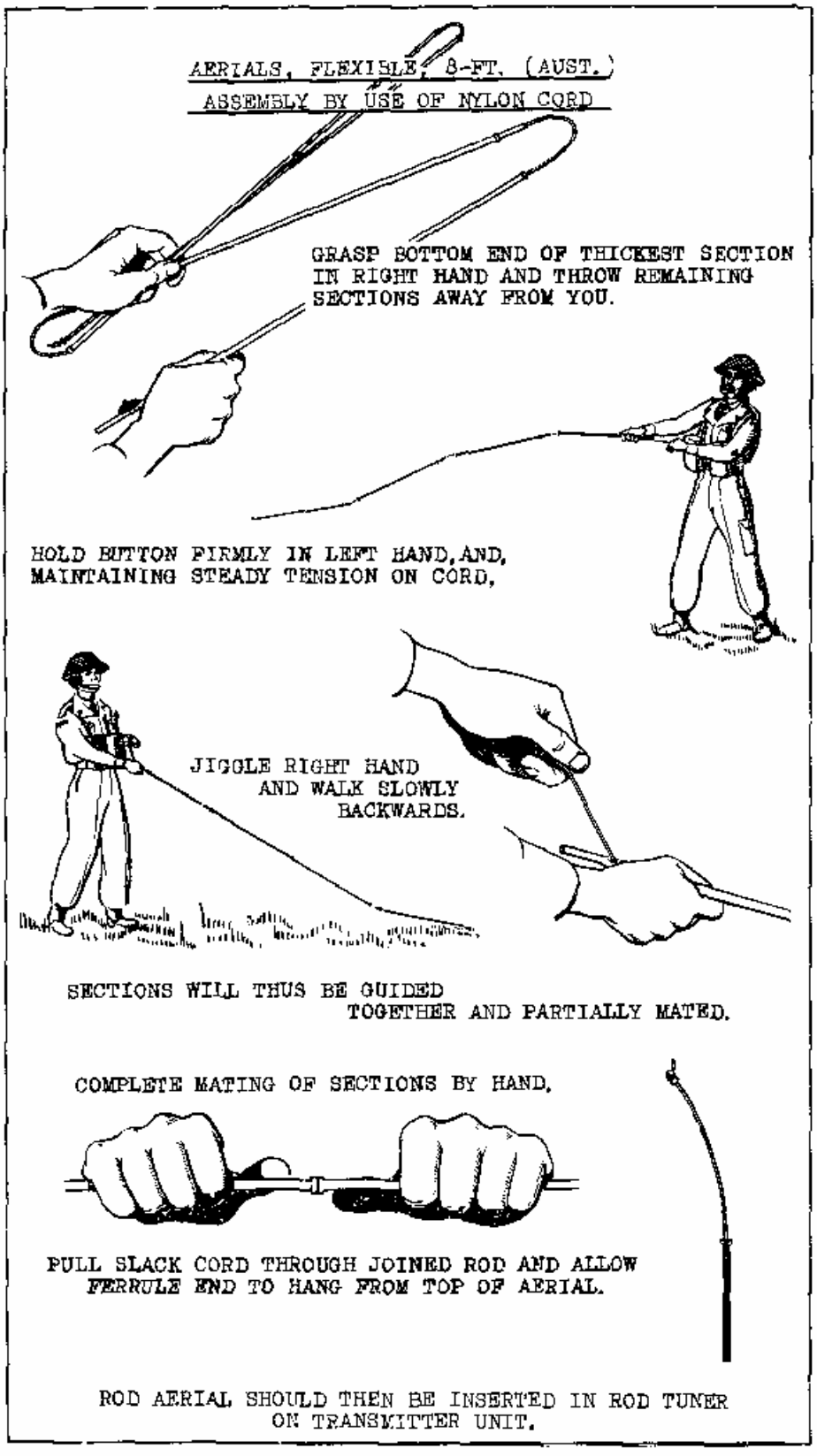

AERIALS, FLEXIBLE, 8-FT. (AUST.)
ASSEMBLY BY USE OF NYLON CORD
GRASP BOTTOM END OF THICKEST SECTION IN RIGHT HAND AND THROW REMAINING SECTIONS AWAY FROM YOU.
HOLD BUTTON FIRMLY IN LEFT HAND, AND, MAINTAINING STEADY TENSION ON CORD,
JIGGLE RIGHT HAND AND WALK SLOWLY BACKWARDS.
SECTIONS WILL THUS BE GUIDED TOGETHER AND PARTIALLY MATED.
COMPLETE MATING OF SECTIONS BY HAND.
PULL SLACK CORD THROUGH JOINED ROD AND ALLOW FERRULE END TO HANG FROM TOP OF AERIAL.
ROD AERIAL SHOULD THEN BE INSERTED IN ROD TUNER ON TRANSMITTER UNIT.

FIG. 17

NOTE

The rod aerial can be accurately tuned when receiving by listening to atmospheric noise, and tuning the rod tuner for maximum noise. The tuning position so obtained will normally be the same as that given by watching the aerial tuning meter for maximum deflection. This alternative method should be used when it is not possible to establish communication by the normal method.

Assembling the rod aerial.

47. In daylight conditions the sections should be joined together by hand, and then fitted to the rod tuner.

48. Should it be necessary to assemble the rod aerial during night time, the operator should proceed as shown in Fig.17. With a little practice this operation can be performed in a few seconds. As operators become more proficient, the possibility of damage to the nylon cord will decrease.

Use this method as little as possible as it reduces the life of the aerial sections as well as the nylon cord. It is almost as quick to join the sections together by hand.

Precautions to be observed when using the rod aerial.

49. (a) Set on man. Do not tune near trees. If you *must* it may be better to re-tune the rod tuner when receiving from the distant station, or tune carefully for maximum atmospheric noise.

(b) Set in vehicle. Before tuning, connect a wire from the earth terminal on the transmitter to the frame of the vehicle. Keep the aerial away from metallic objects as far as possible. If communication is

unsatisfactory, try turning the vehicle through a circle, testing at different vehicle directions for an improvement.

(c) Set on ground. Both in tuning and operating, try to keep arms and body as far as possible from the aerial. In particular, try to keep your body away from the rod tuner. If possible use the counterpoise spike with the counterpoise wires spread out. Connect the green counterpoise wire to the transmitter earth terminal.

To increase range of the rod aerial station.

50. The following hints will help to increase the range of the rod aerial station :-

(a) If operating below 4 Mc/s. Increase frequency if possible.

(b) If operating below 7 Mc/s. Attach a 16-ft. length of wire (any wire) to the top section

