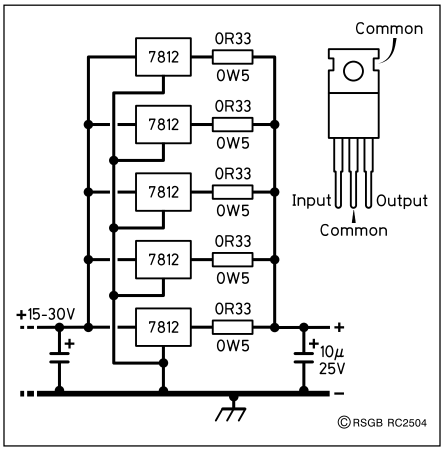

Fig 5: Circuit diagram of the stabilised power unit, providing 12V regulated output at up to 5A.

audio harmonics due to the magnet core. The end paragraph on page 11 of David Owen's 'Alternating Current Measurements' (Methuens's Monogrtaphs on Physical Subjects, 1937) throws some light."

He also draws attention to 'The Crystal Radio' - subtitled 'What's old is new again!' by Dave Evison, W7DE, (*QST*, December 1997, pp56-57) although this presents the conventional circuit diagram (**Fig 4(a)**) with the diode tapped down the coil and a 1000pF capacitor connected across the headphones. W7DE emphasises that building a crystal set is one of the few ways of "reaching today's kids" with the true magic of radio buried under layers and layers of complicated hardware that needs to be stripped away to reveal radio in its purest form.

But G3MXV has surely shown that even the humble crystal set can throw up some interesting experiments that can confound accepted practice as well as (possibly) providing a means of interesting youngsters in radio in their pre-teen years.

STABILISED 12V OR 13.8V AT 5A

KLAAS ROBERS, PA0KLS,in *Electron* (October 1999, pp439-441) provides some useful hints on how low-cost three-terminal voltage regulator chips can be used to stabilise the output of power supplies at 12V at up to 5A, simply by using up to five 7812 chips in parallel: see **Fig 5.** The output voltage can be increased to 13.8V by connecting three 1N4001 diodes, as shown in **Fig 6.** To provide heat sinking, he mounts the 7812 chips on the sides of the metal box enclosing the PSU. A simple enough dodge, although I cannot recall having seen this idea in print. **Fig 7** shows some alternative ways of raising the output to 13.8V: (a) using a pilot bulb to replace the 270Ω 1W resistor. (b) To provide switched 12V or 13.8V output. (c) To set the output voltage to any required value between 12V and 13.8V. Presumably more or less 1A regulator chips could be connected in parallel to meet other current requirements, provided each regulator feeds through a 0.33Ω 0.5W resistor.

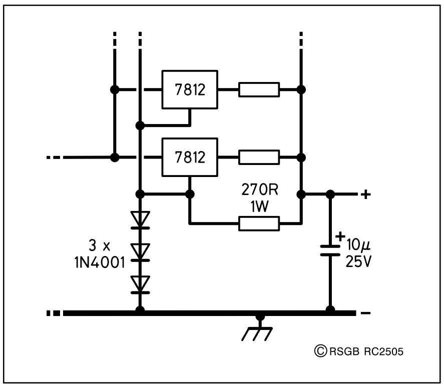

Fig 6: Output voltage can be increased to 13.8V by inserting three 1N4001 diodes in the ground lead.

The technique of raising the 'ground' terminal of a three-terminal regulator IC to increase the output voltage is well established and is featured also in an article by Sam Ulbing, N4UAU 'Getting more voltage out of a regulator IC' (*QST*, January 1999, pp45 & 65). He shows how (**Fig 8**) by properly selecting the values of R1 and R2, the LM7805's output voltage can be made to be any value between 5V and 1.5V less than the voltage applied to the regulator's input, as an alternative to a series string of diodes which will each add about 0.6V to the output. With the values shown, output is 9V when using ¼W 5% tolerance carbon-composition or film resistors. Other output voltages can be obtained from the equation: Vout = 5V + (5V/R1 + Iq) x R2, where Iq is the quiescent current of the regulator, which varies somewhat with input voltage, temperature, and with individual devices. N4UAU suggests it is wise to make the Iq portion of the current through R2 small.

