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SECTION 1, CHAPTER 13

TRANSMITTER T.1333

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INTRODUCTION

1. The purpose of the transmitting equipment described in this chapter is to enable one-way emergency communication to be made from a dinghy, boat, or other situation, with ships and shore stations. It is capable of transmitting morse S.O.S. signals automatically and continuously, or the transmitter can be keyed and any necessary message be transmitted. With automatic transmission, the S.O.S. signal (distress) is repeated three times and these are then followed by twelve long dashes, the sequence being continued so long as the transmitter is in operation. The equipment has primarily been designed to be operated from a rubber dinghy under emergency conditions and on this account it possesses several special features which are described in detail later. The spot frequency is 500 kc/s (600 metres) crystal control and the transmitter provides either C.W. or M.C.W. service. The power output into the aerial is 5 watts and under the most suitable conditions the range is approximately 100 miles.

FIG. 1—VIEW OF EQUIPMENT IN DINGHY

2. The equipment consists of two separate units as detailed below:—

(i) Transmitter, including a hand-driven generator for all power supply, aerial wire and earth line.

(ii) Rocket kite apparatus for launching a kite into the air for support of the aerial.

3. A view showing the equipment in use is given in fig. 1. The transmitter is supported between the knees of the operator, and the aerial raised by the kite and the earth line dropped into the water. After the transmitter is tuned, S.O.S. signals are sent out automatically by merely turning the handle of the power supply generator. Operation is therefore possible by one person, but it is facilitated by a second, particularly if it is required to transmit a message by keying.

4. The transmitter is watertight and will float. It can be dropped into the sea from a height of ten feet without injury and as it is contained in a yellow waterproof cover it is easily discernible when in the water. It will not adversely be affected by altitudes up to 40,000 ft., by any temperature between + 30 deg. C. and − 20 deg. C or by vibration of 10G in any plane at frequencies between 25 and 100 c/s. The weight of the complete transmitter, including 208 ft. of aerial wire and earth line and sinker is approximately 22 lb. This weight does not, however, include the rocket kite apparatus.

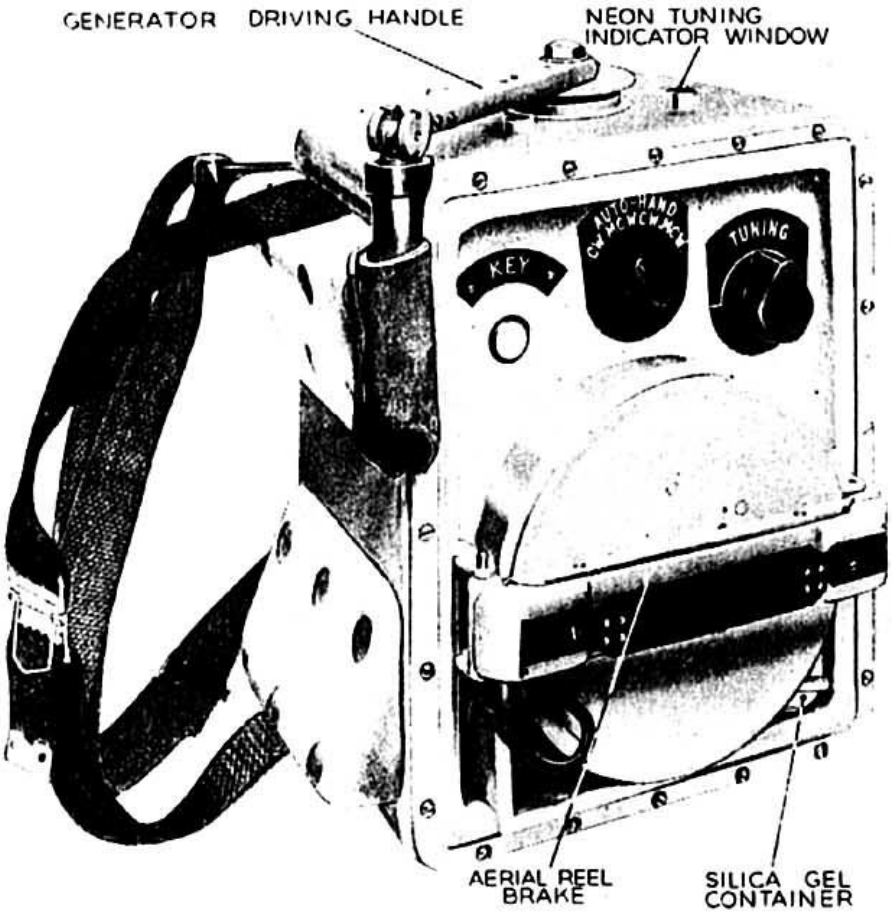


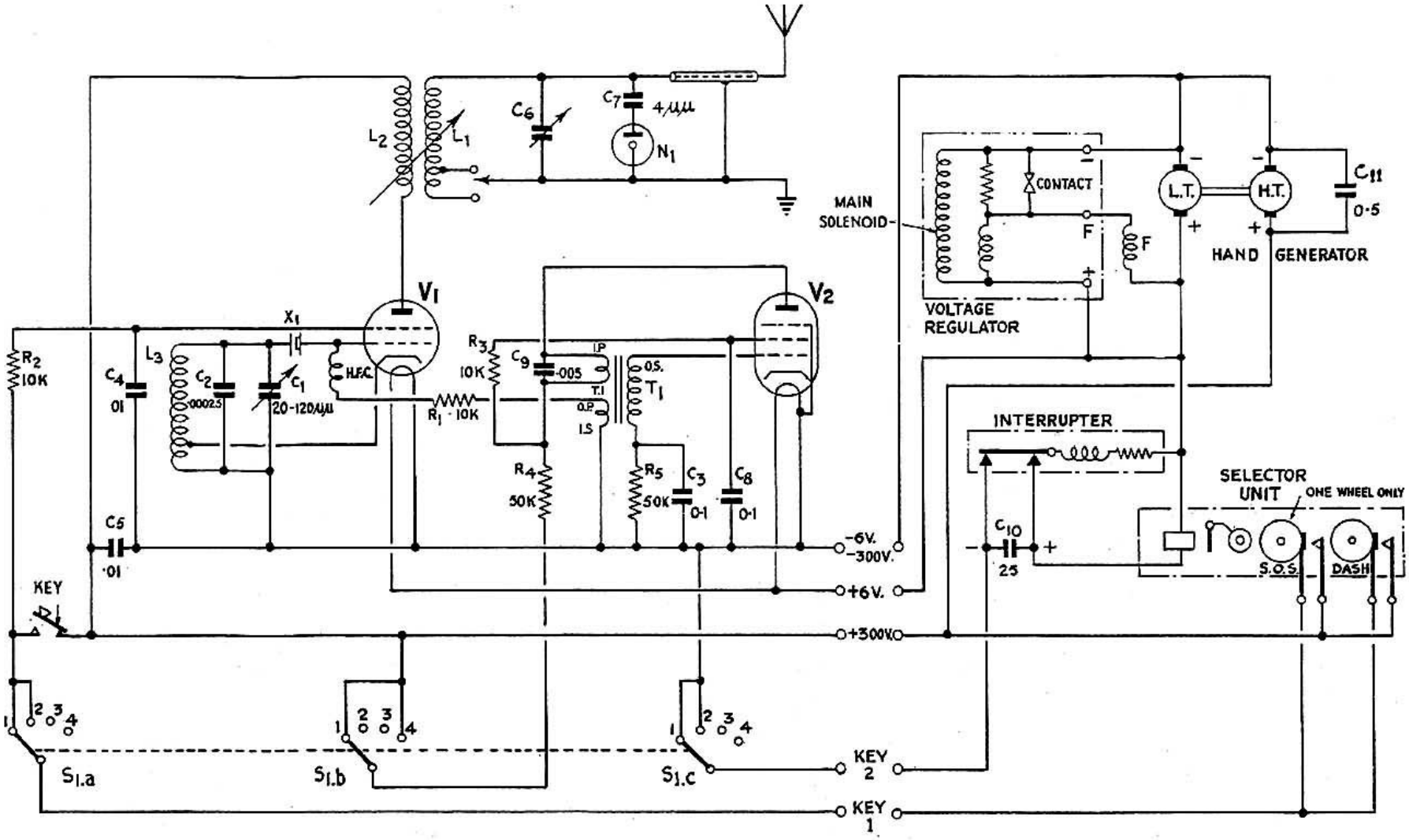
FIG. 2—VIEW OF TRANSMITTER T.1333

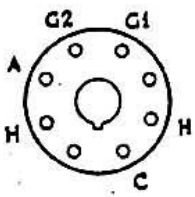
GENERAL DESCRIPTION

Transmitter

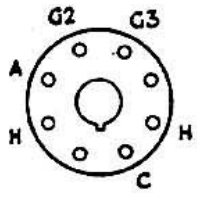
5. The view of the complete transmitter is given in fig. 2. It consists of a light steel case which contains the oscillator and modulator, the hand-driven generator for providing the L.T. and H.T. supplies, the voltage regulator, the interruptor, the selector and aerial and earth line. These units are described in detail later.

