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## MURPHY B24, B25

Five-valve battery superhets with QPP output and special HF overload preventer circuit. Provision is made for a high-resistance pickup and a low impedance extra loud-speaker. Marketed by Murphy Radio, Ltd., Welwyn Garden City, Herts. B24 released 1934; B25, 1935.

THE aerial is coupled to the band-pass tuning unit by coupling coils L1 (MW) and L2 (LW). In series with the coupling coils is a small winding, L2A, which, together with C1, forms an image suppression circuit.

The primaries and secondaries of the band-pass unit are tuned by VC1 and VC2 and are inductively coupled by L5 and L6. The secondary coils are connected to a point on the grid bias potentiometer

network, R18-21, the reason for which will be explained later; a blocking condenser, C3, passes the signals on to the grid of the mixer valve, V1. The grid of this valve is taken to the AVC line via the grid resistance, R2.

V2 is a double diode triode, the triode portion of which forms, with the oscillator coils and tuning condenser VC3, the local oscillator. The output is injected into the filament circuit of V1 via the oscillator grid coils L9, L10, which are also in the V1 filament circuit. HF is diverted into these coils by R7 and C8. Coils L13, L14, serve to prevent the coupling coils being short circuited from an HF viewpoint by the filaments of the other valves and the accumulator. Only one diode of V2 is used, and this is employed in a special overload prevention circuit to take care of distortion due to powerful signals from a near-by transmitter.

The diode is connected to the secondaries L7, L8, via R4, and is biased by reason of the connection to the bias potentiometer mentioned above. The diode of V2 is about one volt negative to the filament of the valve and therefore the diode is not

conducting and no current flows through the resistance, R4, and the secondary coils of the band-pass unit under conditions of weak signals. When, however, a strong signal is tuned in, which produces a voltage greater than one volt positive on the diode, the latter commences to conduct and current flows through the secondary windings of the band-pass unit, thus damping the circuit and limiting the voltage applied to V1; in this way overloading is prevented in V1 and the succeeding valves.

The screen grid of V1 is fed via R1 and R12 from the HT line, C16 being the decoupling condenser. R1 also assists in diverting a certain amount of HF input via C6 to the coupling coils L9, L10, in order to increase the coupling on LW.

The IF output from V1 is coupled by an intermediate frequency transformer L15, L16, to the grid of V3, an HF pentode amplifying valve to which AVC is applied via R9 decoupled by C11.

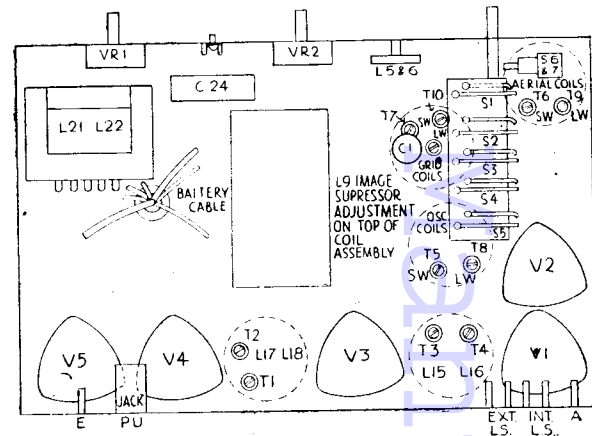
A second IFT, L17, L18, transfers the signal to the signal diode of the double diode triode second detector valve, V4. The volume control, VR1, is the load

resistance and from this control the LF signal is passed via R11 and C15 to the grid of the triode section of V4. The grid is biased by being returned via R16 to a tapping on the grid bias potentiometer network R18-21.

A jack is connected across the volume control for connection to a pickup and the contacts are arranged so that when the pickup plug is inserted into the jack the signal diode circuit is broken, thus preventing radio reception.

The AVC diode of V4 is fed from the anode of V3 via C13, the AVC load resistances being R14 and R15. Full AVC

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### VALVE READINGS

No signal, vol. control at maximum. Readings taken with a new battery and a 1,000-ohm-per-volt meter on 0-250v. range.

V	Type	Electrode	Volts	Mas
1	VP215 (Met)	Anode	115	1.25
		Screen	55	.4
2	HL21DD (Met)	Anode	50	.5
		Screen	135	1.4
3	VP215 (Met)	Anode	60	.4
		Screen	51	1.0
4	L21DD (Met)	Anode	51	1.0
		Screen	135	1.3
5	QP240 (clear)	(each)		
		Screen	132*	.3

Pilot lamp, 2.5v, 0.2 amps, MES. 133.5v  
 \* For code T valve, HT screen tap  
 " " S " " " 126.0v  
 " " R " " " 118.5v  
 " " Q " " " 111.0v  
 " " P " " " 103.5v

An overload preventer circuit is a special feature of this Murphy battery five.