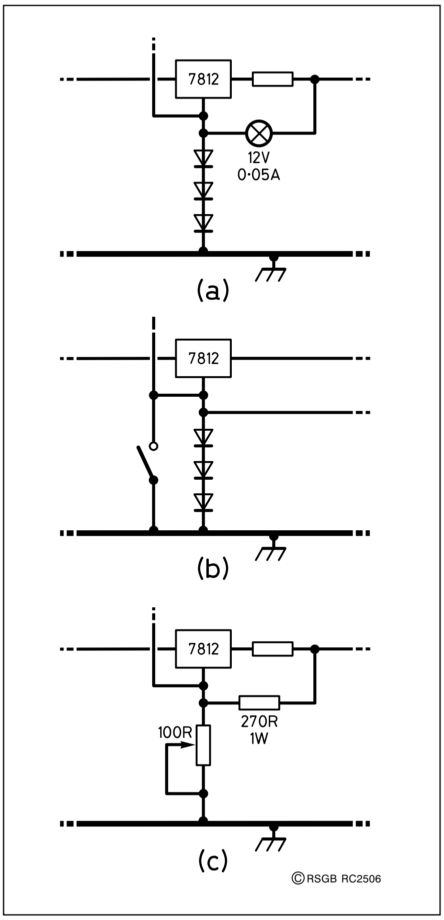

Fig 7: Alternative methods of providing 13.8V output (b) with switch closed for 12V.

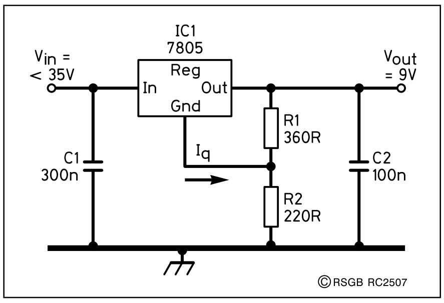

Fig 8: By selecting suitable values of R1 an R2 (see text), the output of the 5V regulator can be made to be any value between 5V and 1.5V less than the voltage applied to the input of the 7805.

Similarly, in an item 'High-power, low-cost supplies' in the 'Circuit Ideas' feature of *Electronics World* (January 1999), A J Bird points out that a Zener diode can be used instead of a string of diodes (**Fig 9(a)**), and that for high-current a bypass transistor can be used (**Fig 9(b)**) with suitable heat-sinking.

THE KOELN E52 FILTER

HORST STEDER, DJ6EV, was especially interested in the item on the elaborate IF filter used in the German wartime Koeln E52 receiver (September *TT*, Fig 1, page 54). He writes: "Because I have been interested for years in the special characteristics of this form of crystal filter based on the work of W Kautter (*Telefunken Zeitung* No.76 & No.77,

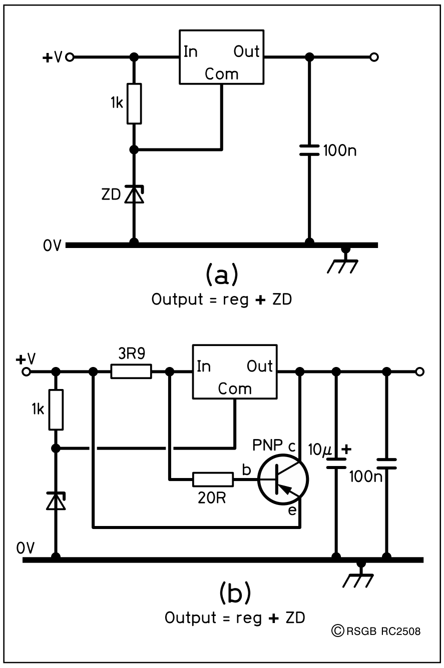

Fig 9: (a) Use of a Zener diode to increase the regulated voltage. (b) For high currents, a suitable series bypass transistor (with heat sinking) may be used.