6. The circuit of the transmitter and power unit is given in fig. 3 and it will be seen that a beam power valve (type 6V6G) V_1, is used as an electron-coupled crystal-controlled oscillator. The screen grid and cathode of this valve form the elements of an inverted Hartley oscillator with a crystal X_1 inserted in the grid circuit, thus forming a crystal locked circuit. Keying is accomplished by breaking the screen supply to the oscillator.





V1 6V6G



V2 6J7G

VALVE BASES

G1 - TOP CAP

T.1333 CIRCUIT

FIG. 3

FIG. 3

7. For use on M.C.W. an A.F. pentode modulator valve (type 6J7G) V_2, is employed with a transformer T_1 to provide feed back between anode and grid circuits. The primary of the transformer is capacity tuned to give a modulating tone of approximately 1,000 c/s. This is fed to the output stage valve V_1, via the grid leak R_1 and R.F. choke (H.F.C.), by means of a tertiary winding on the transformer. The modulator valve V_2 is not keyed and oscillates continuously when in circuit.

8. The aerial coil is capacity tuned and is provided with two taps which are selected by means of a switch which is integral with the tuning condenser spindle, the effect being approximately to double the tuning range of the variable condenser C_6.

9. The aerial is connected to one end of the coil, the earth lead being connected to the other end.

10. Tuning indication is provided by a neon lamp N, which is connected in series with a small condenser C_7 across the aerial coil, maximum output being indicated at maximum lamp brilliance.

Power unit

11. The circuit of the hand-driven generator with its associated voltage regulator is also included in fig. 3. Included in this diagram are the circuits of the interruptor and selector units which are described later. Two outputs (330 volts H.T. and 6·3 volts L.T.) are provided by the generator, these being collected by the two pairs of brushes.

Voltage regulator

12. The voltage regulator consists of a relay having an iron-cored bobbin carrying two inductive windings and one non-inductive winding. An armature, mounted on a stiff reed is tuned to a periodicity of approximately 1,000 c/s and carries a contact which, in the non-operated state, makes with a stationary self-centring contact. As the voltage rises across the L.T. brushes of the generator, the flux density of the relay core increases, attracts the armature and breaks the contacts, thus putting the 42-ohm resistance winding of the relay in series with the field winding F of the generator. Less current then flows in the field windings of the generator and this reduces the voltage across the L.T. brushes, with the result that the contacts make again. This cycle is repeated at the natural frequency of the armature of the relay. It will be clear that the lowered L.T. voltage will reduce the flux of the relay magnet owing to the smaller current flowing in the 55-ohm shunt winding. Since the regulator controls the common field winding of the generator, it governs both the L.T. and H.T. voltages and it can be adjusted to operate at a predetermined L.T. voltage.

Automatic keying mechanism

13. The automatic keying mechanism is for the purpose of automatically transmitting sequences of three S.O.S. signals followed by twelve long dashes. It consists of (*a*) a selector unit and (*b*) an interruptor which operates the selector unit.

Selector unit

14. The circuits of the selector unit and interruptor are included in fig. 3. The selector unit consists of a simple electro-magnetic relay which steps round a ratchet wheel. This in turn drives a wheel, the periphery of which is provided with two series of notches or grooves to produce three S.O.S. signals and four long dashes. This wheel is shown in two sections in the circuit diagram.

15. Two pairs of keying contacts, one operated by the S.O.S. and the other by the long dash grooves on the signal wheel are connected in parallel and break the H.T. feed to the R.F. oscillator valve screen.

16. The sequence of three S.O.S. signals and twelve long dashes is accomplished by means of two cams on a large toothed wheel geared to the signal wheel in the ratio of 1 to 4. These cams are so designed that for a quarter revolution of the large toothed wheel, the S.O.S. contacts will come into operation, the long dash contacts being inoperative, while for the remaining three-quarters of a revolution the long dash contacts operate, the S.O.S. contacts now being inoperative.

Interruptor unit

17. The interruptor unit governs the periodicity of the impulses fed to the selector unit, irrespective of the supply voltage fluctuations. Its purpose therefore is to supply a series of timed impulses to drive the selector unit.

18. The unit consists of a small spring-controlled bobbin-shaped armature carrying a small coil wound at right angles to its axis and surrounded by a stator. This stator consists of eight short lengths of soft iron disposed circularly and held in place by being embedded in the material of the case containing the device. When the keying switch is set to AUTO, L.T. is applied to the armature