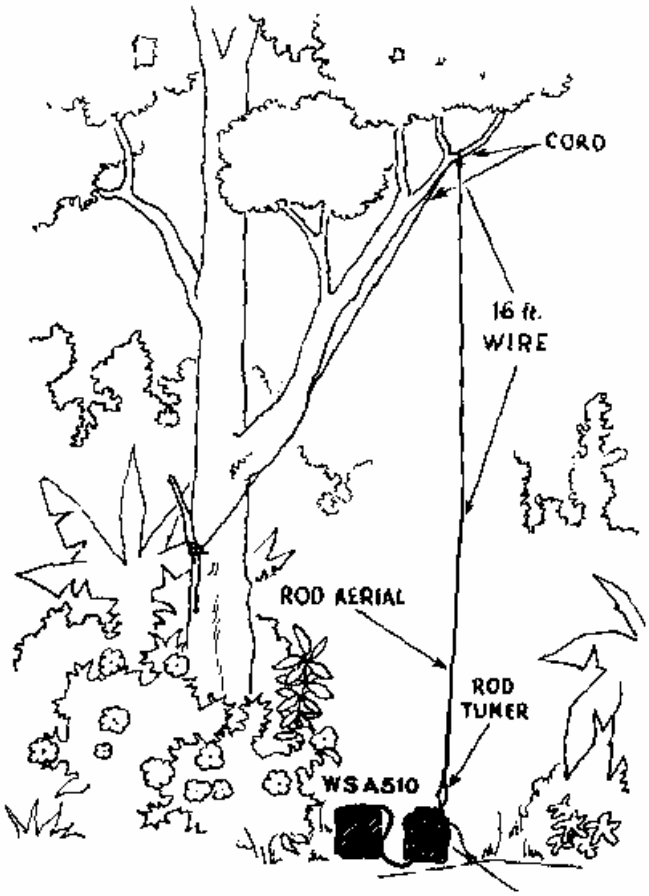


FIG.18 - EXTENSION OF ROD AERIAL

of the rod aerial, and suspend the other end from a tree of suitable height, as shown in Fig. 18.

KEEP THE AERIAL WIRE AS FAR AS POSSIBLE FROM THE TREE.

Then re-tune the rod tuner. This method of improvisation should increase the range by approximately 100 per cent.

(c) If operating above 7 Mc/s. Remove the rod aerial and rod tuner from the transmitter unit, and suspend a 24-ft. length of any available wire from a convenient tree. Attach the free end direct to the aerial terminal. In this method, aerial tuning is performed by turning the frequency control knob on the transmitter.

(d) Use the counterpoise whenever possible.

51. Further increases in range can only be obtained by correct use of the end-fed and dipole aerials described in Sections 10 and 11.

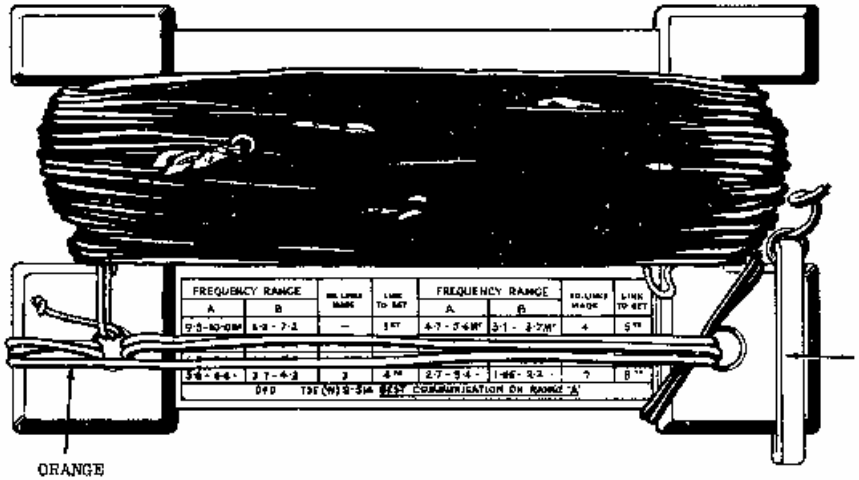
SECTION 10 — THE END-FED AERIAL AND ACCESSORIES.

(2-10 Mc/s)

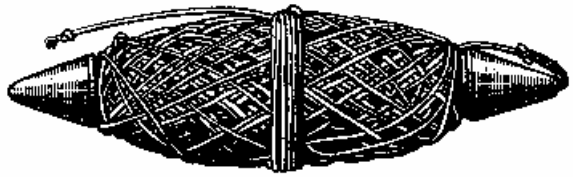
General.

52. The end-fed aerial (Aerials, end-fed, adjustable, 135-ft.) is simpler to erect than the dipole aerial. It is depicted in the accompanying illustrations, and on the bobbin insulator. The bobbin also displays a chart which indicates the number of links of the aerial to be used for each frequency. The frequency ranges mentioned (A and B) correspond to the A and B positions of the **A-B-Net** switch on the transmitter unit.