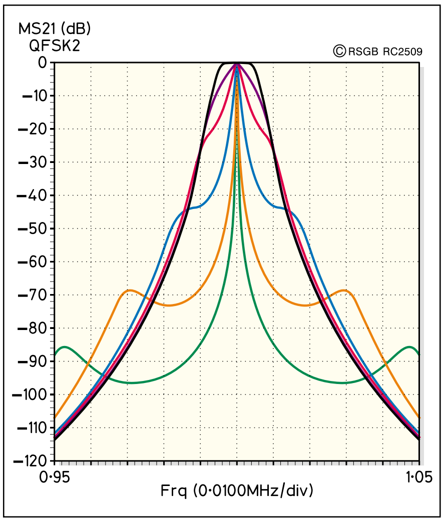

Fig 10: Response curves of the E-52 filter (modelled with the ARRL Radio Designer software) without the 8-pole LC filter at various settings of the continuously-variable bandwidth control.

1937), I can give some additional information about this filter. It was used in several German wartime receivers with IFs ranging from 352kHz to 1MHz.

"Briefly, the 6-pole LC preceding the dual section crystal filter was not an overkill to suppress possible spurious crystal responses (in fact the crystals used in these filters were carefully cut and selected to suppress such responses) but was absolutely necessary to compensate for an undesirable effect of the crystal filter which is nowhere mentioned. Based on the bandwidth control mechanism through symmetrical detuning of the terminating LC circuits, the stopband rejection would otherwise be quite insufficient at the narrower bandwidths.

"A while ago I modelled the filter chain of the E-52 using the ARRL-Radio Designer software, based on the circuit values and the bandwidth specifications (10kHz/3dB to 26kHz/60dB and 0.2kHz/3dB to 4kHz/6)dB) given in the operator's manual of the E-52. See **Fig 10** and **Fig 11**, which show response curves derived from screenshot illustrations for various bandwidth settings. Fig 10 shows the responses of the dual-section crystal filter alone, while Fig 11 shows the responses with the 8-pole LC filter (note the different frequency scaling on the two illustrations). The roughly symmetrical peaks appearing in the stopband are in fact the resonances of the detuned LC circuits.

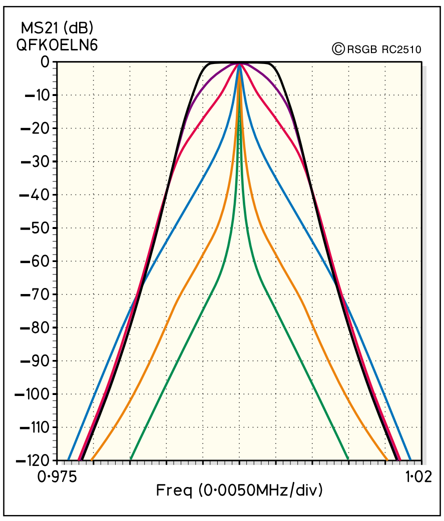

Fig 11: The E-52 filter with the 8-pole LC filter. Note that the curves are plotted with a different frequency axis.

"The 8-pole filter (together with the additional 2-pole band filter preceding the demodulator stage) thus assures the exceptional total stopband rejection of over 130dB as given in PA0AOB's paper.

"The computer modelling moreover shows another very undesirable effect, inherent with this method of bandwidth control. In the intermediate settings towards narrower bandwidths, the response curve immediately loses its nice flat-top and deteriorates into a relatively narrow peak response with very shallow slopes. Only in the extreme bandwidth settings do the responses look very good. This effect was mentioned by Kautter in his second paper (*Telefunken Zeitung* Nr.77) but was 'forgotten' or 'overlooked' in all of the subsequent descriptions of this filter. These later articles show the response curves only for the maximum and minimum bandwidth settings, and they look good!"

