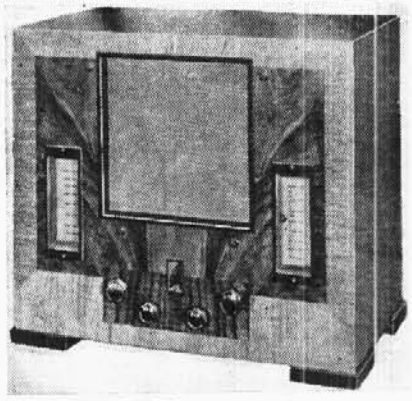
"TRADER" SERVICE SHEET

521

H.M.V. 442, 443, 570, 570A & MARCONIPHONE 296, 289



The HMV 442 superhet.

THE HMV 442 is a 4-valve (plus rectifier) 2-band superhet, designed to operate from AC mains of 200 to 250 V, 50-100 C/S.

At several points in the circuit, special measures have been employed to obtain a desired overall frequency characteristic, and a "Fluid Light" tuning indicator of the meter-type is used. A static suppressor and image suppressor are also included, and a triode output valve feeds the speaker.

The Marconiphone 296 is a similar receiver, and the HMV 443 is similar except for certain mechanical differences, most of which concern the cabinet.

The HMV 570 and Marconiphone 289 are radiogramophone versions of the 442, and the differences are described under "Radiogram Modifications." The HMV 570A is a slightly modified version of the 570. All three radiograms are fitted with automatic record changers.

Release date, all models : 1934.

CIRCUIT DESCRIPTION

Aerial input via **C1** and **L5** to tap on **L2** (MW), or **L1** to tap on **L3** (LW), to inductively coupled band-pass filter. Primary coils **L2** (MW) plus **L3** (LW) are tuned by **C27;** secondary coils **L6** (MW) plus **L7** (LW) by **C28.** Coupling by mutual inductance between primary and secondary coils. Image suppression on both bands by **L4, C2** and **L5.** The aerial circuit trimmer **C26** is used to match the input circuit to the aerial loading.

