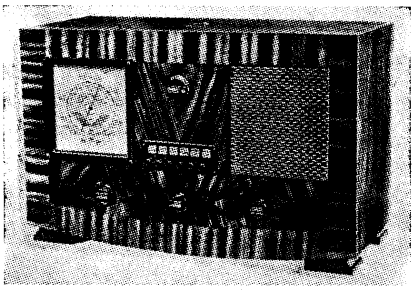
Supplement to the Wireless & Electrical Trader, Nov. 25, 1939

"TRADER" SERVICE SHEET

437

H.M.V. 1400

MARCONIPHONE 872



The H.M.V. 1400 battery receiver.

THE H.M.V. 1400 is a 5-valve 3-band battery superhet, with mechanical automatic tuning for six stations. Two transformer coupled beam tetrodes in push-pull are used in the output stage. A feature of the set is the provision of a "battery economiser" switch, which enables the HT voltage to the first three valves to be reduced by means of a resistance in series with their HT positive line. This reduces the total HT consumption from about 9mA to 6mA, without affecting the output stage.

The Marconiphone 872 is identical except for the cabinet, but this *Service Sheet* was actually prepared on the H.M.V. model.

Release date: *Both models, Feb.* 1939.

CIRCUIT DESCRIPTION

Aerial input from **A1** socket is via MW coupling coil **L3**, image rejector circuit comprising **L1, R2, L2** and **S2** (closed MW) or **S1** (closed LW), and LW coupling coil **L4** to single tuned circuits **L5, C24** (SW), **L6, C24** (MW) and **L7, C24** (LW).

A second aerial socket **A2** feeds signal via resistance **R1** to **A1** socket for reception of strong local transmission.

First valve **(V1, Marconi metallised X24 or X23)** is a triode hexode operating as frequency changer with internal coupling. Grid sections of triode oscillator coils **L8** (SW), **L9** (MW) and **L10** (LW) are tuned by **C25**; parallel trimming by **C26** (MW) and **C10, C27** (LW); series tracking by **C7** (SW), **C8** (MW) and **C9** (LW). Individual HT feed for each band by **R6** (SW), **R7** (MW) and **R8** (LW). Reaction coupling from anode by untuned sections of coils, via **R9,** and common impedance of trackers **C7, C8, C9.**

Second valve **(V2, Marconi metallised Z21)** is a variable-mu RF tetrode operating as intermediate frequency amplifier with tuned-primary tuned-secondary iron-cored transformer couplings **C28, L11, L12, C29** and **C30, L13, L14, C31.**

Intermediate frequency 465KC/S.

