SUB SECTION EB HETERODYNE DETECTORS.

HETERODYNE DETECTOR UNIT E25X

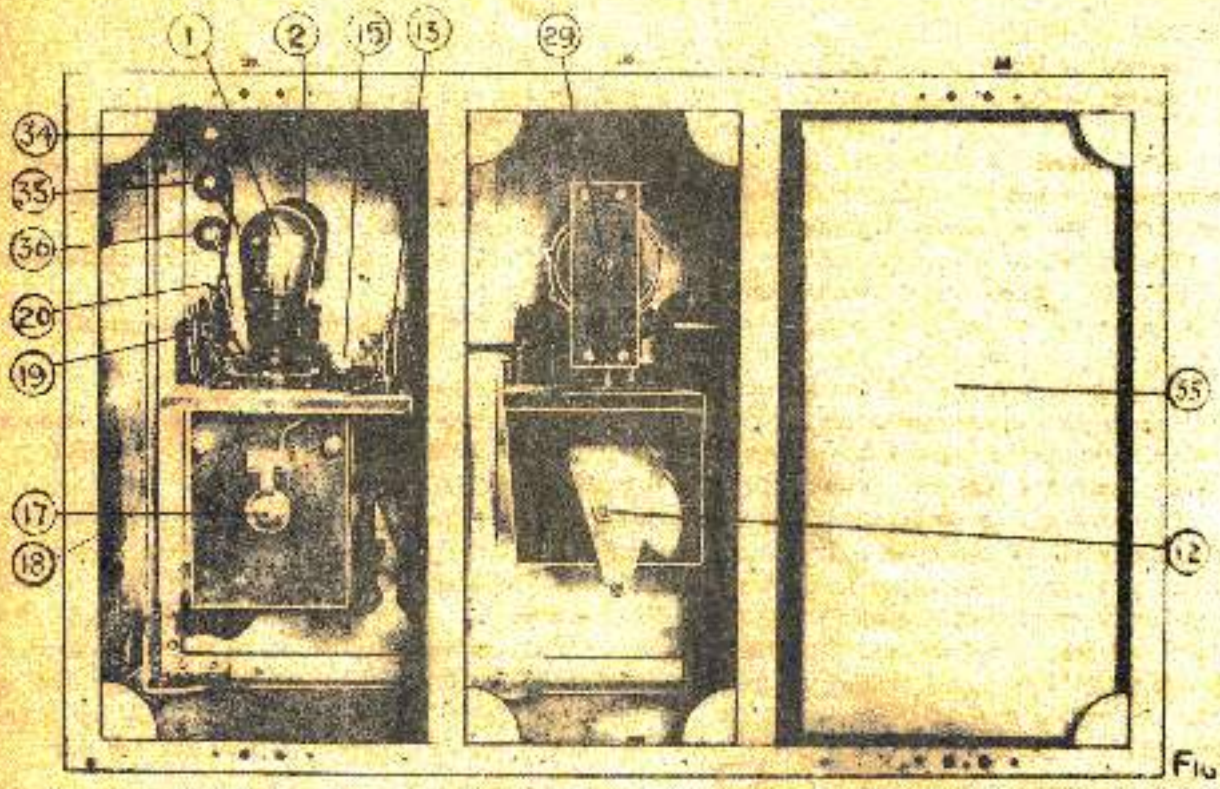

Fig b

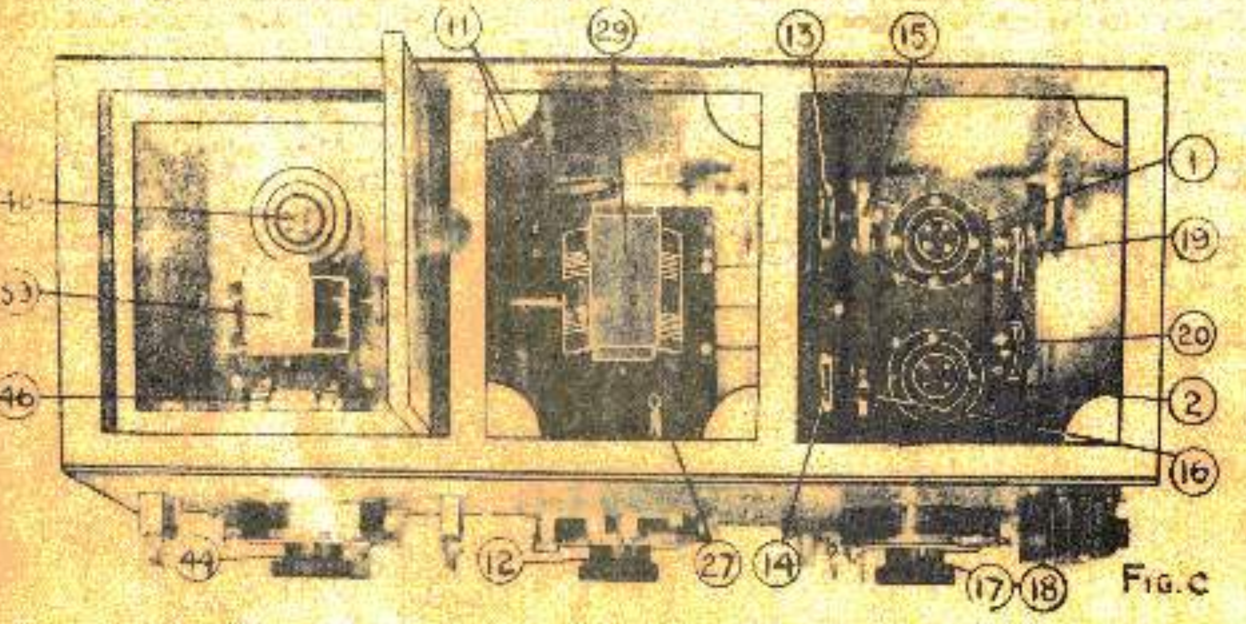

Fig. C

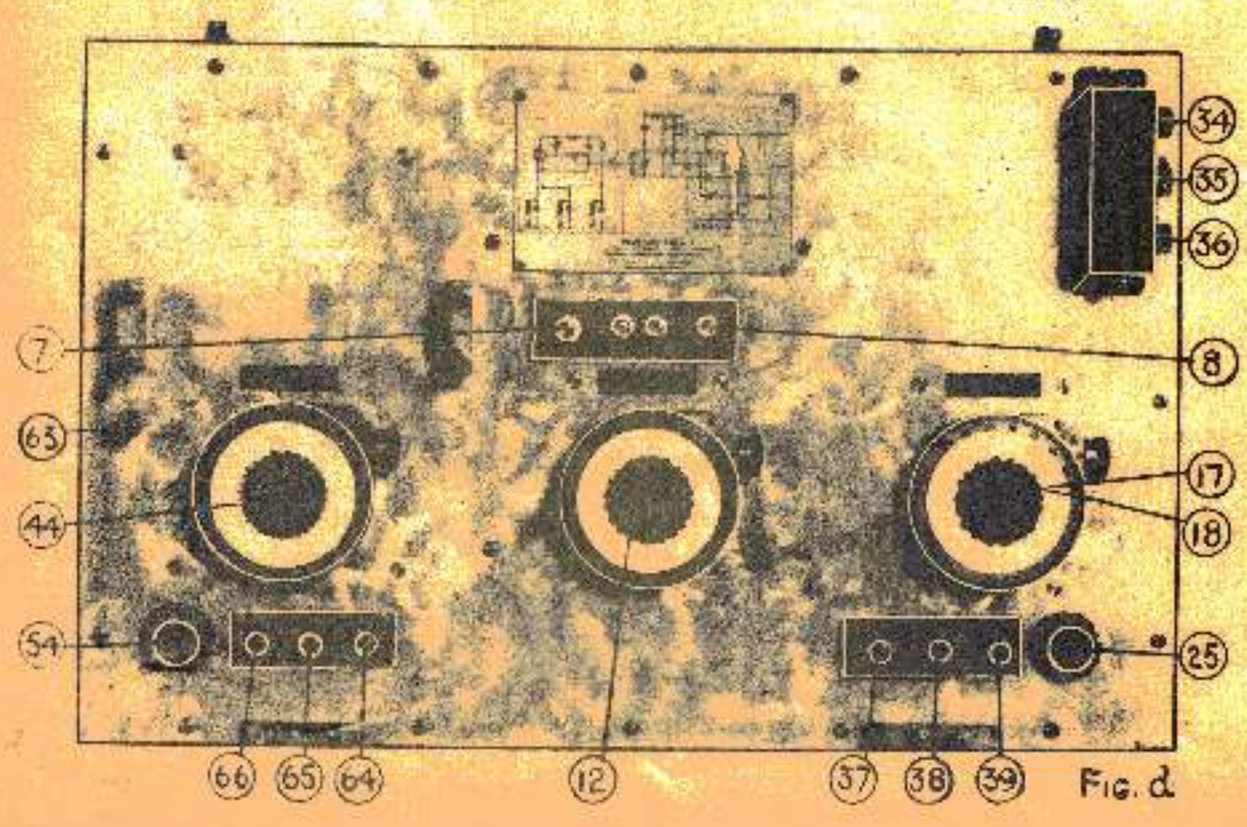

Fig. d

HETERODYNE DETECTOR UNIT E25X

Date of design:- 1930.
Frequency Range:- 7,500 - 23,000 kc/s.
Valves used.- Two NR15A first detectors (1) and (2) in push-pull.
One NR16A super-heterodyne (40)

E25 is used for High Speed Automatic Reception in conjunction with Amplifier M16. The super heterodyne method of reception is used in E25 - M16 (see Admiralty Handbook of W/T (1931) paragraph 697). The resultant Supersonic Frequency signals are amplified in amplifier M16.

The aerial is loosely coupled to the input circuit through the small coupling condensers (9) and (10). This gives the following advantages:-

(a) It makes the detector adjustments practically independent of alteration of the aerial constants, due to sway, etc.
(b) It reduces the effect of atmospheric and other interference.
