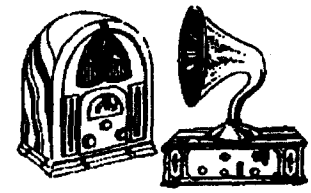
Vintage Radio

by PETER LANKSHEAR



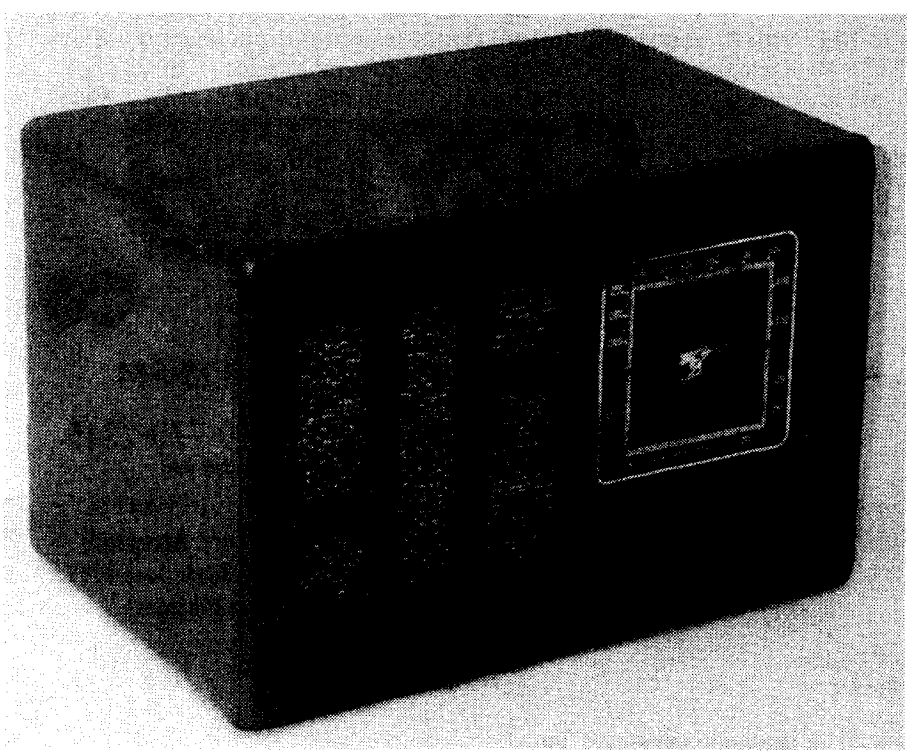
Building your own classic radio

In the last column we traced the history of John Moyle's 'Little General', in its time Australia's most popular mantel receiver. So many were made over a period of about 20 years that the remains of many (possibly unrecognised) must still be in existence. A bit of hunting around may unearth the remnants of one, which could be restored or rebuilt without too much trouble. But the design is so uncritical that in many instances, you could assembly your *own* Little General — from parts salvaged from a junk box, or from receivers considered not worth restoring.

There is a unique satisfaction in making your own electronic equipment, the more so if it is built from scratch. This is evident from the space given over to home construction during the valve era, by magazines such as our predecessor *Radio and Hobbies* — which each month published several constructional articles, ranging from simple one valve battery operated receivers to complex high performance radiograms.

Readers who grew up with these projects could now enjoy the nostalgia of restoring or making a Little General; for others this could be a good project with which to sample valve radio construction. Naturally, the ideal would be to have a Little General to restore; but failing that, building one from salvaged parts is a practical proposition.

Although any of the various versions described last month could be made, the 1947 model was chosen as it used a readily available permanent magnet (PM) speaker and yet retained the 'no frills' circuit of the original Little General. If the benefits of AGC are desired, the circuit of the Dual Wave version published in last month's column could be used with little additional complication.



A Little General built 50 years on. Billed as 'Australia's most popular mantel', John Moyle's design set new standards of simplicity and compact size.

