

# R.S.G.B



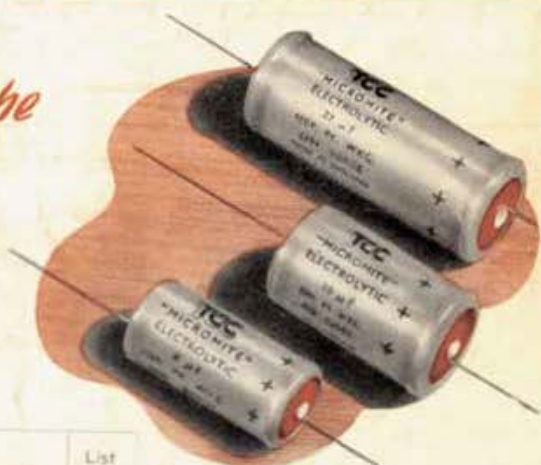
# BULLETIN

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	Peak Wkg.	Surge	Length	Diam.			
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15 $\mu$ F	450	550	1 1/2	1 1/2	130	CE 92 PE	5/-
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16 $\mu$ F	350	400	2 1/2	1 1/2	120	CE 91 LE	4/-
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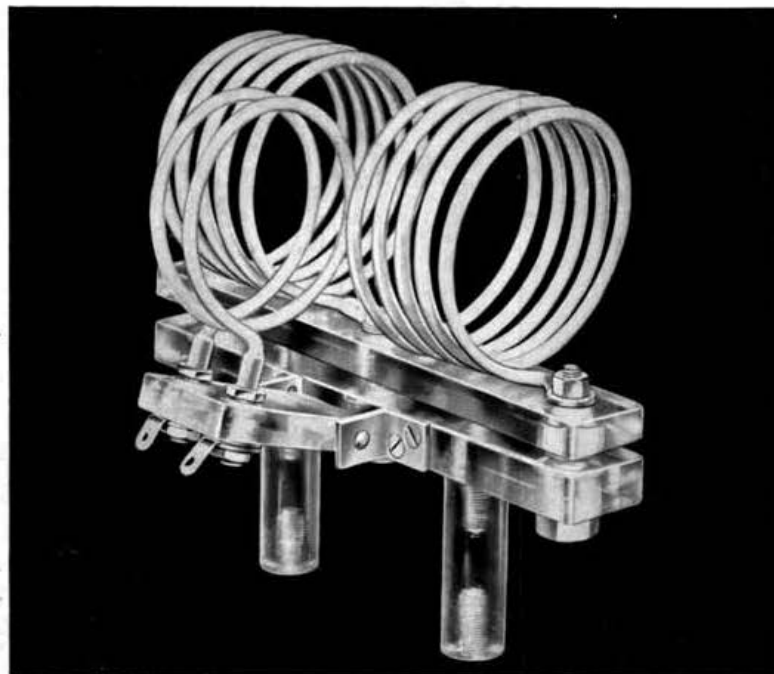
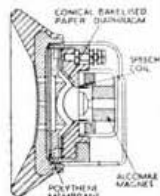
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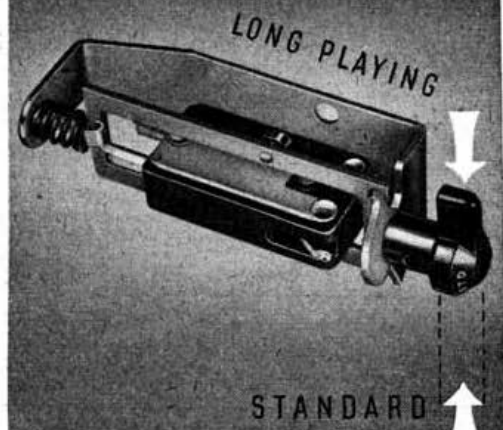
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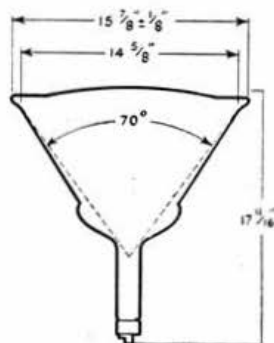
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## R.S.G.B. Bulletin

Vol. xxvii No. 12.

June 1952

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# Forthcoming Events

## REGION 1

**Bury.**—July 10, 7.30 p.m., Y.M.C.A., The Rock.  
**Chester (C. & D.A.R.S.).**—Tuesdays, 7.30 p.m., Tarran Hut, Y.M.C.A.  
**Crosby.**—June 24, July 8, 8 p.m., over Gordon's Sweet Shop, St. John's Road, Waterloo.  
**Darwen & Blackburn.**—August 1, 7.30 p.m., Y.M.C.A., Limbrick, Blackburn.  
**Liverpool.**—June 28, 2.30 p.m., Larkhill Mansion House, West Derby.  
**Manchester.**—First Monday, 7.30 p.m., College of Technology, Sackville Street.  
**Preston.**—June 20, July 4, 18, 7.30 p.m., Three Tuns Hotel, North Road.  
**South Manchester (S.M.R.C.).**—Alternate Fridays, 7.30 p.m., Ladybarn House, Mauldeth Road.  
**Southport.**—June 23, July 7, 21, 8 p.m., Y.M.C.A., off Eastbank Street.  
**Warrington (W. & D.R.S.).**—First and third Tuesdays, 7.30 p.m., King's Head Hotel.  
**West Cumberland.**—July 5, 7 p.m., Kells Community Centre, Whitehaven.  
**Wirral (W.A.R.S.).**—June 25, July 9, 23, 7.45 p.m., Y.M.C.A., Whetstone Lane, Birkenhead.

## REGION 2

**Barnsley.**—June 27, July 11, 7.30 p.m., King George Hotel, Peel Street.  
**Bradford.**—June 24, 7.30 p.m., Cambridge House, 66 Little Horton Lane.  
**Catterick & Richmond.**—Wednesdays, 7 p.m., Loos Lines, Catterick Camp.  
**Darlington.**—Thursdays, 7.30 p.m., 129 Woodlands Road.  
**Doncaster.**—July 9, 7.30 p.m., Black Bull, Market Place.  
**Gateshead.**—Thursdays, 7 p.m., Y.M.C.A., Sutherland Hall, Durham Road.  
**Hull.**—June 25 (General), July 9 (Beginners), 7.30 p.m., R.E.M.E. Canteen, Walton Street.  
**Middlesbrough.**—Thursdays, 7.30 p.m., Joe Walton's Boys' Club, Feversham Street.  
**Newcastle-upon-Tyne.**—June 23, 8 p.m., British Legion Rooms, 1 Jesmond Road.  
**Pontefract.**—June 26, July 10, 8 p.m., Fox Inn, Knottingley Road.  
**Rotherham.**—Wednesdays, 7 p.m., Cutlers Arms, Westgate.  
**Scarborough.**—Thursdays, 7.30 p.m., L.N.E.R. Rifle Club, West Parade Road.  
**Sheffield.**—June 25, 8 p.m., Dog and Partridge, Trippett Lane; July 16, 8 p.m., Albreda Works, Lydgate Lane.  
**Slithwaite.**—Fridays, 7.30 p.m., 3 Dartmouth Street.  
**Sunderland.**—June 25, July 9, 7.30 p.m., 16 North Bridge Street.  
**York.**—Wednesdays, 7.30 p.m., Club Rooms, Y.A.R.S., Fetter Lane.

## REGION 3

**Birmingham South.**—July 6, 20, 10.30 a.m., Stirchley Institute.  
**Coventry.**—June 27, 7.30 p.m., Priory High School, Wheatley Street.  
**Kenilworth, Warwick & Leamington.**—June 19, July 17, 7.30 p.m., Dalehouse Lane.  
**Rugby.**—July 1, 7.30 p.m., Public Library, St. Matthew Street.  
**Stourbridge (S. & D.R.S.).**—July 1, 8 p.m., King Edward's School.  
**Worcester (W. & D.A.R.C.).**—Thursdays, 7 p.m., City Library (basement), Foregate Street.  
**Wrekin (W.A.R.S.).**—Mondays, 8 p.m., Y.M.C.A. Canteen, Wellington.

## REGION 4

**Alvaston.**—Tuesdays and Thursdays, 7.30 p.m., Sundays, 10 a.m., Nunsfield House, Alvaston, Derby.  
**Chesterfield.**—June 17, July 1, 15, 7.30 p.m., Bradbury Hall, Chatsworth Road.  
**Derby (D. & D.A.R.S.).**—June 18, 25, 7.30 p.m., Derby College of Arts and Crafts (sub-basement), 119 Green Lane.  
**Leicester (L.R.S.).**—June 16, July 7, 7.30 p.m., Hollybush Hotel, Belgrave Gate.  
**Mansfield (M. & D.A.R.S.).**—July 6, 3 p.m., Swan Hotel.  
**Newark.**—June 22, July 6, 7 p.m., Northgate House, Northgate.  
**Northampton (N.S.W.C.).**—Fridays, 6 p.m., July 4, 7 p.m., Clubroom, 8 Duke Street.  
**Retford.**—July 6, 3 p.m., Community Centre, Chapel Gate.  
**Workshop.**—July 7, 7 p.m., King Edward Hotel.

## REGION 5

**Chelmsford.**—July 1, 7.30 p.m., Marconi College, Arbour Lane.

**Ipswich.**—Second and last Wednesdays, 7.30 p.m., T.A. Drill Hall, Woodbridge Road.  
**Southend.**—June 26, 7.45 p.m., G2BHA, 27 Park Road.

## REGION 6

**Gloucester.**—Alternate Thursdays, 7.30 p.m., Spread Eagle Hotel, Market Parade.  
**High Wycombe.**—June 24, 7.30 p.m., G5WW, Nethercote, Totteridge.  
**North-West Wilts.**—Fridays, 8 p.m., G3HXA, London Road Inn, Calne.  
**Southampton.**—July 5, 7.30 p.m., 22 Anglesey Road, Shirley.  
**Stroud.**—Wednesdays, 7.30 p.m., Subscription Rooms.  
**Swindon.**—June 21, July 19, 7.30 p.m., Connaught Rooms (off Regent Street).

## REGION 7

**Acton, Brentford, Chiswick.**—Tuesdays, 7.30 p.m., A.E.U. Rooms, 66/68 High Road, Chiswick, W.4.  
**Barnes & Richmond.**—Second Tuesday, 7.30 p.m., 308 Upper Richmond Road, East Sheen, S.W.14.  
**Bexley (N.K.R.S.).**—Second and fourth Mondays, 7.30 p.m., Freemantle Hall.  
**Bromley, Kent (N.W.K.A.R.S.).**—July 6, 7.45 p.m., The Shortlands Tavern, Station Road, Shortlands.  
**Chingford.**—June 19, July 3, 8 p.m., A.T.C. Headquarters, Pretoria Road, E.4.  
**Dulwich & New Cross.**—July 7, 7.45 p.m., The Kentish Drovers, Rye Lane, Peckham.  
**East Ham.**—Summer recess.  
**East London District.**—Summer recess. Next meeting September 28, 3 p.m., Ilford Town Hall.  
**East Molesey (T.V.A.R.T.S.).**—July 2, 8 p.m., Carnarvon Castle, Hampton Court.  
**Enfield.**—July 20, 3 p.m., George Spicer School, Southbury Road.  
**Finsbury Park.**—June 17, July 22, 7.30 p.m., 164 Albion Road, Stoke Newington, N.16.  
**Hayes & Uxbridge.**—July 4, 7.30 p.m., The Vine, Uxbridge Road.  
**Holloway (G.R.S.).**—Mondays, Wednesdays and Fridays, 7.30 p.m., Grafton School, Eburne Road, N.7.  
**Grays.**—June 20, 8 p.m., Bairds Cafe, Orsett Road.  
**Guildford & Woking.**—July 7, 3 p.m., visit Vickers-Armstrong's, Weybridge, 2.30 p.m. (names to T.R. by June 30).  
**Hendon & Edgware (E.D.R.S.).**—June 25, July 2, July 9, July 16, 8 p.m., St. Martin's School, 22 Goodwin Avenue, Mill Hill.  
**Hoddesdon.**—July 3, 8 p.m., Salisbury Arms.  
**Ilford.**—Thursdays, 8 p.m., 579 High Road.  
**Kensington & Shepherds Bush.**—July 11, 8 p.m., 38 Royal Crescent.  
**Lewisham (R.A.R.C.).**—Summer recess.  
**Norwood.**—July 19, 7.30 p.m., 35 Grangecliffe Gardens, South Norwood.  
**Slough.**—Third Thursday, July 17, 7.45 p.m., Golden Eagle, High Street.  
**Southgate.**—July 10, 7.30 p.m., Arnos Secondary Modern School, Geography Room, Wilmer Way, New Southgate.  
**Sutton & Cheam (S. & C.R.S.).**—July 1, 15, 7.30 p.m., Sutton Adult School, Benhill Avenue.  
**Watford (W.R.A.T.S.).**—June 17, 7.45 p.m., July 1, 13, "Cookery Nook," The Parade.  
**Welwyn.**—July 8, 8 p.m., Council Offices, Welwyn Garden City.

## REGION 8

**Brighton (B.D.R.C.).**—Tuesdays, 7.30 p.m., Eagle Inn, Gloucester Road. (E.B.S.W.C.).—Thursdays, 7.30 p.m., 27 Warren Avenue, Woodingdean.  
**Chatham (M.A.R.T.S.).**—Mondays, 7.30 p.m., Co-operative Hall, Luton Road.  
**Eastbourne.**—June 26, July 10, 24, 7.30 p.m., Swallow Cafe, 333 Seaside.  
**Gillingham (G.T.S.).**—Alternate Tuesdays, 7.30 p.m., Medway Technical Institute.  
**Hastings (B. & H.R.C.).**—June 17, July 1, 15, 29, Saxon's Cafe, Sea Front.  
**Isle of Thanet (I.O.T.R.S.).**—Fridays, 7.30 p.m., George Hotel, Hawley Street, Margate.

## REGION 9

**Bath.**—June 16, 7.30 p.m., Y.M.C.A., Broad Street.  
**Bristol.**—June 20, July 18, 7 p.m., Carwardine's Restaurant, Baldwin Street, Bristol, 1.

(Continued on Page 556)



# R.S.G.B. BULLETIN

Official Journal of the

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## ACCENT ON V.H.F.

RARELY does an issue of this magazine pass without the appearance of some contribution or other towards the fund of knowledge about the very high frequencies. Perhaps it takes the form of a modest note somewhere in *Around the V.H.F.s*; or maybe it consists of an article marking a major step forward in the v.h.f. art.

All such have their merits.

The smaller month-by-month additions to v.h.f. knowledge can only be recalled by a look-back over past years of the BULLETIN—an exercise which reveals their cumulative value.

Among the larger contributions it can be said that milestones have been erected from time to time by such articles as those by E. A. Dedman (G2NH) who in 1949 in *The Proceedings of the R.S.G.B.*, laid down much of the fundamental technique which is observed today; by D. N. Corfield (G5CD) with his masterly expositions on equipment for 70 centimetres; by W. H. Allen (G2UJ) for his very practical 2-metre converter and, later, his grounded-grid amplifier which in little more than a year has become a classic; but the list is a long one and mention even of these three "v.h.f. architects" is almost invidious.

To these may be added the various contests on the metre and centimetre bands, sponsored by the Society, catering for those who wish to "go portable," or stay at home in comfort, or explore the many mysteries of 420 Mc/s.

Truly, in one way and another, there is plenty of diversity—and plenty of opportunity—in v.h.f. in its many aspects.

Yet it cannot be denied that activity on the v.h.f. bands is still on too modest a level. Hazarding a rough guess we would say that perhaps 10 per cent. of the membership operate on them (the regular v.h.f. man might feel inclined to say that 10 per cent. was optimistic). Of the possible reasons that may be adduced for this lack of activity one is paramount, and that is the apparent technical snags that loom so forbiddingly before the newcomer to v.h.f. as to discourage him for ever. An attempt is therefore being made in the current issue to show that first steps on two need not be halting ones—but to prove at the same time that it is a good idea to learn to walk before you try to run!

Also in this issue is announced the institution of an entirely new type of v.h.f. contest. It is called *The Regional V.H.F. Ladder* and it aims to promote increased activity on our v.h.f. bands not by means of a single spasmodic contest but on the basis of the individual station's all-the-year-round performance.

No contest is perfect—as last month's editorial attempted to show. And, although the rules for the *V.H.F. Ladder* have been carefully considered over many months by the Contests Committee and the Council, experience may show how they can be improved after, say, a year's run.

The rules for the ladder have been kept as simple as possible. Indeed, participants will be very much on their honour! A prudent proviso states that proof of contact may be required—which will prevent an operator from making a donkey of himself by entering claims which, when the 12-monthly tally is made, he cannot substantiate.

Criticism of the *V.H.F. Ladder* there is bound to be, and that is all to the good by stimulating the flow of ideas on the subject. Criticism, too, there may be, on the grounds that such a contest is "undignified" and not in keeping with the scientific basis on which the Society rests. Such a view, one imagines, will command respect but will be rejected as a little outdated in these days of competitive Amateur Radio. If the ladder fosters greater enthusiasm for and greater occupancy of the v.h.f. bands; stimulates the flow of material to the V.H.F. Editor; and at the same time meets the widespread wish for good-tempered competition, then it will fulfil the needs which its sponsors visualise. But if it does not—if it develops into the devil-take-the-hindmost pursuit race that so many contests in so many quarters have become, then the sooner it be terminated the better.

Let's give it a trial, then, with the easy-going urbanity associated with v.h.f. working, and we may find that it turns out to be something very well worth doing.

J.H.

REMEMBER THAT THE SECOND HARMONIC OF  
21 MC/S FALLS INTO THE TELEVISION BAND.

# An Improved Low-Pass Filter and Simplified Alignment Procedure

By LOUIS VARNEY, A.M.I.E.E. (G5RV)\*

In this article, the author describes an 80-ohm, 4-section, low-pass filter, designed to cover the television frequency band, 41 to 70 Mc/s, with an effective attenuation of about 60 to 70 db. Simplified test equipment, enabling the amateur to align the filter accurately without special and costly apparatus, is also described.

THE low-pass filter to be described—the circuit of which is shown in Fig. 1—consists of two M-derived end-sections and two full T-sections of constant K. The filter has a cut-off frequency of 32 Mc/s, and an insertion loss of less than 0.25 db in the pass region. Provided it is inserted in a properly-terminated 80-ohm coaxial cable, the filter may be used on any frequency between 1.7 and 30 Mc/s with negligible loss of transmitting power. The coaxial cable may feed either a dipole aerial direct, or the link coil of any correctly adjusted aerial tuning unit.

## Construction

The mechanical construction should follow as closely as possible the electrical layout of the circuit. The model shown in the accompanying photograph was built into a box measuring 12 in. by 3 in. by 3 in. made of No. 22 s.w.g. sheet brass, the lid and back being removable. Screening partitions are fitted between each end-section and the centre sections. Tests indicate that copper, aluminium, or tin-plated mild steel would be equally effective.

It is important that the variable condensers should be bolted direct to the metal box in order to achieve low-inductance connections from rotors to "earth" (i.e., the box). Similarly, the coils (L2, L3 and L4) must be connected *individually* by the specified length of lead to each condenser (C2 and C3), in order to avoid a common-inductance effect which would degrade the performance of the filter.

If condensers of suitable maximum capacity for C2 and C3 are not available, condensers similar to those used for C1 and C4 may be employed, a 100  $\mu$ F silver-mica condenser being connected in parallel with each so that the required capacity of 124  $\mu$ F may be attained.

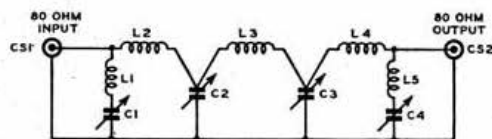


Fig. 1.—Circuit of 4-section Low-Pass Filter.

- L1, 5. 0.36  $\mu$ H, 7 turns, winding length 1".  
L2, 4. 0.59  $\mu$ H, 10 turns, winding length 1  $\frac{1}{4}$ ".  
L3. 0.73  $\mu$ H, 12 turns, winding length 1  $\frac{3}{8}$ ".

All coils are of 16 s.w.g. copper wire,  $\frac{1}{8}$ " internal diameter, self-supporting, with connecting lead 1" long at each end.

- C1, 4. 36  $\mu$ F. C2, 3. 124  $\mu$ F.  
For C1 and C4 use a 50 or 60  $\mu$ F (max.) receiving type variable condenser, preferably of s.l.c. type for ease of setting to correct capacity "by eye." (Raymart, Eddystone or similar). For C2 and C3 use a 150  $\mu$ F (max.) variable condenser, or as C1, C4 with a 100  $\mu$ F silver-mica condenser in parallel with each.

The coils should not be mounted nearer than their own diameter ( $\frac{1}{2}$ -in.) to the metal box, as their "Q" would be seriously affected. To minimise mutual coupling L1 and L5 should be mounted with their axis at right-angles to L2 and L4.

The variable condensers are mounted along a line  $\frac{1}{2}$ -in. from the bottom of the box, a spacing of 3 in. being allowed between shaft centres. No difficulty should be encountered in duplicating the layout described and illustrated in the photograph.

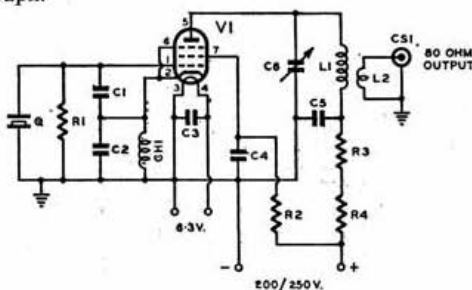


Fig. 2.—Circuit of the Test Oscillator

- L1. 7 turns, 16 s.w.g. copper wire,  $\frac{1}{8}$ " internal diameter, winding length  $\frac{1}{2}$ ".  
L2. 1 turn link coil, 22 s.w.g. p.v.c. (see text).  
C1. 47  $\mu$ F ceramicon.  
C2. 147  $\mu$ F ceramicon (100+47  $\mu$ F).  
C3, 4, 5. 0.001  $\mu$ F mica.  
C6. 5-100  $\mu$ F midget air trimmer (Polar) fitted with miniature pointer knob and dial (Eddystone, No. 425).  
R1. 100,000 ohms,  $\frac{1}{2}$ W.  
R2. 47,000 ohms,  $\frac{1}{2}$ W.  
R3. 2,200 ohms,  $\frac{1}{2}$ W.  
R4. 100 ohms,  $\frac{1}{2}$ W (metering resistor).  
CH1. 24 s.w.g. enam. copper wire on  $\frac{1}{4}$ " diameter former, 2" winding length.  
V1. EF91 or EF50 (Mullard). Typical operating conditions; Ea 220V; Esg 200V; Ia 6.5mA.  
CS1 Coaxial socket (Belling & Lee).

## Alignment

If the reader can obtain the use of a signal generator covering the desired frequency range (28-70 Mc/s), and an S27 or similar receiver, a complete characteristic curve can be plotted, enabling the attenuation to be measured.

For those who must make use of what they have on hand, the following simplified, but effective, method has been devised.

## Test Oscillator

A test oscillator of stable output should be constructed. A suitable circuit is shown in Fig. 2. This embodies a 7000 kc/s crystal in a modified Colpitts oscillator, the output circuit being tuned to harmonics of the crystal frequency. The component values specified for the anode tuned circuit will permit harmonics from the 4th to the 10th inclusive to be selected, providing an output frequency in the filter pass-band (28 Mc/s), one near the filter cut-off point (35 Mc/s), and eight

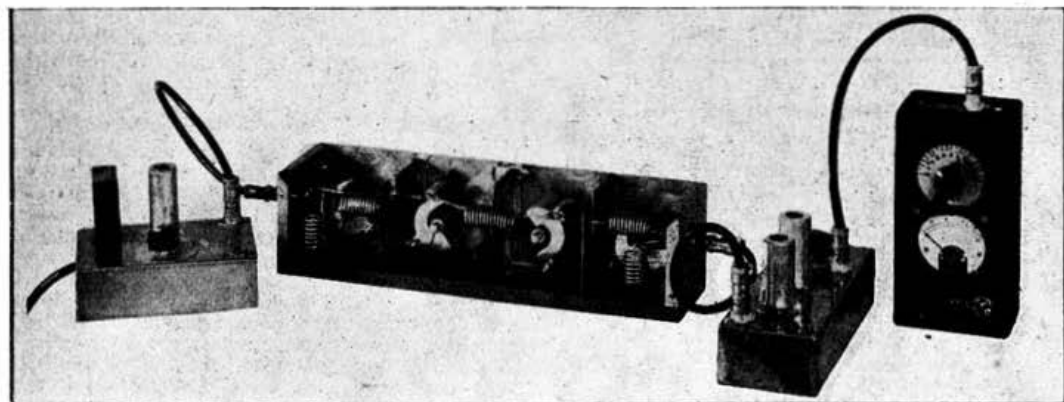
\* 184 Galleywood Road, Chelmsford, Essex.

frequencies in the stop-band. The decreasing amplitudes of the higher harmonics is of no importance since the alignment is essentially a qualitative test—accurate measurement of attenuation values being beyond the scope of such simple apparatus. With care, however, approximate quantitative measurements can be made.

