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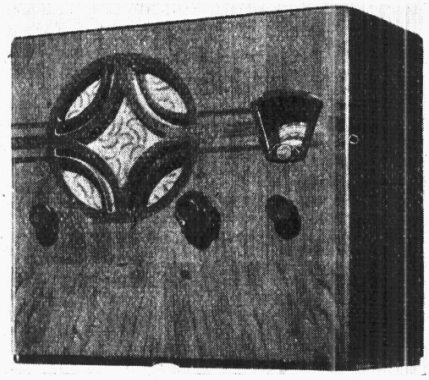
"TRADER" SERVICE SHEET 617

PHILIPS 372B BATTERY TRF RECEIVER



The Philips 372B receiver.

SIX valves, including a class B output valve, are employed in the Philips 372B, a 2-band battery receiver, using the Superinductance tuning system. The chassis is mounted on a shelf in the cabinet, the combined HT and GB battery going into the compartment beneath it. The accumulator stands on the shelf, and the chassis is shaped to accept it.

Two interesting features are the inclusion of a six-way connecting panel on the chassis deck for the termination of the battery leads, and a mechanically operated shutter that covers the tuning scale when the receiver is switched off. There is provision for the connection of a gramophone pick-up and an external speaker.

Release date and original price : 1934; £11 11s. *complete with batteries.*

CIRCUIT DESCRIPTION

Two aerial input sockets are provided, **A1** and **A2.** Input from **A2,** which is intended for general reception, is via series choke **L1** (MW) or choke **L2** (LW) to tappings on the tuning coils **L3** (MW) and **L4** (LW), which are tuned by **C21.** The aerial circuit is shunted by impedance matching circuit **R1, C2.** Input from **A1** is fed directly to **A2,** but **A1** is a "split" socket, and upon insertion of the aerial plug the two sections are joined, so that **C1** is connected in parallel with the input circuit. This socket is intended only for the reception of very strong transmisions.

A plate aerial, fitted in the roof of the cabinet and permanently connected to the **A2** socket, permits the receiver to be operated without an external aerial.

First valve **(V1, Mullard metallised PM12M)** is a variable-mu RF tetrode operating as signal frequency amplifier, with tuned-secondary transformer coupling by **L5, L6, L7, L8** and **C24** to a second RF tetrode **(V2, Mullard metallised PM12A)** operating as signal frequency amplifier, but with fixed grid bias potential. **V2** is coupled by another tuned-secondary RF transformer, **L9, L10, L11, L12** and **C27,** to a diode detector valve **(V3, Mullard metallised PM1HL),** a triode with anode and control grid strapped together.

Audio frequency component in rectified output is developed across load resistance comprising **R7** and **R8,** the latter being the manual volume control, and passed via AF coupling condenser **C10** to CG of a third RF tetrode valve **(V4, Mullard metallised PM12A),** which operates as AF amplifier. **R7** limits the maximum signal voltage that can be applied to **V4** to a value that the valve can safely handle. IF filtering by **C11** and **C13** in **V4** CG and anode circuits respectively.

