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SECTION 3, CHAPTER 7

BLIND APPROACH RECEIVERS, R.1124A AND R.1125A

Contents

List of Illustrations

List of Illustrations—*continued*

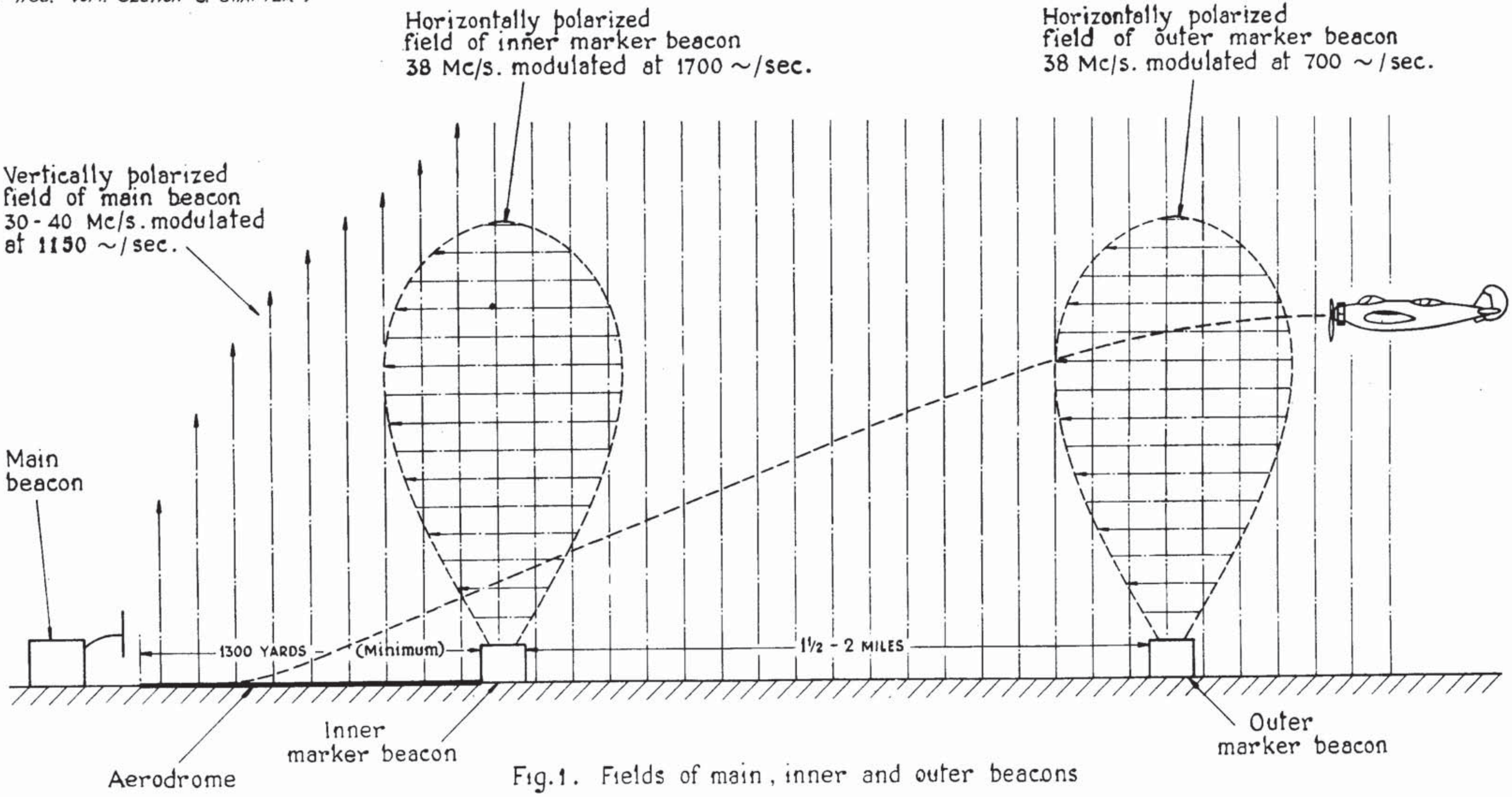

Fig.1. Fields of main, inner and outer beacons

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BLIND APPROACH RECEIVERS, R.1124A AND R.1125A

INTRODUCTION

General

1. The blind approach receiving equipment is designed for installation in aeroplanes to enable the pilot, in conditions of poor visibility, to take up the correct approach track to an aerodrome fitted with the blind approach beacon, and to maintain this course until the moment of landing. In addition to course indication, provision is made for the reception of marker beacon signals indicating the distance of the aeroplane from the aerodrome boundary at two particular instants during the approach. A full description of the methods of using blind approach apparatus is given in A.P. 1751, Blind Approach, Pilot's Handbook.

Nature of received signals

2. The transmission system of the blind approach beacon will be dealt with in Section 1, Chapter 9 of this Air Publication, but before dealing with the receiving apparatus it is necessary to appreciate the nature of the signals to be received.

3. The transmitting apparatus comprises three entirely independent radiators, *viz.* (i) the outer marker beacon, (ii) the inner marker beacon and (iii) the main beacon. Both marker beacons are situated on the approach track, the inner marker beacon near the edge of the landing run-way and the outer marker beacon about 2 to 3 miles outside the run-way on the approach side. The radiation from these beacons is horizontally polarized and is chiefly concentrated in the upward direction. The same radio frequency (38 Mc/s) is radiated by each, the radiation of the outer is modulated to a depth of about 90 per cent. at a frequency of 700 c/s, and that of the inner to the same depth but at a frequency of 1,700 c/s. Fig. 1 shows the fields to be detected in pictorial form.

4. The main beacon is situated outside the inner edge of the run-way. The aerial system consists of a vertical dipole energized by the main transmitter and two reflector dipoles placed one on each side of the energized dipole as shown pictorially in fig 2. A relay-operated switch is located at the mid-point of each reflector. The two relays are operated by the keying system in such a manner that when the circuit of one reflector is completed the other is open, rendering them operative alternately. The polar diagram of the main beacon therefore oscillates

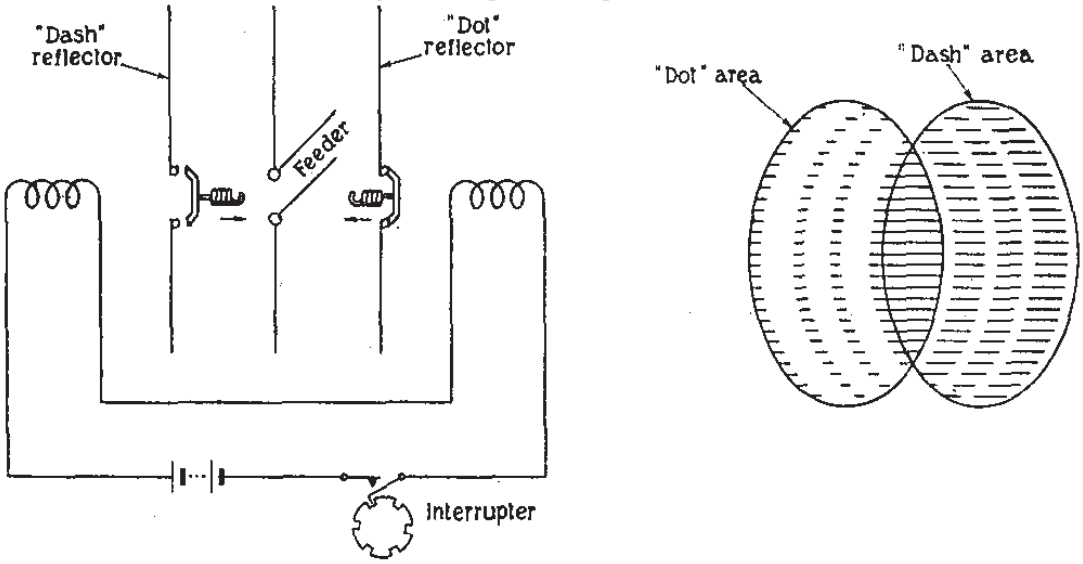

FIG. 2. Switching of reflectors.

to the right and left of the approach track, as shown in fig 3. The duration of the successive switching impulses is such that an aeroplane to the left of the approach track receives a succession of increments of field strength, having a duration of $\frac{1}{8}$ sec., separated by intervals of $\frac{7}{8}$ sec. while an aeroplane to the right of the approach track receives a succession of increments of field strength having a duration of $\frac{7}{8}$ sec., separated by intervals of $\frac{1}{8}$ sec. These increments of field strength are superimposed upon a " steady " field strength, which depends upon the distance from the transmitter, the height and other factors. Along the correct course, however, the field strength is unchanged by switching from one reflector to the other.

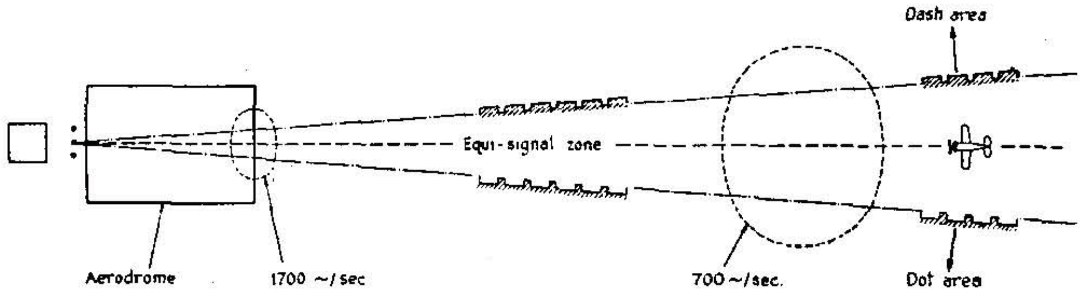

FIG. 3. Marker and Course Signals

5. The radiation from the main transmitter is modulated at a frequency of 1,150 c/s. After rectification, the aural signal received in an aeroplane flying on the correct approach track is an unbroken note of 1,150 c/s. If to the left of the track, modulated dots of $\frac{1}{8}$ sec. duration, and if to the right, modulated dashes of $\frac{7}{8}$ sec. duration, are received (*see* figs 2 and 3). In addition to aural indications, visual indications are given by the course meter.

Receiving equipment

6. The receiving equipment is designed to operate from a 12-volt battery, the power consumption being approximately 85 watts. The weight of the complete equipment, with the exception of the battery, is 80 lb. Dimensions and weights of individual components will be given in the paragraphs dealing with the constructional details.

7. The equipment consists of several units, namely :—

(i) The main beacon receiver, type R.1124 or R.1124A. These differ only in the constructional details of certain connecting cable joints (*see* para. 92). Type R.1124 was an early version, and the screw connections for the Breeze plugs and sockets had an American thread. Subsequent models, designated. R.1124A, were provided with cable connections that had an English thread. Both are 6-valve superheterodyne receivers operating in the band 30·5 to 40·4 Mc/s.

(ii) The marker beacon receiver, type R.1125 or R.1125A. These receivers are again electrically identical but differ in construction as explained in sub-para. (i) above. Both employ a two-valve circuit consisting of a detector with regenerative amplification followed by an A/F amplifying stage.

(iii) The power supply unit, which contains a dual purpose rotary transformer for L.T. and H.T. supplies to the main and marker beacon receivers, together with certain filter systems. A relay for remote switching control is also incorporated.

(iv) The control unit, which provides for the operation of the equipment, switching on, selecting the correct frequency, volume adjustment, etc.

(v) The main junction box, in which the leads from various units are interconnected. This facilitates the rapid and easy removal of any of the other units for test or replacement.

(vi) The visual indicator, which is a small instrument designed for dashboard mounting. It gives course indications by means of a pointer, while two neon lamps show when the inner and outer marker beacons respectively are being flown over. A glide path indicator is also incorporated in this instrument (*see* para. 9).

(vii) The remote control cable mechanism, which is fitted in order that the frequency of the main beacon receiver may be selected by the pilot.

(viii) The vertical aerial (and loading coil, if fitted), which supplies the main beacon receiver with its R/F input, *via* a special co-axial feeder.

(ix) The horizontal dipole aerial, which supplies the marker beacon receiver with its R/F input, *via* a special type of feeder.

(x) The interconnecting cables, which are enclosed in Breeze metallic screening hose and are fitted with special types of plug, which engage with sockets on the various instruments.

GENERAL DESCRIPTION

Visual indicator

8. Before dealing with the action of the main beacon receiver, the visual indicator will be briefly described. This is an assembly of two moving coil micro-ammeters, one of which is the course meter, and the other the glide path meter. The movement of the former is in the horizontal and that of the latter in the vertical plane. The scale of the course meter is marked L and R for left and right respectively ; these letters indicate the direction of turn to bring the aeroplane on to the correct track. The scale of the glide path indicator is arbitrarily marked.

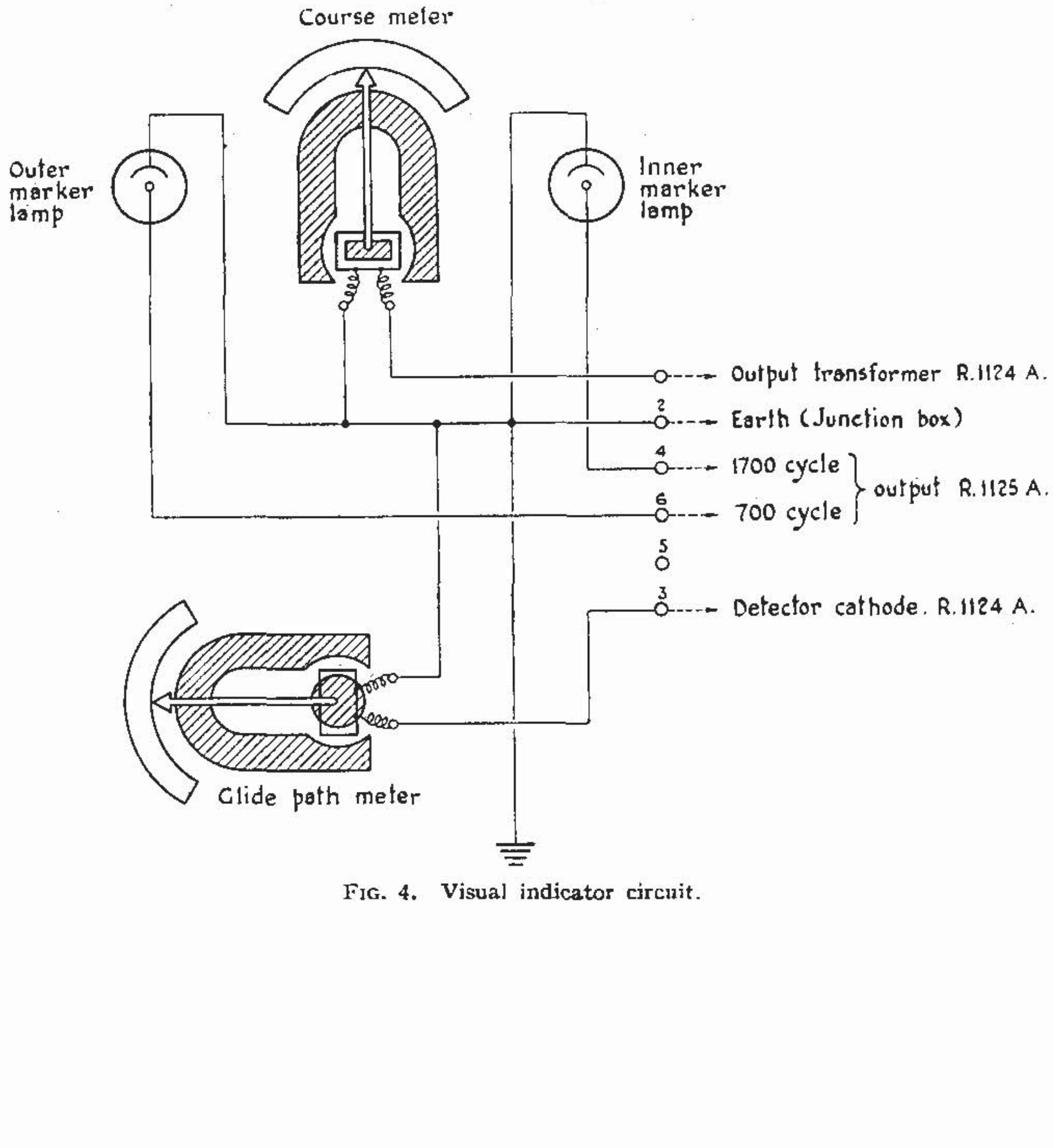

FIG. 4. Visual indicator circuit.

In addition to the two meters, two neon lamps are incorporated. These are operated by the marker beacon receiver through two A/F filters tuned respectively to 700 c/s and 1,700 c/s. The flashing of each neon lamp is an indication that the corresponding marker beacon is being flown over.

9. The action of the glide path meter is that of an ordinary D.C. micro-ammeter. It is operated by the D.C. space current of the detector valve of the main beacon receiver. This current is (very nearly) directly proportional to the R/F input to the valve. Thus the glide path meter may be regarded simply as a field strength meter graduated in arbitrary units.

10. The action of the course meter is somewhat different. The coil is wound on a metal former, but the fixed iron core, instead of being cylindrical as in ordinary moving coil micro-ammeters, consists of a comparatively narrow bar (*see* Fig. 4). This has the effect of concentrating the magnetic field into the middle of the gap between the pole pieces as shown.

11. If a short sharp impulse of current passes through the coil, when the latter is in its normal position and the pointer is reading zero, the coil is deflected to right or left according to the direction of this impulse. As soon as the coil starts to swing, however, it moves into a considerably weaker field. Two effects are then of importance :—(i) since the metal former is also moving in only a weak field, the currents induced in it are of small magnitude and the movement is practically undamped. Even a very small impulse of current may therefore cause a large deflection ; (ii) while the coil is moving through the weak field, a second short pulse of current in the opposite direction will have only a small tendency to cause the coil to deflect in the opposite direction, compared with the effect of the first pulse, which occurred when the coil was situated in a strong field.

12. If a current wave of the form shown in fig. 5 (L. or M.) is applied to the meter, the first impulse will cause the coil to be deflected to the left or right. The second impulse tends to cause the coils to be deflected in the opposite direction but actually has little or no effect because it occurs at a time when the coil is moving through only a weak field. Thus the effect of the whole wave is to cause the coil to deflect to the left or right, and to return to its normal position under the control of the spiral springs. As the coil returns to the normal position it re-enters the concentrated portion of the field, and the movement becomes heavily damped owing to the current induced in the coil former, and is practically dead beat in coming to rest.

Receiver R.1124A

13. The receiver R.1124A employs six valves of the indirectly-heated type, arranged in a superheterodyne circuit (shown in fig. 6) and comprises a pre-selector R/F amplifier V_1, a frequency changer V_2, two intermediate-frequency amplifiers V_3 and V_4, an anode-bend second detector V_5 and an output valve V_6 which operates the course meter only.

14. The main beacon signals are received on a vertical aerial which is connected to the receiver by a co-axial cable transmission line terminating in a plug which engages a socket on the receiver.

15. The " live " member of the socket is connected to the inductance L_1 by means of a tap by which the input impedance is approximately matched to the line impedance. The control grid of the R/F amplifier valve V_1 is connected to the input circuit *via* the condenser C_1 and through leak resistance R_1 to the grid bias control line. A condenser C_2 is connected between the latter and earth. The inductance L_1 is tuned to any one of six pre-determined frequencies by the pre-set variable condensers CT_1 to CT_6.

16. The anode circuit of the valve V_1 is coupled to the fourth grid of the frequency changer valve V_2 by the tuned radio-frequency transformer L_2. The primary winding is tuned to the signal frequency by one of the pre-set condensers CT_7 to CT_{12}, and the secondary winding by one of the pre-set condensers CT_{13} to CT_{18}. The whole arrangement therefore constitutes a radio-frequency band-pass filter (*see* Signal Manual, Part II, A.P.1093, Chapter XII).

