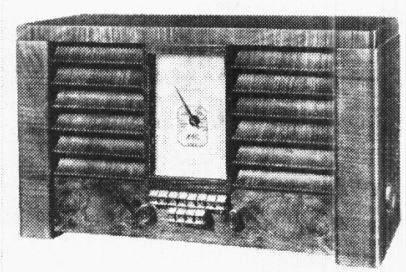
Supplement to the Wireless & Electrical Trader, Nov. 11, 1939

"TRADER" SERVICE SHEET

435

G.E.C. BC4066, 4056

3-BAND BATTERY SUPERHETS



The G.E.C. BC4066 table battery superhet receiver

THE G.E.C. BC4066 is a 5-valve battery 3-band superhet, with mechanical press-button tuning for eight stations and press-button wavechange and "off" switching.

The receiver uses two battery beam tetrodes in push-pull in the output stage. The SW range is 16·5 to 50 m.

The BC4056 is a very similar receiver, the divergencies being explained under "Model BC4056 Modifications." This *Service Sheet* was prepared on a BC4066.

Release dates: BC4066, June, 1939; BC4056, April, 1939.

CIRCUIT DESCRIPTION

Two alternative aerial input sockets **A1, A2.** Input from **A1** is via coupling coil **L1** (SW) and coupling condenser **C2** (MW and LW), assisted by single turn coils **L2** (MW) and **L3** (LW), to single-tuned circuits **L4, C25** (SW), plus **L5, C25** (MW), plus **L6, C25** (LW) which precede first valve **(V1, Osram X22),** a heptode operating as frequency changer with electron coupling.

Oscillator grid coils **L7** (SW), plus **L8** (MW) plus **L9** (LW) tuned by **C26;** parallel trimming by **C27** (SW), **C28** (MW) and **C5, C29** (LW); series tracking by **C7** (SW), **C6, C31** (MW) and **C30** (LW). Reaction by coils **L10** (SW), **L11** (MW) and **L12** (LW) and **C8.** On SW, **L11** and **L12,** and **R6,** are short-circuited by **S6** and **S7** respectively.

Second valve **(V2, Osram metallised W21)** is a variable-mu RF pentode operating with fixed GB as intermediate frequency amplifier with tuned-primary tuned-secondary iron-cored transformer couplings **C32, L13, L14, C33** and **C34, L15, L16, C35.**

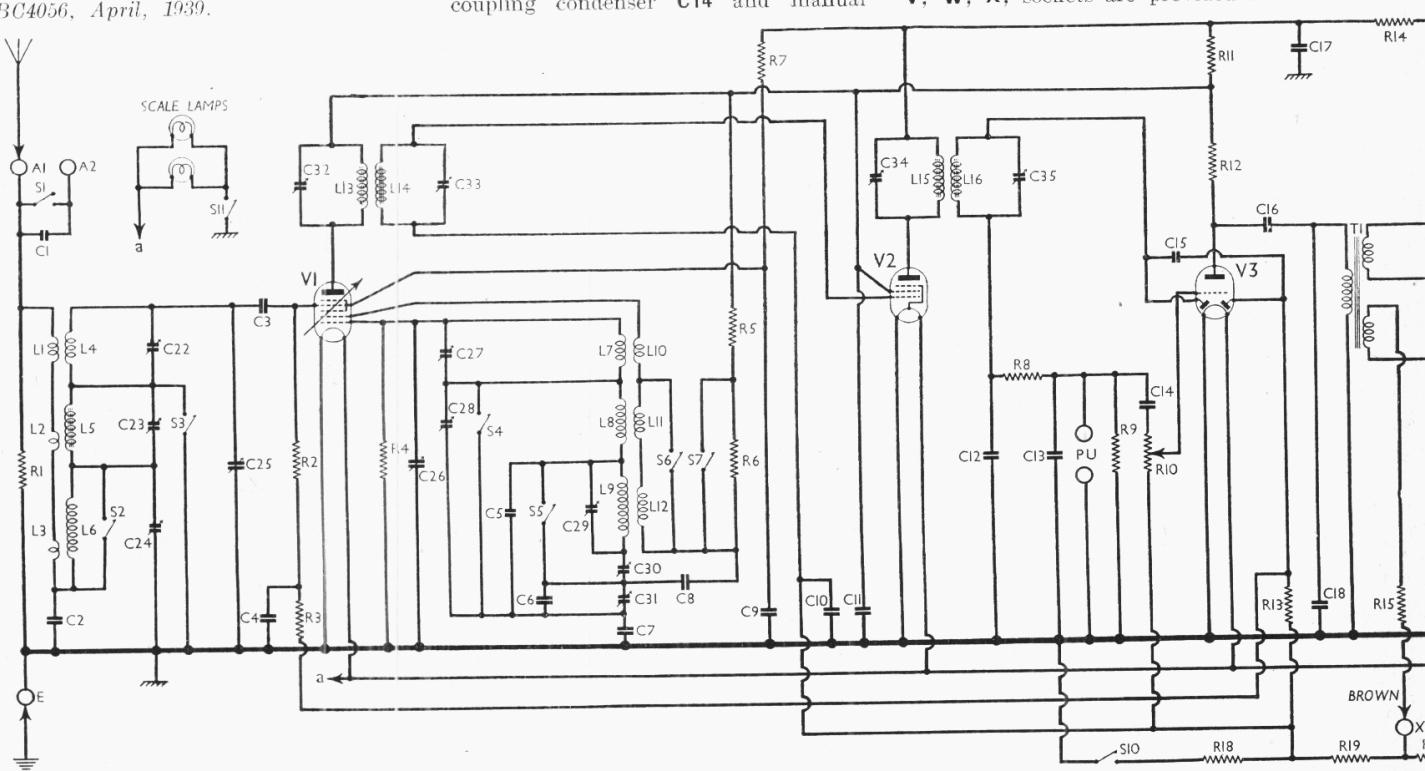
Intermediate frequency 456KC/S.