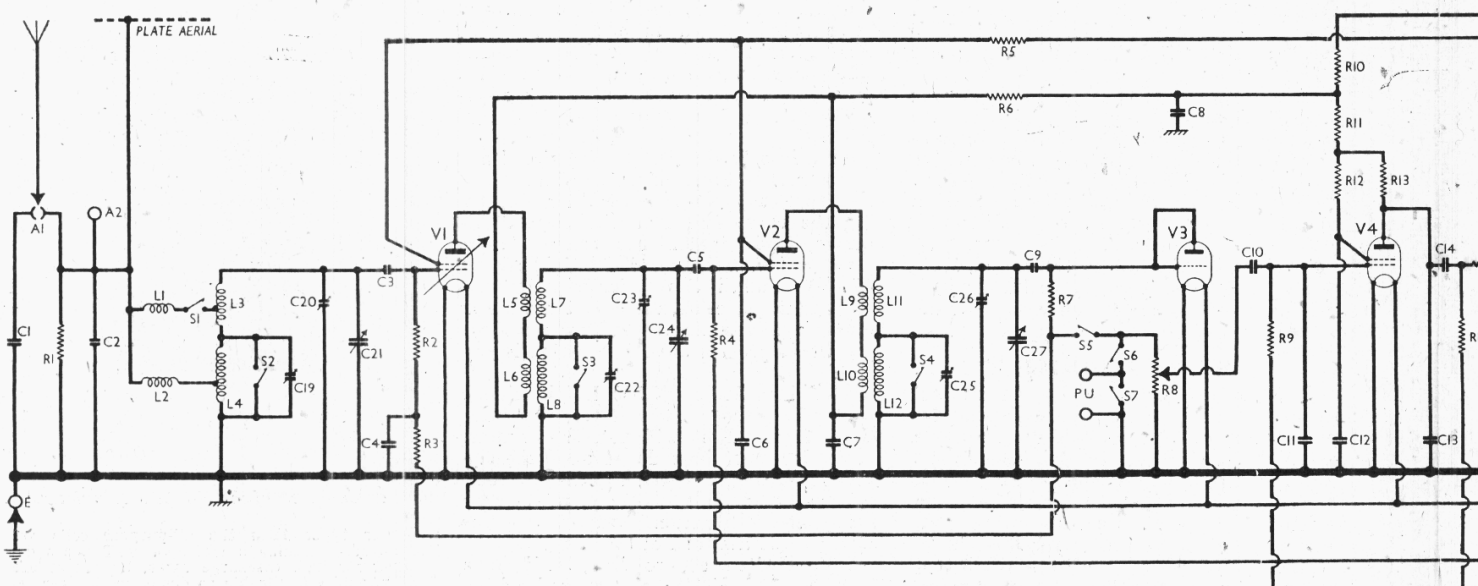
DC potential developed across **R8** is tapped off and fed back through a decoupling circuit as GB to first RF amplifier, giving automatic volume control.

Provision for connection of gramophone pick-up by sockets across **R8.** Switches **S5** and **S6** permit the pick-up to be switched in and out of circuit, **S5** opening on gram to mute radio, so that the pick-up may be left permanently connected. When the receiver is switched to radio, **S7** closes and short-circuits the pick-up sockets.

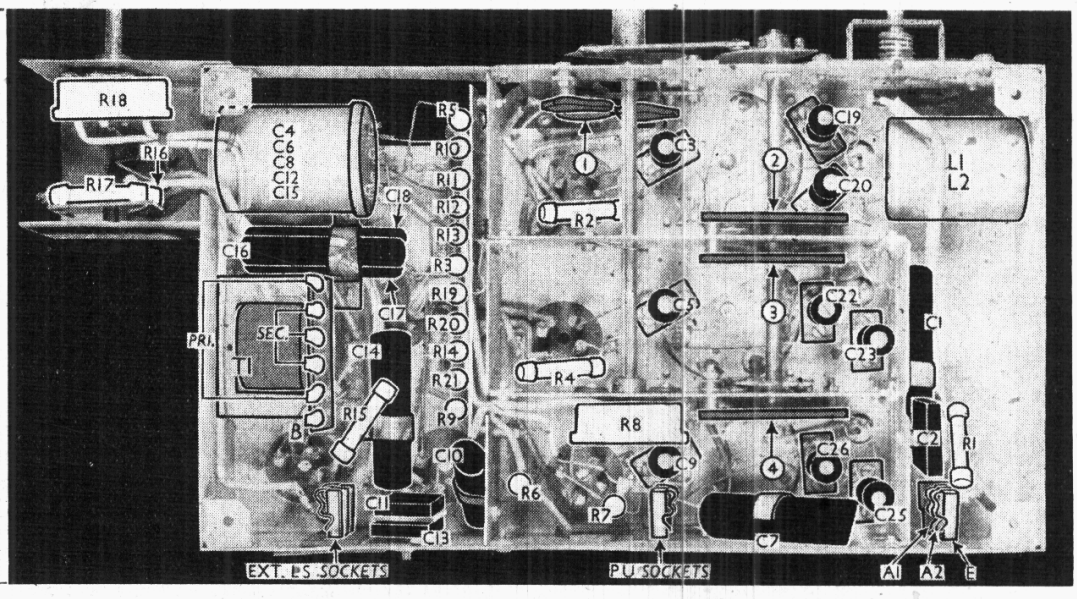
Resistance-capacity coupling by **R13, C14** and **R14,** via grid stopper **R15,** between **V4** and triode driver valve **(V5, Mullard PM2DX),** which is in turn transformer coupled by **T1** to double-triode class B push-pull output valve **(V6, Mullard PM2B).**

Fixed tone correction by **C17, C18** in anode circuits. Variable tone control by **C16, R18** between anodes. Provision for connection of high impedance external speaker between anodes.