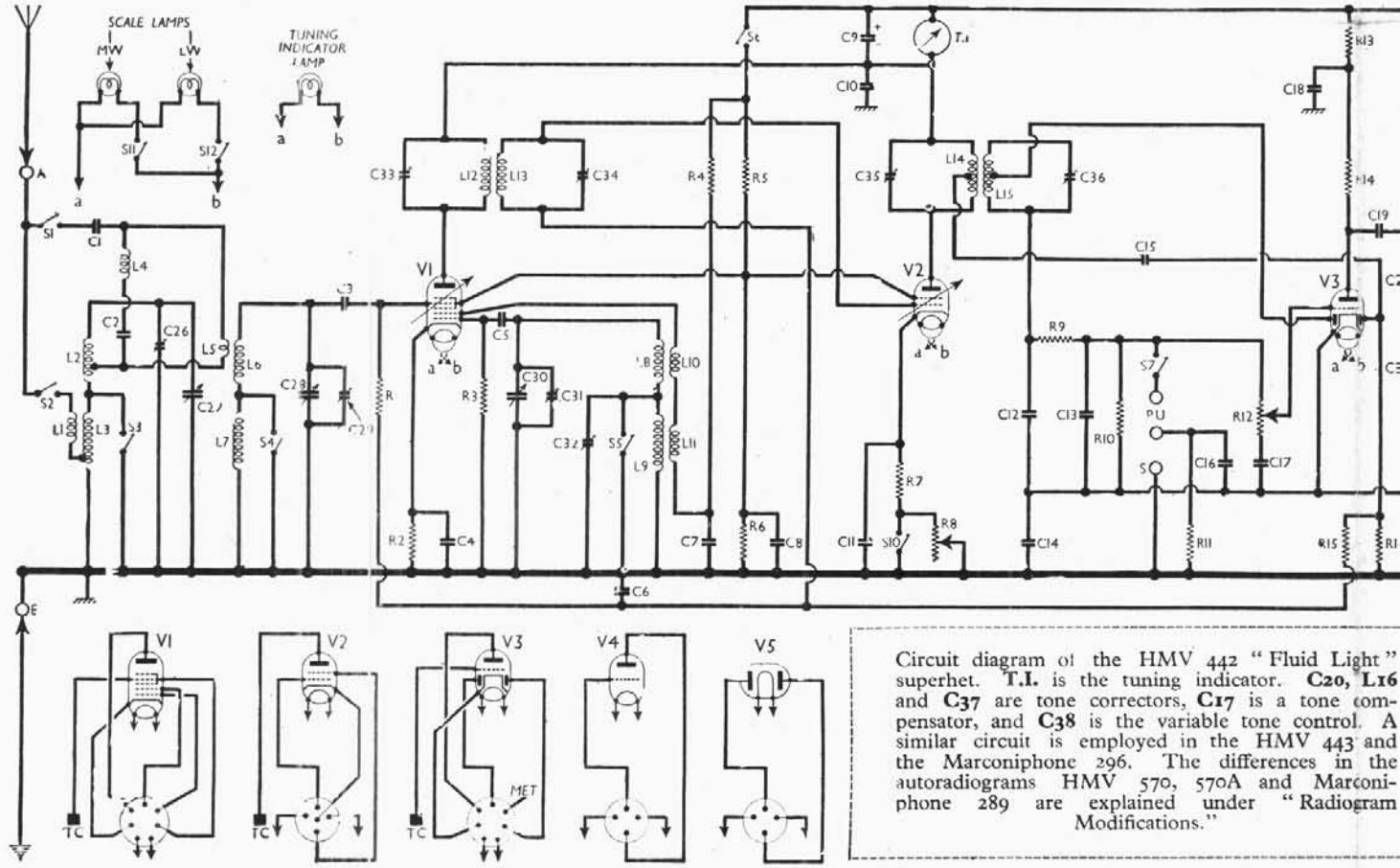
First valve **(V1, Marconi MX40)** is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L8** (MW) plus **L9** (LW) are tuned by **C30.** Parallel trimming by **C31** (MW) and **C32** (LW). Tracking by specially shaped vanes of **C30.** Reaction from anode by coils **L10, L11** (MW and LW).

Second valve **(V2, Marconi metallised VMS4B)** is a variable-mu RF tetrode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C33, L12, L13, C34** and **C35, L14, L15, C36.**

Intermediate frequency 125 KC/S.

Anode current to **V1** pentode and **V2** is fed via a meter-type tuning indicator **T.I.,** whose "pointer," which moves in sympathy with changes in the anode current, moves a shutter which shades more or less of the light from a lamp illuminating the "Fluid Light" tuning indicator aperture. The meter winding is shunted by an electrolytic condenser **C9.**

Noise suppression is achieved by over-biasing **V2** so that it will not respond to small signals, the magnitude of which is determined by adjustment of the static



Circuit diagram of the HMV 442 "Fluid Light" superhet. **T.I.** is the tuning indicator. **C20, L16** and **C37** are tone correctors, **C17** is a tone compensator, and **C38** is the variable tone control. A similar circuit is employed in the HMV 443 and the Marconiphone 296. The differences in the autoradiograms HMV 570, 570A and Marconiphone 289 are explained under "Radiogram Modifications."

suppressor control **R8**, so that noise and signals are suppressed until a signal great enough to exceed the excess GB voltage, and therefore local static, is tuned. During less noisy periods, or when greater sensitivity is required, the suppressor circuit is eliminated by closing **S10**. This switch opens only when the volume control knob is pulled "out."