(c) It prevents the aperiodic aerial circuit from causing excessive damping in the grid circuit should the aerial approach resonance at any frequency on which the model is being used. (See Admiralty Handbook of W/T (1931) paragraph 698 (2)).

Reaction may be obtained by the reaction condensers (17) (18) which are connected between the anodes and grids of the detector valves. They are adjusted by one handle, being mounted on the same shaft. The super heterodyne is doubly screened from the detector and feeds it through a screened lead and very small coupling condenser (41) to the mid point on the detector grid coil (11). The design here has been aimed at making the heterodyne entirely independent of the circuit which it is feeding, and it will be found that any alteration in the value of the tuning condenser (12) does not affect the heterodyne circuit in any way. The filter chokes (48) (50) (51) and decoupling condensers (49) (52) (53) are fitted to prevent coupling between the super-heterodyne circuit and the R/F circuit through the common battery leads.

The complete range of frequencies is covered by a set of two pairs of plug in coils, one coil of each pair for the heterodyne circuit and the other for the detector tuned grid circuit. The ranges covered by each pair of coils are as follows:-

(29) (59) 7,500 - 15,000 kc/s. (30) (60) 15,000 - 23,000 kc/s.

The ends of the grid coil (11) are connected to the grid insulating condensers (13) (14) of valves (1) (2) which are arranged as push-pull detectors. The anodes of the valves are connected through two R/F chokes (19) (20) via terminals (34) and (38) to amplifier M16.

The R/F heterodyne and detector circuits are so designed that the settings for any frequency are approximately the same on the two tuning condensers (12) and (44). This facilitates picking up a station if its frequency is not accurately known.

The super-heterodyne is always to be used for heterodyning a signal to the beat frequency at which the first supersonic amplification takes place, about 150 kc/s. When receiving C.W. the second heterodyning is done in amplifier M16.

