FEBRUARY, 1962

# RSGB BULLETIN

VOL. 37, No. 8

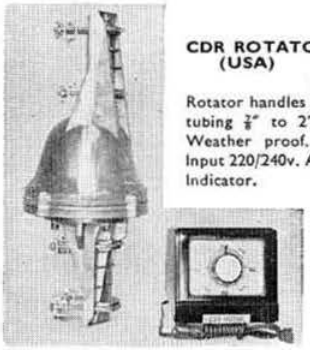
JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

## THE DRAKE 2B RECEIVER

**(new from U.S.A. with a very high reputation)**

**Price:** Receiver complete with crystal calibrator and "Q" Multiplier/Speaker Unit, **£138.**

*(Units available separately)*



**CDR ROTATORS (USA)**

**AND CONTROL UNIT**

Rotator handles a 150 lb. load with ease. Fits tubing ⅜" to 2" dia. Weighs only 10 lbs. Weather proof. Instantaneously reversible. Input 220/240v. A.C. Price: Rotator and Table Indicator. **£18 . 19 0**

**PLEASE NOTE.**

**These Rotators are especially made for KW and do not require a mains step-down transformer.**

### K.W. QUALITY EQUIPMENT *

*** KW "VICEROY" S.S.B. TRANSMITTER**

180 watts P.E.P., full vox, 10-80 metres. Send for details.

*** THE KW500 LINEAR AMPLIFIER**

500 watt P.E.P. input, grounded grid P.A. Suitable for being driven by the KW "Viceroy" or similar transmitter. Including 1750 volt H.T. supply. **£87 . 10 . 0** *plus carriage*

*Other KW equipment usually available from stock:—*

***KW VANGUARD.** 50 watt Transmitter. A.M. and C.W.
***KW VICTOR.** 120 watt Transmitter. A.M. and C.W.
***KW VALIANT.** Mobile and fixed station. Tx.
***KW 160.** "Topband" Tx. High level mod and BK C.W.
***"KW Match"** SWR Meter. Low and high Pass Filters. Microphones. Dow-Key Relays, etc.

**WE CAN NOW GIVE PROMPT DELIVERY ON THE K.W. "VICEROY" S.S.B. TRANSMITTER (MKII) AND POWER SUPPLY—ALSO ON "VANGUARDS," "VALIANTS" & "VICTORS."**

*Main Distributors for*

**HAMMARLUND**

**latest HQ145X, HQ170 & HQ180 in stock**

*** THE KW "VICEROY" S.S.B. EXCITER**

Very SUITABLE FOR DRIVING THE P.A. of your A.M. transmitter. It is not difficult to change your Class "C" stage to a linear. Similar in appearance to the KW "Viceroy" but with self-contained power supply. 8 watts Input sufficient to drive Linear 6146's, TT21's, 4/125A, etc. Low impedance output. Full VOX control and anti-trip.

**£87 . 10 . 0** *plus carriage*

*your NEW Communications Receiver*

**· hallicrafters ·**

**DRAKE · GELOSO · MOSLEY**

(Model 2B) **(G209-R)** **(CM-1)**

Make sure you buy a new Receiver that is "peaked to perfection." Our engineers take a pride in adjusting all imported Receivers to meet manufacturers' specification.

We believe we have the largest turnover of imported amateur receivers in the U.K. Our stocks are always changing, therefore you can be assured that you get the latest production model.

We stock:—

**MOSLEY.** Beams and Vertical.
**K.W. TRAP DIPOLES.**
**B & W PHASE-SHIFT NETWORKS, £2 . 15 . 0.**
**McCOY 9 Mc/s S.S.B. FILTERS, £16 . 10 . 0.**
**FERRITE BEADS** for the 5 Band Aerial described on Page 283 of the December 1961 "Bulletin" **50 for 15/-, 100 for 30/.**

*Most available on easy terms.*

*EASY TERMS AVAILABLE* *IMPORTERS OF U.S.A. EQUIPMENT* *TRADE IN YOUR RECEIVER FOR A NEW ONE!*

# K. W. ELECTRONICS LTD., VANGUARD WORKS

**1 HEATH STREET, DARTFORD, KENT. Cables: KAYDUBLEW-Dartford. Tel. Dartford 25574**

**Volume 37 No. 8**
**February 1962**
**2/6 Monthly**

# R.S.G.B. BULLETIN

## CONTENTS



EDITOR:
*John Clarricoats, O.B.E., G6CL*

DEPUTY EDITOR:
*John A. Rouse, G2AHL*

EDITORIAL OFFICE:
*R.S.G.B. Headquarters, New Ruskin House, Little Russell Street, London, W.C.1.*
*Telephone: HOLborn 7373*

ADVERTISEMENT MANAGERS:
*Sawell & Sons Ltd., 4 Ludgate Circus, London, E.C.4*
*Telephone: FLEet Street 4353*

*The R.S.G.B. Bulletin is published on or about the 15th of each month as its official Journal by the Radio Society of Great Britain and issued free to members. Closing date for copy is the 22nd of the month preceding publication.* 

# Radio Society of Great Britain

(Incorporated 1926)

***PATRON***

H.R.H. THE PRINCE PHILIP, DUKE OF EDINBURGH, K.G.

***COUNCIL 1962***

***President***

E. G. INGRAM, GM6IZ

***Immediate Past President***

Major-General E. S. COLE, C.B., C.B.E., G2EC

***Executive Vice-President and Honorary Treasurer***

N. CAWS, F.C.A., G3BVG

***Ordinary Elected Members***

C. H. L. EDWARDS, A.M.I.E.E., A.M.Brit.I.R.E., G8TL R. C. HILLS, B.Sc.(Eng)., A.M.Brit.I.R.E., G3HRH A. O. MILNE, G2MI
L. E. NEWNHAM, B.Sc., G6NZ R. F. STEVENS, G2BVN G. M. C. STONE, A.M.I.E.E., A.M.Brit.I.R.E., G3FZL
J. W. SWINNERTON, T.D., B.Sc.(Econ.)(Hons.), A.I.L., G2YS

***Zonal Representatives***

F. K. PARKER, G3FUR F. A. RUSSELL, G3BHS P. H. WADE, G2BPJ
A. C. WILLIAMS, GW5VX E. W. YEOMANSON, G3IIR

---

***General Secretary and Editor***

JOHN CLARRICOATS, O.B.E., G6CL

***Deputy Editor***

JOHN A. ROUSE, G2AHL

***Assistant Secretary***

MAY GADSDEN

---

***REGIONAL REPRESENTATIVES***

Region 1.—North Western. B. O'Brien (G2AMV), 1 Waterpark Road, Prenton, Birkenhead, Cheshire.

Region 2.—North Eastern. J. R. Petty (G4JW), 580 Redmires Road, Sheffield 10, Yorkshire.

Region 3.—West Midlands. W. A. Higgins (G8GF), 28 Kingsley Road, Kingswinford, nr. Brierley Hill, Staffs.

Region 4.—East Midland. F. C. Ward (G2CVV), 5 Uplands Avenue, Littleover, Derby.

Region 5.—Eastern. S. J. Granfield (G5BQ), St Luke's, 47 Warren Road, Cambridge.

Region 6.—South Central. L. W. Lewis (G8ML), 34 Cleevelands Avenue, Cheltenham, Gloucestershire.

Region 7.—London. P. A. Thorogood (G4KD), 35 Gibbs Green, Edgware, Middlesex.

Region 8.—South Eastern. Office Vacant.

Region 9.—South Western. R. E. Griffin (G5UH), 13 Alexandra Road, Uplands, Bristol 3.

Region 10.—South Wales. C. H. Parsons (GW8NP), 90 Maesycoed Road, Heath, Cardiff, Glam.

Region 11.—North Wales. Robert Jones (GW3JI), Beirut, Albert Drive, Deganwy, Caernarvonshire.

Region 12.—East Scotland. A. G. Anderson (GM3BCL), "Helford," Pitfodels, Aberdeen.

Region 13.—South-East Scotland. G. P. Millar (GM3UM), 8 Plowlands Gardens, Edinburgh 10.

Region 14.—West Scotland. Office Vacant.

Region 15.—Northern Ireland. J. William Douglas (GI3IWD), 54 Kingsway Park, Cherryvalley, Belfast.

Region 16.—East Anglia. Office Vacant.

Region 17.—Southern. M. P. Nicholson (G2MN), 80 South Leigh Road, Warblington, Havant, Hants.

*The annual subscription rates to the R.S.G.B. are as follows: Home Corporate Members—30/-; Overseas Corporate Members—28/- ($4 U.S. or Canadian). Associate Members under 21 years of age—15/-. Application forms may be obtained from Headquarters on request.*

# IMAGINATIVE DESIGN CONCEPT

## PRODUCES COMPACT, LOW COST SSB, AM, CW COMMUNICATIONS RECEIVER WITH FINE RECEIVER PERFORMANCE

**Now the leading manufacturer of quality amateur radio aerials offers you tried and proved components in the new Mosley CM-1 Communications Receiver. But – FOR THE FIRST TIME – these have been combined so as to result in performance equal to or better than that of receivers selling for several times the price.**

**Stop at the Mosley booth and see the powerful new CM-1 at the Radio Hobbies Exhibition, November 22–25.**

*Clean, functional panel layout and compact cabinet of receiver and speaker will compliment the finest Amateur Station. Baked on dukane grey and black enamel over heavy gauge steel. Receiver: 10½" x 7½" x 8" deep. Speaker: 7½" x 7½" x 8" deep.*

**FEATURES and PERFORMANCE:**

Double conversion with crystal controlled first oscillator. All necessary crystals included.
Diode detector for AM and product detector for SB and CW.
Covers complete range of all amateur bands – 80 metres through 10 metres. Ten metre band segmented in three overlapping increments of 650 kc. each. Each band and each segment covers full 12" dial scale.
Receiver is equipped with an automatic noise limiter which is very effective against impulse noises.
Calibration every 5 kc. WWV reception at 15 mc.
S-meter functions on AM, CW or SSB, with or without BFO.
Five dual-purpose valves plus four semi-conductor diodes provide functions of 12 valve sections.
VALVE and DIODE LINEUP: One 6AW8A, triode mixer and crystal oscillator; one 6AW8A, 2nd mixer and tunable oscillator; one 6AW8A, 1st IF and 1st Audio; one 6AW8A, 2nd IF and product detector; one 6AW8A, 2nd audio and BFO; 1N34, AM detector; 2F4, power rectifier; two IN54A's, noise limiter.
SELECTIVITY: 2.5 kc. at -6 db.
SENSITIVITY: ½ microvolt for 10 db. signal-to-noise ratio on ten metres.
STABILITY: Less than 500 cycles drift after one-minute warm-up. Less than 200 cycles change for 10% line voltage change. Temperature compensated and voltage regulated.
IMAGE and IF REJECTION: 35 db. minimum.
AUDIO OUTPUT: ½ watt at 6% distortion.

*REAR CHASSIS ACCESSORY FACILITIES: Transmitter Relay Terminals, Accessory Power Socket, External Speaker/VOX Terminals.*

*POWER CONSUMPTION: 33 Watts. (230 volts AC, 50 to 60 cps.)*

**Net Price only £86**

**Matching Speaker Model CMS-1 extra.**

| AUSTRALIA | DENMARK | RHODESIA | FINLAND |
|---|---|---|---|
| *MAGNECORD AUSTRALASIA PTY. LTD. Kyle House, 31 MacQuarie Place, Sydney* | *HANS HOLTMAN, OZ9DC SØBAKKEN 21, Charlottenlund* | *STUDIO FOUR Salisbury, Rhodesia* | *OSMO A. WIIO, OH2TK Laajalahdentie 24 A1, Mukkiniemi* |

*(Write to your local distributor for price outside the United Kingdom)*

**O. J. Russell, G3BHJ, Manager**

**Mosley** *Electronics Ltd.* 15 Reepham Road, Norwich, Norfolk, Telephone 45069

# Current Comment

## *discusses topics of the day*

### *The Panel of Experts—Sequel*

THE January 1962 number of *Telecommunications Journal*, official organ of the International Telecommunication Union, contains a full account of the decisions reached at the first meeting of the Panel of Experts to which reference was made on this page in our November 1961 issue. The Panel met in Geneva for two weeks last September and although no decisions were taken in respect of the use of frequencies between 4 Mc/s and 27·5 Mc/s by the Amateur Service, the recommendations made to administrations are of distinct interest to amateurs generally.

The decision to set up a Panel of Experts was taken at the International Radio Conference held in Geneva during 1959. The objectives of the Panel are intended to lead to a programme which will (a) enable the best possible use to be made of the high frequency radio spectrum by applying the most suitable technological means; (b) promote the introduction of means of telecommunication other than by high frequencies to serve as substitutes or complementary systems providing long-term solutions; (c) enable a world technical assistance project to be worked out, together with a financial project to serve as a basis.

The Amateur Service, because of the limitations placed upon it by international regulation, has always from the earliest days, sought to apply the most up-to-date technological means at its disposal to the problems of interference and congestion. It is of special significance, therefore, that the Panel of Experts has recommended that many of the technological advances which have become almost common-place in Amateur Radio circles are to be recommended for adoption by administrations at reasonably early dates. As an example, the Panel came to the unanimous conclusion that one of the most important and efficient methods of securing economies in the use of the high-frequency portion of the spectrum is to replace double sideband systems by single sideband systems. The Panel decided to recommend that administrations should refuse to permit double sideband radiotelephone transmissions as from a specific date—e.g. January 1, 1967—in the Fixed Service on frequencies between 4 and 27·5 Mc/s. A similar recommendation was made in respect of the Maritime Mobile Service but the date suggested for the change-over was given as January 1, 1970. The use of s.s.b. in the bands used by the Aeronautical Mobile Service is also advocated.

For many years radio amateurs have been aware of the need to use no more power than is necessary for maintaining contact. The Panel appreciated the importance of this point of view in radio communications generally and decided to recommend that radiated power must be reduced to the minimum necessary to ensure a satisfactory service.

Since before the last war radio amateurs have recognized the value of using directive radiating systems. Commercial stations on the other hand have failed, in general, to take advantage of technical advances in aerial design with the result that radiation is often wasted in unwanted directions. After examining the statistical analysis of the Master Radio Frequency Record the Panel came to the conclusion that in most cases the aerial was usually the inadequate element in h.f. radio communications by stations in the Fixed Service. The Panel has recommended that the International Radio Consultative Committee (C.C.I.R.) should be asked to compile a Manual on the Design of Directional Aerials. Those charged with that task would do well to examine the extensive Amateur Radio literature on the subject.

Frequency stabilization, having exercised the attention of radio amateurs for the past 35 years, is regarded by the Panel as of great importance in reducing congestion and interference. The use of a common frequency for certain services is also recommended. It is known that there are many very short-distance h.f. circuits in national Fixed and Mobile Services (for example less than 150 miles), each of which uses a different frequency within the same country. The Panel is of the opinion that a large number of circuits could be made to operate in a given country with the same frequency of the required power, a view which all experienced radio amateurs will share.

The Panel discussed methods of replacing the use of the high frequencies (4 Mc/s—27.5 Mc/s) by other means of telecommunication. The use of telephone circuits and of frequencies other than high frequencies were examined and recommendations made. The employment of radio relay stations for multiple distance work and the use of the v.h.f. and u.h.f. bands for broadcasting were also considered. In the same context systems employing v.h.f. tropospheric scatter and space relays—terms which trip lightly off the tongue of the average amateur—were also discussed as being methods of replacing the use of the high frequency portion of the spectrum for communication purposes.