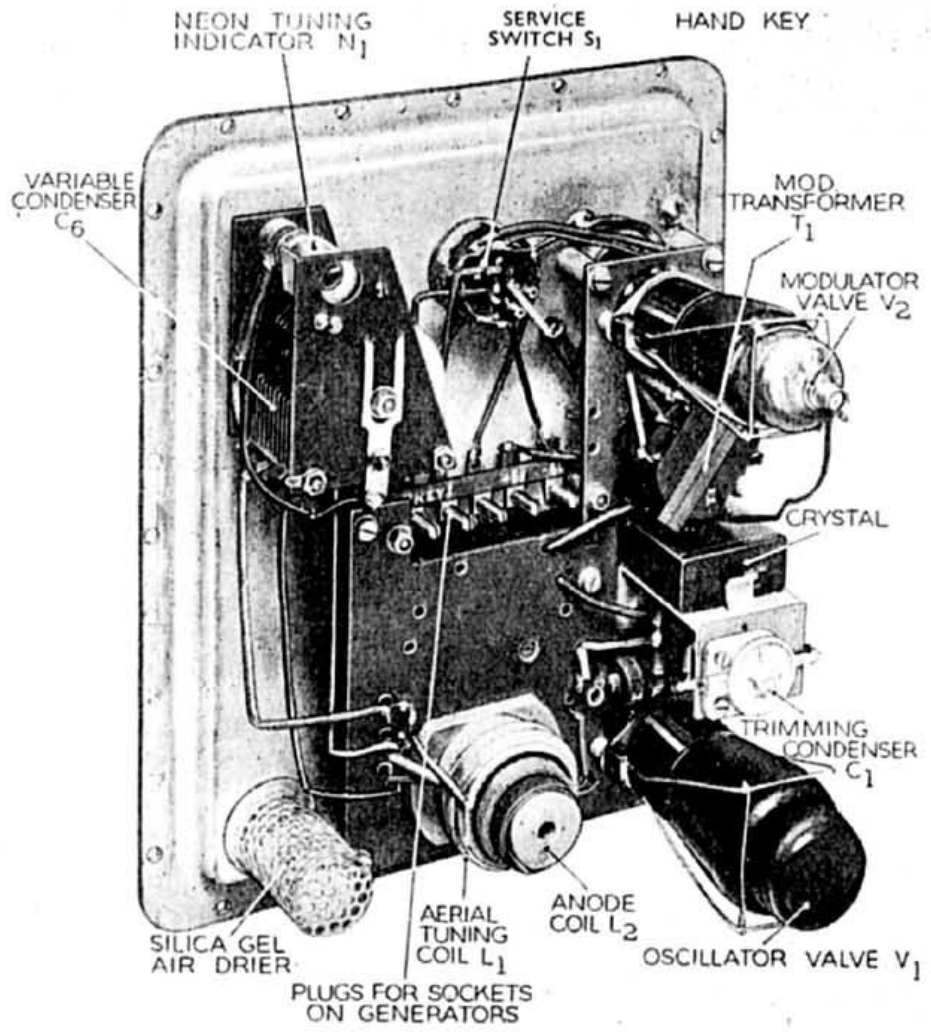


FIG. 4—REAR VIEW OF FRONT PANEL

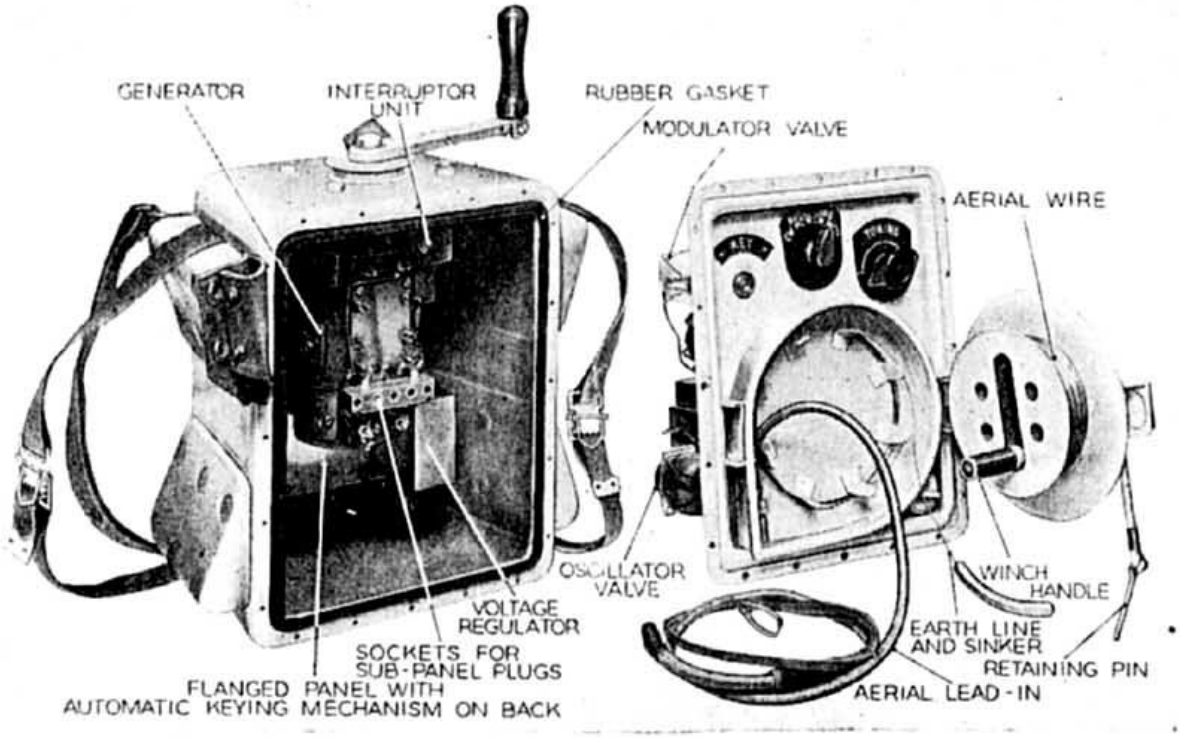


FIG. 5—VIEW SHOWING INTERIOR OF CASE

coil, causing its ends to become oppositely polarised, whereupon the coil swings towards the soft iron pole pieces. This partial rotation of the armature breaks a pair of contacts in the L.T. supply when, due to the torsion of a spiral hair spring, the armature swings back and the contacts are again made, and the cycle repeated; this operation, which is similar to the oscillation of the balance wheel of a watch, is repeated at a rate of approximately 5 c/s.

19. Another pair of contacts which are also operated by the movement of the armature, make and break the L.T. supply to the relay of the selector unit which thus receives an impulse to step the signal wheel round at each oscillation cycle of the armature.

CONSTRUCTION

20. The transmitting equipment, which includes the transmitter, power unit, voltage regulator, automatic keying mechanism, aerial and earth line, is contained in a light steel case, the sides and bottom of which are strengthened by ribbing.

21. Knee grips are provided on the two sides of the case which is also fitted with a webbing strap for slinging over the shoulder of the operator and two knee straps.

22. The front panel, which is also a light steel pressing, is secured to the body of the case by twenty screws and a gasket is fitted between the edges of the case and the panel. The case is watertight, felt glands impregnated with oil being fitted at all spindle entries and blind holes being employed for all screws. A silica-gel drying unit is fitted which will absorb a limited amount of moisture which may get into the case by condensation from the atmosphere. It will not, however, cope with actual leakage of sea water.

23. On the front panel are the hand key, a service switch with four positions and aerial tuning knob, each being easily identifiable by a name plate with lettering in luminous paint which is radioactive and does not require previous exposure to light to become luminescent.

24. On the lower part of the front panel is an annular case with a hinged door containing the aerial reel. A series of projections are provided in the case round which are wound the aerial lead-in and earth line. The aerial consists of 208 ft. of stainless steel flexible wire, and the earth line, which is 10 ft. long, is provided with a sinker. A spring-loaded folding handle is fitted to the aerial reel and a brake button is fitted under the leather handle on the outside of the door. The door is secured when closed, by a pin attached to the case by a leather thong. This pin is retained in position by a thin piece of soft wire threaded through a hole in the end and this can be sheared by the action of withdrawing the pin.

25. At the bottom right-hand corner of the front panel is the silica-gel drying unit which is provided with a cap, and by the removal of this, access can be had to the drying element for renewal or revitalisation.

26. At the top of the case is the generator driving handle which is secured in position in a dog by means of a screw having a left-hand thread. A locking ring is fitted over the generator spindle and normally this should be screwed down tightly to prevent the ingress of water. When the equipment is to be used, the locking ring should be unscrewed. When not in use, the driving handle of the generator is folded downwards and retained in position in the webbing pocket. A window is also fitted in the top of the case through which the tuning indicator lamp can be viewed.

27. The interior equipment of the case is assembled as two main units, (*a*) the back of the front panel assembly, and (*b*) the case assembly.

28. A view of the rear of the front panel is given in fig. 4 and it will be seen that on a bakelized fabric sub-panel are mounted the oscillator and modulator components in one assembly, the aerial tuning condenser and controls being mounted direct on the panel. The various components shown in the circuit diagram, fig. 3, are easily identifiable in this view.

29. The sub-panel carries a 5-pin assembly which, when the panel is fitted to the case, engages with a socket assembly on the power generator (see fig. 5).

30. The power generator is fitted in the case and secured by seven screws; on the generator is a socket assembly which engages with the plugs of the front sub-panel assembly. The armature of the generator is driven by a train of four gear wheels which gives an overall ratio of 1 to 43.

31. A flanged steel panel is fitted in the back of the case and held in position by four screws. This panel is also secured to the back of the generator by means of a flexible piece of leather, the two units being fastened together before insertion in the case; should it be necessary to remove either, both must be taken out of the case as one assembly by taking out the case screws. On the front of the panel are mounted the interruptor and voltage regulator both of which are provided with covers. On the back is the selector unit; fig. 6 shows the assembly of these units on the panel. Explanations of their functions have been given in paras. 12 to 19.

32. Two types of case are used for transmitter T.1333. One type is the same as is shown in the general photographs and this has knee grips of moulded rubber or cork attached to the sides of the case by countersunk screws, the metal sides being flat as can be clearly seen in fig. 5.

33. With the other type of case the knee grips are pressed out of the metal and the only attachments are the shoulder and knee straps. In all other respects the transmitters are alike and the parts of one, including the front panel, generator and driving handle, are interchangeable. The actual transmitter therefore can be installed in either type of case without any modification.

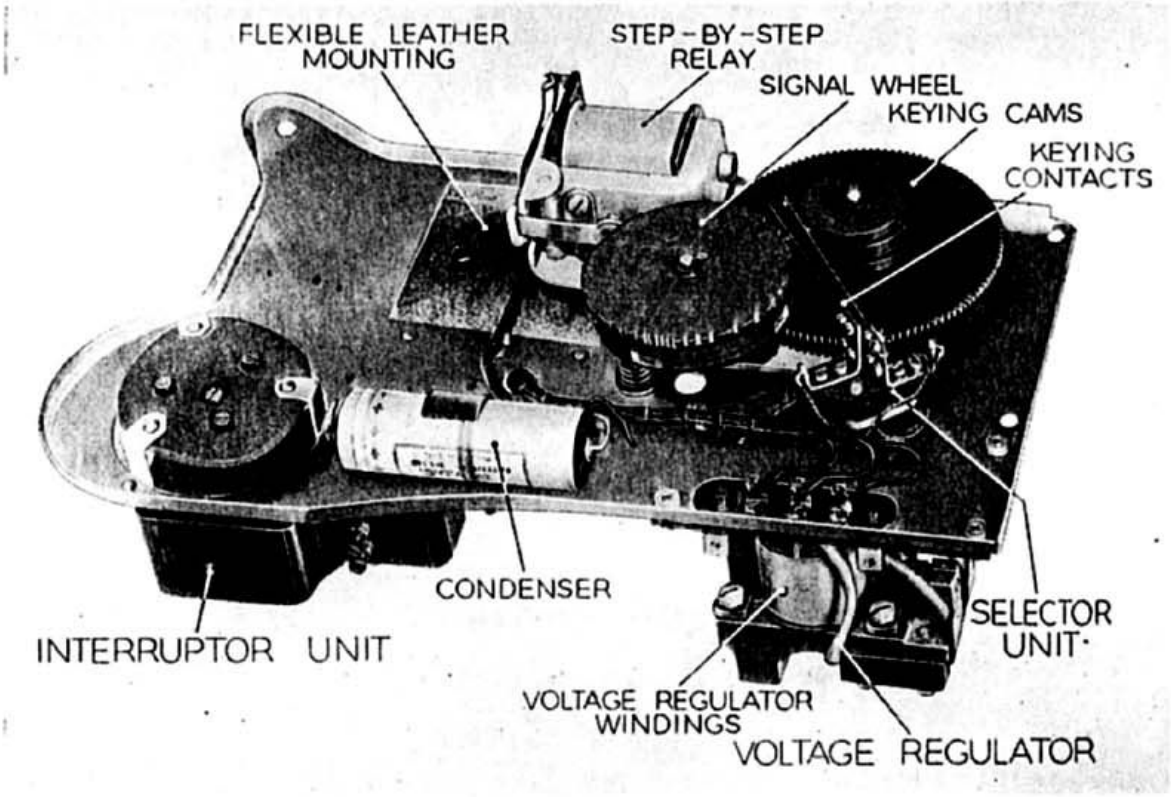


FIG. 6—AUTOMATIC KEYING MECHANISM AND VOLTAGE REGULATOR

VALVES

34. Two valves, one indicator lamp and one crystal are employed in the equipment and particulars of these are given below:—

V_1, oscillator, type 6V6G
V_2, modulator, type 6J7G or KTZ63
N_1, neon tuning indicator
X_1, crystal, 500 kc/s.

Waterproof packing

35. Although special precautions have been taken to make the case of the transmitter watertight, it has been found necessary to enclose it in a double case consisting of felt and waterproof material, the latter being fitted with a breather valve. This valve will allow of variations of atmospheric pressure at different altitudes, but it seals automatically when it becomes wet. It consists of a spongy substance contained in a wooden cylinder used to close the mouth of the waterproof case; this substance expands when wet and provides an effectual seal against the ingress of water.