HT is supplied to **V1** and **V2** screen grids from a separate tapping HT+1 on



Circuit diagram of the Philips 372B TRF receiver. **V3** is a triode valve with anode and grid strapped to operate as a diode, **R7, R8** acting as the load resistance. The DC potential across **R8** is fed back to **V1** as AVC voltage. The plate aerial is a sheet of metal extending across the roof of the cabinet. Aerial **A1** socket is split, the two halves being joined when a plug is inserted so that **C1** shunts the aerial circuit. **V1** and **V2** are RF amplifiers.



Under-chassis view. The switch units are indicated here by numbers in circles and arrows, the arrows indicating the directions in which the units are viewed in the diagrams in column 3 overleaf. A diagram in column 5 overleaf shows the internal connections of the multiple condenser unit seen in the top left-hand corner.

the HT battery, the rest of the circuit being supplied from a single HT+2 tapping. Grid bias potentials for **V2, V4** and **V5** are obtained from tappings on a potential divider, comprising resistances **R19, R20, R21,** which is connected across the GB section of the HT battery.

VALVE ANALYSIS

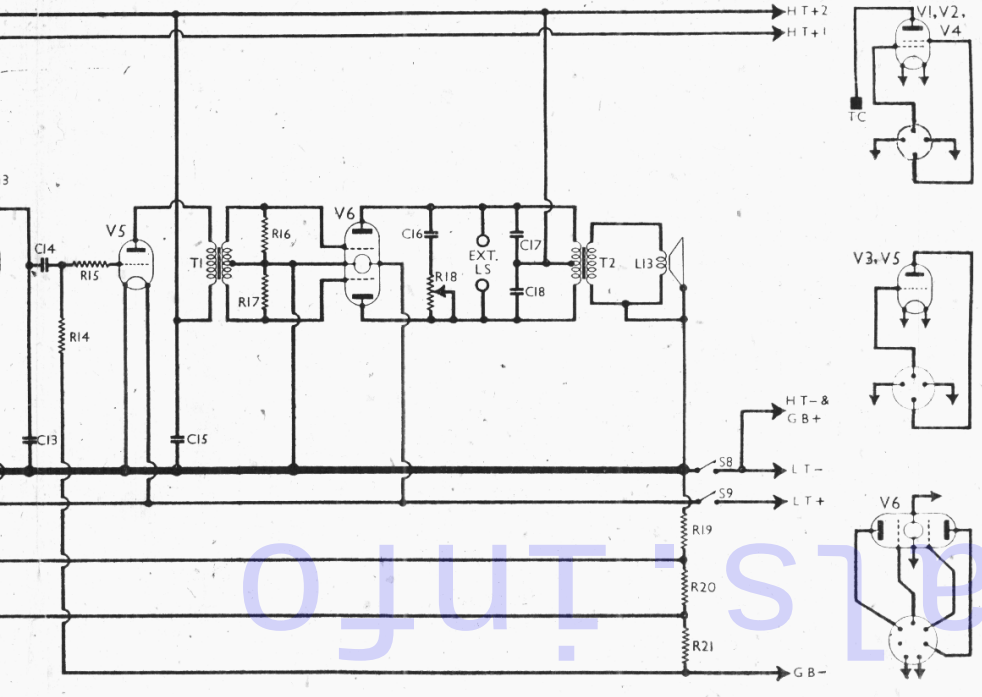
Valve voltages and currents given in the table (col. 5) are those quoted in the makers' manual. They are average values and are therefore approximate. Variations up to 20 per cent. will not necessarily indicate a fault. The figures are based on the assumption that the potential at HT+1 is 60 V, that at HT+2 is 130 V, and that the GB− potential is −3 V.

When readings are being taken, the receiver should be switched to MW, the volume control should be at maximum, and there should be no signal input.

Voltages should be measured on the most suitable scale of a 1,000 ohms-per-volt meter whose negative lead is connected to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 PM12M	123	0·3	52	0·07
V2 PM12A	123	0·5	52	0·11
V3 PM1HL	—	—	—	—
V4 PM12A	52	0·35	35	0·1
V5 PM2DX	128	2·8	—	—
V6 PM2B	129†	1·15†	—	—

† Each anode.

