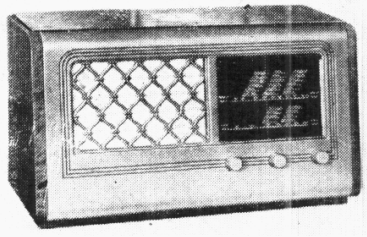
Supplement to The Wireless & Electrical Trader, August 23, 1947

"TRADER" SERVICE SHEET 825

H.M.V. 1115

and TABLE AUTORADIOGRAM 1604



The H.M.V. 1115. An illustration of the autoradiogram 1604 appears overleaf.

A SMALL frame aerial "loop" is formed by the aerial M.W. coil in the H.M.V. 1115 receiver, permitting it to operate without an external aerial. The receiver is a 5-valve (plus rectifier) 2-band superhet with a push-pull output stage, designed to operate from A.C. or D.C. mains of 200-250 V, 40-100 c/s in the case of A.C. The lower limits of the wavebands are 180 m and 900 m respectively.

The H.M.V. 1604 is a table radiogram employing a modified version of the 1115 chassis, but it is applicable to A.C. mains only, and their frequency must be 50 c/s. The differences in the chassis are described under "Radiogram Modifications" overleaf, but this *Service Sheet* was prepared from a 1115 receiver.

Release date and original prices: 1115, *July*, 1946, £13 13*s*., *plus* £2 19*s*. 2*d*. *purchase tax, increased February*, 1947, *to* £17 6*s*. 6*d*., *plus* £3 15*s*. 1*d*. *purchase tax.*

1604, *December*, 1946, £33 12*s*., *plus* £7 5*s*. 8*d*. *purchase tax, increased February*, 1947, *to* £40 19*s*., *plus* £8 17*s*. 6*d*. *purchase tax.*

CIRCUIT DESCRIPTION

Tuned frame aerial input by **L1, C30** (M.W.), with the addition of loading coil **L2** (L.W.), precedes triode-hexode valve **(V1, Marconi metallized X76M)** operating as frequency changer with internal coupling. Provision for the connection of an external aerial via the potential divider network **C1, C2, R1.**

Triode oscillator grid coils **L3** (M.W.) and **L4** (L.W.) are tuned by **C31.** Parallel trimming by **C32** (M.W.) and **C9, C33** (L.W.); series tracking by **C10** (M.W.) and **C11** (L.W.). Reaction coupling from anode by coil **L5** on M.W., and the common impedance of the tracker **C11** on L.W.

Second valve **(V2, Marconi W76)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C5, L6, L7, C6** and **C13, L8, L9, C14.** All the tuning capacitors are fixed, and alignment is effected by varying the positions of the iron-dust cores.

Intermediate frequency 465 kc/s.

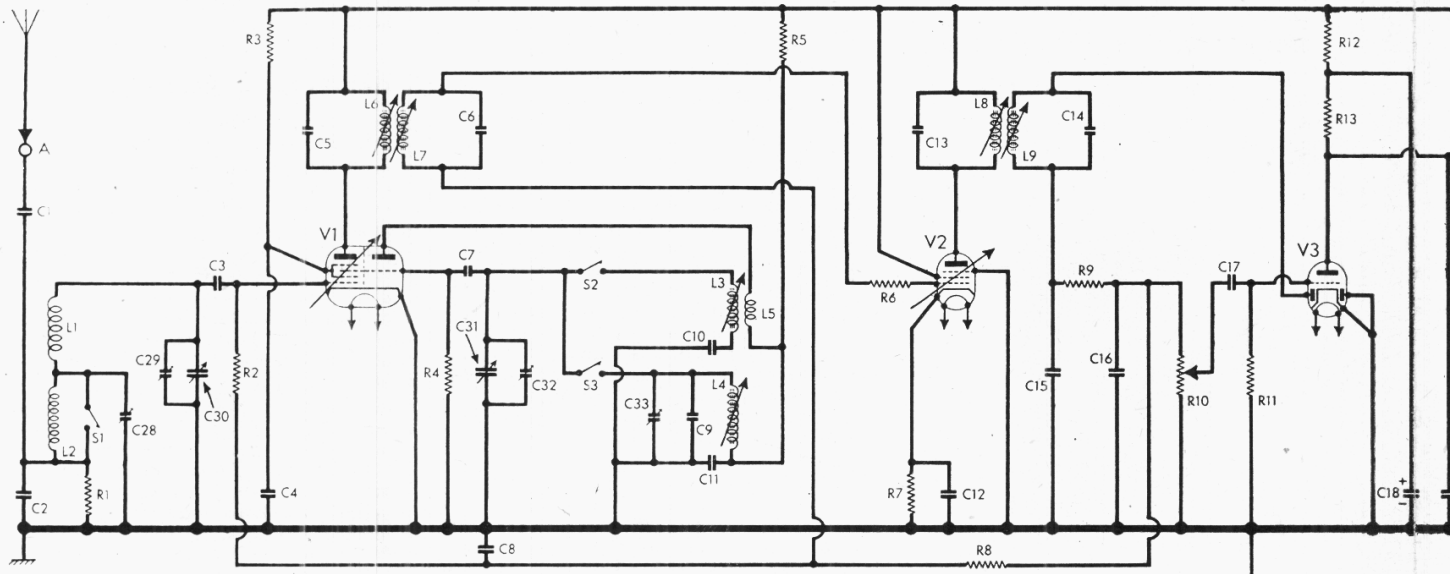
Diode second detector is part of double diode triode valve **(V3, Marconi DH76),** in which one diode is not used and is strapped to cathode. Audio frequency component in rectified output is developed across the manual volume control **R10,** which is also the diode load resistor, and passed via A.F. coupling capacitor **C17** and C.G. resistor **R11** to C.G. of triode section, which operates as A.F. amplifier. I.F. filtering by **C15, R9** and **C16** in diode circuit, and **C19** in triode anode circuit.