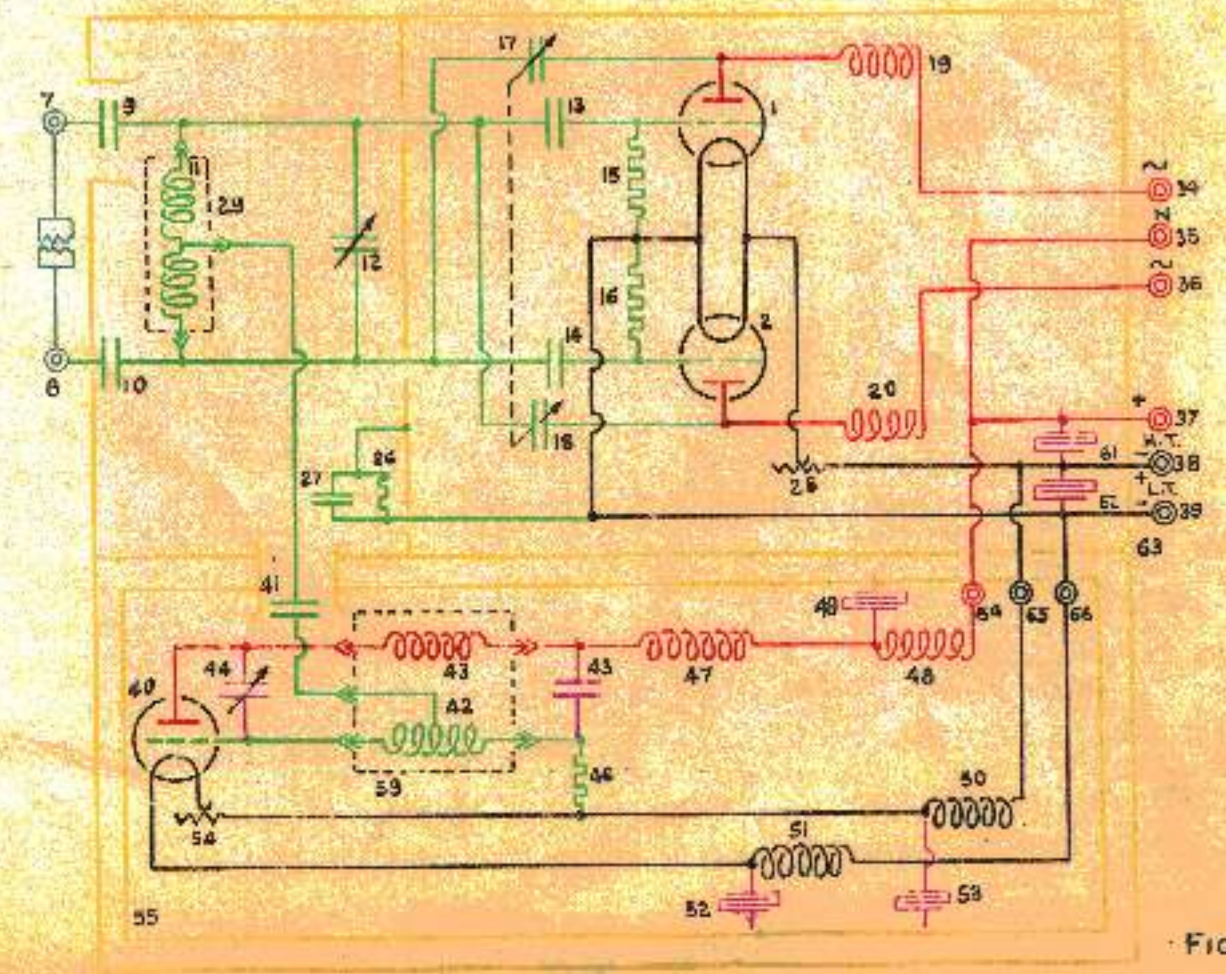

FIG 2.