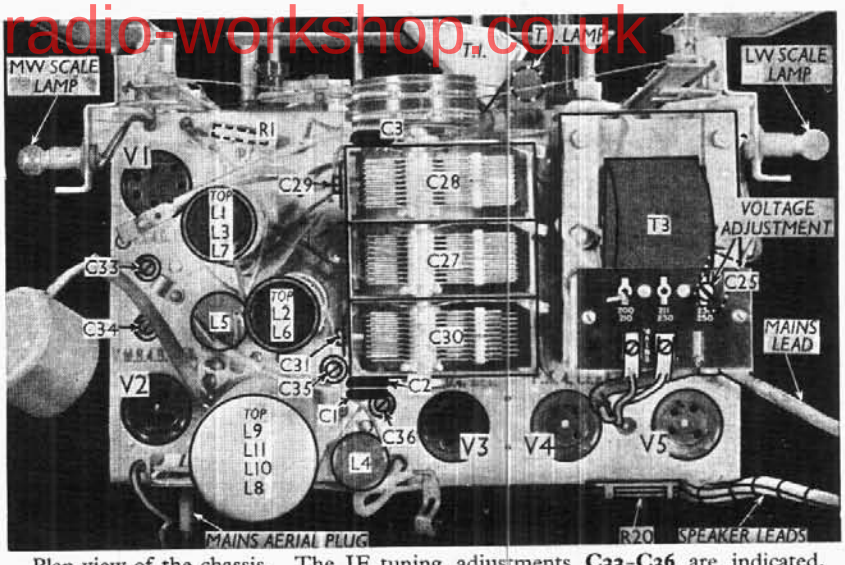
Diode second detector is part of double diode triode valve **(V3, Marconi metallised MHD4)**. Audio frequency component in rectified output is developed across load resistance **R10** and passed via manual volume control **R12** and decoupling condenser **C17** to CG of triode section, which operates as AF amplifier. **C17** introduces a bass compensating effect as the volume control is turned "down." IF filtering by **C12, R9, C13**. Provision for connection of gramophone pick-up across **R12, C17** via **S7** and **C16**.

Second diode of **V3**, fed from tap on **L14** via **C15**, provides DC potential which is developed across load resistance **R16** and fed back through decoupling circuit as GB to FC and IF valves, giving automatic volume control. Delay voltage, together with GB for triode section when operating as gramophone amplifier, is derived from the drop along **R17** in cathode lead to chassis, via **R19**, which develops a voltage smaller in value, but of opposite sign to that across **R17**.

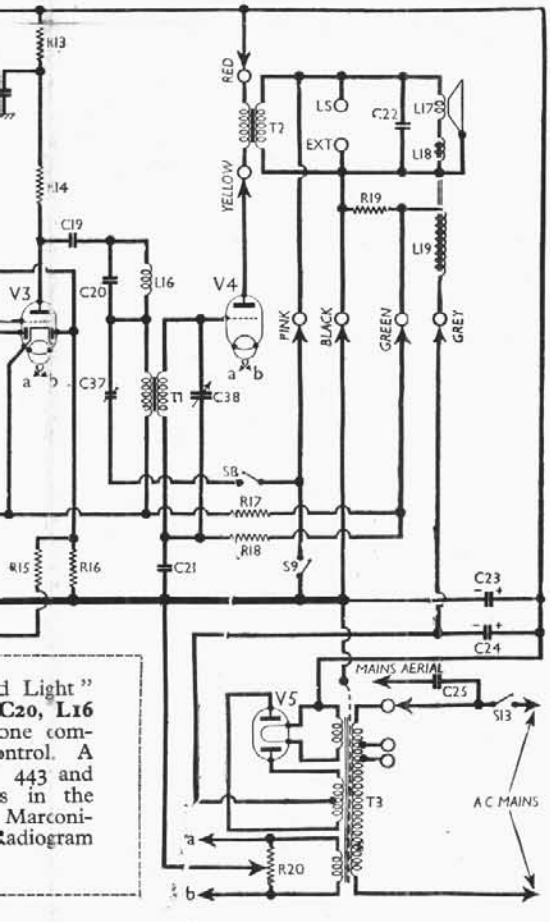
Parallel-fed transformer coupling, via tone compensating filter **L16, C20**, by **R14, C19** and **T1** between **V3** triode and directly-heated triode output valve **(V4, Marconi PX4)**. Variable tone control by variable condenser **C38** across **T1** secondary. Tone correction by **C22** across **T2** secondary, and high note compensation by positive feed-back from speech coil circuit to **T1** primary via **S8** and pre-set condenser **C37**. Switch **S8** opens on gram, so that the feed-back is applied only on radio; and **C37** is adjusted to control high-note compensation.

