

SUB-SECTION **GE** HETERODYNE UNITS.

HETERODYNE UNIT K5

PAGE GE2

" " K7

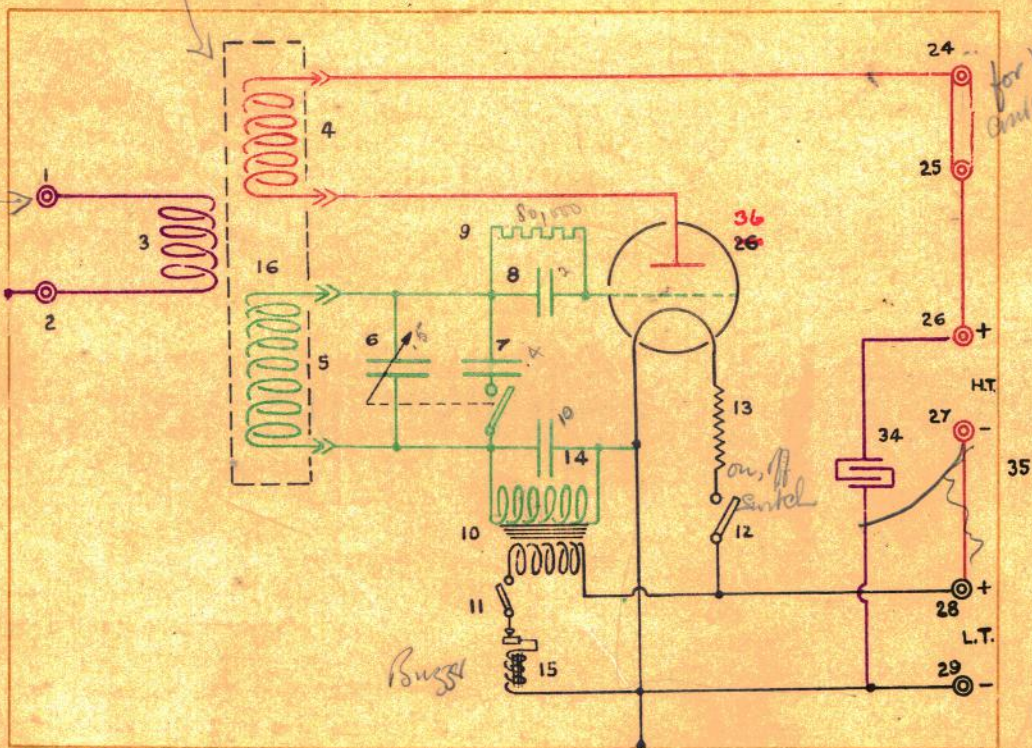
" GE5

Anode + Grid coils

GE 2

# HETERODYNE UNIT K 5

Connect central tap as receiver



for telephone  
Antenna transformer

Bugs

FIG. A.