Diode second detector is part of double-diode triode valve **(V3, Osram HD23).** Audio frequency component in rectified output is developed across load resistance **R9** and passed via AF coupling condenser **C14** and manual volume control **R10** to CG of triode section, which operates as AF amplifier. IF filtering by **C12, R8** and **C13** in diode circuit, and **C18** in triode anode circuit. Provision for connection of gramophone pick-up across **R9.**

Second diode of **V3,** fed from **L16** via **C15,** provides DC potential which is developed across load resistance **R13** and fed back through decoupling circuit as GB to frequency changer valve, giving automatic volume control.

Parallel-fed transformer coupling by **R12, C16** and **T1,** which has two separately wound secondaries, between **V3** triode and quiescent push-pull output stage comprising two beam tetrode valves **(V4, V5, Osram KT2's).** Provision is made for bias adjustments to obtain matching of the valves. Variable tone control by **C19, R17** between anodes. Fixed tone correction by **C20, C21** between anodes and chassis. Provision for connection of low impedance external speaker across secondary of output transformer **T2.**

Fixed GB for **V1,** and GB for **V2, V3** and the output valves **V4, V5** is obtained from drop along resistances **R18, R19, R20, R21** and **R22** which form a potential divider in the negative GB lead to chassis. At the points marked **V, W, X,** sockets are provided for the



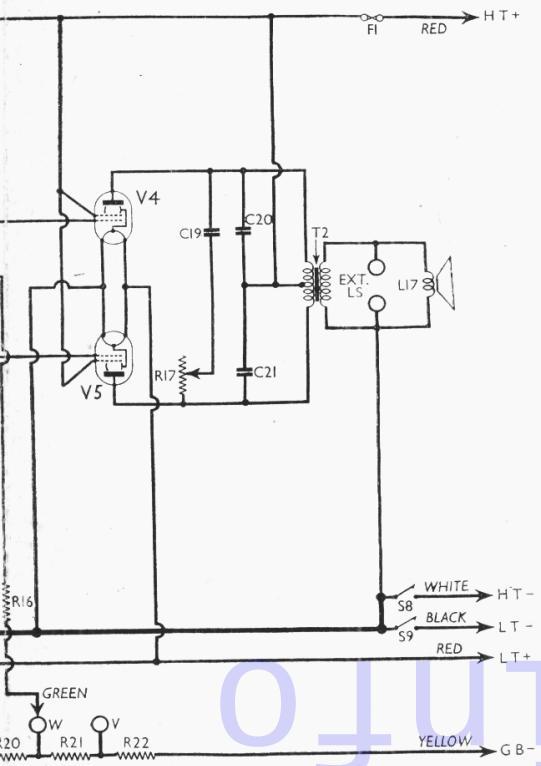
Circuit diagram of the G.E.C. BC4066 receiver. The BC4056 is almost identical, except for the omi

grid return leads of **V4** and **V5** for purposes of matching as mentioned above. The socket employed for each valve should be that whose letter corresponds with that marked on the valve.