The oscillator is constructed in a small metal box measuring 5 in. by 3½ in. by 1½ in. deep and fitted with a base plate to ensure adequate screening. One end of the anode coil (L1) should be soldered direct to the fixed vanes of the tuning condenser, the other end being connected to the anode by-pass condenser (C5). The link coil (L2) should be mounted about 1/16 in. from the "cold" end of L1 or, as a refinement, may be made movable in order to provide variable power output. This was not found necessary, however, for the tests to be described.

ing the range of test frequencies required. The circuit (Fig. 3)—which resembles the "front end" of a typical straight television receiver—is built into a metal box measuring 7 in. by 2½ in. by 1½ in. deep, fitted with a base plate. Small metal plates are mounted across each valve-holder to screen the grid and anode coils from each other. All by-pass condensers should be soldered directly between the valve-socket pins and earth by short leads not more than ½ in. long.

The coil turns can be fixed in place on the formers with the aid of a number of small rings (about 1/16 in. thick) cut from a piece of p.v.c. outer covering, removed from a length of ½-in. diameter coaxial cable (PT1 or Uniradio 32). Two of these elastic rings are slipped on to the coil former and spaced about ¼ in. apart, the lower one being about ¼ in. from the flange. By gently prizing up each ring with a scriber, the coil wire



Test equipment showing (left to right) the test oscillator, low-pass filter, wide-band amplifier and harmonic monitor.

If a 7000 kc/s crystal is not available, one with a frequency between 7000 and 7200 kc/s can be used, provided due allowance is made for the difference in fundamental frequency when calibrating the output circuit. No provision is made for continuously measuring the c.o. valve anode-current, since a check on harmonic output is normally indicated by the harmonic monitor to be described later; but an initial current measurement may be made when the oscillator is first tested.

### Wide-band Amplifier

The second piece of essential test-equipment comprises a two-stage wide-band amplifier cover-

may be slipped between the ring and the coil former, and thus secured. After each coil has been wound, the rings may be gently squeezed together until their inner edges are in contact with each outer turn, resulting in a very neat and secure winding. The two end wires of each coil should be long enough to connect direct to the appropriate component.

The gain control (R2), is a 5000-ohm potentiometer used as a variable resistor in the common cathode lead to V1 and V2. It would be advantageous to use a potentiometer with a logarithmic law, but this is not essential. The indicating device consists of a 0-100 microammeter

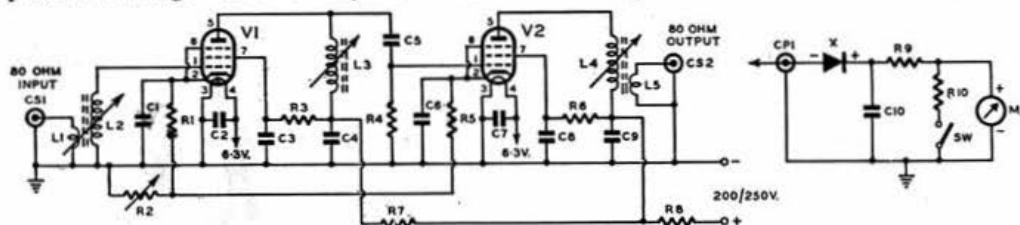


Fig. 3.—Circuit of Wide-Band Amplifier

- C1, 2, 3, 4, 6, 7, 8, 9, 10. 0.001μF mica (T.C.C. CM20, or similar).  
C5 100μμF ceramicon.  
R1, 5. 150 ohms, ½W.  
R2. 5,000-ohm potentiometer used as variable resistor.  
R3, 4, 6, 7. 4,700 ohms, ½W.  
R8, 9. 1,200 ohms, ½W.  
R10. 82 ohms, ½W.  
CS1, 2. Co-axial socket (Belling and Lee).  
CP1. Co-axial plug (Belling and Lee).  
SW. Toggle switch.

- X. Crystal diode (B.T.H. CG1C or G.E.C. CEX33).  
M. 0-100 microammeter, d.c., m.c.  
V1, 2. EF91 or EF50 (Mullard).  
L1 2 turns, 22 s.w.g. enam. copper wire wound over L2.  
L2 8 turns, 30 s.w.g. enam. copper wire.  
L3 6 turns, 30 s.w.g. enam. copper wire.  
L4 10 turns, 30 s.w.g. enam. copper wire.  
L5 2 turns, 22 s.w.g. enam. copper wire wound over L4.

All coils close-wound on Alladin formers, type PP5938 with iron-dust slugs.

with its associated components, built as a separate plug-in unit so that it is available for other applications. If desired, the harmonic monitor may be plugged into the amplifier output socket in place of the indicator—in which case the monitor must be retuned each time the test oscillator frequency is altered. This method adds a useful degree of selectivity to the equipment and helps to avoid break-through of unwanted lower-order harmonics.

### Harmonic Monitor

Although not essential for aligning the filter, the harmonic monitor is a useful adjunct to the tests to be described, and should be in the possession of all T.V.I.-conscious amateurs. The circuit (Fig. 4) differs from the original (described

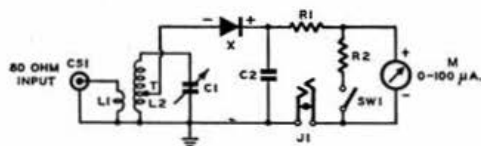


Fig. 4.—Circuit of Improved Harmonic Monitor.

- L1. 1 turn link of 22 s.w.g. p.v.c. wound between turns 1 and 2 of L2.
- L2. 7 turns of 16 s.w.g. copper wire,  $\frac{1}{8}$ " internal diameter, winding length  $\frac{1}{2}$ ", tapped at second turn up.
- C1. 5–100  $\mu$ F midget air trimmer (Polar) fitted with miniature pointer knob and dial (Eddystone, No. 425).
- C2. 0.001  $\mu$ F mica.
- R1. 1,200 ohms,  $\frac{1}{2}$ W.
- R2. 82 ohms,  $\frac{1}{2}$ W.
- X. Crystal diode (B.T.H. CG1C or G.E.C. GEX33).
- SW1. Toggle switch (Bulgin).
- J1. Headphone jack socket.
- M. 0–100 microammeter, d.c., m.c.
- CS1. Coaxial socket (Belling & Lee).

three years ago in the BULLETIN<sup>(1)</sup>), and incorporates the following modifications: (i) L2 is now 7 turns,  $\frac{1}{8}$  in. in diameter, in order to cover the British television band more conveniently; (ii) R1 becomes 1200 ohms to give increased sensitivity (the optimum value for R1 is the root mean square of the sum of the forward and reverse resistances of the crystal diode); and (iii) R2, switched by SW1, multiplies the microammeter scale by a factor of 7.4 to protect the instrument in the presence of strong signals, thus extending the sensitivity range by about 10 db (note that the crystal diode is an approximately square-law device).

The monitor may be calibrated by plugging it into the output of a 7 or 14 Mc/s p.a. fitted with a harmonic check point<sup>(2)</sup>, and tuning it to the various harmonics present in the p.a. output circuit. Tuning from zero on the monitor condenser scale (i.e., maximum capacity), the first harmonic to be encountered will be at 28 Mc/s (i.e., the 4th harmonic of a 7 Mc/s p.a., or the 2nd harmonic of a 14 Mc/s p.a.). By tuning the monitor carefully towards minimum capacity and noting the dial position for each successive harmonic—which will appear as a distinct upward kick on the microammeter—an accurate calibration from 28 to 70 Mc/s can be made. If the monitor has been constructed in the manner described, using similar components, the calibration should be approximately as follows:

Frequency (Mc/s)	28	35	42	49	56	63	70
Scale Reading	1.6	4.6	6.25	7.25	7.9	8.4	8.7

### Calibration of Test Oscillator

Set the pointer of the output circuit tuning condenser to read zero on the scale with the vanes of C6 fully meshed, so that the output frequency increases with increasing dial reading. If the circuit values have been closely followed, and an EF50, EF91 or similar valve is used, the harmonics of the 7000 kc/s crystal will appear at the following approximate dial readings (assuming a scale calibrated 0–10 is used for 180-degree rotation of the condenser):

Frequency (Mc/s)	28	35	42	49	56	63	70
Crystal Harmonic	4th	5th	6th	7th	8th	9th	10th
Test Osc. Dial	2	5	6.75	7.75	8.4	8.9	9.2

An exact calibration should be made, if possible, by plugging the test oscillator output into the harmonic monitor, which will have been already calibrated.

### Alignment of Wide-band Amplifier

The wide-band amplifier input should be connected to the output socket of the test oscillator by a convenient length of coaxial cable. Either the harmonic monitor or a separate crystal-diode output meter (Fig. 3) should be plugged into the w.b.a. output socket. After checking the l.t. and h.t. supplies (the latter can be between 200V and 250 V, preferably from a stabilised source), the gain control is turned to about half way, and the test oscillator is set to 42 Mc/s, the monitor also being tuned to this frequency. Starting with the coil slugs nearly fully in, the following procedure should be followed:

- (1). Increase gain until a deflection of 20 to 30  $\mu$ A appears on the meter. Trim oscillator and monitor for maximum reading at 42 Mc/s.
- (2). Adjust all w.b.a. slugs for maximum deflection, decreasing gain as required to avoid overloading and damaging the meter.
- (3). Tune oscillator to 49 Mc/s (also monitor, if used), and readjust w.b.a. slugs 1 and 3 for maximum deflection. (Slugs are numbered from input end of amplifier).
- (4). Retune oscillator and monitor to 42 Mc/s and adjust gain until meter reads about 40  $\mu$ A.
- (5). Retune oscillator and monitor to 49 Mc/s and retrim slugs 1 and 3 until a deflection of 40  $\mu$ A is obtained at this frequency.

The amplifier is now aligned and should have a reasonably wide-band response. The overall gain—about 37 db at 42 Mc/s, and some 4 db down at 49 Mc/s—is adequate for its purpose.

### Filter Alignment

With the test oscillator plugged into the filter input, the filter output into the w.b.a. input, and the w.b.a. output into the harmonic monitor (or output meter unit), proceed as follows:

- (1). Set all filter condensers "by eye" to the calculated values (Fig. 1) and mark the pointer knob positions on filter front panel for future reference.
- (2). Tune oscillator and monitor to 42 Mc/s.
- (3). Increase w.b.a. gain until a reading is obtained on the microammeter (if the filter is



nearly correctly set, this deflection will be quite small—a few microamperes only).

(4). Adjust C1 and C4 on the filter for minimum meter reading, increasing the gain of the w.b.a. as required to retain a reading.

(5). Tune oscillator and monitor to 49 Mc/s, adjusting the latter carefully to obtain the maximum possible microammeter reading. Full amplifier gain will now be required.

(6). Adjust C4 for minimum deflection, and then C2 and C3 (which tune flatly and should already be quite near the calculated values).

(7). Retune to 42 Mc/s and, if required, retrim C1 for minimum reading.

(8). Reduce gain, and set oscillator and monitor frequency to 28 Mc/s. Increase gain until a convenient meter reading is obtained and noted.

(9). Remove filter—joining the coaxial leads by means of a line-coupler (such as the Belling & Lee Cat. No. L616)—and note meter reading, retuning the oscillator slightly, if necessary. Provided the reading is within 4 or 5  $\mu$ A of that obtained with the filter in at 28 Mc/s, the loss in the pass-band will not exceed 0.25 db, and will therefore be negligible. If, however, the loss appears to be too great, C2 and C3 may be carefully readjusted at 28 Mc/s, with the filter in circuit, to obtain maximum deflection.

(10). Mark the final position of all filter condenser pointers on the filter panel for future reference. As the filter is now accurately aligned, there should be no need to alter the condenser settings when in use.

Experience has shown that this simple alignment procedure ensures that the filter will exhibit its correct characteristic over the entire television band of 41 to 70 Mc/s. The method is applicable in all TV areas, since the attenuation continues at a figure of about 60 db throughout the band (Fig. 5).

### Conclusion

The following points should be carefully noted if the correct result is to be obtained:

(1). Always remember to switch-in the meter shunt when connecting the monitor direct to the test oscillator.

(2). When the filter is not in use never leave the w.b.a. in circuit with the gain control advanced, otherwise the microammeter may be damaged (even when using the shunt).

(3). With the complete test equipment connected and the oscillator switched off, there should be no deflection of the monitor meter at any setting of the monitor tuning condenser if the w.b.a. is stable. A deflection indicates that the amplifier is self-oscillating, and inter-stage screening and decoupling should be checked. No trouble should be experienced in this direction, however, since the overall gain of the amplifier will not exceed approximately 40 db.

(4). When adjusting the filter condensers, small spurious indications may be observed in the monitor meter as the correct setting of C1 or C4 is approached. These can, however, be ignored since the correct "main" dip of the meter is sharply defined.

(5). The correct setting of C1 may be found to be slightly on the high capacity side of the calculated value of 36  $\mu$ F, and that for C4 slightly on the low capacity side of this value. C2 and C3 will be almost exactly at the calculated value of 124  $\mu$ F.

(6). Three 12 in. lengths of coaxial cable, having each end terminated in a suitable coaxial plug, will be required for interconnecting the filter and test equipment. These cable links must be properly made up; it will not suffice to use makeshift connections between units, as the screening and correct termination conditions must be preserved.

The following general

procedure should be adopted when using the filter. First, tune-up the transmitter in the normal way, using a coaxial line-coupler in place of the filter between the transmitter output and the a.t.u. After noting the p.a. anode and feeder currents, substitute the filter for the line-coupler, and, if necessary, slightly readjust the p.a. tuning and link coupling to produce normal anode and feeder currents. If the introduction of the filter results in appreciably lower

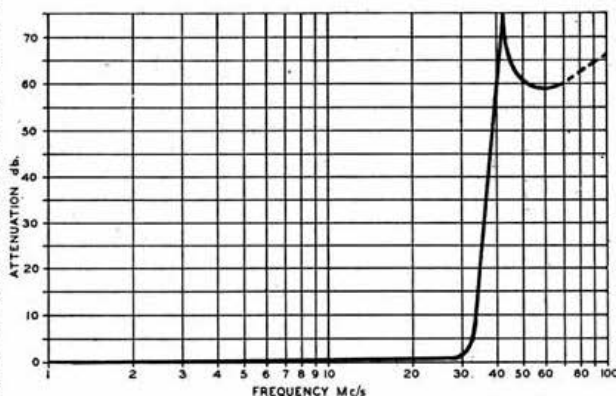


Fig. 5. Typical attenuation characteristic of the 4-section low-pass filter (taken under laboratory conditions).

feeder current and perhaps higher-than-normal anode current, a serious standing-wave condition probably exists on the coaxial line. It may be necessary to alter the link-coil turns, or to tune-out the reactance of either the transmitter or the a.t.u. link coil by connecting a 250  $\mu$ F variable condenser in series or in parallel with one of these link coils so that the introduction of the filter causes no change in operating conditions. The transmitter should never be tuned-up with only the filter connected to it (i.e., a.t.u. disconnected), as this condition will produce misleading results, e.g., the minimum feed to the p.a. may be abnormally high.

For filter adjustment the sensitive harmonic indicator described by J. W. Mathews, G6LL, in the February, 1952, issue of the BULLETIN, could be used in conjunction with the test oscillator. There are also a number of other possible applications of the test gear which, it is hoped, will form the subject of a future article. In the meantime it is suggested that the equipment, as described, could be constructed by and used for the benefit of members of local clubs.

### References

- (1) VARNEY, "Further Advances in T.V.I. Suppression," R.S.G.B. BULLETIN, May, 1949.
- (2) VARNEY, "A 50-watt T.V.I.-proof Transmitter," R.S.G.B. BULLETIN, July, 1950.

T.V.I. and 21 MEGS.  
WATCH THAT SECOND HARMONIC

# FIRST STEPS ON TWO

*A practical article in elementary language to assist those who wish to commence activity on the 145 Mc/s band.*

**M**ANY good reasons exist why amateurs should take a practical interest in v.h.f. working. The writer does not propose to review them here. It is assumed that the reader has decided for himself that he would like to "get going on two"—the most easily accessible of all his v.h.f. allocations—and wishes to know the best way to go about mastering those first steps that will direct him towards the 2-metre amateur band and successful operation within it.

Lucky indeed is he who has access to an active local 2-metre station and can see for himself what is needed in the way of equipment, and more particularly the circuit constants that permit the band to be located on transmitter and receiver—for that is the major fundamental problem of all. Although "pockets" of 2-metre activity exist up and down the country, the level of interest is, however, comparatively low, and in many cases no nearby helper will be available. This means that the would-be aspirant to 2-metre operation must start from bedrock and master the problems as they arise—which in turn can be discouraging enough to persuade him that "there is no future in it." And so the wide two-megacycle expanse of the band continues to remain empty.

Yet if the "first steps on two" are taken carefully no discouragement need occur, and the excitement of treading new ground will at length be experienced.

## Finding the Band: the Aerial

The most important and obvious thing of all is to find the band in the first place! This suggests

two steps—building a simple "search receiver" and erecting an aerial. Of these, the aerial step should be taken first. No receiver will give of its best unless it is working off a properly resonant aerial such as a dipole. The constructor would find it worth while to spend the modest extra half-hour needed to make the aerial a 3-element Yagi; the increase in gain thereby afforded is so great that he can be sure that if his receiver—when built—fails to produce a signal, the aerial is not to blame.

The newcomer to 2-metres will hear a great deal about stacked arrays and the like, but he would be well advised to close his ears to the enticements offered by aerials that are not in the "first steps" category. The 3-element Yagi will prove an excellent device with which to start by virtue of its mechanical simplicity, low wind resistance, and the fact that it will work without the need for any tedious matching if the following dimensions are adhered to:

**Dipole:** 19½ in. each section, its inside ends as close together as possible.

**Reflector:** 40½ in. long, 16 inches behind dipole.

**Director:** 36½ in. long, 16 inches before dipole.

**Feeder:** 80-100 ohms coaxial or twin, one conductor connected to each arm of the dipole.

To ensure an accurate 80-100 ohms match, the dipole must have an unbroken element immediately above it, welded to it at its furthest ends—the familiar folded-dipole trombone structure.

Half-inch copper tube can be used, the inner or feeder end of each arm of the dipole being

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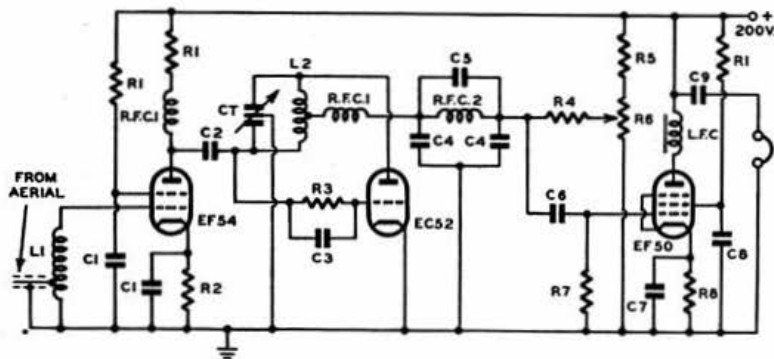


Fig. 1.

Circuit diagram of a simple search receiver for v.h.f.

C1	500 to 1000µF (by-pass).	R1	1000 ohms ½W (decoupling)	L2	50-100 Mc/s-10 turns; 80-140
C2	10 to 20µF (interstage coupling)	R2	180 ohms ½W (cathode bias).		Mc/s-6 turns; 110-170 Mc/s-3
C3	50µF (grid capacitor).	R3	1 to 5 megohms (selected for smoothest regeneration).		turns; each coil centre-tapped, ½" diameter self-supporting.
C4	0.001 to 0.005µF (super-regen. filter).	R4	10,000 ohms 1W.	LFC	Audio output choke (or substitute LFC and C9 with output transformer to match headphones or small speaker).
C5	500µF (super-regen. filter).	R5	50,000 ohms 1W.		
C6	0.01µF (audio coupling).	R6	50,000 ohms wirewound (regeneration control).		
C7	25µF 12V wkg. (audio by-pass).	R7	50,000 ohms.		
C8	0.1µF (screen decoupling).	R8	300 ohms (cathode bias).	RFC1	24 turns on ½" former, close-wound.
C9	0.1µF (output).	L1	3 turns 14 s.w.g. close-spaced ½" diameter, tapped one turn up for 100 ohm output.	RFC2	Any medium wave winding, or one winding of a 465 kc/s i.f. transformer.
CT	15-25µF per section midget variable (sample used had 2 fixed plates and 3 moving plates per section).				

flattened and drilled to bolt to a stand-off insulator. As the arms are short, they will require no support at their remote ends if rigid tubing is employed. The whole of this simple 3-element array can be mounted on a 3-foot length of lath, which in turn can be bolted to an existing mast for the initial experiments.

### Finding the Band: a Simple Receiver

The main task, however, is to find the band, and the aerial cannot do that on its own. A receiver of some description is necessary—the simple “search receiver” referred to earlier.

In his early days on 2 metres the writer used a r.f. receiver, with some success for c.w. but little for 'phone (except on the loudest of signals). He located the 2-metre band only because a Government station in the district happened to transmit on a nearby frequency, and co-operative officers arranged suitable test transmissions for calibration purposes. In many districts the traffic on police, ambulance or business radio channels may help the amateur to pinpoint the frequency on which his receiver is working—assuming the complete absence of any other form of calibration at this stage. Where this is not practicable two alternatives exist in the shape of the B.B.C. television stations between 45 Mc/s and 66.75 Mc/s (eventually), and the B.B.C. v.h.f. broadcasting station on 90 Mc/s, audible up to about 100 miles from Wrotham, Kent.

It is in order to identify these signal sources that the search receiver is required. The circuit (Fig. 1) consists of a simple super-regenerative detector, preceded by an r.f. amplifier to prevent radiation, and followed by an audio stage to give a reasonable signal in a pair of headphones.

Mention of “super-regen” may appear at first sight to be retrogressive, and so it is, if such a design be contemplated as the main, permanent receiver for 2-metre operation. But it should not be forgotten that super-regeneration has much to commend itself as a means of enabling the inexperienced user to find his way round the vast, often uncharted, silences of the v.h.f. spectrum, and to seize on such beacons as the B.B.C. television and f.m./a.m. transmitters already mentioned.

The purpose of this super-regenerative search receiver is first of all to locate one of the B.B.C. television stations, the B.B.C. station on 90 Mc/s, or a Government or airport transmitter of known frequency, and thus obtain calibration points on the wavemeter. In the table of component values to Fig. 1, inductances are shown that will allow this “leap frogging” location of frequencies to be achieved.

Readers who may wonder why no reference has so far been made to that much publicised tool, the grid dip oscillator, should be reminded (i) that the instrument is useless if uncalibrated, and (ii) that the search receiver can, in fact, be used as a grid dip oscillator if a suitable meter is added, its coil being mounted reasonably in the clear.

### The Absorption Wavemeter

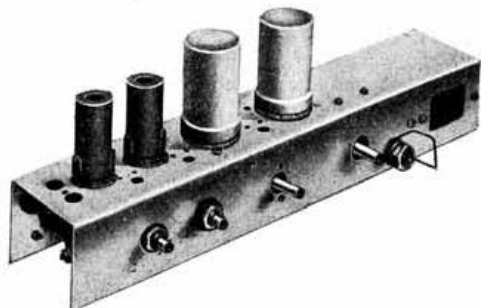
The next task is the construction and calibration of the absorption wavemeter. Without it the experimenter will have great difficulty in selecting correct harmonics when he comes to build his transmitter.

The wavemeter consists simply of a one-turn coil across a 100  $\mu$ F variable condenser, i.e. 6½ in. of No. 14 s.w.g. copper wire coiled in its centre to 1 inch diameter and soldered across the two lugs of the condenser. A pointer and simple scale

complete the instrument. The wavemeter should be built on a bakelite bracket sufficiently long to enable the coil to be held inside any equipment without allowing the hand to touch the latter. The absorption wavemeter built by the writer covered the frequency range 59 to 152 Mc/s.

This, of course, is no guide as to how the calibration will “fit” on any other model made from parts that may be to hand, and it should be checked against the B.B.C. stations received on the search receiver. Even so, in the absence of any signal source on 145 Mc/s, the user may still be unable to find the band, though the lower frequency “markers” have been located.