36. The method of packing the transmitter in the two cases is important and is shown by the series of diagrams given by fig. 7 which are explained in a series of stages below. The references are the same as those on the diagrams.

(i) Place transmitter in the felt bag as shown at (1) with the generator handle underneath and the control panel towards the operator.

(ii) Fold front flap of felt bag over the transmitter, then fold the two side flaps over and finally the long flap. Lay the tapes underneath, then pass them over and tie on top with quick release double bow knots.

(iii) Place transmitter (now in felt case) in the waterproof case keeping it in the position shown, i.e., generator handle underneath and long flap of felt case away from operator. The

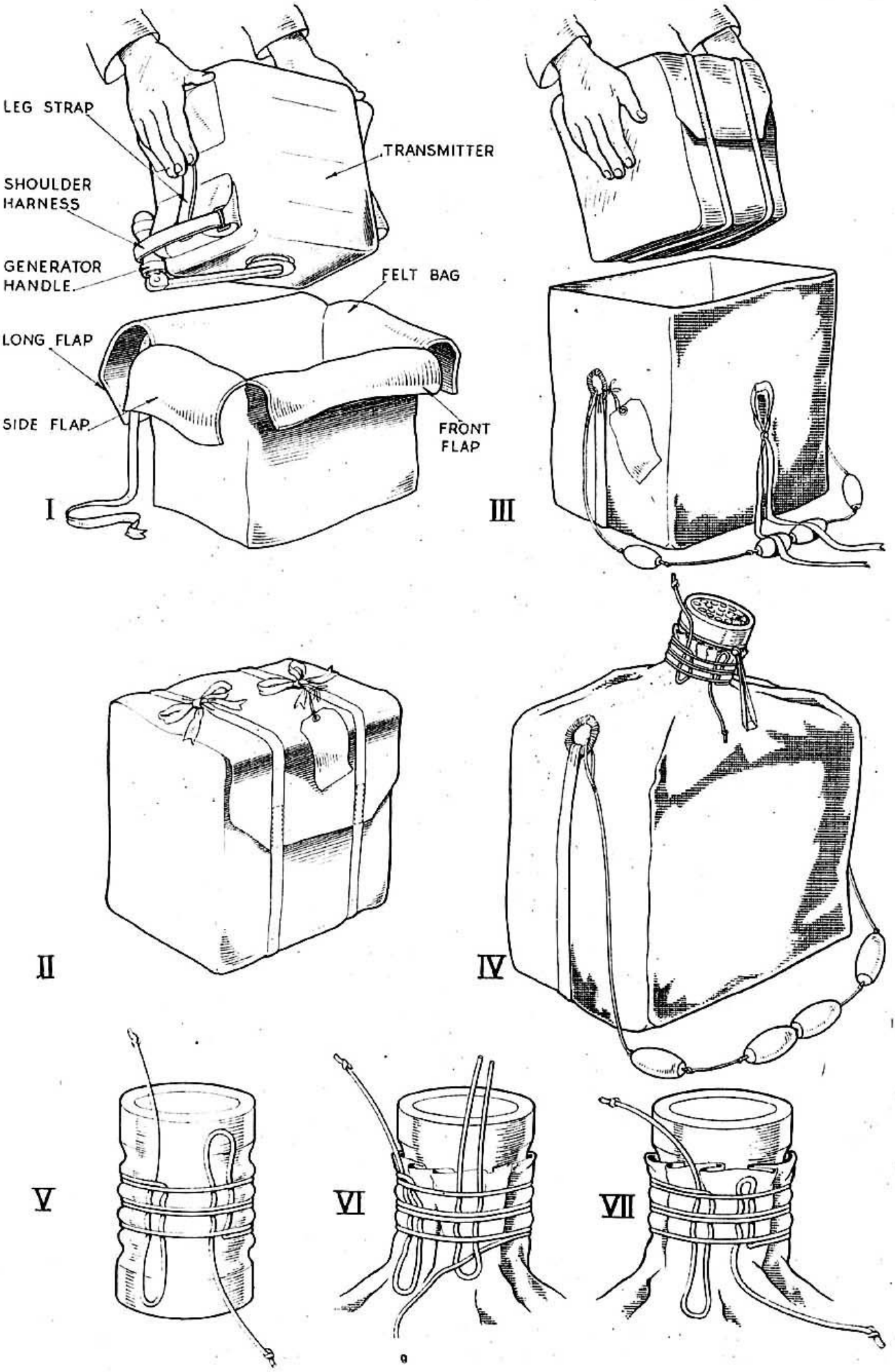


FIG. 7—METHOD OF PACKING TRANSMITTER IN FELT AND WATERPROOF CASES

tapes K and lanyard handle L on the waterproof case should also be in the position shown. It is essential that the transmitter be in the position shown in order that the bag will float the correct side up.

(iv) Pleat the mouth of the waterproof case around the breather valve. Flat folds should be employed and lashed as shown at (vi) and (vii) to make the case watertight. The tapes K on the outer case are tied round the top groove of the breather valve so that it is tilted at an angle of about 45 deg. (knot M) in which position it will be above the surface of the water.

(v) This diagram shows the valve and lashing cord as supplied; it indicates the method of lashing as described below.

(vi) The procedure of lashing is shown in this diagram. A loop of cord is used to pull the bottom end under the lashing, the loop being finally withdrawn.

(vii) The ends of the lashing are finally adjusted to leave two knotted ends of cord approximately 6 in. long at top and bottom so that a strong pull on either will release the valve from the bag.

(viii) The transmitter must be mounted in the aircraft in the position shown by fig. 8 (i.e. control panel uppermost) and the quick release strap should be well padded with the beaded lanyard underneath.

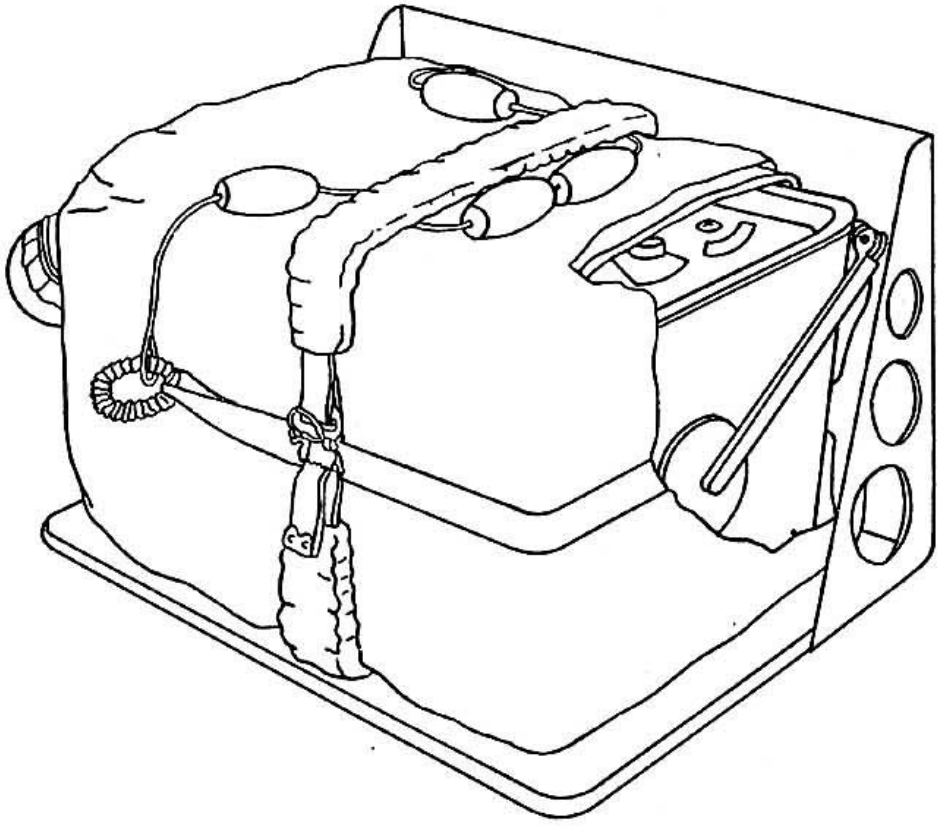


FIG. 8—METHOD OF MOUNTING TRANSMITTER IN AIRCRAFT

ROCKET KITE AERIAL

37. The aerial is supported by a kite which is launched into the air by means of a rocket fired from a Verey pistol. The kite, folded up and contained in a case, is drawn up by the rocket, and when it reaches the height determined by the length of attached line (200 ft.) it is stripped of its case and opens automatically. In a wind of 6 m.p.h. or over it will remain aloft. The aerial is then attached to the line and the kite allowed to rise, carrying the aerial to the requisite height of about 208 ft. Both case and rocket fall away.

38. Two kites and associated launching apparatus are carried and these are packed in a single container approximately 3 ft. long with a cross section of 7 in. by 3 in. The container is made of laminated plastic material and is divided into three compartments.