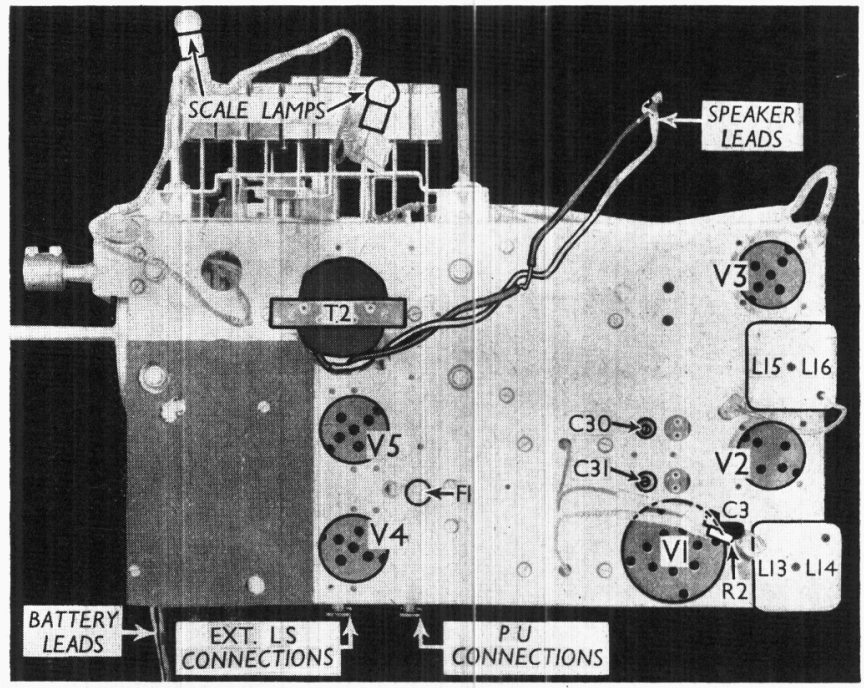
COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	A2 aerial series condenser ...	0·00002
C2	Aerial MW and LW coupling	0·003
C3	V1 tetrode CG condenser ...	0·0005
C4	V1 tetrode CG decoupling ...	0·05
C5	Osc. circuit LW fixed trimmer	0·00004§
C6	Osc. circuit MW fixed tracker	0·0001
C7	Osc. circuit SW tracker ...	0·00395
C8	Part reaction coupling ...	0·005
C9	V1 SG decoupling	0·25
C10	V2 CG decoupling	0·02
C11	V1 anodes, V2 SG and V3 anode RF by-pass	0·25
C12	IF by-pass condensers ...	0·0001
C13		0·0001
C14	AF coupling to V3 triode ...	0·02
C15	Coupling to V3 AVC diode...	0·00005
C16	AF coupling to T1	0·25
C17	HT circuit RF by-pass ...	0·05
C18	IF by-pass	0·0002
C19	Part of variable tone control	0·005
C20	Fixed tone correctors ...	0·001
C21		0·001
C22‡	Aerial circuit SW trimmer...	—
C23‡	Aerial circuit MW trimmer...	—
C24‡	Aerial circuit LW trimmer...	—
C25‡	Aerial circuit tuning ...	—
C26†	Oscillator circuit tuning ...	—
C27‡	Osc. circuit SW trimmer ...	—
C28‡	Osc. circuit MW trimmer ...	—
C29‡	Osc. circuit LW trimmer ...	—
C30‡	Osc. circuit LW tracker ...	—
C31‡	Osc. circuit MW tracker ...	—
C32‡	1st IF trans. pri. tuning ...	—
C33‡	1st IF trans. sec. tuning ...	—
C34‡	2nd IF trans. pri. tuning ...	—
C35‡	2nd IF trans. sec. tuning ...	—

§ Made up of two condensers in parallel.
† Variable. ‡ Preset.