### RESISTANCES

R	Ohms
1	25,000
2	2 meg
3	100
4	1,000
5	2 meg
6	10,000
7	50,000
8	100,000
9	2 meg
10	150,000
11	250,000
12	50,000
13	25,000
14	490,000
15	2 meg
16	2 meg
17	150,000
18	100
19*	100
20	800
21	25
22	100,000
VR1	1 meg
VR2*	100,000

\* See note re Model B25.

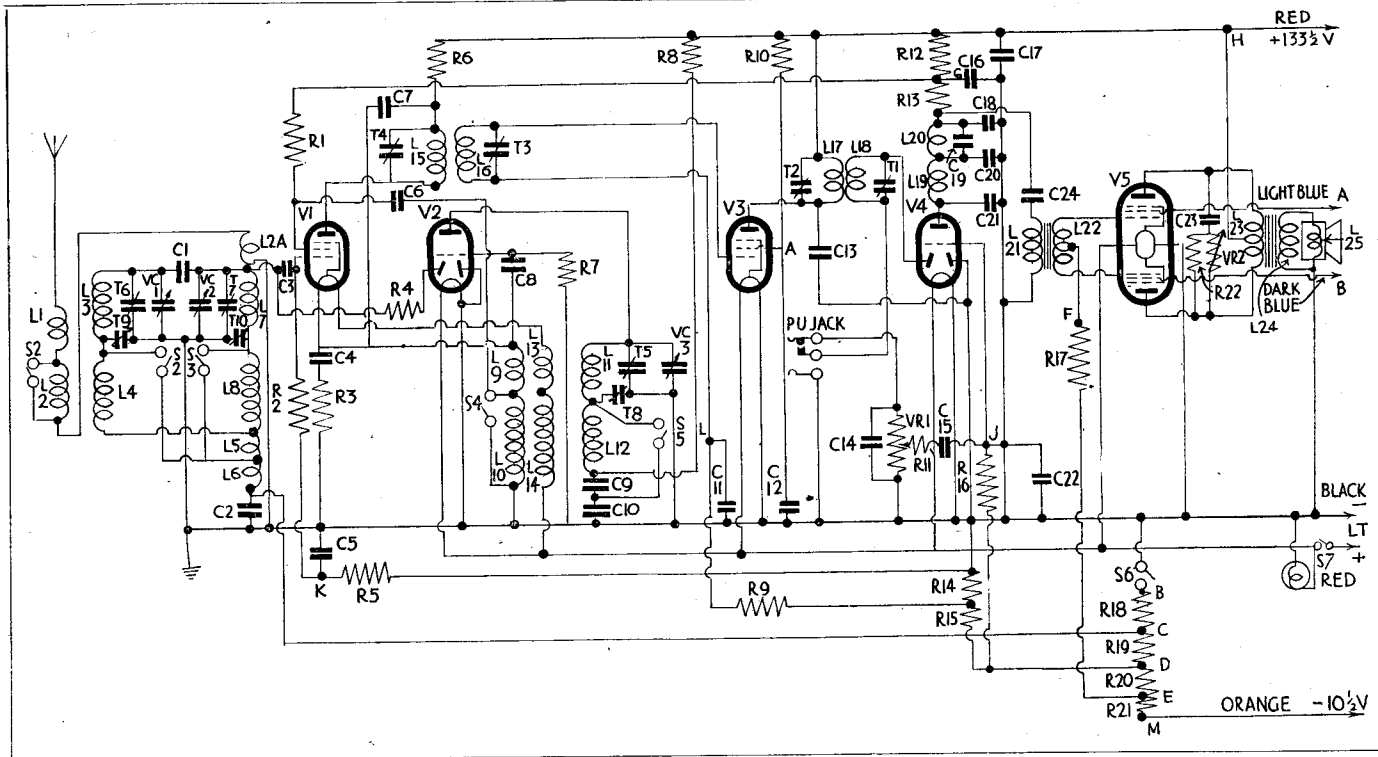
### CONDENSERS

C	Mfds	C	Mfds
1	2 mfd	13	.00005
2	.1	14	.00005
3	.005	15	.001
4*	.00025	16	1
5	.01	17	1
6	.001373	18	.001
7	.002	19	.001373
8	.0003	20	.003
9	.001373	21	.002
10	.002	22	.00005
11	.025	23	.01
12	1	24	.2

\* See note re Model B25.