53. The aerial consists of eight different lengths of wire. The first terminates at the open end in an insulator, and at the other in the "eye"



AERIALS, END-FED, ADJUSTABLE, 135-ft.



CORDS, AERIAL, WEIGHTED

COUNTERPOISE ASSEMBLY

NOTE: The frequency ranges "A" and "B" shown on the aerial bobbin correspond to the "A" and "B" positions on the transmitter "A-B-NET" switch.

FIG.19 - END-FED AERIAL COMPONENTS

half of a link assembly.

54. The next length starts with the "hook" half of the link assembly, and terminates in the "eye" half, as do all the remaining lengths. Each link is numbered on the linkage components in the order of erection, and as shown on the bobbin chart.

NOTE

Aerials may be encountered in which the links are not numbered. These are earlier models which will gradually be replaced.

55. For safe keeping, each length of aerial is joined to the next by a few inches of nylon cord. Fig. 20 shows the make-up of this aerial assembly.

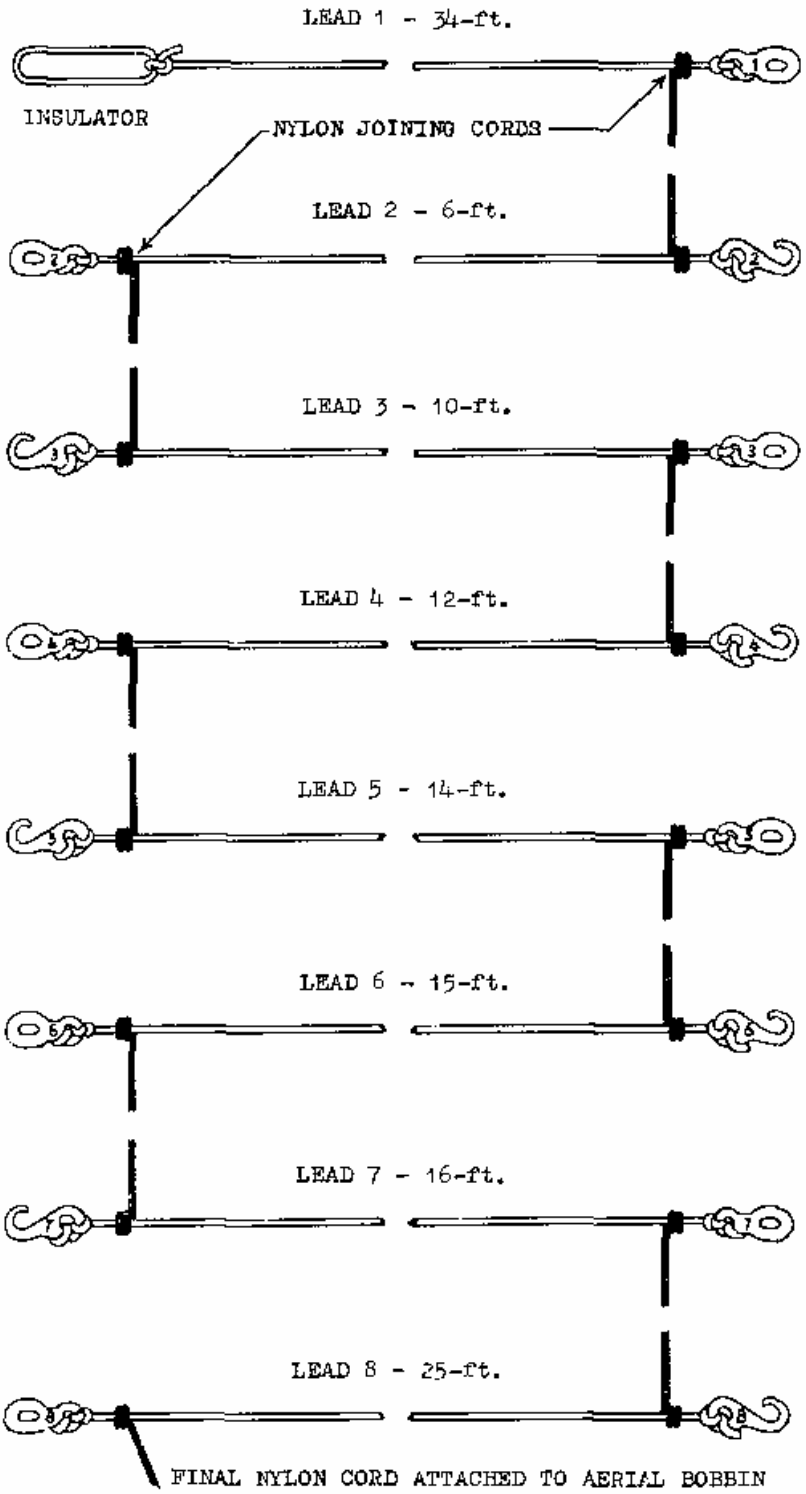
IMPORTANT

Each link of the aerial is different in length from the others, (See Fig. 20 for link lengths), and the frequencies obtained depend on the links used. The links are wound on the bobbin in the reverse order to that shown in the chart. It follows that great care must be taken to preserve this order, and to avoid damage or loss of any of the links. It is advisable to examine the aerial frequently, and to ensure that the nylon joining cords are securely fastened to the linkage components, and that all links are present.

56. Also attached to the aerial bobbin is an orange lead-in wire for connection to the final link of the aerial and the transmitter unit.

57. The following figures give an indication of the ranges that can be expected with the end-fed aerial :-

Ground Wave		Sky Wave	
VOICE	CW	VOICE	CW
6	12	25	75



LAST EYE IN USE IS JOINED TO HOOK ON 3-ft. ORANGE AERIAL LEAD TO SET

FIG. 20 - COMPOSITION OF END-FED AERIAL

REMEMBER

A horizontal or inclined aerial must be used to receive and transmit sky wave signals satisfactorily.

Erection of the end-fed aerial.

58. (a) Locate a suitable tree.

(b) Unwind the aerial cord, and, holding the free end, throw the bobbin over the highest possible branch.

(c) Connect the free end of the cord to the insulator on the aerial.

(d) Unwind as much of the aerial as required in the direction approximately at right angles to the line of the distant station.

(e) Haul on the aerial cord to raise the aerial to the required height. Make fast the cord to the tree.