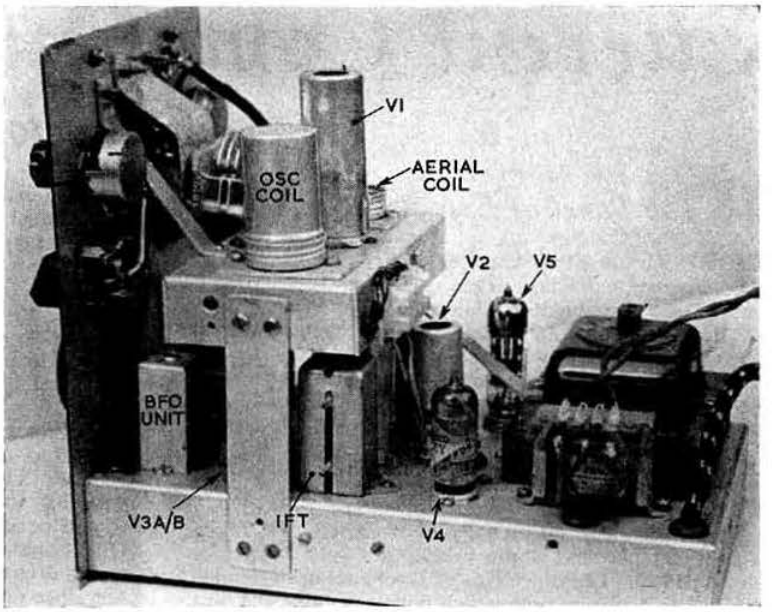
Radio amateurs—no less than professional engineers—are continually striving to obtain greater efficiency from the frequency space which falls between 4 Mc/s and 27·5 Mc/s. The technological devices such as the use of s.s.b., directional aerial systems, restricted power and improved frequency stabilization all work to that end but as far as amateurs are concerned the wider use of the v.h.f. and u.h.f. bands for local contacts would seem to be a logical method of achieving better operating conditions in the long distance communication bands.

The further deliberations of the Panel of Experts will be studied with interest. J.C.

# An Inexpensive Superhet Receiver

*Simple Design for the Newcomer*

By G. W. McDONALD (G2OX)*




**A view of the receiver constructed by G2OX. The frequency changer unit is clearly shown as a separate deck.**

THERE seems to be a revival of interest in home constructed amateur equipment, but some of the recent articles on the subject have been rather ambitious for the inexperienced constructor. The receiver to be described is simple technically and costs little more than the t.r.f. receivers so popular in the past with the beginner to Amateur Radio.

The superheterodyne circuit was chosen because of its superior selectivity over the straight receiver. Construction is no more difficult than is a t.r.f. and if future developments are in mind, further stages, both i.f. and r.f., can easily be added to the basic circuit later without a complete rebuild. Bearing this in mind it is necessary to provide enough space on the original chassis for such developments. The writer has used an unconventional layout and one that can be recommended if portable or mobile work is contemplated.

* *55 Cherrytree Drive, Whickham, Newcastle-upon-Tyne*

## Circuit

The frequency changer is a triode-hexode followed by one stage of i.f. amplification at 456 kc/s, a detector and two audio stages. A b.f.o. is incorporated using one half of the first audio valve. The power supply uses the normal full-wave rectifier circuit.

The frequency changer (type ECH81) is of conventional design. Plug-in coils are used as a matter of convenience, it being up to the constructor whether to use these or a switched unit. The wavebands covered are 1·8, 3·5, 7·0 and 14·0 Mc/s.

The i.f. amplifier uses a valve type 6AU6, a high gain pentode, which has a very low internal capacitance between grid and anode. This is a desirable feature if instability is to be avoided in a high gain stage. The detector is a type

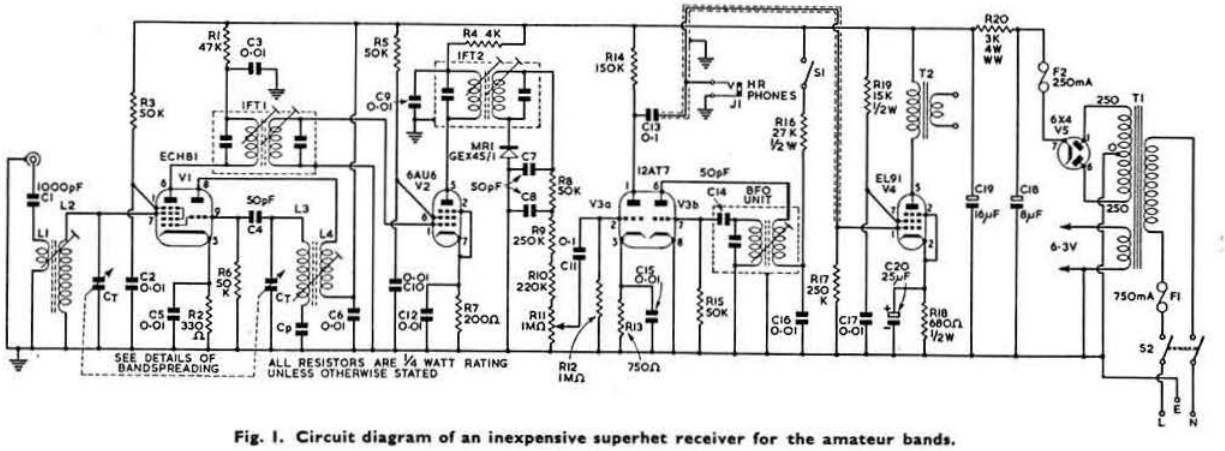



**Fig. 1. Circuit diagram of an inexpensive superhet receiver for the amateur bands.**

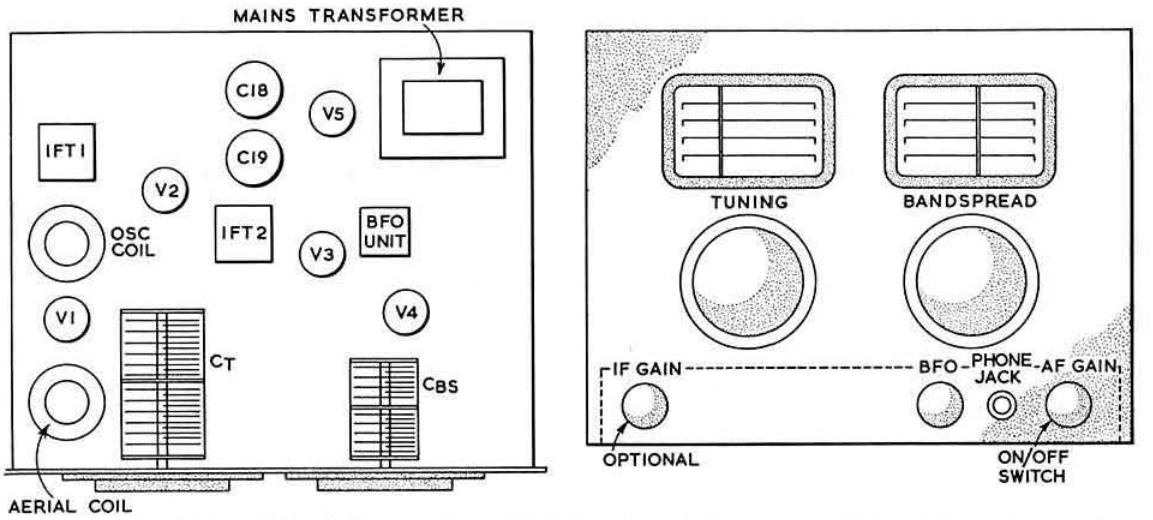



**Fig. 2. Conventional chassis and panel layout. Room should be left on the chassis for the possible addition of a further i.f. stage at a later date.**

GEX 45/1 germanium diode used mainly to conserve space and heater power. Similar diodes can later be fitted to provide a.v.c. and noise limiting facilities.

The a.f. end of the receiver uses one half of a 12AT7 double triode valve as a first a.f. amplifier and it is from this stage that the headphone output is taken. The gain control is fitted to this stage. Further amplification for the operation of a small speaker is by a low anode current output pentode valve type EL91.

For the reception of c.w. signals a b.f.o. is necessary and the second half of the 12AT7 is used for this purpose. No actual coupling was required to the i.f. amplifier but should the strength of the b.f.o. injection be inadequate a 5 pF capacitor between the anode of the b.f.o. valve and the anode of the i.f. valve will give all the coupling required for efficient operation. The b.f.o. coil may be a 456 kc/s i.f. transformer or a manufactured unit. The writer used the former.

The power supply uses an indirectly heated valve type 6X4. This saves a heater winding on the mains transformer, cutting down size if not cost. It should be noted that any leakage between the heater and cathode of the 6X4 will cause mains hum, therefore a reliable valve should be used in this position. Smoothing is by an *RC* filter and has proved sufficient for headphone work. Fusing is provided in both the a.c. and d.c. sections of the power supply. Double pole mains switching and the use of three-pin mains plug makes the apparatus comform to the usual safety requirements.

**COMPONENTS LIST**

C1, 100 pF silver mica.
C2, C3, C5, C6, C9, C10, C12, C15, C16, C17, 0·01 μF 500 volt tubular.
C4, 50 pF silver mica.
C7, C8, C14, 50 pF silver mica or ceramic.
C11, C13, 0·1 μF 500 volt mica.
C18, 8 μF electrolytic 350 volt d.c.
C19, 16 μF electrolytic 350 volt d.c.
C20, 25 μF electrolytic 25 volt d.c.
CT, 380 pF twin gang variable.
CS, 50 pF silver mica.
CP, See data supplied with coils.
L1, L2, L3, L4, Aerial and oscillator coils, plug-in B7G or international octal type (Denco (Clacton) Ltd.), modified to bandspreading requirements.
B.F.O. Unit, 456 kc/s (Denco (Clacton) Ltd.).
IFT 1, 2, 456 kc/s i.f. transformer, miniature type, Weymouth or Denco (Clacton) Ltd.
R1, R4, 4 K ohms, ½ watt.
R2, 330 ohms, ½ watt.
R3, R5, R6, R8, R15, 50 K ohms, ½ watt.
R7, 200 ohms, ½ watt.
R9, R17, 250 K ohms, ½ watt.
R10, 220 K ohms, ½ watt.
R11, 1 Megohm variable (carbon).
R12, 1 Megohm, ½ watt.
R13, 750 ohms, ½ watt.
R14, 150 K ohms, ½ watt.
R16, 27 K ohms, ½ watt.
R18, 680 ohms, ½ watt.
R19, 15 K ohms, ½ watt.
R20, 3 K ohms, 4 watt wire wound.
MR1, Germanium diode type GEX45/1 or equivalent.
V1, ECH81.
V2, 6AU6
V3, 12AT7 or ECC81.
V4, EL91, 6AM5 or N77.
V5, 6X4, U78 or EZ90.
T1, 325-0-325 volts 65 mA, 6·3 volts 3·5 amp., 200-250 volts a.c.
T2, Pentode output transformer.
S1, Single pole on/off toggle switch.
S2, Double pole on/off toggle switch.
F1, 750 mA fuse.
F2, 250 mA fuse.
J1, Headphone jack (open circuit type).

### Bandspreading and Oscillator Tracking

The easiest method of bandspreading is to use a 5 to 15 pF twin gang variable capacitor connected in parallel with the main ganged capacitor. A good slow motion drive is essential on the bandspread capacitor. Other methods may be used but they usually involve the use of a complicated oscillator tracking arrangement if full frequency coverage is desired as well as bandspreading. The writer feels that such complications are best avoided until the experience of the constructor can cope with them.

Tracking of the oscillator over the frequency coverage of each range presents no difficulties if commercially made coils are used—one follows the details given by the coil manufacturers. Using the parallel method of bandspreading has no effect on the tracking arrangements.

### Construction

The layout used by the writer is shown in the photograph and a more conventional layout in Fig. 2. Little need be said on the subject of layout, it being mainly a matter for the constructor concerned. However, some important precautions must be taken to avoid instability. The stages

**VALVE BASES CONNECTIONS**

| PIN | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | BASE |
|---|---|---|---|---|---|---|---|---|---|---|
| ECH81 | G2,4 | G1 | C G5 | H | H | Ah | G3 | At | Gt | B9A |
| 6AU6 | G1 | G3 | H | H | — | G | C | — | — | B7G |
| 12AT7 | A'' | G'' | C'' | H | H | A' | G' | C' | H tap | B9A |
| EL91 | G1 | C | H | H | A | — | G2 | — | — | B7G |
| 6X4 | A'' | — | H | H | — | A' | C | — | — | B7G |

should progress from input to output without any doubling back, and wiring of the early stages should not cross over that of the later stages. Obvious points, perhaps, but how often do they cause instability. In the writer's case a certain amount of doubling back had to take place owing to the small chassis available but no instability was experienced, mainly due to the modern components, small in size, well screened and that little bit of luck which always serves the radio amateur so well when he tries things out. Wiring of

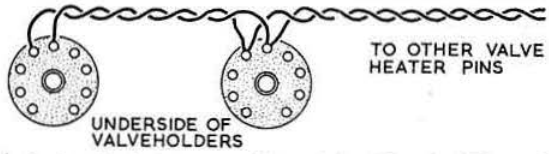



**Fig. 3. Details of the heater wiring. Twisted flex should be used. One side of the heater wiring is connected to earth at the mains transformer end only. This method of wiring reduces mains hum to a minimum.**

the receiver may be by the point to point method, or the components may be mounted on tag strips. The writer favours the former because it gives shorter connecting leads. It is important to run the heater leads as shown in Fig. 3 if mains hum is to be avoided on headphone reception. The chassis is of 16 s.w.g. half-hard aluminium which if made with 2 in. sides and corner brackets is rigid enough for all purposes. It is advisable to have one earthing point for each stage connected to the chassis by a 4 BA bolt, connections being made thereto by means of soldering tags. All earth return leads of the stage concerned are made to this point. This prevents instability due to undesirable coupling between stages caused by the common impedance of earth return loops.

### Conclusion

The receiver has proved to be very stable in operation and although the gain is not that of a communication receiver the low noise level at full gain makes the weakest signal easy

**VALVE VOLTAGES**

| | $V_a$ | $V_{sg}$ | $V_k$ | |
|---|---|---|---|---|
| ECH81 | 250 | 150 | 2 | $V_{osc.}$ 180 |
| 6AU6 | 220 | 100 | 2 | |
| 12AT7(A) | 120 | — | 1·4 | |
| 12AT7(B) | 180 | — | — | |
| EL91 | 250 | 250 | 12 | |

to copy, particularly when using headphones. It is hoped that in the near future to add an r.f. stage and another i.f. stage and so produce a receiver approaching communication standard at very low cost.

It is the writer's hope that this article, aimed at the less experienced amateur, will encourage him to build his own apparatus.

**London Meeting**
**Friday, March 30, 1962**
**V.H.F. Symposium**

arranged by the London U.H.F. Group

**"S.S.B. on Two Metres"** by F. A. Griffiths (G3MED)
**"Nuvistor Pre-amplifiers"** by G. M. C. Stone (G3FZL)
**"Stabilized Power Supplies for V.H.F. Equipment"** by A. J. Worrall (G3IWA)
**"Transistors for V.H.F."** by John Gazeley (B.R.S.20533)

**Subject to be chosen by Norman Ross (G3LAR)**

**at the**
**Institution of Electrical Engineers, Savoy Place, Victoria Embankment**

**Buffet Tea 6 p.m** **Meeting Commences 6.30 p.m.**

### Liverpool Freshers' Conference

DURING the University Freshers' Conference from September 28 to October 4, the University of Liverpool Amateur Radio Society operated an exhibition station under the call-sign G3OUL. Equipment comprised Labgear LG300 and Heathkit DX40U transmitters and an Eddystone 888A receiver, all loaned by the manufacturers concerned. Operation was principally on 20m and 80m, with excursions to 15m and 40m. More than 60 contacts were made with amateur stations in 24 countries.