D.C. potential developed across **R10** is tapped off and fed back, via a decoupling circuit, as G.B. to F.C. and I.F. valves, giving automatic volume control.

Parallel-fed auto-transformer coupling by **R13, C20** and **T1,** via grid stoppers **R14, R15,** between **V3** triode and push-pull output stage comprising two pentodes **(V4, V5, Marconi KT71's).** Fixed tone correction by **C22** in anode circuit.

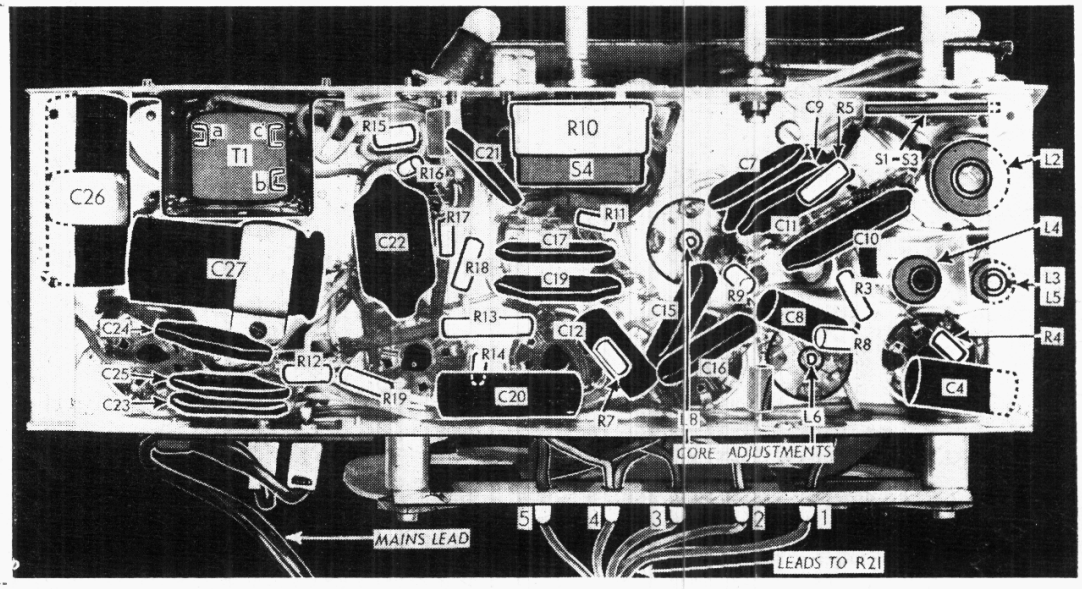
When the receiver is operated from

(*Continued col.* 1 *overleaf*)



Circuit diagram of the H.M.V. 1115 A.C./D.C. superhet. **L1** acts as a frame aerial in the absence of an external aerial. **T1** is an auto-transformer whose primary is between **a** and **b**. The small differences in the 1604 autoradiogram are explained overleaf, under "Radiogram Modifications." Inset beneath the circuit is a diagram showing the waveband switch unit, as seen from the rear of an inverted chassis.