Provision for connection of low impedance external speaker across **T2** secondary, while **S9**, in the same position, closes to mute the receiver between rest positions of the waveband switch control.

HT current is supplied by full-wave rectifying valve **(V5, Marconi U12)**. Smoothing by speaker field and **R19** (in negative HT lead to chassis) and electrolytic condensers **C23, C24**. Potential developed across **R19** is applied via **R18** as GB to **V4** and, as explained previously, it offsets part of that developed across **R17**. Mains aerial coupling via **C25**. The low-resistance potentiometer **R20** is connected across the heater circuit to balance out hum voltages. This requirement applies particularly to the directly-heated output valve **V4**.



Plan view of the chassis. The IF tuning adjustments **C33–C36** are indicated. **C25** is mounted on the chassis deck beneath **T3**.



d Light" C20, L16 one control. A 443 and s in the Marconi-Radiogram

COMPONENTS AND VALUES

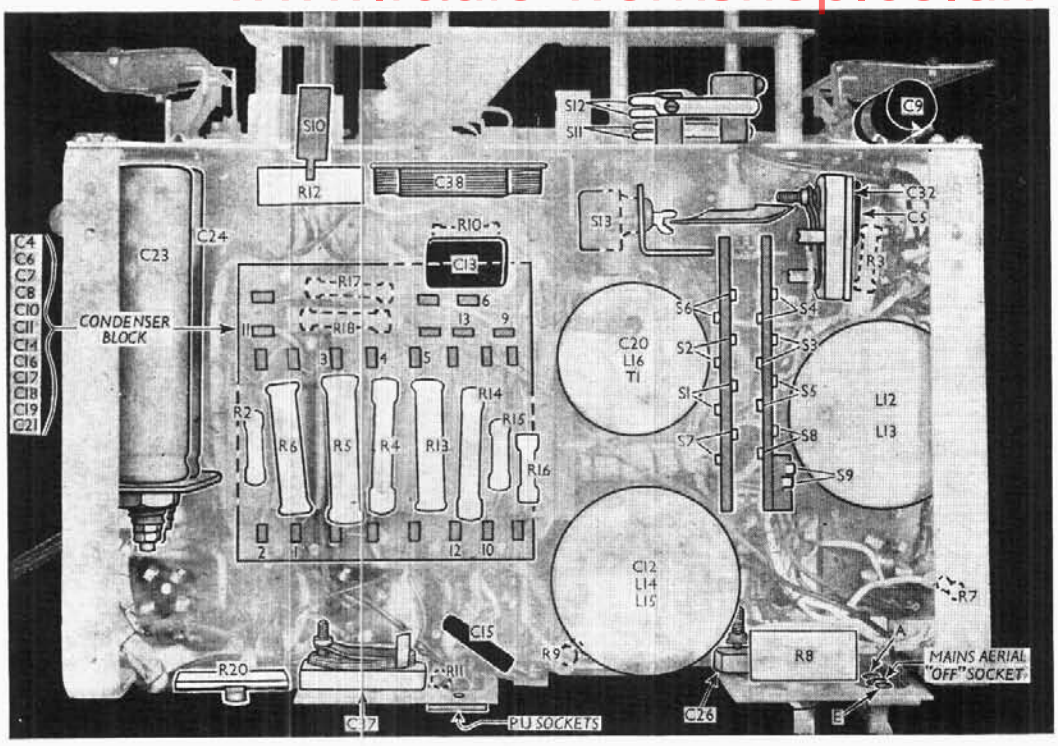
	RESISTANCES	Values (ohms)
R1	V1 pentode CG resistance	1,000,000
R2	V1 fixed GB resistance ...	1,000
R3	V1 osc. CG resistance ...	50,000
R4	V1 osc. anode HT feed ...	50,000
R5, R6	V1 and V2 SG's HT feed potential divider ...	23,000 / 23,000
R7	V2 fixed GB resistance ...	230
R8	Noise suppressor	14,000
R9	IF stopper	50,000
R10	V3 signal diode load ...	230,000
R11	V3 triode CG decoupling	100,000
R12	Manual volume control ...	200,000
R13	V3 triode anode decoupling	23,000
R14	V3 triode anode load ...	50,000
R15	AVC line decoupling ...	1,000,000
R16	V3 AVC diode load ...	500,000
R17	Part AVC delay	23,000
R18	V4 CG decoupling ...	230,000
R19	V4 GB resistance	500
R20	Heater circuit pot. ...	48