HETERODYNE DETECTOR UNIT E26X

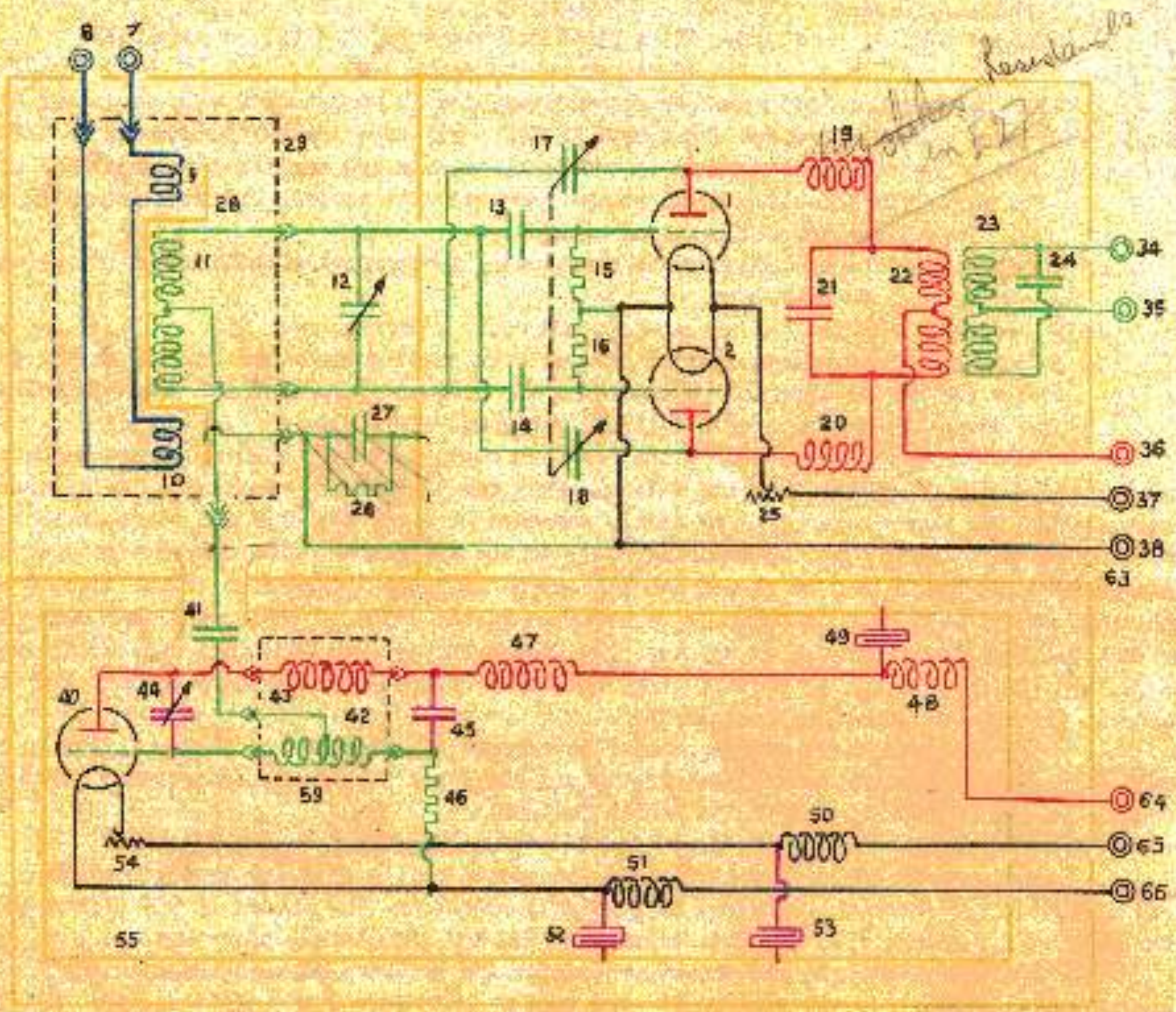

FIG. a.

