# FERGUSON 205B

## Covering also Table Model 215B

The Ferguson 205B Portable.

A BATTERY-OPERATED superhet using 2V valves, the Ferguson 205B is a 2-band portable receiver covering M.W. and L.W. The 215B is a table model using a slightly modified 205B chassis, whose differences are described overleaf.

*Release dates and original prices: 205B, May 1948, £13 2s 6d; 215B, August 1948, £14, plus purchase tax and without batteries in each case*

## CIRCUIT DESCRIPTION

Tuned frame aerial input by **L2, C20** (M.W.) and **L2, L3, C20** (L.W.) precedes an octode valve **(V1, Mullard metallized KK32)** operating as frequency changer with electron coupling. Provision for the connection of an external aerial and earth via coupling coil **L1.**

Oscillator grid coils **L4** (M.W.) and **L5** (L.W.) are tuned by **C21,** with parallel trimming by **C22** (M.W.) and **C3, C23** (L.W.); series tracking by **C4** (M.W.) and **C5** (L.W.). Reaction coupling by anode coil **L6.**

Second valve **(V2, Mullard metallized KF32)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C24, L7, L8, C25** and **L9, L10, C26.** **L9** is untuned, but is very closely coupled to **L10, C26.**

**Intermediate Frequency 470 kc/s**

Diode second detector is part of double diode triode valve **(V3, Mullard metallized KBC32).** Audio frequency component in rectified output is developed across manual volume control **R5,** which is the diode load resistor, and passed via A.F. coupling capacitor **C11** and C.G. resistor **R7** to grid of triode section, which operates as A.F. amplifier.

I.F. filtering by **C9, R5, C9** in diode circuit and **C15** in triode anode circuit.

Second diode of **V3,** fed from **L10** via **C12,** provides D.C. potential which is developed across load resistor **R10** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control.

Parallel-fed transformer coupling by **C14** and **T1** is employed between **V3** triode and double pentode quiescent push-pull output valve **(V4, Mullard QP22B).** Tone correction in anode circuit by **C17.**

G.B. potential for **V4** is obtained from the drop across **R14, R15** in the H.T. negative lead to chassis, and a tapping at the junction of these resistors provides fixed G.B. for **V1, V2** and A.V.C. delay voltage.