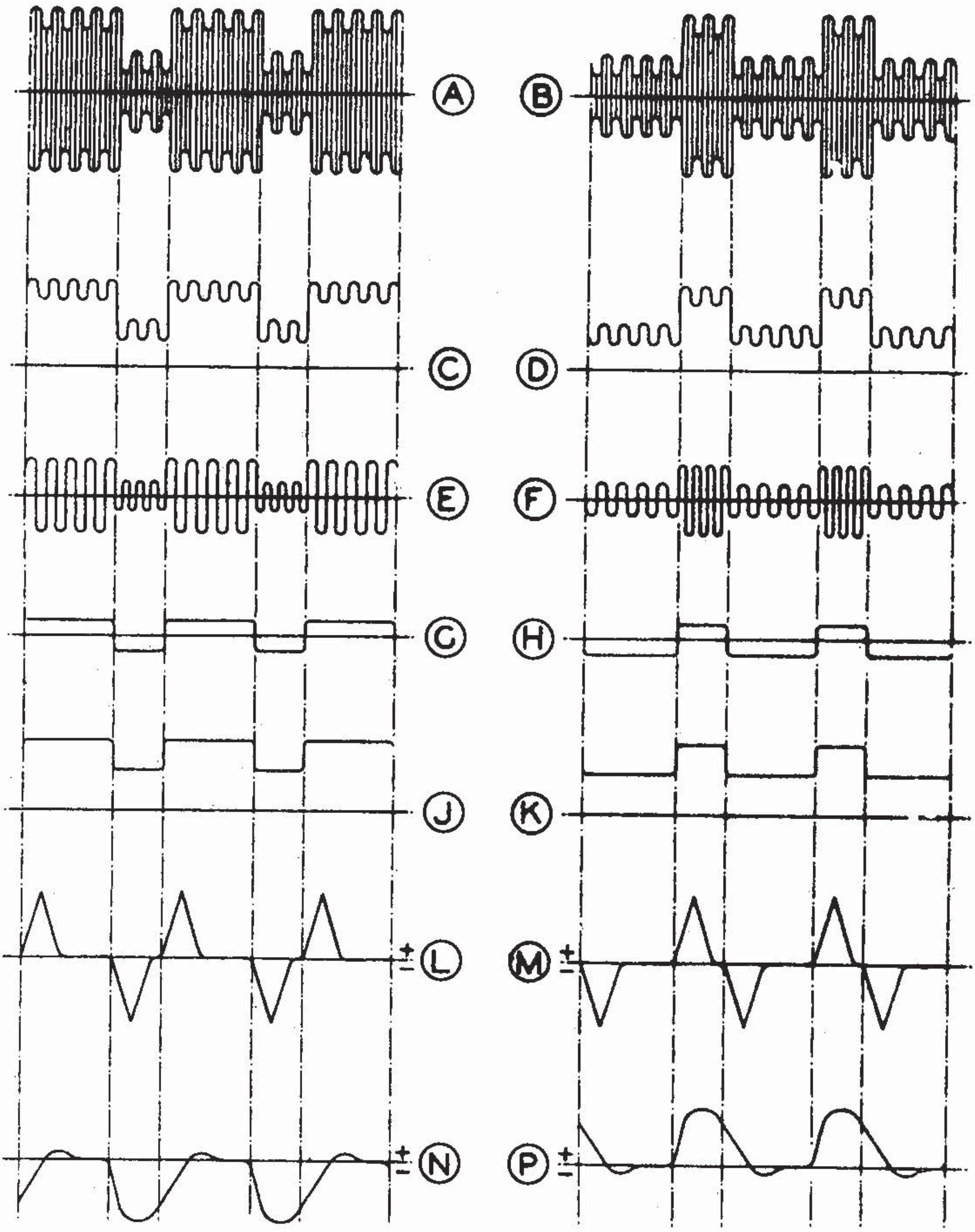

FIG. 5. RECEIVER R.1124 A — WAVEFORMS

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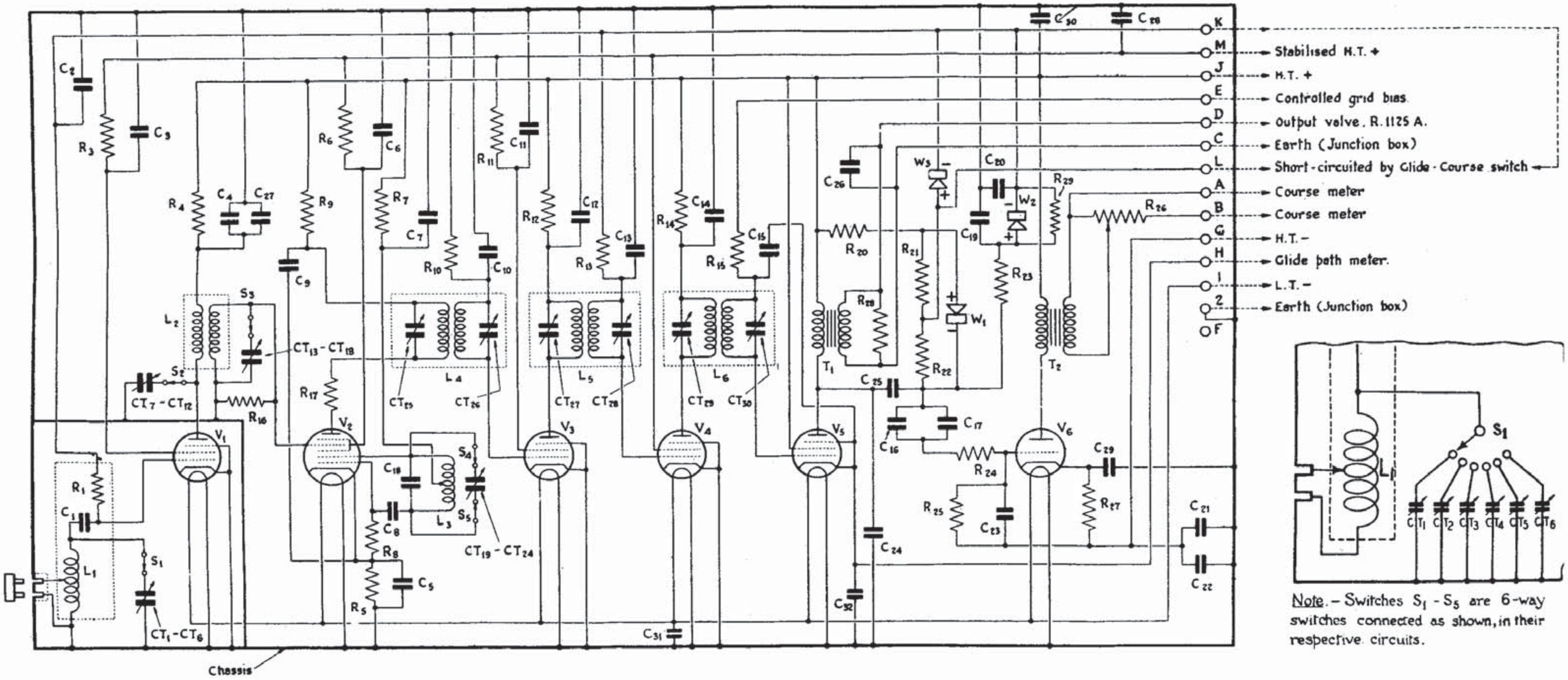
Components	
C2 C1, C3 CT7 CT12 CT1 CT6, C4 CT13, C27 CT18, C9, C6.CT25 C7 C8 C18 C5, C10 CT26 CT19 - CT24, C11 CT27, C12, C13 CT28, C31 CT29, C14, C15 CT30, C26 C32 C24, C25 C16, C17, C19, C20 C23, C30, C28 C29, C21 C22	Condensers
R3 R1, R4, R16, R9 R17 R6, R8 R5 R7, R10, R11, R12, R13, R14, R15, R20 R28, R21 R22, R25.R24.R23, R29, R27, R26	Resistances
L1, L2, L4 L3, L5, L6	Inductances
S1, S2 V1, S3, V2, S4 S5, V3, V4, V5.T1, W3 W1, W2. V6. T2	Miscellaneous



Note. – Switches $S_1 - S_5$ are 6-way switches connected as shown, in their respective circuits.

FIG.6. RECEIVER R.1124 A — THEORETICAL CIRCUIT DIAGRAM

P.1894.

Components (left to right)	Category
C_1 C_{11} C_3 C_2 C_4 C_{10} C_5 C_5 C_8 C_6 C_9 C_7	Condensers
R_1 R_4 R_3 R_2 R_{11} R_{10} R_7 R_8 R_5 R_9 R_6	Resistances
L_3 V_1 T_1 V_2 T_2 L_2 L_1	Miscellaneous

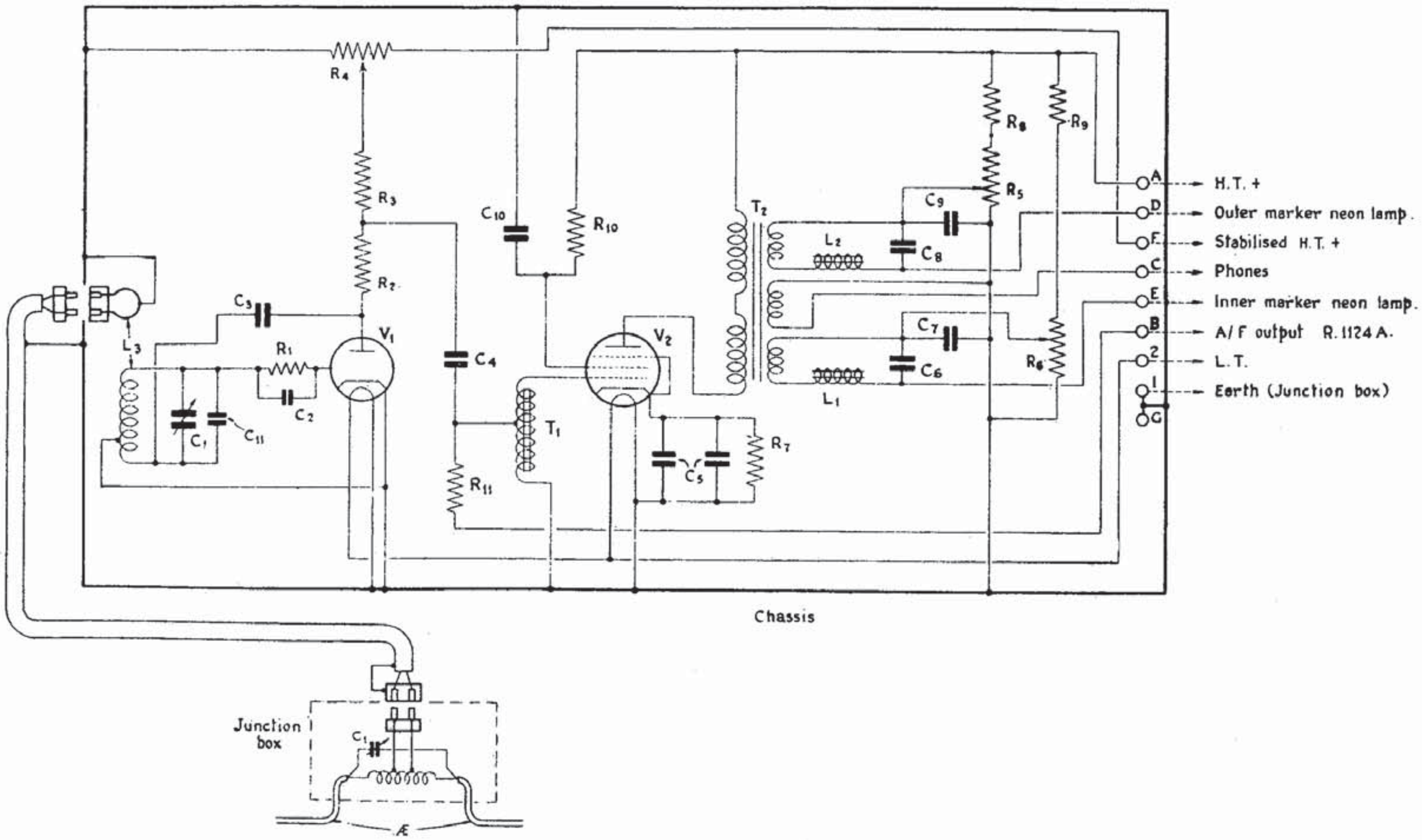


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FIG. 7 RECEIVER R.1125A — THEORETICAL CIRCUIT DIAGRAM

17. The frequency changer valve V_2 is a heptode. An oscillatory circuit consisting of an inductance L_3, condenser C_{18}, and one of the pre-set condensers CT_{19} to CT_{24}, is connected between the first grid (oscillator control) and second grid (oscillator anode), the H.T. feed being taken through the de-coupling resistance R_7 with its associated condenser C_7 to the centre point of the coil so that the circuit functions as a Hartley oscillator. Automatic control grid bias is provided by the resistance R_5 and by-pass condenser C_5. The oscillator grid bias is of the " leaky " type and is provided by the resistance R_8 and condenser C_8.

18. The frequency-changing process is briefly described in Signal Manual, Part II. A.P.1093, Chapter XI. The anode current of the heptode contains, among others, an oscillatory component at the designed intermediate frequency, which is approximately 7 Mc/s. This frequency is amplified by the two succeeding stages, the first consisting of the tuned R/F transformer L_4 and valve V_3, and the second consisting of the tuned R/F transformer L_5 and valve V_4.

19. Valves V_3 and V_4 are R/F pentodes. The cathode of each is earthed, and grid bias is derived from the grid bias control line *via* de-coupling resistances R_{10} and R_{13} and the respective secondary windings of the R/F transformers L_4 and L_5. De-coupling condensers C_{10} and C_{13} are associated with the de-coupling resistances. The output of the intermediate frequency stages is applied to the control grid circuit of the second detector valve V_5 *via* a tuned R/F transformer L_6.

20. The usual de-coupling resistances R_3, R_6 and R_{11} and condensers C_3, C_6 and C_{11} are associated with the screens of valves V_1, V_2 and V_3. The anodes of valves V_1, V_2, V_3 and V_4 are de-coupled by resistances R_4, R_9, R_{12} and R_{14} and associated condensers C_4+C_{27}, C_9, C_{12} and C_{14} respectively. The anode and screen H.T. supplies are shunted by reservoir condensers C_{30} and C_{28} respectively. The H.T.—line is connected through condenser $C_{21}+C_{22}$ to earth.

21. The three intermediate frequency transformers L_4, L_5 and L_6 are tuned by means of pre-set condensers mounted in the transformers themselves. They are correctly adjusted during manufacture and should not be interfered with. If their setting is disturbed, it is a matter of considerable difficulty to re-align the intermediate frequency stages, even if proper equipment is available.

22. The valve V_5 is a radio-frequency pentode, operated as a lower-anode-bend detector. The grid bias voltage is derived from the control unit *via* de-coupling resistance R_{15} and condenser C_{15}, but not from the common grid bias line supplying valves V_1, V_3 and V_4. Part of the mean space current of this valve is used to operate the glide path meter.

23. The A/F transformer T_1, the secondary of which is shunted by resistance R_{28} and condenser C_{26}, feeds part of the output of the valve V_5 to the output valve of the marker beacon receiver, and thence to the telephone receivers. A small portion of the A/F output current, however, flows in the path C_{25}, R_{22}, R_{21}, R_{20}, which is in parallel with the primary winding of the transformer T_1. A metal rectifier W_1 is shunted across a portion of this circuit in order to provide an automatic gain control voltage for the valves V_1, V_3 and V_4, and also to produce a waveform suitable for operating the course meter.

24. Before describing the remainder of the circuit it is necessary to appreciate the nature of the signal received under various conditions. When the aeroplane is flying on the correct track the signal is a steady carrier, modulated at 1,150 c/s. The detector valve V_5 rectifies this and its anode current may be resolved into three components, *viz.*: (i) a radio-frequency component which is by-passed by the condenser C_{24}, and need not be considered further; (ii) a steady D.C. component which is above the no-signal value; (iii) an A/F component of 1,150 c/s; the greater part of this component passes through the primary winding of the output transformer T_1, setting up a secondary voltage which is passed to the telephones *via* the A/F stage of the marker beacon receiver. A portion of the A/F component flows in the path C_{25}, R_{22}, R_{21}, R_{20}, a metal rectifier W_1 being connected in shunt with R_{21} and R_{22}. This rectifier suppresses one-half of the voltage wave across these resistances so that a uni-directional

pulsating P.D. is set up across the resistance R_{22}, with the polarity indicated in fig. 9 by the conventional signs. This pulsating P.D. is applied between the cathode line (*via* resistance R_8 in the control unit) and the automatic gain control line. The resistance R_{23}, the metal rectifier W_2, and the condensers C_{19} and C_{20} are inserted in order to provide a time delay circuit and smooth out the 1,150 c/s pulsations, and by this means a steady bias voltage is applied to the grids of valves V_1, V_3 and V_4. A third rectifier W_3 connected between the A.G.C. line and the junction of resistances R_{21} and R_{22} ensures a low resistance path for grid current from valves V_1, V_3 and V_4 back to the negative bias line without affecting the time constant of the control circuit. A medium impedance triode valve V_6 is employed in the output stage, which functions as a D.C. amplifier for the course meter only. Automatic grid bias for this valve is provided by R_{27} and C_{29}.

25. Referring to fig. 5, when the aeroplane is to the left or right of the correct track, the received signal is chopped into short intervals of alternately strong and weak carrier, as shown in A or B. After rectification by the valve V_5, the anode current of the latter contains a R/F component by-passed by condenser C_{24}, and an A/F component super-imposed upon the D.C. component (C and D). This waveform may again be resolved into an A/F component (E or F) (which is applied to the telephones *via* the marker beacon receiver) a rectangular wave (G or H) and an average steady value. Owing to the presence of the components R_{23}, W_2, C_{19}, C_{20} only the latter is applied to the A.G.C. line. The presence of the capacitance $C_{16}+C_{17}$ prevents any direct current from flowing in the filter circuit C_{16}, C_{17}, R_{24}, R_{25}, C_{23}. The waveform reaching the grid of the output valve V_6 is, therefore, as shown in G or H. This grid receives a negative bias from the cathode resistance R_{27} which is associated with a by-pass condenser C_{29}. The anode current of this valve will therefore vary in the manner shown in J or K. This current flows in the primary winding of the output transformer T_2 and will set up a secondary E.M.F. proportional to the rate of change of the primary current. The latter quantity is plotted in L and M. The secondary current will be proportional to this and will therefore possess the same waveform, so that diagram L or M may therefore be taken to represent the current which flows in the moving coil of the course meter. The diagrams N and P show the movements of the course meter pointer which kicks with the first pulse received. The effect of the return pulse is almost suppressed by the non-linear friction characteristic and non-linear field of the meter, as explained in paras. 10 to 12. It will now be appreciated that when the aeroplane is to the left of the track the pointer will move from zero to the right and back to zero, while when on the right of the track, it will move from zero to the left and back to zero, repeating this movement synchronously with the frequency of the keying rhythm, *viz.* once per second. The pre-set potentiometer R_{26} controls the amount of signal passed to the course meter.

Receiver R.1125A

26. A theoretical circuit diagram of this receiver is given in fig. 7. It consists of a simple cumulative-grid detector with anode voltage controlled Reinartz reaction, followed by an A/F output stage which feeds the receiving telephones and also the inner and outer marker beacon neon lamps in the visual indicator. Both marker beacons operate on a frequency of 38 Mc/s, the outer being modulated at 700 c/s and broken into dashes, while the inner is modulated at 1,700 c/s and broken into dots. These signals are received on a horizontal dipole aerial AE fitted on the aeroplane and are fed to the receiver *via* a junction box and a screened cable with two inner conductors. At the receiver, the output from the cable is coupled to the tuned input circuit of the detector valve V_1 by means of the balanced primary winding of the R/F transformer L_3.

27. The input circuit is tuned to the marker beacon frequency by the pre-set condenser C_1. The circuit is connected to the grid of the valve *via* the condenser C_2 and leak resistance R_1, the required reactive feedback from the resistance R_2 in the anode circuit being *via* the condenser C_3. The resistance R_3 is the principal anode load, the A/F voltages set up across this component being applied to the grid of the succeeding valve V_2 *via* the condenser C_4 and the primary winding of the auto-transformer T_1. Reaction is controlled by the potentiometer R_4 which varies the H.T. supply voltage to the detector valve.