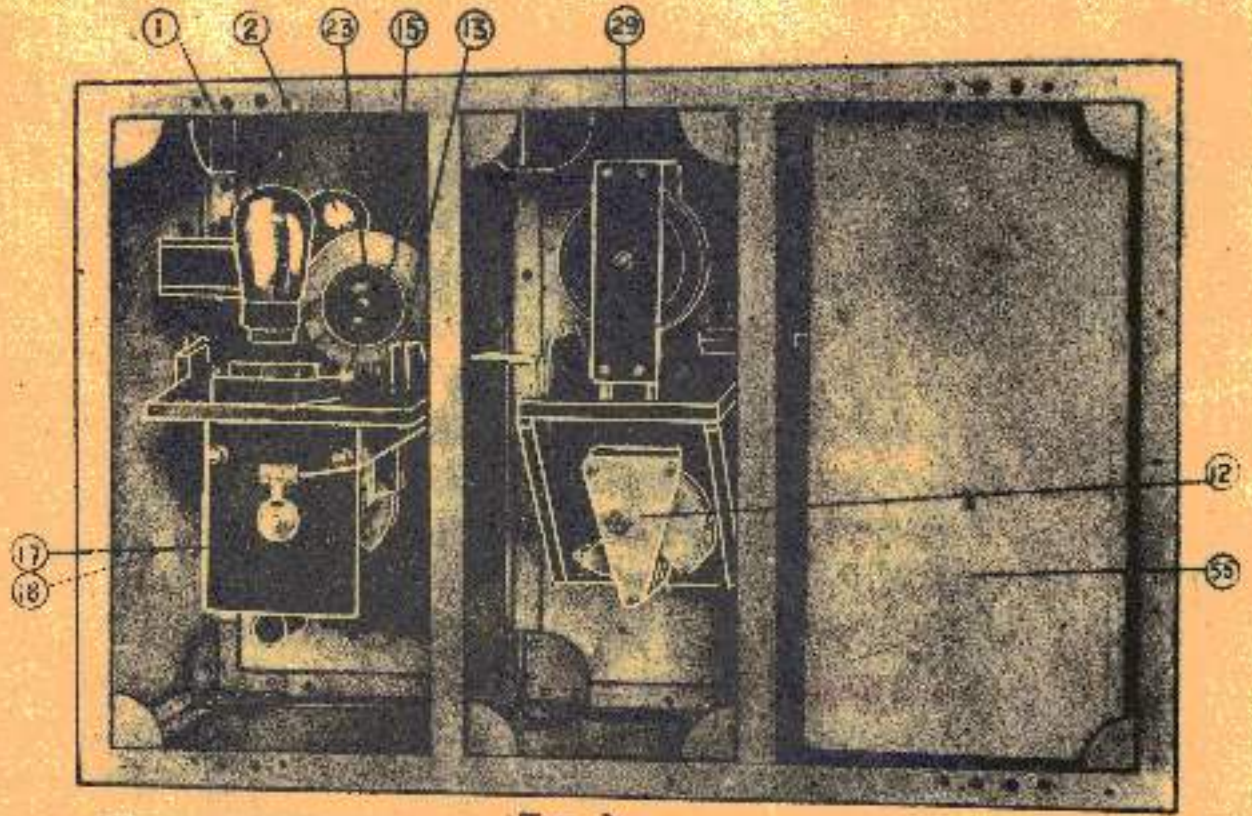

FIG. b

HETERODYNE DETECTOR UNIT E26X

Date of design: 1930.
Frequency range: 750 ~~1500~~ - 20,000 kc/s.
Where fitted:- D/F outfit SGX.
Valves used: Two NR15A first detectors(1) and (2) in push pull.
One NR12A super-heterodyne(40).

E26 is used as part of D/F outfit SGX for receiving signals on the highest of the three frequency bands, (i.e. 750 - 20,000 kc/s), where the usual methods of R/F reception and amplification are unsatisfactory. (See Admiralty Handbook of W/T (1931) paragraph 581). The super-heterodyne method of reception is used in E26 - M8 (See Admiralty Handbook of W/T (1931) paragraphs 807 and 810). The resultant supersonic frequency signals are amplified in Amplifier M8.

The frame coil is coupled to the tuned grid circuit of the detector valves(1) and (2) by two coils (9) and (10) which are wound at the outer ends of the former on which the grid inductance (11) is also wound. A special form of screen (28) is fitted between the aerial coupling (9)(10) and grid coupling (11) coils to prevent unsymmetrical capacitive coupling between them. (See Admiralty Handbook of W/T (1931) paragraph 798). The magnetic coupling between these coils is arranged to be loose to prevent the aerial circuit from causing excessive damping in the tuned grid circuit should the aerial approach resonance at any frequency at which the model is being used (See Admiralty Handbook of W/T (1931) paragraph 683 (2)).

The aerial coupling coils (9) and (10), the grid coil (11) and the electrostatic screen (28) are all mounted as a 6-pin plug-in unit (29). The tapping on the grid coil(11) is connected by one of the plugs via the small coupling condenser (41) to the grid coil (42) of the heterodyne circuit. The grid and anode coils (42)(43) of the heterodyne valve (40) are wound on a five-pin plug-in coil (59), a divided circuit tuned by the variable condenser (44) being used to provide the R/F heterodyne frequency.

The complete range of frequencies is covered by a set of ~~five~~ six pairs of plug-in coils, one coil of each pair for the heterodyne circuit and the other for the aerial and detector circuits. The ranges covered by each pair of coils are as follows:-

750 - 1500	
1500 - 2400 kc/s.	7500 - 13,500 kc/s.
2400 - 4000 "	13,500 - 20,000 "
4000 - 7500 "	

In the early models the ranges were quoted to the nearest round number of metres which give slightly different values of frequency. There is, however, sufficient overlap to enable round numbers of kilocycles to be marked on future range coils without having to alter the coils themselves.

