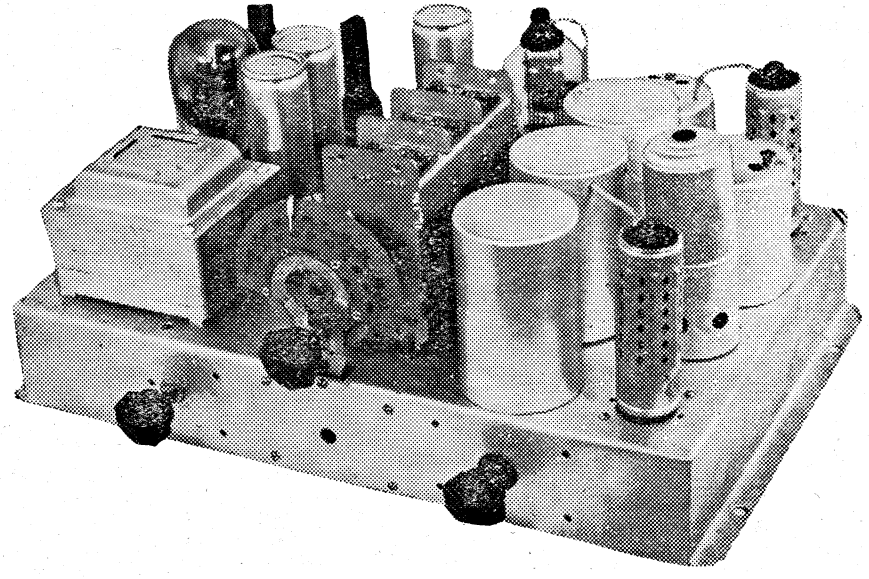
HOW TO CONSTRUCT A STANDARD SUPERHET.—Push Pull Utilizing Osram (Catkin) Metal Valves and Lekmek Kit, Type 356-R.

Lekmek Engineers in accordance with their policy of keeping abreast with progress in Valve Development describe herein the construction of the Standard Push-Pull Superhet (as described in Wireless Weekly, 9th March, 1934), utilising the new Osram (Catkin) Metal Valves in conjunction with Standard Lekmek Kits and other standard components. The results as checked on the Standard Signal Generator are excellent and those interested should be well satisfied.



The Standard Superhet requires 7 valves—2/VM4, 1/MHD4, 2/MPT4, 1/U12, 1/57. A brief description of the circuit is as follows: One stage of radio frequency using an Osram type VMS4 valve coupled to a type 57 detector oscillator valve which is followed by one stage of intermediate frequency amplification (VMS4 valve) at 186KC. The output from the intermediate stage is rectified by an Osram type MHD4 double diode triode valve which ensures linear detection and high audio frequency gain without distortion. The audio system comprises two MPT4's in push-pull which are resistance coupled by special circuit, the patent rights of which Lekmek control throughout the Commonwealth and New Zealand.