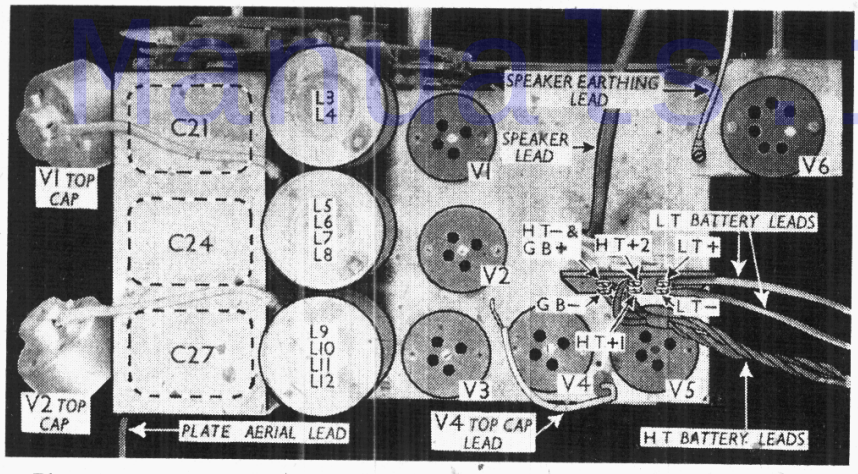


COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	Aerial circuit shunt ...	32,000
R2	V1 CG resistance ...	1,000,000
R3	V1 CG decoupling ...	1,000,000
R4	V2 CG resistance ...	1,250,000
R5	V1, V2 SG's decoupling...	40,000
R6	V1, V2 anodes decoupling	1,000
R7	Part V3 diode load ...	320,000
R8	Manual volume control; part V3 diode load ...	500,000
R9	V4 CG resistance ...	2,000,000
R10	V1, V2, V4 SG's and V4 anode HT feed potential divider	5,000
R11		64,000
R12		640,000
R13	V4 anode load	125,000
R14	V5 CG resistance ...	1,000,000
R15	V5 grid stopper	100,000
R16	T1 secondary shunt resistances	10,000
R17		10,000
R18	Variable tone control ...	50,000
R19	GB battery potential divider	40
R20		160
R21		320

	CONDENSERS	Values (μF)
C1	A1 aerial shunt	0·025
C2	A2 aerial shunt	0·00008
C3	V1 CG condenser ...	0·00001
C4	V1 CG decoupling ...	0·1
C5	V2 CG condenser ...	0·000025
C6	V1, V2 SG's decoupling	0·5
C7	V1, V2 anodes decoupling	0·1
C8		0·1
C9	Coupling to V3 diode ...	0·000015
C10	AF coupling to V4 ...	0·01
C11	IF by-pass	0·00025
C12	V4 SG decoupling ...	0·1
C13	IF by-pass	0·00025
C14	V4 to V5 coupling ...	0·01
C15	HT circuit reservoir ...	0·1
C16	Part variable tone control	0·01
C17	Fixed tone correctors ...	0·005
C18		0·005
C19‡	Aerial circ. LW trimmer	0·000027
C20‡	Aerial circ. MW trimmer	0·000027
C21†	Aerial circuit tuning ...	0·00043
C22‡	1st RF trans. LW trimmer	0·000027
C23‡	1st RF trans. MW trimmer	0·000027
C24†	1st RF trans. sec tuning	0·00043
C25‡	2nd RF trans. LW trimmer	0·000027
C26‡	2nd RF trans. MW trimmer	0·000027
C27†	2nd RF trans. sec. tuning	0·00043

† Variable. ‡ Pre-set.



Plan view of the chassis. The battery lead connecting panel is indicated just above **V5** valve holder, and the six terminals on it are identified.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial MW choke	32·0
L2	Aerial LW choke	119·0
L3	Aerial MW tuning coil ...	3·15
L4	Aerial LW tuning coil ...	28·35
L5	1st RF transformer primary coils	13·0
L6		55·0
L7	1st RF transformer secondary coils	3·15
L8		28·05
L9	2nd RF transformer primary coils	13·0
L10		55·0
L11	2nd RF transformer secondary coils	3·15
L12		28·05
L13	Speaker speech coil... ...	4·5
T1	Intervalve trans. Pri. ...	450·0
	Sec., total	90·0
T2	Speaker input trans. Pri., total	800 0
	Sec. ...	0·75
S1–S4	Waveband switches... ...	—
S5–S7	Radio/gram switches ...	—
S8, S9	Battery circuit switches ...	—