Under - chassis view. The wave-band switch unit **S1-S3** is seen at the top right-hand corner. The tags on the intervalve auto - transformer are lettered **a, b, c** to agree with the circuit diagram. In the autoradio-gram 1604 there are 11 tags on the strip at the rear, and the leads from **R21** go to tags **7, 8, 9, 10** and **11**, numbering them in the same direction as they are shown here.



COMPONENTS AND VALUES

	RESISTORS	Values (ohms)
R1	Part aerial coupling ...	22,000
R2	V1 hex. C.G. resistor ...	470,000
R3	V1 S.G. H.T. feed ...	10,000
R4	V1 osc. C.G. resistor ...	100,000
R5	V1 osc. anode H.T. feed...	10,000
R6	V2 C.G. stopper	10,000
R7	V2 fixed G.B. resistor ...	100
R8	A.V.C. line decoupling ...	1,500,000
R9	I.F. stopper	100,000
R10	Manual volume control ...	500,000
R11	V3 triode C.G. resistor ...	10,000,000
R12	V3 triode H.T. decoupling	10,000

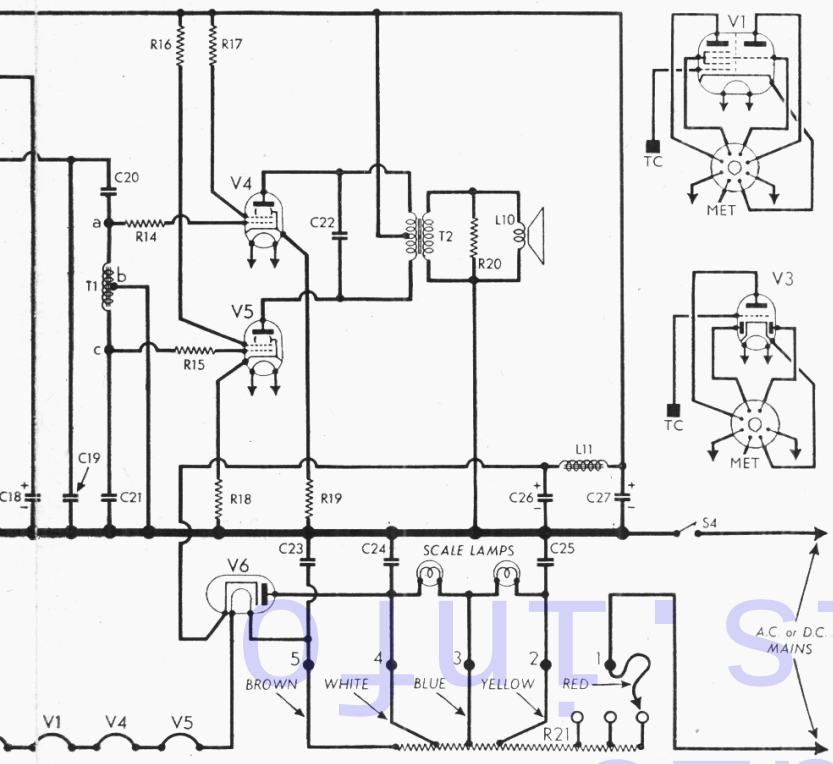
Continued next col.

	RESISTORS (*Continued*)	Values (ohms)
R13	V3 triode anode load ...	100,000
R14	V4 C.G. stopper	10,000
R15	V5 C.G. stopper	10,000
R16	V5 S.G. stopper	100
R17	V4 S.G. stopper	100
R18	V5 G.B. resistor	160
R19	V4 G.B. resistor	160
R20	Safety load resistor ...	47
R21	Heater ballast resistor ...	415*