39. In each of the two outer compartments is placed one kite in a cover and in the centre compartment are two rockets each of which is connected to one of the kites by a tow line. The assembly arrangements are clearly shown in fig. 9. The second kite is intended as a reserve. Also

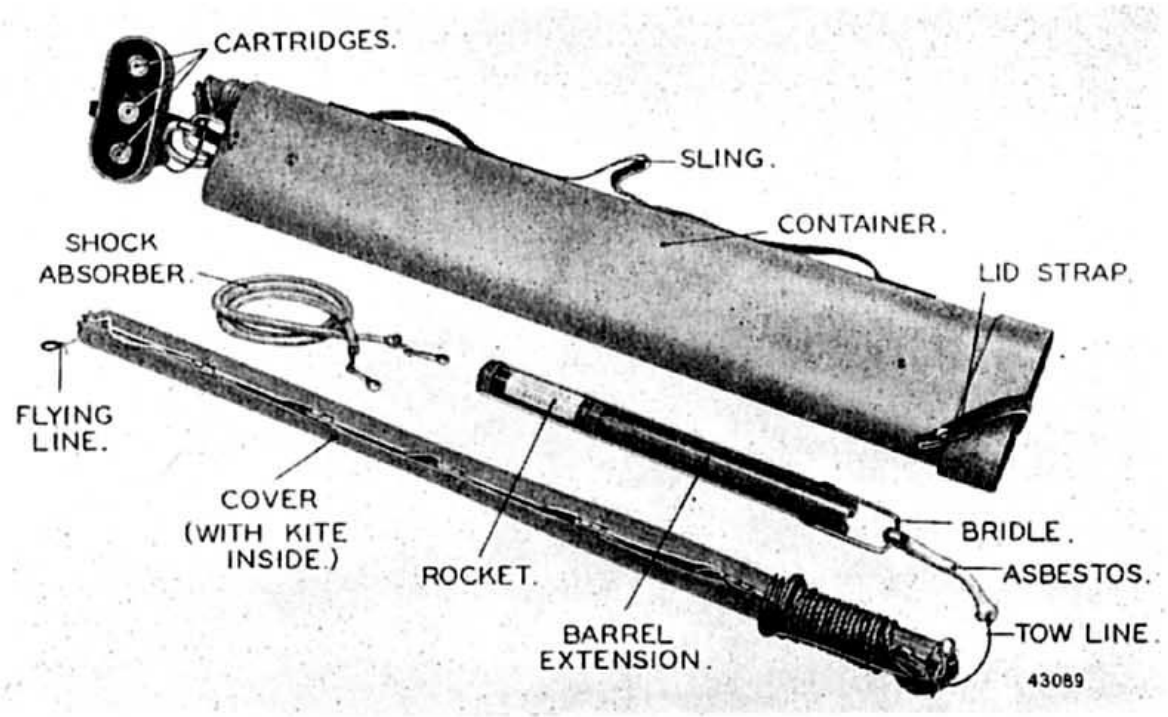


FIG. 9—ROCKET KITE CONTAINER WITH ONE KITE (IN COVER) AND ROCKET REMOVED

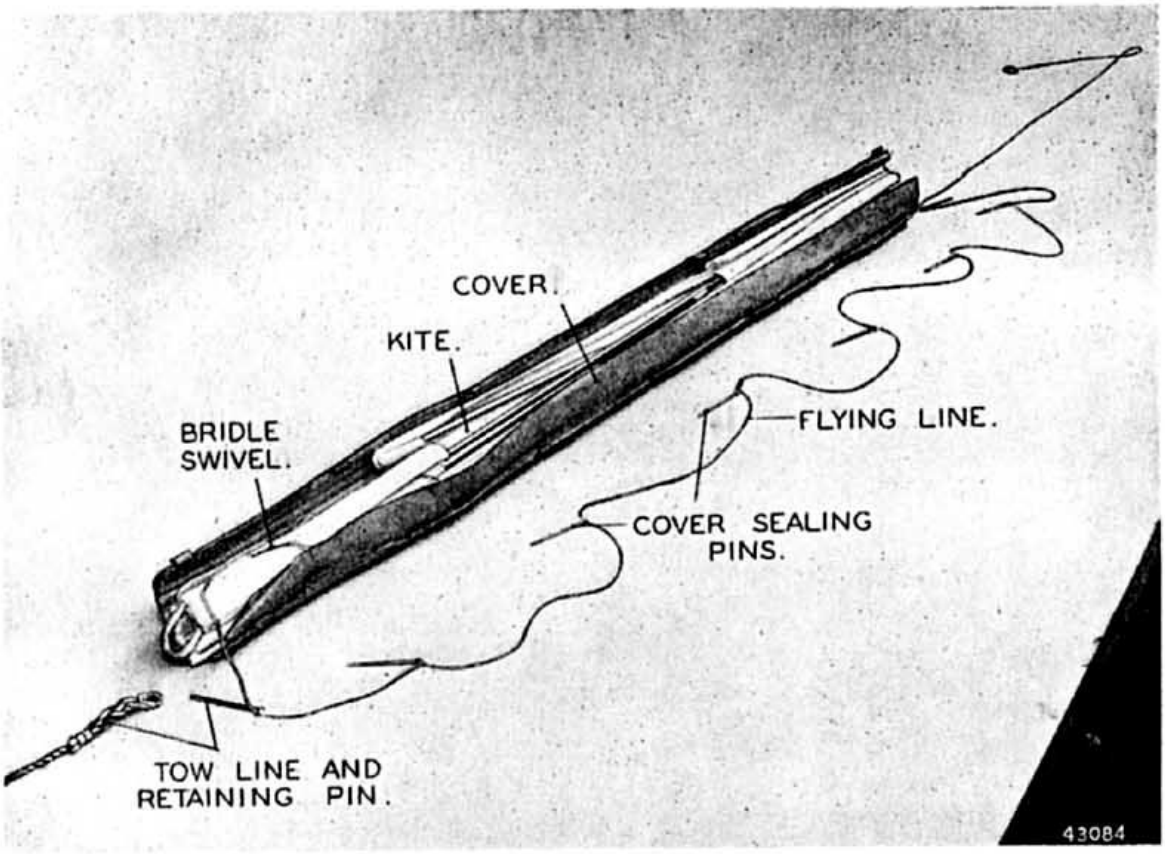


FIG. 10—KITE IN ITS COVER WITH SEALING PINS WITHDRAWN AND COVER PARTLY OPEN

in the container are an elastic shock absorber by which the kite line is attached to the dinghy before launching, a barrel extension for fitting to the Verey pistol and three cartridges. The kites are folded up inside corrugated stiff paper cases and the 200 ft. of flying line is housed in the corrugations in such a manner that it will pay out freely when the kite assembly is launched.

40. The kite cover (see fig. 10) is opened by the pull of the line when it reaches the limit of its length; the pull releases quickly detachable pins. It is absolutely essential for the correct functioning of the apparatus that the kite be folded in the correct manner and properly packed in its retaining cover. Full instructions for carrying out this work are given in Chap. 5, Sect. 8, Part 3, Vol. I of A.P.1182 to which reference should be made.

41. A complete list of the items constituting the rocket kite apparatus is given below:—

Container, kite and rocket	Cartridges (3) 1 in., kite, Mk. I
Kite, collapsible, Mk. II	Barrel extension
Kite cover	Flying line
Rocket, launching, Mk. II	Shock absorber

42. The kite is made of light fabric stretched over a frame made up of four light metal alloy tubes. This frame is collapsible. Attached to the face of the kite are a pair of stabilizers carried on a common light wooden spar to which the line bridle is attached, the line being secured by a small metal swivel.

43. Reference to fig. 11 will show the construction of the kite and the manner in which, when it is folded with all frame members together and parallel, it will open out by reason of the pull exerted by the two elastic strops. These strops are stranded elastic and when the kite is closed are under considerable tension. It will be seen that the two cross pieces of the frame each terminates in a pocket in the fabric at one end and on the further main member at the other at which point it is fitted with a clip which is capable of sliding along the main member. Half way between the two main members the cross pieces are pivoted together and at this point a rubber ring is doubled round in order to assist the opening action which is as follows. When the kite is released from its cover the elastic strops pull the ends of the cross members along the main members until the sliding clips reach stops on the members; the kite is then fully open.

44. At each top corner of the kite is a loop of webbing pinned into the top of the frame and sewn to the fabric. The rocket line is attached through these two loops and held by a split pin which is pulled out at the end of the limit of travel of the flying line. The rocket is thus freed from the kite which then begins to open.

45. The cover in which the kite is packed consists of stiff paper, with stitched double corrugations for the whole of its length on one side, there being seventeen corrugations, i.e. thirty-four in all. The flying line is threaded first into each corrugation of the lower row and then into each corrugation of the upper row. Along each edge of the cover are eyes or hinges by means of which the cover may be kept closed by six split pins threaded through the eyes; these pins are secured to the flying line. The flying line passes out through the lower end of the cover and is made fast to the dinghy before the rocket is fired. When the jerk occurs at the end of the flying line travel the pins are pulled out in quick succession and the cover is forced off under the expanding action of the kite inside it.