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (recessed grub screws) noting that there are two fixing screws in the larger (switch) of the two concentric knobs;

free the HT battery leads from the cleat (2 wood screws) holding them to the chassis shelf;

free the accumulator leads from the cleat holding them to the cabinet, above the accumulator compartment;

unsolder from the top left-hand corner at the rear of the cabinet the black lead connected to the sheet metal plate aerial which extends across the roof of the cabinet;

unsolder from the speaker transformer the earthing lead from the tag on the end of the core frame, and the three leads from the black cable;

using a long-bladed screwdriver, and passing it through the holes in the bottom of the cabinet, remove the four bolts (with metal washers, rubber grommets and metal distance-pieces) holding the chassis to its wooden shelf.

When replacing, connect the speaker leads as follows, viewing the receiver from the rear;

black rubber lead from black braided cable to bottom rear tag on right of transformer;

yellow/black sleeved lead from braided cable to top front tag on right of transformer;

red sleeved lead from braided cable to top rear tag on right of transformer;

yellow sleeved (earthing) lead from tag on chassis deck to earthing tag at rear of transformer frame.

Each chassis fixing bolt requires two rubber grommets, one going either side of the cabinet base, with one distance-piece between each pair. The metal washer goes directly under the head of the bolt.

Do not omit to fit the springy contact strip to one of the fixing bolts, so that it makes contact between the chassis and screening foil on the chassis shelf.

Removing Speaker.—Remove the chassis; slacken the square nuts (with lock-nuts and washers) holding the four clamps to the rim of the speaker, swivel the clamps and lift out the speaker.

When replacing, the transformer should be at the top, and the leads should be connected as indicated previously.

GENERAL NOTES

Switches.—S1-S4 are the waveband switches, and **S5-S7** the radio/gram change-over switches, in three ganged rotary units beneath the chassis. These units are indicated by arrows and numbers in circles in our under-chassis view, and are shown in detail in the diagrams in col. 3, where they are drawn as seen when viewed in the directions of the arrows in the under-chassis view.

S8, S9 are the battery circuit switches, ganged in a single assembly, mounted on the front chassis member and indicated in our illustration somewhat above and to the left of the waveband units. They, also, are shown in detail in the diagram with the waveband units in col. 3. This assembly is operated by the waveband switch control via a pin at one end of a lever attached to the spindle, and it has a QMB action.

The table (col. 3) gives the switch positions for the four control settings, starting from the fully anti-clockwise (off) position of the control. A dash indicates open, and **C**, closed. In the "Off" position a metal shutter falls and obscures the tuning scale.

Coils.—The series aerial chokes **L1** and **L2** are in a screened unit beneath the chassis. The aerial tuning coils **L3, L4** and the RF transformers **L5-L8** and **L9-L12** are in three screened units on the chassis deck, with their connecting tags projecting into the under-chassis compartment, which is divided by metal screens into several sections, one of which is reserved for the circuit associated with each coil unit.

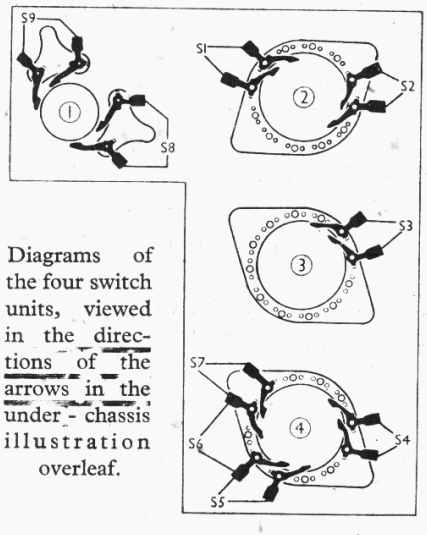
All the tuning units in this receiver are of the special "Superinductance" type; the coils are of very low loss, carefully matched and enclosed in large sealed metal screening containers. Great care should be exercised if work becomes necessary on the coil units themselves. Unless it is absolutely necessary, the cans should not be disturbed at all.

Tuning Gang.—The variable tuning condensers **C21, C24, C27** are in a ganged assembly mounted on the chassis deck. These again are accurately matched at the works and enclosed in sealed screening containers which should not be disturbed. They are protected from mechanical damage by a strong metal cover.