Selecting the parts

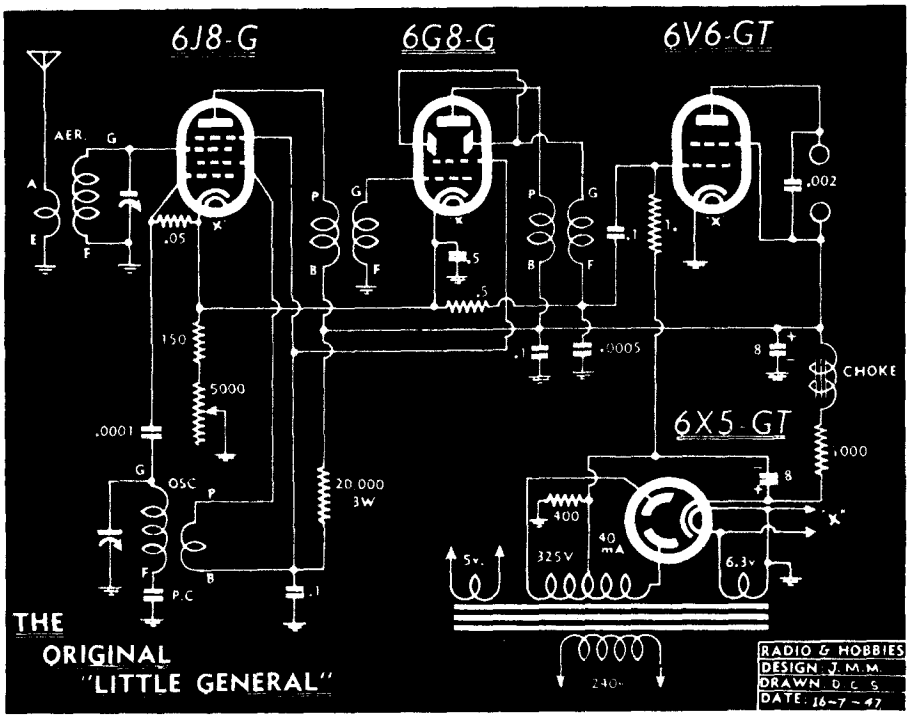
The most critical components are the dial and its associated two gang tuning capacitor, and the aerial and oscillator coils. Although original kitsets used RCS and Crown 3" dials, any small dial would be satisfactory. The set illustrated uses a 4" Companion unit. A dial from a small mantel set or even a knob with a scale would do at a pinch.

Provided that there are two tuned windings, just about any 450 - 470kHz IF transformers can be used. Permeability tuned or iron cored types are preferable, but not essential. Naturally, all components and windings should be carefully checked to make sure that they are intact. Take care to note the connections of the IF transformers. Reversal of one winding will cause a serious loss of gain because of the reliance upon both magnetic and capacitive coupling.

The remaining major items are a small power transformer and a 5" speaker. If an original Little General is being restored, the power transformer and loudspeaker is not likely to present a problem. Most power transformers salvaged from receivers would be suitable, but obviously should not be too large.

HT winding voltages are not critical, anywhere between 200V and 330V being acceptable. Voltages higher than 330V were common with electromagnetic (EM) speakers, but require input filter capacitors with a peak voltage rating higher than the 450 volts normally available today.

Assuming that a matching power transformer and speaker are not available, a PM speaker is the best choice and easiest to find. It is convenient but not essential to have the output transformer mounted on the speaker.



The 1947 version differed very little from the 1940 original, as suggested by the title on its schematic. The main differences were an added 150 ohm RF bias resistor, a 0.1uF HT bypass cap, an indirectly heated rectifier and a permanent magnet speaker — which in turn made it desirable to use an HT filter choke.