**The University of Liverpool Amateur Radio Society's stand at the Freshers' Conference from September 28 to October 4, 1961. Several new members were enrolled during the period.**

### Science and Technology

SIR JOHN COCKCROFT, O.M., K.C.B., C.B.E., F.R.S., Nobel Laureate in Physics and President of the British Association for the Advancement of Science, will speak on " Science and Technology " at the City Hall, Newcastle-on-Tyne, on April 3, at 7.30 p.m. Admission will be by ticket only, available free of charge from Mrs. M. D. Morrison, Joseph Cowen House, 153 Barras Bridge, Newcastle-on-Tyne.

# An Introduction to Crystal Filters

## *PART 2—H.F. Filters*

By HAMISH V. BELL, B.Sc. (G3MAZ)*

IN Part 1 the discussion was related to crystal filters in the low-frequency spectrum below 1 Mc/s since these are the type most generally used and about which the most is known. However, it has been shown [2] that the selectivity of a simple bandpass filter is dependent only upon the pass-band width and the position of the frequency of infinite attentuation relative to the cut-off frequency. In other words, it is not, in theory, dependent upon the centre frequency of the filter.

"In theory," there of course lies the difficulty! There is a limitation in practice in the value of *Q* factor which is obtainable and in the stability of the crystal unit. Nevertheless, there is a great deal of incentive to devise a workable high frequency filter, since its use would be advantageous both in receivers and s.s.b. transmitters. Fewer frequency conversions would be required and high selectivity could be achieved so that the receiver, or transmitter, would be less liable to generate spurious signals.

Assuming there is no limitation on the mid-frequency of a filter, any configuration used at the lower frequencies can be used as a high frequency filter. However the more stringent requirements as regards stability and *Q* factor usually result in designs which are difficult to achieve practically.

To make a four-crystal lattice filter for frequencies of the order of 5 Mc/s with access only to surplus crystals would be virtually an impossibility and so some other approach must be found.

One such approach is that suggested by W3TLN (*QST*, January, 1959) based upon an article by Kosowsky in the

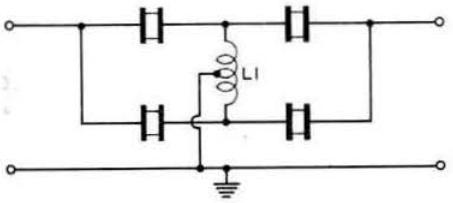



**Fig. 12. "Back to back" connection for high frequency filter suggested by W3TLN.**

*Proc.I.R.E.* (February, 1958). This employs a pair of two-crystal lattices connected "back to back" as in Fig. 12. The coil L1 serves as a load for each section and according to W3TLN is apparently not critical as regards inductance, although in common with any inductor associated with a filter, it should have as high a *Q* as is possible. For details regarding the construction of a filter of this type the article by W3TLN should be consulted; instructions for shifting the crystal frequencies are also given.

### Spurious Responses

At this point, a short digression is permissible to consider the effect of spurious crystal responses on the filter characteristic. It was mentioned earlier that spurious responses could occur in crystals and could be represented by another series inductor and capacitor in parallel with the components giving the main resonance.

The crystals used for the low frequency filters are fortunately free from spurious responses, due to the particular cut used, and so this factor is not important. This is not the case with crystals designed for higher frequencies and indeed some of the spurious responses can be as little as 3db below the main response. The spurious frequencies may be moved within certain limits during manufacture but even in a well-designed crystal cannot be eliminated entirely. The final placing is dependent upon the cut and the physical properties of the crystal. Methods used to reduce spurious responses include special grinding techniques and also the plating of only part of the crystal on each face, the latter having the secondary effect of reducing the parallel capacitance. Such measures, of course, are not generally available to the amateur but nevertheless it is interesting to consider commercial practice.

### Suitable Crystals for H.F. Filters

Coming now to crystals which are available cheaply to the amateur, the obvious choice is the FT243. It is not, however,

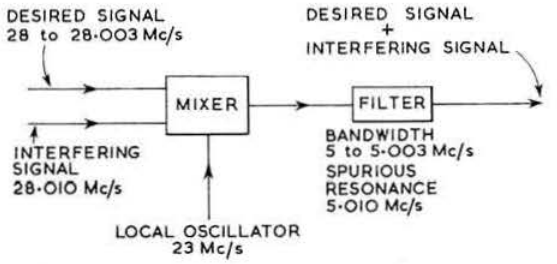



**Fig. 13. Effect of spurious responses in filter used for reception.**

just a matter of selecting a crystal marked with the required frequency and hoping that it will fit the bill. Possibly the figures in Table 1, relating to one crystal of this type, will help to impress the point. Measurements were made on several crystals, using accurate frequency determining equipment, and these figures are representative of the others. It is seen that there are three spurious responses of which the first is the one most likely to cause trouble.

In order to reduce the effect of these responses, several filter sections should be used in cascade since it is unlikely that two spurious responses will occur at the same frequency. The result will be a lower value of attentuation at the spurious resonance frequencies but no actual passband will be formed. For filters used for transmitting, this is quite satisfactory, since the audio response can be shaped to cut off sharply at 300 and 3300 c/s. There is thus very little signal passed to the filter at the spurious resonance frequencies. For reception,

**TABLE 1**

**Measurements on FT243 Crystal**

| | |
|---|---|
| Marked frequency | 6850 kc/s |
| Measured resonant frequency | 6848·299 kc/s |
| Measured antiresonant frequency | 6849·935 kc/s |
| Pole-zero spacing | 1·636 kc/s |

**Spurious Responses**

| Higher than antiresonant frequency | Level relative to main response |
|---|---|
| 5·024 kc/s | −12db |
| 12·658 kc/s | −5db |
| 13·759 kc/s | −11db |

Equivalent series resistance at resonance ≃ 250 ohms
Effective parallel capacity = 11·1 pF

* *152 Kingsway, Widnes, Lancs.*

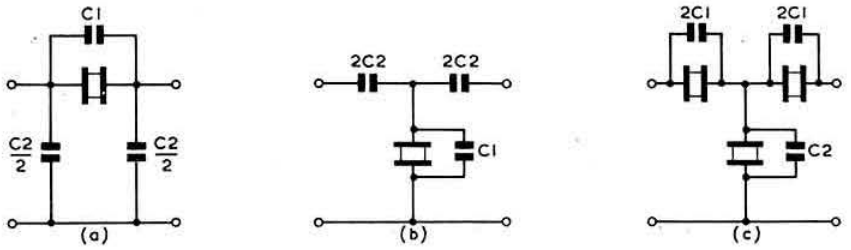



Fig. 14. Basic sections of ladder filters (a) Lowpass, (b) Highpass, (c) Bandpass.

however, the situation is somewhat different, since a signal at the input can beat with the local oscillator to produce the spurious resonance frequency, and will be passed to the detector along with the desired signal. This is illustrated in Fig. 13. Generally the attentuation will be greater for the interfering signal than for the desired signal, but their relative strengths may counteract this.

### Ladder Filters

A form of filter not generally employed at low frequencies is the ladder type, three forms of which are illustrated in Fig. 14. The reason for its lack of use is the low percentage bandwith available since the filters are comprised of crystals and capacitors only. At high frequencies, however, although the percentage bandwidth is the same, the actual bandwidth in cycles per second is sufficient for an i.f. amplifier. With the crystals available, this configuration does look as though it may be a possible approach to high frequency crystal filters.

Owing to the large number of spurious responses, it is much better to employ only one crystal in each section and put a number of sections in series. For s.s.b. transmitters therefore it is only necessary to connect either a number of lowpass sections or a number of highpass sections in series to select the required sideband, the audio response being tailored to provide the necessary 3 kc/s bandwidth. For a receiver i.f. amplifier it would be necessary to have a bandpass characteristic formed by putting a number of highpass filter sections after a number of lowpass sections. Alternatively a bandpass section could be used but this would be more critical to adjust and the choice of rejection frequencies would be limited. The suppression of spurious frequencies would also be reduced.

Taking the circuits of Fig. 14, it is seen that no d.c. path exists between input and output and so the response will fall off at low frequencies. The bandwidth depends upon the ratio $\frac{C1 + C_o}{C}$ where $C1$ is any capacity added in parallel with the crystal. The placing of the frequency of infinite attenuation will depend upon the ratio $\frac{C2}{C1 + C_o}$. These ratios hold in each of the three cases, the element values being modified as shown on the diagrams.

If the maximum control over bandwidth and the placing of the attenuation frequency is to be obtained, the ratio $\frac{C_o}{C}$ should be low, a value of 250 having been found feasible for the range 5 to 8 Mc/s. However with FT243 types, it is likely to have a much higher value than this, since the crystals were designed for good frequency control characteristics rather than h.f. filter applications.

The formulae relating to the design of these filters are quite simple, and can be easily applied, but they require a knowledge of the values of the elements of the crystals. In the case of surplus crystals, these obviously are not known. Measurements can be made if suitable apparatus is available, and a method of carrying out these is described later. With a knowledge of the approximate values of the various components it is, however, possible to adjust the filter experimentally.

### Lowpass Filter

After some initial calculations to determine approximate component values, the experimental approach was adopted with a single section of a lowpass filter, using an FT243 type crystal, whose resonant frequency was 8150 kc/s. The parallel capacitance of these units is high, in this case 13 pF and so no additional parallel capacity was required.

Small trimmers were used for $C1$ and $C2$, and the circuit arranged as shown in Fig. 15. The impedance of the filter depends upon the bandwidth and the crystal series capacity, but in general will be low, between a few hundred ohms and 5K ohms. The resistor $T$-network is to enable the signal generator to be isolated from the input of the filter. The output was fed via a pi-network to match the impedance to a receiver fitted with an S-meter. The voltage divider action reduced the input to the receiver and in some cases it may be desirable to use a cathode-follower instead of the resistive network. The filter would then be terminated by a 1·2K ohms resistor.

From this single section an attenuation of about 10-15db was obtained in the stopband, but minor passbands appeared due to the spurious responses and here the attenuation dropped to virtually zero. The rejection notch immediately h.f. of the passband was very deep and sharp. As a result it

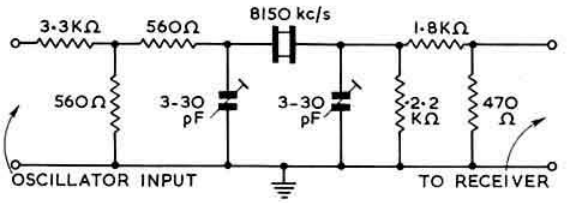



Fig. 15. Experimental single section of lowpass ladder filter using FT243 crystal.

would provide a high degree of suppression for any signal placed at that frequency such as a carrier. The disadvantage, as was expected, was the narrow bandwidth available due to the high parallel capacity of the crystal. The bandwidth was of the order of 1·5 kc/s and so would not be suitable for the generation of s.s.b.

### Highpass Filter

A similar highpass filter was built using the same crystal, but results were not so good as for the lowpass version. The input and output impedances will be generally slightly higher and the maximum attenuation is very dependent upon the series resistance of the crystal at resonance. The passband was very narrow with the spurious responses providing alternate stop and passbands higher in frequency.

### Conclusions on Ladder Filters

It would seem that the highpass filter is likely to be more critical than the lowpass version as regards requiring a low series resistance crystal, inferring of course a high $Q$ factor.

In either case, a lower value of parallel capacity than that provided by the FT243 crystals would be most desirable. The variation of the parallel capacity between crystals of different frequencies is quite wide and does not show any definite trend. As a result it may be found that crystals of the same frequency have different values of parallel capacitance and if so, those with low values would be selected for use in filters.

It should be possible to overcome this disadvantage of narrow bandwidths by placing an inductor in parallel with each crystal. This reduces the effective parallel capacitance and so increases the pole-zero spacing. The value of inductance required depends upon the initial parallel capacitance of the crystal and the factor by which it must be reduced to enable the desired passband width to be achieved. The effective circuit below the resonant frequency of the crystal can be considered to consist of only the crystal parallel capacitance $C_o$ and the added inductance $L_o$. Consequently, the susceptance of this combination is $2\pi fC_o \left[1 - \frac{f\infty^2}{f^2}\right]$ where $f\infty$ is the parallel resonant frequency of $L_o$ and $C_o$. The effective value of $C_o$ can now be reduced to any selected figure by the appropriate choice of $f\infty$ and hence $L_o$. The inductor should, if possible, be made variable to enable the passband to be adjusted easily after the filter has been built. This was not tried with the two sections described above, but should enable the FT243 type of crystal to provide sufficient bandwidth for s.s.b. transmitters and receivers.

The type of crystal which is cut especially for overtone operation will generally have a low parallel capacity at its fundamental frequency to enable the effective parallel capacity at the overtone frequency to be kept low. As a result, these crystals will make good filter crystals on their fundamental frequencies, but of course the overtone frequency may not be an exact multiple of the fundamental frequency. This is because the overtone is due to a mechanical rather than an electrical harmonic and so the effective element values may produce a slightly different output frequency to the electrical harmonic. It is therefore necessary to measure the fundamental frequency carefully.

Further information on ladder filters, their design and matching can be obtained from the monograph mentioned in reference [2].

## Measurements

Measurements of the inductance, capacitance and resistance of a crystal cannot be made directly, but have to be deduced from measurements of the significant frequencies. The instruments required for this purpose are an oscillator covering the desired range and fitted with a fine tuning control, a valve millivoltmeter and an accurate frequency measuring device.

The oscillator should produce several volts output at a low impedance and this output should be reasonably constant over a range of ± 10 kc/s about the approximate frequency of the crystal to be measured.

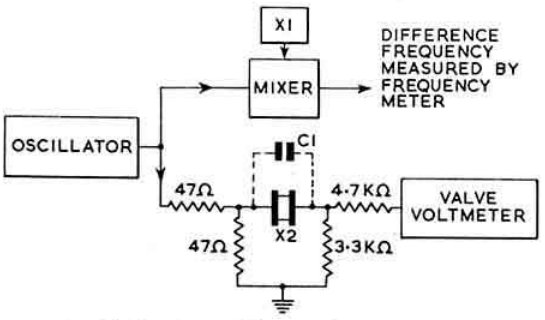



**Fig. 16. Circuit used for crystal measurements.**

The valve millivoltmeter is only required to indicate the changes in voltage as the oscillator is varied through the resonant and antiresonant frequencies of the crystal, and so can be of quite simple design. A broadly tuned r.f. stage in front of a normal valve voltmeter should be sufficient to give a workable deflection. Alternatively a receiver having a broad i.f. bandwidth and fitted with an S-meter could also be used.

Since quite small frequency changes must be measured, the best method is as illustrated in Fig. 16. The signal from the oscillator is fed to the crystal test circuit and also into a mixer. The other input to the mixer is from a crystal, X1, whose frequency differs from that of the crystal under test (X2) by something of the order of 250 kc/s to 1 Mc/s. The output of the mixer is broadly tunable over this range and so the difference frequency can be measured by comparison with a BC221 or similar frequency meter. The oscillation frequency of X1 is measured in the normal manner, as accurately as possible, although within limits this measurement does not govern the accuracy of the final results.

The oscillator is now tuned to the resonant frequency of X2 (where a maximum is indicated on the valve voltmeter) and the beat frequency from the mixer is measured, using the frequency meter. If the two frequencies X1 and X2 only differ by a small amount, a calibrated audio frequency oscillator can be used in place of the frequency meter. The anti-resonant frequency is found in a similar manner, where the valve voltmeter indicates the first minimum higher in frequency than the series resonant frequency. A small capacitor whose value is known (say 10 to 20 pF), is placed in parallel with the crystal and the new antiresonant frequency is determined. The actual frequency in each case is the oscillating frequency of X1 plus the difference as measured by the frequency meter. This assumes X1 is lower in frequency than X2. If the reverse is true, then the small difference frequency should be subtracted from the oscillating frequency of X1.