The ends of the grid coil are connected to the grid insulating condensers (13)(14) of valves (1) (2) which are arranged as push-pull detectors. The anodes of the valves are connected through two R/F chokes (19)(20) to a tuned anode circuit (21)(22) resonant to the supersonic frequency which is about 85 kc/s. Another circuit (23)(24) also tuned to the S/F is coupled to the tuned anode circuit (21)(22) and joined to the output terminals (34)(35) which are connected to Amplifier M8. The condensers (21)(24) are semi-adjustable to enable the circuits they control to be accurately tuned to the S/F. They are not to be altered after leaving Signal School. Reaction may be obtained by the reaction condensers (17) and (18) which are connected between the anodes and grids of the detector valves and are adjusted by one handle, being mounted on the same shaft.

The R/F heterodyne and the detector circuits are so designed that the settings for any frequency are approximately the same on the two tuning condensers (12) and (44). This facilitates picking up a station if its frequency is not accurately known. The super-heterodyne is doubly screened from the detector and feeds it through a screened lead and very small coupling condenser (41) to the mid point of the detector grid coil (11). The design here has been aimed at making the heterodyne entirely independent of the circuit, which it is feeding and it will be found that any alteration in the value of the tuning condenser (12) does not affect the heterodyne circuit in any way. When the frame-coil is connected to the E26, the reaction condensers (17)(18) should only be used to reduce the damping in the detector circuit and increase signal strength. Care should be taken that the reaction is not increased so far that the detector circuit oscillates. In no case should it be necessary to use the reaction condenser at a setting greater than 10-15°.

The Filter Chokes (49)(50)(51) and decoupling condensers (48)(52)(53) are fitted to prevent coupling between the super-heterodyne circuit and the R/F circuit through the common battery leads. In order to use the E26 - M8 - N8 - with the framecoil for D/F it is necessary that the three variable condensers of E26 should be properly adjusted, and if the signals to be received are C.W. the heterodyne M5 must be set approximately to the supersonic frequency. If the frequency of the signals to be received is known, the heterodyne and detector circuits may be approximately set to their right values by reference to the curves of settings. If the required signals are not heard it may only be necessary to make a small adjustment to the heterodyne condenser. If signals are then heard they may be made loudest by increasing the reaction until the detector circuit is just short of the oscillating point, and at the same time re-tuning the