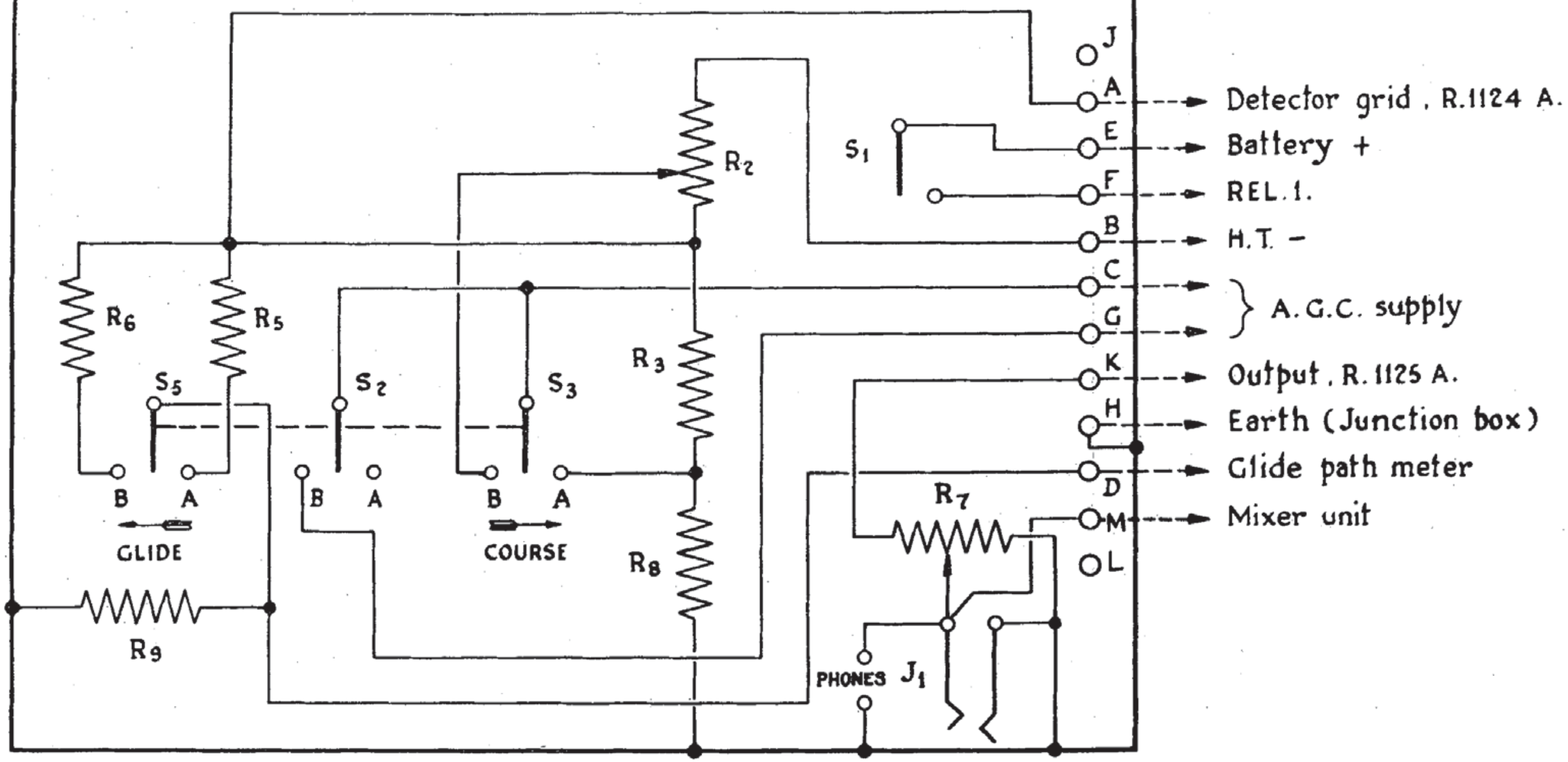

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FIG. 8. CONTROL UNIT — THEORETICAL CIRCUIT DIAGRAM

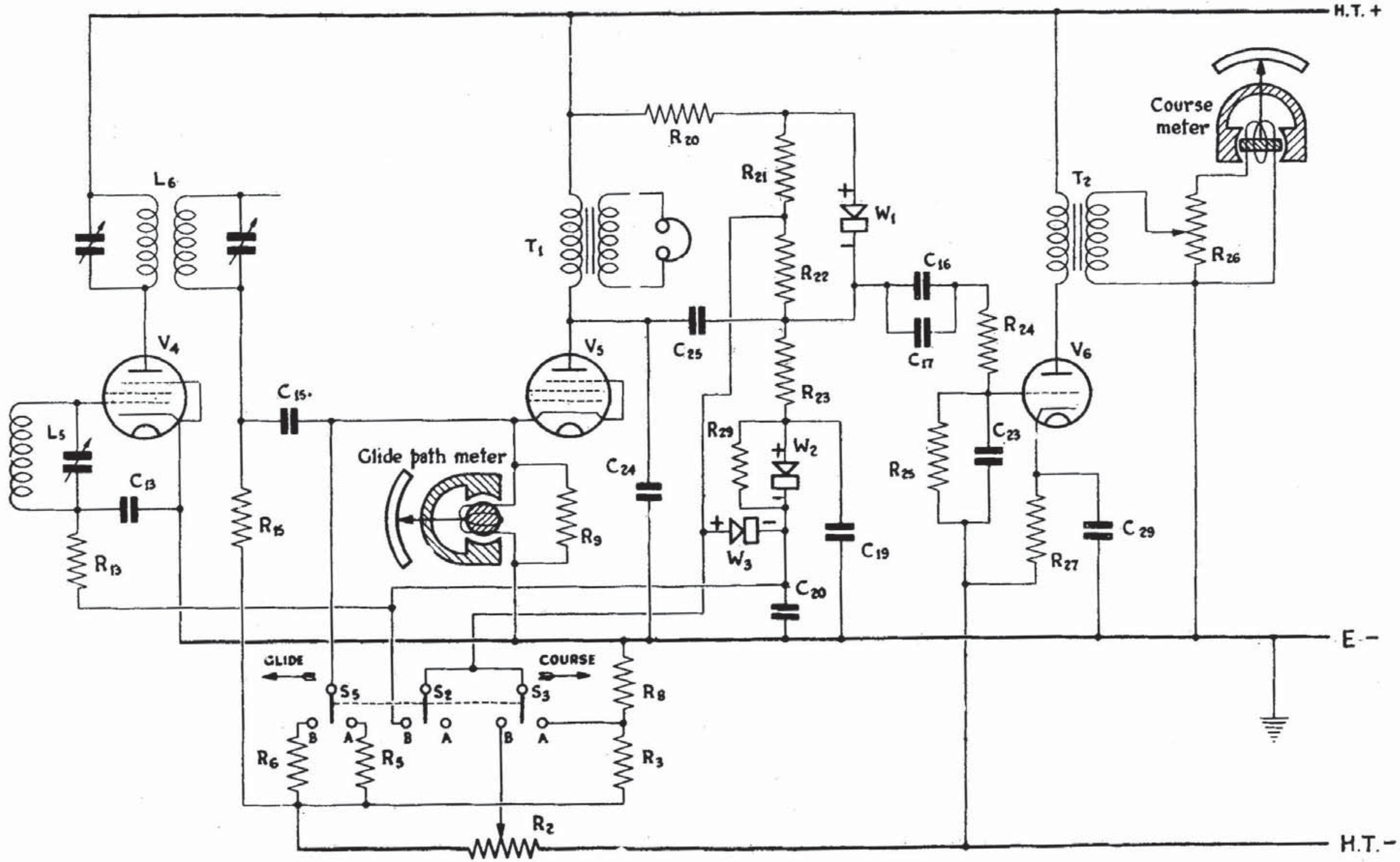

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FIG. 9. GLIDE AND COURSE — SKELETON CIRCUIT

28. The A/F output from the detector valve of the main beacon receiver is also fed to the primary of the auto-transformer T_1 through the resistance R_{11}.

29. The output valve V_2 is a pentode, its auxiliary grid being maintained at a mean steady potential slightly below that of the anode by the feed resistance R_{10}, with which a R/F by-pass condenser C_{10} is associated. The valve derives its A/F input voltage from the secondary winding of the auto-transformer T_1. Automatic grid bias is applied by the resistance R_7 shunted by the A/F by-pass condenser C_5.

30. The anode circuit includes the primary winding of the output transformer T_2. This transformer has three secondary windings. The middle one supplies the telephone receivers. The other two supply the neon lamps of the visual indicator, the upper, *via* the A/F filter L_2—C_8, tuned to 700 c/s, for the outer marker and the lower, *via* the A/F filter L_1—C_6, tuned to 1,700 c/s, for the inner marker. Two pre-set potentiometers R_5 and R_6 associated with by-pass condensers C_9 and C_7 respectively, provide an adjustable priming voltage for the neon lamps.

31. The receiver is fitted with two sockets, one for the engagement of the screened transmission line to the plug of the aerial circuit, and the other for the Breeze interconnecting cable plug.

Control unit

32. A theoretical circuit diagram of the control unit is given in fig. 8. The controls are as follows :—

(i) The ON-OFF switch. This is the switch S_1 on the theoretical circuit diagram it controls the battery current through the starter relay REL_1 in the power unit.

(ii) The frequency selector switch. This operates a bowden cable mechanism and remotely controls the switches S_1, S_2, S_3, S_4, S_5 (fig. 6), in the main beacon receiver, so selecting the desired frequency.

(iii) The " service " switch. This has two positions, engraved COURSE and GLIDE respectively ; it controls the grid bias circuits of the main beacon receiver. When this switch is in the COURSE position, the grids of the valves V_1, V_3 and V_4 receive an automatic gain control voltage from the rectifier W_1 (fig. 6) as explained in para. 25. When in the GLIDE position, the automatic gain control line is short circuited and the grid bias of the valves V_1, V_3 and V_4 is controlled by means of a potentiometer.

(iv) The manual gain control. This is the potentiometer just referred to, and is denoted by R_2 on the theoretical circuit diagram.

(v) The volume control. This is a potentiometer (R_7, fig. 8) connected directly across the receiving telephones for the adjustment of the general signal level.

33. Referring to fig. 8, the service switch operates the three switches S_2, S_3 and S_5, the two former being ganged. Terminal C, which is connected to the moving members of both, is connected externally to the junction of the resistances R_{21} and R_{23} in the main beacon receiver. In the COURSE position S_2 is open and S_3 is at A, so that this junction is connected to the junction between R_3 and R_8.

34. The resistances R_8, R_3 and R_2 are in series between the cathode and the H.T.— line, so that the initial bias (*i.e.* irrespective of that due to rectification of the A/F signal by W_1) is that due to the volts drop across R_8.

35. When the service switch is in the GLIDE position, switch S_2 is closed and S_3 is at B. The junction of R_{21} and R_{22} in the main receiver is then connected to the tapping point on the potentiometer R_2, giving manual control of the amplifier gain, while the A.G.C. line is short circuited. Fig. 9 is a skeleton circuit diagram showing the interconnection between the main receiver, visual indicator and control unit with the alternative positions of the service switch.

36. The switch S_5 is independent of the switches S_2 and S_3 although operated simultaneously. In effect, it varies the resistance of the path between the cathode of V_5 and negative H.T. and so diverts a larger or smaller amount of the space current of this valve from the moving coil of the glide path meter. The latter is also permanently shunted by the resistance R_9 in the control unit.

Power unit

37. A theoretical circuit diagram of the power unit is given in fig. 10. The principal component is a rotary transformer of the permanent magnet field type, which is driven from the 12-volt general service accumulator of the aeroplane. This rotary transformer provides both the L.T. (heater) supply and the H.T. supply for the receivers R.1124A and R.1125A.

38. The 12-volt supply is connected, through the main junction box to the motor commutator of the machine, *via* one pair of contacts on the relay REL_1. The winding of the relay is also energized from the general service accumulator, through the switch S_1 on the control unit. By this means, the supply cables, which carry a heavy current, are kept as short as possible and the distance between the control unit and the remainder of the equipment does not affect the terminal P.D. at the motor terminals. Except as stated above, the accumulator is not connected to the blind approach equipment.

39. On closing the switch S_1 in the control unit, the lower contacts of the starter relay close the circuit through the motor armature winding, a R/F choke L_5 being connected in series in the positive lead and a similar choke L_6 in the negative lead. Two condensers C_7 and C_8 are connected in series across the motor brushes, the mid-point being earthed. The assembly L_5—C_7, L_6—C_8 forms a filter which prevents interference with the R/F portion of the equipment.

40. The H.T. armature winding is connected to the main junction box through a R/F filter system consisting of the condensers C_3, C_4, the R/F chokes L_2, L_3, and the condensers C_5, C_9, each pair of condensers being connected in series and the mid-point earthed. A fuse F_1 is fitted in the positive H.T. lead. The H.T. circuit is completed by the relay REL_1, when the winding is energized by the closure of the switch S_1 in the control unit. The anode supplies are fed to the respective receivers *via* the iron-core choke L_4, a condenser C_6 being connected from the out-going H.T. supply lead to earth. The screen voltages for the receiver R.1124A, and the detector anode voltage for the receiver R.1125A are fed *via* the resistances R_1 and R_2. The neon lamp N_1 functions as a voltage stabilizer.

41. The negative brush of the L.T. armature is connected to the main junction box *via* the R/F choke L_1 a condenser C_2 being connected between the L.T.—brush and earth. It should be noted that the L.T. + brush is connected directly to earth. A condenser C_1 is connected between the out-going L.T. — lead and earth. The condensers and choke enumerated form a R/F filter.

Aerial for receiver R.1124A

42. This is a short retractable vertical aerial for reception of the main beacon signals. It is connected to receiver R.1124A by a flexible co-axial feeder. If the feeder has to exceed 20 ft. in length a small loading coil is connected between the aerial and the feeder in order to provide better matching of the aerial and line impedances.

Aerial for receiver R.1125A

43. This is a dipole aerial mounted horizontally on the aeroplane for reception of the horizontally-polarized signals from the marker beacon transmitters. It is connected to receiver R.1125A by a screened feeder with two inner conductors. To match the aerial and feeder impedances, a tuned circuit, housed in the junction box for the screened feeder, is connected between the dipole elements. The feeder is tapped to two points on the inductance symmetrically disposed about the centre.

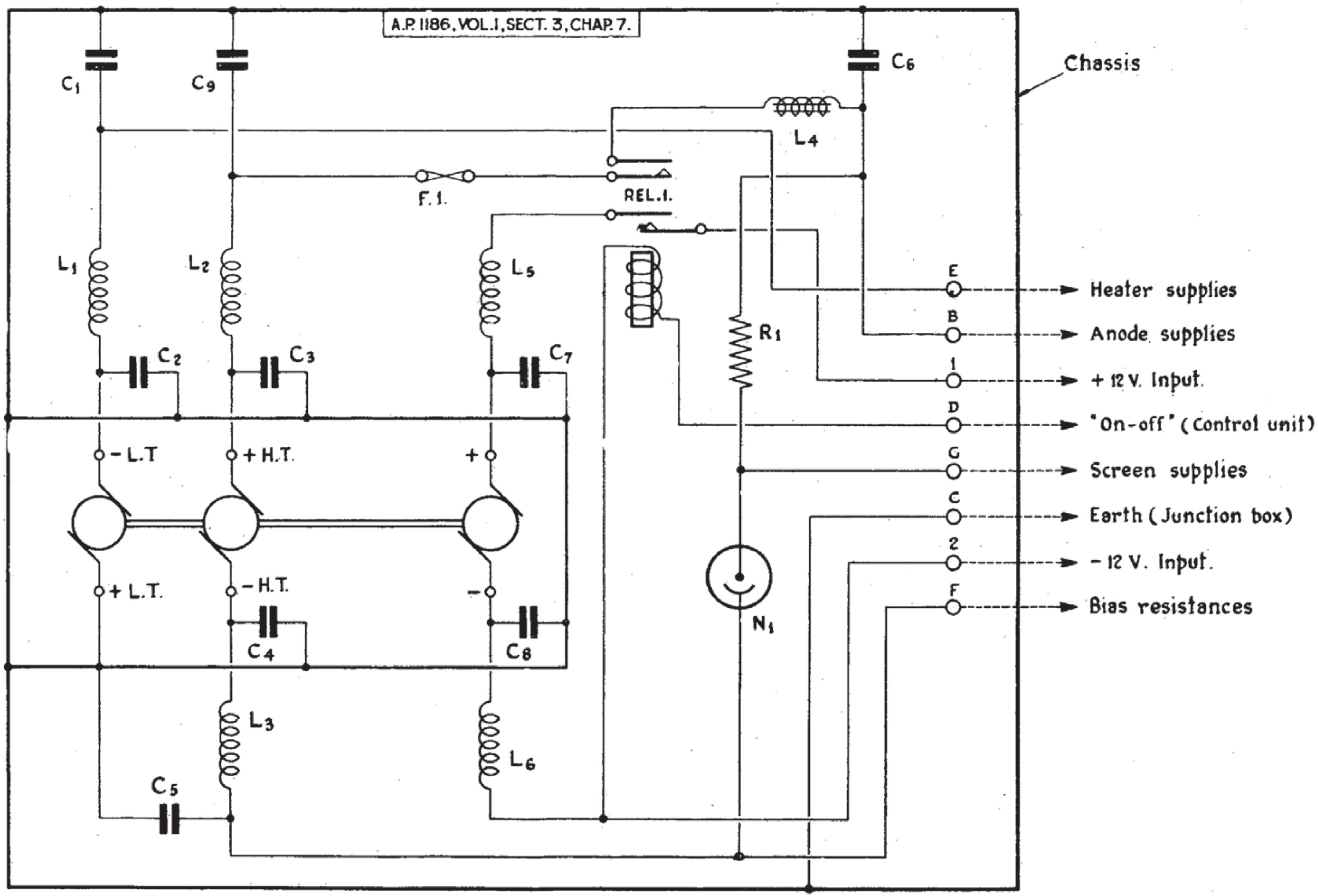

FIG.10. POWER UNIT — THEORETICAL CIRCUIT DIAGRAM

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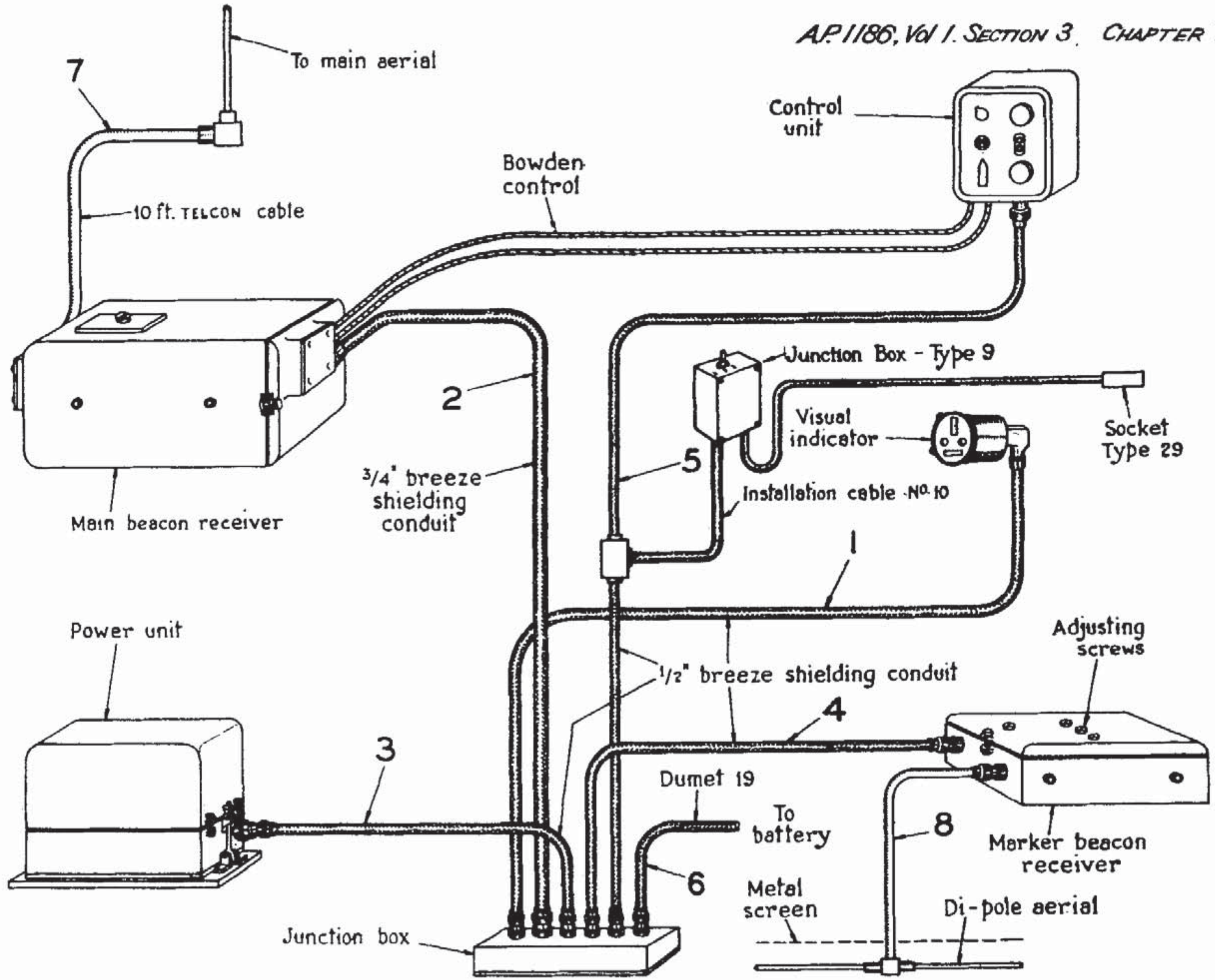

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FIG. 11. INSTALLATION DIAGRAM

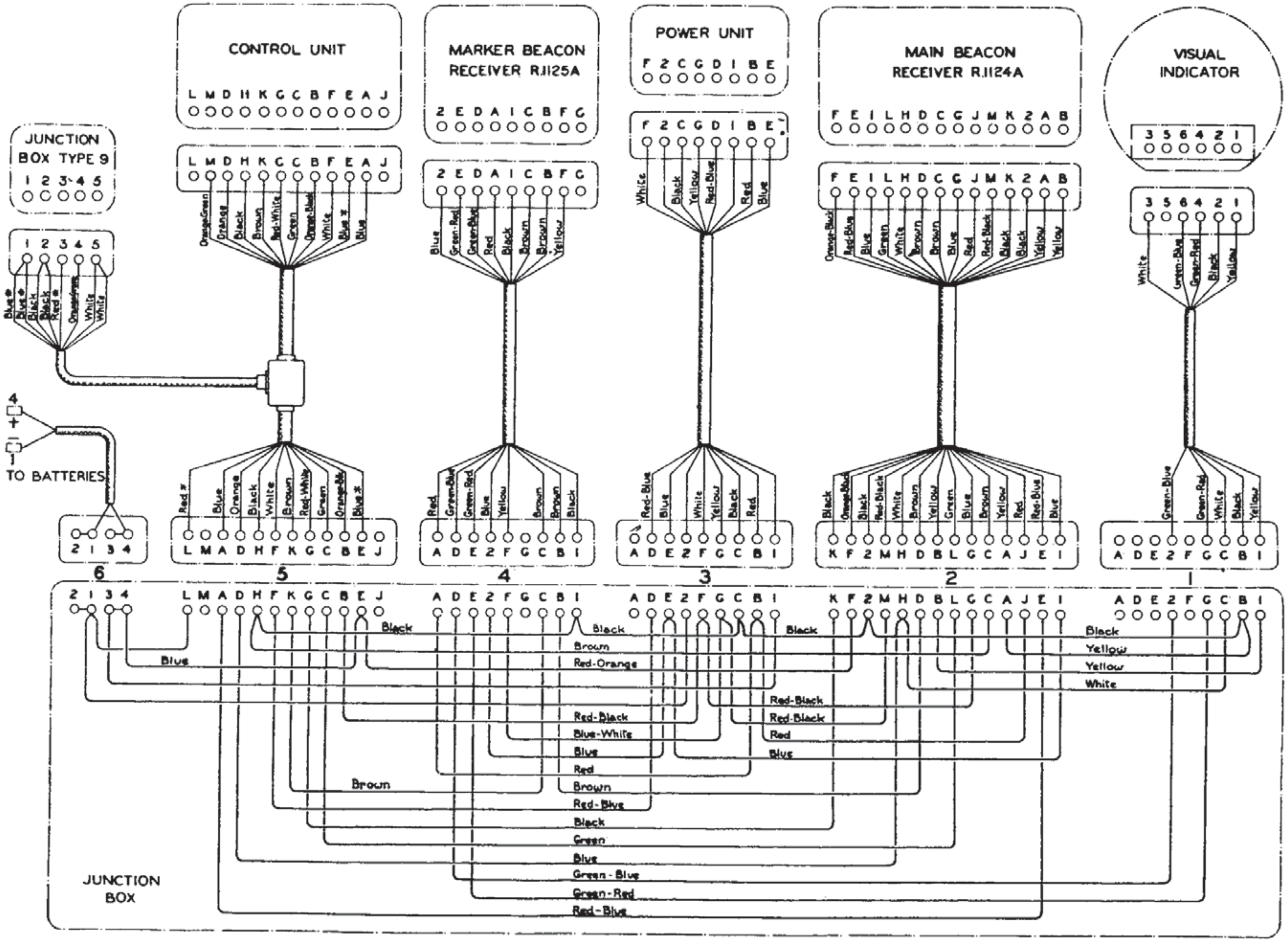

FIG. 12. JUNCTION BOX AND CABLE COLOUR CODE

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Junction box and cables

44. The power supply connections for the receivers, and the various interconnections between the units of the equipment are made through a junction box. These connections are shown in fig. 11. The junction box has six Breeze sockets with which are engaged the Breeze interconnecting cables from the visual indicator, receiver R.1124A, power unit, receiver R.1125A, control unit and 12-volt battery respectively. The cable colour code, terminal designations and internal junction box connections are indicated in fig. 12.

CONSTRUCTIONAL DETAILS

Visual indicator

45. Front and back views of the visual indicator are shown in figs. 13 and 14 respectively. Referring to fig. 13, (1) is the course meter and (2) its white indicating line which moves horizontally towards the marks R (right) or L (left) if the aeroplane is not on the correct approach track. The glide path meter (3) has an uncalibrated vertical scale (4).