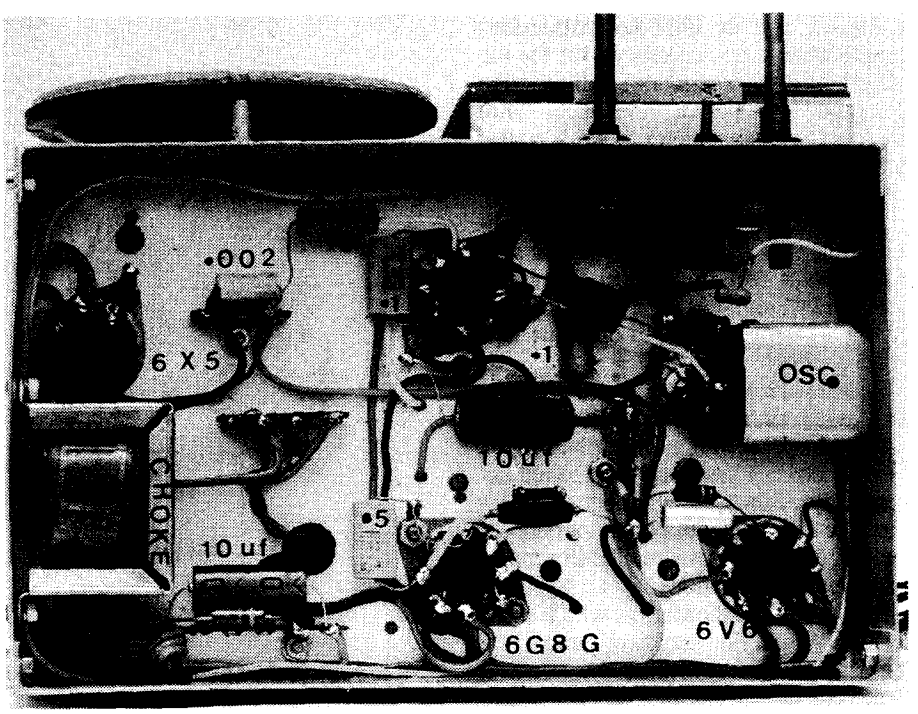
Filtering options

The original version used a 325V transformer and a 2500 ohm field winding on the EM speaker. At 40mA drain, the HT would have been 250 volts. In the 1947 model, the same power transformer was used in combination with a small filter choke and a 1000 ohm resistor, implying a choke resistance of about 1500 ohms. However, most small chokes have a resistance of about 500 ohms.

With transformers rated at a voltage of 250 or less, no resistor is necessary. But assuming a 500 ohm choke and 40mA HT drain, add about 25 ohms of series resistance for each volt above this. Thus for a 270 volt transformer, an additional 500 ohms would be suitable, and for 325 volts, the resistor should be about 2000 ohms. These resistors would need to have a rated dissipation of at least 5 watts, and in the latter case preferably 10W.

Now that compact high value electrolytic capacitors are available, resistive filtering would be a practical proposition. A pair of 32uF capacitors and a filtering resistor of 1000 ohms should be used for transformers with HT windings of less than 270 volts. Above this voltage add 500 ohms to the values shown above. If necessary, a choke can be wound on an old output transformer core using the method described for output transformers in this column for March 1991. Of course a secondary winding is unnecessary — just fill the bobbin with the fine wire.

As the octal valve series was large, there are several alternatives for each socket, with the more common types



The underside layout is not critical, and was quite different in each of the various models. One advantage we have today is the smaller size of modern capacitors.

given in the parts list. Other frequency converters that work well are types OM10, 6A8-G and 6D8-G. A later alternative IF valve intended for this type of service was the 6AR7-GT, but it has different socket connections from the recommended types.

The 6V6 proved to be very satisfactory for the output stage. An alternative, used by many manufacturers of receivers of this type, is one of the European high gain pentodes — examples being the KT61, 6AG6-G and EL33 or EL3NG. If one of these valves is used, the bias resistor (from the centre-tap of the HT winding to ground) should be changed to 220 ohms. As John Moyle pointed out, although these valves have twice the sensitivity of a 6V6, in practice the difference is hardly worthwhile and they have the disadvantage of being large and requiring twice the heater current of a 6V6.

Two popular types of rectifier are suitable. First choice is the indirectly heated 6X5-GT or EZ35. Originally an 80 was used and if the power transformer has a 5.0 volt winding, the octal equivalent 5Y3-G or -GT could be used, but their filament power consumption is double that of a 6X5-GT. The receiver illustrated uses the 5.0 volt winding for the 6.3 volt pilot lamps, which consequently do not regularly burn out.

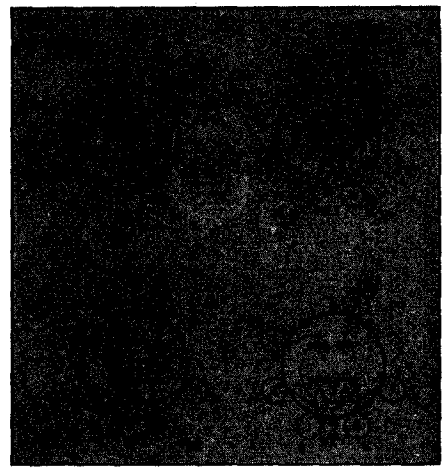
Chassis making

Construction commences with making a chassis, and in 1947 no instructions would have been necessary. But for the benefit of today's readers I will describe the procedure. Aluminium sheet 1mm thick is the easiest metal to work, and it is a good idea to ask the supplier to guillotine the sheet exactly to size.

The chassis plan gives the original dimensions, but first check that your substitute parts will fit. Collect the major components together for a benchtop trial layout — remembering to open the tuning capacitor!

The power transformer and the dial unit used in the unit pictured were slightly larger than those by John Moyle, and the chassis has been lengthened accordingly. Although with modern capacitors the chassis depth could be reduced, the original depth was retained to maintain cabinet proportions.