Two methods of overcoming this difficulty are available. First of all, it is possible to calibrate the receiver and the absorption wavemeter by means of a sub-standard absorption wavemeter such as the G.R. Model 758A—a somewhat expensive American device of extreme accuracy, obtainable from Claude Lyons, Ltd. Its range is 55-400 Mc/s. Several groups of amateurs have already acquired this wavemeter and have found it helpful in getting equipment going on 2-metres. Even if one can only borrow it for a short time, it can be used to calibrate the search receiver which may then be used as a 2-metre marker, and the home-made absorption wavemeter can be constructed at the same time before the sub-standard wavemeter is passed on to the next user!



A crystal multiplier chain constructed on this small inverted-U aluminium or copper chassis comprises a complete self-contained 2-metre converter (less r.f. stages). The line-up is 6F12-6F12-EF54—into an EF54 mixer, each with its appropriate pre-set capacitor. An almost identical chassis may be constructed for use as the drive source for a 2-metre power amplifier, a typical valve sequence being EL91-EL91-QV04/7.

### Harmonic Counting

How to “hit the band” without the use of such a wavemeter is the subject next to be dealt with, and it is at this point that the construction of a transmitter begins to suggest itself. A quartz crystal acquired at this stage can be used not only as the drive source for 145 Mc/s output via a chain of multipliers, but also to furnish calibration points at wide intervals throughout the v.h.f. spectrum. The higher the frequency of the crystal, the wider apart these points will fall. For instance, a crystal with a nominal frequency of 8 Mc/s will produce harmonics at 128, 136, 144 and 152 Mc/s, among others, and the wrong one could be selected if no other source of calibration existed. But a 12 Mc/s crystal will drop harmonics on 120, 132, 144 and 156 Mc/s, with rather less chance of incorrect identification. And if, by fortune, the starting frequency is 24 Mc/s the harmonics will be further apart still. Thus the wavemeter and search receiver can be accurately calibrated for 145 Mc/s. All the crystals mentioned will produce output at 72 Mc/s via multiplier stages—which is a step nearer to the construction of a 2-metre transmitter.

## The Transmitter

Design of 2-metre transmitters has now reached a standard form. The conventional circuit diagram is given at Fig. 2. In its construction no pitfalls are likely to be experienced so long as each tank circuit is checked with the absorption wavemeter to ensure that the correct harmonic has been selected. A drive current of about 1.25 mA should appear in each grid return lead, and about 5 mA in the grid of the 832. A closed-circuit jack is included in each grid return lead.

This design may be simplified by omitting the final p.a. stage, so that the doubler valve V3, feeds the aerial. In this case a single-turn coil, coupled into the centre of L3, will function as an effective means of feeding a low-impedance line.

Choice of valves will often be governed by what is available from the individual's own resources. The popular TT11 may be substituted for any or all of the V1, V2 and V3 positions, while a 6V6G is good enough for V1. Where the EL91 is used, it is worth while connecting the blank pin to earth, to make the socket suitable for use with an EF91 or 6F12 if preferred.

## A Permanent Receiver

Variety in 2-metre converter design is much more diverse than in transmitter design. As this subject is complex and sometimes controversial, it is only possible to touch briefly upon circuit designs that might be used.

The super-regenerative receiver described earlier can be dismissed straight away; its purpose should be confined to stand-by uses—and perhaps as the grid-dip oscillator already mentioned.

What next then? One of those war-time surplus converter units, tailored for "two" and feeding the main station receiver? An excellent proposition—and not too difficult to put on the band with the aid of the equipment so far described. But there are two snags: first, it is very tricky to persuade an RF27 unit to produce a T9 note; and secondly, the device is remarkably insensitive. In fact, when used with the writer's BC348 station receiver an input power of 800  $\mu$ W was required to produce 200 milliwatts at the output end—whereas the crystal-controlled converter normally used needed only 6 microvolts input for the same performance. Nevertheless, as a first step the RF27 is not to be decried.

The second step should definitely be a crystal-controlled converter. One never tires of advocating it against all the fancy—and often heart-breaking—trick circuits which can so easily produce complete frustration in the newcomer to the band.

The chain of crystal multipliers for the converter can resemble that employed in the transmitter, except that 6F12 or EF91 valves may be used in all positions, since no great amount of power output is needed. If a 7.4 Mc/s crystal is used it can be multiplied by  $3 \times 3 \times 2$  to produce a fixed local oscillator frequency of 133.2 Mc/s. This, beating against signal frequencies of 144–146 Mc/s, will produce an intermediate frequency, swinging between 10.8–12.8 Mc/s on the tuning scale of the station main receiver. At one stride the difficulties of a satisfactory mechanical arrangement for 2-metre tuning are overcome.

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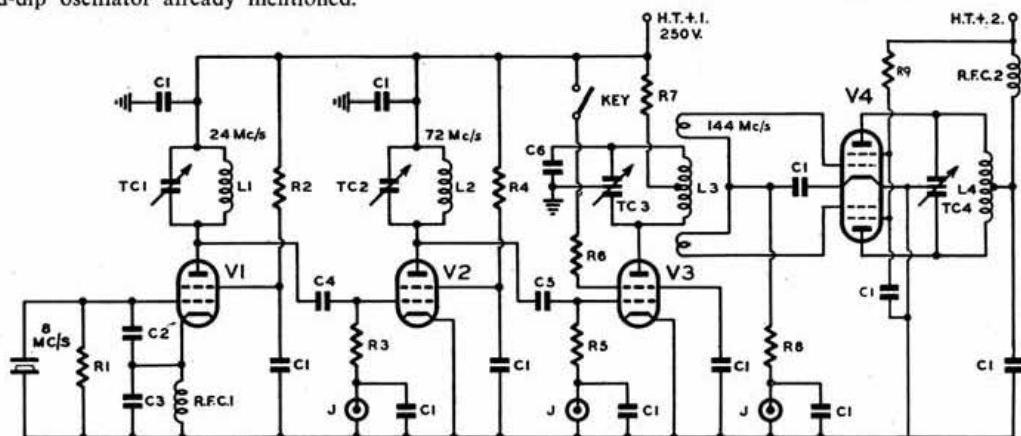


Fig. 2.  
Circuit of a simple 4-stage transmitter for the 2-metre band.

- C1 1000  $\mu$ F (by-pass).
- C2 20  $\mu$ F.
- C3 50  $\mu$ F.
- C4 100  $\mu$ F (interstage coupling).
- C5 32  $\mu$ F (interstage coupling).
- C6 8  $\mu$ F balancing capacitor (or Philips trimmer).
- TC1 50–75  $\mu$ F 1st multiplier tuning (surplus midget version had 6 moving and 6 fixed plates).
- TC2 20–50  $\mu$ F 2nd multiplier tuning (surplus midget version had 4 fixed and 3 moving plates).
- TC3 Butterfly trimmer 25  $\mu$ F max., 3rd multiplier tuning.
- TC4 2-section midget capacitor (3 fixed and 3 moving plates per section) approx. 15+15  $\mu$ F; final amplifier tuning.
- R1 100,000 ohms (1st multiplier grid return).
- R2 10,000 ohms (1st multiplier screen dropper).
- R3 100,000 ohms (2nd multiplier grid return).
- R4 47,000 ohms (2nd multiplier screen dropper).

- R5 100,000 ohms (3rd multiplier grid return).
- R6 20,000 ohms (3rd multiplier screen dropper).
- R7 50 ohms (or as RFC2—3rd multiplier anode stopper).
- R8 20,000 ohms (final amplifier grid return).
- R9 25,000 ohms (screen dropper).
- RFC1 1st multiplier cathode choke, small 2-section "pi."
- RFC2 Final amplifier anode choke, 24 turns on  $\frac{1}{4}$ " dowel.
- L1 24 Mc/s for V1; 11 turns 24 s.w.g. on  $\frac{1}{2}$ " former.
- L2 72 Mc/s for V2; 4 turns 14 s.w.g.  $\frac{1}{2}$ " diameter self-supporting.
- L3 144 Mc/s for V3; 4 turns 14 s.w.g. centre-tapped,  $\frac{1}{2}$ " diameter self-supporting.
- L4 Final amplifier; 2 turns 10–14 s.w.g. silver plated, 1" diameter self-supporting. Coupling coil: single turn loop in centre of L4.
- V1, 2 EF91, 6F12 or EL91.
- V3 EL91 or QV04/7.
- V4 832 or TT15.



# Will you be on 21 Megs?

By W. H. ALLEN, M.B.E. (G2UJ)\*

As announced in the May issue, the 21 Mc/s band will be released to U.K. amateurs on July 1, 1952—operation being initially restricted to c.w. between 21,000 and 21,200 kc/s. Many of us will be eager to try our luck in territory which should possess some of the good features of both 14 Mc/s and 28 Mc/s, and enjoy the thrill of breaking new ground. The following article is intended as a guide to help members to "get going on 21."

## Receivers

SO far as the receiver is concerned, a problem arises only with those types—including, unfortunately, many of the ex-Service models—whose tuning range stops short in the vicinity of 20 Mc/s. Very little can be done quickly to assist the owners of such receivers, but the temptation to remove a few turns from the coils serving the highest frequency band should be resisted unless one is quite familiar with receiver design and the problems of oscillator tracking. This is not to suggest that alterations are not practicable but is a caution against possible interference with the good performance of an otherwise satisfactory receiver.

The best solution is to construct a converter with either a tunable or crystal-controlled oscillator, using the existing receiver as the first and second i.f. stages in a double-conversion superhet. Those who already have a converter for 28 Mc/s are in a strong position, as in most cases it should be possible to arrange for the signal frequency circuits to cover both 21 and 28 Mc/s, (i) by fitting larger capacity tuning condensers, and (ii) by a suitable choice of i.f., making the oscillator operate on the low side of the signal on 28 Mc/s and on the high side for 21 Mc/s.

As an example, with an i.f. of 3.5 Mc/s the oscillator would tune between 24.5 and 26.5 Mc/s for signal frequencies in the 28 to 30 Mc/s band, and between 24.5 and 24.95 Mc/s for the range 21 to 21.45 Mc/s. Naturally, if coverage at the higher frequency were to be restricted to 29.7 Mc/s, where the 10-metre band will eventually end, the band-spread on both ranges could be increased.

Almost without exception, normal communications receivers cover the new band; some, such as the *Denco* DC19, provide for calibrated band-spread over this range. The evergreen HRO, while not permitting band-spread operation without considerable alteration, covers 21 Mc/s on the 14-30 Mc/s general coverage coils. The *Eddystone* 680 and 750 receivers with mechanical band-spread, and the 640 with a separate band-spreading ganged condenser, will operate normally.

Home-constructed receivers, both straight and superhet, and particularly those with plug-in coils, should present no difficulties for their owners. As a quick check for approximate calibration during coil-winding operations, the absorption frequency meter described later would be a handy instrument to have available.

## Transmitters

The average amateur transmitter, with coverage extending to the 28 Mc/s band, will need very little alteration. If the normal 3.5 or 7 Mc/s drive is in use, the conversion of one stage to a tripler instead of a doubler or quadrupler may be all that is required; and, as most transmitters

have tuning condensers, at least in the intermediate stages, with more than sufficient capacity swing for tuning to the bands already in use, it may not be necessary to alter any coils at all. In the p.a., where for best efficiency the working "Q" of the tank circuit is important, it might be advisable to construct a new coil for optimum performance.

So far as the exciter stages are concerned, it should be borne in mind that, when tripling or quadrupling has to be carried out, greater efficiency is obtainable at lower frequencies, where the valves are not operating so near to their frequency limits.

In one design published by the Society—the 25-watt five-band transmitter described in the booklet *Simple Transmitting Equipment*—the 21 Mc/s band was included by using the 14 and 28 Mc/s coils, the tuning condensers in the exciter section being 60  $\mu$ F and the p.a. tank condenser a series-gap type of considerably smaller effective capacity. It was suggested that the 21 Mc/s band might be reached by operating one of the stages on 10.5 Mc/s (using the 14 Mc/s coils), and this might be a useful scheme to adopt in some cases, the v.f.o. being tuned to half this frequency. Care should be taken, however, that no appreciable energy is radiated on 10.5 Mc/s, as it does not fall in an amateur band.

Information regarding transmitter design for 21 Mc/s has already appeared in the *BULLETIN*, details of which will be found in the reference section at the end of this article.

## Aerials

The length of a half-wave aerial for the 21 Mc/s band varies between 21.8 ft. and 22.1 ft., according to whether it is cut for resonance at the high or low end of the full band. With such a small variation in the required length there should be no difficulty in making one dipole cover the range effectively, particularly if it is folded and fed with a 300-ohm line.

Many operators will, however, be anxious to employ an existing aerial for the job. A useful table of wire lengths for aerials from  $\frac{1}{2}$  to 4 wavelengths long for all bands from 1.7 to 28 Mc/s, will be found in the aerial section of the Society's booklet *Simple Transmitting Equipment*, from which it will be seen that the popular "long wire," some 132 ft. in length, is slightly short for 3-wave operation (138.5 ft. at 21.1 Mc/s) and on the long side for 2½-wave working, where the length should be 115.3 ft. for the frequency mentioned. The inclusion of a Pi-coupler<sup>(1)</sup> should, however, enable efficient use to be made of existing long-wires.

For multi-band operation the Zepp. aerial has many attractions, and a recent reference<sup>(2)</sup> has

- (1) CRAGG, *The Use of Pi-coupling Networks*, p. 446, R.S.G.B. BULLETIN, June, 1951.
- (2) WHALLEY, *The Design of Pi-network Tank Circuits*, p. 439, R.S.G.B. BULLETIN, April, 1952.
- (3) MAINPRISE, *The Helping Hand to Amateur Radio*, p. 491, R.S.G.B. BULLETIN, May, 1952.

\* 32 Earls Road, Tunbridge Wells, Kent.

been made to the subject of tuning resonant feeders. The booklet previously mentioned also deals with the question of Zepp. aerial design and adjustment.

Those who already possess a *folded* dipole with 300-ohm feeder working on 7 Mc/s may find that it will work with fair efficiency as a centre-fed  $1\frac{1}{2}$ -wave aerial on 21 Mc/s. The radiation pattern will not, of course, be the same as on the lower frequency, but it should be well worth trying.

Beams are, naturally, in a somewhat different category from simple aeriels and must normally be considered as one-band devices. Published designs for 14 and 28 Mc/s beams may readily be converted to 21 Mc/s operation by the simple process of altering all dimensions in inverse ratio to the frequencies concerned.

#### Locating the Band

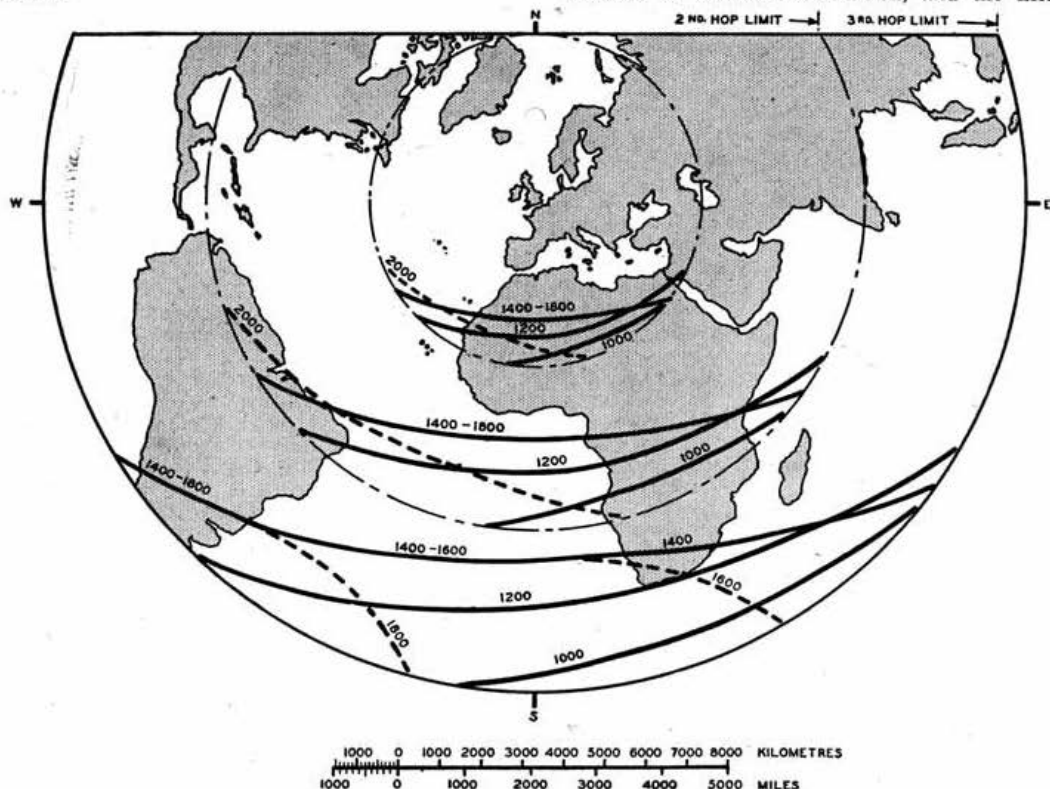
Nothing very ambitious is required to locate the third harmonic of a 7 Mc/s drive, provided both the second and fourth harmonics are normally utilised for output on 14 and 28 Mc/s respectively. Where, however, 14 Mc/s has been the highest frequency in use, confusion is possible; and the simplest instrument to give a completely unambiguous indication is the absorption frequency meter. This may be constructed very quickly, and if the following instructions are adhered to, calibration presents no problems.

Such a meter is by no means a precision device; the object of the present design is merely to assist in *locating* the band on either transmitter or receiver.

As condensers of the same nominal capacity vary considerably one from another in their capacity "swing," a similar component to that employed in the prototype should be used, i.e. a *Wavemaster* 160  $\mu\text{F}$  type 92/057, which may be obtained from Webb's Radio. The coil consists of  $24\frac{1}{2}$  ins. of 14 s.w.g. bare copper wire wound into a coil of  $4\frac{1}{2}$  turns with an outside diameter of  $1\frac{1}{2}$  ins. (a U2 dry cell makes a handy former) with the turns spaced so that the length of the coil is exactly 1 in. A 3-30  $\mu\text{F}$  Philips concentric trimmer is connected in parallel with the coil and variable condenser, and some form of insulated handle should be attached to the latter, together with a scale reading from 0 to 100 degrees. (An *Eddystone* type 62 metal dial serves admirably—though, alternatively, a suitable scale may be drawn on card). An extension handle for rotating the condenser is convenient but not absolutely essential.

#### Calibration

Set the variable condenser to full capacity (zero on the scale) and adjust the trimmer until the circuit resonates at exactly 14 Mc/s when checked against the appropriate circuit in a transmitter. Means of indicating resonance is unnecessary as this may be observed by noting a "kick" on the anode current meter in the transmitter. During this operation the coupling between the coil of the frequency meter and that in the transmitter should be as loose as possible in the interests of accurate calibration, and the merest



The chart shows predicted conditions for July, 1952, for transmission via the E-layer in the new 21 Mc/s band. Areas consistently workable from S.E. England are bounded at the near limits by the appropriate curve of the maximum skip distance for the hop concerned (times expressed in G.M.T.), and at the far limits by the appropriate hop-limit radius. Radii for the 0° wave-angle limits of one-, two-, and three-hop transmissions are drawn at 4,000 km., 8,000 km., and 12,000 km., respectively. Four-hop propagation is unlikely on this band at present. The predictions indicate conditions similar to those which existed on the 28 Mc/s band about a year ago. Openings occasioned by Sporadic-E should be quite frequent. The far-limit radius of a one-hop transmission via the E-layer is about 2,300 km (e.g., TF, FA), and further hops via the E- or F-layers may then permit contacts with areas which are otherwise in the skip zones. (Chart prepared by Paul Sollom, B.Sc., A.C.G.I., G3BGL, Vide p. 542).

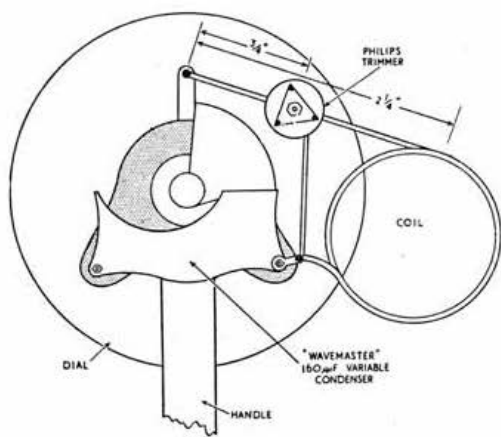


Diagram of simple absorption wavemeter for 21 Mc/s (described in text).

flicker of the indicating meter is all that is required.

The meter is now tuned to 14 Mc/s with the variable condenser at full capacity and a dial reading of zero; 21 Mc/s will then be found at approximately 60 degrees and 28 Mc/s at just over 80 degrees.

To calibrate the meter when a transmitter is not available, the 15 Mc/s standard frequency transmission from WWV can be employed. Tune in this station on the receiver, couple the absorption meter to a coil of about half-a-dozen turns of wire in series with the aerial lead, and with the dial on the meter set to 15 degrees resonate the instrument by means of the Philips trimmer. The point of resonance is indicated by a reduction in strength of the incoming signal and is very sharply defined; care is required to make sure that it is not missed. Having done this with, as before, the loosest possible coupling between the two coils, the meter is set to indicate the positions of both 21 and 28 Mc/s as previously described. When a straight receiver is in use the meter may be coupled to the detector coil (with the valve oscillating weakly), the resonance point being indicated by a momentary cessation of oscillation as the two circuits come into resonance.

#### References

VARNEY: A T.V.I.-proof 50-watt Transmitter, July, 1950; An Improved 75-watt T.V.I.-proof Transmitter, December, 1951, and January, 1952; A 5-band 150-watt T.V.I.-proof Power Amplifier, April, 1952.  
HAMMANS: A Switched Wide-band Exciter, January and February, 1951; Home-made Wide-band Couplers, November, 1951.



[Photo by G. S. Milne]

#### Old Timers at Falmouth

Arthur Milne, G2MI (licensed 1925); Arthur Gosling, G2VC (1925); John Clarricoats, G6CL (1926); Herb. Bartlett, G5QA (1927); Steve Townsend, G2CJ (1927); Dave Beattie, G2WW (1927); with May Gadsden, who was appointed Assistant Secretary of the R.S.G.B. in 1929.

#### Swedish Summer Camp

**A**MATEURS in the 3rd Swedish District are to hold a summer camp at Astön in the neighbourhood of Sundsvall (Lat. N 62° 24' 4", Long. E 17° 43' 7") during the period from July 7-13. The camp is well sited and should make an ideal vacation centre. The maximum charge per day will be 5 Swedish kroners for three meals and accommodation. There will be no charge for children.

All enquiries should be addressed to Mr. C. H. Nordlöw, SM3LX, Pluggränd 6, Härnösand, Sweden.

#### Franco-British Television Programmes

**T**HE B.B.C. are making arrangements with Radiodiffusion et Télévision Françaises for the relaying of joint Franco-British television programmes to Britain during the week ending July 14. The programmes, which will be produced in Paris and seen simultaneously in both countries, will be relayed between Paris and London by various television links. Two of the longer "jumps," namely Alembon-Swingate and Swingate-Wrotham are 40 and 49 miles in length respectively. The latter is the longest that has ever been attempted by this means for a regular service. On both hops, E.M.I. microwave links are being used.

Incorporated in the links are new type klystron valves which enable the transmitters to operate on powers of the order of 3-5 watts. This is probably the first time such powers have been utilised on links operating at 4500 Mc/s. Another unique feature of the links, which have an aerial power gain of 1000, is that frequency modulation is employed. The slatted construction of the parabolic reflector aerials offers less wind resistance.

#### Police Radio at Northern Radio Exhibition

**D**URING the recent Northern Radio Exhibition held in Manchester, Superintendent Ian D. Auchterlonie, G6OM, of the Manchester City Police, described, in the course of a 30 minutes' television programme, the history and development of Police Radio. The talk was illustrated with suitable museum pieces and photographs taken from his scrapbook of early equipment.

On another occasion Superintendent Auchterlonie took part in a special demonstration designed to show the efficiency of the "999 system." Description of television announcer Macdonald Hobley was broadcast over the police radio net with instructions to the police to try and pick him out from the crowds in Piccadilly, Manchester. Mr. Hobley was located in seven minutes.

The whole operation was controlled by G6OM from the R.I.C. studio and was listened-to over loudspeakers by the visiting public.

#### Paul Godley

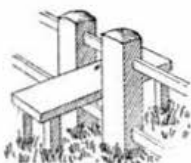
**I**N a recent letter to Headquarters, Mr. Paul Godley, of Upper Montclair, New Jersey, asked for his greetings to be conveyed via the BULLETIN, to those members of the Society who recall his visit to the United Kingdom in 1921.