46. The rocket is mounted in a bridle (see fig. 9) consisting of two tubular members attached to two transverse hoops which fit the rocket tightly, the leading hoop at the head of the bridle being secured to the rocket by a screw. The rear end of the bridle is hinged and at the end of the hinged piece a wire cable about 4 ft. long is attached, a part of the cable being covered with asbestos to protect it from heat during flight. To the end of the wire cable is attached a cord with two spliced eyes, one long and the other short. The long splice is looped through and over an eye spliced in the end of the wire cable and the short eye is attached to the two loops in the top of the kite, being held in position by a split pin. As soon as the split pin is withdrawn the rocket tow line is freed from the kite.

47. The pistol used for firing the rocket is the standard 1 in. signal pistol to which an extension tube about 1 ft. long is fitted by means of a bayonet slot that engages with a small stud on the side of the pistol barrel. The rocket fits into the barrel extension. The cartridges used are a special type and the ordinary signal cartridges are unsuitable.

48. A shock absorber is provided on the flying line at the bottom end. This consists of about 4 ft. 6 in. of cased elastic fitted with a spring snap hook at each end. One hook is made fast to the ring at the end of the flying line and the other to one of the fabric rings on the dinghy to which the life line is attached.

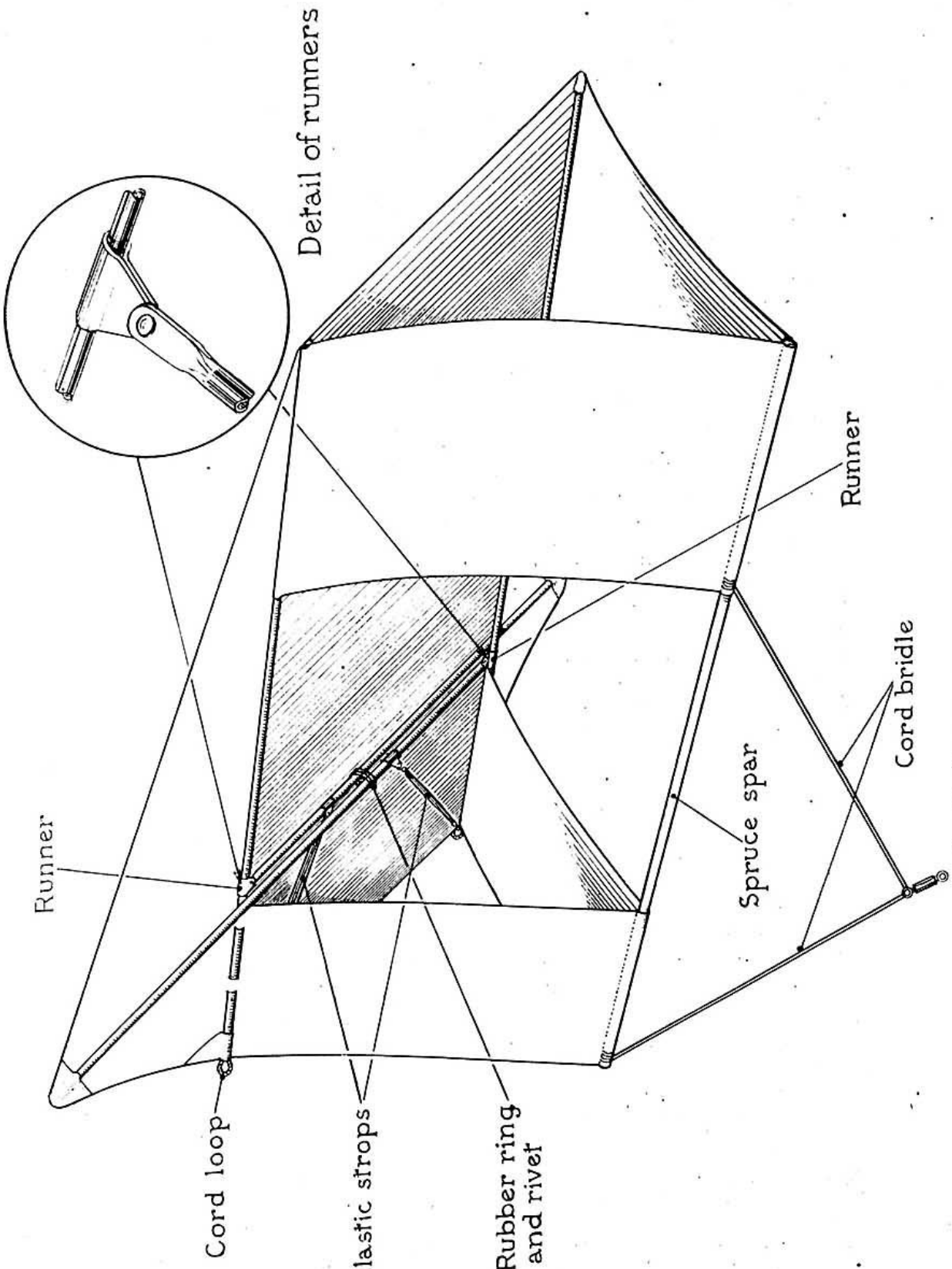


FIG. 11—KITE FULLY OPEN OUT OF ITS COVER

OPERATION

49. The equipment is used in the following manner, after the transmitter and rocket kite have been collected into the dinghy and the sea drogue of the dinghy has been put overboard to check drift.

50. *Rocket kite operation.*—

(i) Undo the sealing straps at each end of the container and open both ends.

(ii) Remove from the container one kite with rocket attached, the pistol barrel extension and the shock absorber. The barrel extension will be found *in situ* on one of the rockets. The shock absorber will be found stowed with the other rocket in the container so that it is necessary to open both ends of the latter.

(iii) Attach one end of the shock absorber by means of its spring hook to a fabric ring through which the life line passes on the outside wall of the dinghy and on the side of the dinghy opposite the sea drogue. Ensure that the shock absorber is clear of obstructions such as the rescue line and sheath knife stowage on the dinghy. Attach the other end of the shock absorber by means of its spring hook to the ring on the end of the kite flying line.

(iv) Unwrap the rocket line from the kite cover (round which it is wound for stowage) and lay the kite on the floor of the dinghy with the top end resting on the side of the dinghy at an angle of about 45 deg. See that the shock absorber and the lower end of the kite and flying line are clear of any obstruction on the floor of the dinghy.

(v) Take the signal pistol from the emergency pack, load it with a cartridge from the container lid but do not cock the pistol.

(vi) Fit the barrel extension to the pistol and put a rocket in the extension so that the hinged piece of the rocket bridle is under and not above the pistol.

(vii) See that the tow line connecting the rocket to the top of the kite is clear of all obstructions.

(viii) Sit on the floor of the dinghy in line with and directly behind the kite. See that the shock absorber is on your left-hand side of the kite and the rocket tow line is on the right-hand side and once again that both are quite clear of any other equipment or possible obstructions (see fig. 12).

(ix) Ensuring that the kite is pointing down wind, cock the pistol, raise it to an angle of about 70 deg., also down wind (in the same direction as the kite is pointing) and fire the pistol.

(x) The rocket should ignite immediately and carry the kite up with it and at the end of the travel of the line the kite will disengage from its cover and fly at the end of the line.

(xi) Taking a turn round the wrist with the flying line, disconnect the ring at the end of the flying line from the shock absorber.

51. *Transmitter operation.*—

(i) Open aerial winch door. Throw earth weight in sea. Hook aerial to kite line ring.

(ii) Pull out winch handle. Pay out the aerial steadily by unreeling it. Hook aerial to lead-in. Tie leather thong to hauling-in line in dinghy to take kite tension off lead-in.

(iii) Unclip pocket and raise handle to cranking position. Unscrew lock ring fully counter-clockwise.

(iv) Select "Auto CW".

(v) Grip set between knees and secure knee straps.

(vi) Crank for 30 seconds to warm valves and turn tuning knob until lamp gives maximum glow.

(vii) Turn steadily at 120 r.p.m. on C.W. and M.C.W. alternatively.

(viii) To release the knee straps quickly pull both buckle loops upwards.

52. It should suffice to turn the generator handle for periods of 5 minutes every quarter of an hour at a speed of approximately 120 revolutions per minute. Care should be taken to avoid contact with the uninsulated portion of the aerial wire while the transmitter is being operated.

53. When it is required to close the transmitter down, the aerial wire should be unhooked from the lead-in and attached to the small hook on the reel. The earth line and aerial lead-in are wound round the lugs in the panel compartment and the aerial wound up and detached from the kite, after which the aerial case is closed and secured with the retaining pin which is resealed with the spare wire provided. Finally, the generator handle grip should be folded down and the locking ring under the handle screwed down to make the case watertight.