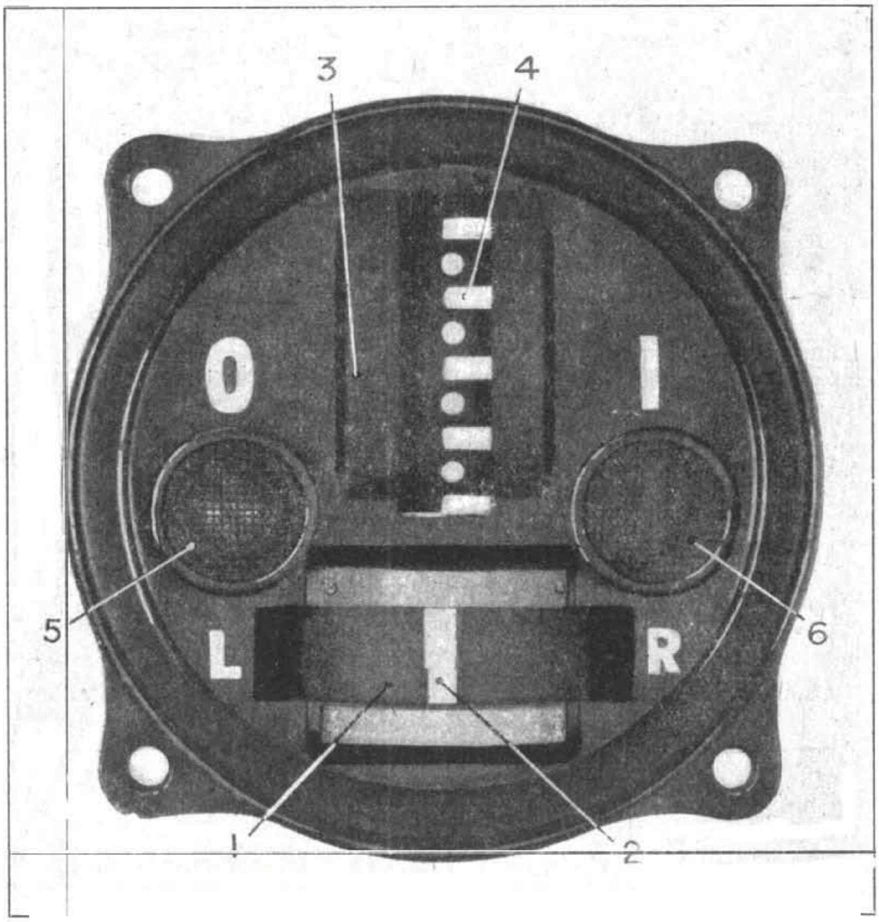

FIG. 13. Visual indicator, front view.

46. Two neon signal lamps are visible through the windows (5), (6) marked O (outer) and I (inner) respectively. The first flashes while the outer marker beacon is being crossed, and the second while the inner marker beacon is being crossed. The scales and the designations L, R, O, I are self-luminous.

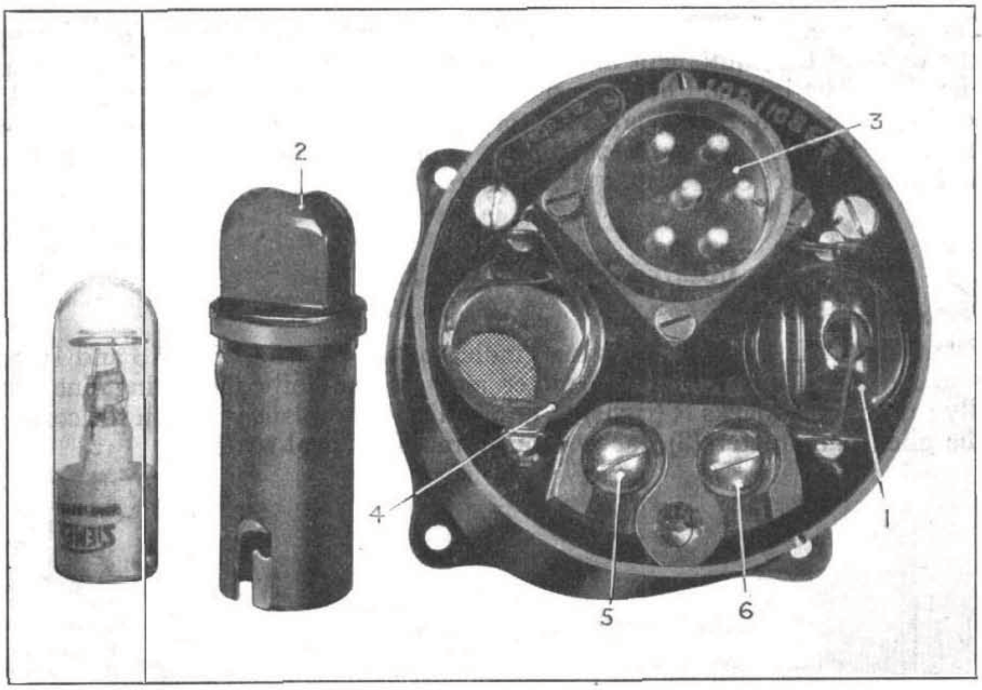

FIG. 14. Visual indicator, back view.

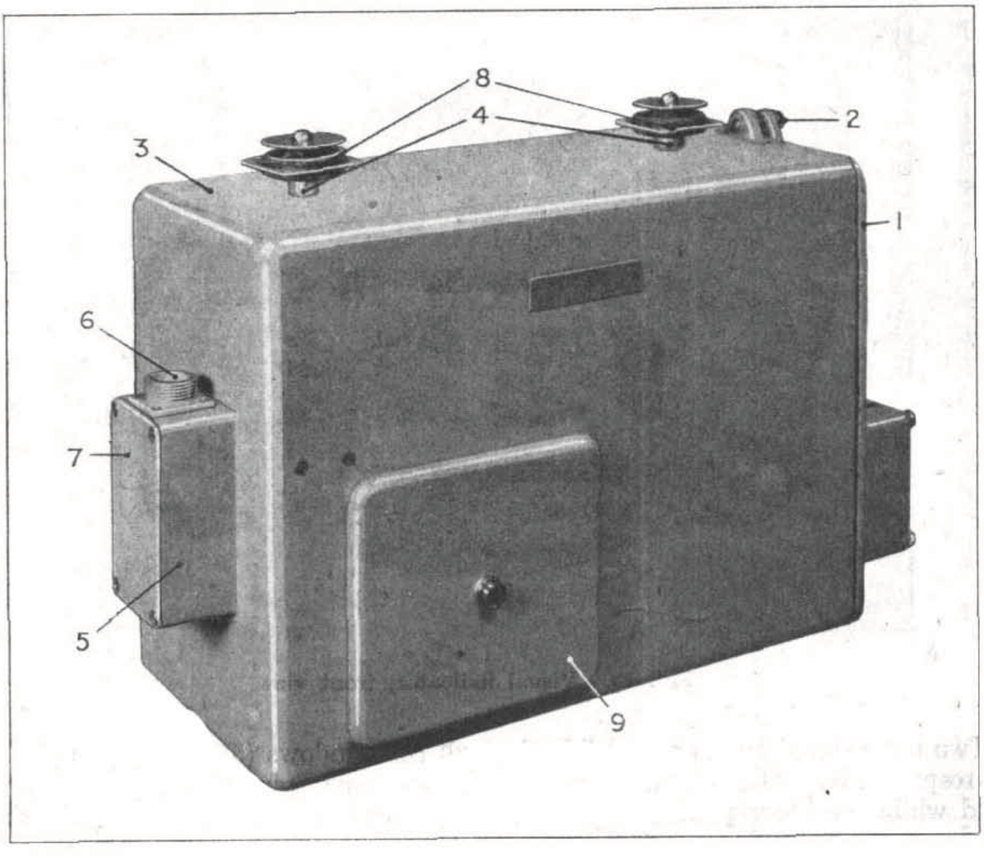

FIG. 15 Receiver R.1124A, exterior view.

47. At the rear of the instrument, illustrated in fig. 14, are the neon lampholders (1) and (2), which may be withdrawn by pushing aside a locking spring (4) and pulling the holder in an axial direction. A six-way screened socket (3) is provided for the plug on the cable from the junction box. This plug is normally a special right-angle plug fitting supplied with the installation cabling, but in certain installations a straight-through plug fitting is supplied. Extra internal lighting is provided for by a removable 12-volt, 3-watt lamp which is connected to the terminals (5) and (6). These may be wired to the dashboard lighting system of the aeroplane, if required.

Receiver R.1124A

48. Fig. 15 shows an exterior view of receiver R.1124A. The components of the receiver are carried by the cover plate (1) on the right which is clamped by screws (2) over the end of a cast aluminium box (3). A rubber gasket is interposed between the box and the cover plate. The box (3) is provided with eight tapped bosses, two of which (4) are shown, and four anti-vibration fixing plates for attachment thereto, two of which (8) are shown. An extension (5) on the left, houses the sockets (6) for the co-axial aerial cable connection and is provided with a removable inspection cover (7). A further removable cover (9) on the front face gives access to the frequency setting trimming condensers.

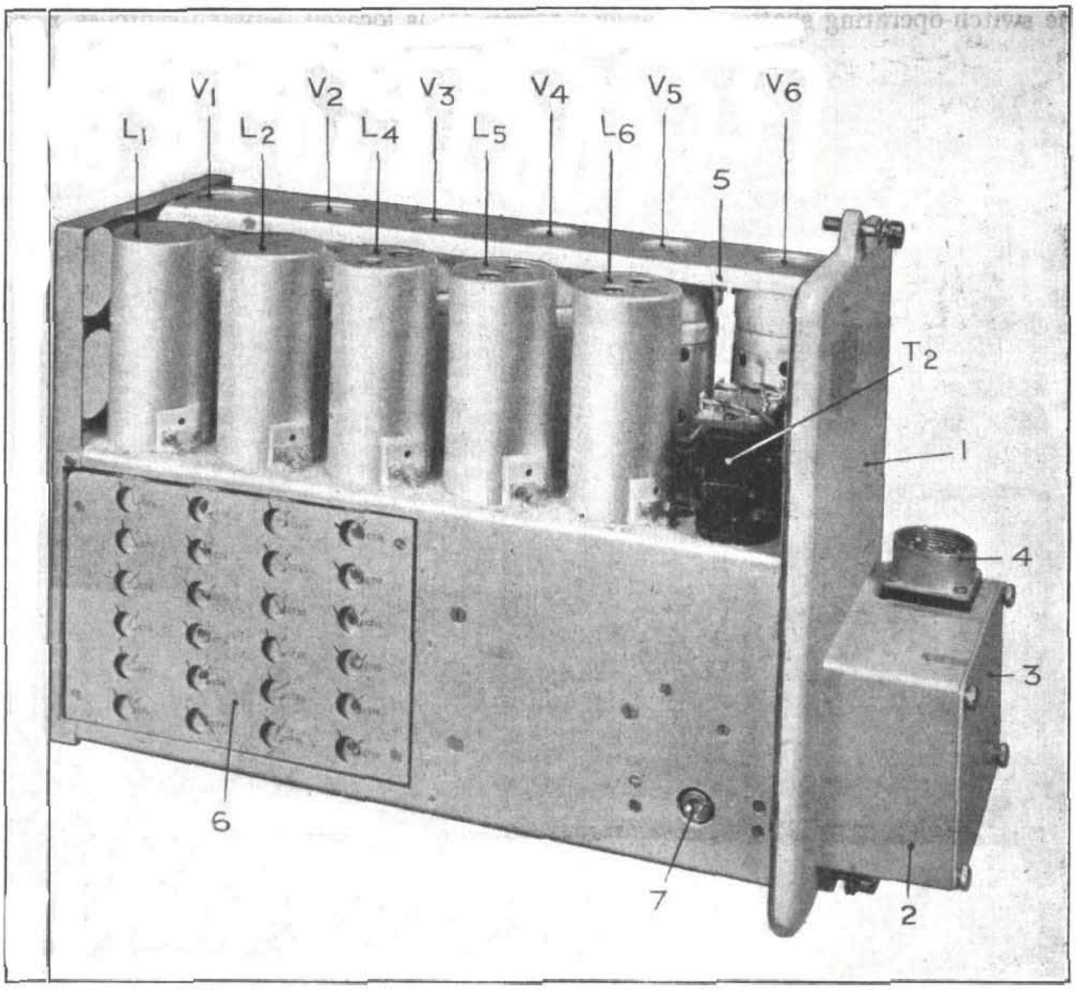

FIG. 16. Receiver R.1124A, removed from housing.

49. A general view of the receiver, removed from its housing, is given in fig. 16. On the right will be seen the supporting cover plate (1) which bears an extension (2) provided with a removable inspection cover (3). The extension houses the power cable socket (4) and the driven assembly of the remote control system.

50. The receiver chassis is divided into two compartments by a platform on the upper side of which are mounted the screened inductances L_1, L_2, L_4, L_5, L_6, the output transformer T_2, and the valves V_1 to V_6. The valve screening boxes are retained in position by a bar (5) held down by springs engaging hooks on the valve platform. The valves are prevented from leaving their holders by spring-pressed pads in the lids of the screening boxes.

51. The adjusting screws of trimming condensers CT_1 to CT_{24} are visible through holes in a removable portion (6) of the front wall of the chassis. A hole in the main front wall gives access to the adjusting screw (7) of the course meter amplitude adjusting potentiometer (R_{28}, fig. 6). A special trimming tool (13, fig. 19) is provided for trimming this receiver and receiver R.1125.

52. An underside view of the receiver is given in fig. 17 and a bench wiring diagram in fig. 18. In fig. 17 some of the frequency setting trimming condensers will be seen behind a sub-panel (1). Carried in front of this panel is the oscillator coil and the switch assembly comprising the switches S_1 to S_5 arranged for ganged control by the shaft (2) leading to the remote control mechanism. A flexible spring coupling (3) is interposed between the shaft (2) and the switch-operating shaft. An earthed screen (4) is located between switches S_1 and S_2.

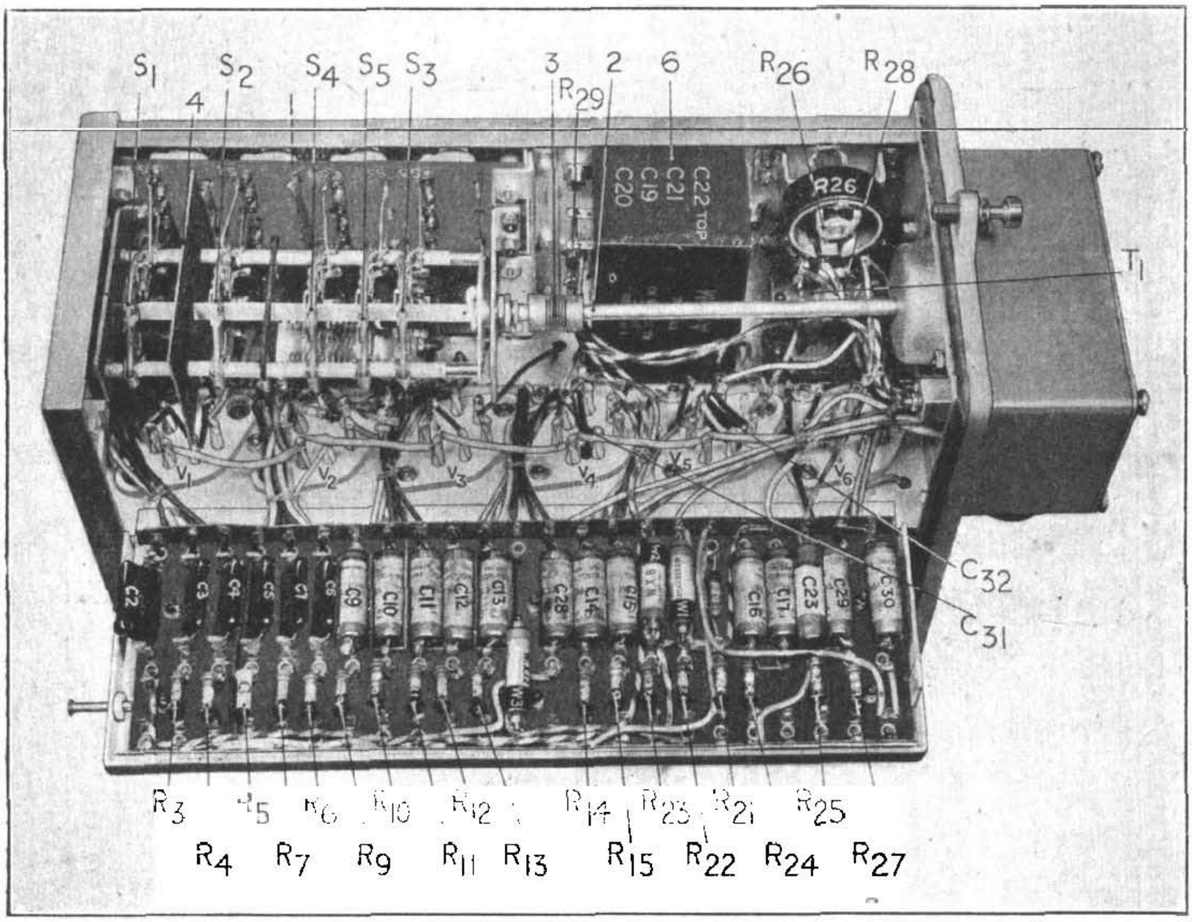

FIG. 17. Receiver R.1124A underside view.

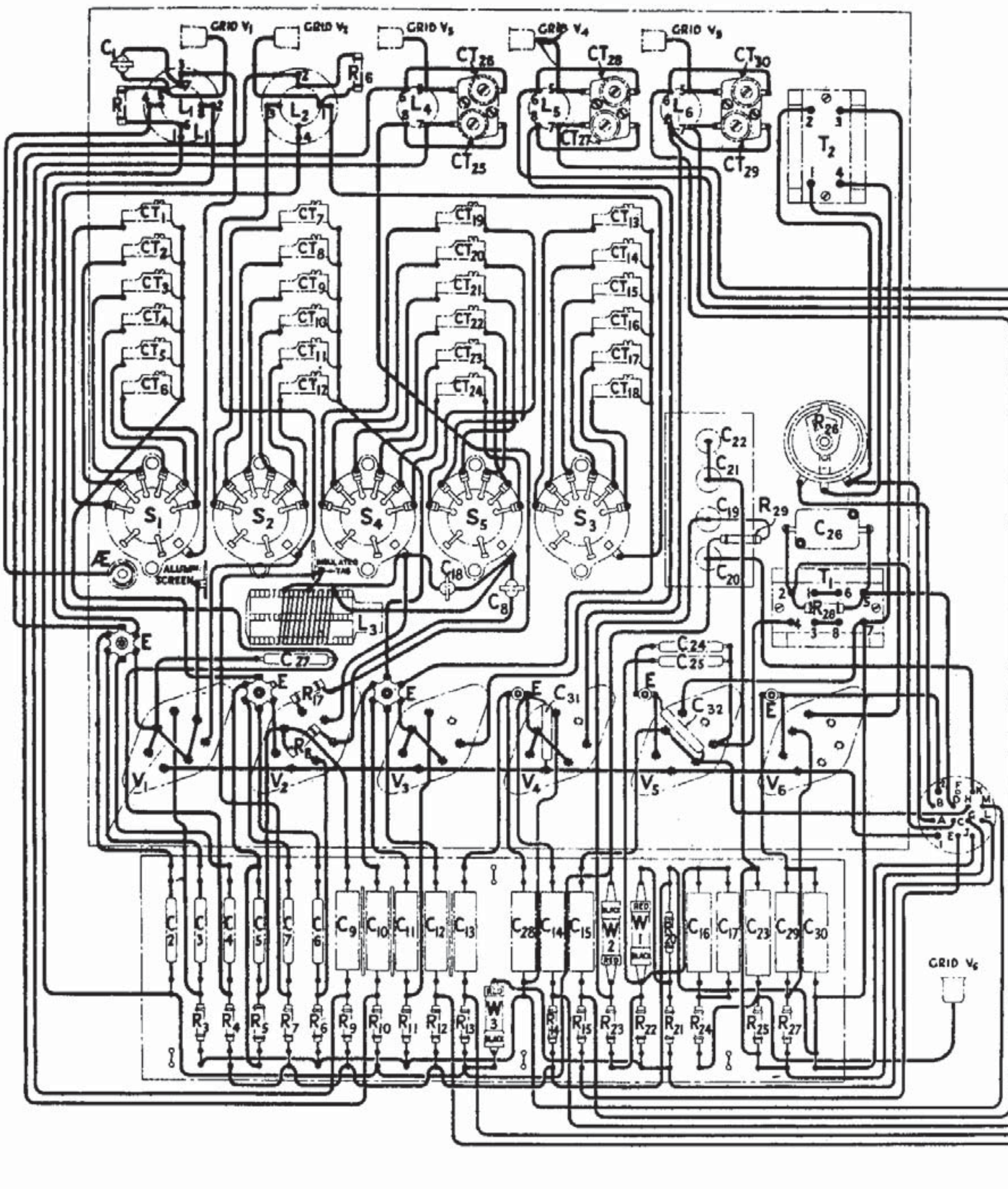

FIG. 18 RECEIVER R.1124 A, BENCH WIRING DIAGRAM

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53. Behind the shaft (2) are the potentiometer R_{26} associated with the course meter, the output transformer T_1, and a condenser pack (6) containing condensers C_{19} to C_{22}. The underside of the valve holders may be seen behind the hinged component board (5) which is shown swung down from its normal position in which it forms part of one wall of the receiver. The board (5) carries most of the smaller components, which are arranged in two rows. Referring to the upper row, on the left-hand side may be seen five moulded mica condensers C_2, C_3, C_4, C_5, C_7 and C_8, each of which has a capacitance of $0{\cdot}002\mu$ F. In the centre may be observed the eight tubular paper condensers C_9, C_{10}, C_{11}, C_{12}, C_{13}, C_{28}, C_{14} and C_{15} each of which has a capacitance of $0{\cdot}1\mu$ F. Immediately to the right of these may be seen the two Westectors W_2 and W_1, and the 10,000-ohm resistance R_{20}. Five tubular paper condensers are mounted on the right-hand side of the upper row. The condenser C_{23} has a capacitance of $0{\cdot}01\mu$ F and C_{16}, C_{17}, C_{29} and C_{30} have a capacitance of $0{\cdot}1\mu$ F each. The lower row comprises eighteen resistances, which are divided into two sections by the Westector W_3. The left-hand section consists of R_3, 1,000 ohms; R_5, 300 ohms; R_7, 2,000 ohms; R_6, 10,000 ohms; R_9, 1,000 ohms; R_{10}, 10,000 ohms; R_{11}, 1,000 ohms; R_{12}, 1,000 ohms and R_{13}, 10,000 ohms. The right-hand section comprises R_{14}, 1,000 ohms; R_{15}, 2,000 ohms; R_{23}, 5 megohms; R_{22}, 500,000 ohms; R_{21}, 10,000 ohms; R_4, 1,000 ohms; R_{25}, 1 megohm, and R_{27}, 1,000 ohms.