If the resonant frequency is $fr$, the antiresonant frequency $fa$, and the antiresonant frequency when the crystal is shunted by capacitor $C1$ is $f_1$, then $C_0$ can be found as follows:

$$C_0 = C1 \left[\frac{f_1^2 - fr^2}{fa^2 - f_1^2}\right]$$

where $C_0$ and $C1$ are in picofarads, and the frequencies are in megacycles per second. This value of $C_0$ includes any stray capacitance introduced by the measuring circuit, although the resistive network in Fig. 16 is designed to reduce stray capacitance due to the measuring instruments.

The equivalent series capacity is next found using the following relationship:—

$$C = C_0 \left[\frac{fa^2 - fr^2}{fr^2}\right]$$

where $C$ and $C_0$ are in picofarads and the frequencies in megacycles per second.

The approximate formula,

$$C \simeq \frac{2.C_0.S}{fr.\ 10^6}$$

can be used, the pole-zero spacing $S$ being in cycles per second while $fr$ and the capacitances are in the same units as before.

From this result and the normal equation for a resonant circuit, the inductance in henries of the crystal ($L$) can be determined:

$$L = \frac{1}{4\pi^2 fr^2 C} \text{ henries}$$

where $fr$ is in megacycles per second and $C$ is in picofarads.

*(concluded on page 392)*

# TECHNICAL TOPICS By PAT HAWKER (G3VA)

*Printed Wiring Panel Repairs · Receiver Trends · Compatible Single Sideband*

*High Power Transistor Rigs · Using Nuvistors · Sunspot Theories*

DURING the past six years, printed wiring panels have almost completely conquered the domestic radio and television chassis, and are now appearing increasingly in amateur kits and test equipment. Apart from the economic advantages to the manufacturer, these printed panels permit the duplication of circuits to very close tolerances, making possible pre-alignment and calibration. They also allow the constructor to tackle complex circuitry with greater confidence.

But electronic equipment has not only to be built . . . it also requires maintenance. And there, often enough, is the rub with printed wiring panels. It is all too easy for the heavy handed or inexperienced repairer to ruin a panel. There is still controversy even among professional service engineers, some regarding them as a boon to servicing; others expressing (forcibly) the opposite view.

But whatever one's opinion, the printed panel is here to stay and, as amateurs, we must learn to live with it. Fortunately the panels have improved markedly over the years, with the copper foil showing much less tendency to come away from the laminated base. However, even now, excessive heating or mechanical mishandling will break the bond between the thin copper strips and the board. It is also easy to bridge over adjacent " wires " with solder which may be difficult to clear without blistering the panel. Then again any undue flexing of the boards is likely to cause hairline cracks in the foil (best detected with a good magnifying glass) which may result in complete or intermittent open circuits.

A good deal of information on tackling repairs to printed wiring panels has appeared in the various trade journals and servicing books. Recently, a small booklet devoted exclusively to this subject, *A Guide to the Repair of Printed Board Assemblies*, has been published by The Electronic Engineering Association (price 3s., 11 Green Street, London, W.1) which packs into some 11 pages of text a great deal of practical advice.

Probably the most common cause of damage is the use of unsuitable tools. You just cannot use the type of soldering iron with which you would tackle outside aerial connections! E.E.A. recommend a soldering iron with a long taper bit preferably not larger than 15 watts, used with thin (22 s.w.g.) cored solder (60/40 tin/lead). Other useful tools are: diagonal wire cutters; snipe-nosed instrument pliers; a small round stiff natural bristled brush for removing solder; a penknife; a small wire pick or soldering aid (E.E.A. suggest sharp pointed instrument tweezers). For tracing faults and making measurements, a sharp needle point probe (needle soldered to crocodile clip) will also be useful.

One of the main difficulties for the amateur is that unlike conventional wiring, it is sometimes difficult (depending largely upon how the component wires are bent over on the wiring side of the panel) to disconnect a small component in order to test it out of circuit. Sometimes it is easier to destroy the component in order to salvage the internal leads to facilitate connecting in a replacement; not so funny if a number of components have to be removed before finding the rogue one. With this technique, the component is cut in half with wire cutters and then stripped away from the internal leads; the wire ends of the new component are formed into loops which can be put over the salvaged connecting wires and soldered into position. In this way no soldering is done on the foil side of the board.

However, sometimes this cannot be done and the original component has to be entirely removed. In this case the small brush (some engineers use a suede-shoe brush) is needed to brush off solder immediately it is molten; then the penknife blade is inserted between the foil and the bent over lead and the lead bent out, so that the component can be wriggled out of the board. When working on this side of the board, note that the iron should not be applied to the foil or conductors, only to the wire ends which are soldered to them. When there is a break in the foil, no attempt should be made to solder this over, or to bridge it by a wire connected to the foils; instead, connect an insulated wire from the terminations of the foil on each side of the break.

If unsoldered wires are to be pulled away from the board, this should be done from the component side, otherwise it is all too easy to pull away some of the foil. After completing a repair on the foil side, the affected part of the board should be given a protective coating of polystyrene dope.

At all times, avoid applying mechanical stress or strain to the boards, or this may cause the hairline cracks to appear. (This type of advice is easy to write—not always so easy to follow when struggling with an awkward component.)

The above hints should take care of most of the simpler types of component replacement, but before tackling such jobs as the replacement of valveholders, i.f. transformers, and other multi-connection components, it is well worth consulting the E.E.A. publication. Otherwise you may find yourself either blistering the panel or in sudden need of a couple of spare hands each holding a soldering iron. Sometimes it seems as though we shall all need to take a course in watch repairs before tackling modern electronic equipment. But at least with the printed panels it is seldom necessary to delve down through several layers of components, each of which must be removed, before getting to the faulty one.

An ingenious form of universal printed circuit board for the constructor is Veroboard (details from Vero Electronics Ltd., South Mill Road, Regent's Park, Southampton). This is a 4·8 in. wide laminated board on which are bonded 21 strips of copper foil running the length of the board. Holes are punched along the centres of the copper strips to connect the components which are mounted on the other side of the board. It is thus possible to construct printed panel equipment to individual design without using any chemical processes.

### Receiver Trends

The h.f. communications receiver is the heart of the amateur station, and it is encouraging to see how interest in receiver design and construction has revived during recent years. It is also significant how many new receiver kits for amateurs and s.w.l. have appeared in the United States.

In *QST* (October, 1961), W2LYH described a 25 valve receiver with constructional problems simplified by sectionalization; this theme is taken up again in the December issue with W9GFS advocating the use of plug-in subassemblies for flexibility.

Most members will tend to examine W2LYH's design with the G2DAF receiver in mind (do not forget that the complete G2DAF articles have been reprinted in a convenient

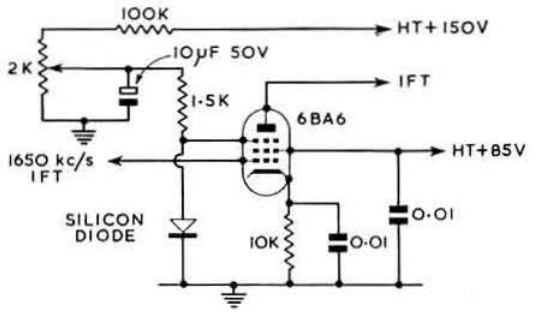



**Fig. 1. A novel regenerative control system to enable an i.f. stage to double as b.f.o. from the Hallicrafters kit receiver SX140K (reviewed in QST, December, 1961). The setting of the 2K ohms control varies the effective resistance between suppressor grid and chassis. The system could be used for any regenerative stage.**

booklet). It is always instructive to see how different designers tackle what is essentially the same set of problems. There are several similarities: the cascode r.f. amplifier; the crystal-controlled h.f. oscillator (used also in several recent commercial models such as the KW77, the Drake 2-B and the unconventional Mosley CM-1); and the tunable first i.f. (W2LYH uses 3-4 Mc/s). But there are also some interesting differences: W2LYH favours triode first and second mixers: his tunable oscillator uses a Franklin (two 6C4) circuit; his first fixed i.f. is 500 kc/s but no attempt is made to achieve high selectivity at this frequency. Instead he has a third conversion to 110 kc/s with both sharp and " broad " i.f. strips at this frequency, feeding a product detector. No a.m. detector is included, a.m. reception being achieved by picking off one sideband of a.m. signals. Also omitted are an S-meter (though a tuning meter is included) and a.g.c. This latter omission is decidedly unusual in such a complex receiver but W2LYH makes out a good case for so doing: " I have never found any use for a.g.c. in ham operating. In fact, use of carrier-derived a.g.c. is directly responsible for many mistaken ideas about such things as ' audio punch ' and ' supermodulation '." Another quote, less likely to cause controversy, is " For a ham-band receiver the crystal-controlled/tunable first i.f. approach seems to me to be ideal, having the advantages of freedom from drift, high image ratio, and equal tuning rate on all bands. Perhaps the idea of constructing the set in several ' building-block ' units will make the thought of constructing your own receiver less formidable."

This set, taken in conjunction with the G2DAF design, reflects the two major approaches of modern designers: (1) those who believe in building in the selectivity as near to the aerial as possible; and (2) those who are content to wait until reaching a final low i.f. This division cuts across factory as well as amateur built sets.

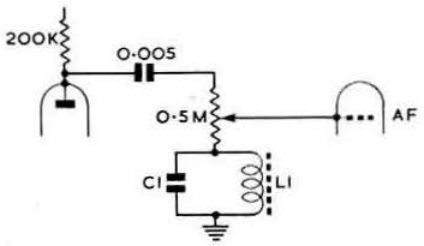



**Fig. 2. A permanently connected audio filter which increases in effectiveness when the volume control is turned down for c.w. reception; C1/L1 are resonated to the audio frequency desired. L1 is about 900 turns on a ferrite core. From DL-QTC (November, 1961).**

Both systems can give good (or bad) results. To some extent the final choice will depend on how concerned you are about cross-modulation and blocking (a good article on this subject is by W0SYF of Collins in *QST*, January, 1955). A hope that it may not be long before cross-modulation and inter-modulation effects can be dramatically reduced is reported in *Electronics* (December 15, 1961). Preliminary results by Westinghouse using an experimental new form of cathode construction promise to produce " ultra-linear " valves. The new structure consists of two or more rectangular cathodes mounted in a row and coated with carbonates only to the sides that face each other. Diodes, triodes and tetrodes using these cathodes can produce almost straight line characteristics, and thus offer the promise of suppressing both inter- and cross-modulation. At present no explanation of this phenomenon has been put forward, but tests on a communications receiver are reported to have greatly reduced cross-modulation.

It is interesting to note that a number of Japanese communications receivers are now on sale in the United States—though generally given new names and model numbers and advertised only as " imported." And finally on this topic may we express the hope that during 1962 manufacturers will provide more detailed performance data in their advertisements and leaflets: we have surely passed the stage when any realistic assessment of selectivity can be made when only " nose " figures are quoted.

### Compatible Single Sideband

There must be many amateurs who, when weighing up the pros and cons of single sideband, have thought how simple it would all be if the spectrum-saving advantage and some of the power gain of s.s.b. could be had without the problems of s.s.b. reception.* In other words if s.s.b. transmissions were compatible with a.m. reception. Why not just suppress one set of sidebands and transmit the other set and the carrier? In practice this can be done (and was done experimentally by the B.B.C. in the 'thirties) but until recently it was possible to modulate only lightly without introducing distortion. During the last few years, however, considerable progress has been made, particularly by L. R. Kahn in the United States. A simplified form of his system—termed compatible single sideband (c.s.s.b.)—has been used by the Munich " Voice of America " megawatt long-wave station since 1956 and can be heard on any domestic receiver. It is generally agreed that the widespread adoption of this system could do a good deal to reduce the chaos on the broadcast bands. A lengthy review of recent c.s.s.b. progress appears in *Proceedings of the I.R.E.* (October, 1961) including the interesting news that a special form of this system has been developed for mobile communication purposes. An advantage of c.s.s.b. over s.s.b. is that full speech clipping (which provides some 6 to 9db of gain) can be used. To judge from the details given in *Proc. I.R.E.*, c.s.s.b. would require a fairly complex exciter circuit. The transmissions can be received without any modification or special tuning technique on a.m. sets. It will be interesting to see whether the system is ever widely adopted for the amateur bands.

### High Power Transistor Rigs

The r.f. and a.f. power available from transistor rigs continues to increase steadily, though good r.f. power transistors remain fairly expensive. Around 10-15 watts output on 3·5 or 7 Mc/s is now well within the capabilities of available units. Fig. 3 shows a design by VE7QL (better known as ZL1AAX) from *CQ* (November, 1961) using a

* The problems of s.s.b. reception are rapidly being overcome with the introduction of receivers of more modern design such as the G2DAF, the KW77 and the Drake 2-B. An objection to the compatible s.s.b. system is that carriers are still radiated and are therefore capable of producing heterodynes.—EDITOR.

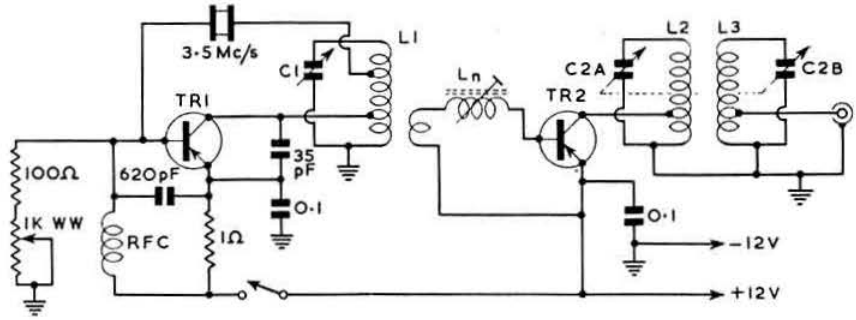



**Fig. 3. VE7QL's 3·5 Mc/s, 15 watt transistor transmitter using TR1 Amperex PADT50 and TR2 Texas Instruments 2N1907. L1, 46 turns No. 22 (Amer.) on 1 in. dia., 3 in. length, collector tap 2½ turns from earthy end, crystal tap 28 turns from earthy end, link 2 turns at earthy end. L2, 29 turns No. 22 (Amer.) on 1 in. dia., collector tap 2½ turns from earthy end. L3, as L2 but tap 4 turns from earthy end for 50 ohm load, 10 turns for 300 ohm load. $L_n$, 10 turns No. 28 (Amer.) close wound on ¼ in. slug tuned former. C1, 230 pF, C2, 385 pF gang. RFC, d.c. resistance about 7-10 ohms (about 300 μH).**

Texas Instruments 2N1907 p.a. The second tuned output circuit is advisable to restore the full sine waveform, and miniature crystals may overheat (FT243 types are suitable).

One advantage of the transistor p.a. is that simply by omitting base bias, it operates in class C permitting efficiencies up to around 90 per cent; the problem of a bias supply can thus be forgotten. A review of transistor r.f. power amplifiers by WA2CMR/6 appears in *R.C.A. Ham Tips* (December, 1961) from which we learn that R.C.A. will soon be marketing transistors putting out 18 watts up to 28 Mc/s and has in development types that will provide a full kilowatt on 3·5 Mc/s!

On the a.f. side, designs for 50 watt transistor modulators are becoming quite common: one appears in *CQ* (November, 1961), another in *Funk-Technik* (Nr. 24/1961). This latter design has a rather unusual split-load driver stage (Fig. 4). Although several transistor hi-fi amplifiers have appeared in the United States it seems that designers have found it none too easy to apply considerable negative feedback to power transistors. One of the big attractions of transistors for hi-fi is the ease with which the output transformer can be eliminated, and also the absence of mains hum.

With all power transistors (a.f. and r.f.) it is most important not to operate equipment without a load. Otherwise excessively high voltages are likely to occur at the collector which can break down the transistor.