	CONDENSERS	Values (μF)
C1	Part MW coupling ...	0·0005
C2	Part image suppressor ...	0·002
C3	V1 pentode CG condenser	0·0003
C4	V1 cathode by-pass ...	0·1
C5	V1 osc. CG condenser ...	0·0001
C6	AVC line decoupling ...	0·1
C7	V1 osc. anode decoupling	0·1
C8	V1, V2 SG's decoupling...	1·0
C9*	T.I. by-pass	25·0
C10	V1, V2 anodes decoupling	1·0
C11	V2 cathode by-pass ...	0·1
C12, C13	IF by-pass condensers ...	0·0002 / 0·0001
C14	V3 cathode by-pass ...	3·0
C15	Coupling to V3 AVC diode	0·00005
C16, C17	V3 triode CG decoupling condensers	1·0 / 0·5
C18	V3 triode anode decoupling	2·0
C19	AF coupling to T1 ...	0·1
C20	Part of tone filter ...	0·001
C21	V4 CG decoupling ...	0·5
C22	Fixed tone corrector ...	0·7
C23*, C24*	HT smoothing condensers	8·0 / 8·0
C25	Mains aerial coupling ...	0·0005
C26‡	Band-pass pri. MW trimmer	—
C27†	Band-pass pri. tuning ...	—
C28‡	Band-pass sec. tuning ...	—
C29‡	Band-pass sec. MW trimmer	—
C30†	Oscillator circuit tuning ...	—
C31‡	Osc. circ. MW trimmer ...	—
C32‡	Osc. circ. LW trimmer ...	—
C33‡	1st IF trans. pri. tuning...	—
C34‡	1st IF trans. sec. tuning...	—
C35‡	2nd IF trans. pri. tuning...	—
C36‡	2nd IF trans. sec. tuning...	—
C37‡	Tone correction control...	—
C38†	Variable tone control ...	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial LW coupling coil	72·0
L2, L3	Band-pass primary coils	3·5 / 13·0
L4, L5	Image suppressor coils	0·3 / 0·75
L6, L7	Band-pass secondary coils	3·5 / 13·0
L8	Osc. circ. MW tuning coil	4·0
L9	Osc. circ. LW tuning coil	6·0
L10	Oscillator MW reaction	4·0
L11	Oscillator LW reaction	2·5
L12, L13	1st IF trans. Pri. ... / Sec. ...	85·0 / 85·0
L14, L15	2nd IF trans. Pri., total / Sec., total	85·0 / 85·0

(Continued overleaf.)