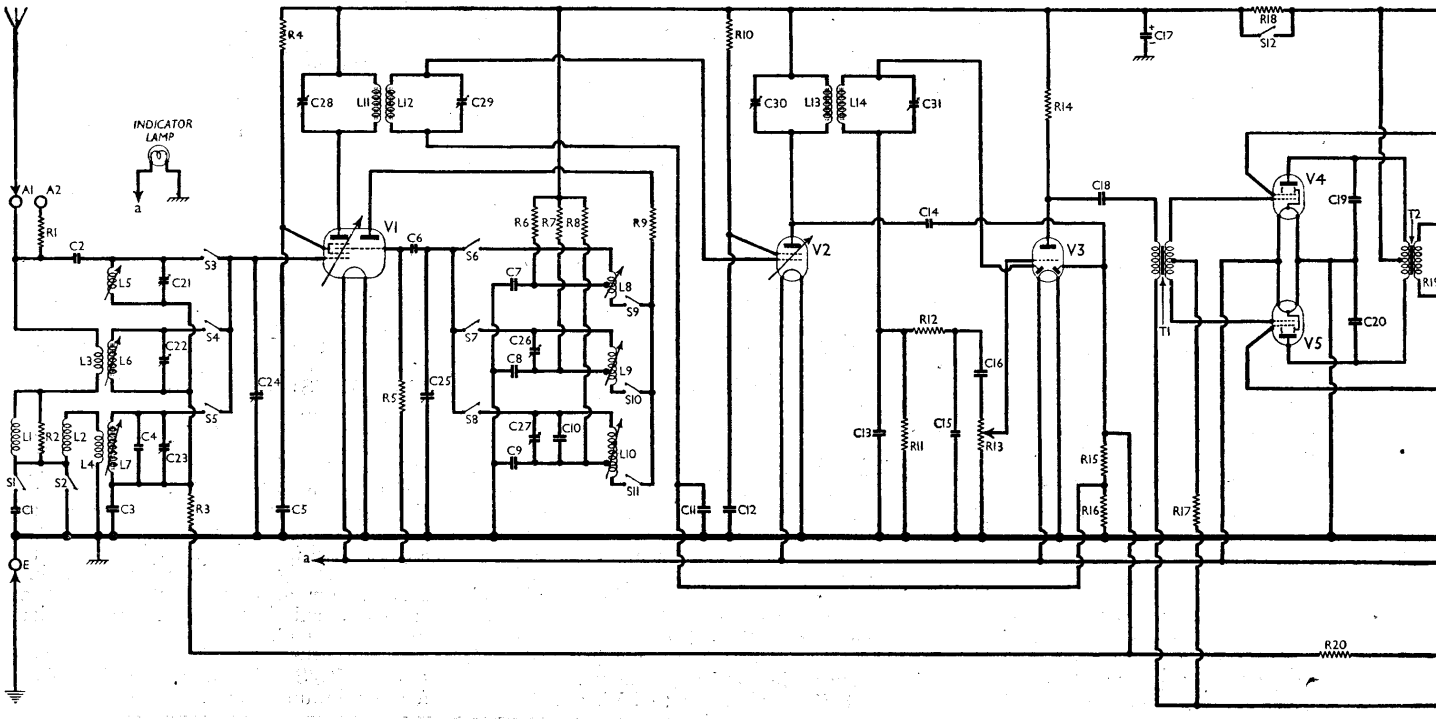
Diode second detector is part of double diode triode valve **(V3, Marconi metallised HD23).** Audio frequency component in rectified output is developed across load resistance **R11** and passed via **R12,** AF coupling condenser **C16** and manual volume control **R13** to CG of triode section, which operates as AF amplifier. IF filtering by **C13, R12** and **C15.**

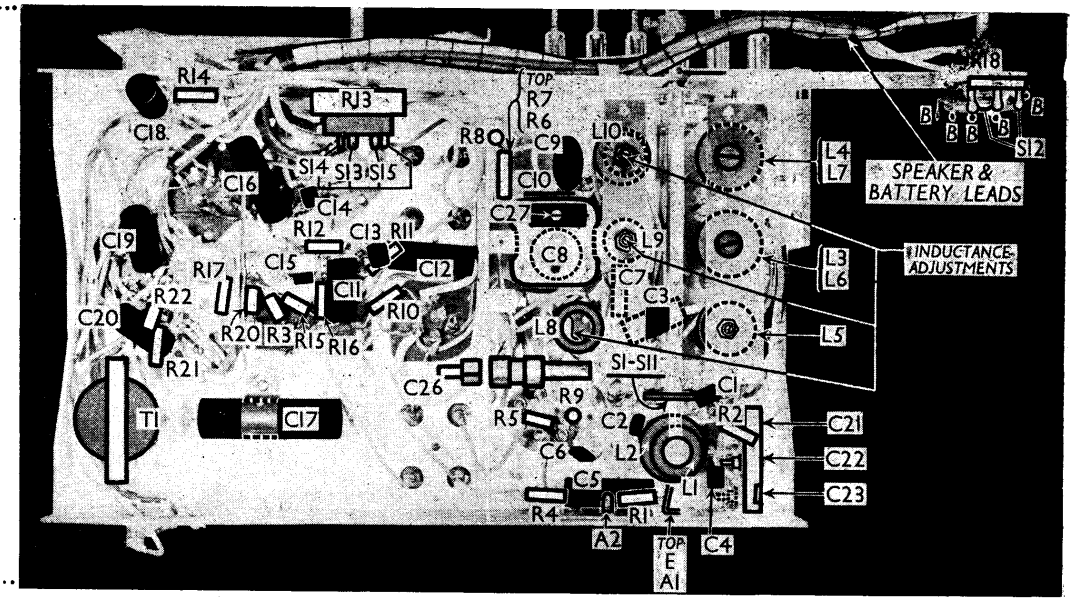
Second diode of **V3,** fed from **V2** anode via **C14,** provides DC potentials which are developed across load resistances **R15, R16** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control.