54. The aerial connection and the earth connection for the instrument are made automatically when the receiver chassis is placed in the outer box. This is accomplished by the provision in the outer box of two internally-projecting pins which fit into corresponding sockets in the receiver chassis. The earth pin is made of sufficient strength to give mechanical alignment and support as well as electrical contact.

Receiver R.1125A

55. Fig. 19 is a view of the exterior of receiver R.1125A with the special trimming tool (13) beside it. It consists of a split cast aluminium case having a deep portion (1), in which is mounted the receiver equipment, and a lid (2). The two parts are clamped together by screws (3) and (4), a rubber gasket being interposed. The lid contains four screws (5), (6), (7), (8), the first of which

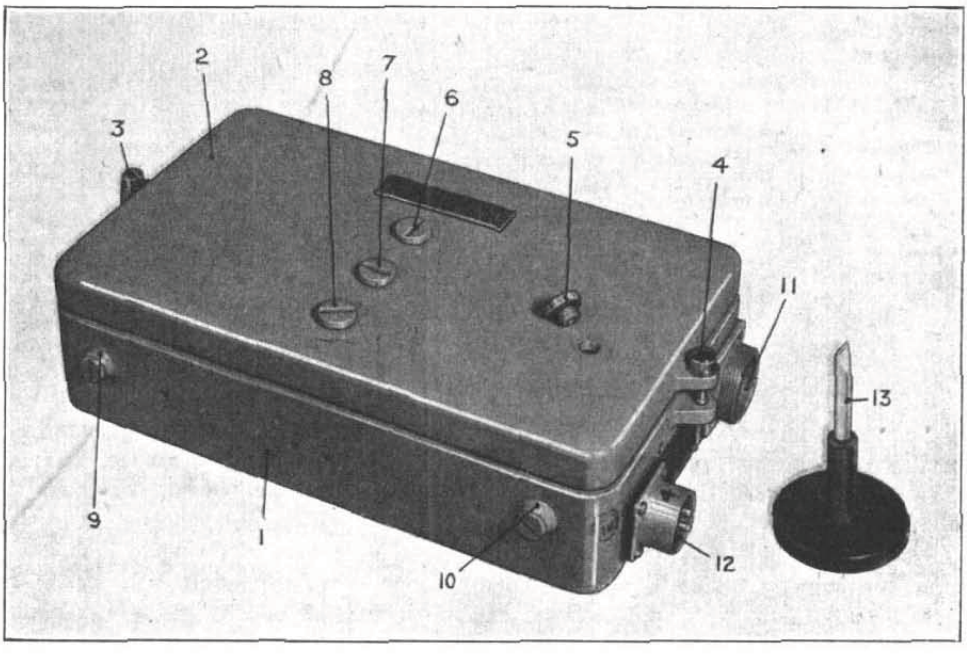

FIG. 19. Receiver R.1125A, exterior view

is shown removed. These screws permit access to the pre-set controls of the receiver which are operated by an insulated screwdriver (13). It is essential that the controls be adjusted with the lid in position.

56. Tapped suspension bosses (9) and (10) are provided on both sides of the case, the two on the rear side not being visible. The case also carries a special two-way socket (12) for the inter-connection cable plug.

57. A view of the interior with the valves removed is shown in fig. 20 and a bench wiring diagram in fig. 21. In fig. 20 may be seen the valve holders V_1 and V_2 mounted on right-angle brackets (1) attached to the base. Each of these brackets is fitted with a spring-retaining harness (2) which holds the valves in position. On the right adjacent to the dipole feeder entry (3) and interconnection cable entry (4) is the grid inductance L_3 and its pre-set trimmer C_1. Between the valve positions is a metal bridge carrying the pre-set reaction potentiometer R_4

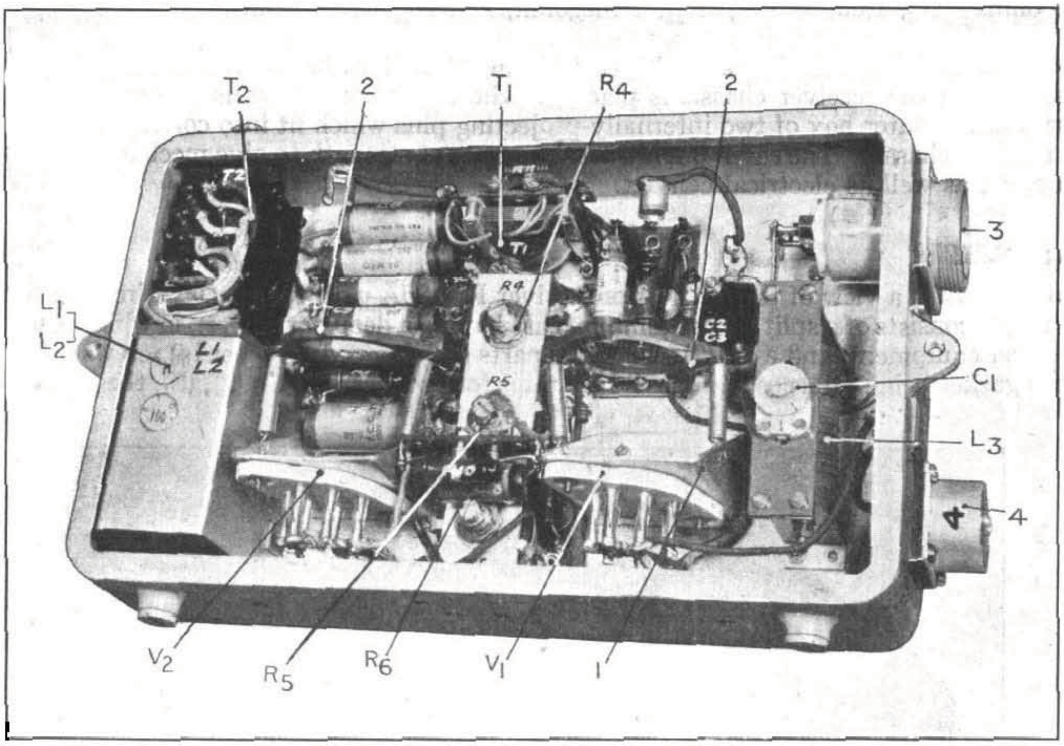

FIG. 20. Receiver R.1125A, interior view.

and the pre-set potentiometers R_5, R_6 for adjusting the polarizing voltage on the neon indicators. All these pre-set controls are accessible through holes in the lid. The intervalve coupling transformer T_1 is seen in the upper left-hand corner and the marker beacon filter inductances L_1 and L_2 in the lower.

58. The remaining resistances and condensers are arranged on sub-panels underneath the valve positions. The slip-on connections to the top caps of the valves will be seen supported by their connecting wires. These caps should be removed from the valves before attempting to remove the valve-retaining harness.

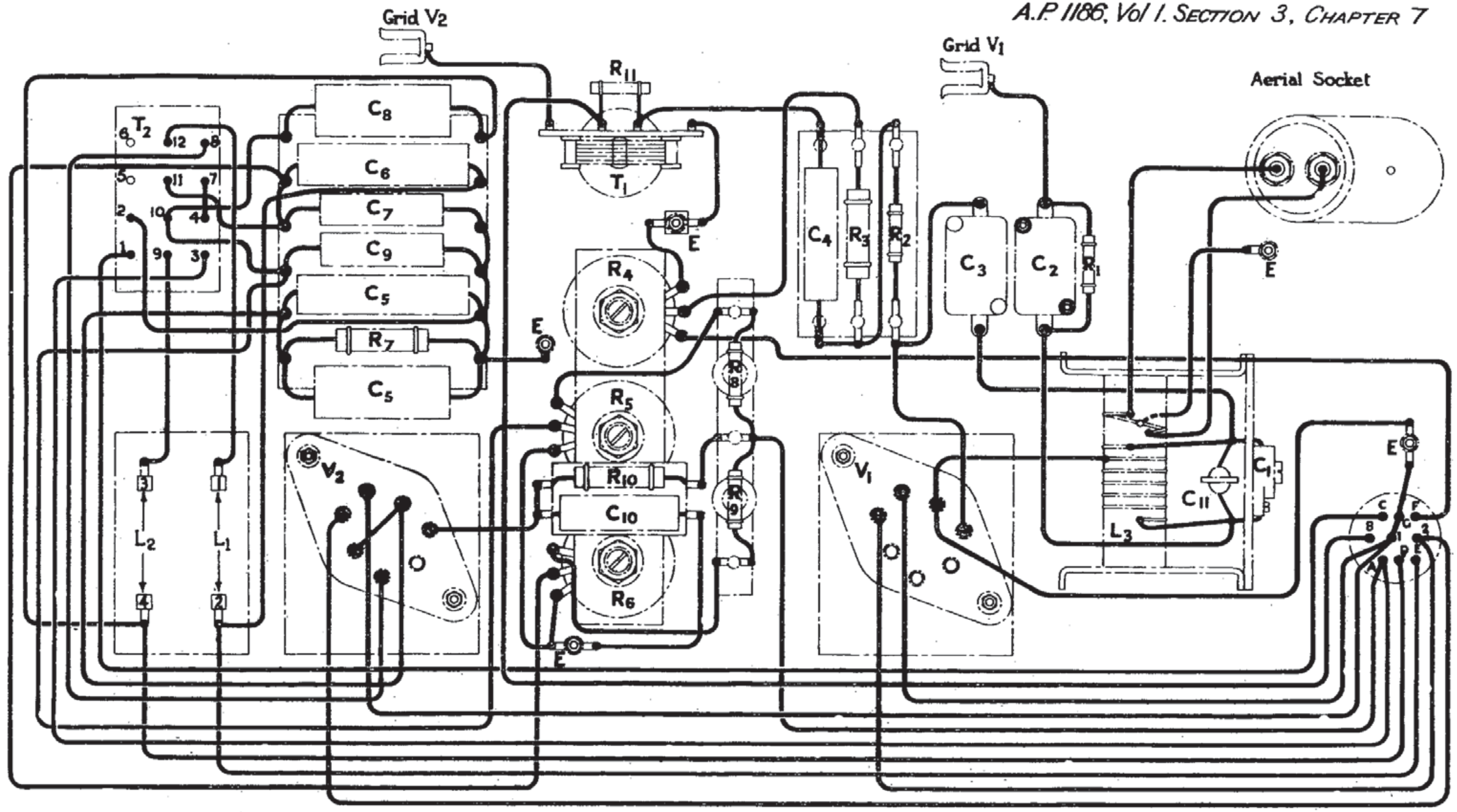

FIG. 21. RECEIVER R.1125 A, BENCH WIRING DIAGRAM

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Control unit

59. Fig. 22 shows a front view of the control unit from which the whole equipment is controlled by the pilot. All the apparatus in the unit is mounted on the detachable cover (1) which is secured to the base-plate (2) by captive screws at the corners. The joint is sealed by a rubber gasket. In the centre is the ON-OFF switch (3), (S_1 of fig 8) also the telephone sockets (4). At the bottom are the selector (5) operating the frequency control switches in

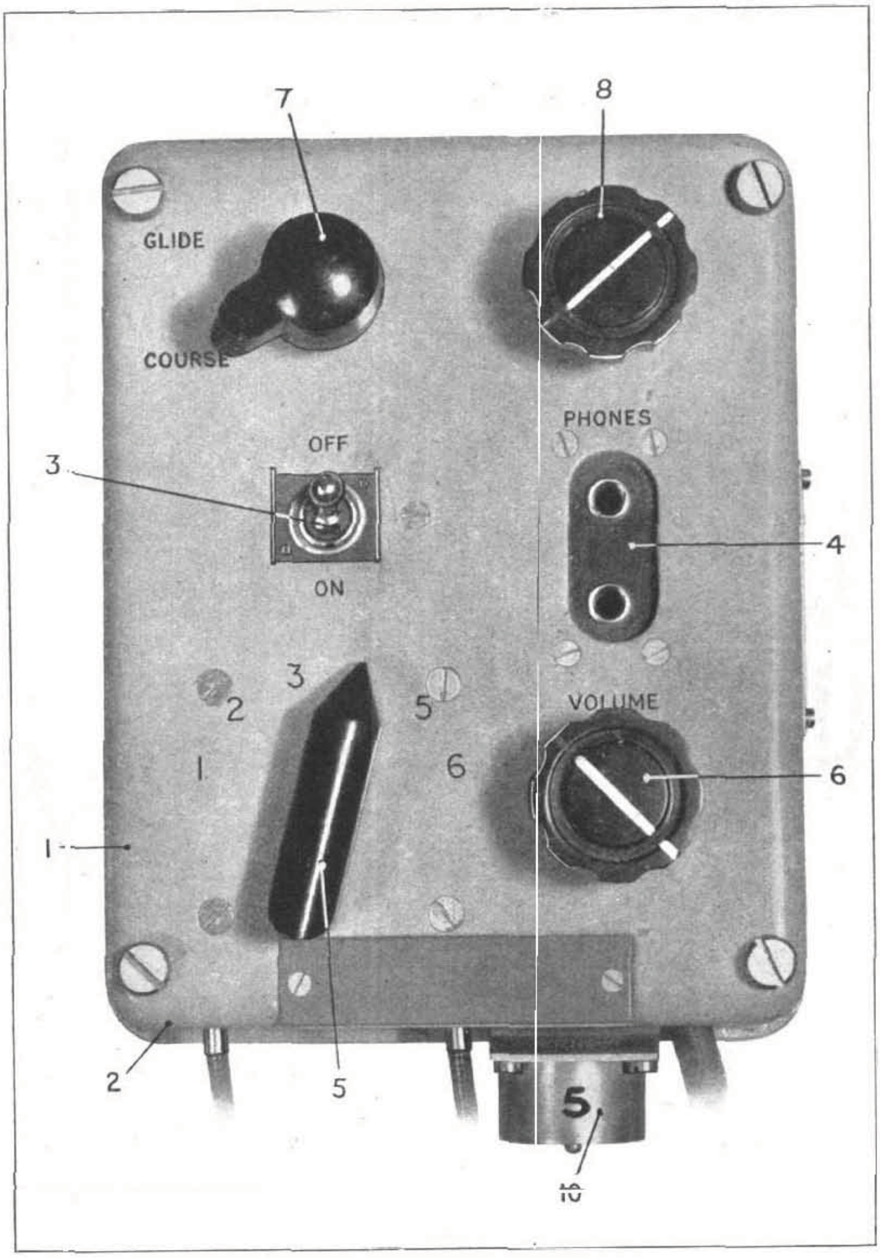

FIG. 22. Control unit, front view

R.1124A through the remote control mechanism and the telephone volume control (6). At the top are the GLIDE-COURSE control (7) which operates the ganged two-way switches S_2, S_3, S_5 (fig. 8) and the glide control (8) which operates the potentiometer R_2 in the same figure. The socket (10) for the interconnecting cable is attached to the bottom of the cover (1).

60. Fig. 23 shows an interior view of the unit and fig. 24 a bench wiring diagram. In fig. 23, at the top may be seen the switch assembly S_2, S_3, S_5 and the potentiometer R_2. On the right is the switch S_1 and also the driving gear of the remote control which can be removed by withdrawing four screws from the face of the unit after removing the handle of the selector

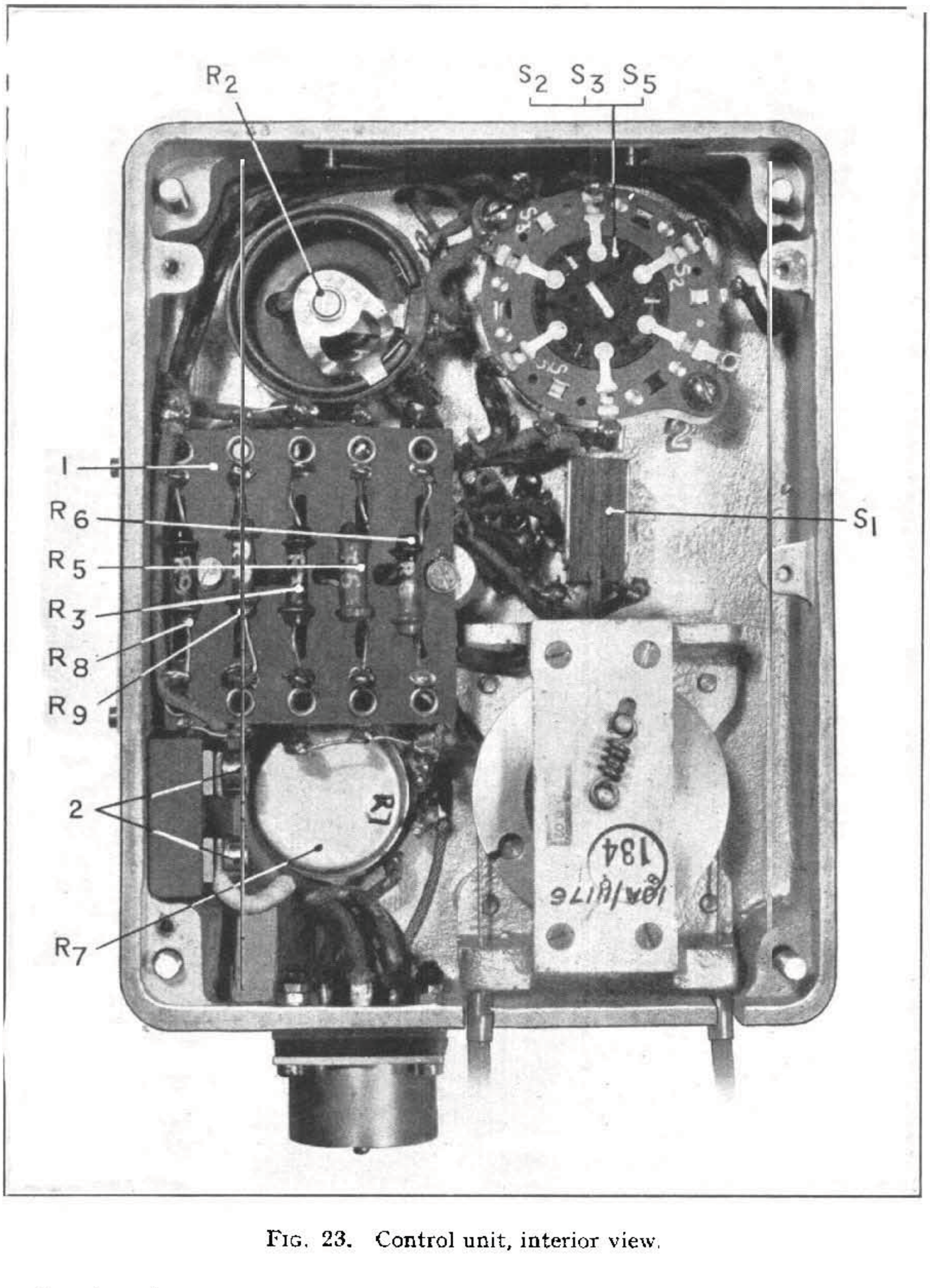

FIG. 23. Control unit, interior view.

(5, fig. 22). On the left are the telephone sockets (not visible) under the sub-panel (1) carrying resistances R_6, R_5, R_3, R_8 and R_9, the alternative telephone terminals (2) and the volume control R_7. The interior components are protected by a synthetic varnish paper board cover, which is not shown in fig. 23.