### WINDINGS

L	Ohms	L	Ohms
1	1	13	6
2	7	14	40
2A	.25	15	40
3	5	16	40
4	12	17	40
5	2.75	18	40
6	.75	19	450
7	5	20	370
8	12	21	1,020
9	.2	22	2,000+2,500
10	.3	23	270 (total)
11	.4	24	.21
12	8.5	25	2.5



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Continued from opposite page

voltage is applied to V1, while V3 grid circuit is connected to the junction of R14 and R15. Delay volts are derived from the bias potentiometer.

The anode circuit of V4 incorporates a heterodyne filter comprising L19, L20, C19, C20, and C21. The voltage dropper for the anode circuit is R12 decoupled by C16, while R13 is the LF load resistance. LF signals are passed from this via the coupling condenser, C24, to the primary L21 of the intervalve transformer. The secondary, L22, feeds the two grids of V5, the QPP double output pentode. The centre tap of L22 connects to the grid bias potentiometer network via the grid stopper R17. The two anodes of V5 connect in the usual way to the secondary L23 of the centre tapped primary output transformer.

A variable tone control network comprising C23, R22, and VR2 is connected across L23.

## GANGING

**IF Circuits.**—Switch receiver to MW and short circuit L9 or L11 to prevent V1 oscillating. Inject a 117-kc signal via a dummy aerial to the grid of V3. Keep input low to prevent AVC action and adjust T1, T2 for maximum.

Next inject the signal into the grid of V1 and adjust T3 and T4 for maximum output. Remove short across L9 or L11.

**MW Band.**—Inject a signal of 220 m into the aerial and earth terminals of the receiver via a dummy aerial. Tune the receiver to this signal and check scale reading. If it is incorrect adjust the receiver tuning point to 220 m and adjust T5 for maximum output.

Next adjust T6 to see whether the output can be increased. Without touching the tuning controls, adjust T7 for best output and repeat adjustments to T6 and then again T7 until best results are obtained.

**LW Band.**—Switch receiver to LW and inject a signal of 1100 m. Tune the receiver to this signal and if the pointer calibration does not register 1100 m adjust the pointer to the 1100-m mark, and trim T8 for maximum output.

## MODEL B25

Although the circuit and layout of the B25 receiver are almost identical with those of the B24, a few differences do exist.

R19 has been altered in value from 100 to 200 ohms, and at the same time has been connected between Tags B and D instead of Tags B and C. As a result, Tag C will be at chassis potential instead of one volt negative, thus altering the delay voltage on V2 diode anode. Tag D will remain, as before, two volts negative, since the resistance between it and chassis is still 200 ohms; furthermore, the voltage distribution at the other tags will be unchanged. It should be noted that, in the B25, R18 is necessary only to provide a DC path across C2. Another change is to be found in the tone control circuit; here, a 50,000 ohms variable resistance, following a logarithmic law, has been used to replace the 100,000 ohms control shunted with a fixed resistance, R22.

In the B24, C4 has a value of .00025 mfd. In

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# BEETHOVEN "LITTLE PRODIGY" 909 AC

*Four-valve, plus rectifier, two waveband, superhet portable, with internal frame aerials. A socket is provided for the use of an external aerial. For operation from AC mains 100-110 volts, 200-250 volts, 40-100 cycles. Marketed 1939 by Beethoven Electric Equipment, Ltd., Chase Road, North Acton, London.*

**T**HE frame aerials L1 (MW) and L2 (LW) are tuned by VC1 section of the gang condenser and connect direct to the grid of the triode-heptode valve V1. This valve is permanently biased by R1, while R2 feeds the screening grid from the HT line.

The triode section employs a tuned grid circuit, the grid leak and condenser being R3 and C2. The grid coils L3 (MW) and L4 (LW) are tuned by VC2 section of the gang condenser while L5 and L6 are the respective anode reaction windings.

V1 is coupled to the grid of the IF amplifying valve V2 by the IF transformer comprising L7 and L8. V2 is permanently biased by R4 in the cathode circuit while

a second IF transformer L9, L10 couples the output to the diode of the single diode triode valve V3.

The signal load resistance is the volume control R6 which has an -IF by-pass condenser C5 across it. AVC is obtained from the DC potential across R6 and is fed via decoupling components R5 and C4 to the grid circuits of V1 and V2.