Parallel-fed transformer coupling by **R14, C18** and **T1** between **V3** triode and two-valve quiescent push-pull output stage comprising two tetrodes **(V4, V5, Marconi KT2's).** Fixed tone correction by **C19, C20** between anodes and chassis. Provision for connection of low impedance external speaker across secondary of output transformer **T2,** and a plug and socket device permits internal speaker to be muted, while **R19** prevents the output impedance from rising dangerously should both speakers be disconnected.

Provision for adjustment of **V4** and **V5** screen voltages as required for matching purposes.

For purposes of battery economy, resistance **R18** is included in the HT feed to **V1, V2** and **V3. S12,** which short-circuits **R18** when closed, may be left open for the reception of the local transmission, but when greater overall sensitivity is required **S12** may be closed. If the opening of **S12** results in a nett reduction of acoustic output volume a considerable economy will be effected since not only will the consumption in

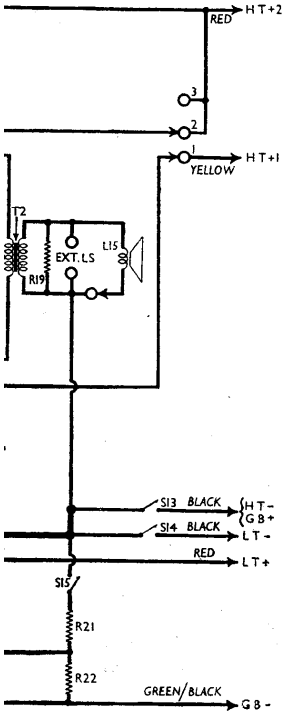




Under-chassis view. The screen over the RF and oscillator section on the right has been taken off by loosening two screws and removing a third. A diagram of the **SI-SII** switch unit is overleaf. Note the inductance adjustments of **L8, L9** and **L10.**

the early stages be reduced but, owing to the characteristic HT current curve of a pair of valves when used as a quiescent combination, the output stage current will be very much reduced.

GB potential for **V4** and **V5** is obtained directly from the 6V GB tapping in the HT battery. For fixed GB potentials for **V1** hexode and **V2,** a potential divider **R21, R22** is connected across the GB section of the HT battery and tends to run down the cells of that section as the rest of the battery is drained; the respective voltages applied to the valves is further sub-divided, since they are fed via a further potential divider consisting of **R20** and the AVC diode load resistances **R15** and **R16,** which are connected in series across **R21.**



Circuit diagram of the H.M.V. 1400 and Marconiphone 872 receivers. Note that all the aerial and oscillator tuning coils have provision for inductance variation for alignment purposes. The screens of the output valves, **V4** and **V5,** have separate HT leads for voltage adjustment according to the letter marked on each valve. **SI2** is the battery economiser switch.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	A2 aerial series	230,000
R2	L1 shunt resistance	7,500
R3	V1 hexode CG decoupling	2,300,000
R4	V1 SG HT feed	50,000
R5	V1 osc. CG resistance ...	50,000
R6	V1 osc. anode SW HT feed	15,000
R7	V1 osc. anode MW HT feed	50,000
R8	V1 osc. anode LW HT feed	50,000
R9	V1 osc. anode stabiliser ...	100
R10	V2 SG HT feed	35,000
R11	V3 signal diode load ...	500,000
R12	IF stopper	50,000
R13	Manual volume control ...	2,000,000
R14	V3 triode anode load ...	100,000
R15	V3 A.V.C. diode load resistances	2,300,000
R16		350,000
R17	V4, V5 CG's decoupling ...	230,000
R18	Battery economiser resistance	10,000
R19	T2 sec. artificial load ...	50
R20	V1, V2 fixed GB and V4, V5 GB potential divider	2,300,000
R21		230
R22		400