A transistor version of the simple "IMP" s.s.b. rig is given in *QST* (December, 1961) using either VXO or v.f.o. control. The v.f.o. unit is based on a design by W6TNS in *Electronics World* (October, 1960); the original circuit is shown in Fig. 5.

For those more interested in small-signal transistors, a straightforward survey of useful receiver and test equipment circuits appears in *QST* (December, 1961). An all-band communications receiver covering the medium-wave broadcast band and all amateur bands to 30 Mc/s is described by G3HRO in *Wireless World* (December, 1961). A method of increasing the gain of transistors at v.h.f. by the connection of a small trimmer from emitter to ground, shunting an r.f. choke, is explained in *Electronics* (November 3, 1961).

## Silicon Diodes—Beware!

The availability of silicon diodes of up to 1,000 P.I.V. rating at reasonable prices is leading to their increasing use by amateurs but reports suggest that many of the diodes

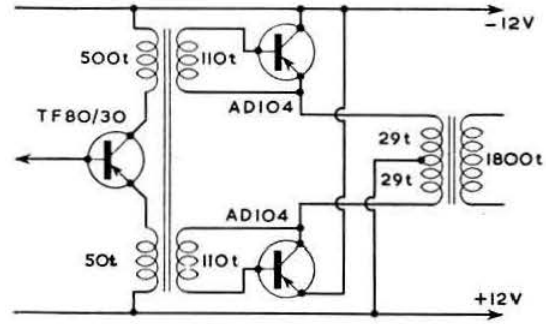



**Fig. 4. Simplified driver/output circuit of 50 watt modulator.**

purchased are coming to an untimely end. Unfortunately, it is not just a case of wiring the right number of diodes in place of a valve rectifier—you have to do a little more than that. An outline of the precautions necessary was given in *T.T.*, June 1961, and prospective users would be well advised to read the notes again before switching on.

## Using Nuvistors

The suitability of Nuvistor metal/ceramic triodes for v.h.f. amplification was discussed by G3FZL in the BULLETIN of March, 1961. Since then further information has been published in various issues of *R.C.A. Ham Tips*. A complete 144 Mc/s converter using two 6CW4 and a 7587 was described in May, 1961. It has now been pointed out (December, 1961 issue) that the newer 6DS4 semi-remote-cut-off Nuvistor should prove better than the 6CW4 as r.f. amplifier (this would probably apply also to the G3FZL pre-amplifier). This is because the gain of the 6DS4 can be manually or

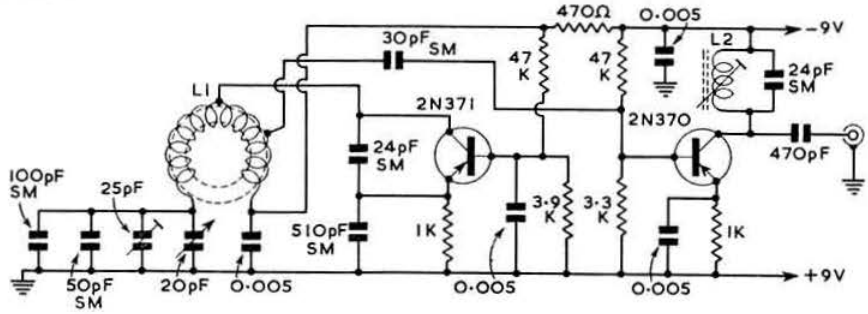



**Fig. 5. W6TNS's highly stable transistor v.f.o. with output covering any 300 kc/s between 4·5-5·5 Mc/s. The transistors are drift types and the circuit could probably be adapted for OC170, OC171 types. In the original, L1 is a toroid coil, 41 turns (No. 24 Amer.) close wound on 0·68 in. dia. with tap at 16 turns from earthy end for T1 and 10 turns from earthy end for output to T2. In the QST design a normal slug-tuned former is used for L1, L2, 36 turns (No. 36 Amer.) scramble-wound on ¼ in. slug-tuned former. Fixed capacitors are silver mica or disc ceramic types.**

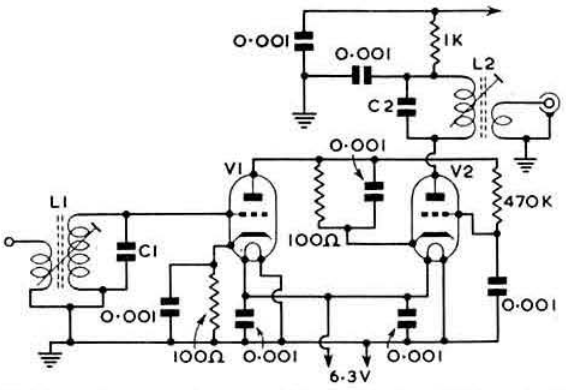



**Fig. 6. Nuvistor cascode pre-amplifier for 21, 28 or 50 Mc/s. For 21 Mc/s, L1, L2, 18 turns (No. 32 Amer.) enam. on ¼ in. slug-tuned former, C1 and C2 15 pF, link windings 1½ turns. L1, L2, aligned to 21·25 Mc/s. For 28 Mc/s, L1, L2, as for 21 Mc/s but C1, C2, 5 pF. Align L1 to 32 Mc/s, L2 to 29·5 Mc/s.**

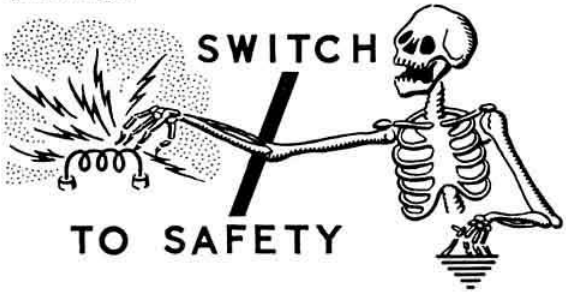
automatically controlled to reduce susceptibility to cross-modulation in the presence of strong local signals.

The design of fixed, broad-tuned Nuvistor pre-amplifiers for 21, 28 or 50 Mc/s using two 6CW4 in a series cascode circuit is discussed in the September, 1961 issue. This provides some 25-35db gain with a noise figure around 4·5db even without precise alignment. A somewhat cheaper unit could probably be made to a similar circuit using one of the television series-cascode double triodes.

### Sunspot Theories

No one needs to be reminded that sunspot activity profoundly affects amateur activities; most of us saw how the remarkable Cycle 19—which reached its peak in March, 1958—produced what may well have been the best DX conditions of the century. The outlook for the next few 11-year cycles is by no means so rosy. Some research workers believe that the 11-year cycle has superimposed on it a 169-year cycle: this would make Cycle 20—due to start in 1965 and reach a peak in 1970—a very weak one, followed by two more low peaks, extending to the year 2005. An alternative theory suggests that cycle peaks follow a long term saw tooth pattern which would also put the next three cycles as relatively low ones—a poor lookout indeed for 10-metre enthusiasts.

But during 1961 an important new theory of sunspots was put forward, which suggests that magnetic fields trapped in the hot electric material beneath the surface of the sun wind and unwind to produce the 11-year pattern, depending on the rotation of the sun and the fact that higher latitudes on the surface of the sun rotate less quickly than near its equator. It remains to be seen whether this new theory (due to astronomers W.L. and W.D. Babcock) makes it any more likely that we shall ever again see 21 Mc/s staying wide open all night.




# Book Review

**THE HISTORY OF BRITISH BROADCASTING IN THE UNITED KINGDOM. Vol. I. THE BIRTH OF BROADCASTING.** By Asa Briggs. Oxford University Press. 425 pages. 50 illustrations. Price 42s.

*The Birth of Broadcasting* is the first of a projected three- or four-volume history of British broadcasting in the United Kingdom. The whole work is designed as an authoritative account of the rise of broadcasting in Great Britain and Northern Ireland up to the passing of the Independent Television Act in 1955 and the end of the B.B.C. monopoly.

The present volume covers the first four years (1922-1926) of British broadcasting, in other words the period when the British Broadcasting *Company* was in being.

After describing the experiments of the Marconi Company from Chelmsford during 1920, the author refers to the ban which was later placed upon them by the Postmaster-General as the result of pressure from the Services and uneasiness in the Post Office. Professor Briggs then makes mention of the large number of wireless amateurs who refused to be contained in a mesh of bureaucratic regulation. It was their enthusiasm, he recalls, which filled the gap between the cessation of the Marconi Company experiments and the authorization of short regular broadcast programmes in January, 1922. The authorization was largely their doing.

History recalls that the Postmaster-General rescinded his veto on broadcasting in response to a petition drawn up by the Wireless Society of London, in December, 1921, and signed by representatives of 63 other wireless societies and clubs with more than 3,000 members between them. The emphasis on " scientific purpose " in the petition was in keeping with the avowed objectives and outlook of the Wireless Society of London, which in October, 1922 was to change its name to the Radio Society of Great Britain.

In a chapter entitled " Writtle and its Rivals " the author refers to the bright young team, with R. D. Bangay in charge and Peter Eckersley the head of the experimental section, who went to Writtle with instructions to broadcast a weekly half hour programme for amateurs. The first such broadcast was made on February 14, 1922. Professor Briggs comments that Eckersley's own contribution to these early programmes was unique because, in addition to being a brilliant engineer, he was also, by accident, something quite different—a born entertainer. Who, among the old timers does not remember Eckersley's trill, " This is Two Emma Toc, Two Emma Toc—Writtle calling "? That period was indeed the beginning of broadcasting in the United Kingdom for a great many people.

A full and illuminating account, backed up with much documentary evidence, is given of the negotiations which led up to the formation of the B.B.C. with a capital of £100,000 and of the reasons which in later years led to its conversion from a business enterprise into a national institution.

Later chapters in the book deal with Broadcasting as a Public Service (mention is made therein of the famous Sykes' Committee, upon which the Society's then President, Dr. William H. Eccles, served, and to the formation of the Wireless Association, with the R.S.G.B. as one of the constituent bodies) and to the Content of Programmes with many references to those who became The First Broadcasters. An interesting account is given of the events leading up to the granting of a charter to the B.B.C. and to the part played by broadcasting in the General Strike of 1926.

There are a number of minor errors of fact which the student of broadcasting history will discover, but all in all this is a most fascinating book, the pleasure of which is enhanced by an excellent choice of illustrations. Reproductions of early wireless programmes and of early wireless receivers are particularly interesting, as are the cartoons from *Punch* and other journals.

In Volume I, Professor Briggs has shown clearly how broadcasting, even in the formative days of the British Broadcasting Company, was beginning to affect the social life of the British people. The results of his diligent research represent a major contribution to the literature of radio communication. Volume II is awaited with interest. **J. C.**

# Modernizing the R.C.A.-AR88 Receiver

By E. PAUL (G3CUY) *

ONE of the most popular receivers in use in amateur stations at the present time is the R.C.A.-AR88. Although it is extremely well built and reasonably cheap on the surplus market, the fact remains that it was designed well over twenty years ago and its performance leaves something to be desired by modern standards.

It is the purpose of this article to show how the performance can be improved for amateur purposes. While some of the alterations suggested are simple and straightforward and should present no difficulty, the more complicated modifications should only be undertaken by those with a considerable experience of work on communications receivers.

### Simple Modifications

The following circuit changes, originally suggested by G. R. Woodville, are straightforward and present no difficulty but care should be taken to see that all soldered joints are well made.

(i) Connect a 10 K ohms resistor across R55 (6·8 K ohms). This will increase the gain by 10db at 29 Mc/s.

(ii) Insert a 270 pF capacitor in series with C116 (2700 pF) and connect a single pole on/off switch across the 270 pF capacitor. This will provide bass cut of −3db at 400 c/s and improve the readability of weak signals. The front panel has to be drilled to take the switch.

(iii) Connect pin 7 on socket J to C98 instead of C97; this will provide 250 volts h.t. fully smoothed for an external pre-amplifier if required.

(iv) Short circuit R42 to prevent the a.v.c. operating when the a.v.c. switch is set to " MANUAL."

(v) Connect a 0·05 $\mu$F capacitor across the meter leads at the holder for the first i.f. valve, i.e. the earthy end of R20 to earth if not already installed.

(vi) Check the insulation of the a.v.c. line. Check all a.v.c. capacitors for leakage (C47 and C48 are most likely to be leaky). Reduce R47 to 500 K ohms.

(vii) If desired, connect TB2, tags 3 and 4 to S23 (rear tags 4 and 5) to give remote control of the receiver.

(viii) Check that R61, R62 are present: if not (i.e. in early receivers) insert a 2 ohm resistor in series with the heater of V9 (6H6) to reduce the voltage to 5·8V. This lowers the hum experienced with some valves due to heater-cathode leakage.

(ix) Check the insulation of C118, C122: if low replace with one 0·01 or 0·002 $\mu$F capacitor.

### Adapting the AR88 for Single Sideband Reception

To improve the AR88 for s.s.b. reception it is necessary to increase the b.f.o. injection. This can be done very easily by joining a short length of wire to the anode of V12 and positioning it close to the grid of V7. The receiver will, of course, be operated on " MANUAL " but even so it will be found that the b.f.o. will now operate the a.v.c. and, therefore, reduce the sensitivity of the receiver. This can be prevented by short-circuiting R42 (see step (iv) of the simple modifications). However, it will then not be possible to mute the receiver by applying a negative bias to the a.v.c. line. Reference to Fig. 1 will show clearly how this problem can be solved.

* *177 Hangleton Road, Hove 4, Sussex.*

Pin 5 on TB2 which originally was the diversity line may now be used to apply blocking bias to the receiver from the transmitter via the transmit/receive or vox relay.

If desired, a variable resistor may be connected between point X and earth to provide control over the blocking bias so that a sidetone note may be heard on the receiver when operating c.w.

If an objectionable degree of hum is now evident, connect a 50 $\mu$F capacitor from the junction of R46 and R43 to earth.

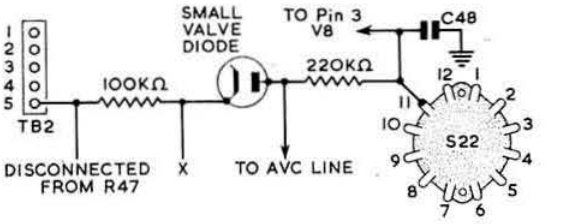



**Fig. 1. Circuit changes to provide muting of the receiver when R42 is short-circuited. The component references in this article refer to the circuit diagram in the official instruction manual.**

### Deterioration of the I.F. Coils

Probably the vast majority of AR88s are suffering from reduced $Q$ of the i.f. transformers due to the effects of dampness. If the equipment necessary to draw the overall i.f. response curve is not available, an indication may be obtained as follows:

(i) Switch to Band 1 and Selectivity position 2.

(ii) Tune the receiver to a frequency towards the low frequency end of the range.

(iii) Accurately tune in a strong signal from a signal generator (or from a broadcasting station if a signal generator is not available).

(iv) Ensure that all i.f. transformers are peaked for maximum output.

(v) Detune on either side whilst watching the S meter in conjunction with the central dial to establish whether the response curve is symmetrical. If it is assymmetrical then it is fairly certain that the $Q$ of some or all of the i.f. transformers is below par.

Brand new boxed i.f. transformers have recently become available and these are probably up to standard. When the writer first purchased his AR88D, however, this was not the case and it was decided to wax impregnate all i.f. transformers. This operation greatly improved the $Q$—probably to original specification. The procedure is as follows:

(i) Obtain a supply of suitable wax. About 4 lb. of Okerin 309 wax obtainable from Astor Boisselier & Lawrence Ltd. of 9 Savoy Street, London, W.C.2, will be suitable.

(ii) Remove an i.f. transformer from the chassis, carefully noting the connections.