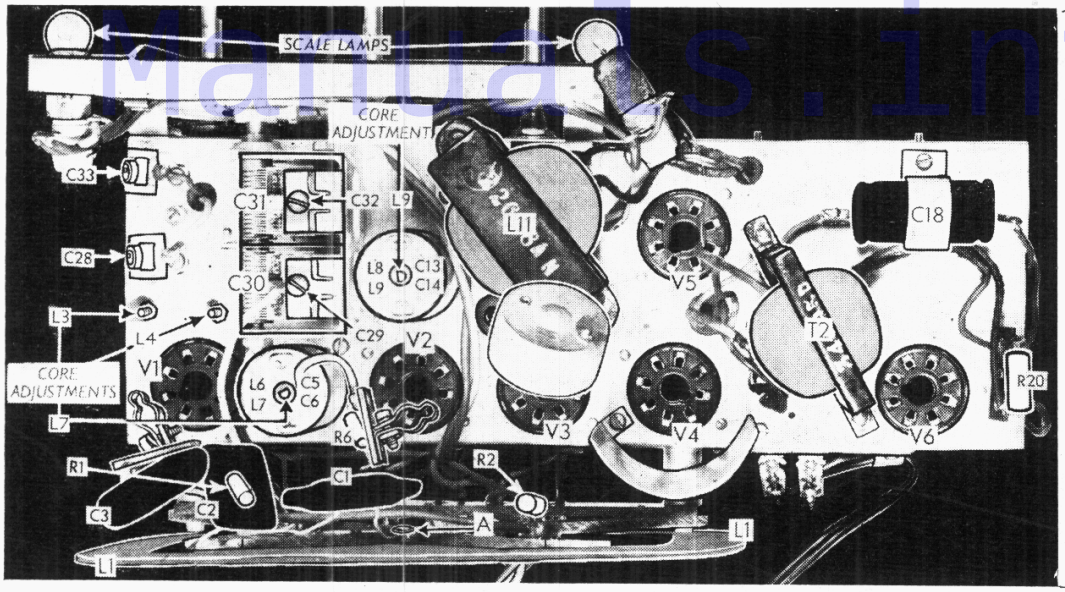
* Tapped at 65Ω + 35Ω + 35Ω + 160Ω + 60Ω + 60Ω from V6 heater.

	CAPACITORS	Values (μF)
C1	Aerial coupling capacitors	0·0035
C2	Aerial coupling capacitors	0·0035
C3	V1 hex. C.G. capacitor ...	0·0001
C4	V1 S.G. decoupling ...	0·1
C5	1st I.F. transformer fixed tuning capacitors ...	0·00008
C6	1st I.F. transformer fixed tuning capacitors ...	0·00008
C7	V1 osc. C.G. capacitor ...	0·000075
C8	A.V.C. line decoupling ...	0·047
C9	Osc. L.W. fixed trimmer...	0·000075
C10	Osc. circ. M.W. tracker ...	0·00035
C11	Osc. circ. L.W. tracker ...	0·0002
C12	V2 cathode by-pass ...	0·047
C13	2nd I.F. transformer fixed tuning capacitors ...	0·00008
C14	2nd I.F. transformer fixed tuning capacitors ...	0·00008
C15	I.F. by-pass capacitors ...	0·0001
C16	I.F. by-pass capacitors ...	0·0001
C17	A.F. coupling to V3 C.G....	0·0023
C18*	V3 triode H.T. decoupling	8·0
C19	I.F. by-pass capacitor ...	0·00023
C20	A.F. coupling to T1 ...	0·05
C21	Anti-parasitic capacitor...	0·00015
C22	Fixed tone corrector ...	0·01
C23	Heater circuit R.F. by-pass	0·0023
C24	Mains R.F. by-pass capacitors	0·0023
C25	Mains R.F. by-pass capacitors	0·0023
C26*	H.T. smoothing capacitors	32·0
C27*	H.T. smoothing capacitors	32·0
C28‡	Aerial circ. L.W. trimmer	0·00003
C29‡	Aerial circ. M.W. trimmer	—
C30†	Aerial circuit tuning ...	—
C31†	Oscillator circuit tuning...	—
C32‡	Osc. circ. M.W. trimmer...	—
C33‡	Osc. circ. L.W. trimmer...	0·00003

* Electrolytic. † Variable. ‡ Pre-set.