Pre-set Trimmers.—C19, C20; C22, C23; and **C25, C26** are a special type of trimmer condenser. They consist of two concentric brass tubes, one of which, the outer, can be slid along the other. They are mounted on a special porcelain rod held at the base in a rectangular brass mount. Normally, the outer tube is sealed in position by a deposit of paint, but for adjustment purposes it may be moved if it is eased gently until the seal is broken.

Switch Table

Switch	Off	MW	LW	Gram
S1	—	C	—	—
S2	—	C	—	—
S3	—	C	—	—
S4	—	C	—	—
S5	—	C	C	—
S6	C	—	—	C
S7	—	C	C	C
S8	—	C	C	C
S9	—	C	C	C



Diagrams of the four switch units, viewed in the directions of the arrows in the under-chassis illustration overleaf.

After readjustment it should be sealed again with a dab of sealing wax, cellulose or paint.

Condensers C3, C5, C9.—These low-capacity condensers are of similar construction to the pre-set trimmers, but they are not intended to be adjusted. This has been done at the works, and afterwards they have been dipped in wax. Replacements could be made with the modern silvered mica type, if necessary. The values assigned to them in the makers' manual are not precise : **C3,** for instance, is quoted at 10-12 $\mu\mu$F; in our tables the nearest commonly used value has been quoted.

Condensers C4, C6, C8, C12, C15.—These are five decoupling condensers, in a single enclosed cylindrical container mounted beneath the chassis. The unit is indicated in our under-chassis view, but the internal connections are shown in a separate diagram in col. 5.

Gramophone Pick-up.—Two sockets are provided at the rear of the chassis for the connection of a gramophone pick-up. As switching is provided, the pick-up may be left permanently connected. **S7** short-circuits the sockets on radio. A hole is punched between the sockets to accept a centre pin on the special plug provided.

External Speaker.—A three-pin socket is provided at the rear of the chassis for a high-impedance (about 14,000 O) external speaker. Actually, only the two outer sockets are intended as the connections, the centre one being there to accept a third pin on the plug. This is fitted to prevent the plug from being inserted inadvertently in a mains socket.

Batteries.—LT, Exide 2 V accumulator cell, type RPB3. HT, Drydex 144 V, type H 1090.

Battery Leads and Voltages.—In all there are six battery leads : two LT leads; two HT+ leads; one common HT— and GB+ lead; and one GB— lead. All the leads are black, but the LT leads can be identified by the coloured red and black spade tags. The remaining leads bear metal labels marked in the American style : "A" for LT; "B" for HT; and "C" for GB.

The voltages are : A—, LT negative; A+, LT positive 2 V. —B, HT negative and GB positive; +B1 (HT+1), HT positive 60 V; +B2, (HT+2), HT positive 130 V; —C (GB—), GB negative —3 V. If an additional lead and plug is attached to the HT—GB+ lead a separate GB battery may be used.

The leads are taken on the chassis deck to a small six-way connecting panel, which is shown in our plan view with the six terminals identified.

CIRCUIT ALIGNMENT

The instructions given in the makers' manual for alignment require special instruments for obtaining a correct scale setting and adjusting the trimmers. The trimmer tool is a two-pronged fork which fits snugly round the grooved necks of the trimmers. A section of the surrounding screening could be used as a fulcrum to obtain a steady pull, and a suitable tool could be made up if one was not readily obtainable.

Another piece of equipment is an auxiliary pointer to take the place of the hair-line engraved on the tuning aperture window in the cabinet, as the chassis must be removed for alignment. With this instrument, the adjustment is largely a matter of trial and error, and although it helps to reduce the number of trials, alignment can be carried out without it, and if the scale has not been disturbed,

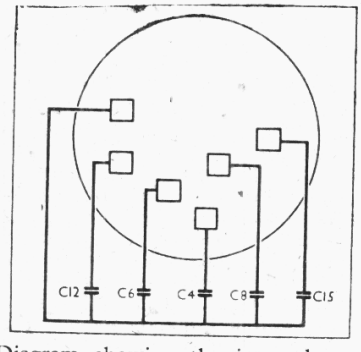


Diagram showing the internal connections of the condenser unit. It is drawn as seen from the right-hand side of our under-chassis view overleaf.

it is not necessary to use one. As the scale drive is very robust, it is unlikely to get out of adjustment. In our sample, the 2,000 m calibration mark on the scale was vertical and in line with the centre of the scale spindle when the gang was at maximum.