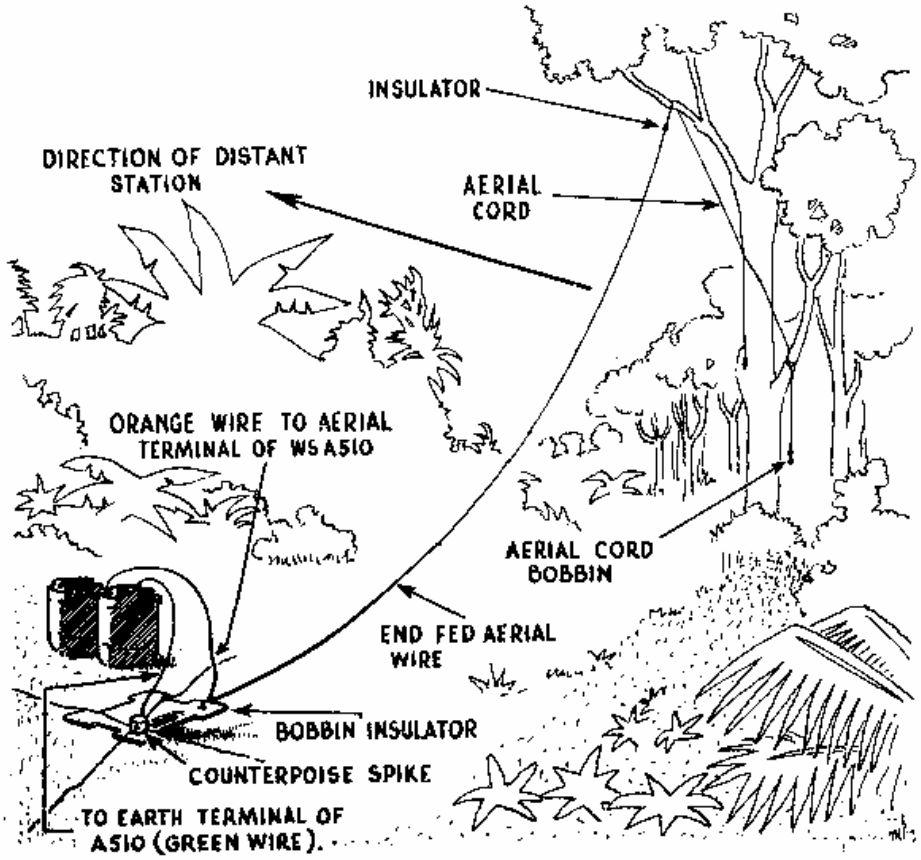


FIG. 21 - END-FED AERIAL ERECTED

NOTE

The maximum breaking strain of the cord is 55-64 lb. The minimum breaking strain of the aerial wire is 64 lb. This is purposely arranged to avoid breaking the aerial when undue strain is exerted in hoisting it. NEITHER THE AERIAL WIRE NOR THE CORD WILL BEAR THE WEIGHT OF A MAN, HOWEVER SMALL - SO DON'T TRY TO SWING ON THEM!

(f) Attach the last link of the selected aerial to one end of the orange lead on the aerial bobbin, and the other end of the orange lead to the aerial terminal on the transmitter. *KEEP THE ORANGE LEAD OFF THE GROUND.*

(g) Drive the counterpoise spike through one hole in the aerial bobbin into the earth in such a position that the aerial is kept off the ground as much as possible.

(h) Spread out the four black wires of the counterpoise at 90 degree intervals, i.e., in roughly the shape of a cross. Then attach the green lead of the counterpoise to the earth terminal on the transmitter.

NOTE

1. *The "A" condition should be used whenever possible.*
2. *It is important to use the counterpoise when working with an end-fed aerial in the "A" or the "B" condition but is more particularly so in the "B" condition.*
3. *For ground wave operation, the nearer the aerial is to the vertical, the better.*

SECTION 11 — THE DIPOLE AERIAL AND ACCESSORIES.

(3.3-10 Mc/s)

General.

59. The dipole aerial, consisting of two "Aerials, lightweight, 68-ft.", is more efficient than the end-fed aerial for sky wave operation, but has little, if any, advantage for ground wave operation. Transmission frequency with this aerial is from 3.3 to 10 Mc/s.

60. The aerial and its accessories (except "Cords, aerial, weighted", which are already depicted in Fig. 19) are shown in Fig. 22.

61. Information regarding the lengths of aerial to be used for given frequencies is contained in a chart on the inside of one flap of the dipole aerial holder. The other flap depicts a method of erecting a horizontal dipole aerial.

62. The preferred arrangement for sky wave communication is to have the dipole strung between two masts, thus keeping the wire horizontal. (See Fig. 23). Trees may be used when masts are not available, but it is important to keep the aerial clear of foliage.

63. The inclined dipole (Fig. 25) is less efficient, and more prone to produce misleading tuning indications. Despite this, it is still slightly more efficient than the end-fed aerial for sky wave working.