	OTHER COMPONENTS	Approx. Values (ohms)
L1	Frame aerial winding ...	1·5
L2	Aerial L.W. loading coil	9·2
L3	Osc. M.W. tuning coil ...	4·2
L4	Osc. L.W. tuning coil ...	7·5
L5	Osc. M.W. reaction coil...	3·5
L6	1st I.F. trans. Pri. ...	6·5
L7	1st I.F. trans. Sec. ...	6·5
L8	2nd I.F. trans. Pri. ...	6·5
L9	2nd I.F. trans. Sec. ...	6·5
L10	Speaker speech coil ...	3·5
L11	H.T. smoothing choke ...	180·0
T1	Intervalve trans. a,b	290·0
T1	Intervalve trans. b,c	290·0
T2	Output trans. Pri., total	360·0
T2	Output trans. Sec. ...	1·2
S1-S3	Waveband switches ...	—
S4	Mains switch, ganged R10	—



Plan view of the chassis. **C3** is mounted on the top cap connector for **V1**, and **R6** is mounted on that for **V2**. The speaker leads are connected to the small tag strip carrying **R20**. No provision is made for an external speaker, but if suitably isolated, one could be connected there. Its impedance should be 5Ω.

CIRCUIT DESCRIPTION—*continued*

A.C. mains, H.T. current is supplied by half-wave I.H.C. rectifying valve **(V6, Marconi U76)** which, with D.C. mains, behaves as a low resistance. Smoothing by iron-cored choke **L11** and electrolytic capacitors **C26, C27.**

Valve heaters, together with scale lamps and tapped ballast resistor **R21** are connected in series across mains input. Mains and heater circuit R.F. filtering by **C23, C24** and **C25.**

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers. With the receiver operating on A.C. mains of 220 V, they give the total H.T. current as 91 mA. Voltages were measured with a meter having a resistance of 500 ohms per volt.

Valve		Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1	X76M	110	2·1	65	4·0
		Oscillator			
		77	2·1		
V2	W76	110	11·6	110	2·9
V3	DH76	50	0·4	—	—
V4	KT71	98	29·0	102	5·0
V5	KT71	98	29·0	102	5·0
V6	U76†	—	—	—	—

† Cathode to chassis, 125 V, D.C.

DISMANTLING THE SET

The cabinet is fitted with a detachable bottom cover, upon removal of which (two round-head wood screws) access may be gained to most of the under-chassis components.

Removing Chassis.—Remove the three control knobs (pull off), taking care not to lose their retaining springs;

slacken the fixing screws of the plastic insulating caps which cover the rear chassis retaining bolts, swivel them out of the way, and remove the two bolts (with metal and paxolin washers, and plastic sleeves) which are revealed;

remove the remaining two recessed wax-covered chassis retaining bolts, and slide the chassis out of the cabinet to the extent of the speaker and ballast resistor leads, which is sufficient for most purposes.

To free the chassis entirely, remove the speaker lead cleat (with cheese-head screw and washer) and unsolder the leads from the connecting panel on the speaker;

remove the two round-head wood screws securing the heater ballast resistor to the right hand side of the cabinet.

When replacing, connect the green lead to the left hand tag on the speaker connecting panel, and the black lead to the right hand tag. Also, do not omit to cover the heads of the two long chassis retaining bolts with a suitable insulating compound.

Removing Speaker.—Remove the chassis, as previously described, and the four cheese-head screws (with washers) securing the speaker to the sub-baffle.

When replacing, note that the speaker lead cleat should be fitted beneath the upper left hand speaker fixing screw, and that the connecting panel should be at the top. If the leads have been unsoldered they should be connected as previously described.

GENERAL NOTES

Switches.—S1-S3 are the waveband switches ganged in a single rotary unit beneath the chassis. The unit is indicated in our under-chassis view, and shown in detail in the diagram inset beneath the circuit diagram overleaf. **S1** and **S2** close on M.W. (control knob anti-clockwise) and open on L.W., while **S3** closes only on L.W.

S4 is the Q.M.B. mains switch, ganged with the volume control **R10.**

Coils.—L1 is the aerial tuning coil, wound flat in the form of a rectangle and mounted vertically at the rear of the chassis to act as a frame aerial when required. Our sample was wound with solid wire, but in early samples stranded wire was used. The L.W. coil **L2** is mounted beneath the chassis, as are also the oscillator coils **L3, L5** and **L4.** The I.F. transformers are in two screened units on the chassis deck.

Scale Lamps.—These are rated at 5 V, 0.15 A, and are shunted by two sections of the heater ballast resistor **R21.** They have clear, spherical bulbs of medium size. The makers' part number is 35420 C.

Transformer T1.—This is the intervalve coupling between **V3** triode and the push-pull output stage. It is an auto-transformer with a 2 to 1 step-up ratio, one half of the winding acting as primary and secondary. Half of the secondary output is applied to each of the output valves. The connections are coded **a, b** and **c** in our circuit diagram, and the corresponding tags are similarly identified in our under-chassis view.