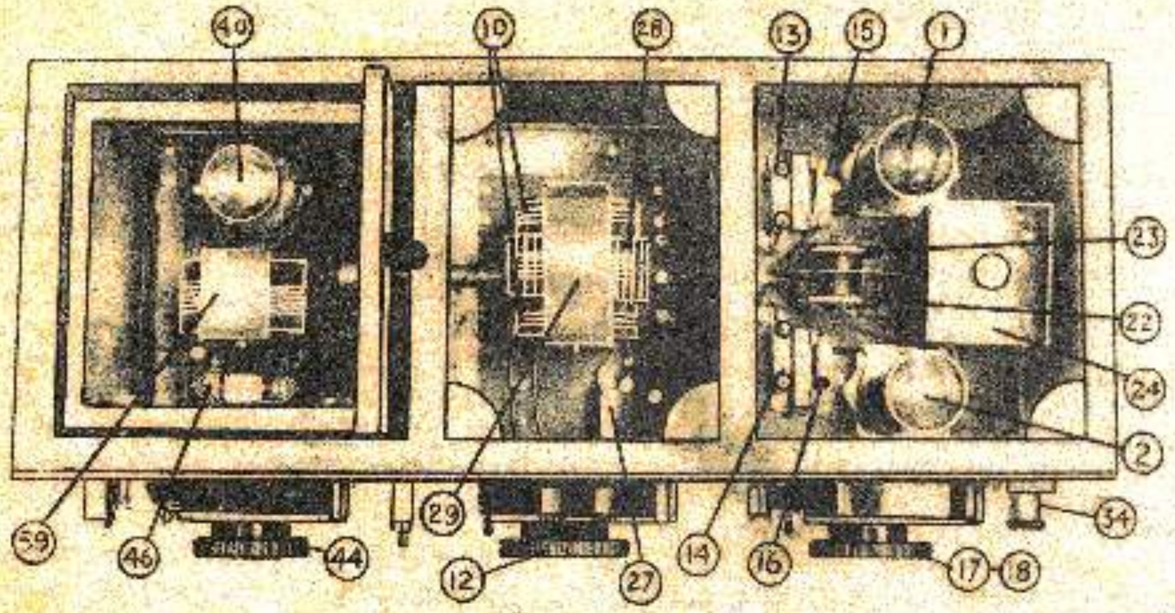

Fig. c

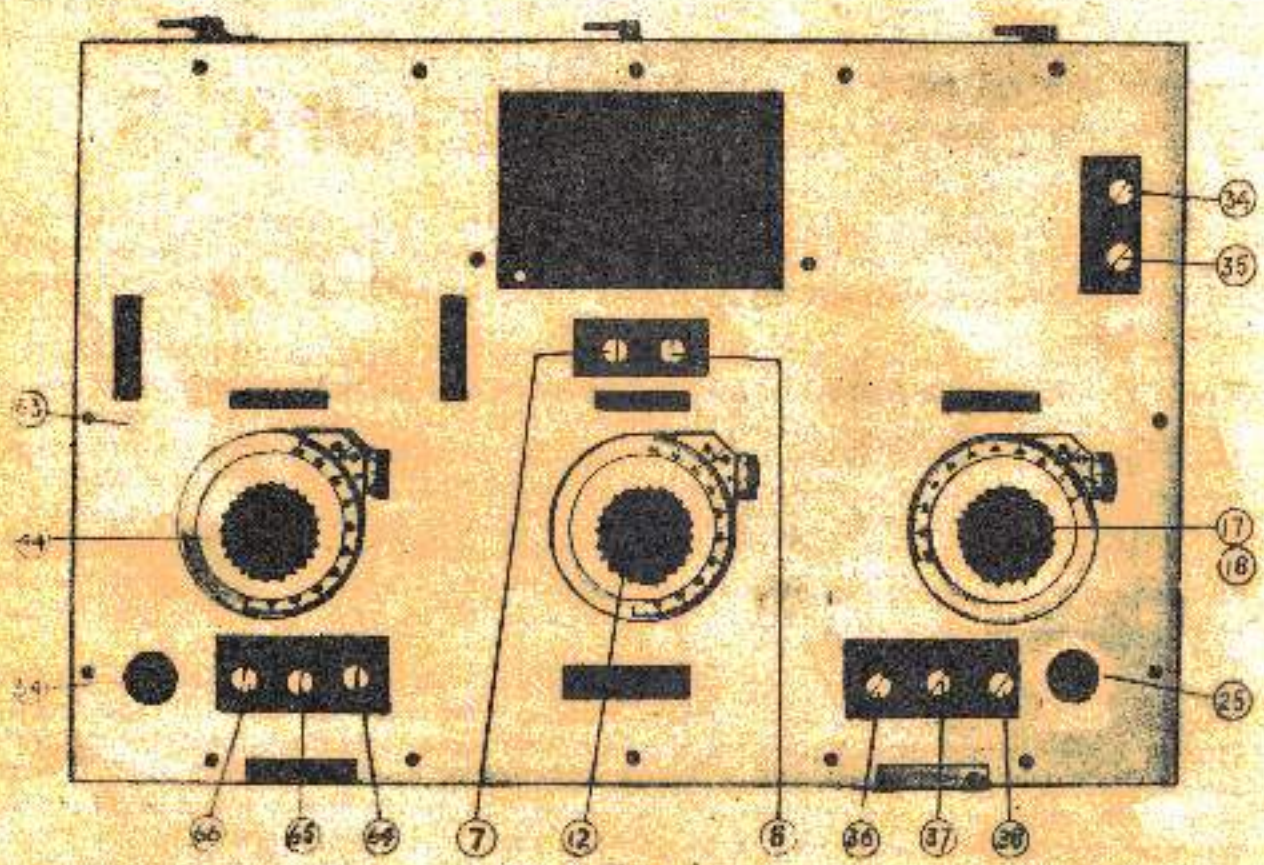

Fig. d

detector circuit. If signals are weak it may be necessary to adjust the heterodyne and detector condensers simultaneously. With practice this can be done over large ranges on the condensers if necessary.

Terminals (36)(37) and (38) are connected to 50-volt anode and 4 volt filament supplies for the two detector valves (1) and (2). Terminals (64)(65) and (66) are connected to 100 volt anode and 4 volt filament supplies for the heterodyne valve (40).