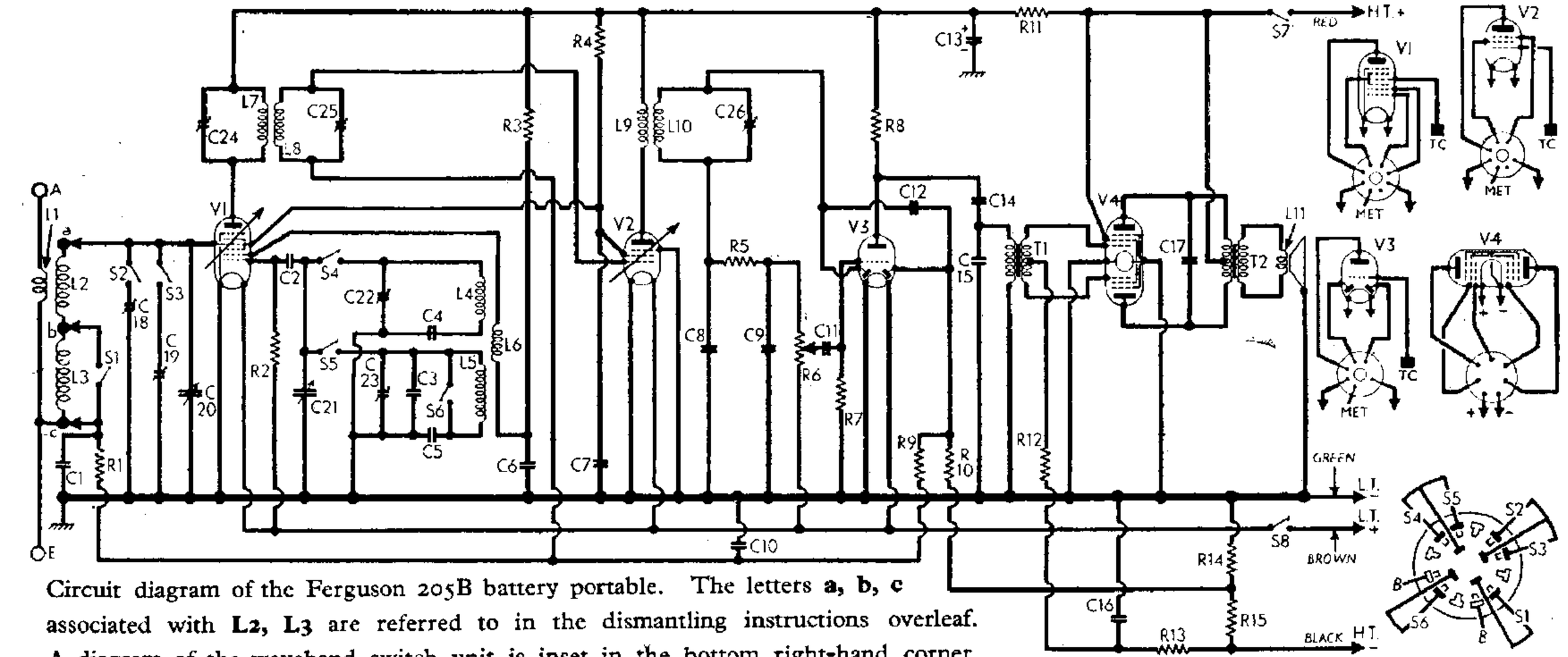
## COMPONENTS AND VALUES

| | RESISTORS | Values (ohms) | Locations |
|---|---|---|---|
| R1 | V1 C.G. decoup. ... | 560,000 | D1 |
| R2 | V1 osc. C.G. ... | 27,000 | L5 |
| R3 | Osc. H.T. feed ... | 10,000 | C1 |
| R4 | S.G's H.T. feed ... | 22,000 | K5 |
| R5 | I.F. stopper ... | 100,000 | H4 |
| R6 | Volume control ... | 500,000 | K1 |
| R7 | V3 triode C.G. ... | 2,200,000 | F1 |
| R8 | V3 triode load ... | 100,000 | H5 |
| R9 | A.V.C. decoupling | 1,000,000 | H5 |
| R10 | A.V.C. diode load... | 1,000,000 | H4 |
| R11 | H.T. line decoup.... | 4,700 | H5 |
| R12, R13 | V4 C.G's decoupling | 47,000 | G4 |
| R14 | V1, V2, V4 G.B. and A.V.C. delay | 560,000 | G3 |
| R15 | | 47 | G5 |
| | | 910 | G4 |

| | CAPACITORS | Values (μF) | Locations |
|---|---|---|---|
| C1 | V1 C.G. decoup. ... | 0·1 | C1 |
| C2 | V1 osc. C.G. ... | 0·0001 | L5 |
| C3 | L.W. fixed trim. ... | 0·00015 | C2 |
| C4 | Osc. M.W. tracker | 0·00059 | C1 |
| C5 | Osc. L.W. tracker... | 0·00028 | D1 |
| C6 | Osc. H.T. decoup.... | 0·1 | D2 |
| C7 | S.G's decoupling ... | 0·1 | K5 |
| C8, C9 | I.F. by-passes ... | 0·0001<br>0·00025 | I4<br>E1 |
| C10 | A.V.C. decoupling | 0·1 | I5 |
| C11 | A.F. coupling ... | 0·001 | E1 |
| C12 | A.V.C. coupling ... | 0·0001 | H4 |
| C13* | H.T. feed decoup.... | 8·0 | E2 |
| C14 | A.F. coupling ... | 0·02 | E2 |
| C15 | I.F. by-pass ... | 0·0005 | F2 |
| C16 | V4 G.B. decoup. ... | 0·1 | H3 |
| C17 | Tone corrector ... | 0·002 | G5 |
| C18‡ | Aerial M.W. trim.... | 0·00004 | D2 |
| C19‡ | Aerial L.W. trim.... | 0·00008 | D2 |
| C20† | Aerial tuning ... | 0·000582§ | B1 |
| C21† | Oscillator tuning ... | 0·000582§ | B1 |
| C22‡ | Osc. M.W. trim. ... | 0·00004 | C2 |
| C23‡ | Osc. L.W. trim. ... | 0·00008 | C2 |
| C24‡, C25‡ | 1st I.F. transformer tuning ... | 0·00018 | B2 |
| C26‡ | | 0·00018 | B2 |
| | 2nd I.F. sec. tuning | 0·0002 | D2 |