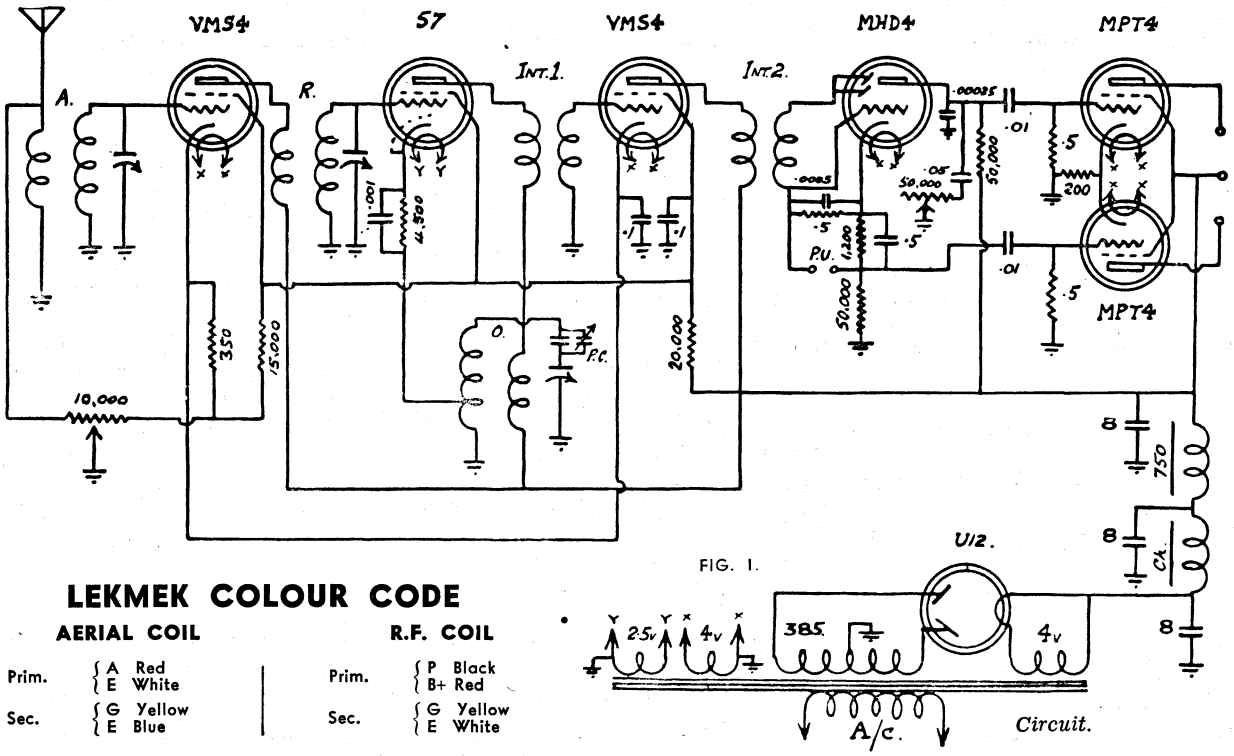


FIG. 1.

LEKMEK COLOUR CODE

AERIAL COIL

Prim.	A	Red
	E	White
Sec.	G	Yellow
	E	Blue

R.F. COIL

Prim.	P	Black
	B+	Red
Sec.	G	Yellow
	E	White

OSCILLATOR COIL

Plate Coil	P (through Osc. coil)	Red
	B+	White
	G	Blue
	Tap	Yellow
	E	Black

I.F.T. 1.

Prim.	Plate	Red
	B+ through Oscil. Coil	Blue
Sec.	G	White
	E	Yellow

I.F.T. 2

Prim.	Plate	Blue
	B+	Red
Sec.	DP	White
	G	Yellow

COMPONENTS:

POWER TRANSFORMER.—The power transformer as specified in the circuit diagram is rated at 125 ma. The primary winding is tapped from 200 to 260 volts to accommodate various line voltages. There are three secondary windings, 2/4 volt filaments, one at 2 amps and the other at 10 amps, and 1/2.5 volt filament winding at 5 amps. The Lekmek Power Transformer type 12T is designed for this receiver.

POWER CHOKE.—A power filter choke is required rated at 50 henrys, capable of carrying 120 ma. and having a resistance of 500 ohms. Lekmek Power Choke type 50/120/500 fulfils these requirements.

THE KIT.—The Lekmek type 356R Kit consists of three coils, the aerial, radio frequency, and oscillator coil, 2 intermediate frequency transformers 186KC, padder and three-gang tuning condenser.

RESISTORS.—The resistors must be of the value specified and of good quality. By-pass condensers must also be purchased with care using only the best procurable. The filter condensers are of the electrolytic type and should be rated to stand 600v.

VOLUME CONTROL.—The volume control is a 10,000 ohm wire wound potentiometer so arranged that as the bias voltage is increased on the two VMS4 valves, the resistance between aerial and earth is decreased, thus ensuring perfect control of volume under all conditions.