Old Timers will remember that to Mr. Godley fell the honour of copying the first message transmitted across the Atlantic on short waves. Reception took place at Ardrossan, Scotland, where a special station had been set up with the permission of the Postmaster General.

"The Story of the first Trans-Atlantic Short Wave Message" is told in a nicely produced book published by the Radio Club of America, 11 West 42nd Street, New York, N.Y. Copies are available price \$1.27 post free.



# THE HELPING HAND



## TO AMATEUR RADIO

### Part XII—Aerials (2)

#### Aerial Power

IN an aerial erected well clear of surrounding objects, the impedance at points of maximum current is equivalent to a pure resistance of about 70 ohms for a half-wave system, and about 95 ohms for a full-wave. This quantity (known as the *radiation resistance*) when multiplied by the square of the r.f. current, gives the power radiated. Also present—but much smaller in value—is the *loss resistance*, which, when multiplied by the square of the current, gives the total power losses arising from dielectric, eddy current, leakage and heating effects.

By

**B. W. F. MAINPRISE**  
B.Sc. (Eng.), A.M.I.E.E. (G5MP)

At high frequencies aerials are efficient, radiating most of the power with which they are supplied. At lower frequencies only a small proportion of the wave can be present on the wire; consequently, radiation resistance is reduced, and if it becomes lower than the loss resistance, more of the power generated by the transmitter will be wasted in overcoming the aerial losses than will be radiated to provide a signal.

An aerial erected near buildings, or indoors, will have a low radiation resistance, and a correspondingly higher current with lower voltage for the same power input. The addition of reflectors or directors may reduce the radiation resistance to about 20 ohms, depending on the number and spacing of these additional elements. Except at specific points (*i.e.*, current maxima) a knowledge of the value of the r.f. current present in the aerial will not enable the *absolute* power to be calculated. It will, however, at any point, enable *relative power changes* to be calculated, since any increase in current at this point must indicate an increase of power in the whole system.

Power is proportional to the square of the current; thus if the power is tripled, the current will rise to  $\sqrt{3}$  or 1.73 times its previous value. This enables an operator to check that the transmitter output is directly proportional to the input, a necessary precaution where telephony is used. For example, if, with an input of 25 watts producing a r.f. current of 0.3A at some point in the aerial system, the transmitter input is successively raised to 35, 50, 75 and finally 100 watts, the aerial current should rise by

$\sqrt{35/25}$ ,  $\sqrt{50/25}$ ,  $\sqrt{75/25}$  and  $\sqrt{100/25}$

times 0.3A, giving values of 0.35, 0.42, 0.52 and 0.6 amperes. Should the observed current readings exceed these values, instability is indicated, and a check of screening and neutralising should be made. If the readings are less than those calculated, insufficient valve emission or incorrect operating conditions should be suspected.

#### Aerial Loading

When aerial loading seems inadequate, the first step is to check that the correct selection of series or parallel tuning has been made, as explained in Part XI, and to confirm the wave distribution by means of a neon lamp run along the feeders where possible.

If the tuning arrangement is correct, then the length of the aerial and feeder may be difficult to resonate on a particular waveband. An aerial should be as long and as high as circumstances permit, and it is often desirable to add a folded section giving little radiation of itself, but enabling the overall length to be more easily resonated.

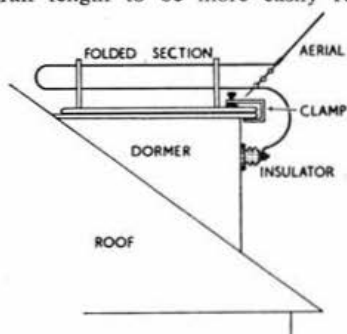


Fig. 1.

Folded section in aerial down-lead mounted above dormer.

Fig. 1 shows a method used by the writer to accommodate such a folded section above a dormer window. Two 12-inch ebonite lead-in tubes are mounted with a push-fit in holes drilled through a  $\frac{1}{4}$ -in. board. A fret-worker's clamp holds this board firmly to the projecting front edge of the dormer. The down-lead, anchored to an insulator which takes the strain, passes through holes drilled in the ebonite tubes, the wire being lightly crimped where it enters and leaves the holes to prevent sliding. Similar supports may be mounted parallel and 6 in. away for a second feeder wire. This arrangement neatly accommodates an extra 10 ft. or so of aerial length. Where a greater length must be added, a sloping folded section (Fig. 2a) may be used, while another method employs a light whip aerial, of



the type used by the Services for tank and mobile transmitters, mounted at the mast-head (Fig. 2b). The disadvantage of the latter is that the mast must be lowered for mounting the whip and for making the connection to the actual aerial wire; the aerial halyard then becomes useless and the aerial tension must be adjusted from the house end. If the point of anchorage to the house is reasonably accessible, a similar whip may be fitted there. In this way an extra 25 ft. or so can be added to an aerial which might otherwise be inconveniently short. Once the aerial system with its folded section has been resonated and found to load the transmitter satisfactorily, the added length may be gradually reduced until loading tends to become sluggish.

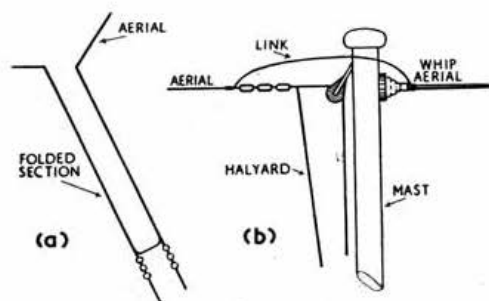


Fig. 2.

(a) Sloping folded section; (b) whip-aerial mounted at mast-head to provide added overall length.

Another cause of poor loading is excessively loose coupling, and this often occurs where series tuning or low-impedance feeders are used. Coupling coils should have almost the same diameter as the tuned coils in which they are inserted, since the field enclosed depends on the relative areas, which depend on the squares of the diameters. A small difference in diameter will result in an appreciable difference in area, so that some of the lines of force round the turns of the tank circuit will fail to cut the turns of the coupling coil. Links should have an equal number of turns at each end. Except on the low frequency bands of 1.8 and 3.5 Mc/s, the number of turns on a link coil should rarely exceed four; any increase will tend to add excessive reactance to the link and defeat its object.

On frequencies above 30 Mc/s the reactance of a link can be balanced out by means of a small condenser wired across the coil, or a small condenser in series with one conductor (depending on circumstances). The condenser may be at either end of the link, though sometimes the balancing is effected at both ends.

Loading may be impaired by incorrect values at the coupling end. Parallel tuned and half-wave feeders, which should be connected to a high-impedance circuit, require a small tuning capacitance so that a larger number of turns can be used on the coil. If the feeder length is longer or shorter than a half-wave, the impedance will be lower, and the impedance of the parallel-tuned circuit should accordingly be reduced by the use of more capacitance and fewer coil turns. Impedance matching is often achieved by tapping the feeders along the coil, equidistant from the centre, instead of connecting them to the coil ends.

A correctly resonated and coupled aerial should present a resistive load to the transmitter, the tank condenser setting for minimum anode current

remaining unchanged, whether the aerial is coupled or not, apart from a very slight decrease in required capacitance due to the small extra capacitance to earth of the coupling coil when inserted in the tank coil. An incorrectly adjusted system will reflect reactance into the tank circuit and the point of minimum anode current will be displaced, necessitating reduction of the number of turns on the link and attention to the length of the aerial and feeder system. Any change in the L/C ratio of the tank circuit may require a corresponding change in the degree of coupling for correct loading.

### Marconi Aerials

The aerials so far mentioned operate in the Hertz mode, requiring no direct connection to earth (though, as a matter of interest, they can be earthed at any point of maximum current or zero voltage—a useful precaution in the Tropics where lightning storms are prevalent).

An aerial for half-wave operation on 1.8 Mc/s would be 250 ft. or more in length. Garden limitations will normally restrict the length to around 132 ft. or less, permitting only quarter-wave operation. Maximum voltage will therefore be present at the remote end of the aerial, with maximum current and zero voltage at the transmitter end, which should be earthed. The radiating properties of the system will depend greatly on the care taken in providing an effective earthing arrangement. The most suitable system employs a number of buried wires in radial or fan formation. A more practical system comprises several 5 ft. lengths of hot-water pipe or tubular scaffolding, with the surface scraped free from rust, driven into the soil until only the tops are showing. The pipes are best spaced around the circumference of a circle several feet in diameter, with the earth lead rising from the centre; alternatively, galvanised sheeting or other metallic plates may be buried at a depth of several feet. The ground should be kept moist. Sometimes compounds, such as common salt or copper sulphate of agricultural grade, are watered in, but their action is not always beneficial in the long run because they kill any vegetation which would otherwise help to conserve moisture in the soil, and their chemical action corrodes the metallic surfaces to such an extent that after an initial period the efficiency of the earthing system may be less than if they had never been applied.

Since a 132-ft. Marconi aerial with a coupling coil, would be effectively more than a quarter-wave in length, the resulting reactance must be balanced out by series tuning, a condenser of 0.0005  $\mu$ F being suitable. A 66-ft. aerial will require parallel tuning, though resonance may also be achieved by tapping the aerial on to the coupling coil to avoid using a condenser.

The earth system may be replaced by a counterpoise, consisting of several long wires running just clear of the ground, forming a capacitance through which the r.f. current flows to earth instead of by direct connection. Unless the counterpoise is extensive, however, it will fail in its object and will operate instead as part of a Hertz aerial, with maximum voltage at the remote end and maximum current at the fed end. Many amateurs are misled into believing that the wire they erected as a "counterpoise" is operating as such, until a test with a neon lamp indicates a voltage maximum at the end. For this reason

(Continued on page 547)

## THE MONTH ON THE AIR



by A.O. Milne G2MI

## Rare DX

ARE certificates really a good thing? We begin to doubt it. The manner in which otherwise friendly, good-natured people become as ravening wolves directly a new country appears on the air, makes one wonder if this anxiety to be "one up" on someone else is not bringing Amateur Radio into disrepute and may in time destroy what used to be called the "Ham Spirit."

We have no personal axe to grind, for we have not even heard FL8MY but we have had a heap of correspondence including a most indignant message from the operator himself. In all good faith and hoping to give the DX fraternity a new country, he flew to French Somaliland for two days and came on the air. The result was something akin to the B.B.C. 'Goon Show,' for in a welter of shrieking fiends his frequency became indistinguishable from a Russian QRM machine!

The really bad offenders were on the mainland of Europe, but the G's were by no means guiltless. "Keep off my frequency," he has warned. "I work the people who call me there in order to get rid of them, but they go into the black book and will in no circumstances get a card. In particular," he says, "the station using the call-sign CT1QG, who after unsuccessfully trying to break-up several contacts, proceeded to call CQ for nearly 15 minutes zero beat can consider his call in the black book in letters of fire!"

Now this chap, (Dick Mc Kercher, W6MLY, who normally signs HZ1MY), will be in Yemen on June 21st and 22nd using the call 4W1MY, but he will answer no one on his own frequency. Call him at least 5 kc/s high or low and take your turn. Last time he made only 150 contacts. He reckons it could have been at least 500, but for the idiotic behaviour of the people he was trying to work.

## Notes and News

Bob Pybus reports OD5AB on 21 Mc/s 'phone, but like many others, says there is very little to be heard on this band. Yet W6AM, who visited us recently, said in the first day of its opening in the States, he worked 16 countries. How about some intensive listening and tell us what you hear? Bob says 3.5 produced a few weak W's and the best on 14 were CR9AG, VS6BA, KR6GJ, KL7AMT, CR6TA, DU7SV and HR1SO. By the way, Italian amateurs had the whole of the 21 Mc/s band released to them on May 1.

G6AB worked OH7OH and HA5BT on 160 on May 6th, so the "old faithful" is not entirely a winter band. G2ZF and many other stations have worked ZC2MAC who is on Cocos Island.

Herb Becker, W6QD, says VR1F is now active as VR4DF and hopes later to go to VR6 and VR7! That's a new one on us!

ZE3JJ reports many ZE's active on 21; so far

\* 29 Kechill Gardens, Bromley, Kent.

he has worked MI3, OQ and PY.

The ban on PJ contacts has been lifted by the F.C.C., so all QSO's made after March 11th, 1952, will count for DX C.C. HSIUN is not recognised, nor is PK5AA whose card has just been received by G2MI. Several PK's have had their gear confiscated.

B.R.S. 19484 says VS1EV (a Liverpoolian) is looking for contacts with that city. There are four FI's on at present. FI8AA and AC are both in Saigon, FI8KVA is at Hanoi, and FI8TR in Haiphong. B.R.S.19454 understands that they may be officially recognised shortly.

G5JL has heard UL7KGH being worked by G8JR. Is this a change of policy or just someone who has not heard of Box 88? He thinks conditions on 7 are on the wane. The best have been OA4ED, 7028 at 0545; OD5AB at 0230; HC1FG, 7007, 0500; KP4OD, 7030, 0530 and YV6AO, 7030 at 0530.

G6LX and G5BZ have been working YI3BZL on 3.5 around 2230 B.S.T. Reports have been of the order of 559. ZL1HM's B.E.R.U. log shows what could have been worked on 3.5, for

<b>WINXX</b> WINXX 
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## WORKED ALL STATES

[Photo by W. Spence, Aberdeen]

A recent collection of QSLs received by CM61Z, each from a different State in the U.S.A.

he lists VE7VO, ZK2AA, VK9KX and hosts of VK1, 2 and 3 contacts.

G3DOG, who is a very busy man with little time for radio and still less for rebuilding, has to sandwich his operating times between the TV programmes. He lives in a block of flats and is severely handicapped on aials, so how about the following? All times G.M.T. VS1CO, 1711, 569; VS6BA, 1733, 579; VS6CG, 1754, 579; ZC6UNJ, 0555, 59; EA9AP, 1050, 579; FQ8AA, 1649, 559; YA3UU, 1746, 469; HZ1MY, 1632; F18YB, 1611, 569; JA2KW, 1237, 579; VQ5DQ, 1739, 59; VE8AW, 0530, 559; ZP1TB, 2054; ZD6DU, 1651, 569; OD5AB, 1537, 448.

The R.A.F. Amateur Radio Society station G8FC seems to be on all day! Some of their best are CT3AA, 1700, 14022; DU1MB, 1525, 14035; F18AB, 1530, 14025; FO8AB, 0745, 14060; MP4BBD, 1600, 14084; VP9OO, 2325, 14030; and ZD2HAH, 1630, 14070. Those which got away were FN8AD, 1644, 14112; HH3L, 1230, 14060; 6A4AA, 0715, 14072 (this one under cover). G8FC now operates from Locking, Soms.

Anyone hearing G3GVK before next January should tell this pirate to QRT. The genuine one is in Aden!

5A2CF is looking for contacts with Ilfracombe, his home town. G3CDC of Sherwood, Notts, has been concentrating on the Pacific area and has worked VR1A, 1130; VR2CG, 0900; ZK2AA, 0745; and has heard KX6AH and KR6IG at 1130 G.M.T. and KW6AZ at 1600.

Ian Davies of Palmers Green has had cards from ZL1HY and ZL2AAK for 7 Mc/s. Both ask that more G's should be active on this band. He also has 'phone cards for this band from ZL3JD and ZL4HE. Yes, Ian, we think ZS2MI should count separately for H.B.E.

G6BB apologises for not having much to report except some good "misses!" DX includes VS7GX, 1934, 14018; VU2CK, 1555, 14030; KG4AF, 2218, 14030; YV5AK, 2110, 14004; ZD2HAH, 0825, 14054; HK4DP, 0605, 7040. G2BP who thinks conditions are on the upgrade on 14, has heard a few weak W's on 21 Mc/s. EA9DC has been very active in Ifni and will be in Rio de Oro later in the year with the call EA9DR. (Thanks W2GT.)

B.R.S. 7594 of Yeovil has heard the following on 28: CR6BH, 2830, 1833; FA8KK/MM, PZ1WK, 28390, 2022; VP6JC, VQ3PBD, 28378, 1755; W2DED/MM, Ess-Lindberg off French Guiana; ZC6UNJ, ZD4AF, 28340, 1740; ZE2KH, 3JP, ZP3AW, 28455, 1904; 5A2TO plus several CX, LU and PY calls. On 14 the outstanding ones were HR1SO, 14148, 2216; HP1LA, 14145, 2318; VP3LF, 14150, 2302; VP5DX, Turks Is., 14133, 2407; YS1A, 14330, 2321; 3A2AH, 14115, 1844. He says PX1AA/DL4IA/3A2AP is now active as W1VKS.

#### Who's Who

G2KU and G3DIV will be active in Monaco from July 8th to 10th inclusive on 7. The call will be 3A2AL and equipment AC/DC to conserve weight.

Campbell Ingraham, VP4LL, ex-VP4TAI, expects to be in England for two months from the end of May. Rick Barry, MP4HBK, is not active yet as he is waiting for his gear to arrive. He says G stations come in very well, around 0800 and also between 1600 and 1700 G.M.T.

Y1BZL returns to England in September. We think that both he and Y1IECU have earned the gratitude of all by the excellent way they

have come across with the QSL cards. Recently Y1BZL Worked All States in just under 4 hours! Doug, Edwards, VS6BZ, is now back in this country and is waiting for his logs to arrive with the rest of his luggage. He mentions a difficulty experienced by many DX stations, the fantastic price of QSL cards when purchased locally. His address is 158 Wandsworth Bridge Road, S.W.6.

KG6AAE has QSL'd all his contacts but says if anyone has been missed, his address is now 1205 Lewis, Laramie, Wyo., U.S.A. B.R.S. 19252 who heard ZD9AA's first-ever 'phone QSO, with G2WW, has just got his receiver working on 28. The very first call he heard was W2ZXM/MM—Capt. Kurt Carlson on the Flying Enterprise II.

ZD4AE is now back in Takoradi. His address is G. B. Stewart, The West African Development Trust, Ltd., Private Postal Bag, Takoradi, Gold Coast. G2DCU is now VK2AWU, while Les Coupland, ex-G2BQC, is active as VK2LJ.

MI3KW says that Eritrea will soon become part of Ethiopia and that as from September next it will no longer be a separate country. Thenceforward all call signs will be ET's. The British Administration will close down. MI3KW's address is K. L. Wills, c/o Aden Airways, Ltd., 83 Viale Roma, Asmara, Eritrea. So make haste for your MI contact.

GM2DBX reports that Philippine stations may now contact non-Americans and that DU7SV is doing his best to make up for the delay. His address is Voltaire Sotto, c/o National Radio School, Cebu City. IIPQ would like to contact an amateur who is either a Scouter or Scout Master. VS7DB, on board a "trooper," found company with VS2DD (G3FGD) who left the ship at Malta, and VS9BB who is returning to the U.K.

#### Visit to Yugoslavia

Bill Malcolm, G6WX, who is an Alderman of Coventry, recently paid a visit to Yugoslavia in company with other civic dignitaries to present a car to the City of Belgrade for the use of the President of the Council. They met Marshal Tito and were entertained by members of the City Council. Contact was made with G2FWW and 6WX's son, G3FV, from the station of Mirko Voznjak, YU1AD. Later the delegation met YU1AG and were also received by the President and Secretary of the Yugoslav Amateur Radio Association, of which all were made Honorary Members. Both YU1AD and 1AG speak excellent English.

#### G3GKM

This call, which belongs to the Babcock and Wilcox Staff Association Radio Society, is being pirated. At present the genuine station is on the air only between 1300 and 1400 B.S.T. Monday to Friday, and on either 14050 or 14076 kc/s. Incidentally the Society embraces members of this famous firm of high-pressure boiler engineers throughout the world. So far the following have been enrolled: W2UWK, W2EWX, ZS6ACO, VK2AJW, and through business associates, ZE3JM, G2LS, GM3AEC, G3CPA and G8IP. G2CRD and G3BSU are London members. If anyone is interested and is associated with the firm anywhere in the world, please write to Mr. Manders, G2CRD, Babcock House, Farringdon Street, London, E.C.4.

#### Sideslip

Sorry; ZD2HAH is, of course, QSL manager for Nigeria, not Gold Coast, where ZD4AB is still in charge. See last month.

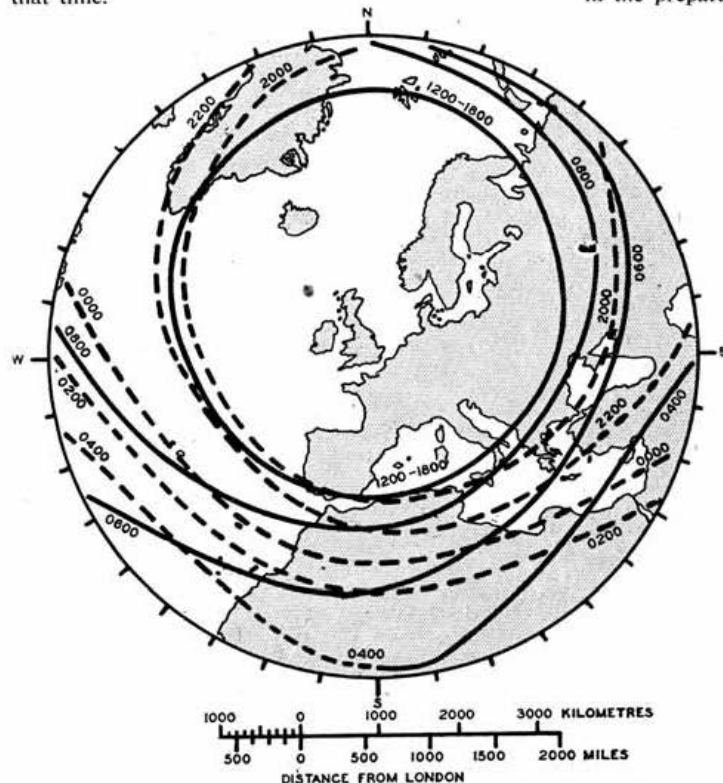


# Skip Distance Predictions for the Amateur Bands

By P. H. Sollom, B.Sc., A.C.G.I. (G3BGL)\*

THE method used for computing a chart of maximum skip distances at various times during the day for a given frequency band was described in the April issue of the BULLETIN. The predictions are based on data supplied to the Society by the Department of Scientific and Industrial Research. Points on a great circle map plotted for the same time are joined together by a curve showing the fringe of the skip zone at that time.

Assuming that the ionosphere is of constant height and that reflections take place from only one layer for a particular frequency, a diagram showing world propagation conditions can be constructed using the maximum skip distance technique. The limiting conditions obtaining during the first hop are repeated for subsequent hops until the ionosphere can no longer support the propagation. This technique has been used in the preparation of the map on page 536.



The curves on the accompanying map, centred on London, show predictions, for July, 1952, of the fringe of the skip zone for transmissions in the 14 Mc/s band from S.E. England via the F<sub>2</sub>-layer, at various times throughout the day (expressed in G.M.T.). At any given time signals may be received from points between the appropriate curve and the edge of the map. The solid curves are for the period when the skip is shortening; the broken curves are for the period when the skip is lengthening.

Skip distances from Ireland are similar to those measured from London in corresponding directions, but will occur about 45 minutes later. Skip distances from Scotland are, in general, 200-500 km. longer than those measured from London in corresponding directions.

Used in conjunction with the Skip Distance Map, published last month, the trend in conditions can be followed. Since the hours of sunrise and sunset are continually changing, and as the sunspot cycle proceeds on its way, it is to be expected that the predicted maximum skip distances (which are for an average day) will be too short at the beginning of the month, and too long at the end, or vice versa, depending upon this trend.

\* The Rowans, Green Street Green, Farnborough, Kent.

## Sunshine and Rain

HEAVY rain—at least in Southern England—during the afternoon of Sunday, June 8, failed to damp enthusiasm at the 250-odd stations participating in National Field Day.

It is too early yet to hazard more than a guess as to the score that may win the National Trophy, but we shall be surprised if last year's winning total is not exceeded by a substantial margin. At least two Southern groups report scores in the region of 1,100 but whether their claims will stand up to the critical examination of the Contests Committee remains to be seen.

One thing is certain—in spite of the rain—N.F.D. was again a great success.

## Technical Service Manuals

THE following technical service manuals have been donated to the Society by Martin W. Berner, VP5MB, who is leaving the U.K. for the West Indies.

R.A.F. Equipment: Monitor Type 28; Oscillator; Unit Type 25; Radio Altimeter Equipment AYY; Signal Generator Type 9A; Signal Generator Type 106; Test Oscillator Type 12A; Test Set Type 37; Test Set Type 209; Test Sets Type 218, 218A, 237, 237A; Test Set Type 219; Test Set

Type 240; Test Set Type 241; Test Set Type 242; Transmitter T.1190A; Transmitter-Receiver TR. 1464; Valve Tester Type 4; Valve Tester Type 4A; Wavemeter Type W.1191A; Wavemeter Type W.1432; Wavemeter Type W.1433.