Now mark out the chassis with a sharp scriber. With a fine hacksaw, remove the metal to be cut away at the corners. Don't use tinsnips as they produce a bent edge — all too obvious in the finished chassis. Folding the sides requires a vice



Here are the base connections for the four valves shown in the schematic, to save you having to look them up. From top left (clockwise) are the 6J8, the 6G8, the 6X5 and the 6V6.

and some angle iron. First, with short lengths of angle in the vice, and, working off their ends, carefully line up the scribed marks and bend the tabs at the ends of the sides at right angles. Note that they are set back by the thickness of the metal.

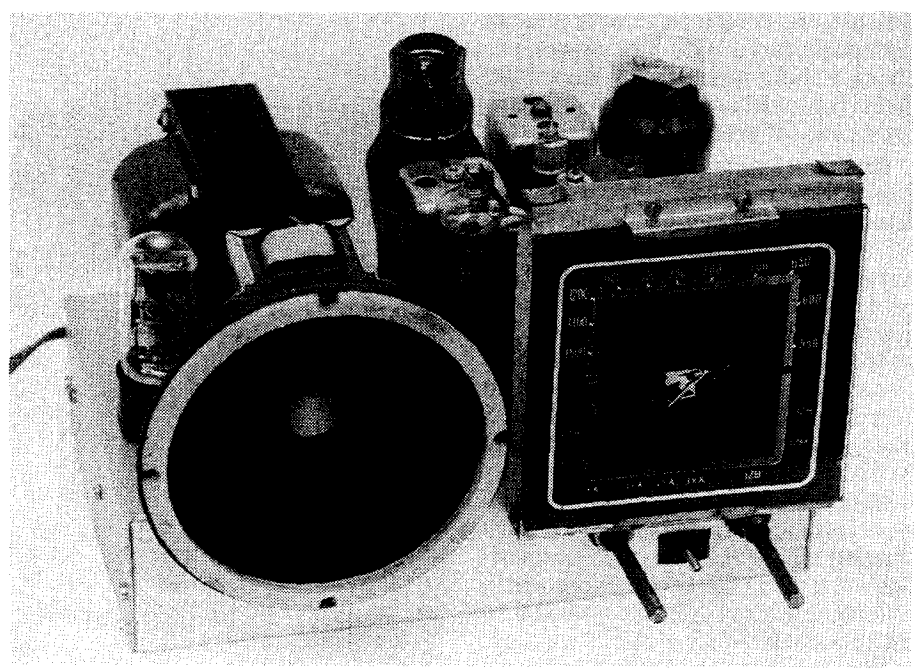
Now, after centring a longer length of angle over the rear jaw of the vice, cut another piece of angle iron to be a few millimetres shorter than the sides of the chassis and position it against the front jaw of the vice. Clamp the chassis with the bending mark in line with the edges of the angle irons. With the aid of a piece of wood (100mm by 50mm is ideal) behind the projecting part of the chassis, carefully fold the chassis forward to form a right-angled bend. Use a hammer on the wood to make the bend as sharp as possible — but NEVER hammer directly on the metal, or unsightly dents will result. Repeat this procedure with the other side and then, with another suitable length of angle iron in front, bend the ends — taking care that the tabs fit inside. Square the chassis up and secure each tab with a screw and nut.

Chassis punch

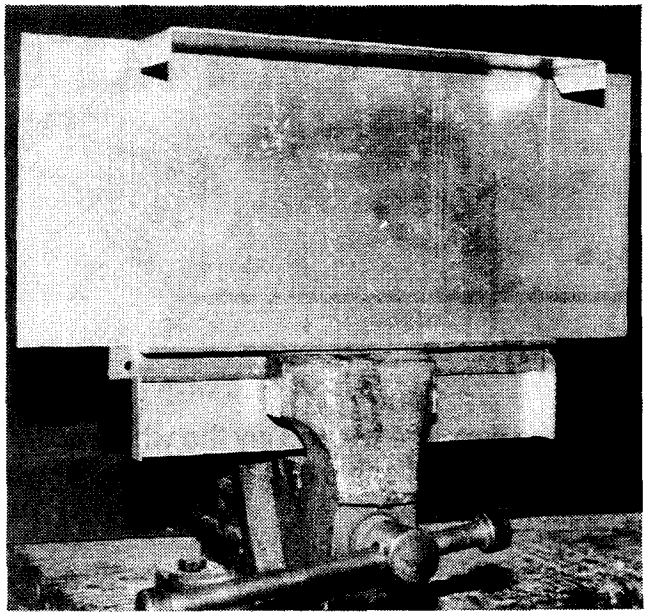
The chassis is now ready for mounting the components. The tools required are minimal, but one tool that will save a lot of work in cutting the valve socket holes is a hole punch consisting of a matching socket and cutter pulled together by a threaded bolt. These are available in various sizes, often from electricians' suppliers, and the 30mm diameter size is suitable for older valve sockets, including octals. Use rubber grommets where power transformer and mains leads pass through the chassis.