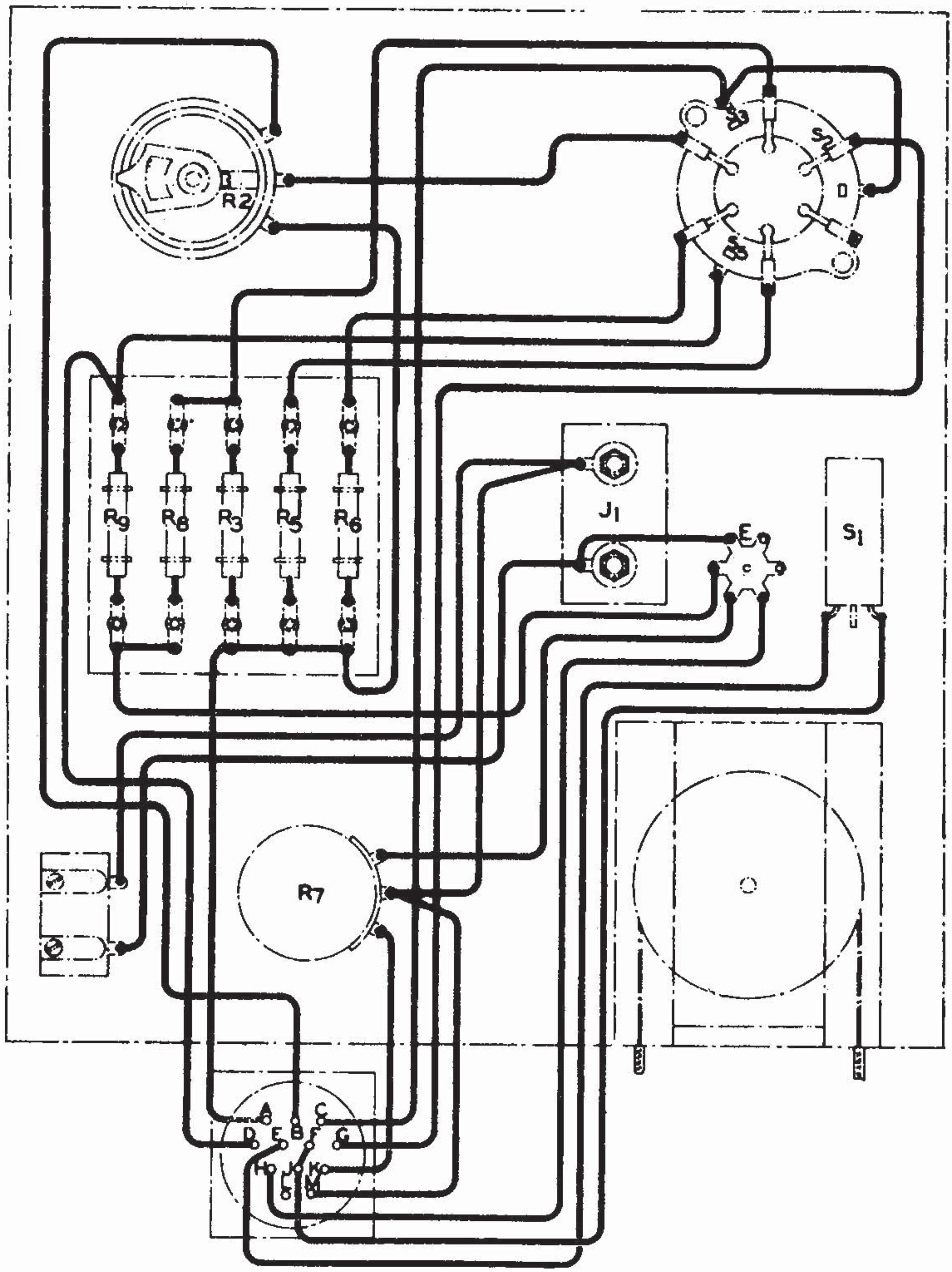

FIG. 24. CONTROL UNIT - BENCH WIRING DIAGRAM

Power unit

61. A view of the exterior of the power unit is shown in fig. 25. A cast aluminium box (1) is provided with two covers; the top cover (2) is held down by captive screws (3) and the base cover (4) is secured in position by countersunk screws. Rubber gaskets of circular section seal the joints between the covers and the box. These covers not only protect the internal components, but also provide an electrical screen which shields the receivers from short wave radiation from the rotary transformer. The power cable connection (5) is attached to the end of the box. The main assembly may be easily detached from the wooden baseplate (6) by releasing the swing bolts (7).

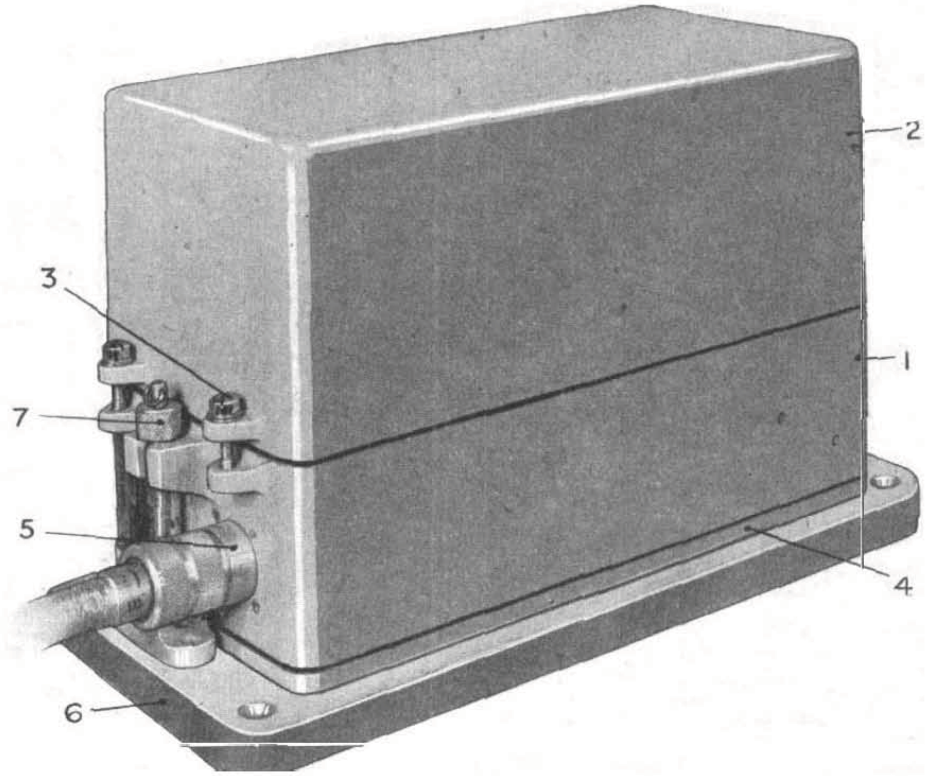

FIG. 25. Power unit, exterior view.

62. An interior view of the upper compartment is shown in fig. 26 and a bench wiring diagram of the complete unit in fig. 27. The rotary transformer (2, fig. 26) is mounted on top of the box (1) on rubber cushioned supports (3). The machine is of the permanent magnet field type. The innermost 13-volt L.T. output winding is brought out to the commutator (4) on the extreme right. The next winding is the motoring winding designed to run on a nominal 11-volt input and is brought out to the commutator (5) on the extreme left. The outermost 200-volt H.T. output winding is brought out to the other right-hand commutator (6). The machine runs at a speed of 5,000 r.p.m.

63. Arranged round the rotary transformer are the R/F chokes L_1, L_2, L_3, L_5, and L_6, of which L_1, L_2 and L_6 may be seen in the illustration. On the left are the starter relay REL_1

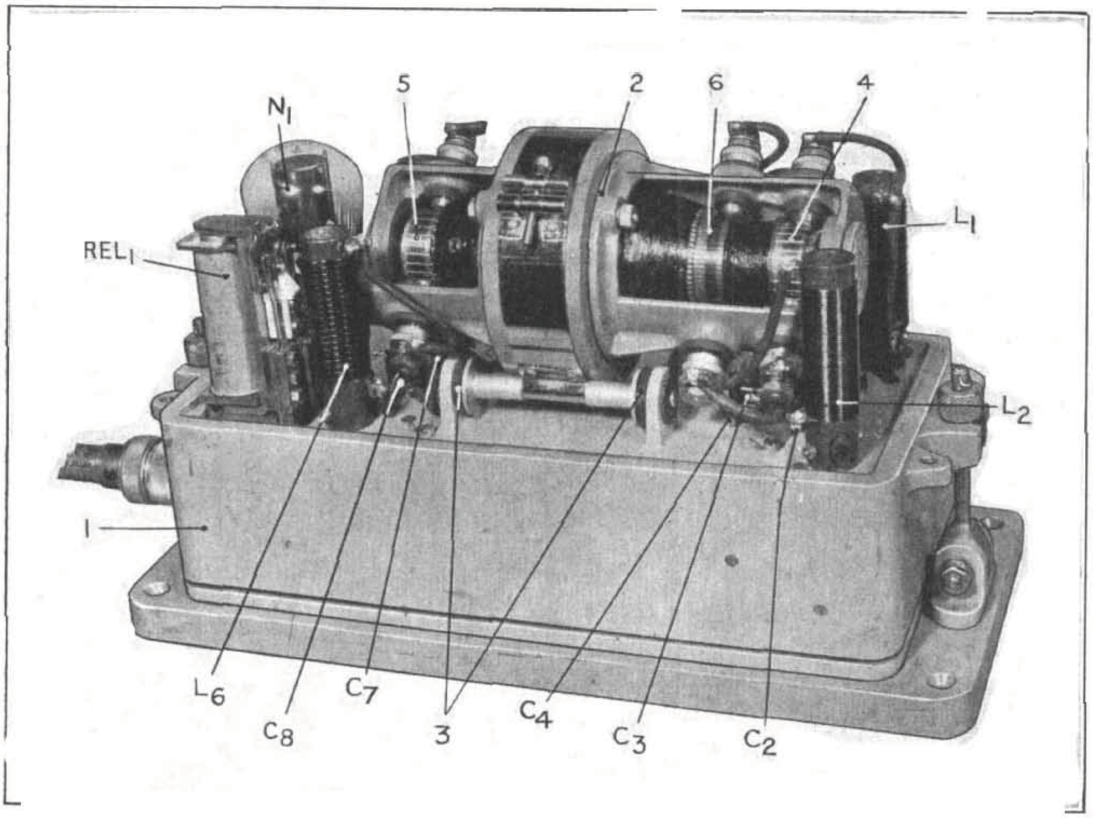

FIG. 26. Power unit, interior view, upper compartment.

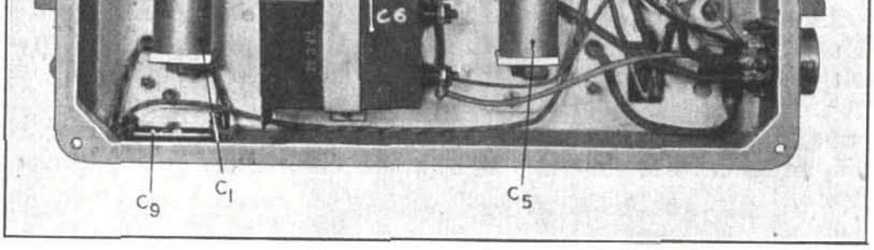

FIG. 28. Power unit, interior view, lower compartment.

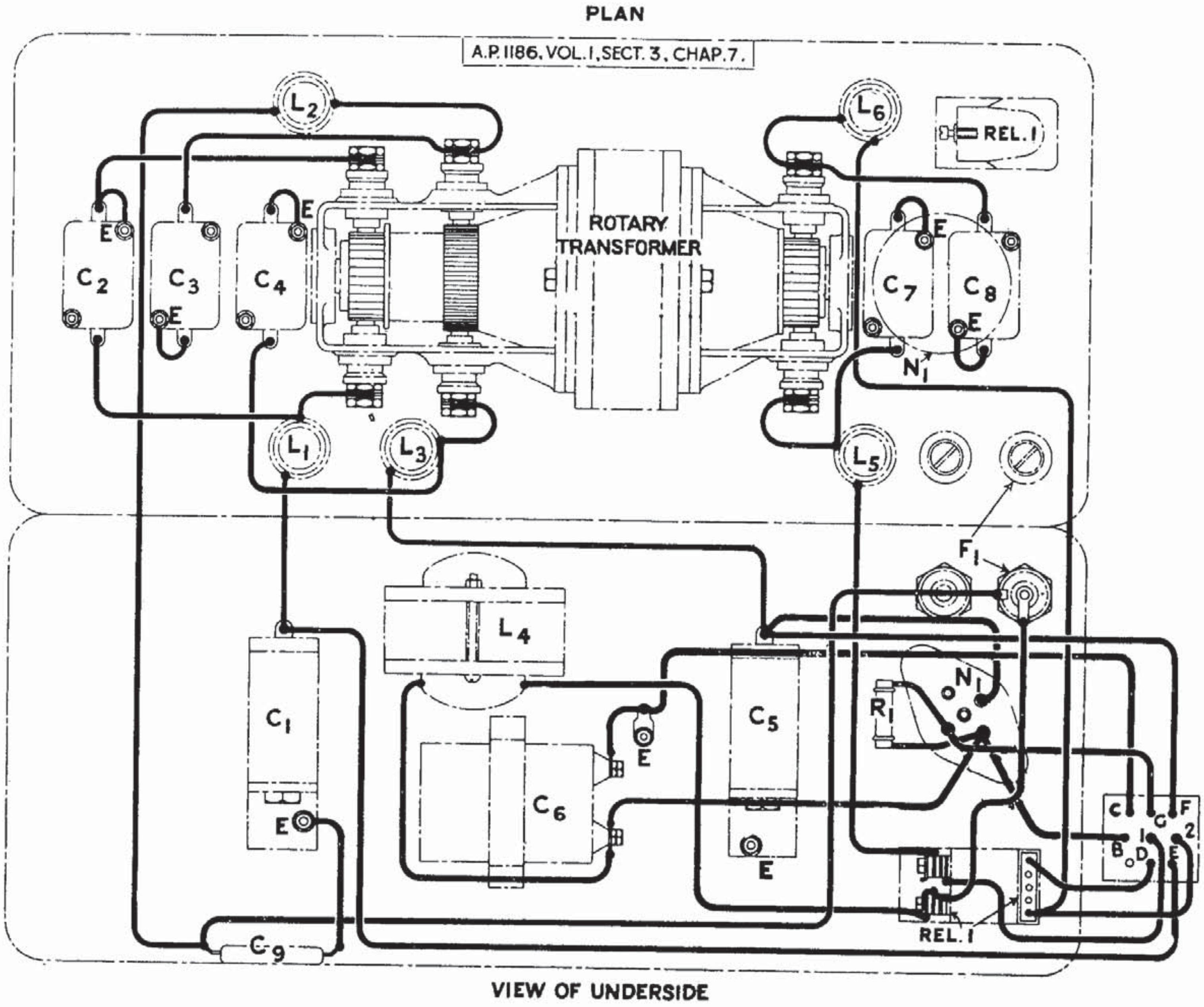

FIG. 27. POWER UNIT, BENCH WIRING DIAGRAM.

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and the neon voltage regulator N_1. Behind N_1, but not visible, are two fuse-holders one of which carries a spare fuse. The filter condensers C_2, C_3, C_4, C_7 and C_8 may be seen beneath the armature.

64. An interior view of the lower compartment is shown in fig. 28. The H.T. smoothing choke L_4 and condenser C_6, the R/F filter condensers C_1, C_5 and C_9 and the H.T. feed resistances R_1 and R_2, are housed in this compartment. The bases of the relay, fuse-holders, neon stabilizer and Breeze socket will also be seen in the figure.

Aerial for receiver R.1124A

65. The vertical retractable aerial for the main beacon signal is shown in fig. 29. It consists of a length of ¾-in. stainless steel tube (1). When fully extended the tube projects 32 in. above the skin of the aeroplane. The top end of the tube is fitted with a small closing cap which may be removed by withdrawing a countersunk screw at the top. At the lower end the tube is provided with a handle (2). The aerial is retracted by giving the handle a quarter-turn in the

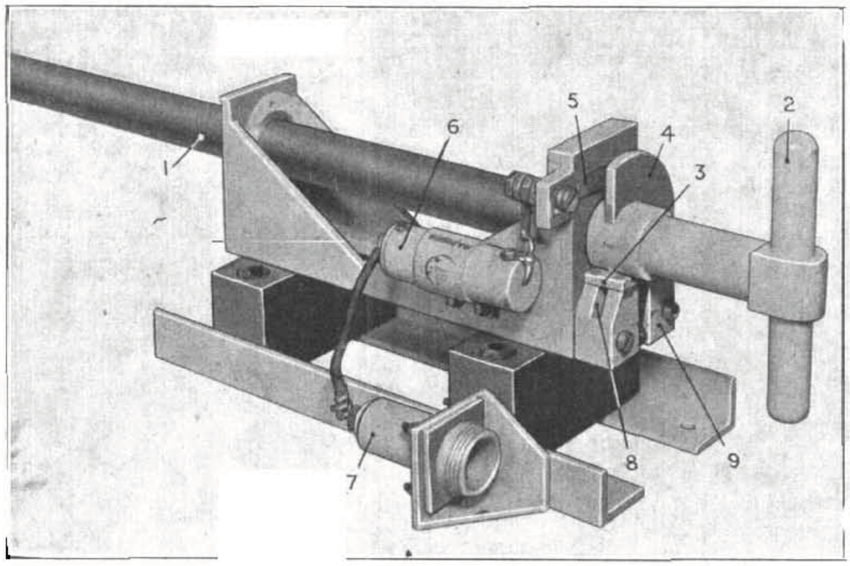

FIG. 29. Aerial for receiver R.1124A

counter-clockwise direction against the stop (3) and pulling it straight down. The cut-away disc (4) on the aerial tube provides a slip-ring for the brush (5) which is connected through the loading coil (6) to the mechanically reversible output socket (7). The disc (4) provides also a locking device by entering the passage (8) in the supporting bracket (9) and being retained in the operating position by a " click " device. A clip is provided in the aeroplane to hold the handle when the aerial is in the retracted position.

Aerial for receiver R.1125A

66. The dipole aerial for the marker beacon signals may be one of two alternative types:—

(i) For mounting outside the fuselage of an aeroplane having a metal skin. Referring to figs. 30 and 31 which illustrate the complete dipole aerial assembly and an enlarged view of the junction box respectively, the aerial consists of two aligned ¼-in. copper tubes, each approximately 39 in. long, enclosed in ebonite tubes (1) and (2) the outer ends of which are closed by caps, (3) and (4) respectively, of streamlined form. These tubes are supported horizontally under the fuselage by streamlined brackets (5) and (6)

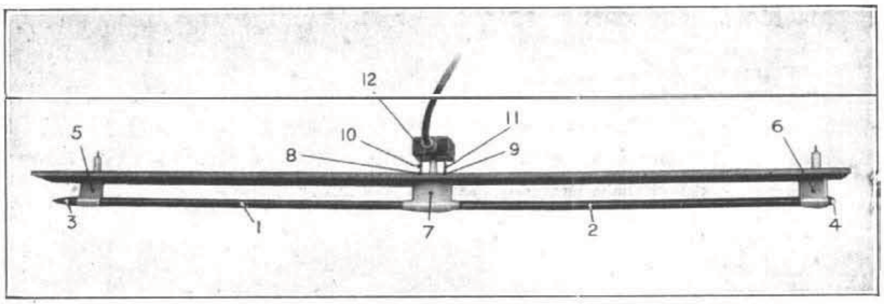

FIG. 30. Aerial for receiver R.1125A.

near their outer ends. The inner ends are clamped inside a similar bracket (7). The inner ends of the aerial proper are extended vertically upwards through the skin of the aeroplane to terminate in sockets (8) and (9). Two plugs (10) and (11) project from the underside of the junction box (12) and engage the sockets (8) and (9). Inside the junction box (*see* fig. 3) is the inductance (1) and pre-set condenser C_1 forming the tuned matching circuit. A socket (2) on the rear wall provides connection to the plug on the screened feeder leading to receiver R.1125A. In this type of installation the metal skin of the aircraft acts as a reflector for the dipole aerial.

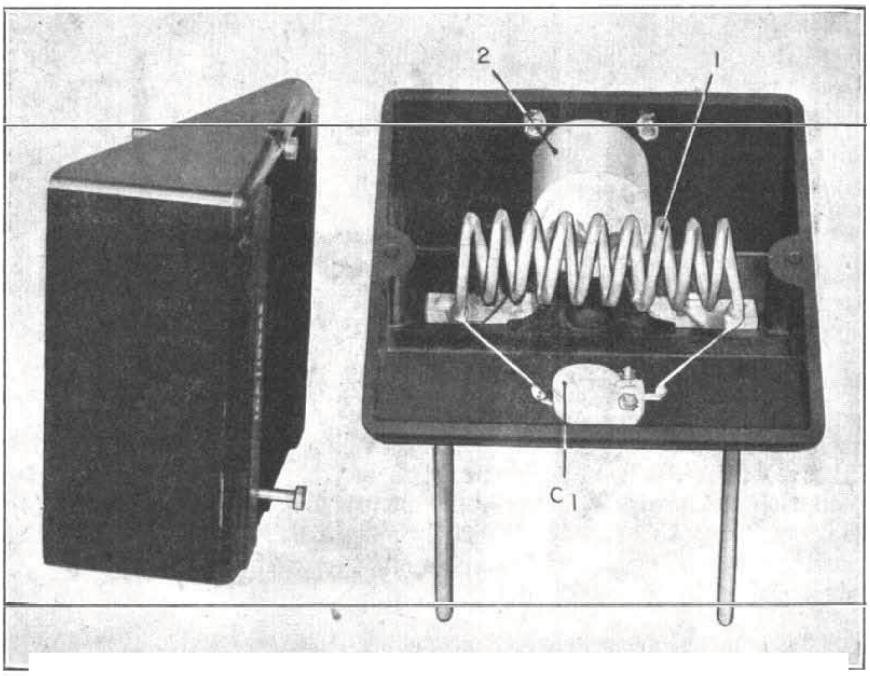

FIG. 31. Dipole junction box, interior view.

(ii) For mounting inside the skin of the aeroplane. This type is intended mainly for use on fabric covered aeroplanes and is a similar assembly, but the dipole conductors are unenclosed and mounted on insulators. Behind the aerial rods, and at a distance between $2\frac{5}{8}$ in. and 6 in., is a metallic reflector screen, at least $8\frac{1}{2}$ in. wide, bonded to the aeroplane at three points at least. This is provided by the constructor.

Junction box

67. Fig. 32 shows the junction box with some of its associated cables. It consists of a cast aluminium box (7), closed by a sheet metal cover (8) which acts as a mounting base. Six Breeze sockets (1 to 6), for the visual indicator, receiver R.1124A, power unit, receiver R.1125A, control unit and battery supply respectively are mounted on the cover (8). Each unit is thus separately removable from the installation for servicing.

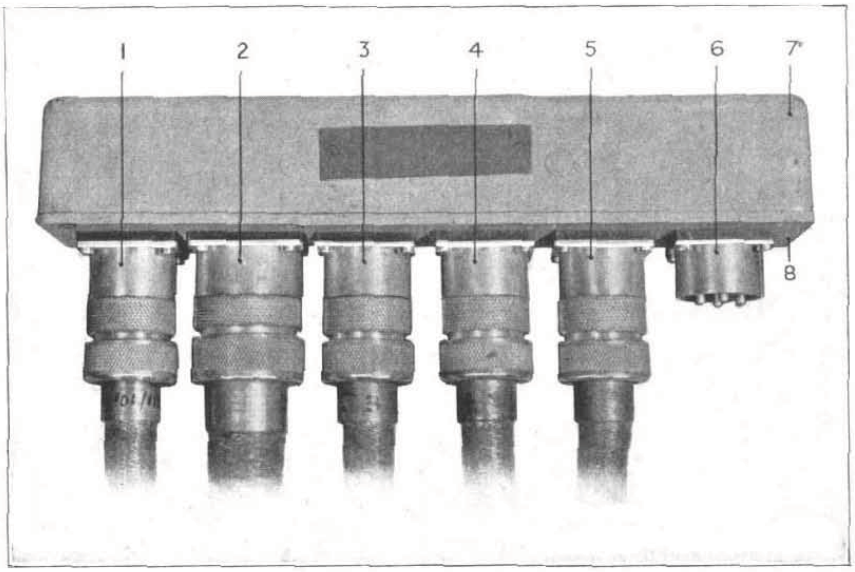

FIG. 32. Junction box.