(iii) Remove the can and unsolder all the capacitors.

(iv) Preheat in a domestic oven at Regulo ¼ for about half-an-hour, taking care not to overheat.

(v) Select a suitable saucepan (prior consultation with the XYL is advised to avoid possible misunderstandings!) and melt the wax. Do not allow the temperature to rise much above melting point.

(vi) Solder a short length of wire to one of the tags on the transformer to facilitate handling and immerse it in the wax. Continue to " fry " gently until no more bubbles rise to the surface. The transformer may now be allowed to cool. The old capacitors may be refitted or preferably replaced with silver mica types. The unit may now be re-assembled and fitted in the receiver.

(vii) Repeat with all the other transformers, one at a time.

The receiver should then be carefully re-aligned, when a

substantial improvement in gain and selectivity should be apparent.

If the test equipment suggested in the instruction manual is not available, the i.f. stages may be aligned as follows:
(i) Connect a 5 volt a.c. meter across the 600 ohm line output terminals (the S meter is not very suitable for this purpose as accurate alignment should be done with a weak input signal) and inject a suitable signal.
(ii) With the selectivity switch at position 2, peak the cores of all i.f. transformers for maximum output.
(iii) The crystal filter may be aligned fairly successfully without a sweep oscillator and oscilloscope by " cut and try " methods, provided care is taken to find the exact frequency of the crystal and that the signal generator (e.g. BC221) is stable. Having found the crystal frequency, all i.f. transformers should be aligned before adjusting the loading coil (L34) and associated capacitors.
(iv) On position 3 of the selectivity switch, align L33 and T4, whilst rocking the signal generator about the crystal frequency, to obtain maximum signal and keeping the response " sounding " right. It is possible by maladjustment, particularly of T4, to obtain too sharp a response on position 3.
(v) Positions 4 and 5 can be adjusted by means of C80 and C81 respectively.

The wax used in the above operation has many other applications and is particularly useful for impregnating mains transformers which will then operate without mechanical hum and be virtually impervious to moisture. When impregnating such transformers it is a good idea to re-dip quickly after the impregnation process has been completed and the transformer has cooled. This will apply an overall layer of wax and thus give further protection against moisture.

### Cross-modulation

The AR88 is somewhat susceptible to cross-modulation—in the writer's case this was particularly troublesome in the top part of the 21 Mc/s band with the beam firing west at times when the State-side broadcasting stations were strong. Experiments with different r.f. valves produced no great improvement unless low slope types were used. Since this was not considered desirable, another solution had to be found and it was realized that the trouble was due to two things: (i) The method adopted for feeding the a.v.c. line to the r.f. valves; (ii) The lack of a separate gain control for the r.f. stages.

The following procedure is a little troublesome but will prove well worth while.
(i) Remove C4, C34, R2 and R5 and connect the grids of V1 and V2 direct to the appropriate tags on the switches.
(ii) Remove the earth connections from all r.f. tuning coils.
(iii) Join together the bottom ends of the first set of coils to form a new a.v.c. line for V1.
(iv) Join together the bottom ends of the second set of coils to form the gain control line for V2.
(v) Connect a 0·001 $\mu$F capacitor from the bottom end of L12 to earth by the most direct route. Repeat with L21.
(vi) Similarly, connect 0·01 $\mu$F capacitors to provide low impedance earth returns for L8, L10, L19 and L20.

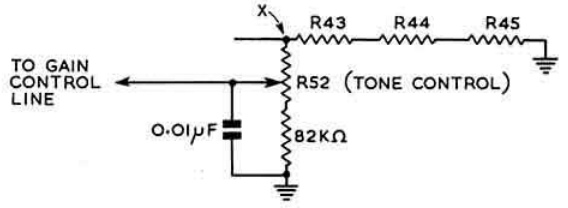



**Fig. 2. Rewiring of R52 (originally the tone control) to function as the r.f. gain control.**

(vii) Remove C47 and connect the existing a.v.c. line to feed V1 only (via R9).
(viii) Wire up the tone control (which now becomes an r.f. gain control) as shown in Fig. 2.

Note that connection X can be conveniently made by disconnecting the wire from C117 and connecting it to the adjacent tag.

When these modifications have been made, the whole r.f. section should be re-aligned according to the instruction manual.

It will be found that cross-modulation is greatly reduced even with the gain control at maximum and that in the odd cases where a certain amount of trouble is being experienced a slight backing off of the new gain control will clear it. Further, the new gain control will be found to be a useful addition to the facilities of the receiver offering as it does an alternative means of controlling gain without the disadvantage of affecting the operation of the S meter or of adversely affecting the noise factor.

### Half-lattice Filters

In these days of congested bands the selectivity of many receivers is inadequate and the AR88D, whilst generally being a good receiver, is no exception. A crystal filter is provided with switched selectivity positions and this does, at

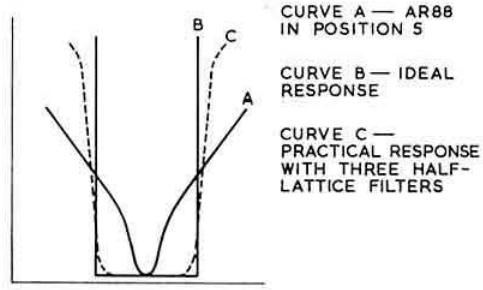



**Fig. 3. I.F. response curves for the AR88D receiver.**

first sight, appear to give a good degree of selectivity, especially on position 5. However, with this type of filter the skirt response is substantial and the sharp peak is unsuitable for phone operation. The ideal response curve is, of course, rectangular (Fig. 3)—a shape which may be nearly attained without undue cost by the use of a series of half-lattice crystal filters.

Two sections give good results but the addition of a third considerably improves the skirt selectivity and is, therefore, worth while. It is thought that the extra trouble involved in using four or more is not justified by the results. Further, for contacts under ideal conditions a broader response is desirable so it was decided to provide for switching the filters in and out.

The modification to be described requires six suitable crystals, one small 455 kc/s i.f. transformer (Ta), two suitable ceramic switch wafers, one small 455 kc/s i.f. coil in can (Tb) and a few fixed capacitors of appropriate values. The revised circuit arrangement is shown in Fig. 4.

The existing knob and spindle assembly is used for the selectivity switch with the following results:

Selectivity Switch Position 1—Somewhat broader than original Position 2.

Selectivity Switch Position 2—One half-lattice filter between V5 and V6.

Selectivity Switch Position 3—Two half-lattice filters between V4 and V5.

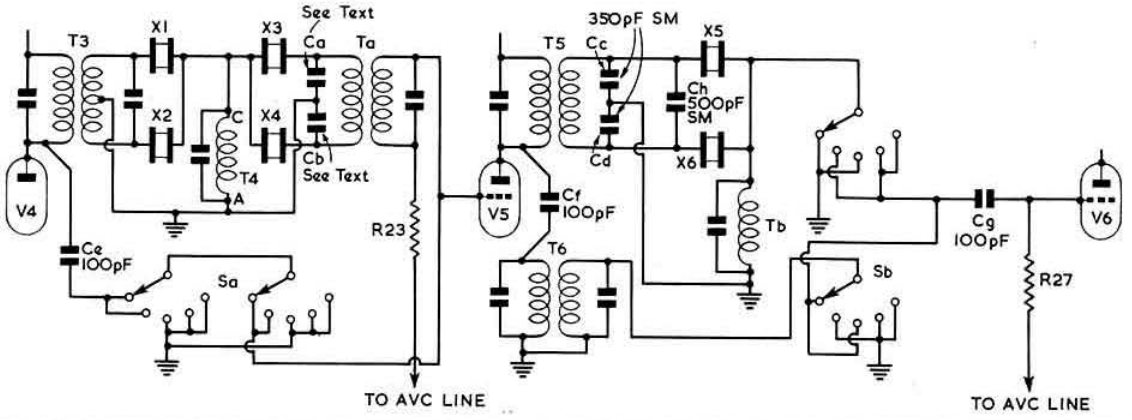



**Fig. 4. Modified wiring of the i.f. stages to incorporate half-lattice crystal filters. Ca, Cb, see text; Cc, Cd, 350 pF silvered mica; Ce, Cf, Cg, 100 pF; Ch, 500 pF silvered mica; Sa, Sb, 2 pole 5 way ceramic switch wafers (see text and Fig. 5). All numbered references refer to the circuit diagram in the official instruction manual. All lettered references are additional components.**

Selectivity Switch Position 4 & 5—Two half-lattice filters between V4 and V5 and one half lattice between V5 and V6.

It is essential that the switches used do not insert any capacity across the filters and the type required is indicated in Fig. 5.

The crystals recommended are FT241A type Channel 45 (X1, X3 and X5) and Channel 46 (X2, X4 and X6) although any two adjacent channels which come within the tuning range of the i.f. transformers will do.

The step by step procedure is as follows:

(i) Remove existing selectivity switch, crystal and phasing capacitor C75.

(ii) Earth both tags " B " on T7 and T8.

(iii) Remove C89 from T5 (it will be necessary to remove T5 from the chassis to do this) and fit Cc, Cd and Ch (Tag C may be used for the earth connection).

(iv) Replace the selectivity switch assembly, using the two

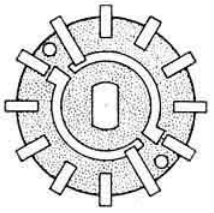


**Fig. 5. Type of ceramic wafer required for the selectivity switch.**

new wafers arranged so that lead lengths will be reduced to a minimum.

(v) Mount all six crystal holders so that the crystals will be upright when the receiver is in its normal position.

(vi) Mount Ta and Tb as indicated in Fig. 6.

(vii) Fit a small screen to reduce the coupling between X5 and Sb.

(viii) Wire up as indicated in Fig. 4. Note that tags " E " on T5 and T6 are not used. Ca and Cb are two capacitors of equal capacity and suitable to tune Ta to 455 kc/s.

(ix) Plug in the crystals and test the receiver. It should operate on all five switch positions but will, of course, need to be re-aligned.

## Alignment Procedure

Ideally, the filters should be aligned with the aid of a sweep oscillator and oscilloscope but the following procedure will give good results.

(i) Remove all the crystals, switch to selectivity position 4 and range switch to Band 1.

(ii) Inject a 454·6 kc/s signal on to the grid of V4.

(iii) Observing the output on a suitable meter, carefully align all transformers for maximum output. (A large signal will be required from the signal generator of course because the only signal feed is through the capacitances of the crystal holders.)

(iv) Now try small capacitors across Ca or Cb, retuning Ta for maximum as necessary, until the output is as low as possible.

(v) Repeat with Cc or Cd. Replace all crystals.

(vi) Switch to selectivity position 2 and carefully adjust the cores of T5 and Tb so that a flat-topped response is obtained as indicated by observing the output meter whilst slowly tuning the signal generator between 450 and 460 kc/s.

(vii) Switch to selectivity position 3 and repeat the procedure with T3, T4 and Ta.

(viii) Switch to selectivity position 1 and, with the signal generator tuned to 454·6 kc/s, adjust T6 for maximum output.

*(Continued on page 392)*

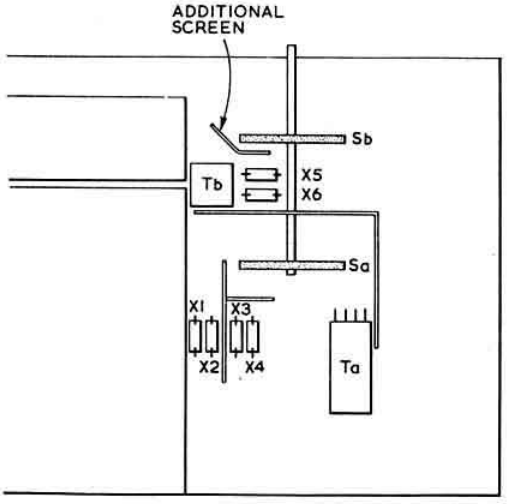



**Fig. 6. Arrangement of the components in the modified i.f. stages.**

# GB 3 MSA

DIAMOND JUBILEE OF FIRST SPANNING OF THE ATLANTIC BY WIRELESS

# POLDHU 1901-1961

CORNISH RADIO CLUB

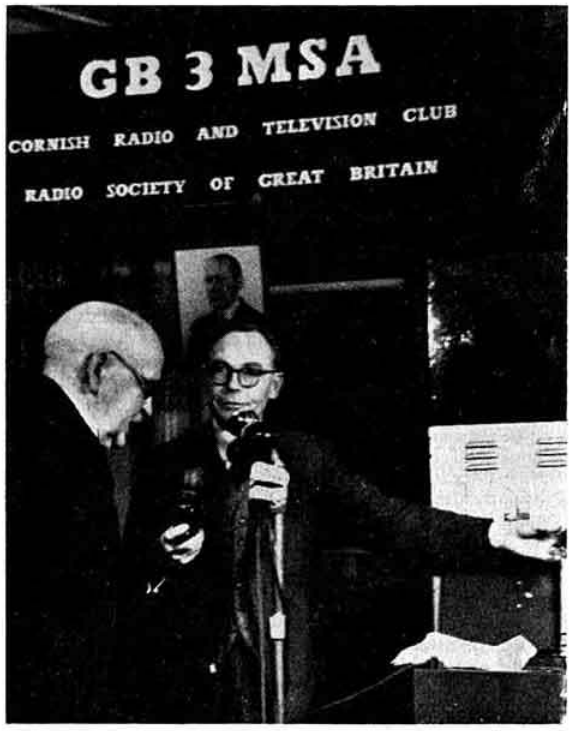
RSGB

AS reported on page 357 of the January issue of the BULLETIN, the Marconi 60th Anniversary Station, GB3MSA, was opened on December 12, 1961, by Mr Charles Tonkin who was closely associated for many years with the original Marconi station at Poldhu from which the first transatlantic wireless signal was transmitted to Signal Hill, Newfoundland, on December 12, 1901. Behind the successful operation of GB3MSA from December 9 to 17 lay many weeks of planning by members of the Cornish Radio and Television Club and the active co-operation of manufacturers in loaning gear to equip the station. The success achieved during the short period of operation may be judged from the fact that more than 1,000 contacts with stations in all parts of the world were made. All are being confirmed by special QSL card, a reproduction of which appears at the top of this page. The cards were designed and donated by Marconi's Wireless Telegraph Co. Ltd.

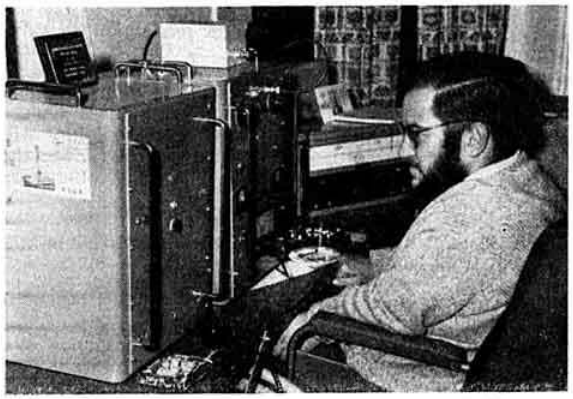
The site at Poldhu is within a few score yards of the cliffs beyond which the Atlantic Ocean stretches to the American mainland with no land mass in between. Such a location posed problems for Marconi in 1901, and the problems were no simpler in 1961 when gusts of more than 100 m.p.h. lashed the cliffs. Thanks, however, to the co-operation of Mr. L. Lewis (G8ML) of Francis & Lewis Ltd. who loaned the 70 ft. towers, the aerials were maintained throughout the operation. One aerial was a 1,200 ft. long wire strung across the cove.

Accommodation for the station was generously provided by the Poldhu Hotel which, although closed during the winter months, arranged all the catering in connection with the cocktail party for those attending the Opening Ceremony.