ssion of R14



Plan view of the chassis. **R2, C3** are attached to the top cap connector of **VI**. **FI** is the bulb-type fuse

	RESISTANCES	Values (ohms)
R1	Aerial circuit shunt... ...	9,900
R2	V1 tetrode CG resistance ...	1,000,000
R3	V1 tetrode CG decoupling...	440,000
R4	V1 osc. CG resistance ...	99,000
R5	V1 osc. anode HT feed resistances	5,500
R6		33,000
R7	V1 SG HT feed	44,000
R8	IF stopper	55,000
R9	V3 signal diode load ...	440,000
R10	Manual volume control ...	1,000,000
R11	V1 anodes, V2 SG and V3 HT feed	6,600
R12	V3 triode anode load ...	99,000
R13	V3 AVC diode load	440,000
R14	V1, V2, V3 HT feed resistance	2,200
R15	V5 CG decoupling	99,000
R16	V4 CG decoupling	99,000
R17	Variable tone control ...	55,000
R18	V1 fixed GB; V2, V3, V4 and V5 GB potential divider resistances	150
R19		500
R20		50
R21		50
R22		25

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial circuit SW coupling coil	0·3
L2	Aerial circuit MW coupling coil	Very low
L3	Aerial circuit LW coupling coil	Very low
L4	Aerial circuit SW tuning coil	0·08
L5	Aerial circuit MW tuning coil	2·0
L6	Aerial circuit LW tuning coil	22·0
L7	Osc. circuit SW tuning coil	0·07
L8	Osc. circuit MW tuning coil	2·7
L9	Osc. circuit LW tuning coil	8·0
L10	Oscillator SW reaction coil	0·4
L11	Oscillator MW reaction coil	1·2
L12	Oscillator LW reaction coil	2·8
L13	1st IF trans. Pri. ...	7·0
L14	1st IF trans. Sec. ...	7·0
L15	2nd IF trans. Pri. ...	4·0
L16	2nd IF trans. Sec. ...	4·0
L17	Speaker speech coil... ...	2·0

	OTHER COMPONENTS (*Continued*)	Approx. Values (ohms)
T1	Intervalve trans. Pri.	630·0
	Intervalve trans. Sec. 1	1470·0
	Intervalve trans. Sec. 2	1900·0
T2	Output trans. Pri., total	1650·0
	Output trans. Sec.	0·2
S S7	Waveband switches ...	—
S8	HT circuit switch (ganged together)	—
S9	LT circuit switch (ganged together)	
S10	GB circuit switch (ganged together)	
S11	Scale lamps switch	—
F1	HT circuit fuse lamp ...	—

DISMANTLING THE SET

The cabinet is fitted with a detachable bottom, upon removal of which access may be gained to some of the components beneath the chassis.

Removing Chassis.—The chassis is mounted upon three wooden battens: two at the front and one, running the length of the chassis, at the rear; the sub-baffle, which carries the tuning scale and speaker, is also mounted on the front battens.

To remove the chassis, the whole assembly must be removed. First remove the three control knobs (pull-off), then the six counter-sunk head wood screws holding the sub-baffle to the front of the cabinet and the six bolts (with washers and lock-washers) holding the assembly to the bottom of the cabinet, when the assembly can be withdrawn as a single unit.

At this stage, *when replacing*, some difficulty may be experienced in getting the cardboard scale sides, which project forward, into the scale aperture in the cabinet. This may be overcome by fitting a rubber band round the top of the scale and bringing part of it through one of the scale lamp openings. The band can then be withdrawn when the scale is in position.