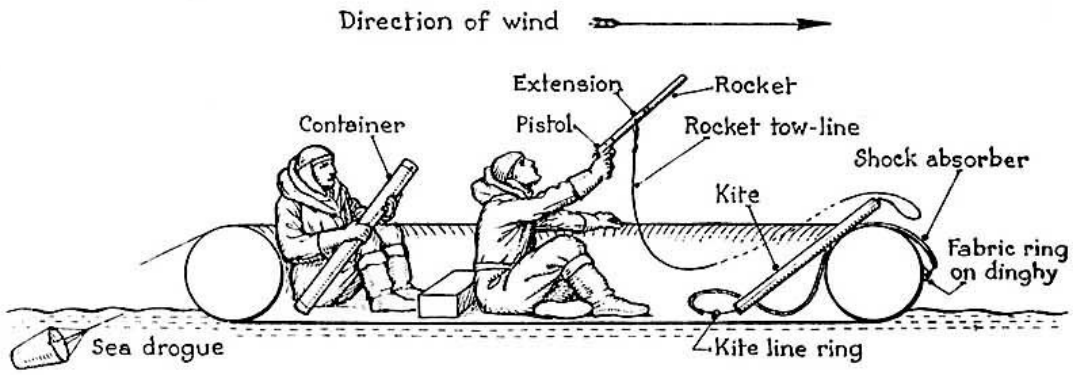


FIG. 12—SKETCH SHOWING METHOD OF FIRING ROCKET

PRECAUTIONS AND MAINTENANCE

54. As this type of transmitter is only likely to have limited use, the amount of maintenance work necessary should be small, but routine checks must be made as described later. Although the case is watertight, it is not airtight and with varying atmospheric pressures at different altitudes there is the possibility of the ingress of water vapour. Limited amounts of moisture will be absorbed by the silica-gel unit but it will be necessary to dry or replace the element at suitable intervals, the length of which will depend on the conditions of use of the apparatus and climatic conditions.

55. Tuning is liable to vary with variations from the perpendicular of the aerial in varying winds owing to alterations of capacity; repeated checks of the maximum brightness of the indicator lamp should therefore be made while the equipment is in operation.

Operational check

56. The correct operation of the equipment should be checked before each operational flight. This is done by measuring the power output obtained into the external artificial aerial load. This aerial load should consist of a capacity of 360 to 500 $\mu\mu$F in series with a 30-ohm resistance, the outer end of the latter being earthed. The most suitable value for the capacity is 430 $\mu\mu$F plus or minus 16 per cent and it can be obtained either by using a variable condenser or a suitable arrangement of fixed condensers. An artificial aerial (Stores Ref. 10B/13281) is available. The checking procedure is as follows. Fig. 13 shows how the transmitter should be operated.

(i) Open winch door.

(ii) Connect end of aerial lead-in to aerial terminal of load.

(iii) Connect earth lead to earth terminal of load.

(iv) Set generator handle by unclipping pocket, raising hand piece and unscrewing locking ring, fully counter-clockwise.

(v) Set service switch to HAND M.C.W.

(vi) Turn handle steadily for half-a-minute at 120 r.p.m. to warm up filaments.

(vii) Press hand key and tune by turning tuning knob until neon lamp gives maximum glow, or until the aerial load ammeter (if used) gives maximum reading. This should be approximately 0·4 amp.

(viii) Repeat (vii) above on HAND C.W. (key pressed).

(ix) Repeat on AUTO M.C.W. and note sequence of signals by observing flashing of neon lamp (or fluctuations of aerial ammeter).

(x) Repeat on AUTO C.W. The correct sequence of signals on AUTO is twelve long dashes followed by three S.O.S. signals. One long dash signal should be approximately four seconds duration followed by a one-second interval. The time for ten such signals should be between limits of 45 and 55 seconds.

(xi) When satisfied that the equipment operates correctly, the earth wire must first be wound carefully into the front panel recess round the lugs provided, followed by the lead-in. The winch door should then be closed and the securing pin reinserted and sealed with a short length of the wire provided for this purpose (25 s.w.g. tinned copper).

Fault location

57. In the event of the equipment not operating satisfactorily it may be due to corrosion, the ingress of water or an electrical fault may have developed. Fault location charts are given in fig. 14. A general internal inspection should first be made by removing the front panel. This can be done by removing the twenty 4 B.A. screws round its edge and gently easing it away from the case, thus breaking the seal formed by the gasket. The panel should be drawn off carefully, avoiding damage

FIG. 13—VIEW SHOWING CORRECT METHOD OF OPERATION

to the inter-unit pins, valves, etc. Any parts which show corrosion or leakage should be treated according to the nature of the damage. In general, the following points should particularly be checked.

(i) Aerial lead-in elbow.—If signs of leakage at this point are present, the retaining nut should be slackened and the tapered surfaces of the elbow resealed with bakelite varnish. The nut should then be retightened carefully.

(ii) Service switch and tuning spindle glands.—Remove knob and gland nuts. The felt rings inside the gland nuts can be repacked with anti-freeze grease or replaced if damaged. The surfaces of the nuts in contact with the front panel should be smeared with bakelite varnish before re-assembly.

(iii) Hand key.—If there are leaks at this point, the rubber diaphragm should be inspected and replaced if damaged. The diaphragm should be lightly smeared with Bostik. The centre nut must not be over tightened so as to cause the gasket to be squeezed out from under the washer and the eight 8 B.A. nuts must be tightened evenly, a little at a time. The key action must be definite and clean and not indeterminate and spongy.

(iv) Neon windows.—If there are leaks at the neon window, the rubber gasket should be replaced, the nuts being tightened evenly.

(v) Generator handle gland.—To obtain access to the driving handle gland, unscrew the locking ring fully counter-clockwise and remove the handle by unscrewing the hexagon-headed screw at the centre. This screw has a left-hand thread and therefore must be unscrewed clockwise. It can be undone by quick movements of the spanner against the inertia of the generator armature. Attempts to prevent the armature rotating should not be made. The packing gland is in the annular recess around the spindle. The packing should be removed and replaced with a new one after carefully cleaning the recess. When re-assembling the handle, ensure that the driving tongue engages correctly with the slot in the generator shaft and turn counter-clockwise to check that the ratchet is operating.

(vi) To remove generator and sub-panel.—The generator and sub-panel must be removed together in the following sequence: Remove the generator handle as described in (v); remove Ozokerite wax and undo seven screws at the handle end of case; remove four panel retaining screws (inside case) after which the generator and panel may be carefully eased out, taking care not to damge the mechanism under the panel by contact with the mounting pillars.

58. When the generator is out of the case, access to the commutators and brush gear can be obtained by removing the four inspection covers. Inspect for chipped or cracked brushes and if in order replace in original positions. The commutators may be cleaned with a soft rag and carbon tetrachloride. Emery cloth must on no account be used, but if scoring has taken place they may be lightly cleaned with the finest sand paper. Examination of the gear box should be made by removal of the cover plate. If water has penetrated, the old grease should be removed, and the box repacked. Care must be taken when re-assembling the generator in the case not to omit the four distance pieces and the felt washer between the case and generator. The felt washer must be soaked in molten anti-freeze grease before being fitted and melted Ozokerite wax should be run in over the heads of the seven holding screws.

Voltage regulator adjustment

59. The adjustment of the voltage regulator of the generator should not be altered unless necessary. Should it have been disturbed, it should be re-adjusted as follows: Energize the coil with 8 volts D.C. across terminal 1 and 3 (fig. 12). Adjust contact gap to 0·012 in. and tighten the lock nut, using the test circuit fig. 15 with terminals 1 and 2 short circuited; adjust voltage across terminals 2 and 3 to 6·7 volts. Then adjust back stop so that voltage drop across terminals 1 and 3 is less than 6·7 volts and more than 6·3. Finally, lock all adjusting screws and coat them with bakelite varnish.