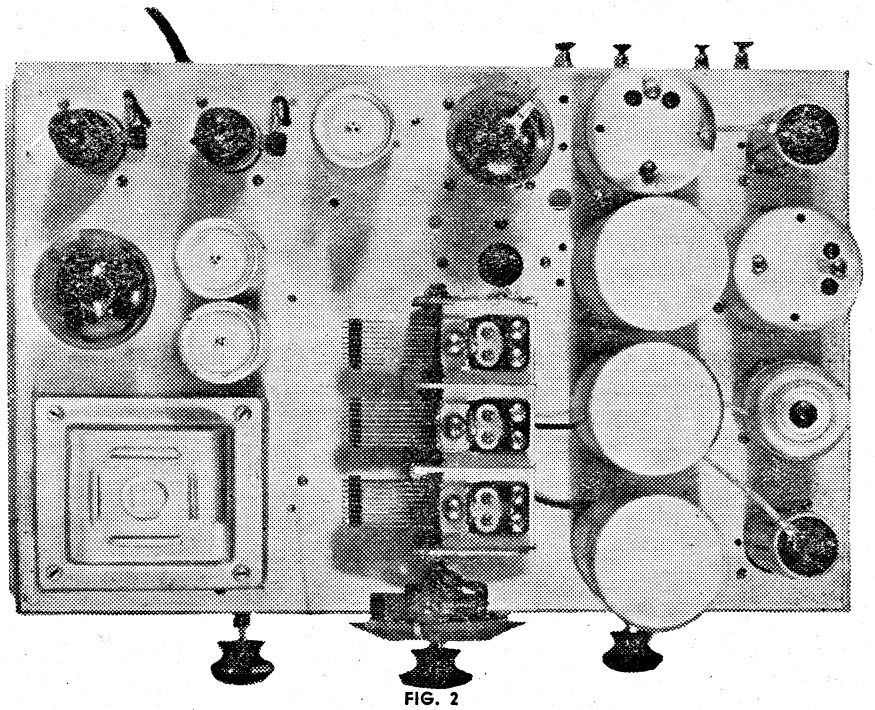


FIG. 2

LIST OF PARTS

1 Base.
1 Power Transformer 385/125, 4v. 4v. 2.5v. (Lekmek type 12T).
1 Filter choke 120 ma. (Lekmek type 50/120/500).
1 Superhet Kit (Lekmek type 356R).
Speaker 750 ohm field, 9,000 ohm P.P. input.

CONDENSERS

3 Electrolytic Condensers 8 MF.
1 .5 fixed condenser.
2 .1 fixed condensers.
1 .05 fixed condenser.
2 .01 fixed condensers.
1 .0001 fixed condenser.
1 .00025 fixed condenser.
1 .0005 fixed condenser.

RESISTORS

1 200 ohm Resistor W.W.
1 350 ohm Resistor W.W.
1 1200 ohm Resistor.
1 4500 ohm Resistor W.W.
1 15,000 ohm Resistor.
1 20,000 ohm Resistor.
2 50,000 ohm Resistors.
2 500,000 ohm Resistors.
1 10,000 ohm Potentiometer.
1 50,000 ohm Potentiometer.
Sundry Screws, etc.

OSRAM VALVES

2—VMS4, 1—MHD4, 2—MPT4, 1—U12, 1—57, and sockets.

TONE CONTROL.—Effective emphasis of the bass or treble response is gained by the inclusion of a 50,000 ohm variable resistance in series with a .05 m.f. condenser, from the plate to the cathode of the MHP4 valve.

THE CHASSIS BASE.—The chassis base may be constructed of either aluminium or of steel. If of steel, it must be sprayed with a protective duco to prevent corrosion. Rigidity is the main point to consider when choosing a chassis.