* Electrolytic. † Variable. ‡ Pre-set.
§ "Swing" value, min. to max.

| | OTHER COMPONENTS | Approx. Values (ohms) | Locations |
|---|---|---|---|
| L1, L2, L3 | Frame aerial windings ... | Very low<br>1·0<br>12·0 | —<br>—<br>— |
| L4, L5 | Oscillator tuning coils ... | 1·5<br>3·6 | C1<br>C1 |
| L6 | Osc. react. coil ... | 3·5 | C1 |
| L7 | 1st I.F. trans. Pri. ... | 8·0 | B2 |
| L8 | 1st I.F. trans. Sec. ... | 8·0 | B2 |
| L9 | 2nd I.F. trans. Pri. ... | 32·0 | D2 |
| L10 | 2nd I.F. trans. Sec. ... | 8·0 | D2 |
| L11 | Speech coil ... | 2·5 | — |
| T1 | Intervalve trans. Pri. ... | 470·0 | F1 |
| | Intervalve trans. Sec., total | 4,000·0 | F1 |
| T2 | Speaker trans. Pri., total | 630·0 | — |
| | Speaker trans. Sec. ... | 0·4 | — |
| S1-S6 | W/band switches ... | — | D1 |
| S7, S8 | Battery switches, ganged R6 ... | — | E1 |




Circuit diagram of the Ferguson 205B battery portable. The letters **a, b, c** associated with **L2, L3** are referred to in the dismantling instructions overleaf. A diagram of the waveband switch unit is inset in the bottom right-hand corner.

## VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers. Their receiver was operating from new batteries and voltages were measured on the 120V scale of a model 40 Avometer, chassis being the negative connection.

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 KK32 | 73 | 0·6 | 34 | 1·35 |
| | Oscillator | | | |
| | 50 | 2·0 | | |
| V2 KF35 | 73 | 1·3 | 34 | 0·35 |
| V3 KBC32 | 13 | 0·35 | — | — |
| V4 QP22B | 110* | 1·6* | 112 | 0·86 |

* Each anode.

## DISMANTLING THE SET

**Removing Chassis.**—Lay the carrying case, front downward, on a felt pad;
unsolder the three leads from tags on the speaker transformer connecting panel, and the earth lead from a tag on the speaker chassis;
remove **V4** (QP22B), and unsolder the three flexible leads connecting the frame aerial assembly to the chassis, at tags on the assembly;
remove the two round-head wood screws (with lock washers) securing the chassis to the top of the carrying case, and lift out the chassis.
*When replacing*, reconnect the speaker leads as follows, numbering the tags on the input transformer from top to bottom: 1, yellow; 2, red; 3, yellow. The brown lead goes to an earthing tag on the speaker frame.
Viewing the frame aerial assembly from the rear left-hand corner of the carrying case, which should be standing on its base, the yellow lead (**a**) on the circuit diagram and the green lead (**b**), which are twisted together, should be soldered to the upper left- and right-hand connecting tags respectively, and the single yellow lead (**c**) should be joined to to the single tag close to the bottom of the assembly.
**Removing Speaker.**—Remove the connecting leads as previously described;
remove the four nuts (with lock washers), securing the speaker to the sub-baffle.
*When replacing*, the transformer should be on the right, and a soldering tag must be fitted beneath the lower right-hand fixing nut.

## GENERAL NOTES

**Switches.**—**S1-S6** are the waveband switches, ganged in a single rotary unit indicated in our rear view of the chassis, in the screened compartment. The unit is shown in detail in a diagram inset in the bottom right-hand corner of the circuit diagram overleaf, where it is also viewed from the rear. **S1, S2, S4** and **S6** close on M.W.; **S3, S5** close on L.W.