Where the early-type transformer (without connecting tags) is used, the equivalent lead colours are : for tag **a,** red; for **b,** red/yellow; for **c,** yellow. The D.C. resistance is 420Ω + 420Ω.

Resistor R21.—This is the heater circuit ballast resistor, divided into six sections for mains voltage adjustment and scale lamp shunting. The rectifier anode is so connected to it that H.T. current passes through the scale lamp circuit.

The resistor unit, which is a wire-wound ceramic unit, is mounted on an insulating strip which is screwed to the side of the cabinet. The seven connections are joined to chassis via five coloured flexible leads, the numbers and colours being : 1, red; 2, yellow; 3, blue; 4, white; 5, brown. No. 1 lead has a choice of three terminals for voltage adjustment, and is the top lead when the unit is mounted in the cabinet.

These numbers and colours are indicated in the circuit diagram, while the

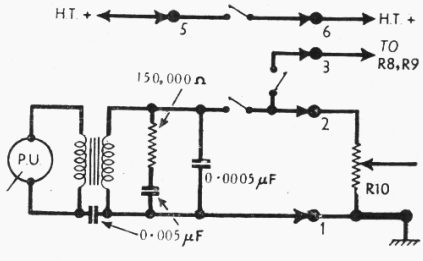


Diagram of the pick-up input circuit in the 1604 autoradiogram. The two lower switches effect the radio/gram change-over, while the upper one cuts off the H.T. supply to **V1** and **V2.**

associated tags at the receiver end of the leads are numbered in our under-chassis view, at the rear of the chassis. **R21** itself does not appear in our chassis illustrations.

Capacitors C26, C27.—These are two dry electrolytics, in separate tubular metal containers beneath the chassis. They are both rated at 32 μF, 175 V peak working, and in our sample they were T.C.C. type CE25F.

Chassis Divergencies.—In addition to the note under "Coils" concerning the frame winding, in some early models also **R7** and **C12** were omitted. Dealers are advised by the makers to introduce these components where they are missing when replacing **V2.** Their values are 100 Ω and 0.047 μF respectively, and they can be obtained from the makers, whose part numbers for them are 33362DG and 36700F respectively.

At one time also, **R9** was 47,000 Ω, which should be changed to 100,000 Ω if instability is experienced. **C21** was omitted when an early type of transformer (without soldering tags) was used. It should be added if one of these transformers is replaced by one of the later type (with tags).

The early cabinet of the 1115 had four plastic covers to protect the heads of the fixing screws. Later, two of them were rendered unnecessary by sinking the screw heads into the batten near the front edge of the cabinet.

Valve Range.—The "76" range of valves used in this receiver have international octal bases with standard connections. Their heater current is 0.16 A, and their approximate heater voltages are as follows: X76M, 13 V; W76, 13 V; DH76, 13 V; KT71, 48 V; U76, 30 V. The KT71 is not strictly one of the "76" series, of course, but it has a larger output than the KT76. **V2** is fitted with a close-fitting shield.

RADIOGRAM MODIFICATIONS

The H.M.V. 1604 is a radiogram employing a slightly modified 1115 chassis fitted in a table cabinet with a lid and equipped with a new style of record-changer, type 35000T. This has a

The 1604 table autoradiogram.

hysteresis motor, and a new type lightweight pick-up in which the needle feels loose when correctly inserted. Users should be warned of this, and instructed to use only "Silent Stylus" needles. The 1604 is restricted by reason of its motor to 50 c/s A.C. mains.

The pick-up is coupled to the receiver via a matching transformer whose winding resistances are 0.1 Ω and 2,500 Ω. The method of connection and the values of added components are shown in the diagram in col. 3, where the switch in the H.T.+ line mutes radio by cutting off the H.T. supply to **V1** and **V2.** Physically, these parts are all mounted on the record-changer assembly, and connected via the connecting strip at the rear of the chassis, which, in the 1115, carries only the ballast resistor connections. In the 1604 the number of tags is increased to eleven.

These tags are numbered 1 to 11, counting from left to right when viewed from the rear of the set, and should not be confused with the tags 1 to 5 shown in our illustrations of the 1115. They are in the same position, but these latter now become **7, 8, 9, 10** and **11.** Tag No. 4 is blank.