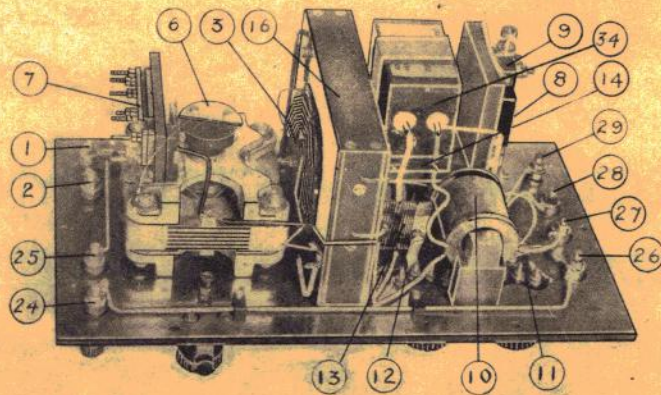


FIG. B

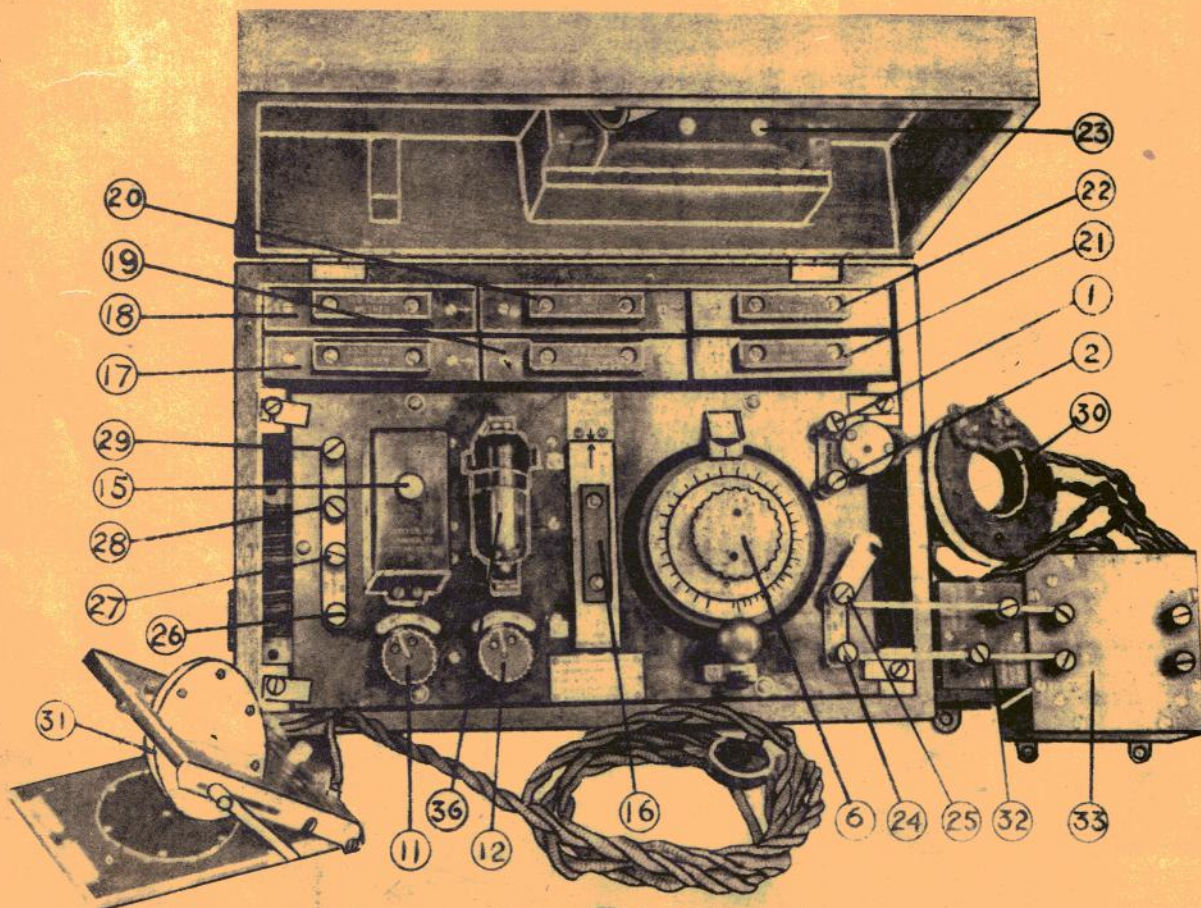


FIG. C

# HETERODYNE UNIT K5

GE3

Date of design:- 1922  
Frequency range:- 13.5 - 2,500 kc/s.  
Valve used:- 6X4

K5 is a heterodyne unit, i.e., a low power oscillator consisting of one valve with a tuned grid and coupled anode. ~~Variable~~ coils (5) and (4) for grid and anode circuits are provided in eight range boxes, six of which (17) to (22) are stowed in the box, one in the lid (23), the eighth being kept in position in the instrument (16). Each range box has a distinctive colour, and discs of corresponding colours are provided to fit on to the spindle of the grid tuning condenser (6) these discs being graduated in wavelengths, in present units.