U.S. Equipment: Loran Handbook for Aircraft; Radio Tube Tester 1-177; Radio Set AN/APN-4. Circuit Schematics: AN/APN-4 Oscilloscope Patterns; I-194-A Pulse Signal Generator Schematic; ID/APN-4 Indicator Schematic; R-9/APN-4 Receiver Schematic.

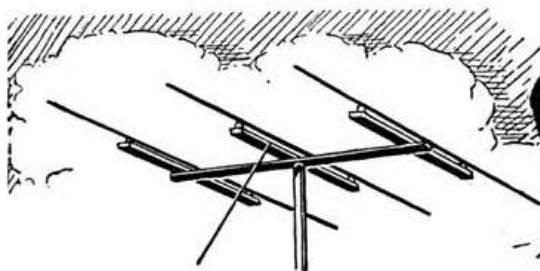
The Society already holds the following U.S. technical service manuals.

Bendix Equipment: Dynamotor Data; Radio Compass MN26; Receiver RA-10C, D, CD, DD; Receiver RA-10CA, CB, DA, DB; Receiver RA-10FA, B; Transmitter-Receiver RTA-1B; Transmitter TA-2 series Transmitter TA-2G & TA-2G-24 series; Transmitter TA-6A & TA-6B.

U.S.A.A.F.: Radio Compass SCR-269-F; Radio Set SCR-522-A, T2 & SCR-542-A, T2.

The above publications are available on loan for limited periods to members who wish to abstract information on specific units of equipment. Enquiries should be addressed to the General Secretary.





# AROUND THE V.H.F.'s

By W. H. ALLEN, M.B.E. (G2UJ)\*

## Two Metre Field Day

**T**HIS event, held on May 11th, was well supported by fixed and portable stations up and down the country, but at the time of going to press it is not known how many portables took part. Conditions were poor, for the most part, with heavy rain accompanied by strong, cold winds in many places at the start. Later in the day the weather improved and with it the propagation.

G6XM/P, from his site near Farnham, Surrey, worked 84 stations with G3AUS (Torquay) and G5YV (Leeds) representing the longest distances towards the south-west and the north respectively. He was, however heard at a distance of 240 miles by B.R.S. 1579, operating portable near Bolton, Lancs., 650 ft. a.s.l.

Considering the general state of the band the log produced by B.R.S. 1579 was extremely creditable. Apart from his reception of G6XM/P previously mentioned, he heard 44 stations—including G3BLP at 200 miles—and it is felt that a list of these calls might be of interest. They were as follows: G2ASR, DCI, FCL, FZU, HCG/P, HCL/P, HGR, JT, OI, 3ABA/P, AGS, AMM, ANC, AOO, AYT/P, BOC, BOP, BPJ, BW, DA, ENS/P, ERD/P, FCV, GMX, MY, QV, 4JJ, 5DP, RW, YV, 6DF, LC, NS, QT, YO, 8IC, QY/P, SB, GW2ADZ, 3ATZ/P, 5BM/P, 5MA/P and GW5MQ. The receiver was a converter with three 616 valves into an Eddystone 640 tuned to 9 Mc/s and working from a 5-element close-spaced Yagi beam 40 ft. high.

Low signal strengths and much fading was the experience of G3WW (March, Cambs.), who worked several portables but heard and called many more without success—including GW5BM/P, who was contacted by both G2XV/P and G3BK. The unluckiest station would appear to have been GC2CNC (Jersey) who heard no signals at all throughout the contest.

G3EHY (Banwell, Som.), noted that as the rain belt moved away towards the north, stations from that direction started to become audible until, late in the afternoon, Yorkshire stations began to appear, and a number of contacts were made with that county. It was not until the contest had been finished for some two and a half hours that conditions became really good, but by that time nearly all stations had closed down after a day's intensive activity, and only EI2W and G8OU (Ashted, Surrey), were left to enjoy them.

GW5MA/P, this time in Merionethshire, six miles south-east of Bala, was handicapped by poor propagation and badly shielded by mountains in the south-easterly direction, despite his height of 1,500 ft. a.s.l. He heard nothing from the London area but managed to make 19 contacts, of which the more distant were with G3BW (Whitehaven, Cumb.), 115 miles, G3EHY 108 miles and G5YV 101 miles. Other stations worked were G2HCL/P, HGR, OI, 3AYT/P, BOC, BPJ, DA, GUU, GZM,

HWC, MA/P, 8SB, GW2ADZ, 3FYR, 5BM/P and 5MQ. G5MA is still optimistic of finding a site somewhere in Merionethshire from where it will be possible to work stations in the south and south-east of England, so we shall probably be hearing from him again.

G3FKO/P, operating two miles north of Bath, heard 30 stations and worked 15, including a new call from Wales—GW3BNQ (Cardiff), with an excellent c.w. note produced by 10 watts into an SCR 522. Despairing of ever getting out to any distance from the town itself, which lies in a valley, G3FKO and G3IWA intend jointly to operate a portable station from this site during most week-ends when the weather permits. Input will be 3.5 watts on 'phone and 4 watts on c.w. on a frequency of 145.24 Mc/s.

## Other Two Metre News

EI2W (Dublin) found conditions poor during the period May 8/11 although some contacts were made, including one with a new station GW8UH. Later the band steadily improved. On May 12, G3GZM (Tenbury Wells, Worcs.), was well received, and on the following day contact was effected with G6NB/P operating in Herefordshire with only 5 watts input. G6NB, who was worked by G2UJ on the 22nd when he was portable at Woolhope in the same county, was getting out remarkably well for so low a power. On May 14, stations in the Eastern Counties, represented by G3DMU (Crowle, Lincs.), and 3WW, made an appearance. GM3EGW (Dunfermline, Fife), was the first Scottish station to be received in Dublin this season. G3BW (Whitehaven, Cumb.), hears EI2W at great strength when beaming north, but nothing when his aerial is pointing in a southerly direction—a case of

## 420 Mc/s Tests

**T**HE following members have notified Headquarters of their intention to participate in the 420 Mc/s Tests on June 21-22, details of which were published in the May issue of the BULLETIN. All members are invited to take part in these tests, whether or not their calls appear below.

Call	Location
G2OI	Winton, Eccles, Lancs.
G2QY	(June 21) Pinner, Middlesex.
G2QY/P	(June 22) Chiltern Hills, Chinnor, Bucks.
G2WJ	Great Canfield, nr. Dunmow, Essex.
G2WS/P	Chaldon Common, nr. Caterham, Surrey.
G2FKZ	East Dulwich, London, S.E.22.
G2FKZ/P	Woldingham, Surrey.
G3APY/P	(June 21) near Crich, Derbyshire.
	(June 22) near Leek, Staffs.
G3FRG	(June 21) Worthing, Sussex.
G3FRG/P	(June 22) Kithurst Hill, near Storrington, Sussex.
G3FZL	East Dulwich, London, S.E.22.
G4CG	Wimbledon, London, S.W.19.
G5CD	Hendon, London, N.W.4.
G6DP	Frodsham, Warrington, Lancs.
G8LY	Lee-on-Solent, Hants.
CC2CNC	La Rocque, Jersey, Channel Islands.
GW2ADZ	Llanymynech, Mont., Wales.

\* 32 Earls Road, Tunbridge Wells, Kent.

reflection or hitherto unsuspected lobes in the beam pattern? G2PU (Cambridge), whose well-clipped modulation gets through at R5 when other Cambridge stations are only receivable on c.w., was worked from Dublin after some difficulty on May 17; while during the early hours of the next morning G3BLP (Selsdon, Surrey), was 30 db. over S9. G3CXD (Newcastle) and 5TP (near Henley-on-Thames) were also heard. During the evening of the same day G2DCI (Liverpool), 3AHB (Poole, Dorset), 3AYC, 3CSC (Prescot, Lancs.), and 3HWC were all worked for the first time.

From his experience of being a much-sought-after 'phone station, EI2W suggests that contacts would be easier to effect if the calling stations were to announce their call signs more frequently, preferably giving their location to enable beam adjustments to be made, and to give two short

calls with, say, a 30-second interval between them rather than one long transmission.

As an example of sustained activity—and incidentally an indication of the number of stations operating on two these days—it would be hard to beat G3WW's effort of 82 different stations worked during the period April 15-May 18, with a dozen or so others heard but not contacted. Those worked included four PA0's, three GW's, one French and one Irish station, and GD3DA/P who was active again from the summit of Snaefell in the Isle of Man on May 17. G3WW is continuing his tests with a beam consisting of three skeleton slots backed by reflectors and finds that arrangement, at 40 ft., some 6 db. better than a 5-over-5 beam 63 ft. high. He is anxious to work GC, GI and GM. Frequency—'phone or c.w.—144.83 Mc/s.

G3EHY reports that activity is on the increase

## Regional V.H.F. Ladders

### RULES

1. Two ladders will be maintained in the BULLETIN; one listing the number of Regions worked by members on 2 metres, the other listing the number of Regions worked by members on 70 centimetres. Further ladders will be started for the higher frequency bands as occasion warrants.

2. To qualify for entry in the ladders, a member must have worked seven Regions on 2 metres, or four Regions on 70 centimetres.

3. Ladders will run from July 1 to June 30 of the following year; only contacts made between these dates will qualify for entry in the current year's ladders. At the end of each yearly period the leading station in each ladder will be declared and a certificate, to be called the *R.S.G.B. V.H.F. Proficiency Certificate*, will be awarded to the operator concerned. The certificate will be endorsed 2 metres or 70 centimetres.

4. Placings in the ladders will be determined

primarily by the number of different R.S.G.B. Regions worked, and secondly, by the total number of different Stations worked. In the event of a tie, the number of Countries worked will be taken into consideration.

5. The expression "different stations" covers the generally accepted meaning of the phrase. A station operating at a fixed address, at an alternative address, or as a portable, will rank as three different stations, e.g., GB3RS, GB3RS/A and GB3RS/P.

6. Proof of contact may be required.

7. Reports should list the total number of Regions, Stations and Countries worked, and should give the call sign of the first station worked in each Region and Country claimed. Reports should reach the V.H.F. Editor (Mr. W. H. Allen, M.B.E., G2UJ, 32 Earls Road, Tunbridge Wells, Kent), by the 20th of each month in order to be printed in the following issue of the BULLETIN.

### REGIONS

The following is a list of the Regions and Counties or Areas forming them:

**Region 1** (North Western).—Cheshire, Cumberland, Isle of Man, Lancashire, Westmorland.

**Region 2** (North Eastern).—Durham, Northumberland, Yorkshire.

**Region 3** (West Midlands).—Herefordshire, Shropshire, Staffordshire, Warwickshire, Worcestershire.

**Region 4** (East Midlands).—Derbyshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire, Rutland.

**Region 5** (Eastern).—Bedfordshire, Cambridgeshire, Essex (outside London Region), Hertfordshire (outside London Region), Huntingdonshire, Norfolk, Suffolk.

**Region 6** (South Central).—Berkshire (outside London Region), Buckinghamshire (outside London Region), Gloucestershire (excluding the Bristol Area), Hampshire, Oxfordshire, Wiltshire.

**Region 7** (London).—The London Region covers all territory within 25 miles' radius of Charing Cross, and the whole of Surrey.

**Region 8** (South Eastern).—Kent (outside London Region), Sussex.

**Region 9** (South Western).—Bristol, Cornwall, Devon, Dorset, Somerset.

**Region 10** (South Wales).—Brecknockshire, Cardiganshire, Carmarthenshire, Glamorganshire, Monmouthshire, Pembrokeshire.

**Region 11** (North Wales).—Anglesey, Caernarvonshire, Denbigh, Flintshire.

**Region 12** (North Scotland).—Aberdeenshire, Angus, Banffshire, Caithness, Inverness-shire, Kincardineshire, Morayshire, Nairnshire, Orkney, Perthshire, Ross-shire, Shetland, Sutherland.

**Region 13** (East Scotland).—Berwick, East-Lothian, Fife, Fifehire, Kinross, Mid-Lothian, Peebles, Roxburgh, Selkirk, West-Lothian.

**Region 14** (West Scotland).—Argyll, Ayrshire, Bute, City of Glasgow Postal Districts, Clackmannan, Dumbarton, Dumfries, Kirkcudbright, Lanarkshire, Renfrewshire, Stirlingshire, Wigtown.

**Region 15** (Northern Ireland).—Antrim, Armagh, Down, Fermanagh, Londonderry, Tyrone.

in the early evenings around 1830 G.M.T., and finds that many good contacts may be had about that time. Although conditions were rather poor during GW5MA/P's visit to Merionethshire he managed to work that station on three occasions. On May 16 from 2300 B.S.T., ON4BZ was a steady and consistent signal on c.w. for well over an hour and a half. 'EHY considers that many Continental stations would get farther afield—and incidentally give operators in the west of England a chance of working them!—if they were to employ c.w. now and then instead of relying on 'phone alone as many of them do at present.

Taken generally, conditions during May were good, regular QSO's being made from G3EHY with G2FCL (Shipley), 3BW, 3CC, 5YV, 6XX (near Goole, Yorks.), and 8GL at distances between 185 and 232 miles.

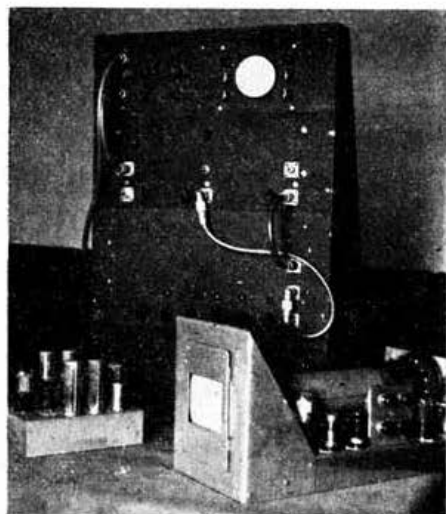
G5BD (Mablethorpe, Lincs.), took part in a Continental opening on May 19. At 1815 G.M.T., PA0NL was worked at RST 589 followed by PA0EQ, PA0FC, PA0FB, PA0JOC, PA0LDG and ON4HC. GD3DA/P, GM3EGW, GM3ENJ, GW5MQ, F8JR and ON4OT were heard but not worked.

GC2CNC (Jersey) is using a new 6-element stacked Yagi type of beam, similar to that described on page 21 of the R.S.G.B. Booklet *V.H.F. Technique* and finds that it loads the transmitter well.

### The First Two-Way Amateur Television QSO

CONSIDERABLE publicity was given in the national and local press to the historic experiment made at Plymouth on May 1, 1952, when Harold Jones, G5ZT/T, and Fred Rose, G3BLV/A/T, established television contact over a three-mile path. So far as is known, this is the first instance of a two-way TV QSO between amateurs anywhere in the world.

G5ZT had been radiating pictures on 426 Mc/s for nearly a month when it was decided to attempt a QSO. A photograph of his equipment appeared



The equipment used at G3BLV/A/T, Plympton. The flying-spot scanner incorporates a Mazda 30C2 5" blue-trace c.r.t. The transmitter comprises an SCR-522 driving a QQV06/40 final, screen-modulated, and running at 20 W input. In the video amplifier and mixed units, a 931A photocell feeds three 6AC7 stages, with 6F32s to provide blanking and video and sync mixing. Multi-vibrators are used to generate the sync pulses.

G2DCI (Liverpool) worked GD3DA/P and EI2W on May 18, using 18 watts to ar. 832 final and an indoor 6-element beam. EI2W reported his signals as 40 db. over S9. The receiver in use has three e.g.t. stages of r.f. amplification, an EF54 mixer and 6J6 oscillator. The r.f. stages are based on the e.g.t. pre-amplifier described in the BULLETIN for April, 1951.

### Helical Aerials

Now that helical aerials are becoming popular on the 70 cm. band it would seem to be an appropriate time for a standard direction of "thread" to be adopted as it is necessary for both sending and receiving aerials to be wound in the same sense if the best results are to be obtained. It is suggested, therefore, that a right-hand thread, as viewed from the back of the aerial looking in the direction of the wave propagation, be regarded as standard practice.

### Flash

At 1618 G.M.T. June 9, 1952, Capt. E. Clarke, G8AO/MA worked G4DC (New Cross) for the first 2-metre contact with the new Maritime Alternative Licence. The ink on the licence was still wet! At the time Capt. Clarke's ship was moored in the London Docks. When at sea he will sign G8AO/MM.

in the May issue. The transmission standard adopted used 250-line pictures sequentially scanned at 50 frames per second. G3BLV, another TV transmitting enthusiast, made an overnight journey from Sunderland, bringing with him his own gear (pictured here) comprising a tele-still camera working on the flying-spot principle, and an SCR-522 transmitter driving a Mullard QQV06/40 running at 20 watts input. The same picture standards were used, and the apparatus was installed at the home of a keen short-wave listener in Plympton. 6-element horizontal Yagi arrays, carefully aligned on each other, were used at both stations.

### Good Definition

Modulation proved to be the stumbling block at both stations, and neither operator is satisfied with results as yet. Signal strength was very good, however, and using a low depth of modulation, pictures of excellent quality were received. Live pictures were transmitted from G5ZT/T, while test patterns and simple shadowgraphs were received from G3BLV/A/T. In spite of the poor modulation conditions, the definition attained was in the region of 2 Mc/s.

Further experiments with improved modulators are in progress at both stations. G3BLV has been received at various points in Sunderland, and is now trying to reach G3ACK at Blyth, about 18 miles away. Meanwhile, G5ZT is building a tele-still scanner similar to G3BLV's unit, so that tests can be made without necessarily running the whole camera chain and lighting system.

### British Triumph

The success achieved by these two operators is the result of a long series of experiments in all fields of Amateur TV transmitting activity, assisted by members of the British Amateur Television Club (of which both are prominent members). The amount of work involved in a project of this kind is enormous, and the fact that only two amateurs in the world, as far as is known, have succeeded in this newest branch of amateur communication, tells its own story. Heartiest congratulations are due to both operators.

G3CVO

# CQ SINGLE-SIDEBAND

By H. F. KNOTT (G3CU)\*

SINCE the previous article in this series was published (April issue), numerous enquiries have been received as to where suitable information on the subject of s.s.b. can be found. The source best known to the writer—and probably most accessible to the reader—is the American periodical *QST*, copies of which can usually be borrowed once the particular issues required are known. The accompanying bibliography sets out, in chronological order, a list of selected *QST* articles containing such information as will help the newcomer to understand the subject, and perhaps stimulate the interest of others who so far have only touched the fringe of it.

In addition to *QST*, *CQ* has also published various constructional articles, whilst the RCA publication *Ham News* has devoted space in several of its issues to the subject.

## Activity

Rebuilding and overhauling of equipment during the spring months has undoubtedly been responsible for some recent inactivity by the s.s.b. stations. The 3.5 Mc/s band now has its full complement again, however, and the new schedule frequency is 3797 kc/s. All stations use lower sideband.

There have been a number of new converts to the system, the best known of these being G3COJ (Hull), who was at one time somewhat sceptical about the advantages claimed for s.s.b., but, having tried it, has now no further doubts. He employs a phasing rig, generating the sideband on 3.7 Mc/s, and uses a 6AG7 (class A) to drive an 813 to 150 watts input. On 14 Mc/s, a 6K8G mixer (with crystal-controlled oscillator injection), and an 807 working in class A, drive the 813. During his first "try out" on 3.7 Mc/s he held two-way s.s.b. QSO's with G3FHL, G3CWC, PA0KC and G13ZX. Later, on 14 Mc/s, he contacted W6DMN, OE13CC, W2JJC and KT1DD—and also W2FGV, KT1UX and PY6BP, who were themselves using a m.

G3COJ suggests that a schedule frequency should be chosen in the 14 Mc/s band—as has been done for 3.7 Mc/s—and thinks 14347 kc/s would be suitable. KT1DD (Tangier), now working regularly on this band, is looking for contacts with G stations using s.s.b. His transmitter comprises a WIJEQ crystal filter, driving an 807 in class AB2.

G3CCZ (Epping), active on 1.8 Mc/s, hopes soon to be on 3.7 Mc/s. His rig consists of two crystal band-pass filters in cascade, operating at 5650 kc/s. He found that when using band-pass couplers, some of the drive frequency and local oscillator output got through to the transmitter output, causing unwanted beats to appear. The trouble was cleared by connecting a tuned circuit in the anode of the mixer stage. The writer has experienced similar effects, and suggests that a cure may often be achieved by using a balanced mixer in place of the single-ended type.

By the time these notes appear in print, G3ESV (Wigan) and G3GXS (Holmrook, Cumb.) will have completed their drive units, and may be on the air.

## "Down Under"

Australian amateurs are not losing time in the s.s.b. field. VK2ZF reports that there are at least

## Selected Bibliography of *QST* Articles on Single-Sideband Operation

### Theory

- Single Sideband (Editorial) January, 1948
- \* Single Sideband Operating Tests January, 1948
- \* What is Single Sideband Telephony? January, 1948
- \* Single Sideband Power Gain March, 1948
- \* What About Single Sideband? May, 1948
- \* A New Approach to S.S.B. June, 1948

### Practical (Filter)

- S.S.B. Transmitter for Amateur Operation January, 1948
- Inexpensive Sideband Filter March, 1949
- Filter Design for S.S.B. Transmitter June, 1949
- \* A Crystal Filter S.S.B. Exciter November, 1950
- \* Crystal Lattice Filters for Transmitting and Receiving, Part I and Part II June, 1951; August, 1951
- A Crystal Filter S.S.B. Exciter May, 1952

### Practical (Phase-Shift)

- A S.S.S.C. Transmitter Adaptor July, 1948
- Simple S.S.B. Transmitter November, 1948
- A Basic Phone Exciter January, 1949
- \* S.S.B. for the Average Ham March, 1949
- 75 & 20-metre S.S.B. Exciter November, 1949
- Audio Phase-Shift Networks January, 1950

### Linear Amplifiers

- \* Linear R.F. Amplifiers May, 1949
- A Two-Stage Linear R.F. Amplifier March, 1951
- \* Sugar-coated Linear Amplifier Theory October, 1951
- \* How to Test and Align a Linear Amplifier May, 1952

### Receiving

- Selectable S.S.B. Reception Simplified April, 1948
- Selectivity in S.S.B. Reception June, 1948
- Selectivity in S.S.B. Reception (Feed-back) August, 1948

\* Recommended as particularly interesting and useful.

15 stations whose activity is divided between 7 and 14 Mc/s, including VK2AC, VK2ZF, VK2CP, VK2VA, VK6EC, VK4CG, VK2AL, ZLIAU, PK4DA (Sumatra). There are also a number of VK3's and two VK7's on 3.5 Mc/s. '2ZF would like to work British and other European stations, but finds that the W and VE stations are usually more wide awake than their European partners in looking out for s.s.b. signals.

Those who are using the WIJEQ crystal-filter type generator and are not satisfied with the speech quality—or are having trouble with unwanted sideband attenuation or carrier suppression—should refer to the May 1952 edition of *QST* in which there are several useful suggestions for improving performance.

Notes, news and suggestions for inclusion in the August issue should be sent to the writer by not later than July 25.

## Spanish Technical Conference

Amateurs, organised by the Spanish National Amateur Radio Society (U.R.E.) in collaboration with the Superior Council of Scientific Researches of Spain, is to be held in Santander from July 22 to 28 next. German, Spanish, Italian and French scientists will speak at the Conference.

In addition to technical discussions the programme will include a wide variety of social activities.

Interested readers should write to Carlos Pereda, Lope de Vega 6, Santander, for further details.

\* 31 Batchwood Green, St. Paul's Cray, Orpington, Kent.



The output of the crystal chain is, of course, fed to the grid of a suitable 2-metre frequency-changer, which, incidentally, resembles the EF54 r.f. amplifier shown in Fig. 1, except for the addition of a grid-leak and condenser on the input side and an i.f. transformer in the anode circuit. Preceding the frequency changer should be at least one stage of r.f. amplification. Here one cannot do better than recommend the use of the "low-noise high-gain" pre-amplifier described by W. H. Allen, G2UJ, in the April, 1951 R.S.G.B. BULLETIN. A "Chinese-copy" of this is easy to construct and will give great satisfaction. When used with the modified RF27 unit referred to earlier, it will effect so great a measure of improvement as to make that unit more of a workable proposition than it normally is.