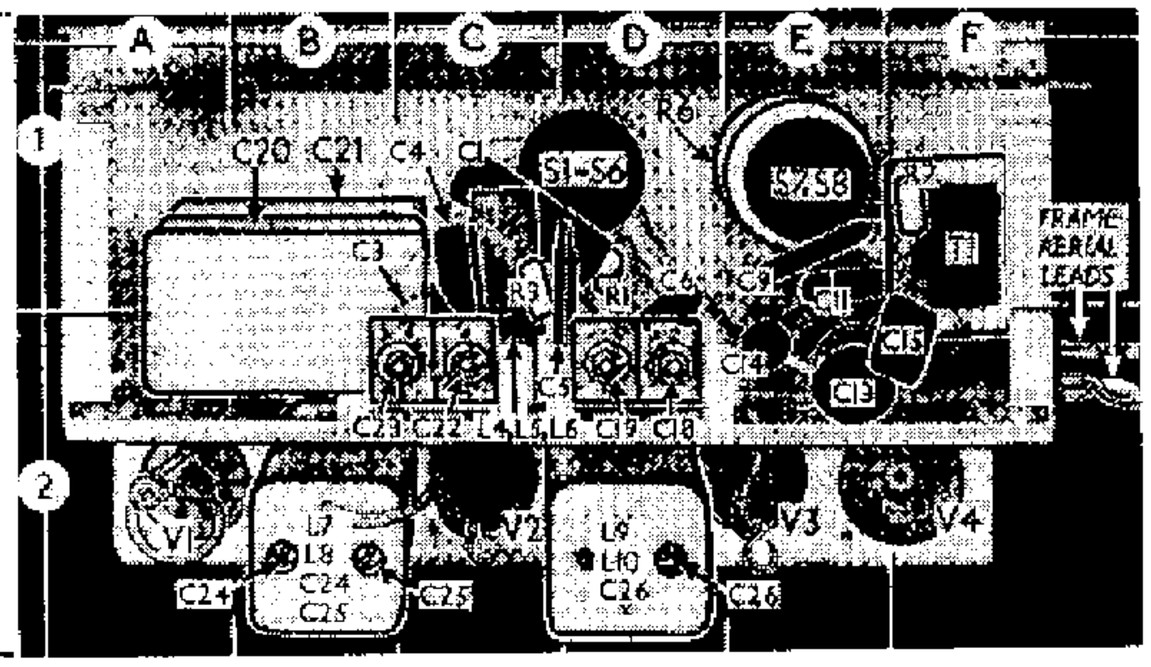
**S7, S8** are the Q.M.B. H.T. and L.T. battery switches, ganged with the volume control **R6**.

**Batteries and Leads.**—Batteries recommended by the makers are: 2 V L.T. accumulator Exide jelly **LBJ3** or **JSK2**; or Ever Ready J203 or J152. 120 V H.T. battery, Drydex H1006 Red Triangle or Ever Ready Winner 120.

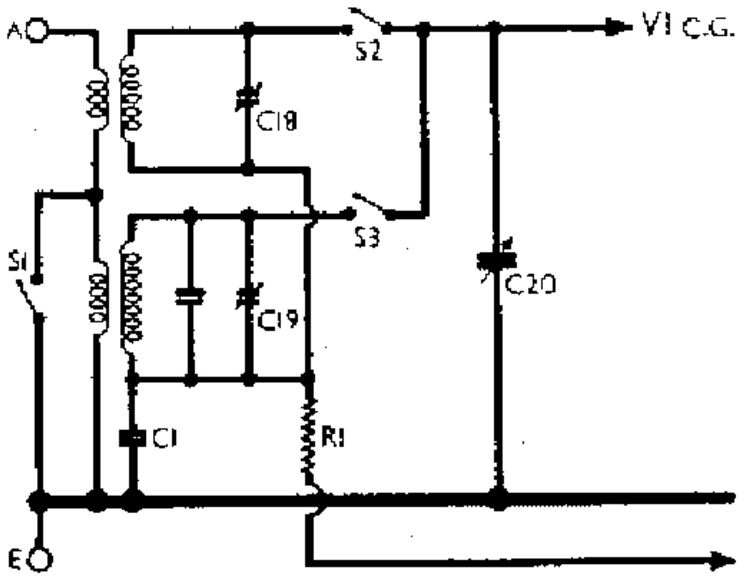
The **L.T.** leads are brown, with red spade tag (positive); and green, with black spade tag (negati wander plug (positive); and black, with black wander plug (negative). G.B. is automatic.