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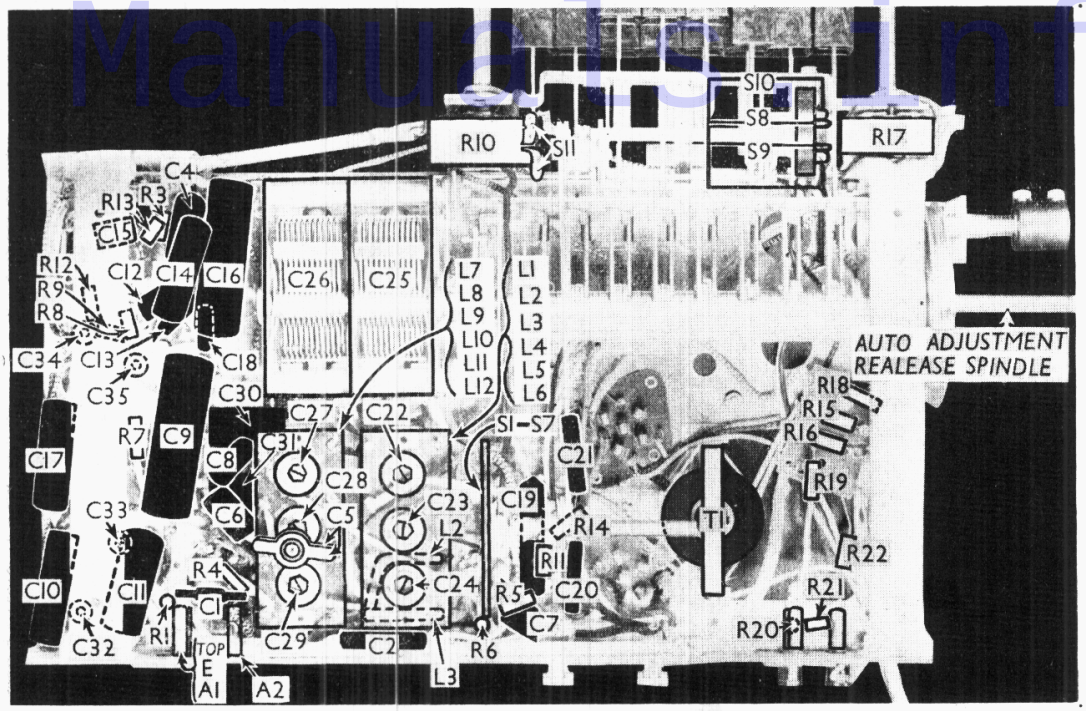

Under-chassis view. A diagram of the **S1–S7** unit is in column 2 below. The tags of **S11**, which is incorporated in **R10** in the BC4066 model, are shown. **L2** and **L3** are small coupling coils. Note the IF trimmers **C32–C35**

Dismantling the Assembly. — The present stage of dismantling will be sufficient for most purposes, but if it is further required to dismantle the assembly, unsolder the three speaker connections (one to frame), remove the scale pointer (by unscrewing it) and the wood screw (with metal washer and rubber grommet) holding the pointer drive bracket to the sub-baffle, withdraw the scale lamps from their brackets and remove the two bolts (with large metal and rubber washers) holding the two front brackets to the bottom of the chassis, when the sub-baffle, speaker and front battens can be removed complete.

To remove the remaining (rear) batten, remove the two bolts (with large metal and rubber washers) holding it to the chassis.

When replacing, note that two large rubber washers are fitted on each bolt, one either side of the batten; also connect the black speaker lead to the left-hand tag on the speech coil panel, and to the tag on the left side of the speaker frame. The white lead goes to the right-hand speech coil tag.

Removing Speaker.—First free the sub-baffle as outlined above, then unsolder the two leads from the three tags on the speaker, and remove the four bolts (with washers and lock-washers) holding the speaker to the sub-baffle.

When replacing, the speech coil panel should be at the top, and the leads should be connected as indicated above.

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 2) are those measured in our receiver when it was operating with an HT and GB battery reading 159 V overall on load. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

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 X22	120 / Oscillator / 57	0·7 / 1·25	60	1·6
V2 W21	135	1·7	120	0·5
V3 HD23	75	0·2	—	—
V4 KT2	148	1·4	150	0·3
V5 KT2	148	1·4	150	0·3

GENERAL NOTES

Switches.—S1-S7 are the waveband switches, in a single rotary unit beneath the chassis, operated through a link by three of the four press-buttons in the lower row. It 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 press-button control settings. A dash indicates *open* and **C**, *closed*.

Switch	LW	SW	MW
S1	C	—	—
S2	—	C	C
S3	—	C	—
S4	—	C	—
S5	—	C	C
S6	—	C	—
S7	—	C	—

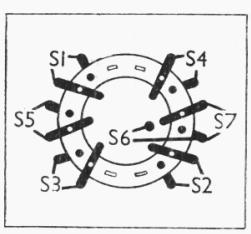

Diagram of the **S1–S7** switch unit, viewed from the coil unit side

S8, S9 and **S10** are the QMB HT, LT and GB circuit switches, operated by the fourth ("Off") press-button in the lower row. The switches open when the "off" button is pressed, but close when any of the waveband buttons are pressed. The tags of these switches are indicated in our under-chassis view.