Under-chassis view. All the switches, except **S10**, are controlled by the four-position main switch control. The connecting tags of the waveband and scale lamp switches are indicated. Twelve condensers are contained in the condenser block, on top of which is mounted an assembly of resistances, and their connecting leads are taken to tags on the covering panel. A diagram showing the connections appears at the foot of cols. 5 and 6 opposite.

OTHER COMPONENTS (*Continued.*)			Approx. Values (ohms)
L16	Tone filter coil	...	900·0
L17	Speaker speech coil	...	8·0
L18	Hum neutralising coil	...	2·5
L19	Speaker field coil	...	2,000·0
T1	Intervalve trans.	Pri.	750·0
		Sec.	8,000·0
T2	Speaker input trans	Pri.	150·0
		Sec.	0·3
T3	Mains trans.	Pri., total ...	28·0
		Heater sec.	0·1
		Rect. heat. sec.	0·1
		HT sec., total	550·0
T.I.	Tuning indicator winding		3,500·0
S1-S5	Waveband switches	...	—
S6	Radio muting switch	...	—
S7	Gram pick-up switch	...	—
S8	Tone corrector switch	...	—
S9	Wavechange muting	...	—
S10	Noise suppressor switch		—
S11, S12	Scale lamp switches	...	—
S13	Mains switch ...	...	—

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (self-tapping screws) from the front of the cabinet, and the static suppressor knob (concentric countersunk-head screw) from the rear;

remove the two round-head wood screws holding the tops of the tuning scales to the front of the cabinet;

disconnect the six speaker leads from the connecting panel on the speaker input transformer;

remove the four cheese-head screws (with washers) holding the chassis to the base of the cabinet.

When replacing, the speaker leads should be connected to the appropriate terminals, according to the colours marked on the connecting panel.

Removing Speaker.—First remove the chassis as described above; then remove the four nuts (with washers and lock washers) holding speaker to sub-baffle.

When replacing, the transformer should be at the top.

VALVE ANALYSIS

Valve voltages and currents given in the table below have been copied from the makers' service manual.

The values given are those to be expected in the average receiver, when the volume control knob is pushed in and turned to maximum, but with no signal input.

Voltages were measured with a 200 ohms-per-volt meter, chassis being negative. Tolerances are given as being with ± 10 per cent.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 MX40	200	1·0	70	2·0
	Oscillator			
	90	2·0		
V2 VMS4B	200	3·0	70	0·7
V3 MHD4	70	1·7	—	—
V4 PX4	210	43·0	—	—
V5 U12	225†	—	—	—

† Heater to chassis, DC.

GENERAL NOTES

Switches.—**S1-S5** are the waveband switches, **S6, S7** and **S8** radio/gram change switches, and **S9** the muting switch, in a rotary, leaf-spring type unit mounted beneath the chassis. This is indicated in our under-chassis view, where the tags of the individual switches are shown. The table (column 4) gives the switch positions for the three operating control settings; the fourth setting is "off." A dash indicates open, and **C**, closed.

S10 is the noise suppressor switch, operated by a push-pull action of the volume control spindle. It opens, bringing the noise suppressor into action, when the control is pulled outwards.

S11, S12 are the scale lamp switches. **S11** closes on MW, **S12** closes on LW; both switches open on gram. The switches form a separate unit, mounted on the front member of the chassis, and are operated by the waveband switch control spindle.

S13 is the QMB mains switch, operated by a cam-disc on the waveband switch control spindle.

Coils.—**L1, L3, L7; L2, L6;** and **L8-L11** are in three tubular units mounted on the chassis deck. **L4** and **L5** are in two smaller unscreened units near them. The IF transformers **L12, L13** and **L14, L15** are in two screened units beneath the chassis. **L16** is in a third screening can beneath the chassis with **C20** and **T1**.

Scale and T.I. Lamps.—These are three Osram MES types, with spherical bulbs. They are rated at 6.2 V, 0.3 A. There is one for each scale, but each lights only when the appropriate waveband is in use, and one for the tuning indicator.

