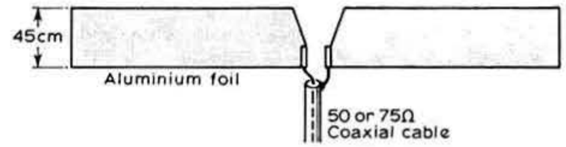

Fig 5. Broad-band aluminium foil aerial. For dimensions see text. Directivity patterns can be changed by having the two foil sections in the same or different planes (eg 180° or 90° or 45° angle between foils).

3·5MHz, 2 by 12m; 7MHz, 2 by 6·2m; 14MHz, 2 by 3·4m. The idea reminds one of the inbuilt vfm/fm aerials in some broadcast radio receivers. It is possible that this could be quite an effective method of constructing loft, room or wall aerials, with broad-band characteristics making it easier to achieve a good match than with most thin-wire indoor aerials. By having the foils at different angles (ie in the form of a short Vee) it should be possible to achieve near-omnidirectional radiation.

Vertical angles again

Over recent months we have included quite a number of comments on low angle radiation and reception (eg the April *TT*) and we have no wish to become a bore on this subject. But one or two additional relevant points have turned up.

For example, a recent paper by Dr E. N. Branley of the Radio & Space Research Station (*Proc IEE*, February 1971) refers very briefly to a recent series of field-strength measurements made at Ditton Park on pulse transmissions over a 3,300km path (actually, we understand, from Cyprus). Large variations in the angle of elevation of a given propagation mode, as *deduced* from observed changes of ionospheric equivalent height and relative lines of travel of the signals, were noted during a year's observations on 10, 17 and 23MHz. On each of these frequencies, the deduced angle of elevation of single-hop F mode ranged from 1° to 10°, while for two-hop it was from 12° to 24°. So here again is further evidence that, for long-distance single-hop working, angles right down to around 1° would be desirable—if only these could be achieved more readily in practice.

It has been indicated on several occasions that one approach to low-angle operation is the use of extremely large ground mats or other natural or man-made ground planes. But there is apparently an alternative approach, which is more or less the exact opposite, making use of *poor* conductivity. This technique is discussed in a paper by E. O. Willoughby and H. Mitt in *Proc IREE Australia* (November 1969) which describes the use of wire mesh aerials over grounds of high Brewster angles. The following is a brief extract: "One of the greatest difficulties in obtaining low angles of fire at vhf and hf is the large area of ground necessary to develop the radiation pattern by ground reflection from a relatively high angle. As an alternative approach, wire mesh aerials were developed with a null along the mesh plane and radiation lobes of opposite polarity above and below this plane. By mounting this mesh a quarter-wave or less above a ground of concrete or bitumen, for vhf, or sand or arid rocky country.... radiation components at low angle of fire above and below the mat add substantively in phase to produce low angle radiation." The paper describes a 110MHz aerial using a 16λ mesh (140ft long). Whether this particular technique has any application to amateur operation seems a bit uncertain, but it is an interesting concept.

Reflectors under dipoles

Ted Cook, ZS6BT, wonders if anyone else has thought of hanging a parasitic reflector a half-wave below a conventional dipole. He has been experimenting with this idea with, as he puts it, "interesting results".

He points out that the use of driven elements stacked a half-wave above one or another is accepted practice (Sterba curtain, Lazy-H etc). And, of course, the advantages accruing from mounting a dipole a multiple of a half-wave above ground have long been recognized. So why not use an artificial ground wire?

ZS6BT writes: "The rules say that if two elements are spaced a half-wave apart, the current in the interfering dipole will be in phase with the driving element and the pattern will be broadside. The rules also indicate that changing the phase slightly will cause the pattern to change from a right-angled broadside; the phase may be changed by varying the spacing or by varying the reactance of the reflector.

"Radiation from a dipole, if viewed from the end, may be represented by a dot in a circle. If a parasitic reflector is used at half-wave spacing the pattern looks more like a dumb-bell. If stacked horizontally, the elements would tend to minimize the up-and-down radiation and concentrate it forwards and backwards, with an increase in gain. I leave it to readers to consider all the implications!