	CONDENSERS	Values (μF)
C1	Part of image rejector ...	0·00005
C2	Aerial SW coupling	0·000015
C3	V1 hexode CG decoupling ...	0·05
C4	Aerial circuit LW fixed trimmer	0·00005
C5	V1 SG decoupling	0·1
C6	V1 osc. CG condenser ...	0·000075
C7	Osc. circuit SW tracker ...	0·005
C8	Osc. circuit MW tracker ...	0·00055
C9	Osc. circuit LW tracker ...	0·0003
C10	Osc. circuit LW fixed trimmer	0·00016
C11	V2 CG decoupling	0·05
C12	V2 SG decoupling	0·1
C13	IF by-pass	0·0001
C14	Coupling to V3 AVC diode...	0·000075
C15	IF by-pass	0·000075
C16	AF coupling to V3 triode ...	0·1
C17*	HT circuit reservoir	8·0
C18	AF coupling to T1	0·1
C19	Fixed tone correctors ...	0·0015
C20		0·0015
C21‡	Aerial circuit SW trimmer...	—
C22‡	Aerial circuit MW trimmer...	—
C23‡	Aerial circuit LW trimmer...	—
C24†	Aerial circuit tuning... ...	—
C25†	Oscillator circuit tuning ...	—
C26‡	Osc. circuit MW trimmer ...	—
C27‡	Osc. circuit LW trimmer ...	—
C28‡	1st IF trans. pri. tuning ...	—
C29‡	1st IF trans. sec. tuning ...	—
C30‡	2nd IF trans. pri. tuning ...	—
C31‡	2nd IF trans. sec. tuning ...	—

* Electrolytic. † Variable. ‡ Pre-set

	OTHER COMPONENTS	Approx. values (ohms)
L1	Image suppressor coils	9·5
L2		33·0
L3	Aerial MW coupling coil	0·4
L4	Aerial LW coupling coil	1·6
L5	Aerial SW tuning coil ...	0·1
L6	Aerial MW tuning coil ...	2·0
L7	Aerial LW tuning coil ...	10·0
L8	Osc. circuit SW coil ...	1·0
L9	Osc. circuit MW coil ...	2·8
L10	Osc. circuit LW coil ...	3·6
L11	1st IF trans. Pri. ...	4·0
L12	1st IF trans. Sec. ...	4·0
L13	2nd IF trans. Pri. ...	4·0
L14	2nd IF trans. Sec. ...	4·0
L15	Speaker speech coil ...	4·0
T1	Intervalve trans. Pri. ...	350·0
	Intervalve trans. Sec., total	5,500·0
T2	Output trans. Pri., total	650·0
	Output trans. Sec. ..	0·3
SI-SII	Waveband switches ...	—
SI2	Battery economiser switch	—
SI3	HT circuit switch ganged R13	—
SI4	LT circuit switch ganged R13	—
SI5	GB circuit switch ganged R13	—

DISMANTLING THE SET

Removing Chassis.—Remove the three lower rotary control knobs (self-tapping screws) and the tuning control knob (recessed grub screw) from the front of the cabinet, then remove the three round-head wood-screws holding the scale assembly, gang drive assembly and battery economiser switch bracket respectively to the front of the cabinet, and the four bolts (with lock-washers and claw washers) holding the chassis to the bottom of the cabinet when, if the bunch of battery and speaker leads is slipped from its cleat beneath the roof of the cabinet, the chassis may be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unsolder the two leads from the connecting panel on the speaker and remove the extension speaker panel bracket from the rear of the cabinet (two round-head wood-screws).

When replacing, the two longer chassis bolts go at the ends of the cabinet, through the wooden feet. The yellow speaker lead goes to the lower

tag (marked —) on the speaker connecting panel, and the black lead to the upper tag (marked +).

If the press-button knobs have been removed, note that upon replacing them a felt washer is slipped on to each plunger before the knob is fitted.

Removing Speaker.—Unsolder the two connecting leads and remove the four cheese-head screws (with washers and lock-washers) holding the speaker to the sub-baffle. *When replacing*, the connecting panel should go on the left and the leads should be connected as indicated above.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with a new HT battery reading 120V overall on load. The receiver was tuned to the lowest wavelength on the MW band and the volume control was at maximum, but there was no signal input. The battery economiser switch **S12** was closed.