The H.T. leads are red, with green

**Drive Cord Replacement.**—30 inches of flax fishing line is required for the 205B drive, this quantity leaving an ample margin for tying off. The length of the 215B cord is about 3 inches more.




Rear view of the chassis, with the cover plate removed. **V2** is fitted with a close-fitting shield. The **S1-S6** unit, indicated here, is viewed in the same direction as it is in the diagram inset with the circuit diagram overleaf.




This diagram shows the aerial circuit in the table model 215B, which is otherwise similar to the 205B except for the differences explained in the next column. The fixed trimmer in parallel with **C19** is 0.00006μF.

To obtain access to the cord run in the portable, it is necessary first to remove the control panel escutcheon, which carries the scale. It it held by four cheese-head screws (with nuts and lock-washers). Two of these are at the ends of the bottom "step" of the control panel, and the other two are at the ends of the rear edge of the escutcheon.

In the 215B, which has a vertical scale, access is comfortably available on both sides of the scale backing plate, and nothing need be removed.

## 215B MODIFICATIONS

In the table model 215B, the principal circuit differences are concerned with the aerial circuit, of which a separate diagram appears in col. 2. The aerial coupling coils have a D.C. resistance of 23 Ω and 50 Ω respectively for M.W. and L.W., and the tuning coils 2.5 Ω and 23.5 Ω. The switches shown have the same action and physical position as they have in the 205B.

**V1** and **V2** have separate screen feeds of 51,000 Ω nad 0.1 μF each instead of our **R4, C7** (which are common to both valves), and **C9** becomes 0.0001 μF to provide tone correction, as a different speaker is used. **V4** is a Mullard KLL32, which, except for its octal base, is equivalent to the 7-pin QP22B.

Dismantling proceedure is entirely different, and that given here for the portable does not apply to the table model. The cord drive system is mainly similar, but in the 215B the upper horizontal run is raised several inches above the position shown in our front chassis illustration to accommodate the vertical scale. One additional pulley is involved.

Alignment instructions are modified slightly also, as the 215B scale is attached to the cabinet. The backing plate is therefore marked with three indented dots which represent 214 M (1,400 kc/s), 1,250 m (240 kc/s) and maximum gang setting for the cursor, reading from left to right.

## CIRCUIT ALIGNMENT

These operations may be carried out with the chassis in position in the carrying case or cabinet.

**I.F. Stages.**—Connect signal generator to control grid (top cap) of **V1** and chassis, removing the existing top cap connector but connecting a 500,000 Ω resistor between the top cap of the valve and chassis. Switch set to M.W., turn the volume control to maximum, and tune to 200 m on scale.