Interruptor unit adjustment

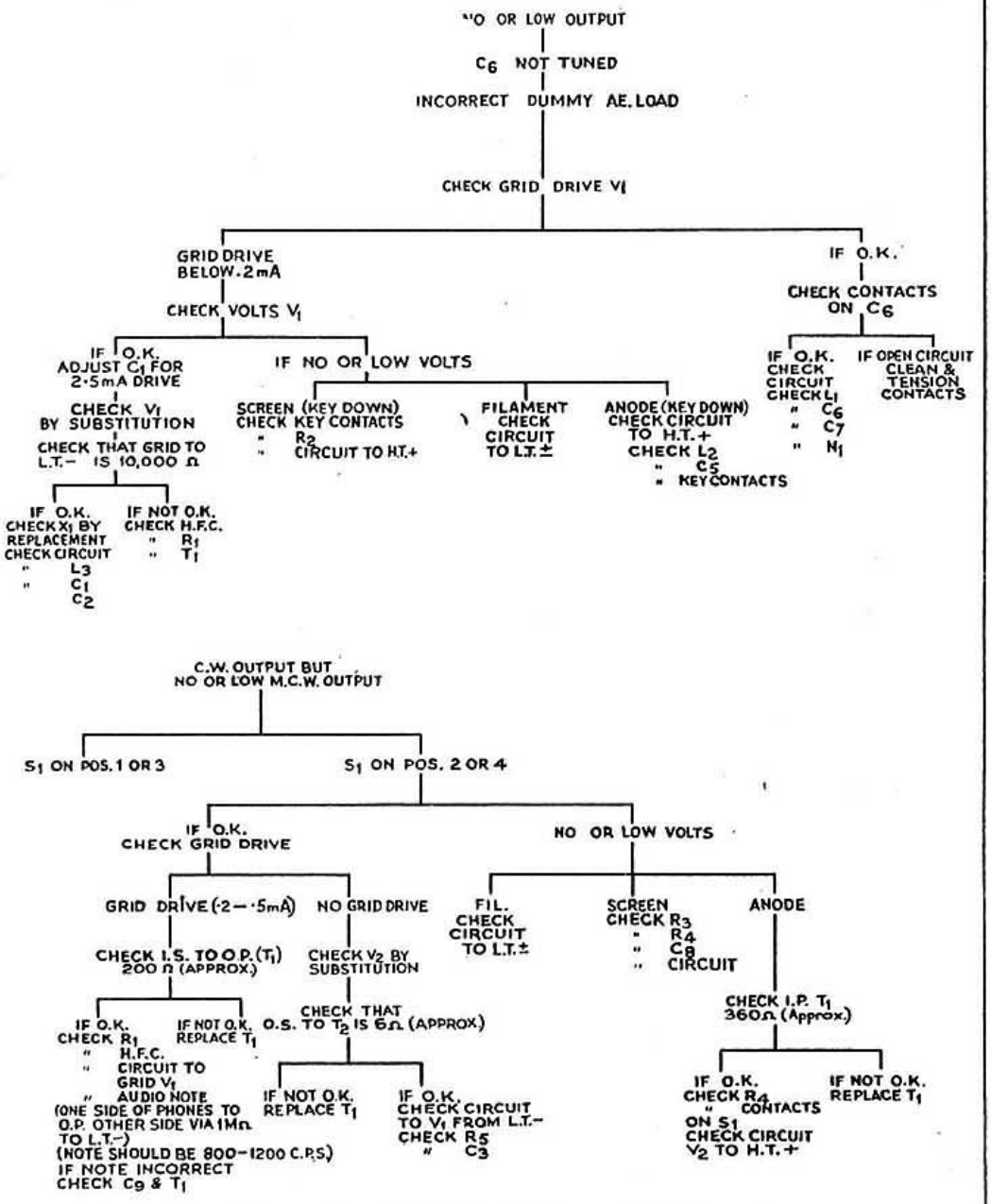
60. Owing to the delicate nature of the interruptor unit it should not be dismantled, but the following checks can be made and the adjustment corrected as necessary. The rotor should oscillate freely and not have more than 0·0015 in. end play (equal to one eighth turn of bearing screw). The contacts should be in alignment and rest on their back springs with a light pressure. At normal, the rotor teeth should be out of alignment with keepers in a clockwise direction, so that corners overlap by 0·010 in. to 0·030 in. upper contacts to be broken and lower contact pressure to be not less than 5 grammes measured at edge of contact bracket on rotor. With interruptor in any position and 5½ to 7 volts D.C. applied (with a 25 μF condenser connected across contacts), the impulse rate should be 4¾ to 5¼ per sec. The rate of oscillation can be adjusted by rotating the hair spring bracket. It is essential that the convolutions of the spring are quite free, and this can be accomplished by loosening the screws securing the bracket and moving it laterally.

Selector adjustment

61. For the correct operation of the selector unit, the following conditions should obtain. The cam assemblies must be individually free on their respective spindles. Gear wheel and pinion should mesh freely with the minimum amount of backlash. The retaining pawl should be two or three teeth behind the driving pawl. It should rest lightly at the base of the tooth and there should be minimum backward movement of the cam when the armature restores. The armature back stop should be set to allow the driving pawl to drop back over one tooth during release; the maximum permissible back movement is 1¼ teeth. Contact springs should be adjusted so that the contacts are in alignment when touching, with the springs approximately at right angles to the block.

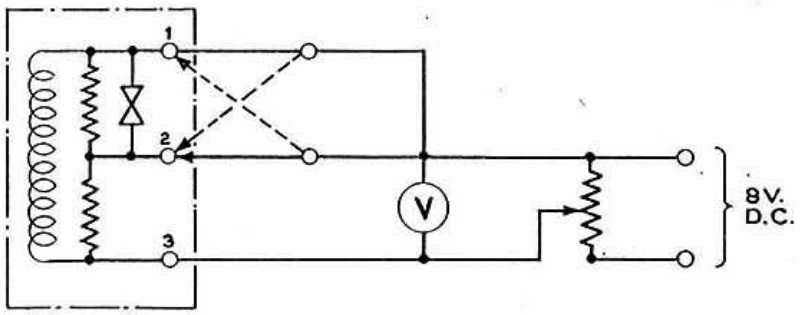
Electrical faults

62. The tests outlined in the two fault-finding charts given by fig. 14 should preferably be made with batteries by removing the front panel of the transmitter (see para. 57) and connecting 320 volts to H.T. and 6 volts to L.T. pins. If batteries are not available, checks can be made on



FAULT LOCATION CHARTS

FIG. 14 FIG. 14



VOLTAGE REGULATOR TEST CIRCUIT

FIG. 15 FIG. 15

the hand generator, but the front panel should be removed and the 5-pin plugs and sockets connected up with extension leads; this permits of easy access to the components. In order to ensure steady readings on the meter the generator handle should be turned at approximately 130 r.p.m. so that the voltage regulator will be operating.

63. The grid current readings of V_1 should be taken by disconnecting the lead to I.S. of transformer T_1 and inserting the milliammeters between I.S. and this lead. Grid current readings of V_2 are taken by disconnecting the lead to the earthy end of resistance R_5 and inserting the meter between R_5 and L.T.—.

64. A test of the operation of the auto-key unit is made by connecting together terminals L.T.— and KEY 2 of the 5-pin socket and turning the generator handle.

Silica-gel desiccator

65. The silica-gel desiccator must be regenerated or replaced after (i) six months, (ii) breaking the air-tight condition of the equipment (e.g. after internal inspection or repair) and (iii) immersion of the equipment in water.

66. The desiccator is regenerated by removing the screw cap of the container and withdrawing the bag which is then heated in an oven for a period of one to two hours at a temperature that will not char the bag (approx. 250 deg. F.). The bag should then be replaced in its case immediately, care being taken to see that the leather washer is in position and the cap screwed on tightly. This drying-out process can be repeated indefinitely, but the bag must not be left exposed to the air before insertion in its container.

67. After operational use which has resulted in the immersion of the equipment in water it should be examined for external damage and signs of leakage. The silica-gel desiccator should be examined and if it is excessively damp, the front panel should be removed and the interior equipment examined after which the routine checks described in para. 56, should be made.

68. Before the front panel is replaced, the edge of the case should be cleaned and the gasket examined to see that it is in good condition. Care must be taken to engage the interplug and socket correctly, after which the screws can be inserted and tightened down a little at a time, so that the pressure will be evenly distributed. The two countersunk holes and screw heads must be clean in order to ensure a good earth connection.

69. Full instructions on the maintenance and packing of the rocket kite apparatus are given in A.P.1182, Vol. I, Part 3, Sect. 8, Chap. 5. As the correct functioning of the gear depends upon its proper folding and packing it is imperative that those instructions be followed in detail.

APPENDIX

NOMENCLATURE OF PARTS

The following list of parts is issued for information only. When ordering spares for this equipment the appropriate section of AIR PUBLICATION 1086 must be used.

Ref. No.	Nomenclature	Qty.	Ref. in fig. 3	Remarks
10D/1422–	Transmitter, type 1333B	1	—	Emergency transmitter for use in dinghy
	Principal components:—			
	Choke			
10C/79	Type	1	—	H.F., 1·5 mH
	Coil, aerial tuning			
10R/13003	Type	1	—	Pile wound, 58 turns, Litz wire
	Coil, anode coupling			
10R/13004	Type	1	—	Wire wound, 112 turns
	Coil, tuning			
10R/13005	Type	1	—	Iron dust core, 89 turns
	Condenser			
10C/5028	Type 2698	1	C_1	20 to 120 $\mu\mu$F., ceramic
10C/4999	Type 2689	1	C_2	250 $\mu\mu$F., 1,000 volts
10C/3190	Type 1545	1	C_3	0·1 μF., 450 volts
10C/8496	Type 188	1	C_4	0·01 μF., 350 volts
10C/3055	Type 1465	1	C_5	0·01 μF., 500 volts
10C/4979	Type 2669	1	C_6	Variable with switch and glands
10C/5020	Type 2690	1	C_7	4 $\mu\mu$F., 500 volts
10C/8190	Type 1545	1	C_8	0·1 μF., 450 volts
10C/8496	Type 188	1	C_9	0·01 μF., 350 volts
10C/4980	Type	1	C_{10}	25 μF., 25 volts
	Type	1	C_{11}	0·2 μF.
	Crystal			
10X/500	Type	1	X_1	500 kc/s
	Drying charge			
10D/3087	Type 1	1	—	Silica-gel in linen bag
	Holder, valve			
10H/493	Type 73	2	—	
	Lamp, indicating			
10E/484	Type 671	1	N1	Neon
	Resistance			
10C/7017	Type 7017	1	R_1	10,000 ohms, $\frac{1}{2}$ watt
10C/1274	Type 1274	1	R_2	10,000 ohms, 1 watt
10C/7181	Type 7181	1	R_3	5,000 ohms, $\frac{1}{3}$ watt
10C/6221	Type 6221	1	R_4	50,000 ohms, 1 watt
10C/6005	Type 6005	1	R_5	50,000 ohms, $\frac{1}{3}$ watt
	Valve			
10E/349	Type 6V6G	1	V_1	American octal
10E/352	Type 6J7G or KTZ63	1	V_2	American octal
	Wire, aerial			
	Type			
	Artificial aerial			
10B/13281	Type 18	1	—	