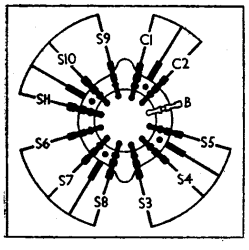
Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X24	114 (Oscillator) 50	0·7 1·25	50	1·1
V2 Z21	114	1·3	88	0·5
V3 HD23	55	0·5	—	—
V4 KT2	114	0·9	114	0·25
V5 KT2	114	0·9	114	0·25

GENERAL NOTES

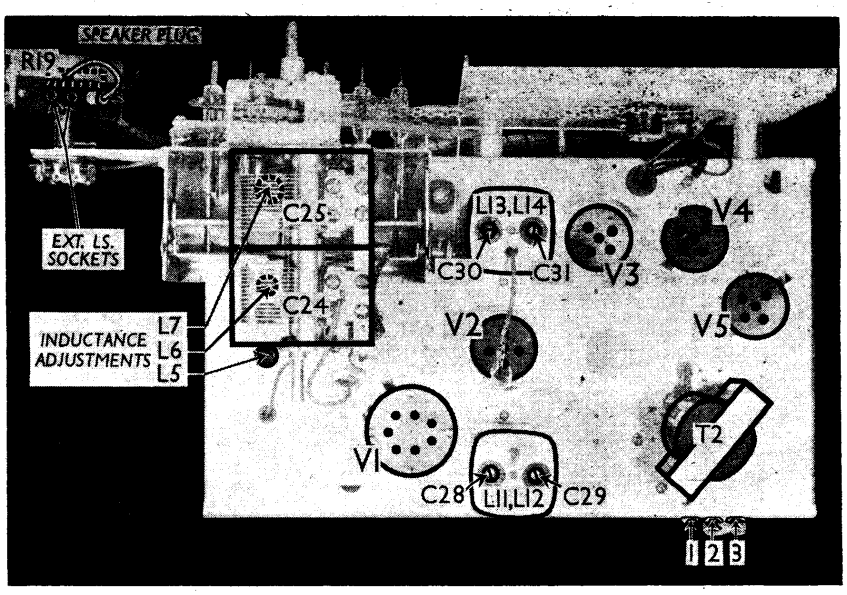
Switches.—**S1-S11** are the waveband switches, in a single rotary unit beneath the chassis. This is indicated in our under-chassis view, and shown in detail in the diagram below. The table (below) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

Switch	SW	MW	LW
S1	—	—	C
S2	—	C	—
S3	C	—	—
S4	—	C	—
S5	—	—	C
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	—	C	—
S11	—	—	C



The S1-S11 switch unit, as seen from the rear of the underside of the chassis.

S12 is the battery economiser switch, mounted on an extension to the front of the chassis, its tags being indicated in our under-chassis view. Note that **R18** is connected across the switch, and is shorted in the "normal" position.



Plan view of the chassis. The external speaker panel is at the top left-hand corner. Note the holes through which the inductive adjustments of **L5, L6** and **L7** are carried out. The screw terminals **1, 2** and **3** are for **V4** and **V5** screen voltage adjustments.

S13-S15 are the battery circuit switches, ganged with the volume control **R13.** Each has one common connection, and their tags are indicated in our under-chassis view.

Coils.—**L1, L2; L3, L6; L4, L7; L5; L8; L9** and **L10** are in seven unscreened units beneath the chassis, all indicated in the under chassis view. All these coils except **L1-L4** have some means for inductance adjustment, either a wire loop **(L5, L8),** a variable iron core **(L6, L7),** or metal "spade" trimmers **(L9, L10).** The positions of these are shown in the illustration.

The IF transformers **L11, L12** and **L13, L14** are in two screened units on the chassis deck, with their associated trimmers.

Scale Lamp.—This is an Osram MES type, rated at 2·0 V, 0·1 A, with a tubular bulb. It is mounted in a holder on a shutter operated by the wavechange switch.

External Speaker.—Two sockets are provided on a bracket at the top of the rear of the cabinet for a low impedance (5 O) external speaker. An adjacent plug and socket device permits the internal speaker to be muted when desired.

Trimmer C26.—This is of the air-cored plunger type, mounted horizontally on the partition beneath the chassis.

Resistance R19.—This load resistance is wire-wound and is mounted behind the external speaker bracket. It is indicated at the top left-hand corner of the plan chassis view.

Batteries.—LT, Exide CZG4-C 2V 40AH glass cased accumulator cell; HT and GB, Marconiphone 114V + 6V combined HT and GB battery, type B498.