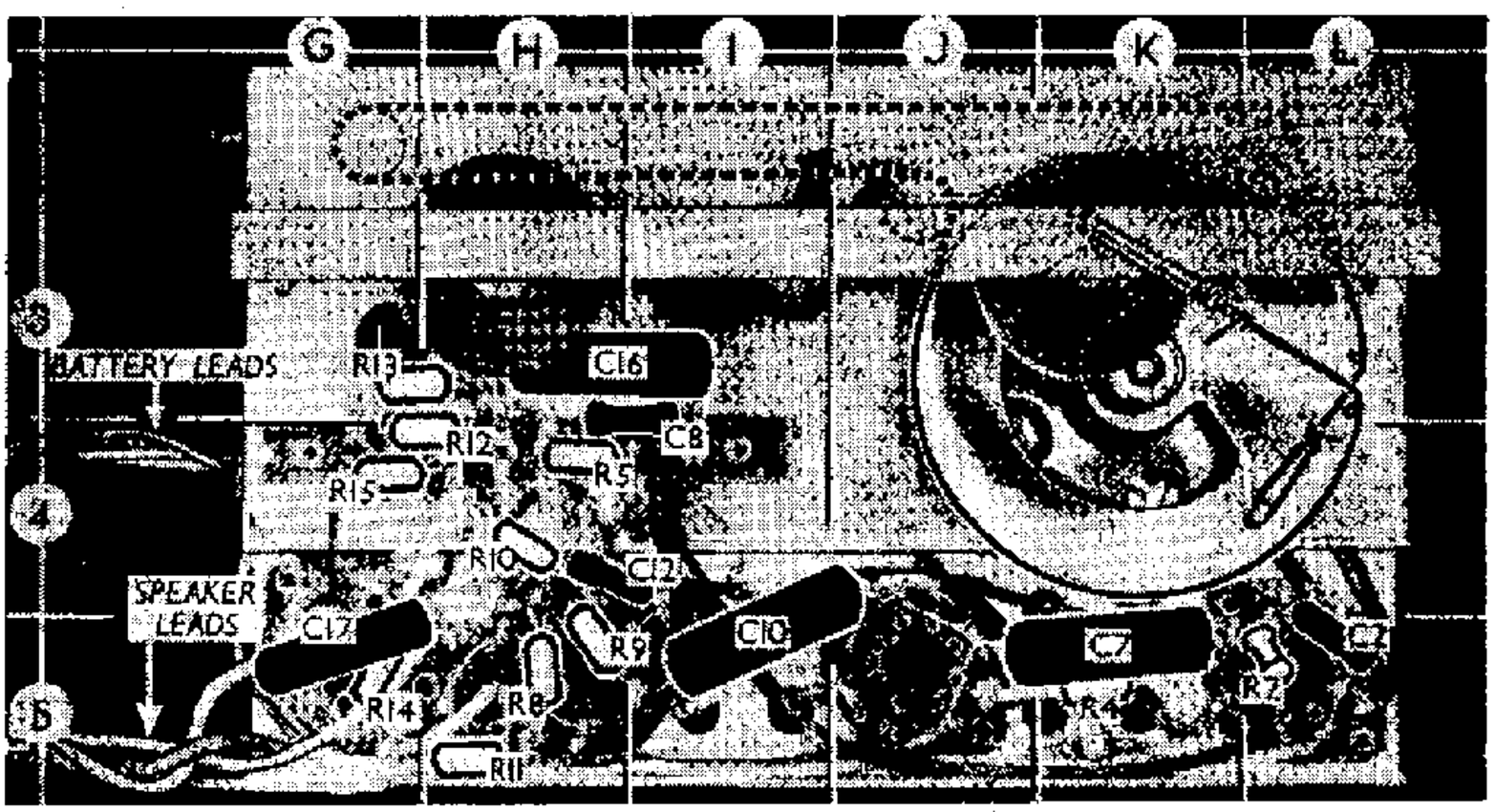
Feed in a 470 kc/s (638.3 m) signal, and adjust **C24, C25** and **C26** (location references B2, D2) for maximum output.

Finally, remove the 500,000 Ω resistor and "live" signal generator lead, and replace **V1** top cap connector.

**R.F. and Oscillator Stages.**—With the gang at maximum capacitance the cursor should coincide with the vertical lines at the right-hand ends of the scales; or, in the table model, with the right-hand indentation in the scale backing plate. It may be adjusted in position by sliding the cursor carriage along the drive cord. Transfer "live" signal generator lead to **A** connection, via a suitable dummy aerial.

**M.W.**—Switch set to M.W., tune to 214 m on scale, feed in a 214 m (1,400 kc/s) signal, and adjust **C22** (C2) and **C18** (D2) for maximum output. Check calibration at 500 m (600 kc/s).

**L.W.**—Switch set to L.W., tune to 1,250 m on scale, feed in a 1,250 m (240 kc/s) signal, and adjust **C23** (B2) and **C18** (D2) for maximum output. Check calibration at 2,000 m (150 kc/s).




Front (or underside) view of the chassis, showing the components mounted round the valve holders. The course of the tuning drive cord is sketched in, the dotted portion normally being concealed by the tuning panel.

*Printed in England by The Cornwall Press Ltd., Paris Garden, London, S.E.1.*