ASSEMBLY

Mount the power transformer and valve sockets. The power transformer must be firmly secured to the chassis as loose laminations will cause an annoying hum if not clamped securely. The electrolytic condensers, filter choke, tone and volume control should now be screwed to the chassis. The speaker socket and all terminals are fitted to the back of the chassis. The gang condenser should have the necessary wires soldered to it before mounting to the chassis. The coils and intermediate frequency transformers are now placed in position taking the utmost care that they are not damaged in handling. The smaller by-pass condensers and resistors are soldered point to point as shown in figure 3, the solder supporting the component. However, some types of by-pass condensers are provided with holes for screwing them to the chassis. All nuts and screws should be as tight as possible as a loose component sooner or later will cause trouble.

WIRING

Before commencing the wiring make sure that your soldering iron is quite clean and has been tinned properly as the difference between a well soldered joint in a radio receiver is often the difference between a first class set and a very poor one. Use a good resin core solder and under no circumstances must a corrosive flux be used. Wherever possible ends of wires, lugs and valve socket springs should be tinned before wiring is commenced. To tin the soldering iron, file the tip with a smooth file and when hot lightly file again in order to clean the surface, and quickly apply the resin core solder to the surface and wipe with a clean rag.

All filaments and the dial lamp are wired first. Filament wires are twisted together and run neatly from socket to socket. A tinned copper busbar should be run across the middle of the chassis and soldered to earth at several points. This busbar is then used as a common earth connection where required, which is more efficient than having separate earth connections all over the chassis. The screens and cathode contacts on the valve sockets are wired next as shown in the circuit, figure 1.

The two I.F.T.'s require the following attention before wiring as the control grid of the VMS4 valves are at the base of the valve and the plates at the cap.

I.F.T. 1.—The white wire which has a grid clip attached to it should have this clip unsoldered and the wire taken below the base of the I.F.T. The I.F.T. 1 has no connection through the top of the intermediate shield.

I.F.T. 2.—Unsolder the grid clip which is attached to the white wire and pass this white wire below the base of the intermediate. The yellow wire should now be threaded through the hole in the intermediate shield and a spade lug soldered to it for connection to the control grid of the MHD4. An additional hole should now be drilled in the intermediate shield and the blue wire threaded through it and a spade lug soldered to it for connection to the plate of the second VMS4. Now that the adjustments have been made to the I.F.T.'s both these and the three coils are wired according to the color code shown herein. The lead from the I.F.T. to the oscillator coil is metal sheathed and earthed.

Finally the audio section of the receiver is wired, special care being necessary in the case of the second detector socket as it is more complicated than the others. The diode plates are connected together as shown in the circuit diagram.

When the speaker socket is wired and the high tension supply connected the set is ready for testing.

TESTING

Carefully check up each connection with the circuit diagram and make sure that none are missed, pick off any surplus solder and pieces of wire that have been accidentally dropped on to the chassis. Carefully inspect resistors and by-pass condensers in order to see that they are not shorting to the chassis. Insert the valves in their respective positions, shown in figure 2. Plug in the speaker and switch on the set. If the rectifier valve blue-glows it is an indication of a short circuit due to a wrong connection in the filter or plate circuit. However, if no blue-glow appears in the rectifier valve, connect aerial, turn the volume control half way up or more, and rotate the station selector until a station is heard. When the set is working line the gang condenser and padder, as described below.

LINING THE COMPLETED SET

Those having access to a properly constructed oscillator have no need for detailed instructions and the following method has been evolved as being the only practicable one for those who must depend on the regular broadcasting services for lining. Set the tuning dial on a station in the vicinity of 250 metres and unscrew the trimmer on the oscillator section of the gang condenser to about ¾ way out and proceed to line the aerial and R.F. trimmers of the gang condenser. By lining the trimmers we mean adjusting them to the position at which the signal is loudest, (the peak). Usually, it is unnecessary to touch the trimmer on the oscillator section once it is set about ¾ way out. However, if the trimmer on the R.F. and aerial sections do not peak, screw in the trimmer on the oscillator section a little at a time until you can get the R.F. and aerial trimmers to peak, i.e., work with as little trimmer capacity on the oscillator section of the gang as possible. Now with the tuning condenser set in the vicinity of any station near 3AR, adjust the padder condenser trimmer for maximum sensitivity using a piece of fibre tubing which fits the control nut on the padder and adjust for maximum volume, care being taken to vary the tuning condenser slightly in either direction concurrently with the padder adjustment. Now turn to the lower wave length (250 metres) and repeat the adjustment for lining the R.F. and aerial trimmer as a final check in order to get the maximum gain from the receiver.