Pick-up Connections.—Three sockets are provided at the rear of the chassis for connection of a gramophone pick-up. Two of the sockets are marked **PU,** and these accept the pick-up input. The third socket, marked **S,** is an earthing socket for the screening braid and other free metal parts of the pick-up. If the sockets are not marked, **S** is the bottom one.

External Speaker.—A low impedance (6-12 Ω) speaker may be connected to the two terminals marked **EXT** and **LS.** These are two of the eight terminals on the speaker connecting panel, which is mounted on the speaker transformer.

Condenser Block.—This is mounted beneath the chassis deck, and is concealed from view in our under-chassis illustration by its connecting panel and an assembly of resistances, but its position is indicated by an arrow. It contains twelve condensers, whose connections are shown in the diagram in cols. 5 and 6, where

Switch Table

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

* Closed between settings only.

the numbers of the tags to which they are connected are seen. The diagram is drawn as seen when viewed from the rear of the underside of the chassis.

It will be seen that one side of each of three condensers, **C10, C16, C17,** is brought out by a coloured lead.

C23, C24.—These are two 8μF dry electrolytics in separate tubular metal containers. They are rated at 500 V peak. Their positive terminals project from the ends of their containers, and the containers form the negative connections. It should be noted that while the negative of **C23** goes to chassis, the negative of **C24** is isolated from chassis, so that insulating washers must be fitted between it and either side of its mounting bracket.

V2 Screening Cap.—It should be noted that the metal screening cap of **V2** is connected to the cathode of the valve, and not to chassis. If it comes into contact with the chassis, the GB circuit will be short-circuited.

R19, C22.—These two components are mounted on the speaker assembly. **R19** is mounted on its wiring behind the **EXT** and **LS** terminals, and is connected to the **EXT** and **Green** terminals.

C22 is mounted on a bracket bolted to the right-hand lug of the magnet. Its leads are connected to the **LS** and **Black** terminals

R19 is sometimes fitted in the chassis. (See under "Chassis Divergencies.")

Chassis Divergencies.—In some chassis an additional 0.1 μF condenser may be connected across **C7.** Also, **C25** may be 0.00035 μF instead of 0.0003 μF. **R19** may be fitted on the resistance assembly over the condenser block. In such cases it occupies the position of **R17,** shown in our under-chassis view; **R17** is then situated between **C13** and **R14.**

RADIOGRAM MODIFICATIONS

The HMV 570 and 570A, and Marconiphone 289 autoradiograms employ a modified version of the chassis used in the HMV 442. The chief electrical difference is to be found in the pick-up circuit, where a filter circuit is introduced, and the input is fed via an independent volume control directly to the control grid of the triode section of **V3.**

The tone filter is fitted externally to the chassis, and consists of a 2,300 Ω resistance, a 0.3 μF condenser, and a filter choke whose DC resistance is 114 Ω, connected in series with one another. This network is then connected across the pick-up. It is enclosed in a metal screening case, which is connected to the metal braid screening the pick-up leads, and so via the **S** pick up socket to chassis.

In the chassis, a 50,000 Ω volume control is connected directly across the two **PU** sockets, and its slider goes to **S7.** The other side of **S7,** however, goes now directly to **V3** triode control grid.

A second radio muting switch (in addition to **S6**) is inserted in the lead from the slider of **R12** to **V3** triode. This switch opens on gram, so that, unlike the table model, **R12** does not operate on gram. It takes up roughly the position occupied in the chassis by the scale lamp switches in the table model.

The pick-up volume control is mounted on a bracket fixed to the front corner of the chassis, just in front of **T3.** Its control spindle points outwards away from the end of the chassis, in a line parallel with the front of the chassis. The side of the chassis from which the four control spindles protrude is referred to still as the "front," although in the gramophone versions the chassis base is bolted to one end of the cabinet and the front assumes a horizontal position, with the control spindles pointing upwards to emerge through the control panel beneath the lid of the cabinet. The pick-up volume control spindle then points towards the front of the cabinet.

