when building RF amplifier projects to splash out a lot of money to buy the highest gain devices that the pocket will allow. For instance. Devices specified for 470MHz operation offer bags of gain at 144MHz enabling the amplifier strip to be designed, at least on paper, with fewer stages than would otherwise be the case. Don't do it my friend unless you are an acolyte in the black arts. Simple circuits often contain stray resonances at harmonic frequencies and these will cause oscillation if the device in use has enough gain in this part of the spectrum. As a rule of thumb, don't go for more than 10dB stage gain unless the circuitry cancels harmonic terms. Just remember this. Output current flows in the emitter while parametric harmonic current flows in the base.

From empirical experience, I've noted a couple of ways where high gain transistors can be used safely and effectively at HF. For some reason, they seem to be stable when working into transmission line type HF transformers, possibly because the leakage losses damp down VHF and UHF resonances. Similarly a low value resistance — in the region of one or two ohms — in series with the base lead offers a suitable repository for harmonic currents. Perhaps someone reading this has got thoughts on the matter. I would be pleased to hear them.

There is one more caveat. Everything said about using transistors with too much gain for the application applies to small signal devices as well. Harmonic problems can degrade receiver noise figure and produce various modes of UHF oscillation with even the best (and most expensive) devices. Design of RF pre-amps should always acknowledge the parametric effect. The judicious use of low value resistance and ferrite beads will nearly always lead to an improvement and perhaps be essential.

Grid troubles

Remember valves? They're great things and in many ways much easier to use than transistors, especially in high power circuits. They are certainly more robust and you can take liberties with them that you would never dream of with QRO solid state.

Most of the circuits that you see for 2m PAs using the 4CX250B indicates a grid circuit tuned in the manner of **Fig 3.** Furthermore there will usually be a low value resistor — about one kilohm — connected somewhere in the grid circuit "to ensure that the circuit is stable under any conditions". What the designers are really saying is that they can't get the thing stable without slugging it to death.

Very often they attribute the "liveliness" of the circuit to lack of neutralisation. In a way they are right but for the wrong reasons. In a VHF design the instability usually occurs at UHF, mostly in the region of 500 MHz. It happens whether the designer uses the vastly expensive Eimac UHF socket or not. Mostly he thinks that the problem is at signal frequency; manifestations of instability are there but the problem is higher up the spectrum.

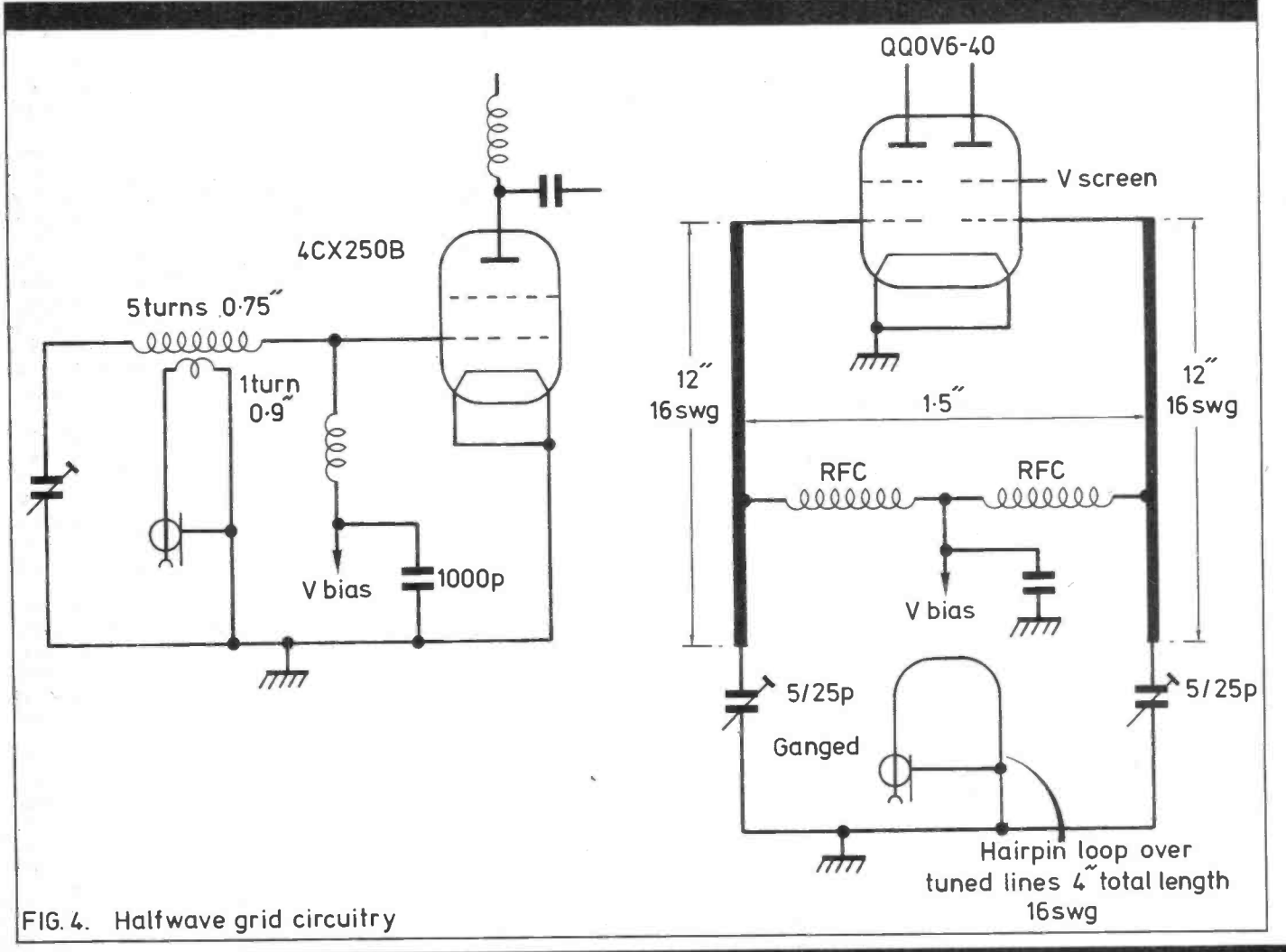

FIG. 4. Halfwave grid circuitry