The grid leak (9) and condenser (8) are fitted to assist in stabilising the frequency of the wave generated. By means of this, the grid current is reduced which considerably reduces any variation of frequency which would be caused by a change of valve or of H.T. or L.T. voltage.

The filament resistor (13) has been adjusted to a value of 2.6 ohms for D.E. valves to ensure that the valve is not "over-run" when the filament battery is at its highest voltage.

A buzzer (15) is fitted coupled to the grid circuit to enable the K5 to produce I.C.W.  
Two coupling coils are provided:-

- (a) Single "ring" coil (30) for tuning, which is coupled in the best position to the circuit being tuned.
- (b) Two coils on a "quadrant" mounting (31) which is fixed to the cabinet wall, one coil being connected to K5 "coupling" terminals (1) and (2), the other being connected to the terminals provided on amplifier M11, etc.

The moving coil is mounted so that it can be rotated in its holder. Coupling should normally be varied by varying the angle between the moving coil holder and fixed coil, without rotating the moving coil itself. Should this not provide sufficient range, coupling may be still further decreased by rotating the moving coil in its holder.

K5, pattern 6373C, is fitted in the main office of flotilla leaders and above, for use as a wavemeter.

Each instrument is supplied with a calibration book, giving the accurate condenser readings for each wave. These calibrations are made using the "ring" coupling coil on a 6-ft. flexible cable. Also, when calibrating, a 4-jar condenser (32), telephone transformer (33), and 120-ohm telephones are connected across the terminals (24) and (25) marked "To 4-jar condenser and telephone transformer". When checking wave frequencies, care must be taken to use the correct length of flexible cable. Either the "ring" or the "quadrant" coils may be used, provided the latter was produced since January 1928. With quadrant coils constructed prior to this date, the ring coil should always be used, as the difference in calibration between the two coils is appreciable. When these terminals are short-circuited the instrument gives accurate readings for ranges 1 - 7, but with range 8 (13.5 - 27 kc/s) a maximum error of 0.5% may be found. If the telephones are connected directly across the telephone terminals large errors appear. This must never be done.

## Methods of Using K5.

### 1. Separate heterodyne.

Short-circuit telephone terminals.

Connect quadrant coupling coil to amplifier in use (e.g., M11).

Put buzzer switch (11) to "Off".

Set the required wave on K5 from calibration book.

Search for the required signal on either side of this setting.

For ordinary C.W. reception, the sensitivity and selectivity of the receiver depend to some extent on the heterodyne beat note, and on the degree of coupling between the heterodyne and the receiver, and these should be adjusted accordingly. If a standard wave is to be received, the quadrant coupling coil should be set to the "tuning" position (see note below) and the heterodyne tuned to the dead space. The condenser reading should then be noted.

### 2. Wavetester for tuning receiving models.

Short-circuit telephone terminals.

Loosely couple "ring" coupling coil to the required circuit.

Use C.W. or buzzer as desired. If using C.W. the receiving set must be oscillating; tune to the dead space. If using buzzer, tune to loudest signals.

### 3. Wavemeter.

Connect telephone transformer, 4-jar condenser and 120-ohm telephones to the K5.

Couple the ring coil to the transmitter. If transmitting C.W., tune to dead space; if I.C.W., tune to loudest signals.

The wave being transmitted can then be determined from the calibration book.

### 4. Receiver. *for C.W.*

Connect aerial to coupling coil terminal (1) on K5, taking care to select the terminal which is not connected to the screen (35). Connect the other coupling coil terminal (2) to earth. Thus an aperiodic aerial circuit is used.

## HETERODYNE UNIT K 5 (CONTD)

5. To tune transmitting apparatus to same frequency as that of a standard transmission.

Set the quadrant coupling coil to "tuning" position (see note below).

Switch on the receiving set, which must include a pattern 6373C K5 and adjust it accurately to the frequency of the incoming signal, setting the K5 to the dead space, taking care the amplifier is not oscillating.