Other differences in the 1604 include a variable tone control, which is mounted on the side of the cabinet. It comprises a 500,000 Ω variable resistor and a 0.005 μF capacitor connected in series between tag **a** on the intervalve transformer **T1** and chassis. Also, **C21** may be connected between tags **a** and **b** on **T1,** in which case its value would be 0.00023 μF. If it is where we show it, between tag **c** and chassis, its value becomes 0.0005 μF. The speaker, which is a 5in type in the 1115, becomes a 6½in model, and **C22** is changed to 0.0023 μF.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator, via an 0.005 μF capacitor in each lead, to control grid (top cap) of **V1** and chassis, leaving existing top cap connector in position. Switch set to M.W., and turn volume control and gang to maximum. Feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L9, L8, L7** and **L6,** in that order, for maximum output. Repeat these adjustments.

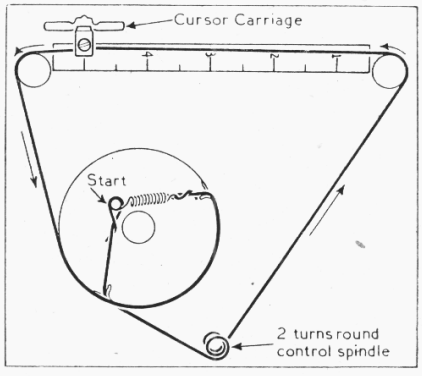
R.F. and Oscillator Stages.—Since the calibrated glass scale is mounted on the cabinet, and the alignment adjustments are carried out with the chassis on the bench, a substitute scale is fixed to the rear of the scale backing plate. This is divided into inches and sixteenths of an inch, and linear measurements on this scale correspond to frequencies given in the alignment instructions, which are read against the centre of the cursor carriage.

With the gang at maximum capacitance, the centre of the cursor carriage should cover the 5 ins. mark on the scale. If any adjustment is necessary, slacken the screw clamping the cursor carriage to the drive cord, adjust the carriage, and tighten the clamping screw.

Connect signal generator leads, via a suitable dummy aerial, to **A** socket, and via an 0.005 μF series capacitor, to chassis.

M.W.—Switch set to M.W., turn gang to minimum capacitance, feed in a 180 m (1,667 kc/s) signal, and adjust **C32** for maximum output. Set cursor carriage to $1\frac{23}{32}$ ins., feed in a 210 m (1,429 kc/s) signal, and adjust **C29** for maximum output. Set cursor carriage to $4\frac{13}{32}$ ins., feed in a 510 m (588 kc/s) signal, and adjust the core of **L3** for maximum output, while rocking the gang. Repeat these adjustments.

L.W.—Switch set to L.W., turn gang to minimum capacitance, feed in a 900 m (333.3 kc/s) signal, and adjust **C33** for maximum output. Set cursor carriage to $2\frac{1}{8}$ ins., feed in a 1,000 m (300 kc/s) signal, and adjust **C28** for maximum output. Set cursor carriage to $4\frac{13}{32}$ ins., feed in an 1,850 m (162.2 kc/s) signal, and adjust the core of **L4** for maximum output, while rocking the gang. Repeat these adjustments.



The tuning drive system as seen from the rear of the scale backing plate. Both ends of the cord are anchored to the single pin marked "Start."

Finally, replace chassis in cabinet and check calibration, at about the middle of the tuning scale, on a station of known wavelength. Adjust cursor to give the best compromise on both wavebands, if necessary.

DRIVE CORD REPLACEMENT

The general scheme of the tuning drive system can be seen in the sketch above, where it is drawn as it would be seen from the rear of the receiver, if there were no obstructions, with the gang at maximum capacitance.

The makers emphasize that only the correct high grade of flax fishing line must be used for replacement, supplies of which can be obtained from E.M.I. Sales and Service, Ltd., Sheraton Works, Hayes, Middlesex. A 30in length is ample for the job.

Tie a small loop (about ⅛in diameter) at one end, pass it into the drum through the appropriate slot in the drum groove, and slip it over the anchor pin marked "Start" in the sketch. A drop of shellac will render the knot non-slipping. Follow the course indicated in the sketch, and finish by passing the other end of the cord through the second slot into the drum, then tie it off on to the spring, which should be sufficiently extended to open the turns well when its far end is hooked to the "Start" anchor pin. Finally, cut off surplus cord.

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