S11 is the scale lamps switch, incorporated in the volume control **R10.** The spindle of this is spring loaded, and when it is pressed, **S11** closes. Normally **S11** remains open.

Coils.—L1-L12 are in unscreened units beneath the chassis, close to the gang condenser in our under-chassis view. They are underneath two paxolin panels carrying six trimmers, and their positions are roughly indicated by arrows in our illustration. **L2** and **L3** are small coupling coils consisting of one turn and half a turn of thick wire respectively.

The IF transformers **L13, L14** and **L15, L16** are in two screened units on the chassis deck, their trimmers being at their bases, and adjustable from beneath the chassis.

Scale Lamps.—These are two Osram MES types rated at 2 V, 0.6 A. They are controlled by **S11.**

External Speaker.—Two terminals are provided at the rear of the chassis for a low impedance (2-4 O) external speaker.

Condenser C5.—This consists of two small fixed trimmers in parallel.

Components C3, R2.—These are attached to the top cap connector of **V1.**

Fuse F1.—This is an Osram MES bulb, rated at 3·5V, 0·15A, which screws into a holder on the chassis deck.

Batteries.—Recommended types for the BC4066 are: LT, Genalex 2V60AH LT cell, No. BC230G; HT and GB, G.E.C. Super 150V + 9V combined HT and GB battery, No. BB859.

Battery Leads and Voltages.—Black lead, spade tag, LT negative; red lead, spade tag, LT positive 2V; white lead, black plug, marked HT−, in HT−, GB+ socket of battery; yellow lead, black plug, marked GB−, in GB−9V socket of battery; red lead and plug, marked HT+, in HT+150V socket of battery.

In addition, there are three grid bias sockets on a panel at the rear of the chassis, marked V, W, and X. Two leads, coloured green and brown respectively, and terminating in plugs, are the grid returns of **V4** and **V5**, and should be plugged in the sockets lettered the same as the valves to which they belong. For instance, if **V4** is marked "W," the green lead should be plugged into socket "W."

MODEL BC4056 MODIFICATIONS

Model BC4056 is very similar to model BC4066, the main difference being that instead of a 150V+9V combined HT and GB battery, a 135V HT battery and a separate 9V GB battery are used. In this case **R19** becomes 450 O (not 500 O); **R22** becomes 100 O (not 25 O), while **R14** is omitted.

Also, in the BC4056 the scale lamps switch **S11** is associated with the tuning control knob, and not the volume control knob as in the BC4066.

The valve voltages and currents in the BC4056 do not differ considerably from those given for the BC4066, due to the omission of **R14**. However, the **V4** and **V5** anode and screen voltages will be lower (of the order of 135V and 133V, instead of 150V and 148V).

AUTO-TUNING UNIT

The mechanical automatic tuning unit incorporated in this receiver is of the type which converts a direct movement of the press-button into a rotary movement of the gang condenser by means of internally toothed forks and toothed wheels.

A full description of the construction and action, with illustrations, was given in **Radio Maintenance** for May 28, 1938, and in the **ABC of Automatic Tuning** on pages 3 and 4.

Each press button can be set to tune to any point on the scale in the following manner. Operate the manual tuning control until the pointer is fully anti-clockwise. With a screw-driver, slacken the locking screw (at the side of the cabinet near the tuning control) by one complete turn. Switch the receiver to the correct waveband, and tune in the required station manually. Holding the manual control fully "in," depress the required button to its fullest extent, without jarring, and without allowing the manual control to move.

Release the button, and also the manual control. Proceed similarly for each new station required, then rotate the manual control until the pointer is fully clockwise, and tighten up the locking screw. Check the press-button settings.

CIRCUIT ALIGNMENT

A removable panel is fitted to the bottom of the cabinet so that complete alignment can be carried out without removing the chassis from the cabinet.

IF Stages.—Switch set to LW and turn gang to maximum. Turn volume control to maximum. Connect signal generator via a 0.1 μF condenser to grid (top cap) of **V1** and chassis. Leave existing top cap connection in place.

Feed in a 456 KC/S signal, and adjust **C32**, **C33**, **C34** and **C35** for maximum output.