Equipment used comprised complete LG300 and Topbander transmitters loaned by Labgear Ltd., Eddystone 880, 840C and 770R receivers loaned by Stratton & Co. Ltd., a TA33JR beam loaned by Mosley Electronics Ltd., aerial towers loaned by Francis & Lewis Ltd., a 4-over-4 144 Mc/s




**Mr. Charles Tonkin (left) with Mr. John Watson (G3AET) at the Opening Ceremony on December 12, 1961. The Newfoundland Memorial Station, VO1MSA, was opened by the Prime Minister of the Province, the Rt. Hon. J. H. Smallwood.**
*(Photo by John Miles, Falmouth)*



**Graham Thomas (G3OGT) operating one of the GB3MSA transmitters. Equipment in this picture includes a Labgear LG300 and an Eddystone receiver.**
*(Photo by John Miles, Falmouth)*

**Onlookers at the Opening Ceremony which was broadcast in sound by the B.B.C. and filmed for television.** *(Photo by John Miles, Falmouth)*

beam loaned by J-Beam Aerials Ltd. and a Marconi-built Army mobile s.s.b. station. G3OCB lent his home-built receiver and G3BHC a transmitter.

Considerable publicity was given to the Memorial Station by B.B.C. Television and Westward Television and the opening ceremony was broadcast in sound by the B.B.C.'s home and overseas services.

The operation reflects great credit on all members of the Cornish Radio and Telvision Club. Behind the scenes workers included G2BHW, G2DDR, G3NKE, G3NUJ, G3NVJ, G6LV and many others. The operators were G2JL, G2BHW, G3XC, G3AET, G3CZZ, G3DCJ, G3DLH, G3HES, G3HZV, G3IGV, G3MFW, G3MSU, G3OGT, G3OHM, G3OJN, G3OYW, G3PEP and G8AW. The overall operation was under the leadership of John Watson (G3AET), Chairman of the Club.

Thanks are due to Mr. Boaz, Falmouth Depot Manager of Marconi's Wireless Telegraph Co. Ltd. for his willing co-operation, the War Office, the Directors and Manageress (Mrs. Shoesmith) of the Poldhu Hotel and the National Trust.

A film of the event was made by G3OUZ and together with a tape recorded commentary will be available on loan to clubs and groups in return for a donation to the Cheshire Homes.

## An Introduction to Crystal Filters (Continued from page 383)

If desired, the equivalent series resistance of the crystal can be found quite easily by noting the reading on the valve voltmeter at the resonant frequency and then replacing the crystal by known values of resistance until the same reading is obtained. The value of resistance giving the same reading is the value of the equivalent series resistance. Values ranging from a few hundred ohms to several kilohms will be found with normal crystals. In general, the lower the series resistance then the higher is the $Q$ and so the more active is the crystal.

The frequency and amplitude of the spurious responses can be measured using the same method, and hence a full picture of each crystal can be obtained. This enables each crystal to be placed in the position where it will be most useful.

### Conclusion

The subject of crystal filters is highly complex and obviously cannot be fully covered in an article of this nature. Further practical difficulties are encountered in the lack of suitable crystals and this undoubtedly hampers experiments in the field of high frequency filters. It is hoped, however, that this simplified treatment will serve as an introduction to the subject as a whole and so possibly provide a foundation on which further knowledge and experiment can be based.

### References

[1] Starr, A. T., " Electric Circuits and Wave Filters " App. IX p. 451 (Pitman).

[2] Sykes, R. A., " A New approach to the design of high frequency crystal filters " (Bell System Monograph 3180).

### Bibliography

Kosowsky, D. I., "The Synthesis and Realization of Crystal Filters " (Technical Report 298, June 1955, Research Laboratory of Electronics, M.I.T.)

Mason, W. P., " Electro-mechanical Transducers and Wave Filters " (D. Van Nostrand).

" *Single Sideband for the Radio Amateur*," A.R.R.L.

## Modernizing the R.C.A.—AR88 Receiver (Continued from page 390)

(ix) Re-check all adjustments so that flat-topped response curves are obtained on positions 2, 3 and 4.

It should be noted that the response curve of a half-lattice filter is affected by the $Q$ of the associated coils, especially the loading coils (T4 and Tb). The original T4 should be about right but it may be necessary to experiment with Tb in order to get the best results. If there is a deep trough in the middle of the response curve on position 2, which cannot be removed by careful trimming, then the $L/C$ ratio of Tb is too low and a different one should be tried. It is, in fact, desirable to select Tb to tune with 100 pF or less, so that the response curve on position 2 is slightly rounded.

Steeper sides to the response curve may be obtained by using a little neutralization across each h.f. crystal. This device, however, has the disadvantage of producing side lobes to the response curve (caused by the unbalancing effect on the circuit) and is, therefore, not recommended especially as the sides of the response with all three filters switched in are already so steep that the slight improvement obtainable by using neutralization would scarcely be noticed.

# THE MONTH ON THE AIR

## A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

By R. F. STEVENS (G2BVN)*

IT seems probable that the sunspot number for January 1962 will have been less than 50, the first time since August 1955 that this has happened. For comparison, the number at the peak of the cycle in March 1958 was 201. We are now entering into the trough of cycle 19, and the sunspot minimum is predicted to occur between November 1964 and April 1965, which means that for the last three years of the present cycle and at least the first year of cycle 20 the sunspot numbers will be less than 40. Fortunately the rate of ascent at the beginning of a cycle is considerably steeper than the descent during the years of decreasing sunspot numbers. The effect of all this on the amateur bands between 1·8 and 30 Mc/s is broadly that conditions on 28, 21 and 14 Mc/s will continue to deteriorate, and conditions on 7, 3·5 and 1·8 should show improvement. The 28 Mc/s band will produce some short skip openings but very little DX, whilst 21 Mc/s will probably only offer fair DX openings during daylight hours. With lower levels of static and ionospheric absorption the three l.f. bands should produce good openings during the hours of darkness. It has been suggested that the year of the sunspot minimum would be an ideal time to launch an intensive study of propagation conditions on 1·8 Mc/s and W1BB has been approached to act as co-ordinator. Further information will be given when definite arrangements have been made, and in the meantime the next trans-Atlantic test will take place on February 18.

Notwithstanding the poor conditions predicted for the months ahead the organizers of a number of DXpeditions are going ahead with their arrangements, and it is to be hoped that the results achieved will be worth the effort involved. In existing marginal conditions it is certain that c.w. will be the mode providing the best opportunities, with s.s.b. a fair second. Both modes are able to put through good signals in poor conditions but DXpedition operators mostly agree that c.w. will provide more and better contacts in the face of severe interference.

### News from Overseas

The *West Gulf DX Bulletin* recently conducted a poll amongst their members to determine what countries were most wanted by operators whose average DXCC score was in the region of 275. The country receiving most " wanted " votes was Gabon (TR8) with 81, followed closely by Tromelin (FB8), Sikkim (AC3), Tibet (AC4), Willis Is. (VK4) and Timor (CR10), all of which received 60 or more mentions. Also included in the list in a high position were the two enclaves of Damao and Dui forming part of Portuguese Goa, any possibilities here having been overtaken by the march of current events. Other countries apparently in high demand are: Heard Island (VK0); Aldabra (VQ7), Yemen (4W1), Cambodia (3W8), Albania (ZA) and China, all of whom had ratings of between 50 and 60. European countries were not in demand, the highest placed being Corsica (FC) with 13 votes.

**5A3CAD,** in El Adem has closed down and returned to the United Kingdom, the present address for cards being shown in *QTH Corner*. Iain, hoping to be able to apply for DXCC, is disappointed by the lack of incoming QSLs.

Vic Crawford, **W1TYQ,** one of the operators of 9K3TL/NZ, and stationed at Dhahran air base, commenting on the operating from the DXpedition station, makes the points: (*i*) c.w. is still the best way to work the greatest number in the shortest time; (*ii*) " masters of ceremonies " are not required. The solution is to have a frequency separation between the U.S.A. stations and the rest of the world; (*iii*) as the number of s.s.b. stations increases the efficiency goes down; (*iv*) careful listening will always bring results. W1TYQ hopes the activity from Dhahran will be continued after the U.S.A. Air Force leaves this base.

During the recent travels of the Russian portable s.s.b. transmitter the following QSO totals were made: UA2AO 1242; UJ8AG 702; UO5PK 664; UM8FZ 526; UH8DA 302. As a result of his achievement UA2AO received a mechanical filter and set of mixer crystals and is now very busy constructing a sideband exciter. The wife of UA2AO is now licensed under the call UA2YL, being the first and only YL-UA2. She is allowed to operate on 3·5 and 7 Mc/s on c.w. only, and on all modes on 28 Mc/s. The fine sounding rig of UA3FG was recently described in the U.S.S.R. journal *Radio*, and it appears that the acquisition of mechanical filters is no longer a problem in the U.S.S.R. The score at UA3FG is now 159/137, and at UA3CR 203/183, all on s.s.b.

**FB8YY,** the base station of the French Antarctic expedition in Adelie Land, will again be active on 14 Mc/s with two new operators. The *M/S Magga Dan* recently landed a new party consisting of the members of the twelfth expedition

**VO1CO uses the equipment shown here for his DX activities. This picture was taken during N.F.D. 1961.**

* *Please send all reports to R.S.G.B. Headquarters to arrive not later than February 20.*

amongst them being the chief radio operator, Roland Novel, and his assistant, Louis Perriot. The primary purpose of the radio section of the expedition is to maintain contact with other Antarctic bases and with France, but during the winter months when a considerable part of the day is spent in quarters, the operators will make every effort to contact amateur stations. The best time for European QSOs is thought to be between 07.00 and 09.00 on 14 Mc/s. 7 Mc/s will also be tried and it is believed that around 05.00 may be the most fruitful time. Amongst the equipment available are two BC610s and a commercial transmitter with an input of 1 kW.

**W2CTN** is now the QSL Manager for the following stations: CR4AH, CR4AX, FG7XF, FG7XH, FK8AI, FK8AT, FK8AW, FM7WQ, FM7WU, HC4IE, HC4IM, HK2YO, HP1IE, HR2FG, JZ0PH, KV4CI, KW6CP, KW6CU, KZ5LC, OA7F, OX3DL, OX3RH, OX3UD, PJ2ME, PZ1AP, PZ1AX, TG9AL, TI2CMF, VK2FR, VK9GK, VK9RR, VP2KH, VP3RW, VP6PJ, VP6PV, VP6RG, VP8AI, VQ1HT, VQ1SC, VQ2EW, VQ2WM, VQ2WQ, VQ3CF, VQ3HD, VQ3HH, VQ3HV, VQ4AQ, VQ5IG, VR2DA, VR2DW, YS1IM, YS1MG, ZB1FA, ZB2I, ZD9AM, ZP9AY, 3A2BZ, 5A4TC, 5N2DCP, 5N2KHK, 9G1BQ.

**VK5KO** is now QRT for a twelve month period and hopes to be in the United Kingdom sometime during March/April 1962. He will be staying at the Overseas Club in Earls Court until November of this year and hopes to meet old acquaintances whilst in this country (via B.R.S.20317).

### QTH Corner

| | |
|---|---|
| **CR6CA** | Box 532, Benguela, Angola, Port. W. Africa. |
| **FB8YY** | R. Monfils, F9AH, 15, Rue Alfred-de-Musset, Chatillon-sous-Bagneux, Seine, France. |
| **FG7XC** | P. A. Habazac, rue de la Maison-Blanche 1, Paris 13, France. |
| **FO8AN** | via W8EWS. |
| **FP8BF** | via W1ISD. |
| **FY7YE** | via W5JLU. |
| **G5HB** | H. Biltcliffe, 23, Jefferson Drive, Brough, Yorks. |
| **HC1AGI** | D. McClenon, c/o NASA, U.S. Embassy, Quito, Ecuador. |
| **JZ0BM** | Rendoni, Manokwari, Netherlands New Guinea. |
| **K4THQ/VE8** | H. F. Odil, Box 113, APO 432, New York, N.Y., U.S.A. |
| **MP4TAC** | 10, Avenue Road, Gosport, Hants. |
| **SP7LA** | Box 424, Lodz, Poland. |
| **TL8AE** | D. Etienne, B.P. 616, Bangui, C. African Republic. |
| **TN8AD** | C. Duvaut, B.P. 1095, Pointe-Noire, Rep. du Congo. |
| **TN8BA** | A. Noger, B.P. 2012, Brazzaville, Rep. du Congo. |
| **TU2AC** | Box 5, Korhage, Ivory Coast Rep. |
| **UA2AB** | A. E. Lakir, P.O. Box 78, Kaliningradsk Oblast, U.S.S.R. |
| **UA2BD** | S. Buratevich, P.O. Box 136, Kaliningradsk Oblast, U.S.S.R. |
| **VE6BY** | A. R. Craig, 13821, Summit Drive, Edmonton, Alberta, Canada. |
| **VP2AC** | via VE6BY. |
| **VE4BY** | via VE6BY. |
| **XZ2US, XZ2VK** | Box 833, Rangoon, Burma. |
| **YV0AA** | Radio Club of Venezuela, Box 2285, Caracas, Venezuela. |
| **SM5ZS/ZC6** | W/O 2, B. O. Engren, Swedish Battn., U.N. B.P.O., Beirut, Lebanon. |
| **ZD6PR** | Box 16, Mzuzu, Nyasaland. |
| **5A3CAD** | I. Trays, c/o Mr. and Mrs. Burnett, 56, Albany Street, Edinburgh 1, Scotland. |
| **5N2EBL** | E. L. Lloyd, Box 114, Ibadan, Nigeria. |
| **5H3GC** | N. Jackson, Box 111, Mbeya, Tanganyika. |
| **6W8AN** | Box 971, St. Louis, Senegal Rep. |
| **VS9KPH** | M/Sig. P. Hudson, Sergeants' Mess, R.A.F. Khormaksar, B.F.P.O. 69. |
| **VS9KAC** | J/T. A. R. Cake, Block One, Middle Annexe, R.A.F. Khormaksar, B.F.P.O. 69. |
| **G3GPE/VS9K** | Sgt. K. Smethurst, Sergeants' Mess, R.A.F. Eastleigh, B.F.P. 10. |
| **G3NAC/VS9K** | via R.S.G.B. |
| **G3OLV/VS9K** | A. S. Coombe, 113, Belnheim Gardens, Wallington, Surrey. |

**R.S.G.B. QSL Bureau:** G2MI, Bromley, Kent.

Following the recent disturbances in Lebanon all amateur licences have been revoked, although most of the foreign nationals have been allowed to keep their equipment. Bryan Bisley (G3OFI, etc.) has been active on 3·5 and 7 Mc/s s.s.b. and c.w. from MP4QAO and MP4DAC, the score at the former QTH being now 103 worked on c.w. on 7 Mc/s. Bryan intends to be active for the greater part of February from MP4QAO.

**HC1AGI,** operated by W3EIS, is very active on 1·8 Mc/s, and is located 11,000 ft. up in the Andes, with the aerial system 300 ft. long and 80 ft. high. From the living quarters to the station takes one hour by car, which makes operating periods irregular. The address for QSLs is given in *QTH Corner*.

### DXpeditions

The **Kamaran Island** DXpedition has been awarded the " DX Signal of the Month " award for October 1961 by the Niagara Frontier DX Association. This commendation is issued monthly to the amateur or group of amateurs most instrumental in providing exceptional DX activity. G3GJQ, on behalf of all the operators involved, has received a handsome parchment, and the group is eligible for the yearly award of a permanent wall plaque.

The QSLs for the Kamaran Islands affray are flowing steadily to the bureaux, all the direct applicants having been answered. **G3GJQ** advises that once all cards have been sent out the log books will be returned to the individual operators, and that after March 1 all QSL requests should be made to the station concerned, either direct or via the R.S.G.B. Bureau. The addresses of the various operators will be found in the *QTH Corner*. A vote of thanks is due to G3GJQ for his prompt handling of the QSL situation which, in view of the numbers involved, was a considerable chore. Some other recent DXpeditions would do well to emulate the QSL policy of the Kamaran group.