If the scale is assumed to be correctly set, the procedure is as follows :

Connect the signal generator via a suitable dummy aerial to **A2** and **E** sockets, and turn the volume control to maximum. Keep the input signal low throughout the whole process, reducing it as the circuits come into line.

MW.—Switch set to MW, tune to 225 m on scale (vertically in line with centre of scale spindle) feed in a 225 m (1,330 KC/S) signal, and adjust **C20, C23** and **C26** for maximum output. The method of adjustment is described in the alignment introduction and under "General Notes."

Feed in a 500 m (600 KC/S) signal and check calibration. If the calibration is incorrect, adjust the scale after slackening the three screws in the plate at its centre, and tighten the screws again. Now feed in a 340 m (883 KC/S) signal; tune it in, and if calibration is not correct within 0.5 per cent., readjust the scale as required and return to 225 m, repeating the whole process until calibration is correct.

Feed in a 200 m (1,500 KC/S) signal, and check that the receiver will tune down to it. If it will not, the trimmer capacities must be reduced until the signal is received, and the alignment procedure repeated. Alternatively, wavelength range and calibration accuracy may be sacrificed at that end of the scale.

LW.—Switch set to LW, feed in a 1,000 m (300 KC/S) signal, and adjust **C19, C22** and **C25** for maximum output. Finally, reseal all trimmers.

TEST REPORT

VARLEY

DRY ACCUMULATORS

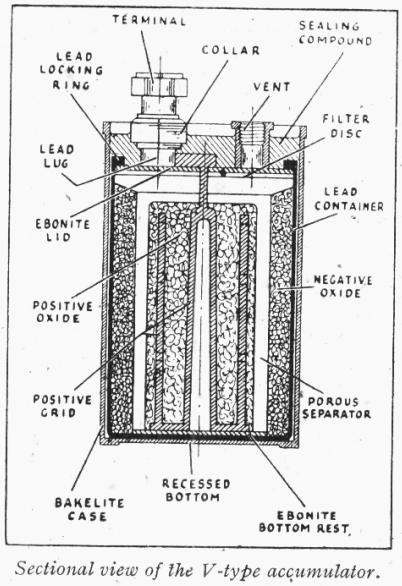
THE principal claims made for the Varley dry-type accumulators are that the absence of moisture externally makes the cells convenient to handle; that they do not spill and damage customers' property, such as carpets, if dropped; that they have a longer shelf life than ordinary free-acid types, and can be supplied and stocked ready charged; that the active material cannot come off the plates; and the terminals do not easily corrode. They are very compact, and can readily be carried in a shopping basket.

The makers guarantee the shelf life to be not less than three months, and claim that if the cell is left for six to nine months without charging, all that is necessary to bring it back to perfect condition is a thorough soaking in distilled water. Acid need never be added as it is introduced into the elements during manufacture, and its gravity cannot alter. The construction, as will be seen from the section drawing below, differs considerably from that of the ordinary accumulator.

There are four all-purpose types: V20, V40, V60 and V80, having a nominal voltage of 2v, and actual ampere-hour ratings of 10, 20, 24 and 40 respectively at the 20-hour rate of discharge. Their prices and dimensions are given in the following table :—

Type	H	W	D	Retail Price	Plus Pur. Tax
V20	4 3/16	2 13/16	2 13/16	11/6	2/6
V40	5 9/16	2 13/16	2 13/16	13/9	2/11
V60	4 5/8	3 5/16	3 5/16	15/-	3/3
V80	6 1/16	3 9/16	3 9/16	19/3	4/2

A sample V60 cell and a sample V40 were tested in *The Trader* laboratory. They were first charged fully, and then discharged at an initial rate equivalent to the 20-hour rate current: 1.5A in the case of the V60 and 1A in the case of the V40. The load resistance values were not varied during the test, and at the end of the 20-hour period the current was falling rapidly, but until this point was reached the current remained reasonably steady. No periods of rest were given, and on the whole the performance was quite satisfactory.



Sectional view of the V-type accumulator.

Other types than the all-purpose cells are produced, including a series of VPT types designed for high discharge rates, but these are not normally applicable to domestic receiver requirements. The manufacturers are Varley Dry Accumulators, Ltd., By-Pass Road, Barking, Essex.

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