The control spindle is fitted with a sprocket wheel, which is driven by a chain from a second sprocket on the control spindle in the middle of the cabinet.

Another physical difference is that the aerial panel, which on the table model is fitted at one corner at the rear of the chassis, is turned, together with **R8** and **C26,** round the corner, so that it faces the rear of the cabinet when the chassis is in position.

The mains connections on **T3** are different. The panel is fitted with three terminals, instead of two. They are marked A, B, C. The mains leads go to A and B; the motor leads to B and C.

A single scale replaces the twin scales used in the table model, so that scale lamp switching is unnecessary. Also, the tuning indicator is moved to a position at one end of the tuning scale.

An important difference between the HMV 570 and the 570A is that the beading round the motor board must be removed before the motor board can be lifted out in the case of the 570, whereas in the 570A it must not be disturbed, since it is permanently attached to the motor board and comes out with it.

The remaining differences between these two models are unimportant, and do not call for remark in service information.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator leads to control grid (top cap) of **V1** and chassis. Adequate coupling will be obtained if the grid lead from the generator is clipped on to the insulated portion of the cap. Push volume control inwards and turn it to maximum. Feed in a 127 KC/S (2,362.2 m) signal, and adjust **C36** and **C34** for maximum output. Feed in a 123 KC/S (2,440 m) signal, and adjust **C35** and **C33** for maximum output. Repeat these adjustments, always in the same order, until no improvement can be obtained.

RF and Oscillator Stages.—Transfer signal generator to **A** and **E** sockets, via a suitable dummy aerial. Keep volume control in and at maximum.

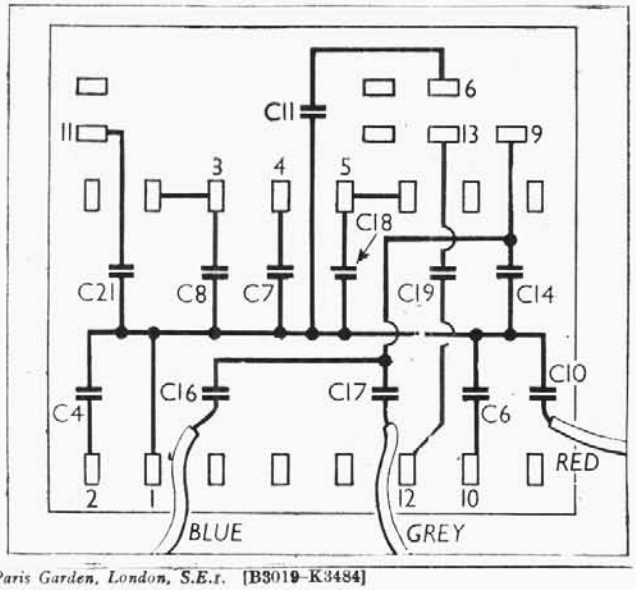
MW.—Switch set to MW, and adjust gang so that there is exactly ¼ inch between the moving vanes and the gang frame. Check that the pointer registers with 200 m mark on scale. Unscrew **C26** to minimum capacity. Feed in a 200 m (1,500 KC/S) signal, and adjust **C31** for maximum output. If two peaks are found, choose that involving the lesser trimmer capacity.

Feed in a 250 m (1,200 KC/S) signal, tune it in, and adjust **C29** while rocking the gang for optimum results. Now adjust **C26** for maximum output.

LW.—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 KC/S) signal, and adjust **C32** for maximum output while rocking the gang for optimum results. Repeat MW and LW adjustments.

C26 must be adjusted finally while the receiver is connected to the aerial with which it will normally operate.

Diagram showing the connections of the condenser block. It is drawn as seen when viewed from the rear of the underside of the chassis, and is so indicated in our under-chassis view



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