"What goes for a dipole goes for a centre-fed co-linear or a multi-band G5RV with two or more in-line reflectors for each of several bands and each set of reflectors 'doing its own thing'. The use of reflectors should not change the lobe pattern but only increase gain. However, the lobe pattern *might* be changed; for example, a $\frac{3}{2}\lambda$ dipole might have one central reflector or two (in-line) end reflectors, or three in-line reflectors; or two in-line reflectors might have inner ends close together or wide apart; on top of all this is possible change of phase.

"Basically, reflectors should not be shorter than 492/*f* feet (where *f* is in MHz), and the spacing should have a similar dimension. It would seem preferable to make each reflector a half-wave, rather than to hang (say) a $\frac{3}{2}\lambda$ wire below a $\frac{3}{2}\lambda$ top. Reflectors could be made physically shorter, and then fitted with tuning stubs for phase adjustment."

One suspects that for maximum effect, the original height of the dipole would need to be fairly high, and that in such circumstances there is no reason why one should not opt for a Lazy-H. Nevertheless the whole idea seems well worth considering—and preferably investigating further: after all, as ZS6BT points out, "there are still many assorted types of dipoles in use—why not try and improve them."

Recharging batteries with "dirty dc"

Some time ago (*TT*, May 1966, and subsequently in *ART2/3*), Joe Cropper, G3BY, drew attention to an effective technique for re-charging dry batteries which he termed "dirty dc" and which had originally been described in *Wireless World* in October 1955, after originating in the Netherlands. He

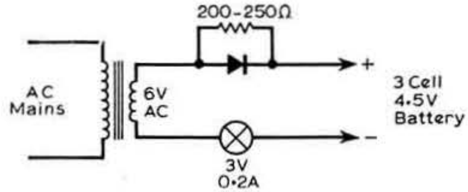

Fig 6. The "dirty dc" charger as suggested by G3BY

mentioned that he had found the system extremely satisfactory in the recharging of cycle batteries used with transistorized field-day equipment. We must admit that although this seemed an excellent way of cutting down the cost of batteries used not only for radio equipment but generally around the home, there has been very little "feedback" from readers suggesting that the technique has been taken up widely. Fig 6 is the circuit diagram of the "dirty dc" charger used by G3BY.

So it was with some interest to find in the Swiss journal *Old Man* (No 3, 1971) an article by Michael Windolph, K8YUC, reprinted from *73 Magazine*. This describes a "reverse-current charging" (asymmetrical ac charging) technique recently investigated in the USA by Donald Vargo of the Lewis Research Centre and found highly effective, not only for recharging a dry battery "even higher than its bought-new charge" but also allowing charging to be carried out at much higher rates than with conventional charging of secondary cells.

Guessed it? Reverse-current charging is our old friend "dirty dc" charging. My only real excuse for referring to this recent article is that it does seem amply to confirm G3BY's belief in the system. It indicates that many successful recharges can be made of ordinary carbon-zinc batteries, and that other cells, including nickel cadmium and lead acid, can be recharged more quickly and more effectively. K8YUC notes that with carbon-zinc cells "it is better to recharge when these have dropped only to 1·3V, since after this point the cell begins to develop holes in the zinc, with consequent drying out and deterioration. However, even a cell with small holes can be rejuvenated with reverse-current charging.

In practice, as our earlier item pointed out, all that is needed is to wire a suitable resistor across the diode rectifier. K8YUC suggests that this resistor should be such that the reverse current should be about 10 per cent of the forward current; the resistor should of course be of suitable power rating. He provides a circuit for use on 117V mains; with 240V mains it is more economical to use a step-down transformer as suggested by G3BY.

If the idea is as good as it appears to be, one hesitates to calculate how many batteries could have been saved in the past 17 years. One only hopes that Ernst Been got some return on his patent No 2752550 (if only from battery manufacturers anxious that the idea should not be too widely used!). Rather ironically the same subject of battery recharging turns up in the Dutch journal *Electron* (No 3, 1971) but only in the form of a diode in series with a 240V 25W lamp—and absolutely no sign of any dirty component. A prophet is seldom recognized in his own home country!