64. The following ranges in miles can be expected with each arrangement of the dipole aerial :-

	Ground Wave		Sky Wave	
	VOICE	CW	VOICE	CW
Inclined dipole ..	6	12	30	90
Horizontal dipole ..	4	8	40	120

THE BEST SKY WAVE RESULTS WILL BE OBTAINED WHEN A HORIZONTAL AERIAL IS USED AT THE NEAR AND THE DISTANT STATION.

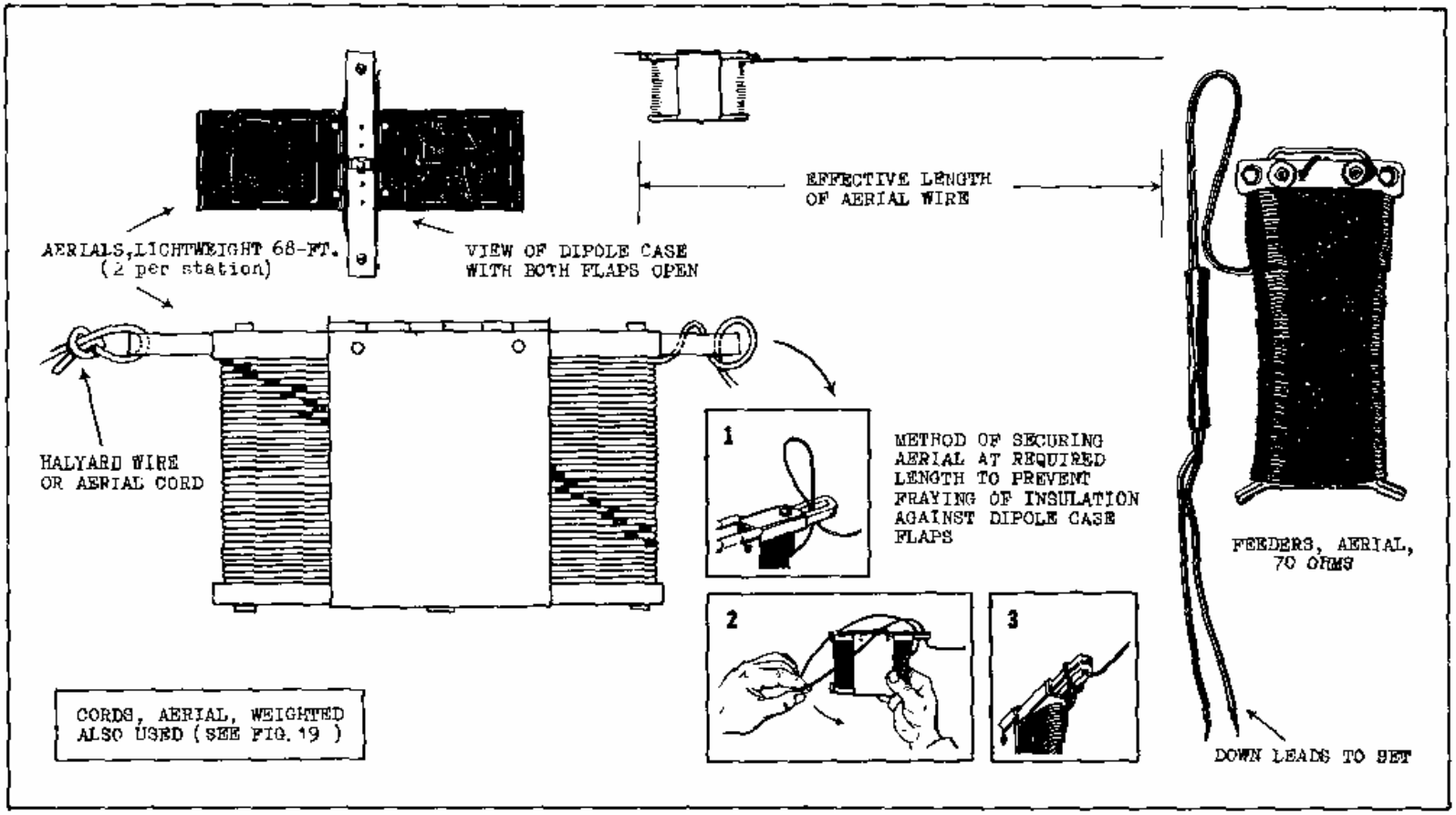


FIG. 22 - DIPOLE AERIAL COMPONENTS

Erection of dipole aerials.