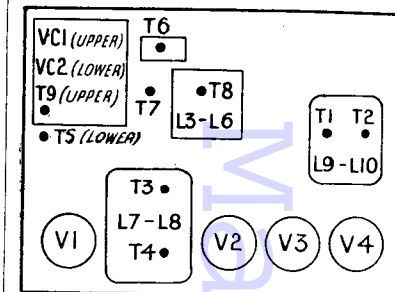
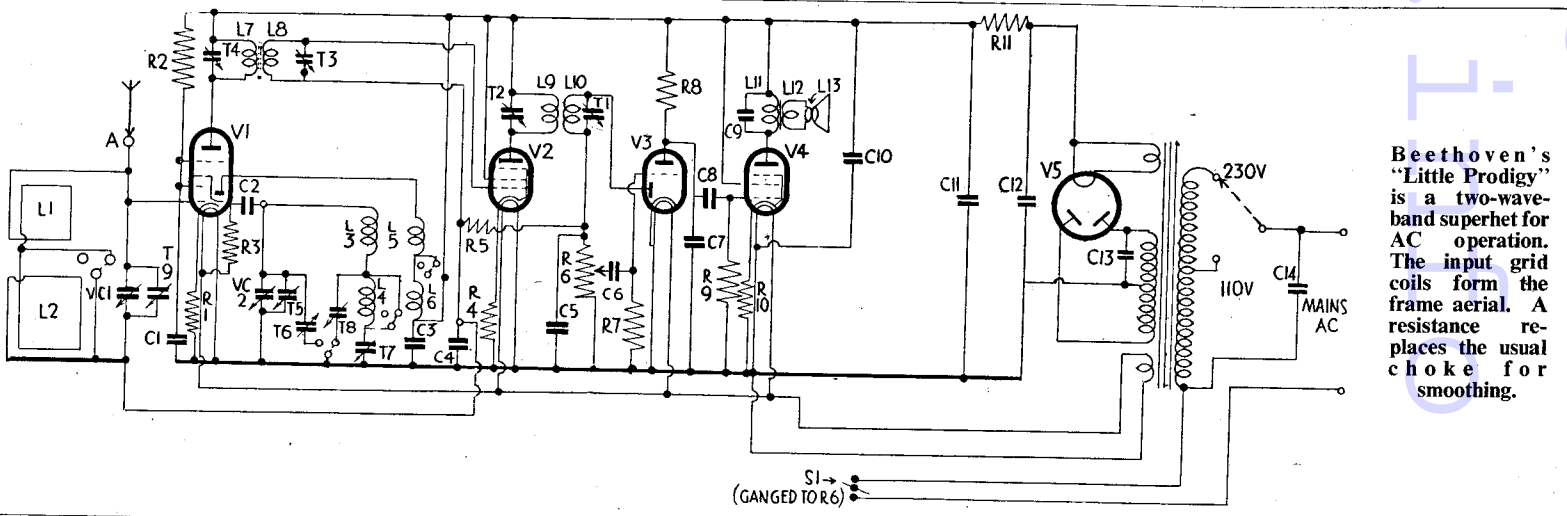
C6 couples the LF signal from the volume control to the grid of the triode section of V3, R7 being the grid leak. V3 is resistance capacity coupled by R8, C8 and R9 to the grid of the pentode output valve V4. This valve is biased by R10 and is coupled by the output transformer L11, L12 to the low impedance permanent magnet loudspeaker L13. A permanent degree of tone correction is effected by C9 across the primary of the output transformer.

V5 is the full wave rectifying valve and the HT output is smoothed by C12, R11, and C11. C13 and C14 provide the HF filtering for the mains input and HT secondary winding of the mains transformer. The on/off switch, S1, is ganged to the volume control R6.

## GANGING

**IF Circuits.**—Switch to MW and set volume control to maximum. Inject a 450.5 kc signal via a .1 mfd condenser to the control grid of V1 and adjust T1, T2, T3 and T4 for maximum output keeping input low to avoid AVC action.

**MW and LW Bands.**—Switch to MW and turn gang to minimum and see that pointer registers with the 200-m mark



Layout diagram of the top of the Beethoven chassis indicating the positions of the main components and trimmers.

## VALVE READINGS

V	Type	Electrode	Volts	Max
1	ECH3	Anode	118	.3
		Osc. anode	118	4.2
		Screen	58	1.6
2	EF9	Anode	118	8
		Screen	118	2.6
3	EBC3	Anode	28	.4
		Anode	112	16
4	EL3	Anode	118	1.8
		Screen	118	1.8
5	AZ1	Fil	220	—

## WINDINGS

L	Ohms	L	Ohms
1	1.5	8	4
2	16	9	10.5
3	5	10	10.5
4	9	11	240
5	4.2	12	.2
6	7.5	13	2.5
7	4		

Beethoven's "Little Prodigy" is a two-waveband superhet for AC operation. The input grid coils form the frame aerial. A resistance replaces the usual choke for smoothing.