When the standard transmission setting has been obtained, press the key of the transmitting set, using C.W.

Although the receiving aerial is now earthed at the cabinet switch, own transmission should be heard, strength 6 - 7. If signal strength is excessive, detune the receiving aerial circuit but do not alter the tuning of the secondary circuit or of the amplifier tuned circuits as this affects the reading of K5.

Adjust the transmitting adjustment till the dead space corresponds to the correct setting of K5, i.e., the setting obtained from the standard wave transmission. The degree of accuracy required is to within half a degree on the K5 scale.

Note:- The readings, obtained when measuring a standard wave may not agree exactly with the calibration book as the latter is made out using the ring coil, while the standard wave is received with the quadrant coil. In any case, the reading will vary with variations of the coupling of the quadrant coil, and, hence, a "tuning" position must be selected for use and the coils must always be placed in this position when tuning. A loose coupling must be used, about  $45^{\circ}$  between the coils being a fair approximation. This position should be clearly marked.

The earlier pattern heterodynes (pattern 6373A) differ from the pattern 6373C in the following respects:-

- (a) No stabilising unit is fitted.
- (b) The instrument is not calibrated.
- (c) Seven range boxes only are supplied which are all coloured black.
- (d) Filament resistor is 0.26 ohms.
- (e) Either NR7 or NR14 valves may be employed.

All pattern 6373B heterodynes were converted so as to become almost exactly similar to pattern 6373C and pattern 6373B is therefore now obsolete.

# HETERODYNE UNIT K7

GE5

Date of design:- 1931  
 Frequency range:- 60 - 600 kc/s.  
 Where fitted:- D/F Outfits SG and SHX.  
 Valves used:- One NR15.  
 Reference:- Admiralty Handbook of W/T (1931) paragraph 519.

Heterodyne Unit K7 is fitted with Tuner A46 (see page BB11), Amplifier M9 (see page H13) and Note Magnifier N20 (see page I10) as part of D/F outfits SG and SHX and is a low power self oscillator consisting of a valve (130) with tuned grid and coupled anode.

The unit has been designed with five ranges controlled by the range switch (136) which is arranged so as to agree with the primary and secondary ranges of Tuner A46 (see page BB11).

In each position 1, 2, 4 or 5 of the range switch (136), a separate grid tuning coil (135)(154)(155) or (156) and anode coupling coil (141)(151)(152) or (153) is connected in the circuit, all the coils not in use being disconnected. In position 3 of the range switch (136) an additional fixed condenser (143) of 0.3 jar is connected in parallel with the grid tuning condenser (142), the coils of range 4 being used. The coupling between grid and anode is fixed for each set of coils in use, the appropriate grid and anode coils for each position of the range switch (136) being wound on the same former. The grid condenser (140) and leak (137) are fitted to assist in stabilising the frequency of the wave generated (see page GE3). The coupling coil (133) is wound in two sections and so arranged that it gives an effective coupling over the whole range of frequencies. The output terminals (131)(132) are connected to the terminals marked "Heterodyne" on Amplifier M9.

The instrument is switched on and off by means of the filament rheostat (146).