65. (a) Select the aerial site, remembering that the aerial should preferably be broadside, i.e., at right angles, to the line of communication.

(b) Set up masts, or locate suitable trees, which should be approximately 140 feet apart, to allow for changes of frequency which will necessitate changes of aerial length.

(c) Unwind both spools until you have unwound on each a length of wire corresponding to the desired frequency. (A chart showing the correct lengths will be found on the inside of the dipole case flap.) Lay the wire along the ground approximately beneath the intended aerial position.

NOTE

1 : *The red marker beads on the aerial wire are at one foot intervals to enable the unwinding of correct lengths.*

2 : *The aerial wire must be unwound to the EXACT length shown, otherwise the tuning indicator will not be a reliable guide.*

3 : *The length of each dipole case should be included in the effective length of aerial. (See Fig. 22).*

(d) If setting up between trees, unwind the aerial cord, and, using the bobbin as a throwing device, throw it over the highest possible branch of the *lower* tree. Attach the cord to the dipole case as shown in Fig. 22. Then move to the other tree, and select a branch on about the same level as that of the lower tree. (This is to ensure that the aerial is as near the horizontal as possible.) Repeat the drill with the other bobbin.

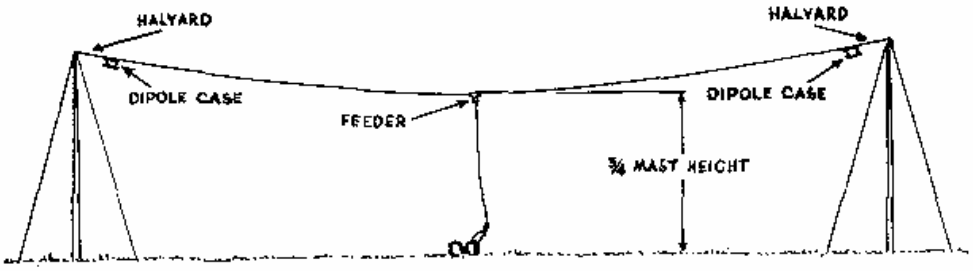


FIG. 23 - DIPOLE AERIAL SET UP BETWEEN MASTS

(e) If setting up between masts, attach the halyards to the dipole cases as shown in Figs. 22 and 23.

(f) Attach the ends of the aerial wires to the feeder terminals as shown in Fig. 24.

(g) Hoist the aerials by means of the aerial cords or the halyards.

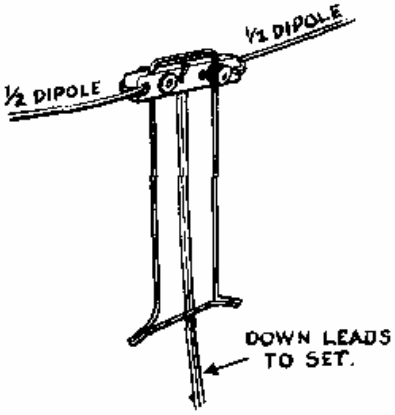


FIG. 24 - DIPOLE FEEDER ARRANGEMENT

NOTE

1 : *In the mast set-up do not hoist the feeder point higher than ¾ height of the supporting points of the aerial. The aerial is lightweight, and has a maximum breaking strain of 64 lb. Too much tension on the halyard, which is more robust than the aerial, will result in a broken aerial wire.*

2 : *In the tree set-up the aerial cord is weaker than the aerial wire but the warning still holds good, except that too much tension will break the aerial cord.*