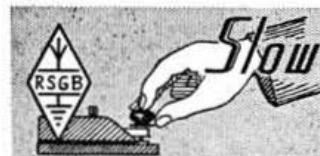
### In Conclusion

Finally, to round off these elementary—but one hopes practical—hints on getting started on the 2-metre band, the writer offers no apology for wasting the reading time of the more experienced worker. This article is not for those who have overcome the problems of v.h.f.; it is for those who have not yet essayed them. Its very simplicity may start trains of thought running in many minds, and requests for further elucidation. If any such requests are received, the writer will attempt to deal with them *en bloc* in a subsequent article.

it is usually preferable to suspend the counterpoise wire at a height of about 6 ft., cut to the same length as the aerial, so that the system operates as a folded Hertz; the wire should, if possible, be run in a direction other than directly under the aerial.

For an input power of 10 watts, an aerial operated in either the Marconi or the folded-Hertz manner will have poorer radiation, with consequent lower radiation resistance and higher current, than a half-wave Hertz erected high and clear of surrounding objects. Similarly, a 66 ft. aerial, loaded to quarter-wave operation, will have poorer radiation but a higher earth current than a 132 ft. aerial on the same site. On 1.8 Mc/s the use of more than one wire to form the aerial top may result in a slight increase of signal strength. Multiple-wire aerial tops and feeders are more often found in long-wave installations, where the aerial length is only a small fraction of the wavelength; their purpose is to provide extra capacitance to earth, thus raising the effective height of the aerial, and reducing the r.f. voltage at the insulators, thereby minimising losses due to leakage and corona discharge.

This article completes the present series under the title, "The Helping Hand to Amateur Radio." It is planned to begin publication shortly of a new series of articles designed to assist those who aspire to pass the Radio Amateur's Examination.



## Slow Morse Practice Transmissions

The following slow Morse transmissions, sponsored by the Society, are intended to assist those who aspire to obtain an amateur transmitting licence. More volunteers are still required for parts of the British Isles not already covered, particularly in the London Area. Stations listed who find themselves unable to continue transmissions should immediately notify the organiser, Mr. C. H. L. Edwards, A.M.I.E.F. (G8TL), 10 Chepstow Crescent, Newbury Park, Ilford, Essex.

\* Each station will operate in turn.

B.S.T.	Call	kc/s	Town	B.S.T.	Call	kc/s	Town
<b>Sundays</b>				<b>Wednesdays (continued)</b>			
10.00	G6MH	1990	Southend-on-Sea	19.30	G3HBX	1870	Warwick
10.30	G3AAZ	1780	Welwyn	21.30	G6XA	1770	Birmingham
10.30	G3EPK			22.00	G3HKC	1800	Grays, Essex
10.30	G5UM	1915	Guildford	22.00	G3DLC	1915	Guildford
11.00	G2FXA	1900	Stockton-on-Tees		G3GIO		
14.00	G5AM	1900	Witnesham, Ipswich				
21.00	G2FIX	1812	Nr. Salisbury	<b>Thursdays</b>			
22.15	G3AEZ	1847	Dorking	19.00	G3NC	1825	Swindon
<b>Mondays</b>				19.30	G3GRM	1815	Derby
19.00	G3NC	1825	Swindon		G2DOF	1830	S. Birmingham
20.30	G6LX	1875	Croydon	19.30	G3DTG		
21.00	G3BLP				G3ENH		
21.00	G3BHS	1720	Eastleigh, Hants		G6KI		
21.00	G3BLN	1900	Bournemouth		G8JI		
22.00	G3AEZ	1847	Dorking	20.00	G3FVH	1920	Hull, Yorks
22.00	G3GIO	1915	Guildford	21.30	G6DL	1760	Birmingham
22.15	G2BRH	1900	Ilford	22.00	G2NK	1730	St. Mary Cray
22.30	G8TL	1896	Ilford	22.00	G3AEZ	1847	Dorking
<b>Tuesdays</b>				22.00	G2FXA	1900	Stockton-on-Tees
19.00	G3IBL	1883	Derby	22.00	G3GIO	1915	Guildford
19.30	G3HGY	1830	Coventry	22.30	G3OB	1803	Manchester
	G5PP			<b>Fridays</b>			
	G5SK			19.00	G3BLN	1900	Bournemouth
21.00	G3EFA	1855	Southport	20.00	G3CSG	1870	Wirral
22.00	G3ELG	1772	Rotherham	21.00	G3BHS	1720	Eastleigh, Hants
22.00	G2BND	1890	Dalston, E.		G3AUT	1785	Rugby
22.00	G2FXA	1900	Stockton-on-Tees	22.00	G3AUF		
22.00	G3GIO	1915	Guildford		G3CBV		
23.00	G2XG	1735	Chingford		G3GTX		
<b>Wednesdays</b>				22.00	G3GIO	1915	Guildford
14.00	G3ADZ	1910	Southsea	<b>Saturdays</b>			
19.00	G3ADZ	1900	Southsea	14.00	G3ADZ	1910	Southsea
				22.00	G3GIO	1915	Guildford
				23.00	G2FXA	1900	Stockton-on-Tees

MEMBERS USING THIS SERVICE ARE REQUESTED TO SEND LISTENER REPORTS TO THE STATIONS CONCERNED

## Thanks from Ceylon

The President of the Society has received the following communication from the Prime Minister of Ceylon.

Sir,

*I wish to take this opportunity to thank you and all members of your Society for the assistance you gave us when Dr. M. V. P. Peiris who was attending on the late Prime Minister, the Rt. Hon. D. S. Senanayake, attempted to contact Sir Hugh Cairns, Neuro Surgeon in U.K. If not for the readiness with which you came to our aid, I am sure we would not have been able to obtain Sir Hugh Cairns's instructions at the time we were desperately making attempts to save the late Prime Minister's life.*

*Let me assure you that not only the members of my family and I, but also the people of Ceylon as a whole, deeply appreciate the courtesy and human concern you showed me on that occasion.*

*Yours faithfully,*

Dudley Senanayake,  
PRIME MINISTER.

Colombo,  
23rd April, 1952.

The President, in acknowledging the communication, replied in the following terms.

Dear Sir,

*I am honoured to receive your letter of thanks for the assistance given by Radio Amateurs after the unfortunate accident to your late Prime Minister, and I shall convey your message to all my colleagues.*

*It is a fundamental principle of Amateur Radio Communication to extend friendship and to serve humanity. We are proud to have been able to offer assistance, and are deeply sorry that there could not have been a more fortunate conclusion. I offer you our sincere sympathy.*

*Yours faithfully,*

Frederick J. Charman,  
President, R.S.G.B.

London,  
15th May, 1952.

## R.S.G.B. Amateur Radio Call Book

**T**HE Second Edition of the Call Book is now on sale, and is available from Headquarters, price 3s. 6d. (3s. 9d. post free).

It contains over 800 additions to the first edition, and 500 changes of address notified since last Autumn. By the inclusion of a Stop Press, it has been possible to print all new call signs notified up to the middle of April.

Transmitting amateurs in Great Britain and Eire whose call signs do not appear are asked to send a post-card immediately to the Call Book Editor (Mr. J. P. P. Tyndall, G2QI, 174 The Drive, Ilford, Essex). Please do not leave it until an announcement is made about the next Edition.

This edition also contains a list of International Amateur prefixes arranged for easy reference both in Prefix and Country order. All correspondence (other than orders) in connection with the Call Book should be sent to Mr. Tyndall.

\* \* \*

Members are asked to note that during recent weeks the Call Book Editor has received a great many letters as well as QSL cards which should have been sent either to Headquarters or to the QSL Bureau.

## Veterans

**S**INCE the publication, last month, of the first list of Veterans, the following Members have notified Headquarters of the call sign they held prior to the 1914-18 war:

S. F. Harris, G5SH, of London, S.W.11. (KXC, KXD).

A. W. Knight, ex-G2LP, of Tolworth, Surrey. (XMA, XMB, XMC).

H. Little, G2NV, of Stourton, Stourbridge, Worcs. (LBX, LSX).

G. R. Marsh, G2IW, of Bath, Somerset (NXT).

E. A. Payne, of Chelmsford, Essex (QCX).

C. C. Redshaw, of Dorchester, Dorset (XZT).

G. W. Tonkin, G5RQ, of Bristol (TBX).

In addition to the above we understand that Dr. A. W. Fawcett, G2HQ, of Sheffield, held the call ASX, and Mr. Maurice Child, of Guildford, the call NWX.

Mr. C. M. Denny, G6DN, of Didsbury, Manchester, and Lt. Col. L. N. Stephens, G2BN, of Kingston on Thames, also held licences prior to the 1914-18 war.

## Official Meetings

**I**N order to avoid a clash with the Second 2 Metre Field Day, the Council has agreed that the Region 1 Meeting shall take place in Liverpool on September 14 instead of on September 21, 1952.

## Opening at Headquarters for Administrative Assistant

**T**HERE is an opening at Headquarters for a keen young radio amateur—preferably one holding a licence—who has a flair for administrative work.

Applicants should be between the ages of 23 and 26 and should have had experience of short-wave radio work. A salary of not less than £400 per annum is offered. After a probationary period of 12 months the officer may join a contributory pension scheme.

Applicants, who must be British, should submit references and give full details of their qualifications and previous experience. A copy of a recent photograph should also be furnished.

Applications marked "Private and Confidential," must reach the General Secretary, Incorporated Radio Society of Great Britain, New Ruskin House, Little Russell Street, London, W.C.1, by July 1st, 1952. Canvassing will be a disqualification.

# Portable and Alternative Address Licences

## G.P.O. Announce New Facilities

AS a provisional measure the Post Office has decided to amend the conditions under which Alternative Address and Portable Licences are issued. Details of the new facilities, which will be subject to review early next year, are summarised below.

### General

(i) Subject to certain limitations the holder of a permit for Alternative Address or Portable operation will be permitted to use his station at a location other than that specified in the permit, provided the Post Office Engineering Department has previously been notified of the proposed location by prepaid registered letter or telegram. An official receipt should be obtained for the registered letter or telegram and the licensee must be able to produce this and his Alternative Address or Portable permit at the notified location when requested to do so by any authorised person.

Notification sent in this manner will be valid for 48 hours from 8 a.m. on the date indicated in the notification. Permission for portable operation may be renewed by the despatch of a further notification, but this procedure cannot be used in respect of an Alternative Address permit which allows use of the station at an occasional alternative address on only one occasion in any period of four weeks.

Notifications must not be sent more than 14 days before the start of operations.

(ii) The Licensee's main, or any other, amateur station for which he has a licence, must not be used while an alternative address station of any description or a portable station is in use.

### Portable Permits

(iii) Permits for Portable operation will be issued at a charge of 10/- per annum and will authorise the licensee to use his station in the open-air (subject to the same technical restrictions as at present) within five miles of the address specified in the permit or within five miles of a point defined in a notification sent in accordance with (i) above.

The permit will also authorise the licensee to use his portable station on a boat that is moored or anchored within 100 yards of the shore on a lake or on narrow inland waters within five miles of the address specified in the permit or a point defined in a notification sent in accordance with (i) above. For licensing purposes narrow inland waters are defined as any canal or waterway which is not more than 100 yards wide or that part of a river between its source and the point where it first becomes 100 yards wide. A lake is any stretch of water which has no outlet to the sea except by narrow inland waters which are at least five miles in length.

Facilities similar to those above may be granted for operation on boats used on certain other inland waters not clearly defined above (e.g., parts of the Norfolk Broads). Applications for permits for use of a portable station on a boat used on such waters should be made in writing to The Engineer-in-Chief, Radio Services and Maintenance Branch, WM3/3, General Post Office, Brent Building, North Circular Road, London, N.W.2. Applications should give full details of the area in which it is desired to operate.

Use of a portable station will not be permitted:

- (a) From any vehicle or vessel whilst it is in motion;
- (b) Within  $\frac{1}{4}$  mile of any premises or vessel in which a receiver may be in use;
- (c) Within one mile of any Government Wireless Station.

During portable operations the location of the station (identified by grid reference or other readily decipherable means) and its call sign, must be sent out not less frequently than once every 15 minutes.

When a portable station is established in a boat it must be dismantled or otherwise disabled from sending if the vessel proceeds to seaward of the defined limits of narrow inland waters or such other limits as may be specified in the permit.

### Alternative Address Permits

(iv) Alternative Address permits will be issued as at present at a charge of 10/- per annum to authorise use of the Licensee's station at a permanent alternative address. Additionally this permit will authorise the Licensee to operate his station for 48 hours at an address which has been notified in accordance with (i) above, but this facility can be used only once in any period of four weeks.

In addition to the permanent Alternative Address permit a Temporary Alternative Address permit will be issued on request at a charge of 10/-. This permit will permit operation of the Licensee's station at a temporary alternative address for a period of not more than one month or for any number of occasions within any one month. Only one Temporary Alternative Address permit will be issued to a licensee in each year.

### Availability of the new Facilities

(v) Current permits do not authorise use of the new facilities and will not be amended to do so. Permits authorising use of amateur stations under the conditions outlined above will not be issued to applicants for new portable or alternative address permits before July 14, 1952. A current permit will be withdrawn and replaced by a new permit on the renewal date if renewal is required. Holders of current permits who require to use the new facilities before the expiry date of their present permits should make written application, stating the date on which it is desired to commence using the new facilities and enclosing the current permit. Applications should be addressed to The Engineer in Chief, Radio Services and Maintenance Branch, WM3/3, Brent Building, North Circular Road, London, N.W.2. Every endeavour will be made to issue a new permit before the desired date, but no guarantee can be given that it will be possible to do so in every case.

### LONDON MEMBERS' LUNCHEON CLUB

will meet at the Kingsley Hotel, Bloomsbury Way, W.C.1 (opposite Headquarters)

at 12.30 p.m. on June 20 and July 18.

Visiting amateurs especially welcome.

Telephone table reservations to HOL 7373 prior to day of luncheon.

# CORNWALL SHOWS THE WAY

*An attendance of 100 at the First County Meeting west of the Tamar*

IT was perhaps appropriate that the first official Society meeting of the year should be held in Cornwall—a county which had never previously staged more than a monthly town or area group meeting.

Any fears that Cornwall would not be able to justify having a meeting of its own were quickly dispelled as the lounge at the spacious, beautifully appointed and centrally situated Madeira Hotel, Falmouth, began to fill up during the morning of Sunday, May 4. From all parts of the Region—even as far as Bristol (a distance of more than 150 miles)—they came.

After an excellent luncheon the Cornwall C.R. (David Beattie, G2WW), welcomed the official party from Headquarters, which included the President (F. Charman, G6CJ), the Hon. Secretary (Arthur O. Milne, G2MI), Council Member C. H. L. Edwards, G8TL, the General Secretary (John Clarricoats, G6CL) and the Assistant Secretary (Miss May Gadsden).

Representative (Herbert Bartlett, G5QA) was now a Member of the Council.

The business meeting was concluded after Miss Gadsden had, with a few well chosen words, referred to a number of Headquarters' activities, with suggestions on how to facilitate the work.

## After Proceedings

During tea a competition was organised in which the prizes consisted of a large number of components and other goods donated by radio manufacturers. Nearly everyone must have collected at least one gift, notwithstanding an attendance of more than 100, whilst "the Lord Mayor of Flushing" (to use the phrase "Clarry" coined to describe his old friend Cliff Metcalfe, G3DQ), came in for a good deal of barracking as a result of his frequent visits to receive the prizes presented by Mesdames Bartlett and Edwards.

After tea the President delivered his famous model aerials lecture and demonstration. To say



Part of the large assembly at the Cornwall County Meeting held in Falmouth, on May 4, 1952. Centre row seated, G2JL, B.R.S. 15699, G2MI, G3HMY, G6CL, G5QA, the President (G6CJ), G2WW, Miss Gadsden, G8TL, G2AYQ, G2VC. G5ZT is seated in front of G5QA. G3AET is to his right.

## Business Meeting

During the business meeting the President spoke of the technical problems arising out of T.V.I. As Cornwall will soon become a "fringe area," his remarks and advice were especially appreciated. Mr. Charman also made reference to the Society's responsibilities in the field of International Amateur Radio and the part it is playing in connection with the I.A.R.U. Region I Bureau.

During the course of his address the General Secretary made the first public announcement regarding the forthcoming release of the 21 Mc/s band. He also paid tribute to Harold Jones, G5ZT, of Plymouth, whose experiments in collaboration with G3BLV/A (from Sunderland) had, but two days earlier, attracted the notice of the National Press. He suggested that members in the Region could feel proud that the first two-way amateur television QSO—possibly in the world—had taken place in the South-West of England. Mr. Clarricoats also discussed licence matters, the BULLETIN, and the present financial position of the Society.

Mr. Milne briefly reported on the activities of the QSL Bureau and spoke of the many other services available to members.

Mr. Edwards referred to the scheme of representation and of his pleasure that the Regional

that it was most warmly appreciated is to make an understatement. It was an occasion we of the South-West will never forget.

## Retrospect

As the last guest departed, those responsible for its organisation felt that Cornwall had indeed set a pattern for county meetings of the future. Maybe, in the years to come, the Council will see the wisdom of going to the membership instead

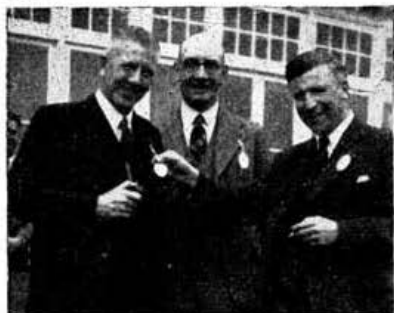


The President meets some Falmouth personalities. The President (Frederick Charman, G6CJ), extreme right, with, from left to right, John Watson (G3AET), Arthur Cosling (G2VC) and Cliff Metcalfe (G3DQ).



of hoping that the membership will always come to London! In other words what better county than Cornwall for a National Convention?

The main organisation of the meeting was carried out by the new Falmouth T.R. (Norman Elliott, B.R.S. 15699), ably assisted by John Watson, G3AET, Ted Bowden, G2AYQ (A.R. for North Cornwall) and Bob Allbright, G2JL (A.R. for West Cornwall).



Herb Bartlett (G5QA) (South Western Regional Representative), with Norman Elliott (B.R.S. 15699) (Falmouth Town Representative), and David Beattie (G2WW) (Cornwall County Representative) at the Cornwall County Meeting.

The meeting was strongly supported by members of the West Cornwall Radio Club (a Society affiliated to the R.S.G.B.), which brought out a special issue of its Journal "The Radio Link," to commemorate the event.

During the Saturday evening prior to the meeting the members of the official party from Headquarters were entertained to dinner by the Regional and County Representatives and other local members.

The evening finished when the President and David Beattie, after visiting the "Lord Mayor of Flushing," were directed back to their hotel by G2MI/P and G8TL/P, who were operating portable from the Maderia Hotel.

"Decibel"

#### Caernarvonshire County Meeting

THE Caernarvonshire County Meeting held in the Empire Hotel, Llandudno, on Sunday, May 11, 1952, was supported by members from all parts of North Wales.

Following an informal luncheon, Fergus Southworth, GW2CUU (Region 11 Representative), extended a warm welcome to the Headquarters representatives, W. A. Scarr, G2WS (Immediate Past President), F. G. Lambeth, G2AIW (Member



The Caernarvonshire County Meeting, Empire Hotel, Llandudno, May 11, 1952. Centre, left to right: G6CL, GW2CUU, G2WS, G2AIW, GW3ENY (C.R. for Caernarvonshire).

of Council) and John Clarricoats, G6CL (General Secretary). Mr. Southworth expressed his pleasure at the excellent attendance, bearing in mind the scattered nature of the Region and transport difficulties.

During the business meeting, Mr. Scarr referred to the International aspects of Amateur Radio and to the steps which the Council is taking to bring about a revision of the Articles of Association. Mr. Lambeth spoke of the services which the Society offers to members and of the scope and purpose of the Scheme of Representation. The General Secretary discussed licence matters, the BULLETIN and the financial position of the Society. During the general discussion which followed, many interesting questions were answered and views expressed on a variety of subjects, including a suggestion that Wales should have its own representative on the Council.

Following a raffle for prizes the Paris, 1950, and Convention, 1951, films were screened. A fine display of specialised metal work for amateur requirements was exhibited throughout the day by Mr. Len Philpotts, G4BI, of Philpotts Metalworks, Ltd. (Loughborough).

During the week-end the delegates from London were provided with an opportunity to see a little of the scenic beauty of North Wales.

"Meny"

#### West Midlands Regional Meeting

ABOUT sixty members attended the Region 3 Meeting held at the Vittoria Restaurant, Birmingham, on May 24. Visitors included VQ5CB and his wife, the Region 4 Representative (G8SA), and Representatives from Regions 4, 6 and 7. The number of County and Town representatives in attendance from within the Region was remarkably high. Council was represented by the President (Mr. F. Charman, G6CJ), the Acting Vice-President (Mr. L. Cooper, G5LC), Mr. T. L. Herdman (G6HD) and the General Secretary (Mr. John Clarricoats, G6CL). Past-President (Victor Desmond, G5VM) and Council Member (Mr. C. H. L. Edwards, G8TL), were also present. It was in the nature of an experiment to hold the meeting on a Saturday, but it was not possible to judge if or how the attendance was affected thereby.

Following an introduction by the R.R. (Mr. J. N. Walker, G5JU), the President discoursed on the problem of television interference, pointing out the difficulties caused through television receiver manufacturers being under no compulsion to apply appropriate safeguards to their productions, and emphasising that proper precautions will enable the trouble to be overcome. He emphasised that a defeatist attitude should never be adopted. Mr. Charman then dealt with the position of the Society in relation to International Amateur Radio affairs, making particular reference to the work of the Region 1 I.A.R.U. Bureau. He explained that whilst, at the moment, the expense of running the Bureau is negligible, the leadership of the R.S.G.B. amongst European societies must be maintained for the good of all, even if the cost becomes appreciable.

Mr. Cooper gave information on the revision of the Articles of Association. Every clause had been most carefully considered by the Council, not only in the light of the situation as it exists today, but with an eye to the future. G5LC proceeded to give a clear outline of the present scheme of representation, the proper application of which is of benefit both to the members and to the Council. Mr. Herdman dealt mainly with content matters, including N.F.D.

The General Secretary followed with his usual informative talk, albeit his well-known "black-book" was missing. He emphasised the good work the Society was doing in connection with licensing matters, mentioning in particular the possibility of additional portable facilities becoming available and of permission being granted for frequency modulation on 14 Mc/s. BULLETIN improvements were referred to, these having been made despite the ever-increasing cost of printing and paper.

During question time, points were raised on a variety of subjects, including a protest regarding the continued presence of intruders in the various amateur bands. N.F.D. rules were also discussed and some suggestions put forward for the consideration of the Contests Committee. G2AO and 6WF complimented Headquarters on the excellent work being performed by the Society and

expressed their satisfaction with the good value obtained for their subscription. VQ5CB mentioned his pleasure at being able to take advantage of the opportunity—to him very rare—of attending a meeting of this kind.

After a substantial tea, Mr. Sims, Senior Lecturer at the B.B.C. Engineering College, Evesham, gave an absorbing lecture on "Aerials," illustrating his subject (literally) with the aid of small aerial systems, working on centrimetric waves, and used in conjunction with small filament and neon bulbs.

Finally, a visit was made by a party of members to the headquarters of the Birmingham Fire and Ambulance Service, where the v.h.f. communications equipment was examined with much interest, the efficiency of the installation being demonstrated by making contacts with vehicles situated at a distance. J.N.W.

### School Television

THE Society was represented at a special Press viewing of the first experimental television programme for schools at Alexandra Palace last month. The transmission was radiated on a u.h.f. closed-circuit link to six Middlesex Secondary Schools, where specially adapted receivers, lent free of charge by a number of manufacturers, displayed the programme to some 240 children aged between 11 and 13 years.

The purpose of this first experiment was to try-out a variety of programme techniques and to test their effectiveness for presenting educational material to children viewing in a classroom. It is planned to conduct a further experiment on a much larger scale in a year or two.

The programmes were televised daily for four weeks, and dealt with such subjects as science, current affairs, travel, aesthetics, and the industrial scene. The reaction of the children was watched and tested by their teachers and officers of the School Broadcasting Council. The experiment was the result of collaboration between the staff of the Television Service, the School Broadcasting Department, and the Middlesex Education Authority.

### Radio Amateur Training Courses

EVENING classes for aspiring radio amateurs have again been arranged, in conjunction with the Essex County Council, for the 1952-3 session at the Ilford Literary Institute High School for Girls, Cranbrook Road, Ilford (adjacent to Gants Hill Station, Central Line). Three subjects are available: Amateur Radio Examination Course; Amateur Radio Refresher Course; and Morse Code and Operating Procedure.

Further details will be published in the August issue of the BULLETIN, but those who wish to attend are asked to communicate in the first instance with C. H. L. Edwards, G8TL, 10 Chesham Crescent, Newbury Park, Ilford, Essex (Tel.: Seven Kings 7384), in order to be assured of a place when the classes commence in September.