The Lekmek Intermediate Frequency Transformers require no attention as they are connected into a standard receiver and lined with a special oscillator. Therefore, under no circumstances must adjustments of the I.F.T.'s be interfered with.

CONCLUSION

This Standard Receiver utilising the Osram Catkin Valves may be varied by using a preselector stage in addition to the Lekmek 356R. Kit.
Lekmek Kit 356RS. Price ..... £6—6—0

or by substituting a preselector for the R.F. stage.

Lekmek Kit 345S. Price ..... £5—5—0
or without the R.F. stage and 465K.C. (2 gang condenser).
Lekmek Kit 345D. Price ..... £4—4—0

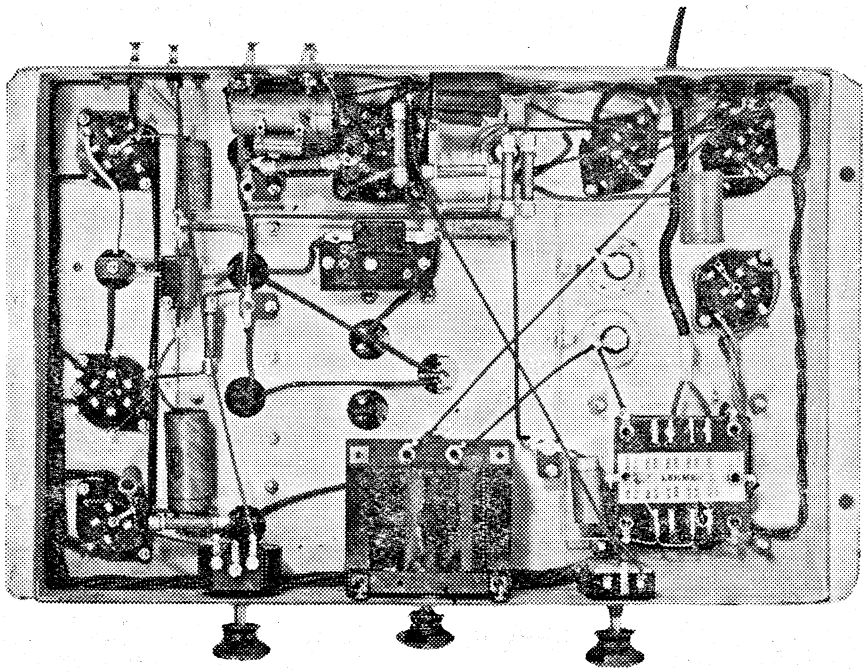


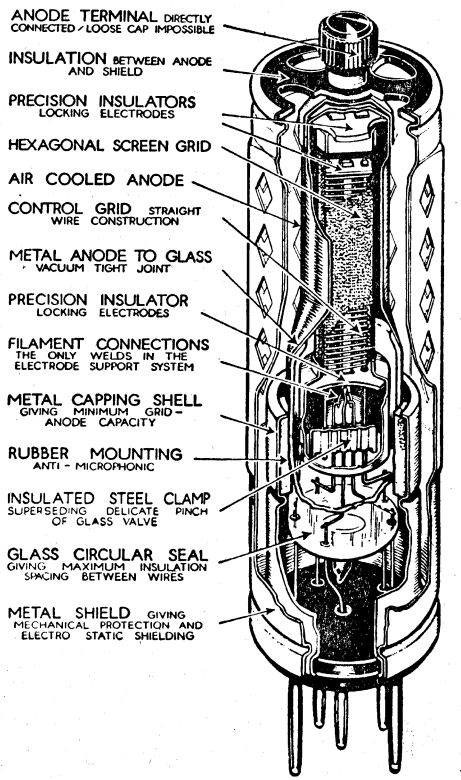
FIG. 3

OSRAM (CATKIN) VALVES—METAL instead of GLASS

OSRAM (CATKIN) VALVES are an entirely new development in the technique of Valve design. Their entrance into the field of Radio is recognised as an innovation of vital importance to both designer and user alike. OSRAM (CATKIN) VALVES are the result of intense scientific research by the General Electric Co. Ltd., England, and are marketed in Australia by their Australian Sole Agents, The British General Electric Co. Ltd. The following are the principal characteristics of OSRAM (CATKIN) Valves:—