Battery Leads and Voltages.—Black lead, spade tag LT negative; red lead, spade tag, LT positive 2V; black lead, yellow plug, in HT negative and GB positive socket; green/black lead, yellow plug, in GB-6V socket; yellow lead and plug, in HT + 108V socket; red lead, yellow plug, in HT + 114V socket.

In addition, there is a matching panel for **V4** and **V5** screens at the rear of the chassis. There are three screw-connectors, marked 1, 2 and 3, while two tags on flying leads emerge from the chassis. The red/black lead belongs to **V4,** and the red/yellow lead to **V5.** For a KT2 valve marked V, connect its screen lead to connector 1; for one marked W, use connector 2; and for one marked X, use connector 3. Incidentally, connectors 2 and 3 are joined together behind the panel.

PRESS-BUTTON UNIT

A mechanical press-button unit is employed for automatic tuning, in which the gang condenser spindle is connected up by means of a system of links and a crank to a stout metal pressing which is pivoted at each end. When this pressing is rocked on its pivots, the gang condenser is rotated.

Each press button, of which there are six, actuates a plunger carrying a semi-circular contact plate. When a button is depressed, this plate moves towards the rocking mechanism, and eventually rotates it to a certain degree depending on the angle of the leading edge of the contact plate.

The angle of the contact plate can be altered by virtue of the fact that the plate is pivoted. It is normally clamped by screwing up its press-button, but when the button is slacked off, the contact plate can be re-set to any position required, and then clamped again.

At the same time as a button is pressed, a further hinged plate is rotated, and this operates a link, moving a bar which releases the manual slow-motion drive, and thus permits the gang condenser to be operated easily by the rocking mechanism and links.

To select a station, tune it in manually, then unscrew the chosen button a turn or two, and depress it fully. Keeping it depressed, screw it up enough

SHOULD THE INDUSTRY PRODUCE A "SOLDIER'S SET"?

A Member of the Forces Explains What Is Wanted

These suggestions come from F. G. Kay, some years ago a member of THE TRADER *staff and now serving "somewhere in England".*

BEING on active service "somewhere in England," I may possibly be out of touch with the latest developments to provide amusement and entertainment for the armed forces and the civil defence services. But as a one-time member of the radio trade, I think the RMA has been greatly behindhand in organising the production of a "soldier's set."

The enthusiasm for radio during the quiet weeks at the outset of war would prove to any doubter that radio will be a big item in the troops' leisure hours during this war. The fortunate few who have a midget receiver or are stationed sufficiently near home to bring a set in are among the most popular of all ranks.

The forces have restricted forms of occupying their leisure. The canteen provides one—but it costs money to go there, and few manage their money so well that it solves the problem all the time. The cinema has a tremendous appeal, but here again it cannot cater for all the men all the time. Games, reading, and the like are apt to pall after a time.

Cannot the radio industry produce a cheap receiver for a maximum of £5, for AC/DC and covering a wide range of voltage? It would have to be light in weight and strong enough to withstand fairly rough usage, with the sensitivity sufficient for the receiver to operate successfully anywhere in the British Isles or France.

At such a price a dozen men could club together and manage. The fact that it seems to be the Government's policy to house troops in permanent huts with electricity "on tap" in almost every case makes a mains set a practical proposition, and it provides a means of lightening the set to the minimum—a necessary point when the set will periodically have to be taken along in a kit bag.

Gramophones, dart boards, parlour games, and so on are being purchased in their thousands by the men, who are now settling down and are anxious to make their billets as comfortable and homelike as possible. Commercially speaking, the radio trade has already missed a small gold mine. From a more altruistic point of view, it is to be regretted that the RMA have made no move to bring the benefit of radio entertainment within the grasp of the men who are not being catered for by official purchases of radio receivers.

It is not too late, surely? Where the RMA have failed to act, is not there a manufacturer with sufficient spare plant, sufficient initiative, and sufficient patriotism to market a "soldier's radio" as quickly as he can get them off the conveyor belts?

More Appreciation

This letter of appreciation comes from E. Riley, proprietor of Day and Co., 16 and 18 Shambles Street, Barnsley:

IN enclosing our subscription for *The Trader* we do so with greater pleasure than ever before, because you are doing what must be a very difficult job in trying to carry on under present circumstances.