### German Radio & Television Exhibition, 1952

THE German Amateur Radio organisation, D.A.R.C., is to operate an Amateur Radio station at the German Radio & Television Exhibition to be held in Düsseldorf from August 22 to 31, 1952. The Exhibition, which is intended to illustrate the extent of Germany's industrial recovery and progress in the field of electronics, will be supported by all manufacturers of radio,

television and associated equipment in the Federal German Republic and Western Berlin.

A few years ago, Germany was forced by the pressure of existing circumstances to build up a network of ultra-short-wave broadcast transmitters, and by March 1, 1952, there were already 70 of these transmitters in operation. A further 30 are to begin operations within the near future, and the industry is incorporating ultra-short-wave ranges in broadcast receivers intended for home consumption.

German developments in television have quickly made-up for lost ground in this field. In 1950, the Nordwestdeutscher Rundfunk began initial test transmissions, using a 100-watt transmitter located at Hamburg. Next autumn there will be four or five television transmitters working for three hours daily with a power of 10 kilowatts. A relay system for the transmission of programmes between Hamburg and Munich is under construction. Definition standard is 625 lines, and six v.h.f. channels (between 174 and 216 Mc/s) are available.

The Exhibition will also feature developments in u.h.f. aerial design, and wire and tape recording, and the German Post Office will display many of the technical aspects of its work.

### VS7 Bulletin—Exhibition Number

TO commemorate the Colombo Plan Exhibition, at which the Radio Society of Ceylon operated an Amateur Radio station (call VS7RSC), a special 56-page number of the VS7 Amateur Radio Bulletin was published. The issue, which is produced in an attractive format, contains a variety of technical and historical articles, together with a specimen of the QSL card used to confirm contacts with the Exhibition station.

The publication costs 2 rupees (3/-) and is available from the Hon. Secretary, Radio Society of Ceylon, 21 Gower Street, Colombo, 5.

### Summer is here . . .

Have you got your R.S.G.B. Pennant?

If not, order now from Headquarters.

These miniature pennants, in red and blue double bunting, are ideal for clubroom, shack, bike, car, or

#### PORTABLE STATION

Large size (12" long) - - - 6/6

Small size (10" long) - - - 5/6

(add 3d. for postage)

# Tests and Contests

## Second European and North African 144 Mc/s Contest

THE French National Society R.E.F. has been invited by the I.A.R.U. Region I Bureau to organise the second European North African V.H.F. Contest following the success of last year's event which was sponsored by V.E.R.O.N., the National Society in the Netherlands.

It is hoped that this contest will be well supported by two-metre enthusiasts in all parts of Europe and North Africa, and become one of the chief events of the v.h.f. calendar.

### Rules

1. The contest is open to any amateur station in Europe or North Africa.

2. Contacts are to be effected in the 144 Mc/s Amateur Band.

3. The period of the contest will be from 1200 G.M.T. on Saturday, July 5, to midnight G.M.T. on Sunday, July 6.

4. Contacts may be made on c.w., telephony, or a combination of the two. Only one contact with any station will count for points.

5. Code numbers will be exchanged during each contact and contacts will only count for points if both stations receive the code numbers correctly.

6. The code number will consist of six figures for a c.w. and five for a telephony contact. The first three (or two) figures will be the RST (or RS) report, followed by a three-figure serial number commencing between 000 and 100 for the first contact and increasing by one for each succeeding contact.

7. Points will be claimed as follows:—  
Up to 50 km: 1 point per contact.  
50 to 100 km: 3 points for each of the first 25 contacts and 1 point for each succeeding contact.

100 to 200 km: 5 points for each of the first 12 contacts and 3 points per contact thereafter.

200 to 300 km: 10 points for each of the first 10 contacts and 6 points per contact thereafter.

Over 300 km: 15 points for every contact. The distance between stations to be reckoned in kilometres. 1 km equals .6215 mile; 1 mile equals 1.609 km.

8. During the contest the station must be operated by one and the same operator.

9. Logs must be in the form shown below and include call-sign, name, address, and the number of points claimed, and be accompanied by a short description of the station including the input to the final stage, the type of frequency control employed, the system of modulation, the type of receiver and aerial system in use and the height of the station above sea level.

Date	Time	Call	Code		QTH	Distance (kilometres)	Pis.
			sent	received			

Humidity..... Pressure .....

10. Logs should be sent to R.E.F., Comité V.H.F., Rue Marceau 72, Montreuil, Seine, France, and must be posted before July 16, 1952.

11. In case of dispute the decision of the R.E.F. Contests Committee shall be final.

12. A certificate will be awarded by R.E.F. to each of the ten leading stations, and to the first two in each country.

### VK/ZL DX Contest, 1952

**A**MATEURS throughout the world are invited to take part in the 1952 VK/ZL DX Contest. The rules, which are substantially the same as for last year, are summarised below.

The Contest is divided into two sections: Telephony—from 1200 G.M.T. on Saturday, October 4, to 1200 G.M.T. on Sunday, October 5, 1952; and Telephony—from 1200 G.M.T. on Saturday, October 11, to 1200 G.M.T. on Sunday, October 12, 1952. One point will be scored for each contact on a specific band with any VK/ZL district, the final score being derived by multiplying the total number of contacts made on all bands by the total number of VK/ZL districts worked on all bands.

Serial numbers will consist of 6 figures in the c.w. section, and 5 figures in the phone section, made up of the

R.S.G.B. BULLETIN, JUNE, 1952.

### R.S.G.B. Frequency Measuring Test

The leading stations in the Frequency Measuring Test, held on May 24, are as follows:

Station	Average error (parts per million)
E. Digman (G3BVA) .....	0.7
J. Kroon (PA0IF) .....	2.1
W. L. Ely (G3HQQ) .....	2.8
E. L. Owen (G2SF) .....	3.5

The frequency of the first transmission was 3574.281 kc/s and of the second 3525.376 kc/s. A full report on the test will be published in the July issue.

RST or RS report plus 3 figures commencing with 001 and increasing by one for each successive contact. Logs must show the date, time (G.M.T.), call sign of station worked, serial number sent and received, and the band. Each new VK/ZL district should be underlined when contacted. A separate log sheet should be used for each band. The summary sheet must show call sign, name and address, details of rig, total score claimed, and a signed declaration that the rules have been observed.

There is also a Listener's section, in which a VK or ZL station heard in a contest QSO counts for points, scoring and log-keeping being the same as for the Transmitting section.

Logs should be posted to reach the Contest Manager, N.Z.A.R.T., Box 489, Wellington, New Zealand, on or before January 23, 1953. A certificate will be awarded to the leading contestant in each country.

### Direction Finding Field Days

**D**ETAILS of the qualifying Field Day to be held on July 6, 1952, are as follows:

Organiser: H. E. Bone, 104 Montagu Road, Walton, Peterborough. (on behalf of the Peterborough R.S.G.B. Group).

Assembly Point: Stilton.

Map: Ordnance Survey, New Popular Edition, Sheet 134.

Assembly Time: 1330 B.S.T.

Intending entrants should notify the Organiser by not later than June 27. The Organiser will advise competitors of the call sign and frequency to be used when acknowledging their entries.

\* \* \*

The Direction Finding National Final will be held on Sunday, September 28, 1952, and not as stated in the May issue.

### Contests Diary

June 22 - -	420 Mc/s Tests
July 5-6 - -	European and N. African V.H.F.
July 6 - -	D/F Qualifying—Peterborough
July 26-27 -	144 Mc/s Open Event
August 17 -	D/F Qualifying—High Wycombe and Oxford
September 7 -	Low Power Field Day
September 21	D/F Qualifying—Edgware
September 28	144 Mc/s Field Day (No. 2)
October 28	D/F National Final
October 4-5 -	Low Power
November 8-9	"Top Band" (No. 2)



# COUNCIL PROCEEDINGS

*Résumé of the Minutes of the Proceedings at a Special Meeting of the Council of the Incorporated Radio Society of Great Britain held at New Ruskin House, Little Russell Street, London, W.C.1, on Monday, April 7, 1952, at 6 p.m.*

*Present.*—The President (Mr. F. Charman in the Chair), Messrs. H. A. Bartlett, L. Cooper, C. H. L. Edwards, D. A. Findlay, T. L. Herdman, F. G. Lambeth, A. O. Milne, H. McConnell, R. Walker, P. W. Winsford and John Clarricoats (General Secretary).

Apologies for absence were submitted for the absence of Messrs. J. Hum and W. A. Scarr.

## *Purpose of Meeting.*

It was explained that the Meeting had been called to give further consideration to the revision of the Memorandum and Articles of Association.

## *Memorandum of Association.*

A revised draft of the Memorandum was approved for submission to the Society's legal advisers.

## *Articles of Association.*

A final redraft of the revised Articles was approved for submission to the Society's legal advisers.

## *Procedure.*

The following procedure was approved:—

1. Draft revisions of the Memorandum and Articles of Association to be submitted to the Society's legal advisers.

2. The views of the Society's legal advisers to be considered by the Council.

3. The draft revisions to be sent, in confidence, to the Regional Representatives for their views.

4. The Regional Representatives to be invited to meet the Council.

5. The draft revisions to be sent to the C.R.s.

6. The views of the C.R.s to be considered by the Council.

7. Final drafts to be submitted to the Society's legal advisers and to the Board of Trade.

8. Approved drafts to be issued to the membership in the form of a Special Resolution.

9. Special General Meeting to be held to consider the Special Resolution.

The Meeting terminated at 10.5 p.m.

*Résumé of the Minutes of the Proceedings at a Meeting of the Council of the Incorporated Radio Society of Great Britain held at New Ruskin House, Little Russell Street, London, W.C.1, on Tuesday, April 8, 1952, at 6 p.m.*

*Present.*—The President (Mr. F. Charman in the Chair), Messrs. H. A. Bartlett, C. H. L. Edwards, D. A. Findlay, T. L. Herdman, J. H. Hum, H. McConnell, A. O. Milne, W. A. Scarr, R. Walker, P. W. Winsford and John Clarricoats (General Secretary).

Apologies for absence were submitted for the absence of Messrs. L. Cooper and F. G. Lambeth.

## *Membership.*

Resolved:—

(a) to elect 59 Corporate Members and 28 Associates;

(b) to grant Corporate Membership to 2 Associates who had applied for transfer;

(c) to grant Life Membership to Mr. R. C. E. Beardow, VEJAML (ex-G3FT).

## *Applications for Affiliation.*

Resolved, subject to the receipt of favourable reports from the Regional or County Representatives to grant affiliation to:—

(a) Hertford & District Radio Society

(b) Lincoln Short Wave Club

(c) Salisbury & District Short Wave Club

(d) Stockport Radio Society

(e) Stroud & District Amateur Radio Society.

## *E.D.R. Jubilee.*

Resolved to authorise the President to attend the E.D.R. Silver Jubilee celebrations in Copenhagen during August, 1952.

*Article in "The Short Wave Magazine" entitled "The Structure of a National Society."*

Correspondence from individual members and copies of resolutions passed at Group meetings of members were submitted.

Resolved to thank the members and Groups for their loyal support.

A resolution passed at a meeting of members in East Ham was considered.

Resolved to advise the Group concerned, via the East London D.R., that the facts as published in the March, 1952, issue of the R.S.G.B. BULLETIN provide a complete answer to the points made in the resolution.

A resolution passed at a meeting of members in Rugby was considered.

Resolved to advise the members concerned, via the Region 3 Representative, that the proposals put forward in "The Short Wave Magazine" in regard to the government of the Society, were based on a recommendation approved at a

meeting of R.S.G.B. Regional Representatives held in London during 1951.

## *Sussex Union of Radio Clubs.*

Consideration was given to the report of the inaugural meeting of the Sussex Union of Radio Clubs. It was reported that the vast majority of the members of the Brighton & District Radio Club had voted against joining the Union.

It was agreed to forward the correspondence to the Region 8 Representative for his comments.

## *N.F.D. Film Record.*

Resolved to authorise Mr. C. H. L. Edwards and the Secretary to produce a film record, approximately 600 feet in length, of the 1952 R.S.G.B. National Field Day event, at an estimated cost of £40.

## *Israel Amateur Radio Club.*

It was reported that the Israel Amateur Radio Club had donated a miniature Club-flag to the Society.

Resolved to thank the Israel Amateur Radio Club for their gesture of goodwill and to send them an R.S.G.B. pennant of the presentation type.

## *Dunfermline Group.*

Consideration was given to proposals put forward at a meeting of Dunfermline members that:—

(a) the Society should form a library of written or recorded lectures;

(b) the "Proceedings of the R.S.G.B." should be revived.

It was agreed to give consideration to the question of producing a recording of a lecture delivered at a forthcoming East London District meeting. The Secretary was instructed to explain to the members concerned the circumstances which first led the Council to publish the "Proceedings of the R.S.G.B." It was agreed that no useful purpose would now be served by reviving that publication.

**Regional, County, District, Town and Area Representatives are asked to note that the Society's financial year ends on June 30 next. No claim for expenses can be accepted if received by Headquarters later than July 15, 1952.**

## *Granfield Trophy.*

The Secretary submitted correspondence from the Region 5 Representative (Mr. R. F. Thurlow) relating to an announcement concerning the conditions under which the Granfield Trophy would be awarded for the current year. The Secretary stated that the announcement, as submitted by Mr. Thurlow, would appear in the April issue of the BULLETIN. The Secretary also tabled a copy of the April, 1952, issue of "The Short Wave Magazine," which contained a reference to the Granfield Trophy, but omitted all reference to the fact that the "Region 5" referred to was Region 5 of the R.S.G.B. and that three of the V.H.F. Contests mentioned were R.S.G.B. Contests.

The steps taken by the Secretary in connection with this matter were approved.

## *Finance.*

Resolved to accept and adopt the Cash Account for the month of March, 1952, and the Balance Sheet for the quarter ended March 31, 1952, as prepared by the Honorary Treasurer.

## *Membership and Representation Committee.*

Resolved to accept, as a Report, the Minutes of a meeting of the Committee held on March 11, 1952.

It was reported that the Recommendations contained therein (which related to Official Meetings) were approved at the previous Council Meeting. It was further reported that new card files of members had been prepared and that these would shortly be issued to the Regional Representatives.

## *I.A.R.U. Region I Bureau Committee.*

Resolved to accept, as a Report, the Minutes of a meeting of the Committee held on March 6, 1952.

It was reported that the Recommendations contained therein (which related to the continuation of the Bureau and to commercial stations operating in exclusive amateur bands) were approved at the previous Council Meeting.

## *Committees.*

Mr. Herdman advised the Council that, due to pressure of private business, he would be unable to continue his membership of the Technical and Region I Bureau Committees.

It was agreed not to fill the vacancies created by the resignation of Mr. Herdman from the Committees referred to above.

The Meeting terminated at 8.40 p.m.



# REGIONAL AND CLUB NEWS

## Admiralty Electronics Society

At the Civil Service Hobbies Exhibition, held in Bath from May 12 to 17, the Admiralty Electronics Society stand attracted much interest. An Amateur Radio station was operated under the call G3BPU/A on 3.5 and 14 Mc/s, using indoor and outdoor aerials. The operators were G2ZR and G3FBA. Several good contacts were effected when local noise level permitted.

On the stand, in addition to QSL cards and a Great Circle map, were an experimental television receiver, a tone generator for an electronic organ, a coil winder, and a crystal set (1926 vintage). R.S.G.B. literature was also displayed.

In the Arts and Crafts Section Messrs. Barrett and Hurst (members of A.E.S.) gained 1st and 2nd prizes for their entries of radio and television receivers and a valve tester.

## Brighton and District Radio Club

Future plans include a lecture by a representative of the Tungsram Valve Co. (June 24). R.S.G.B. members on holiday in the Brighton area will be welcome at the club H.Q. Hon. Secretary: R. T. Parsons, 14 Carlyle Avenue, Brighton 7.

## Bristol

Herbert Bartlett (G5QA), Council Member and R.R., was guest of honour at the May meeting when an interesting discussion on Society affairs took place. F. H. Chambers (G2FYT), reported on the Cornwall and Devon County Meeting held at Falmouth on May 14.

Some thoughts and suggestions on the topic of "the average amateurs' approach to consistent DX operating" will be given by H. J. Gratton (G6GN), at the meeting on June 20.

## Coventry

An interesting lecture and demonstration on the design and construction of modern transmitters was given recently by G6XY. G3ABA/P operated a portable station during the R.S.G.B. 2-metre field event and did well, despite the fact that high wind prevented the 24-element beam from being raised to its full height.

## Coventry Amateur Radio Society

A lively and entertaining "Quiz" was staged on May 26. The D/F Group has now been formed. David Harris (G3RF) has the arrangements in hand. This year's M.A.R.S./C.A.R.S. Contest was won by M.A.R.S. and the Society offer their congratulations to M.A.R.S. on a narrow but well-deserved victory. Twelve members took part in the R.S.G.B. 2-metre Field Day on May 10/11.

Club nights continue at the Y.W.C.A., Queen's Road, at 7.30 p.m. Future programme includes Auction Sale (June 23), Open Discussion (July 7), D/F Practical Demonstration (July 21).

## Leicester Radio Society

"Principles of Frequency Modulation" was the subject of a well-attended lecture given recently by C. L. Wright, B.Sc. (Eng.). Coloured slides, covering all major events in the area, are being prepared, and will be shown at a future meeting. A programme of activities can be obtained on application to the Hon. Secretary: A. L. Milnthorpe (G2FMO), 3 Winstor Drive, Thurmaston, near Leicester.

## Manchester and District Radio Society

Meetings are held at 7.30 p.m. on the first Monday of every month at the Brunswick Hotel, Piccadilly, Manchester.

## Medway Amateur Receiving and Transmitting Society

W. H. Allen (G2UJ) and L. S. King (G4IB) were welcome visitors at a recent meeting of the Society. A talk by Mr. Allen on 144 Mc/s work was warmly acclaimed by all present; his ability to get down to bed-rock being much appreciated.

A "Bring and Buy" Sale, held on April 28, was a great success and resulted in a profit of more than £7.

## Medway Hamfest

A Hamfest, organised by the Medway Amateur Receiving and Transmitting Society, is to be held at 207 Luton Road, Chatham, on Sunday, July 6, 1952, at 2.30 p.m. There will be a business meeting at 3 p.m., raffles and entertainment at 4.15 p.m., tea at 5 p.m., "mystics" at 5.45 p.m. and raffle announcements at 6.30 p.m. Tickets, 1s. 6d. each (2s. 6d. double), can be obtained from the Hon. Secretary, M.A.R.T.S. (C. R. Hawkins, 9 Sanctuary Road, Gillingham), or from local R.S.G.B. representatives.

## Midland Amateur Radio Society

This year the Society celebrates its "coming of age," and numerous interesting events have been planned—including a field weekend on June 28-29 in which the Slade Radio Society will participate. The Annual Dinner will be held on October 25, when it is anticipated that the Lord Mayor of Birmingham, accompanied by the Lady Mayoress, will be present. A talk on "Cavity Resonators and other Wave Guides" was the highlight of a recent meeting. Future

lectures include: "Home-built Tape Recorders," by E. C. Naylor Strong (June), and "Mathematics is Easy," by T. R. Theakston (July). Meetings are held on the third Tuesday each month at the Imperial Hotel, Temple Street, Birmingham. Hon. Secretary: G. W. C. Smith, 84 Woodlands Road, Birmingham 11.

## Purley and District Radio Club

At the A.G.M. held last month, the name of the club was changed to the above form, and the following Officers were elected: Chairman—F. Hoare (G2DP); Vice-Chairman—T. Young (G2AYM); Hon. Secretary—A. Frost (G3FTQ); Hon. Treasurer—G. B. Hobbs (G3EFO). Meetings are held on the fourth Thursday of each month at the Railway Hotel, Purley.

## Salisbury and District Short Wave Club

The club station (call G3KFK) is active on 3.5 Mc/s and will soon be operating again on 144 Mc/s. A D/F day has been arranged for June 15. The club meets each Tuesday at 7.30 p.m. in the Club Headquarters, The Saw Mills, Wilton. Members of H.M. Forces stationed locally are welcomed. Hon. Secretary: V. G. Page (G3IVP), 32 Feversham Road, Salisbury.

## Slade Radio Society

J. Collett (G3BUR) and M. A. Brett (G3HBD) gave an interesting lecture and demonstration on "Mobile V.H.F." at a recent meeting. To encourage beginners in the art of D/F, an evening test, with instruction, will take place on June 20. Highlight of the future programme will be a "Midnight D/F Test," to be held in conjunction with the M.A.R.S. field weekend on June 28-29. Further details may be obtained from the Hon. Secretary: C. N. Smart, 110 Woolmore Road, Erdington, Birmingham 23.

## Southend and District Radio Society

At the May meeting, Mr. Walters, of Belling & Lee Ltd., demonstrated the company's "Servograph Plotting Equipment"—a device which, using a microwave generator, records mechanically on graph paper the polar diagram of miniature aerials. The Society is to install and maintain an Amateur Radio Station at the International Boy Scout Jamboree to be held at Hockley, Essex, from August 9 to 16. Hon. Secretary: G. Chapman, Bell Hotel, 20 Leigh Hill, Leigh-on-Sea, Essex.

## South Manchester Radio Club

The club premises are now available to members on Friday evenings, alternate weeks being devoted to arranged programmes, operation of the club station, constructional work, etc. Talks and demonstrations on "Wire Recorders," by G3DDO, and "V.H.F.," by G3FDO and G3BAK, are planned for June 20 and July 4 respectively.

## Stockport Radio Society

Elementary lectures are being arranged for beginners, and Morse classes are already taking place. "G.C.A.," by G3FYE, and "High Fidelity," by ex-G2HDV, were the subjects of recent talks. Hon. Secretary: G. R. Phillips (G3FYE), 7 Germans Buildings, Buxton Road, Stockport.

## Sutton and Cheam Radio Society

As reported last month, the Society were the winners over the Thames Valley Society of the recent Cullen Cup Contest. The thanks of both societies are due to Horace Cullen (G5KH) for the gift of the trophy. Hon. Secretary: F. J. Harris (G2BOF), 143 Collingwood Road, Sutton, Surrey.

## Thames Valley Amateur Radio Transmitting Society

More than 60 members and friends were present at the May meeting to hear Louis Varney, A.M.I.E.E. (G5RV), lecture on T.V.I. suppression. The Chair was taken by the President, Leslie Cooper (G5LC).

Among the many visitors were Council Member P. W. Winsford (G4DC), R.S.G.B. Vice-President H. V. Wilkins (G6WN), and ex-Members of Council W. E. Russell (G5WP) and E. A. Dedman (G2NH). Others came from Houston (Texas), Manchester, St. Albans, Guildford and Woking.

Mr. Dedman has joined the Committee in place of Mr. G. F. Barrett (G8IP), who is now in Cyprus.

## Torbay Amateur Radio Society

Prior to their visit to the Cornwall Radio Society meeting, the General Secretary and Miss Gadsden, together with Council Member Herbert Bartlett (Region 9 Representative), attended a special meeting of the Society held on May 2.

During the evening Mr. Claricots spoke about the international aspects of Amateur Radio and described some of the frequency allocation problems which will have to be faced in the future. He also made mention of the recent amateur television achievements of Harold Jones (G5ZT/T), of Plymouth, and his colleague G3BLV/A/T.

The Chair was taken by Frank Wadman (G5GK), who,

during the course of the evening, introduced a number of well-known local v.h.f. workers (G2BMZ, 3AVF, 3CQC and 3GAO) to the Secretary.

Among those who also supported the meeting were Walter Sydenham, B.Sc. (G5SY), a Vice-President of the R.S.G.B.; Gordon Wheatcroft (G3HMY), C.R. for Devon; and Tom Smith (G3EFY), T.R. for Exeter. The meeting concluded with a draw for gifts donated by F/Lt. A. E. Jeffery (G3AWD, ex-ZE2KN) and Ken Grimes (G3AVF).

The Constructors' Contest organised by the Torbay Society is open to any member of the R.S.G.B. in the Dartmouth to Teignmouth area. Details of contests, trophies and membership may be obtained on application from the Hon. Secretary: L. H. Webber (G3GDW), 43 Lime Tree Walk, Newton Abbot.

### Tredegar

Mr. K. Bryant, B.R.S. 19522, of Glan Howy, Park Place, Tredegar, Mon., proposes to form a Radio and Television Society in his district. Members interested in the proposal are invited to contact Mr. Bryant.

### Vickers-Armstrongs Ltd. (Weybridge) Social and Athletic Club (Electronics Section)

The Electronics Section of the club, formed in March, now has 70 members. Meetings are held in the clubroom at the Sports Ground, Kings Head Lane, Byfleet, Surrey. The club transmitter will soon be on the air using the call G3IVW. On July 12—the parent club's Annual Sports Day—the Section will be arranging a radio equipment display; visitors will be welcomed. Hon. Secretary: A. W. Warner (G3FZC), Sales Accounts Dept., Vickers-Armstrong Ltd, Weybridge Works, Surrey.