REMOTE CONTROL

General

68. The mechanical remote control, for coupling the frequency selector switch on receiver R.1124A to the control unit operating member, is a bowden control with positive actuation in both directions. It is compensated for stretch in the cables by a spring-loaded differential gear at the driven end. Both the driving and driven units are readily detachable from the control unit and receiver R.1124A respectively. The complete control is supplied as a separate functioning assembly correctly wound and tensioned and adjusted to give the correct relative angular positions between the driving knob and the switch arm.

Driving assembly

69. Fig. 33 shows the complete control assembly, the working parts being removed from their housings, and the special adjusting tool. The driving assembly consists of an alloy casting (1) supported from the front of the control unit by four screws (2). Mounted on the driving shaft (3) are the manual control handle (4) and an aluminium drum (5) bearing two grooves (6) round which are wound the operating cables in opposite directions. The cables are anchored by soldered brass cylindrical ends housed in transverse holes in the drum (5), from which they may be removed when the cable is slackened off. The non-adjustable nipples (7) of the bowden outer casings are housed in recesses in the casting (1). The drum is located and restrained in one of six selectable positions by a " click " roller (8) engaging a steel cam member (9) mounted on the shaft (3).

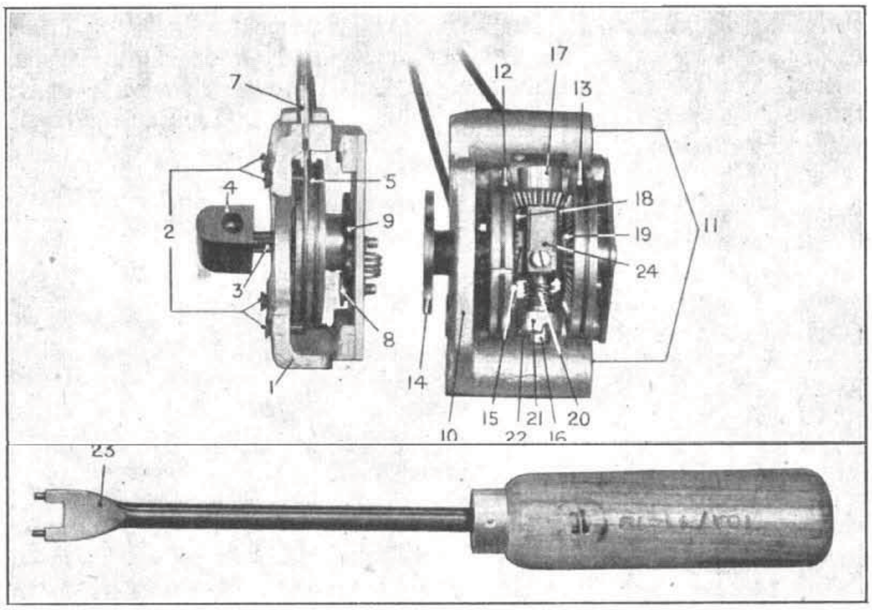

FIG. 33. Remote control assembly.

Driven assembly

70. The driven assembly consists of an alloy casting (10) with passages (11), through which holding bolts on receiver R.1124A are adapted to pass. The two incoming bowden wires pass in opposite directions over two separate pulleys (12) and (13) running independently on the main shaft. The main shaft carries the switch-operating disc (14) and a mounting (15) for a transverse shaft (16) on which is mounted a bevel planet pinion (17). The pinion (17) engages bevel gears (18) and (19) to which the pulleys (12) and (13) respectively are attached.

71. When operated normally, the whole differential gearing, described above, and the operating disc (14) rotate about the axis of the main shaft. The differential gear is provided to maintain a constant tension on both cables without upsetting the position of disc (14). For this purpose, the transverse shaft (16) bearing the pinion (17) is constrained, by a spring (20), to rotate in such a direction as to wind up the cables on pulleys (12) and (13) through the gears (18) and (19). The spring (20) is anchored at one end to the mounting (15) and at the other to an annular castellated member (21) engaging a pin (22) passing through the shaft (16). The tension on the spring (20) may be adjusted by rotation of the member (21) with the special tool (23).

72. Also attached to the shaft (16) is a ratchet gear which is engaged by two spring-pressed pawl members, the spring (24) of one of these members is visible in fig. 33. The ratchet mechanism enables the spring tension adjustment to be made without special means for securing the shaft (16), while it is free from the spring restraint.

73. The switch-operating disc has two slots which are asymmetrically placed so that they can engage in only one way with two pins projecting from a disc on the end of the switch-driving shaft in receiver R.1124A. When supplied, the remote control is set up and tensioned to give the correct operative relation between the driving knob and the switch arm.

Adjustments

74. It will sometimes be found necessary to dismantle the remote control system, *e.g.* when the cables are to be passed through a space too small to allow the passage of the driving or

driven assemblies. Should this be necessary do not release the spring (20) but adopt the following procedure. Lock the differential gear by screwing the locking plate provided to the member (21). The locking plate extends outside and over the pulleys (12) and (13) to prevent rotation of member (21) and the pinion (17). Slacken off the cable-adjusting nipples and remove the cables from the grooves in the drum (5) in the driving unit. The cables may then be completely withdrawn from this unit, installed in the required space and replaced on the drum. The adjusting nipples should then be tightened until all the slack is taken out of the cables and finally the locking plate should be removed.

75. Should it become necessary at any time to release the tension on the spring (20), the following procedure should be followed after reassembling the control. Remove slackness in the cables by rotating the pulleys (12) and (13) in opposite directions. Tension the spring (20) by depressing the member (21) with the special tool and giving it one complete turn in the clockwise direction. Finally allow the member (21) to rise and engage the pin (22) passing through the transverse shaft (16).

76. The correct alignment between the control handle (4) and the switch-operating disc (14) may be checked by placing the handle (4) in the fourth position. In this position the slot in disc (14) which is adjacent to the face of the casting (10) bearing the cable anchorages should be at right-angles to this face. When the disc (14) is viewed directly, the cables being on the left, the other slot will be seen to be slightly below the diameter upon which the first slot lies.

VALVES

77. Indirectly heated valves are used for both receivers R.1124A and R.1125A. In receiver R.1124A, the R/F amplifier (V_1) and two I/F amplifiers (V_3 and V_4) are type V.R.106. The frequency changer valve (V_2) is type V.R.107, the second detector valve (V_5) is type V.R.108 and the output valve (V_6) is type V.R.109. In receiver R.1125A the detector valve (V_1) is type V.R.109, and the output valve is type V.R.108. The neon stabilizer tube in the power unit is a type V.S.110.

INSTALLATION

78. A typical layout of the installation, which varies for different aeroplanes, is shown in fig. 11. Receiver R.1124A is usually housed in a metal crate. Either the crate or the receiver is mounted on a system of shock absorbers. Two of these shock absorbers will be seen screwed to two of the receiver mounting bosses in fig. 15. In some cases the receiver will fit the suspension provided in alternative positions. The position selected should be that which allows the cover plate over the trimming condensers to be more readily accessible for removal.

79. Receiver R.1125A is usually mounted in the same crate as receiver R.1124A. In large machines it may be arranged to be mounted aft of this position to reduce the length of the high frequency feeder connecting it to the dipole aerial. As with receiver R.1124A it should be provided with a shock-absorber mounting and access to the four trimming port screws should be readily obtainable.

80. The power unit is stowed either on the crate or on an adjacent portion of the aeroplane. The stowage consists of a platform on which are mounted the quick-release wing bolts. A spring suspension is unnecessary in view of the internally provided shock-absorber mounting of the rotary converter. The top cover should be readily removable without having to remove the whole unit from its platform. Subsequent stowage of any material which would prevent this should be avoided. When the aeroplane is in level flight, the rotary converter shaft should be horizontal, as its bearings have no provision for taking end-thrust. Before use, it should be verified that the armature of the starting relay is working freely, that the neon stabilizer tube is correctly in place, and that the H.T. fuse is intact and in position.

81. The control unit is mounted, by screwing the base-plate to the stowage provided, within reach of the pilot's seat and usually on the port side of the cockpit. To obtain access to the securing screws, detach the body of the unit from the base-plate by loosening the four fixing screws in the body.

82. The blind approach equipment is linked up with the aeroplane radio installation by means of a mixer unit known as junction box, type 9; this mixer unit consists of an aluminium alloy box containing a P.O. key switch, a 1 : 1 ratio A/F transformer, a 5-pin Breeze plug and a 4-way connector. A flexible 4-core cable is usually connected between the junction box and a 4-way terminal box fitted on the aeroplane.

83. Referring to fig. 34, it will be seen that the switch S_1 is provided with three positions. These are engraved INTER-COMM, MIX, and BLIND APPROACH respectively. Simplified diagrams, which explain the action of the switch, are given at B, C and D. This switching arrangement enables the pilot to select signals from either the blind approach receiver or the aeroplane inter-communication arrangements. In the intermediate position the output from these two sources is mixed by means of the transformer T_1.

84. The six-way junction box may be mounted on the crate or on extension brackets. In some installations a separate stowage, suitably marked, is provided on the aeroplane. The empty box is screwed to the stowage. Do not attempt to remove or replace the cover plate bearing the sockets, with the cable plugs in position in the sockets. When replacing the cover plate see that the interconnecting wires on the back are not trapped between the plate and box.

85. It is essential to ensure an efficient earthing connection between the junction box and the metal portions of the aeroplane or the aeroplane earthing system when the aeroplane is of non-metallic construction. If the unit is mounted in a crate, the paint on the brackets and on the contiguous surface of the junction box should be scraped away to ensure electrical continuity.

86. The visual indicator, which is a delicate instrument requiring careful handling, is normally mounted in the aeroplane dashboard. The Breeze socket behind the instrument is usually engaged by a right-angle plug on the instrument leads. In some cases a straight-through plug is fitted. The Breeze cable is threaded behind the dashboard to the point where it connects with the instrument. When auxiliary dial lighting is necessary, the two independent terminals on the back of the indicator are connected to the dashboard lighting system to operate a 12-volt lamp within the instrument. There is no connection between these terminals and the other circuits of the indicator.

87. The remote control bowden cables should be installed with great care to avoid sharp bends. The system will not operate satisfactorily if this precaution is neglected and, should operation be possible, undue wear and a liability to breakdowns will result. With the driven assembly removed from the receiver R.1124A, the coupling plate on the switch should be easy to turn with the fingers, and it should be possible to feel the switch arms passing the various contacts. The remote control will not operate satisfactorily if these conditions do not obtain.

88. The two angle-aluminium brackets on the main aerial, feeding receiver R.1124A, are screwed, through the holes provided, to a stowage in the form of a bracket or fitting containing four fixing holes. When the aerial tube is first passed through the gland provided in the skin of the aeroplane or if it is subsequently necessary to withdraw the tube through this gland, the closing cap must be removed by taking out the countersunk screw at the top. A clip is provided in the aeroplane for securing the handle when the aerial is in the retracted position. The socket on the aerial assembly terminating the co-axial feeder is reversible and may be fitted to face either outboard or inboard depending on the relative positions in the aeroplane of the aerial and its associated receiver R.1124A.

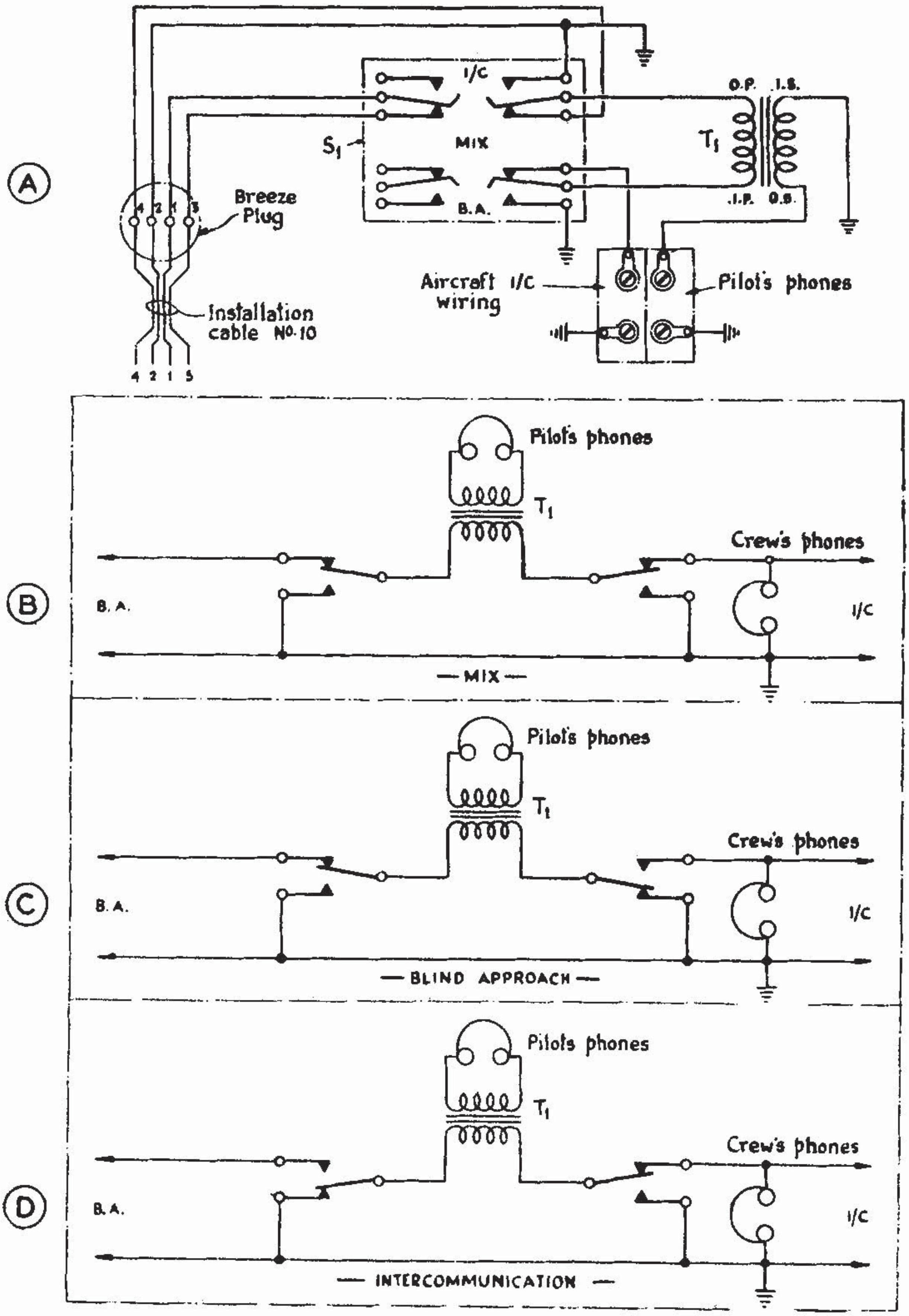

FIG. 34. JUNCTION BOX, TYPE 9, THEORETICAL CIRCUIT DIAGRAM

P.1894

89. The enclosed type of dipole aerial for receiver R.1125A is mounted under and outside the fuselage, the supporting brackets each being secured to a suitable anchorage, care being taken that not more than one-third of the total length of each tube is allowed to overhang. The associated junction box, containing the matching circuit, is clamped by a central bolt to a seating provided inside the aeroplane, the metal prongs on the underside of the box engaging with the turned-up portions of the aerial tubes. The holes in the floorwalk or lining of the aircraft through which the aerial tubes or their extensions pass should be at least ¾ in. diameter and their edges must be clear of the conductors.

90. With the unenclosed type of dipole aerial, the supports are screwed below the false floor of the aeroplane with the turned-up portions projecting to port or starboard. The associated junction box is mounted on its side with the socket facing upwards. This arrangement avoids obstruction of the floor of the machine and prevents damage to the junction box. The reflector screen should be thoroughly bonded in at least three positions. An area at least 7 ft. long and 1 ft. wide of the fabric immediately below the aerial should be kept free from metallic dope; clear or pigmented dope only should be applied to this area.

91. In both types of dipole aerial installation, care should be taken to earth the feeder socket by a 16 s.w.g. tinned copper wire connected from the soldering connection on the socket to the nearest suitable earth connection on the aeroplane.

92. The cables interconnecting the various units, except the aerial feeders and battery leads, consist of colour coded flexible leads protected by Breeze metal braided hose. The hose between the junction box and receiver R.1124A is ¾ in. internal diameter. The other cables are carried in hose of ½ in. internal diameter. All the cables terminate in numbered plug connections which fit correspondingly numbered sockets on the appropriate units. It should be noted that some of the earlier installations have American threads on the plugs and sockets; later installations are provided with British threads. In order to differentiate between the two systems, it is suggested that, in the American installation, a red spot approximately ¼ in. diameter should be painted on the plugs and sockets at both ends of each cable run. The continuity of the earthing system depends upon the locking rings on the ends of the connectors, and care should be taken that these are screwed home tightly.

93. The battery lead is a dumet 19 cable. The single co-axial feeder connecting the main aerial and receiver R.1124A is a Telcon 5C cable. The double screened feeder connecting the dipole aerial and receiver R.1125A is a Telcon 12D cable.

ADJUSTMENT AND OPERATION

General

94. When the equipment has been installed in the aeroplane, and before adjustment, check the following points:—

(i) The aeroplane battery is correctly connected to the appropriate cable and is capable of maintaining an output of 7 amperes at 12 volts at the junction box terminals RT (fig. 32).

(ii) The valves in receivers R.1124A and R.1125A are in working order and correctly inserted.

(iii) The neon tube stabilizer and H.T. fuse are inserted in the power unit.

(iv) The aerials are connected to their appropriate receivers.

(v) The Breeze interconnections are in their correct positions and screwed home properly.

95. A test oscillator and an A.C. voltmeter are required for the alignment of the equipment. The Universal Avometer is suitable for the purpose. It should be set to a position in the " A.C. Volts " range that gives the maximum reading. This will usually be the second position, *i.e.* 75V or on some models, 120V. The A.C. voltmeter will function as an output meter, and it should be connected across the telephone terminals. Tuning should only be effected by means of the insulated trimming tool provided. In order to avoid any inaccuracy due to slight changes in frequency during the warming up period, it is advisable to switch on the apparatus at least 30 minutes before the adjustments are made.

Alignment of receiver R.1124A

96. Turn the pre-set course meter control (R_{26}) fully counter-clockwise and replace the receiver in its case. Set the frequency selector switch in the control unit to position 1, the service switch in the same unit to COURSE and the adjacent volume control for maximum volume (fully clockwise).

97. Connect up and switch on the test oscillator, tuning it to the desired frequency on the first receiver position. Set the modulation to 1,150 c/s. and bring the oscillator close to the aeroplane. Connect the A.C. voltmeter across the headphone sockets in the control unit and plug a pair of headphones into the cord socket. Switch on the equipment by means of the switch S_1 in the control unit. Listen for a slight residual hum in the headphones and verify that the rotary converter in the power unit is operating.

98. Remove the tuning panel cover of receiver R.1124A and turn the four condensers marked CT_1, CT_7, CT_{13} and CT_{19} to the approximate positions required. This can be found by taking the distance between the two marks on the sheet metal cover over each trimmer as the frequency range covered, *i.e.* 30·5 to 40·5 Mc/s, and mentally dividing it to get the spot frequency required.

99. Trimmer CT_{19} should now be carefully adjusted with the trimming tool until the signal heard in the headphones is a maximum, the slight amount of de-tuning caused by the tool being compensated for by a slight additional movement in the counter-clockwise direction. The remaining trimmers CT_1, CT_7 and CT_{13} should now be readjusted. For the final tuning the test oscillator should be so far removed from the aeroplane that the output shown by the Avometer does not exceed 10 volts on the 75V. A.C. range with no telephones connected. The signal strength is thus kept below the value necessary to operate the A.G.C., and accurate tuning adjustments may be made. The final tuning must never be done with the course-glide switch in the "glide" position, since under these conditions the tuning of the receiver is affected by signal strength.

100. The other five spot frequencies are set up in a similar manner by means of the remaining groups of trimmers, *e.g.*, position 2, trimmers CT_2, CT_8, CT_{14} and CT_{20}. Finally, replace the cover over the trimmers and screw firmly home.

Alignment of receiver R.1125A and dipole aerial

101. Set the test oscillator to generate 38 Mc/s with 1,700 c/s modulation, and bring it close to the aeroplane. The test oscillator aerial should be placed in such a position that it is parallel and opposite to the dipole aerial in the aeroplane. Remove the tuning-port screws in the cover of receiver R.1125A. Before attempting to adjust the aerial trimmer, it will first of all be necessary to advance the reaction control, taking care that the receiver does not go into oscillation. Adjust the aerial trimmer C_1 and the trimmer across the coupling coil in the dipole aerial junction box to give maximum signal. Now adjust the reaction control until maximum output is shown by the output meter. Note the reading and reduce reaction until about half the maximum reading is shown. This adjustment will generally provide adequate marker sensitivity, but test flights will be necessary to determine the degree of sensitivity required. The reaction control must never be set at the threshold of oscillation, as, although the H.T. supply is stabilized, a variation in the L.T. voltage may cause the receiver to oscillate, resulting in loss of marker signals. All these controls interlock to a certain extent, and it is advisable to repeat this procedure in order to obtain optimum settings and a clear note.

102. The dipole aerial should be so balanced that reception on either half of the dipole is of equal intensity. This can be checked by earthing the sides of the aerial alternately at the junction box, and noting the deflection produced by the test oscillator in the output meter. The coil in the junction box may be balanced by springing the turns together or apart.

103. Now switch off the oscillator and turn the two neon lamp controls (R_5 and R_6) until a glow appears in both the visual indicator lamps. Turn them in a clockwise direction through an angle of about 20°, until the lamps are extinguished. Switch on the oscillator again. The inner marker indicator lamp should now light, and a 1,700 c/s tone should be heard in the headphones. Change the modulation of the test oscillator to 700 c/s. The outer marker indicator lamp should now light, the inner should be extinguished and a 700 c/s tone should be heard in the headphones. Finally, replace the cover on the junction box and the tuning-port screws in the cover of the receiver R.1125A.