RF and Oscillator Stages.—Check that the pointer is straight, and coincides with the mark at the high wavelength end of the scale when the gang is at maximum. Connect signal generator via a suitable dummy aerial to the **A2** and earth sockets.

MW.—Switch set to MW, tune to 214 m on scale, feed in a 214 m (1,400 KC/S) signal, and adjust **C28**, then **C23**, for maximum output.

Disconnect **C26** by unsoldering the lead from its fixed plates, and connect an external variable condenser between the disconnected lead and chassis. Feed in a 500 m (600 KC/S) signal, and adjust external condenser and receiver tuning control together for maximum output. Disconnect external condenser and re-connect **C26**. Without altering tuning control setting, adjust **C31** for maximum output. Repeat the 214 m adjustments.

LW.—Switch set to LW, and tune to 1,000 m on scale. Feed in a 1,000 m (300 KC/S) signal, and adjust **C29**, then **C24**, for maximum output.

Disconnect **C26** as before, and connect external condenser. Feed in a 1,818 m (165 KC/S) signal, and adjust external condenser and receiver tuning control together for maximum output. Disconnect external condenser, re-connect **C26**, and without altering tuning control setting, adjust **C30** for maximum output. Repeat the 1,000 m adjustments.

SW.—Switch set to SW, tune to 16.7 m on scale, feed in a 16.7 m (18 MC/S) signal (via a SW dummy aerial); and adjust **C27**, then **C22**, for maximum output. **C27** should be adjusted to the higher frequency peak (lower capacity). If "pulling" is experienced when **C22** is adjusted, rock the gang slightly to compensate for this.

TURN OUT ALL THAT OLD IRON!

Ministry of Supply Launches Drive for Scrap Metal

IN a message addressed specially to those engaged in the manufacture of radio and electrical apparatus, the Ministry of Supply points out:—

NO doubt you will appreciate the special importance at the present time of augmenting the national supplies of scrap iron and steel, and ensuring that these become available to the steel-works at the earliest possible moment.

Many factories and commercial premises contain such items as discarded machines, machine parts, old steel pulleys, shafts, broken tools, disused piping, metal sheeting, unwanted dies, jigs, old metal containers—these and any articles containing iron or steel can now be put to national use.

You would be rendering a very useful service if you would have a special search made and any such material collected together and disposed of forthwith. The scrap iron merchants and dealers in your district, some of whom advertise in the press, would be pleased to quote you for this material and arrange prompt collection.

You will appreciate that while, in the national interest, prices to the final consumer are controlled, these bear no relation to the price of scrap at its source, as transport and preparatory operations are necessary before the metal is delivered in suitable form to the steelworks.

FROM now on the scrap-collection campaign thus launched on behalf of the British steel industry will gather weight. Every nook and corner of the country will be tapped for material to feed British steel-melting furnaces. This is no panic measure, designed in a hurry to provide material to steel-works gasping for supplies.

Thanks to foresighted steps taken before the war, the raw material position is strong. It is necessary to look further ahead, however, and to build up a second, third, and *n*th line of defence. The key to this is raw material on the spot.

Every manufacturer and industrial undertaking in Britain is being approached by this direct letter from the Iron and Steel Control, requesting the systematic clearance of all useful scrap material. This will be extended to industrial firms which do not produce scrap in the ordinary course of manufacture, but which may well have discarded machine parts or obsolete plant.

Lighting Specifications

THE following British Standard Specifications regarding wartime lighting have been issued and are available from the British Standards Institution, 28 Victoria Street, London, S.W.1. The prices quoted include postage:—

BS/ARP3.—Electric Hand-lamps (3d.).
BS/ARP6.—Shelter Lighting (8d.).
BS/ARP7.—Lighting of Report and Control Centres (6d.).
BS/ARP15.—Light-locks for Shops (3d.).
BS/ARP16.—Low-intensity Lighting—0.002 ft. candles (3d.).
BS/ARP20.—Low-intensity Lighting—0.02 ft. candles (3d.).
BS/ARP21.—Low-intensity Lighting—0.2 ft. candles (3d.).

ARP SETS

"Accepted with thanks" appears in a Manchester Corporation minute in connection with an offer made by Arthur Smith, wireless trader, Withington, to maintain free of charge all ARP sets in working order.

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