"I found only one relevant reference in a Telefunken publication, showing the numbers for a 0.7kHz/3dB setting as 11kHz at 40dB, 20kHz at 60dB! Thus, this elegant method for continuously variable bandwidth control has its drawbacks. But one has to consider that at the time these filters were built, QRN was much more of a problem than QRM. Also, the narrowest bandwidth setting of <200Hz still provides very good selectivity, even for today's environment. For this reason the E-52 is still much loved by CW enthusiasts.

"These characteristics probably prompted Telefunken to abandon this form of bandwidth control after the war, in favour of crystal filters with bandwidth control through variable coupling (IF 525kHz). Although this meant abandoning continuously variable control in favour of four switched positions (6kHz, 3kHz, 1kHz and 0.2kHz) with elaborate alignment of the two filter sections (6 trimmers per bandwidth-setting for centre frequency and neutralisation!) the resulting response curves look better, especially at 3 and 1kHz."

MATTERS ARISING

FRED WARD, G2CVV, spotted an error in the text of the item on 'New life for the FT-200/250' (*TT*, November 1999, p62). The text suggests "It may be easier to wire the pins 1, 4 and 5 together before installing the bases" [for the two 6146B valves]. This should have read "pins 1, 4 and 6", as correctly shown in Fig 5. Apologies!

JESPER FOGH BANG draws attention to two errors in Fig 1 of the October, 1999, item on 'Efficient Short Meander Antennas' which illustrated three of the many folded dipole antennas developed by Dr Kraus, W8JK, in the 1940s. While the conventional half wave folded dipole in (a) is correct, in both (b) and (c) the two antennas should be open-circuited in the top wire. An amended diagram is shown in **Fig 12**. This item was concerned primarily with the very short multi-element meander monopole and dipole antennas using a constructional technique resembling the old caged dipole, but with the wires in series rather than parallel. Surprisingly, although the *TT* item reproduced correctly the claims on radiation efficiency and bandwidth made by the authors of the paper in the professional journal *IEEE Transactions on Antennas & Propagation* (for which all papers are refereed by professional engineers), it seems clear that the claimed performance cannot be reproduced. There seems little doubt that the radiation resistance of antennas using the information in the paper must be very low, so that the radiation efficiency will be adversely affected by the appreciable ohmic losses of the thin No.26 American gauge wire used for the folded sections other than the central tubing.

While ohmic losses could be reduced by using larger diameter copper wire, this is still likely to prove an unduly lossy antenna compared with a normal half wave resonant dipole or the relatively simple folding developed by Dr Kraus, or the forms of resonant meander antennas discussed in *TT* February 1992 (see also *Technical Topics Scrapbook, 1990 - 94*, p130). It seems that all attempts to develop physically very small antennas still run into the low efficiency problems ascribed by classical theory to electrically small antennas. ♦

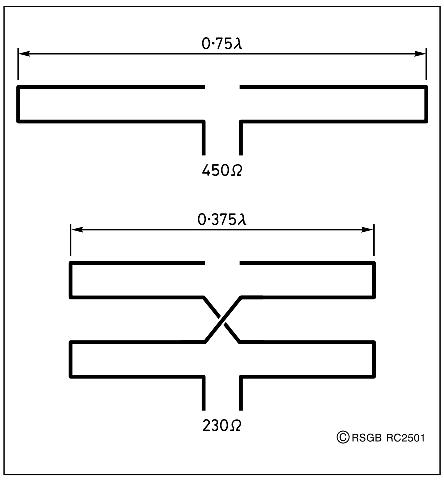

Fig 12: Corrected diagrams for the Kraus 0.75λ and 0.375λ folded dipoles.