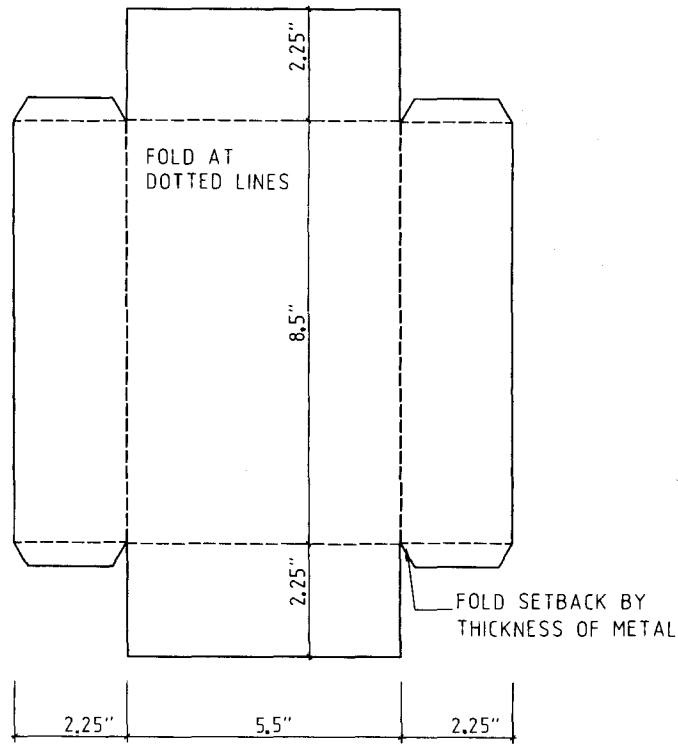
To allow for the thickness of a baffle, mount the loudspeaker back about 3mm from the front line of the dial glass. Depending on the speaker's shape, it may be necessary to provide a small cutout at the front edge of the chassis.

There is nothing critical about the wiring, but keep grid and anode leads as short as possible. Support each end of



The completed chassis. A similar layout was used for all versions, with exact dimensions and orientation dependent on the size of the main components. 6G8-G and 6B8-G IF valves require shielding — this chassis uses a 'goat' type shield (centre rear), which John Moyle also used in the original.





Above: Folding the chassis with two lengths of angle iron in the vice — the front piece being a few millimetres shorter than the side being bent. At right are the dimensions for the original 1940 chassis, which may need to be varied to suit your components.

wire ended components, using tag strips if necessary. To cater for shielded valves, earth pin 1 of all sockets.

Making the cabinet

Complete the project by making a simple cabinet. I have not given any dimensions, as these will depend on the size of the finished chassis. Allow 10mm or so clearance for easy fitting. For the sides, top and bottom use 10mm plywood, but 5mm is best for the front. With a fretsaw or fine coping saw cut out the speaker and dial openings before assembling. Well-fitted butt joints, pinned and glued, are quite sufficient to make a very sturdy box. Round the edges with sandpaper.

The original cabinets were covered with upholstering fabric known by names such as 'Leatherette' or 'Rexine'. Fortunately, equivalents are still used for car head linings. For a nominal charge, a co-operative car upholsterer covered my cabinet with an offcut of a mid-brown liner used for Commodore cars.

A convenient mount for the speaker grill fabric is a piece of heavy cardboard sub baffle, with a cutout to line up with the speaker cone. Stain or paint the cardboard black. Cut the cloth to be a bit larger than the baffle and stretch it out on a flat surface, holding the edges down with cellulose tape. Lightly coat the surface of the cardboard with PVA glue and lay it on the cloth, leaving a weight on it for an hour or so. Too much glue will bleed through the cloth. The cloth can then be trimmed to the edges of the baffle, which can then be fastened inside the cabinet with short screws. Secure the chassis in the cabinet with a long bolt, through a hole near the rear of the centre of the chassis — lining up with a matching hole in the bottom of the cabinet.

How it performs

John Moyle's assertion that for everyday listening, conventional receivers had excess audio gain is vindicated by this little receiver. Performance is more than adequate for urban locations, and with a few metres of outside aerial it is capable of trans- Tasman night time reception. The only practical difference from five-valve sets is that the volume control is used over more of its range.

Aurally the Little General compares more than favourably with its modern counterparts. Mine has recently performed well in keeping me in touch with the world during house painting, gardening and concrete laying sessions — just the type of service that John Moyle had in mind for his outstandingly successful creation. ❖