### West Lancs Radio Society

Meetings are held every Tuesday at 8 p.m. in a room over Gordon's sweetshop in St. John's Road, Waterloo. The club will take part in a forthcoming local Hobbies Exhibition. Hon. Secretary: S. M. Sugden (G3GSS), 44 Gores Lane, Formby.

## Silent Keys

Members in the Manchester area, particularly those who were active on 1.8 and 3.5 Mc/s in pre-war days, will be sorry to learn of the death in hospital, following severe burns received at his home, of Norman Clifford Hardman, G2PO. He obtained his licence shortly after the 1914-1918 war in which he served as a Wireless Operator in the Merchant Navy. He did not resume activities after the 1939-1945 war.

Many members, both at home and abroad, will be grieved to learn of the death in Japan on April 18 last of Kenneth Cook, G2PQ/VS6AJ.

Before the war Ken was an active member of the Westcliff R.S.G.B. Group. During the war he served in the R.N.V.R. Whilst in Hong Kong he operated under the call VS6AJ and was for a time the Hon. Secretary of the Hong Kong Amateur Radio Transmitting Society.

Our deepest sympathies are extended to his family in their sudden loss.

With deep regret we record the death of one of the old-timers of Amateur Radio, R. Frank Speake (G5IQ), of Wolverhampton. A member of the Society since 1928, he was also a founder of the pre-war Wolverhampton Amateur Radio Society and did much to build up and strengthen the Amateur Radio movement in that district. During the war he was engaged on Government work, also serving for a period in the A.F.S.

To his widow, daughter and son we extend our heartfelt sympathies.

With deep regret we record the death, as the result of an accident in his shack, of Howard Gwilliam, GW6GW, Tredegar, aged 52, one of the best-known radio amateurs in Monmouthshire. Prior to receiving his own licence in 1930 he operated the station of the Ebbw Vale Radio Society under the call G2QG.

A staunch supporter of the old-time spirit of Amateur Radio Howard was, up to the time of his death, active on 160 and 80 and occasionally on 2 metres.

Although his voice will no longer be heard he will be remembered with affection by all who cherished his friendship.

GW5BI

## LEICESTERSHIRE & RUTLAND COUNTY MEETING

SUNDAY, JUNE 29, 1952.

EMPIRE HOTEL, FOSSE ROAD, NORTH LEICESTER.

### Programme:

Assemble	-	-	-	12 noon
Luncheon	-	-	-	1.00 p.m.
Business Meeting	-	-	-	2.15 p.m.
Tea	-	-	-	4.30 p.m.
Film Show, Lecture & Raffle	-	-	-	5.30 p.m.

Tickets (10/6 each) from the C.R., Mr. V. H. Thomas (G2CUR), 3 West Avenue, Wigston, Leicester, and the Leicester T.R., Mr. L. Milnthorpe (G2FMO), 3 Winstor Drive, Thurmaston, Leicester, not later than June 20.

### Representation

The following are additions or amendments to the list of Town Representatives published in the February, 1952, issue.

#### Region 1.—Lancashire West

Crosby & District.—J. D. Siddall (G4BM), 47 Woodville Avenue, Crosby, Liverpool 23.

#### Region 2.—Yorkshire West

Rotherham.—H. N. Gubby (G3ELG), 37 Sough Hall Road, Thorpe Hesley.

#### Region 3.—Staffordshire

Leek, Cheadle, Stone, Stafford, Newcastle-u-Lyme & Comberton.—D. Poole (G3AQW), 13 Oldfield Avenue, Norton-le-Moors, Stoke on Trent.

#### Region 7.—London, South-West

East Molesey.—A. Mears (G8SM), 4 Broadfields, Guildford & Woking.—R. L. F. Ramsey (G3ARM), Rock Hill, Sydney Road, Guildford.

#### Region 14.—Renfrewshire

East Renfrewshire.—W. T. McDowall (GM3CAR), 28 Evan Crescent, Giffnock.

#### Change of Address

County Representative—Fifeshire & Kinross—Region 13. Address of Mr. C. A. M. Clackson should read: 7 John Street, Brucefield, Dunfermline.

### FORTHCOMING EVENTS— (Continued from Page 526)

Exeter.—July 4, 7 p.m., Y.M.C.A., 41 St. David's Hill.

North Devon.—July 3, 7.30 p.m., Rose of Torridge Cafe, The Quay, Bideford.

Torquay.—June 21, July 19, 7.30 p.m., Y.M.C.A., Castle Road.

West Cornwall.—June 19, July 3, 17, Fifteen Balls, Penryn.

#### REGION 10

Cardiff.—July 14, 7.30 p.m., The British Volunteer, The Hayes.

#### REGION 13

Edinburgh (L.R.S.).—June 26, July 10, 24, 7.30 p.m., Edinburgh Chamber of Commerce, 25 Charlotte Square.

#### REGION 14

Falkirk.—June 27, July 11, 25, 7.30 p.m., The Temperance Cafe.

1952 (29th) EDITION 608 PAGES

## RADIO AMATEUR'S HANDBOOK

(Published by the American Radio Relay League)

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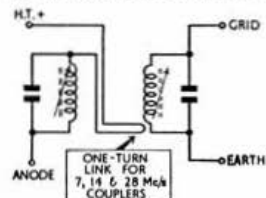
R.S.G.B. Sales Dept., New Ruskin House, Little Russell Street, London, W.C.1

# LETTERS TO THE EDITOR

The Society assumes no responsibility for the views expressed herein by correspondents.

## Wide-band Couplers

DEAR SIR,—With reference to the excellent article by R. H. Hammans, G2IG, in the November, 1951, issue of the BULLETIN, the following information may be of interest to readers who intend to construct the couplers therein described. Having several R.1143 receivers on hand, I removed the i.f. transformers for conversion, but found they were slightly different from those described by G2IG; they were wound with some 17 turns of enamelled copper wire. When modified as suggested wide-band coverage was found to be impossible due to overcoupling. It may have been that the coils in these transformers are in closer proximity to one another than those used by G2IG. After a little experimenting it was found that link coupling was the most suitable arrangement. A single-turn link of p.v.c. wire was wound over the cold end of the secondary and wired in series with the primary; this proved successful. Used with 6V6 doubler valves for 7, 14 and 28 Mc/s operation, driving a single 807, up to 2.5 mA drive could be obtained on all bands. Drive was adjusted to the required level for c.w. and phone operation by controlling the output from the 3.5 Mc/s v.f.o.



Circuit of the modified R.1143 I.F. transformer.

Although low-impedance output was not required, it was tried with satisfactory results, so that, using 6L6 valves instead of 6V6s, these couplers could be used in the wide-band exciter with low-impedance output described in a previous issue. The couplers are now built into a rig similar to that described by Louis Varney, G5RV, in the December, 1951, issue of the BULLETIN, but covering only 7, 14 and 28 Mc/s, and they function very efficiently.

The writer was prompted to give this information in case any reader should have acquired the same type of i.f. transformers as described above, and had been disappointed with the results obtained after modifying in accordance with G2IG's data.

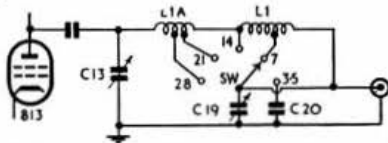
Yours faithfully,

W. N. L. SEWARD, M.I.P.R.E. (G3AED).

Reading, Berkshire.

## Pi-filter Tank Circuit

DEAR SIR,—Referring to the article by Louis Varney (G5RV) in the April issue (150-watt T.V.I.-proof P.A.), the following modification to the pi-filter tank circuit may be of interest to readers, since it eliminates the coarse loading control, thus simplifying the layout while still enabling a physically small condenser to be used for C19. The latter is fitted with a 3:1 slow-motion drive, and tuning is quite simple.



Circuit of the modified pi-filter tank circuit. C19, 500  $\mu$ F; C20, 500  $\mu$ F silver mica; L1, wound on TUSB former; SW, TUSB switch.

I have been using this circuit for some time in an 813 p.a. and found it quite satisfactory from the T.V.I. point-of-view.

Yours faithfully,

J. M. IYON, B.Sc. (Hons.),  
A.M.I.E.E. (G3BKF).

Witham, Essex

## T.V.I.

DEAR SIR,—I am in full agreement with Mr. Petty's remarks and with the editorial in the April issue. I have felt for a long time that a great many amateurs are taking a too passive attitude towards the problem. They seem to hope vaguely for someone else to produce a simple foolproof solution while they sit back and grumble or resign themselves to their fate by joining the viewing public.

If we amateurs do not make our stand now, it will eventually become the accepted thing not to transmit at all during the ever-increasing hours of television.

I suspect some amateurs do not even attempt the "de-bugging" of their transmitter, deeming it to be a difficult job to be undertaken by only the most enthusiastic, especially as there is no guarantee of ultimate success. Neither do they give any thought to the less popular types of transmission such as n.b.f.m. and s.s.s.c., even though some of these systems are known to be less subject to T.V.I. and B.C.I.

Such an attitude is inexcusable and defeatist. The resources of today are far superior to those that were at the disposal of the "old-timers" and they, in the past, achieved the seemingly impossible many times.

Many amateurs have sought refuge in the v.h.f. bands, but what of their fate when v.h.f. television arrives? If we have not won our case by then, the transmitting amateur will rapidly become a being that haunts only the early hours of the morning.

Has the amateur any greater obligation to maintain his silence for the benefit of the viewing public than has every owner of an unsuppressed vehicle, electrical appliance, radio, television or other interference generator?

I think not, provided that he has done everything in his power to ensure that his transmitter conforms to the terms of his licence. It is high time we amateurs dug in our heels and revolted at being held responsible for every flash on the television screen.

Finally, may I add my weight to G4JW's suggestion that the BULLETIN should devote more space to T.V.I. matters? I would urge the Society to do everything in its power, not only to stir every amateur into the grim realisation that it is his hobby which is being threatened and that it is up to him to do something about it, but to help educate both manufacturers and the viewing public to a better understanding of the difficulties. Even as a minority we have some rights.

Yours faithfully,

CLIFF SHARPE, G2HIF.

Wantage, Berkshire.

## More Views on N.F.D.

DEAR SIR,—May I add a word to the N.F.D. controversy? Personally I see little sense in limiting the transmitter input to 5 watts when it is permissible to use 100 watts on the receiver. However, it is my experience that 5 watts on the transmitter is quite adequate when the location is good. I well remember the W5 who received the shock of his life when exchanging the same report with a 5-watt N.F.D. station, he was using 1kW.

In my view there are only two ways to treat N.F.D. as it is organised at present. Either it is just another contest, in which case you go out to win by assembling the best possible gear and a handful of really first-class operators, strictly keeping all others outside the tent and most definitely off the key, or you regard N.F.D. as a pleasant week-end in the country and let everyone have a go; the position of the station in the final table being a matter of secondary consideration.

In conclusion, I feel I must say a word in defence of my little portable set in Manchester. The contact with the Exhibition station was made on "Top Band" with 0.75 watt input. The aerial was a short piece of wire inside the second floor of a large steel frame building, and the 2-mile between the two stations was more or less filled with steel framed buildings. Finally, the receiver at the Exhibition was located in a particularly noisy place. I think this example is hardly a fair one to select when judging the merits of QRP. Frankly I regarded Mr. Whalley's reference to G2MI/P as somewhat irrelevant.

Yours faithfully,

A. O. MILNE, G2MI.

Bromley, Kent.

DEAR SIR,—Like many others I was surprised to read that Council had accepted the suggestion of the Contests Committee that for N.F.D., 1953, one station shall operate on two non-adjacent bands. I wonder what consideration has been given to the formidable list of objections?

One naturally designs, say, a 1.7 Mc/s oscillator to spread the band well over the dial. Using harmonics of this oscillator, the usable part of 7 Mc/s (7 to 7.15 Mc/s) will only spread over 37.5 of the 180 degrees, and will be far too cramped. The same will apply with greater force to 3.5 and 14 Mc/s. Plug-in coils do not solve the difficulty as the L/C ratio for one band is hopelessly "out" for the other. We therefore require separate m.o. circuits, and since the same holds true for the p.a., we might as well have separate transmitters. Nobody in his right mind would design a fixed station transmitter for alternate bands. Why go to all that trouble for one day only?

In aerials, too, efficiency will be lost. Owing to "end effects" a full wave on 3.5 Mc/s is much shorter than four waves on 14 Mc/s. Aerial coupler components need to be variable over a very considerable range, as the impedances to be matched will vary very considerably from one band to another.

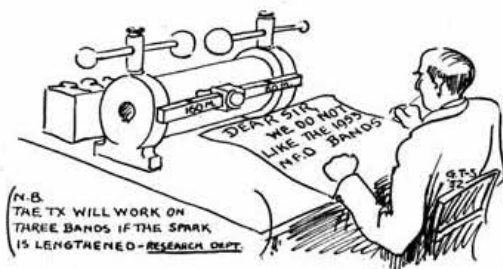
This new rule may well promote inactivity, for many will agree with my own decision. It is that, having a nice "Top Band" job in use at all times, which will reach down to 80 metres for N.F.D., I would be wiser to *keep out* of N.F.D. than to mess it about to give a less effective performance, for one day only. I think a wide inquiry as to members' opinions should be made before this rule is fixed.

Yours faithfully,

H. S. CHADWICK, G8ON.

Workshop, Notts.

PROGRESS!



DEAR SIR,—The writer is in complete agreement with Mr. Whalley's letter in the April BULLETIN concerning N.F.D.

It seems to me that N.F.D. is waning in popularity with the membership. Whilst, perhaps, the number of stations operating remains high, I suggest that the number of members actually supporting the event have lessened considerably.

Why not remove the irksome power restrictions even to the extent of allowing the use of 150 watt input on the h.f. bands? If some form of handicapping is necessary, why not a power multiplier on the following lines:

Power inputs from 50 to 150 watts—Score X1

" " " 25 to 50 watts— " X2

Below " " 25 watts— " X3

To my mind, the important regulation is the time limit on station erection and this should be retained.

Yours faithfully,

C. COLLINS, G(W)8SC.

Malvern, Worcs.

DEAR SIR,—May I express my agreement with the remarks of Mr. John J. Yeend (G3CGD) in the May issue on the question of N.F.D.?

I sincerely hope the new allocation of frequencies will be scrapped long before we have to consider designs for 1953 N.F.D. gear. Apart from the operator angle, the additional complication to gear does not seem to be justified. Surely, if the original spirit of N.F.D. is to be maintained, one station should be for "local" work, and one for DX?

When a revolutionary new rule is introduced, some explanation from the Contests Committee for its need would help. I refer, especially, to the new one about not changing the aerial during the contest. This eliminates the possibility of experiment, and would appear to be unnecessary; it "ties down" N.F.D. contestants while leaving other things "wide open"—e.g. the use of 807s in a 5-watt station. The temptation to push up the volts a bit is always there.

I suggest a handicap based on the dissipation of the final valve (and preceding valves not to be larger). The station at which I operated this year used a pair of EF91s in the final at 250V max., and they cannot exceed 5W. In connection with B.R.S.250's remarks, the rig can be on the air, working from the car battery, within 15 minutes—including removing from the house, connecting up, and running out an aerial!

And how I agree with GW5FN! 813s in push-pull on 150W licences—and they expect you to believe them, too! In pre-war days, a 25W licence encouraged some people (I won't call them amateurs) to run 100W. The 150W licence appears to make them need 1kW+!

Yours faithfully,

G. P. ANDERSON (G2QY).

Pinner, Middlesex.

### Region 1 N.F.D. Trophy

The Society's Region 1 Representative (Basil O'Brien, G2AMV) proposes to donate to the membership in his Region a trophy, to be known as the "Region 1 N.F.D. Trophy." The Trophy will be awarded annually to the Group in Region 1 scoring the highest number of points in the R.S.G.B. National Field Day event and will be held by that Group for one year.

### New Members—Correction

The call sign of K. S. P. McFarlane, 3 Millais Road, Leytonstone, E.11 (p. 511, May issue), should read G3ICG, and not G3IGG as stated.



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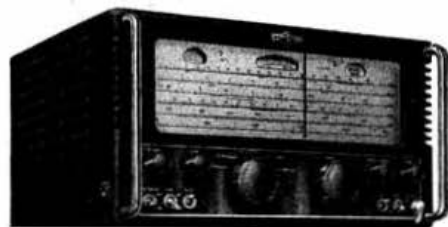
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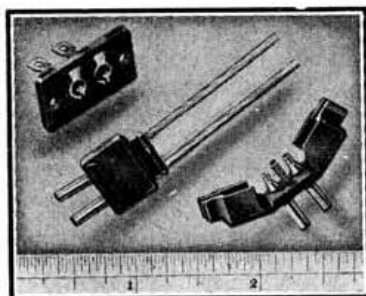
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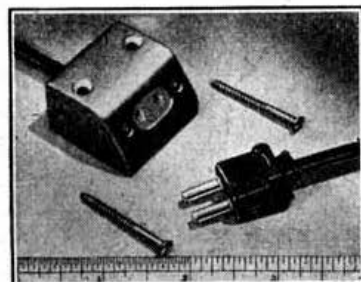
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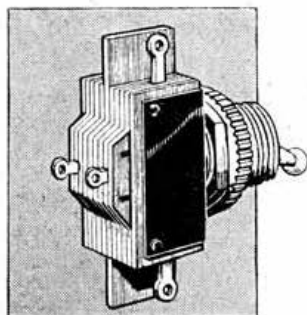
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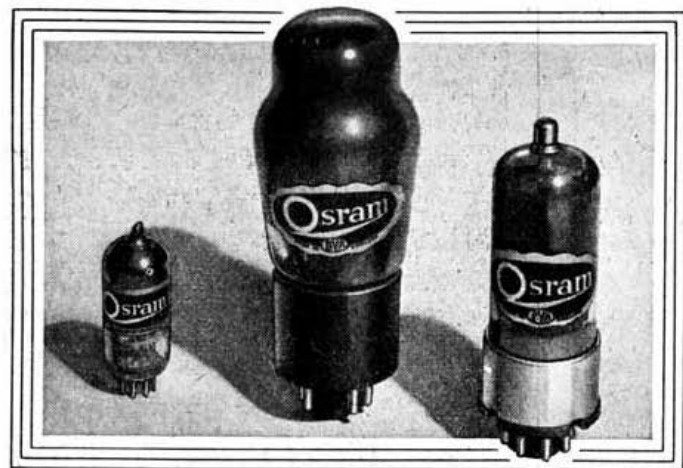


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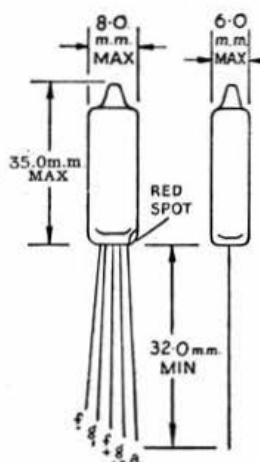
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(Continued on Page 568)

# EXCHANGE and MART SECTION

(Continued from Page 567)

**METALWORK.**—All types cabinets, chassis, racks, etc., to your own specifications.—**PHILPOT'S METAL WORKS LTD.** (G4BI), Chapman Street, Loughborough. (99)

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**OFFERS** please for DB oscilloscope 399A, good condition. BC.221 wavemeter with built-in power supply, 230 V a.c. regulated, with cover, phones and charts.—**Box 381, NATIONAL PUBLICITY CO., LTD.**, 358 Strand, London, W.C.2. (381)

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ABBREVI.: Heads. CH., Cheese. RH., Round. CS., Countersunk. NP., Nickel Plated. CP., Cadmium Pl. SC., Self-Colour.

6BA				BRASS				STEEL			
1/16"	CH NP	1/6	1/6	1/16"	RH NP	1/5	1/5	1/16"	CH NP	1/-	1/-
1/8"	SC	1/5	1/5	1/8"	"	1/6	1/6	1/8"	RH SC	1/-	1/-
3/16"	NP	1/7	1/7	3/16"	"	1/7	1/7	3/16"	CS CP	1/-	1/-
1/4"	"	1/9	1/9	1/4"	"	1/9	1/9	1/4"	RH SC	1/2	1/2
5/16"	"	1/10	1/10	5/16"	"	1/11	1/11	5/16"	CS CP	1/1	1/1
3/4"	"	1/11	1/11	3/4"	"	2/-	2/-	3/4"	"	1/2	1/2
7/8"	"	2/-	2/-	7/8"	SC	2/1	2/1	7/8"	RH SC	1/2	1/2
1"	SC	1/11	1/11	1"	NP	2/3	2/3	1"	CS CP	1/4	1/4
	NP	2/1	2/1		CS SC	1/4	1/4		"	1/5	1/5
	"	2/3	2/3		NP	1/6	1/6		RH SC	1/5	1/5
	"	2/6	2/6		"	1/7	1/7		CS CP	1/7	1/7
	Inst/H	1/9	1/9		"	1/8	1/8		CH	1/9	1/9
	NP	1/9	1/9		"	1/9	1/9		"	2/6	2/6
	CS	2/-	2/-		"	1/10	1/10		H/H	2/9	2/9

4BA				BRASS				STEEL			
1/16"	CH SC	2/-	2/-	1/16"	RH NP	1/10	1/10	1/16"	CS CP	1/2	1/2
1/8"	NP	2/1	2/1	1/8"	"	2/3	2/3	1/8"	"	1/3	1/3
3/16"	"	2/1	2/1	3/16"	"	2/9	2/9	3/16"	RH	1/4	1/4
1/4"	"	2/2	2/2	1/4"	"	3/-	3/-	1/4"	SC	1/2	1/2
5/16"	"	2/6	2/6	5/16"	CS	1/8	1/8	5/16"	"	1/4	1/4
3/4"	"	3/3	3/3	3/4"	"	2/-	2/-	3/4"	CS CP	1/4	1/4
7/8"	Hex/H	2/6	2/6	7/8"	"	2/3	2/3	7/8"	RH SC	1/6	1/6
1"	"	3/6	3/6	1"	"	1/10	1/10	1"	CP	1/9	1/9

2BA				BRASS				STEEL			
1/16"	RH NP	2/10	2/10	1/16"	CH NP	4/3	4/3	1/16"	H/HSC	1/9	1/9
1/8"	"	3/-	3/-	1/8"	SC	3/-	3/-	1/8"	Lge RH	2/-	2/-
3/16"	"	3/3	3/3	3/16"	"	5/-	5/-	3/16"	RH SC	2/-	2/-
1/4"	SC	3/3	3/3	1/4"	RH	4/9	4/9	1/4"	CH	2/6	2/6
5/16"	NP	4/3	4/3	5/16"	CS NP	4/-	4/-	5/16"	RH CP	2/9	2/9
3/4"	Hx/HSC	10/-	10/-	3/4"	SC	4/9	4/9	3/4"	CS	2/-	2/-

8BA				BRASS				STEEL			
1/16"	CH NP	2/-	2/-	1/16"	CH SC	2/-	2/-	1/16"	CH CP	2/-	2/-
1/8"	"	2/6	2/6	1/8"	NP	2/2	2/2	1/8"	CS	2/-	2/-
3/16"	CS	1/8	1/8	3/16"	"	2/6	2/6	3/16"	CH	2/2	2/2
1/4"	CH	2/3	2/3	1/4"	"	2/9	2/9	1/4"	RH	2/2	2/2
5/16"	CS	1/9	1/9	5/16"	Hex	2/9	2/9	5/16"	CH NP	2/3	2/3
3/4"	"	2/6	2/6	3/4"	"	2/10	2/10	3/4"	RH CP	2/3	2/3

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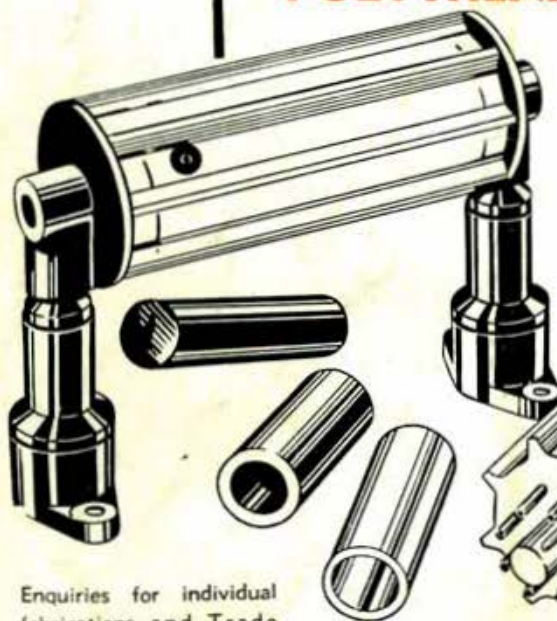
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