Flight testing

104. In addition to the above adjustments, a check on the width of the beam should be carried out. The beam is usually adjusted at the transmitter to have an angular width of between 3° and 5°. Thus, with an angle of 4½° the beam should be 1½ miles wide at a distance of 20 miles from the transmitter. The aeroplane should be flown at a constant air speed directly across the beam at a distance of 20 miles from the transmitter and a height of about 3,000 ft. The air speed should be noted and the time in seconds elapsing between the disappearance of the "dots" and the appearance of the "dashes." The observation should be repeated by flying back across the beam at the same air speed after turning the aeroplane through 180°, and the mean of the two times taken. This figure when multiplied by the speed in m.p.h. and divided by 3,600 should give approximately 1½ miles if the receiving equipment is reproducing the beam width properly.

105. The correct functioning of the course meter should be checked and, if necessary, the meter movements should be reduced by means of the control (R_{26}) on receiver R.1124A, which should then be locked. The neon lamp controls (R_5, R_6) in receiver R.1125A may require readjustment to produce the best indications when flying over the marker beacons.

106. A note should be made of the most suitable position for the glide path gain control (R_2) on the control unit, when switching to GLIDE on passing over the outer marker beacon, at 1,000 ft. This position should be such that at the outer marker beacon the glide path meter reading is near the bottom of the scale and that it does not go over to full scale on any normal approach or landing. If interference from the engine is noticed, adequate steps should be taken for suppression at the source.

PRECAUTIONS AND MAINTENANCE

107. Immediately after its initial installation and before every flight in which the blind approach equipment is to be used, care should be taken that all valves are in an efficient condition and correctly inserted, the H.T. fuse is in position, the vertical and horizontal aerials are connected, and the Breeze interconnections between the varions units and the main-junction box are in their correct positions and screwed home. The supply voltage from the general service accumulator should be checked at the terminals RT of the junction box (*see* fig. 12). It should be not less than 12 volts while supplying a current of 7 amperes.

108. The equipment should be kept clean, dust may be removed either by wiping with a soft dry cloth or by means of a blast of dry air. All securing nuts and bolts and the Breeze connection plugs should be examined periodically for tightness. All contacts should be kept clean and free from grease.

109. The power unit should be removed from the aeroplane periodically. The commutators should be cleaned with a piece of clean linen, and the brushes examined to see that they are correctly bedded down and free to slide in the brush holders. They should not, however, be disturbed unnecessarily. If it is necessary to remove any brush, it should be carefully replaced in exactly the same position, otherwise it will take a long time to bed down again owing to the extremely light spring pressure employed in this machine.

110. On no account whatever must the armature be removed from the machine, otherwise the magnetism of the field magnet will be seriously impaired and the machine will be rendered useless.

111. All bonding connections on the aeroplane should be tested periodically for continuity. Faulty bonding may cause an excessive noise level in the telephones and irregular operation of the visual indicator.

112. The fit of the valve pins in their sockets should be checked whenever any unusual noise develops. If necessary the pins should be opened slightly with a thin-bladed knife. Valve sockets should be cleaned out with a wooden dowel.

113. If the signal fades out after the receiver has been in operation for one or two hours, it is usually an indication that the L.T. supply is failing. This may be due to a faulty or run-down accumulator. A similar effect may be noticed if the receiver has been incorrectly tuned owing to the tuning adjustments being made before the valves have reached a stable operating temperature. It is therefore necessary that the receiver should be switched on for about 30 minutes before tuning, as a frequency drift of 50 kc/s takes place during this period.

114. Intermittent or rough signals may be caused by breaks or badly soldered joints in the aerial feeder cables, but if key-clicks are present in the equi-signal zone and the beam edges are indistinct, the transmitter may be at fault.

115. The glide path meter normally reads about half scale when the glide-course switch is in the COURSE position. If the pointer of the glide path meter rises to the top of the scale when the aeroplane is close to the transmitter *e.g.* after the inner marker has been passed, the A.G.C. system may be defective. A fault in the A.G.C. system, which would result in a wide equi-signal zone and indistinct beam edges, may be due to a defect in one of the controlled valves *i.e.* V_1 V_3 or V_4. New valves should be inserted, one by one, until the faulty valve is discovered.

116. If the trouble persists after new valves have been substituted, it may be due to faulty insulation between the A.G.C. line and earth. The insulation may be tested with a megger in the following manner. The Breeze cabling should be disconnected from the receiver, and the glide-course switch put in the COURSE position. The resistance between the cable socket V or K and earth may now be measured. If this test proves satisfactory the valves V_1, V_3 and V_4 should be removed from the receiver, and the rectifiers W_3 and W_4 disconnected. The insulation resistance between the Breeze pin V or K and the chassis should now be measured.

117. After flying over the main beacon transmitter at a low altitude, the signal should cut out for about 20 seconds. If the period is abnormally prolonged, the receiver should be examined to ensure that the resistance R_{29} has been included.

118. If difficulty is experienced in tuning the receiver because of a change in capacitance when the pressure on the trimming tool is removed, a new trimmer should be fitted.

119. A faulty neon stabilizer may cause a sudden change in signal strength during flight. It is essential to ensure that the neon stabilizer in the power unit will strike under all conditions, especially with no signal, and with the glide-course switch in the COURSE position. If it fails to function correctly, a new stabilizer should be fitted.

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. 11	Remarks.
	Blind approach receiving equipment :—			
	Consisting of :—			
	Aerial, aircraft :—			
10B/10861	Type 1	1	—	External dipole. For Hampden, Whitley, Wellington, Harrow, London, Blenheim, Gladiator, Battle, Anson, Halifax, Botha, Beaufort and Defiant.
	or			
10B/10862	Type 2	1	—	Internal dipole. For Hurricane, Oxford and Beaufighter.
10B/10865	*Type 3	1	—	Retractable—fitted with contactor for length reduction on Oxford, Blenheim, Wellington, Anson, Hampden, Whitley, London, and Harrow.
	Box, junction :—			
10A/11842	Type 7	1	—	Main junction box.
10A/11986	†Type 9	1	—	Mixer for outputs.
	Connector :—			
10H/26	Type 103	1	1	For Halifax.
	or			
10H/27	Type 104	1	1	For Anson.
	or			
10H/28	Type 105	1	1	For Hurricane.
	or			
10H/29	Type 106	1	1	For Oxford.
	or			
10H/30	Type 107	1	1	For Battle and Gladiator.
	or			
10H/31	Type 108	1	1	For Spitfire.
	or			
10H/32	Type 109	1	1	For Botha.
	or			
10H/33	Type 110	1	1	For Blenheim, Whitley and London.
	or			
10H/34	Type 111	1	1	For Hampden and Harrow.
	or			
10H/35	Type 112	1	1	For Albatross.
	or			
10H/36	Type 113	1	1	For Wellington.
	or			
10H/37	Type 114	1	1	For Beaufort.
	or			
10H/38	Type 115	1	2	For Blenheim.
	or			
10H/39	Type 116	1	2	For Hurricane, Oxford and Spitfire.
	or			
10H/40	Type 117	1	2	For Gladiator, Albatross and Beaufort.
	or			
10H/41	Type 118	1	2	For Wellington and Anson.
	or			
10H/42	Type 119	1	2	For Whitley, Harrow and Halifax.
	or			

* This item is not required when T.R. 1133 is fitted.

† This item is required only for Blind Approach /T.R.9 installations in bombers.

APPENDIX—*contd.*

Ref. No.	Nomenclature.	Qty.	Ref. in Fig. 11	Remarks.
	Blind approach receiving equipment :— (*contd.*)			
	Consisting of :—(*contd.*)			
	Connector :—(*contd.*)			
10H/43	Type 120 .. .. *or*	1	2	For Hampden and Botha.
10H/44	Type 121 .. .. *or*	1	2	For Battle and London.
10H/45	Type 122 .. .. *or*	1	3	For Hurricane, Oxford and Blenheim.
10H/46	Type 123 .. .. *or*	1	3	For Anson, Battle, London and Spitfire.
10H/47	Type 124 .. .. *or*	1	3	For Wellington.
10H/48	Type 125 .. .. *or*	1	3	For Hampden, Albatross and Halifax.
10H/49	Type 126 .. .. *or*	1	3	For Whitley and Harrow.
10H/50	Type 127 .. .. *or*	1	3	For Beaufort.
10H/51	Type 128 .. .. *or*	1	3	For Gladiator.
10H/52	Type 129 .. .. *or*	1	3	For Botha.
10H/53	Type 130 .. .. *or*	1	4	For Anson and Harrow.
10H/54	Type 131 .. .. *or*	1	4	For Blenheim, Hampden, Halifax and Botha.
10H/55	Type 132 .. .. *or*	1	4	For Beaufort.
10H/56	Type 133 .. .. *or*	1	4	For Hurricane, London and Spitfire
10H/57	Type 134 .. .. *or*	1	4	For Gladiator and Albatross.
10H/58	Type 135 .. .. *or*	1	4	For Oxford and Battle.
10H/59	Type 136 .. .. *or*	1	4	For Wellington.
10H/60	Type 137 .. .. *or*	1	4	For Whitley.
10H/61	Type 138 .. .. *or*	1	5	For Anson.
10H/62	Type 139 .. .. *or*	1	5	For Oxford, Halifax and Botha.
10H/63	Type 140 .. .. *or*	1	5	For Hurricane.
10H/64	Type 141 .. .. *or*	1	5	For Hampden and Gladiator.
10H/65	Type 142 .. .. *or*	1	5	For Battle.
10H/66	Type 143 .. .. *or*	1	5	For Whitley, London, Harrow and Beaufort.
10H/67	Type 144 .. .. *or*	1	5	For Blenheim.
10H/68	Type 145 .. .. *or*	1	5	For Albatross.
10H/69	Type 146 .. .. *or*	1	5	For Wellington.
10H/73	Type 148 .. .. *or*	1	5	For Spitfire.
10H/11174	Type 46 .. .. *or*	1	7	For Hurricane and Gladiator.

APPENDIX—*contd.*

Ref. No.	Nomenclature.	Qty.	Ref. in Fig. 11	Remarks.
	Blind approach receiving equipment :—(*contd.*)			
	Consisting of :—(*contd.*)			
	Connector :—(*contd.*)			
10H/11182	Type 51	1	7	For Oxford and Botha.
	or			
10H/11190	Type 57	1	7	For Blenheim and Spitfire.
	or			
10H/11216	Type 61	1	7	For Anson.
	or			
10H/11224	Type 67	1	7	For Battle, Hampden and London.
	or			
10H/11237	Type 74	1	7	For Wellington.
	or			
10H/11253	Type 83	1	7	For Whitley.
	or			
10H/11316	Type 87	1	7	For Harrow.
	or			
10H/11653	Type 96	1	7	For Halifax.
	or			
10H/70	Type 147	1	7	For Albatross and Beaufort.
	or			
10H/11175	Type 47	1	8	For Hurricane.
	or			
10H/11183	Type 52	1	8	For Oxford and Gladiator.
	or			
10H/11217	Type 62	1	8	For Anson and Halifax.
	or			
10H/11225	Type 68	1	8	For Battle.
	or			
10H/11238	Type 75	1	8	For Wellington and Albatross.
	or			
10H/11246	Type 79	1	8	For Hampden.
	or			
10H/11254	Type 84	1	8	For Whitley.
	or			
10H/11262	Type 86	1	8	For Blenheim, London and Beaufort.
	or			
10H/11317	Type 88	1	8	For Harrow.
	or			
10H/11797	Type 99	1	8	For Botha.
	or			
10H/74	Type 149	1	8	For Spitfire.
10H/187	*Type 150	1	—	For Hurricane.
	or			
	*Type	1	—	For Spitfire.
10H/188	*Type 151	1	—	For Hurricane.
	or			
	*Type	1	—	For Spitfire.
10H/189	*Type 152	1	—	For Hurricane.
	or			
	*Type	1	—	For Spitfire.
10H/190	*Type 153	1	—	For Hurricane.
	or			
	*Type	1	—	For Spitfire.
	Controls, remote, Type F :—		Ref. in Fig. 8	
10D/11184	Assembly No. 1	1	—	For Oxford and Spitfire. Length 4 ft.
	or			
10D/11192	Assembly No. 2	1	—	For Blenheim. Length 12 ft. 1 in.
	or			
10D/11218	Assembly No. 3	1	—	For Anson. Length 2 ft. 7½ in.
	or			
10D/11226	Assembly No. 4	1	—	For Battle. Length 3 ft. 3 in.
	or			

*These items required for Hurricane and Spitfire only.

APPENDIX—*contd.*

Ref. No.	Nomenclature.	Qty.	Ref. in Fig. 8	Remarks.
	Blind approach receiving equipment :—(*contd.*)			
	Consisting of :—(*contd.*)			
	Controls, Remote, Type F :—(*contd.*)			
10D/11255	Assembly No. 5 .. .. .. *or*	1	—	For Whitley. Length 11 ft. 7 in.
10D/11263	Assembly No. 6 .. .. .. *or*	1	—	For London and Wellington. Length 5 ft. 1 in.
10D/11318	Assembly No. 7 .. .. .. *or*	1	—	For Harrow. Length 12 ft. 10 in.
10D/11418	Assembly No. 8 .. .. .. *or*	1	—	For Gladiator, Hurricane and Halifax. Length 7 ft.
10D/11810	Assembly No. 9 .. .. .. *or*	1	—	For Beaufort. Length 13 ft. 7 in.
10D/48	Assembly No. 10	1	—	For Hampden and Botha. Length 7 ft. 6 in.
	Control unit :—			
10A/11841	Type 6	1	—	
10A/11456	*Type 12	1	—	
10A/10863	Indicator, visual	1	—	
	Power-unit :—			
10A/11840	Type 5 .. .. *or*	1	—	12 V. input.
10A/11853	Type 12	1	—	24 V. input.
10D/5	Receiver R.1124A	1	—	
10D/6	Receiver R.1125A	1	—	
	Switch-unit :—			
10F/13	†Type F .. .. *or*	1	—	Aerial and telephone switch, 12 V. operated.
10F/14	†Type G	1	—	Aerial and telephone switch, 24 V. operated.
10A/11841	Control unit, Type 6 :—			
	Principal components :—			
10H/11265	Connector, telephone	1		
	Resistances :—			
10C/11105	Type 450	1	R_8	150Ω ½ watt.
10C/11109	Type 454	1	R_2	400Ω, potentiometer.
10C/11110	Type 455	1	R_7	20,000Ω potentiometer.
10C/11111	Type 456	1	R_9	50Ω, ½ watt.
10C/11087	Type 447	1	R_5	1,000Ω, ½ watt.
10C/108B	Type 576	1	R_8	130Ω, ½ watt.
10C/11114	Type 459	1	R_6	20,000Ω, ½ watt.
	Switches :—			
10F/11115	Bulgin S 80 T	1	S_1	S.P., ON-OFF.
10F/11116	Yaxley RL 7016-15-6	1	S_2, S_3, S_5	Three-bank.
10A/11840	Power unit, Type 5			
	Principal components :—			
	Condensers :—			
10C/10629	Type 440	6	C_3-C_4, C_7-C_9	0·01μF.
10C/10825	Type 484	1	C_6	4 μF.
10C/10911	Type 501	2	C_5, C_1	2 μF.
10H/10916	Fuse, type 1055/150	2	F_1 and spare.	150 mA. Belling Lee.
	Inductances :—			
10C/10805	4062A	1	L_4	A/F choke.
10C/10912	125 LU 8/20	3	L_1, L_5, L_6	
10C/10913	125 LU 8/17	2	L_2, L_3	
10F/10915	Relay, type 4615 AW	1	REL_2	
10C/1617	Resistance	1	R_1	3,000Ω, 5 watt.

* This item required for Wellington only.

† This item necessary only in Blind Approach/T.R.1133 Installations.

APPENDIX—*contd.*

Ref. No.	Nomenclature.	Qty.	Ref. in Fig. 6	Remarks.
	Blind approach receiving equipment :— (*contd.*)			
	Consisting of :—(*contd.*)			
	Receiver R.1124 A :—			
	Principal components :—			
	Condensers :—			
10C/7901	Type 120	1	C_{24}	0·001 μF.
10C/8010	Type 133	11	C_2-C_7, C_{25}-C_{27}, C_{31}, C_{32}	0·002 μF.
10C/10394	Type 404	1	C_8	10 μμF.
10C/11075	Type 502	1	C_{23}	0·01 μF.
10C/11076	Type 503	12	C_9-C_{17}, C_{28}-C_{30}	0·1 μF.
10C/11077	Type 504	24	CT_1-CT_{24}	Trimmers.
10C/11078	Type 505	1	C_{19}-C_{22}	2+2+2+2 μF.
10C/11074	Type 512.	1	C_{18}	2 μμF.
	Inductances :—			
10C/11081	20 LU 52 B..	1	L_1	Aerial.
10C/11082	20 LU 52 A..	1	L_2	R/F.
10C/11083	3 LU 24	1	L_3	Oscillator.
10C/11084	20 LU 51 A	3	L_4-L_6	I/F.
10D/22	Rectifier, W X 12, type 15.. ..	1	W_3	Westector.
10D/11080	Rectifier, W X 6	2	W_1, W_2	Westector.
	Resistances :—			
10C/11111	Type 456	1	R_{17}	50Ω, ⅓ watt.
10C/11085	Type 460	1	R_{26}	500Ω, potentiometer.
10C/11086	Type 461	1	R_5	300Ω, ⅓ watt.
10C/11087	Type 447	7	R_3, R_4, R_9, R_{11}, R_{12}, R_{14}, R_{27}	1,000Ω, ⅓ watt.
10C/11088	Type 462	3	R_7, R_{15}, R_{28}	2,000Ω, ⅓ watt.
10C/11089	Type 463	4	R_6, R_{10}, R_{13}, R_{21}	10,000Ω, ⅓ watt.
10C/11090	Type 448	2	R_8, R_{20}	100,000Ω, ⅓ watt.
10C/11091	Type 464	1	R_1	250,000Ω, ⅓ watt.
10C/11092	Type 465	2	R_{22}, R_{24}	500,000Ω, ⅓ watt.
10C/11093	Type 466	1	R_{25}	1 MΩ, ⅓ watt.
10C/11094	Type 467	2	R_{23}, R_{29}	5MΩ, ⅓ watt.
10C/11477	Type 553	1	R_{16}	25,000Ω, ⅓ watt.
10F/11079	Switch, R1.7016-15-5	1	S_1-S_5	Yaxley, five bank.
	Transformers :—			
10A/11099	4300-1	1	T_1	
10A/11100	4300-3	1	T_2	
10D/6	Receiver R. 1125A :—		Ref. in Fig. 7	
	Principal components :—			
	Condensers :—			
10C/7902	Type 121	1	C_2	0·0001 μF.
10C/8009	Type 132	1	C_3	0·0005 μF.
10C/11075	Type 502	3	C_4, C_7, C_9	0·01 μF.
10C/11076	Type 503	1	C_{10}	0·1 μF.
10C/11077	Type 504	1	C_1	Trimmer.
10C/10394	Type CDS 3	1	C_{11}	10 μμF.
10C/11101	Type 506	1	C_6	0·04 μF.
10C/11102	Type 507	1	C_8	0·22 μF.
10C/10651	Type	1	C_5	0·1 μF.

APPENDIX—*contd.*

Ref. No.	Nomenclature.	Qty.	Ref. in Fig. 7	Remarks.
	Blind approach receiving equipment:— (*contd.*)			
	Consisting of :—(*contd.*)			
	Receiver R. 1125A :—(*contd.*)			
	Principal components :—(*contd.*)			
	Inductances :—			
10C/10790	3 LU 25 A	1	L_3	Aerial.
10C/11107	20 LU 50 A..	1	L_1	2 iron-core. Single case.
	Resistances :—			
10C/11087	Type 447	1	R_7	1,000 μF, $\frac{1}{3}$ watt.
10C/11090	Type 448	3	R_1, R_8, R_9	100,000Ω, $\frac{1}{3}$ watt.
10C/11104	Type 449	3	R_4, R_5, R_6	200,000Ω, potentiometer.
10C/11105	Type 450	1	R_2	100Ω, $\frac{1}{3}$ watt.
10C/11106	Type 451	2	R_3, R_{10}	50,000Ω, $\frac{1}{2}$ watt.
10C/11094	Type 467	1	R_{11}	5MΩ, $\frac{1}{3}$ watt..
	Transformers :—			
10A/11108	6484B	1	T_1	Auto
10A/11282	CG 4300-4	1	T_2	
	Accessories :—			
	Aerial, aircraft, types 1 and 2 :—			
10A/10866	Impedance, Matching unit, type 8	1		
10B/10869	Insulator, type 40 (for aerial, type 2)	6	—	Tufnol stand-off insulator
	Aerial, aircraft, type 3 :—			
10A/10858	*Coil, loading	1		
10H/162	Socket, type 87	1	—	Screened.
	Controls, remote :—			
10A/11419	Tool, tensioning	—	—	
	Control unit :—			
10A/10871	Mounting, type 30	1		
10H/7971	Socket, type 29	1	—	Micro-telephone, 4-contact, single pin
	Indicator, visual :—			
	Lamp, filament :—			
5A/2182	12 V., 3 W.	1		
	or			
5A/2183	24 V., 3 W.	1		
10E/6	Lamp, indicating neon No. 3 ..	2		
	Power unit :—			
10A/10917	Brushes, set of	1	—	For rotary transformer.
10A/11264	Mounting, type 31	1	—	Comprising base and swing bolts.
10E/10914	Stabilizer, Neon, type V.S. 110 ..	1		
	Receiver R.1124A :—			
10A/11421	Tool, tuning	1		
	Valves :—			
10E/11905	Type V.R.106	3	V_1, V_3, V_4	R.F. amplifiers.
10E/11096	Type V.R.108	1	V_5	Second detector.
10E/11097	Type V.R.107	1	V_2	Frequency changer.
10E/11098	Type V.R.109	1	V_6	Output.
	Receiver R.1125A :—			
	Valves :—			
10E/11098	Type V.R. 109	1	V_1	Detector.
10E/11096	Type V.R. 108	1	V_2	Output.

* This item required for Wellington, London, Harrow, Hampden and Whitley.