Rigid construction with greater precision in the setting up of electrodes, together with better cooling, combine to enable the valves to give better results than hitherto.

The method of bringing the leads out at the base of the valve reduces losses to a minimum and improves insulation. The valve is unbreakable and cannot become loose or detached from its socket. It is carried in a non-microphonic mounting and is totally screened.

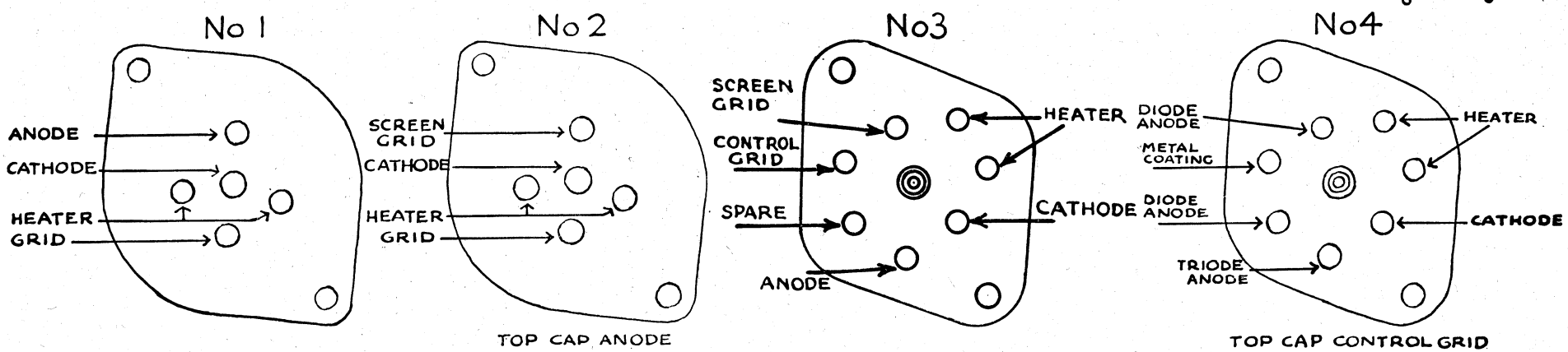


CHARACTERISTICS & SOCKET CONNECTIONS

FILAMENTS 4 VOLTS 1 AMP.

Type	Purpose	Average Anode Volts	Average Screen Volts	Average Anode Current M/A	Average Screen Current M/A	Negative Grid Bias Volts	Resistance A/c. ohms	Amplification Factor	Mutual Conductance MA/volt	Valve Socket No.	List Price
MH4/K/M	Triode	200	—	4.5	—	3.0	11.100	4	3.6	1	17/6
MS4B/K/M	Screen Grid	200	80	3.4	1.2	—	350.000	1,120	3.2	2	20/–
VMS4/K/M	Variable Mu	200	80	10.0	2.0	0/30	—	—	2.2/.03	2	20/–
MPT4/K/M	Pentode	250	250	32.0	8.0	13.0	40.000	120	3.0	3	23/–
MHD4	Double Diode Triode	200	—	3.0	—	3.0	18.200	40	2.2	4	18/6
U12	Full Wave Rectifier	RMS 350.0.350	D.C. Output 120 M.A. at 320 Volts.								14/6

VALVE SOCKET CONNECTIONS LOOKING ON UNDER SIDE OF BASE



THE VALVES WITH THE IRON CONSTITUTION