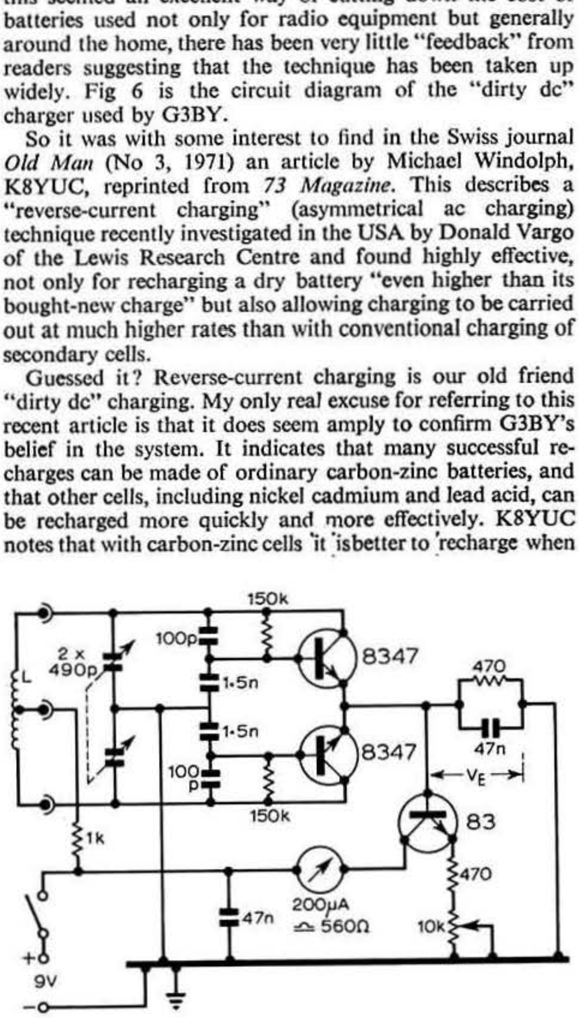

Fig 7. The F3GZ meter for 160kHz to 21MHz. The low-frequency coils are adapted from broadcast units. 450–850kHz, 2 × 80 turns on 22mm former with 20mm ferrite core; 850–1,750kHz, 2 × 55 turns on 26mm former; 1,700–3,400kHz, 2 × 29 turns on 22mm former; 3,200–6,400kHz, 2 × 14 turns on 16mm former; 6,200–12,400kHz, 2 × 5 turns on 9mm former; 12,000–21,500kHz, 2 × 2·5 turns on 6mm former. In practice, British constructors may have to adjust coil windings to suit their requirements

Carbon mics

Recalling the many stations which used to make effective use of carbon microphones in the 'thirties—some achieving very good results for example with home-made "transverse current" types and double-button units, it has often seemed a little puzzling that so little attention is given these days to a device in which, in effect, the transducer is also an amplifier.

Barry Priestley, G3JGO, has clearly also been thinking along these lines. He writes: "I only realized recently that the MPT was still using carbon microphones but with the exciting current reduced 'now they have discovered the closed magnetic circuit for transformers'. The quality and absence of hiss resulting from the low currents would not degrade most ssb rigs. Is the crystal microphone an expensive non-essential?"

On the subject of quality and ssb, it may not be widely known that the BBC operates a number of point-to-point ssb links to provide programme feeds to their overseas relay stations. Even on music they obtain good quality circuits in this way—this calls for an order of frequency stability better than 2Hz. But instead of the usual communication-type 250-3,000Hz filters, they specify 90-6,000Hz. A description of some of the special techniques involved appears in *Point-to-Point Communication* (January 1971). We mention this not to encourage amateurs to broaden their signals but just to emphasize that quality on ssb can be what you want it to be.

Low-frequency gdo/wavemeter

One hesitates to include "yet another" dip-meter circuit. An excuse in this case, however, is that only rarely are published designs intended for use right down to about 160kHz. But this is stated to be the lowest limit of a unit described by G. Lagardere, F3GZ in *Radio-REF*, No 4, 1970; upper limit is 21MHz using a series of plug-in coils. The good low-frequency coverage is stated to result, in part, from the use of a symmetrical push-pull oscillator. While the original model used type 8347 npn surplus transistors, F3GZ suggests that 2N706A or 2N2369 could be used equally well. A third transistor (npn type 83, but again hardly likely to be critical) is used to amplify the