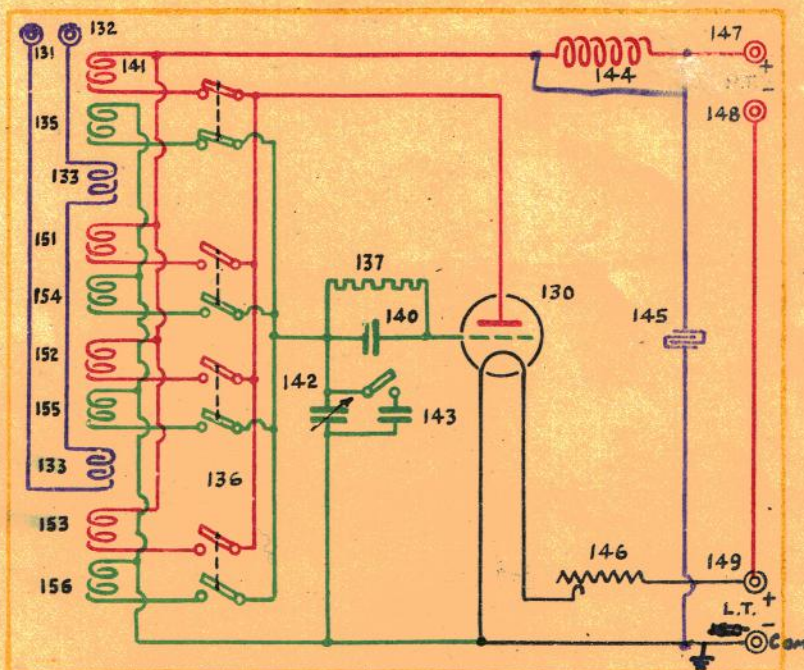


Fig. a.

## EQUIVALENT CIRCUIT.

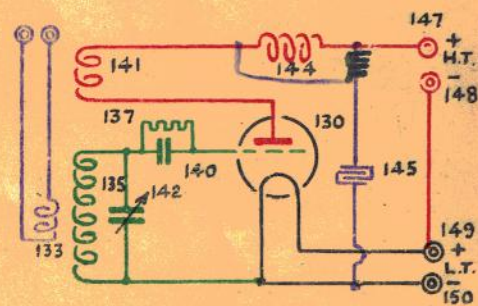


Fig. b.

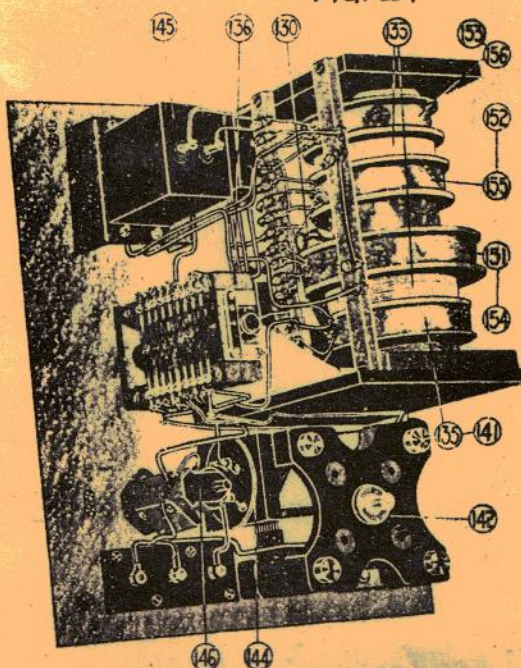


Fig. c.

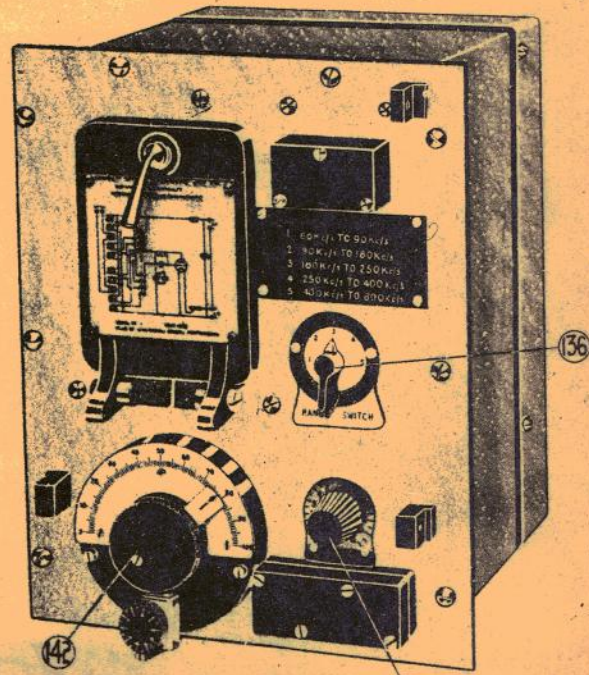


Fig. d.