We are surprised that so few makers are using your advertising columns, because we consider that it is just as necessary now as at any time to keep in touch with the retail trade. We, in our small way, have never missed a week advertising in our local paper, nor do we intend to do so throughout the war, so long as we are able to pay for such advertising.

Your effort to get some data regarding the age of radio engineers was a splendid move. The age limit of thirty years for this class of workman is, in our opinion, too high for such a young industry as ours.

Wishing you success during the war and always,

E. Riley

"TIN AND ITS USES": INTERESTING REVIEW

IN the third number of the International Tin Research and Development Council's new quarterly review, "Tin and Its Uses," are given accounts of the council's Bureau of Technical Information, and of the free technical service offered to tin consumers.

It is explained how these services may be utilised by firms who, under war conditions, are operating for the first time processes involving tin, and some examples are given of the difficulties encountered in the application of tin in various industries, and of the methods recommended to overcome them.

An interesting recent development in the use of tinplates consists in applying a highly decorative surface of another metal, such as copper, nickel or chromium, to produce what are known as "pre-finished" sheets which can be formed into a great variety of useful artieles without requiring expensive plating and polishing operations after *fabrication.*

Copies of "Tin and Its Uses" may be obtained free of charge by readers of *The Trader* upon application to the International Tin Research and Development Council, Fraser Road, Greenford, Middlesex.

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to hold the contact plate, then allow it to return to its normal position, and tighten it up firmly. Check the setting by changing from manual to automatic tuning, and vice-versa.

The moving parts and bearings of the mechanism and the gang condenser should be kept lubricated with a light grease (except the edge of the slow motion drive disc).

If the mechanism jams, it may be due to the bar failing to release the slow-motion drive, and this should be examined to see that the rear collar on the tuning knob spindle comes away from the drive disc when a button is pressed.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to LW, turn battery economiser switch anti-clockwise (maximum HT), and gang and volume control to maximum. Connect signal generator to control grid (top cap) of **V1**, via a 0·1μF condenser, and chassis. Leave existing top connector in place.

Feed in a 465KC/S signal, and adjust **C28, C29, C30** and **C31** in turn for maximum output. Repeat these adjustments.

RF and Oscillator Stages.—When gang is at maximum, pointer should be horizontal. Owing to the flexible nature of the gang condenser mounting, the chassis must be horizontal during alignment, otherwise the scale indication may not be correct. Connect signal generator to **A1** and **E** sockets.

MW.—Switch set to MW and tune to 225m on scale (black spot). Feed in a 225m (1,333·3 KC/S) signal, and adjust **C26** and **C22** for maximum output. Tune to 530m on scale, feed in a 530m (566KC/S) signal and adjust inductance trimmers of **L9** and **L6** for maximum output. A screw beneath the chassis adjusts **L9**; **L6** is reached through a hole in the chassis deck, and a special tool (E.M.I. Service, Ltd., Stock No. Q2527) is necessary. It consists of a pointed rod of insulating material with a rubber bush. The point should be located in the hole in the paxolin coil mounting strip, with the rubber bush bearing on the coil core. The core may now be rotated by turning the tool. Repeat the MW adjustments.

LW.—Switch set to LW, and tune to 1,100m on scale. Feed in a 1,100m (272·7 KC/S) signal, and adjust **C27**, then **C23**, for maximum output. Tune to 1,900m on scale, feed in a 1,900m (158 KC/S) signal, and adjust inductance trimmers of **L10** and **L7** for maximum output. The core of **L7**, reached through a hole in the chassis deck, has a hexagon head for adjustment. **L10** is adjusted by a screw beneath the chassis.

Repeat these adjustments, then tune to 1,400m on scale, feed in a 1,400m (214·3 KC/S) signal, and re-adjust **C23** for maximum output.

SW.—Use a 100 O non-inductive resistance in parallel with the output of the signal generator, and a 40 O resistance in series with the high potential lead. Switch set to SW, tune to 50m on scale, feed in a 50m (6 MC/S) signal. Adjust wire loop inside **L8** to receive the signal, then adjust loop inside **L5** for maximum output. Use a strip of insulating material with a slot in it as a tool.

Tune to 18m on scale, feed in an 18m (16·67 MC/S) signal, and adjust **C21** for maximum output.

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