The trip to **Sikkim** (AC3) and **Bhutan** (AC5) to be undertaken by **VU2NR** will, according to latest news from Raju, take place after the last week of March. VU2NR hopes to spend 14 days at each country, and will be taking along a home-made 100 watt transreceiver for c.w. and s.s.b. together with a Birdcage aerial. Operation will be on both modes on 14 and 21 Mc/s, with c.w. only on 7 Mc/s if conditions justify this. **VU2BK** also hopes to make a trip to **Bhutan,** but no other details are available other than that the operation will be on c.w. and a.m. on 14, 21 and 28 Mc/s.

**FO8AN** commenced operation from the **Marquesas** at 16.00 on January 7 with a c.w. QSO with K6ENX (via G3KZI). Signals have not been worked from this country according to latest reports although they have been heard around 15.00 on the long path. For this and other projected activity by Danny Weil, operators should call 10 kc/s down from the DXpedition frequency.

**YV0AA** operating from the Aves Islands off the coast of Venezuela was well heard in the United Kingdom being contacted on s.s.b. and c.w. on 21, 14 and 7 Mc/s.

**Baja Nuevo** will be activated under the call **HK0AA** by a group of operators headed by HK1QQ. The projected date is April 28 for a period of five days, with operation on all modes.

TOPS member **W1RAN** will be active from FP8 from February 12-24 on 1810, 3515, 7015, 14015, 21015 and 28015 kc/s, c.w. only.

### Contests

The second weekends of the **A.R.R.L. DX Contest** will take place during the periods March 2-4 (telephony) and March 16-18 (c.w.). A summary of the rules will be found on page 360 of the January BULLETIN.

The **Sixth Annual *CQ* World Wide S.S.B. Contest** will take place during the last weekend in March from 12.00 Saturday, March 24, to 18.00 Sunday, March 25, with only 24 hours of

operating permitted. A major change in the rules is that contacts between stations in the same country will not count except for the prefix multiplier. Also, the same station may be worked once on each band for the purpose of accumulating points and therefore separate log sheets must be submitted for each band worked. For example, if HB9TL is worked on 14 Mc/s he may also be worked on 28, 21, 7 and 3·5 Mc/s, adding the proper points score each time. However, once the HB9 perfix has been contacted on any band it cannot be counted again. Copies of the rules and log sheets are available upon receipt of a large s.a.e. sent to G2BVN.

The 1962 contest of the **R.E.F.**, the French national society, will be held from 14.00 on February 24 to 22.00 February 25 (c.w.), and from the same times April 14 to 15 (telephony). The numbers to be exchanged consist of the RS or RST report and the number of the QSO. Three points are scored for each contact with a station in a DUF country, with a multiplier of one for each French department or each DUF country other than France and Corsica on each band. The total score will consist of the points times the multiplier. Logs should be sent to R.E.F., B.P. 42-01, Paris, France.

Results of the **1961 R.E.F. Contest** show that the leading station in the foreign c.w. section was **G3EYN** with 4,437 points, his nearest competitor being **OH2KH** with 2,992 points. In the telephony section **G3NAC** was placed second with a score of 6,904 points, first place being taken by **I1FMC** with 7,626 points.

The **International Millennium SP Contest 1962** will take place during the periods 20.00, April 7, to 20.00, April 8 (c.w.), and the same times April 14 to April 15 (telephony). All bands from 3·5 to 28 Mc/s may be used and numbers to be exchanged will consist of the RS/RST report together with the serial number of the contact. This contest is open to short wave listeners in addition to transmitting stations A copy of the rules and specimen log extract may be obtained by sending a s.a.e. to G2BVN.

## DX Briefs

An interesting exchange of signal reports between **ZL2GX** and **G8PO** took place on January 8 involving three bands: 3,700 kc/s, 08.00, RS56 both ways: 7,098 kc/s, 08.05, RS59 both ways; 14,290 kc/s, 08.15, RS58 both ways. ZL2GX used a half-wave dipole on 3·5 and 7 Mc/s with a three element Yagi on 14 Mc/s. At G8PO the aerials in use were: 3·5 Mc/s 44 ft. vertical; 7 Mc/s ¾ wavelength vertical and 14 Mc/s, a three element fixed quad. G8PO comments that the outstanding thing about these exchanges was the amazing signal strength on 7 Mc/s.

With reference to the map of Polish call areas published last month, R.S.G.B. member SP5HS points out that the current names of the districts referred to as Stettin, Oppeln and Allenstein are Szcecin, Opole and Olsztyn respectively.

There have been recent references to the possible division of the trust territory of Ruanda-Urundi into a republic and a kingdom respectively. More DXCC fodder?

The group known as the **Crozet Islands** will be the site of a French meteorological station to be established and in operation by 1963. The reconnaissance party intended to operate under the call FB8WW on 14,020 kc/s, but there have been no reports of this station having been worked from the United Kingdom, although the signals have been heard in VK. The reconnaissance party had only low power equipment and an inefficient aerial system, which should be rectified when the permanent station is set up. The Crozet Islands are an uninhabited barren group similar to the Kerguelen Islands which also form part of the French Antarctic lands.

All cards for **VP8GQ,** now active from Signy Island, should go to **G3PAG,** now acting as QSL manager, as should cards for VP8EG for QSOs after October 5. G8KS who was the manager for the original VP8EG is receiving many QSLs for contacts after October 5 with which he is unable to deal. It seems a pity that this confusion of call-signs was allowed to occur.

W3AYD advises that the QSLs for the Cayman Islands DXpedition under the call **VP5BL/5** should be despatched by the end of January.

Azerbaijan is scheduled to have s.s.b. representation under the call **UD6BE,** who will be active on 14 Mc/s.

The many friends of Frank Hooson, **G3YF,** will be pleased to hear that he is making good progress, and it is hoped that the call will be heard again on the DX bands in the very near future.

There have been further reports that **OH** stations will soon have permission to use the **1·8 Mc/s** band, but no definite details are forthcoming.

The next **Top Band trans-Atlantic test** period will be on February 18, and it has been pointed out that the c.w. station WCC on 2·035 kc/s is useful as a marker, although outside the band.

**UA1KED** QSLs are now freely available as the logs come through to RAEM, Ernst Krenkel, who has assumed QSL manager responsibilities.

For those wishing to chance their luck with another QSL application to **KC6UZ,** his present QTH is: C. Kunz, 4730 East Ave., Washington 28, D.C.

### Band Reports

The **1·8 Mc/s** band has brought forth a reasonable amount of DX but conditions have not been outstanding. At the time of writing the opening of December 17 remains the best so far. However January 7 produced a fair crop of DX and HC1AGI was heard by **G3PU** at 07.30 on 1,809 kc/s with a signal strength of 33/49. The bar to a QSO was apparently heavy static at the Ecuadorian end of the path. VP3AD and EL4A were also reported active on this day but were not heard in the United Kingdom. B.R.S.19107 also reports HC1AGI on January 7, but at 04.43 when his signals were 569. At 05.09 W0VEH/VP9 was heard calling CQ with 559 signals. Although the band apparently commenced to go down after about 05.30 it did remain open to North America until a comparatively late hour and G3PU contacted W1PPN at 08.26, whilst W1BB/1 was still audible working W6s at 08.40. Stations worked by **G3PU** include W1BB/1, W1PPN, W1TX, VE1ZZ, VE2ATU and VE2AYY, whilst W2FYT, W2GGN, W2QHH, W2UWD, K8HBR/8, appear on the list of those heard. **B.R.S.20317** obtained a new one in EI5B at 23.40 on 1,838 kc/s, and UO5AA at 05.30 on 1,827 kc/s was another welcome addition to the log. Known to be on the band but not heard were PZ1AT (1,803 kc/s), VP7NY and KH6IJ who contacted W1BB/1. On January 14 HC1AGI was heard in QSO with W8JIN, W8PQQ, W0IFH and KH6IJ, the times being between 06.00 and 06.30 and the frequency 1,803 kc/s. "VP5FP" has been reported widely at signal strengths which lead us to believe that the station is located in the Home Counties. Early riser **B.R.S.19107** came on the band at 03.49 and was almost immediately rewarded with VE3KE calling CQ at 579, followed by K8JOO and W8PXK, and at 04.20 UB5WF with 589 signals. A recent "first" on this band was a two-way s.s.b. QSO between G3CHN and W2FYT.

As might be expected, **3·5 Mc/s** has been producing some worthwhile DX, and dealing first with the c.w. section our reporter **B.R.S.20317** records JA6AK at 21.50, EP2BH (19.18), KP4AOO (09.00), UA9CM (21.30), VO1EC (19.00), Ws (at times between 21.00 and 10.00), ZL3FZ (08.10) 4X4WF (21.30) and 5A3TQ (21.45) raising his countries heard on this band to 101. The reception of signals from Japan obviously point the way for the months ahead, and in addition to JA6AK, JA1ON is also known to be active on this band, both stations having been heard around 3,505-9 kc/s. Turning to s.s.b. DXpedition station YV0AA was worked by GI3CDF, which is in accordance with conditions

on this band during the early morning period. **B.R.S.20317** reports HR3HH and PZ1AX around 06.00 with ZL2AAG and ZL1AIX at 08.10. In the evenings Australians were well heard with outstanding signals from VK3AHO (19.00), VK3BM (19.40), VK3HG (19.50) and VK3JA (19.25). Other evening DX included CN8IK, HZ1AB, LX1DE, UB5WF, UC2AA, YU1FC, VS9AAC and 3V8CA. **B.R.S.19107** mentions several of the above and comments on the strong signals from ZL1AIX at 08.00. Later in the day 4X4IX and 4X4DK were often heard and VE3BQL/SU in the Gaza strip was frequently active. The broadcast station on 3,787 kc/s often heard with good signals has been identified by B.R.S.20317 as Teheran (EQD) having a power of one kilowatt. **G5KW** started using s.s.b. on the band on January 13, since when he has worked 40 countries including OY7ML. VS9AAC, HZ1AB, 4X4CW, SV0WT (Crete), PZ1AX, CN8IK, VO1EC, YV5ANS, LX1DE, UB5WF, VK3AHO, 3V8CA, VE7MT, XE1CV, VP9DL, HK4EB, ZS6TE, EP2AT, OX3AI and VE3BQL/SU.

Obviously 7 Mc/s is a band that contains a lot of DX if only it can be heard under the infernal machines that clutter up the frequencies below 7,100. **B.R.S.20317** comments that Radio Cairo on 7,050 kc/s often transmits signals that on occasions spread a full hundred kilocycles. There is still apparently little s.s.b. activity although **B.R.S.19107** reports strong signals from HH2AID on 7,090 kc/s at 07.50, with some W6s heard around 08.30. There has been no shortage of activity at the c.w. end of this band and a tally from B.R.S. reporters produces: DU1AQ/9 (22.55), EP2BB (15.50 and 21.00), JA1EUV (12.45)—a most unusual time for JA, JA1DFN (09.30), JA8LN (08.50), KH6CL (09.30), with 579 signals! KP4ASK (20.30), UI8AH (15.00), UL7NB (18.26), UM8KAB (19.30), VQ2W (19.15), YV0AA (23.59) and 9Q5AAA (18.36). A rare one who appeared with 459 signals, was KC6BD in the East Carolines, but the QRM was apparently too much for him to hear the European sufficiently well to make many QSOs. North America has been well heard beginning with K1JTC at 19.00 and round the clock until 11.15 when W6UOV was S6. Generally, United Kingdom—W6 contacts seem to be possible around 10.00. Thanks to VP8GQ, Signy Island is workable without too much difficulty these days and **G3AAE** records a QSO with this station at 22.40. Given a chance, and this includes some abatement of the QRMurder, this band will give a good account of itself in the months to come.

Generally, **14 Mc/s** is but a shadow of its former self, although occasionally the band will stir to produce conditions approaching those that have been noted in the recent past. **G8PL** comments that it is a waste of time listening before 06.00 and the chances are that it will be 07.00 before any signals are heard, and he does not mean DX signals! The WAE Contest promoted a little much needed activity at the c.w. end. A combined worked/heard listing from **G8PL** reads: 06/07.00 SM5ZS/ZC6, TT8AA, UD6BN, UI8BO, UL7KAA, VQ5IB, VS9AGV and 5A1TW; 07/08.00 EP2AF, KA2MA, UH8BO, UI8KBA, UM8KAA, UA0SB, 3V8CA, 5A4TC, 5N2LKZ and 6W8DD, and between 08.00 and 09.00 we have JA1BK, JT1KAA, 6W8DE and 5N2BCF. G8PL queries the ON5 prefix now being heard, and this is used following the end of the possible permutations using ON4. **G3AAE** spent a fruitless hour chasing FO8AN one Sunday afternoon, but it seems likely that the departure of the *Yasme* will be much delayed owing to a further set of troubles which seem to beset this DXpedition. This may well provide European stations with a chance of a contact with the Marquesas, which, as yet, does not rank separately from the remainder of French Oceania. From the log of **G3AAE** we extract ET2US (17.15), TN8AG (18.05), VQ8BB (17.44), VQ8BM (18.10), VP8GQ (20.25), 5U7AC (20.32) and 4S7EC (15.30). **G3HDA** (Stratford-on-Avon), notwithstanding the indifferent conditions, has been able to find some worthwhile DX in the shape of CR4AH (16.20), EP2BK (09.55), EL4A (09.35), HK1AAF (12.02), HK7ZT (12.38), KC6BD (09.24), KG4CW (19.10), KZ5EM (22.56), PJ2ME (12.12), UA0AZ (12.38), VP2VJ (19.26), VP4BY (12.05), VP5BL (17.45), YN1AA (11.55) and 6W8DF (09.30). Heard were FG7XI (12.35), FP8BD (20.10) and YV0AA (19.25).

Turning now to the high end of the band there has been no lack of s.s.b. activity although the Pacific stations have been conspicious by their absence. As consolation there have been some extremely good openings to VK and ZL during the early afternoons and VK3AHR and VK5MS have been heard with very strong and consistent signals. VK5MS has recently worked VR1B who is usually around 14,300 at midday, and mentioned that VK9GP on Norfolk Island is active on 14 and 21 Mc/s, both a.m. and c.w., and is particularly looking for United Kingdom contracts. VK9GP is often on around 06.00, but the activity is not on a daily basis. From the Cook Islands ZK1BO is now available on a.m. and c.w. around 08.00. The list of stations worked by **MP4BBW** looks like a *Who's Who of World Sideband* activity. Ian is now up to 230 confirmed on s.s.b., and thinks that 300 is possible, but not this year! Propagation conditions in Bahrein have been poor with the band opening late and closing early. One can only surmise as to the contents of the MP4BBW log during good conditions but which at the present includes: AP2AD (12.45), CE3VU (11.01), CR6CA (17.34), CX2AX (11.17), CR9AH (13.06), EA6AZ (10.10), EL2V (17.08), ET2US (18.35), FK8AC (12.14), W6QMN/KB6 (05.46), KH6EEM/KB6 (04.53), KC6AY (10.47), KG6GX (11.43), K6OTJ/KJ6 (04.20), KH6s (05.00—06.00), KM6BI (03.48), KP4AZJ (12.29), KR6KS (05.01), K6CQV/KS6 (05.24), KV4BQ (11.54), KW6DG (05.34), KX6BQ (05.10), OA4ED (12.14), PJ2AA (12.59), PZ1AX (06.55), PJ2MC (11.02), TI2LA (13.33), UI8AE (11.41), UG6AW (13.13), UL7JA (04.45), UM8KAB (09.39), VE3BQL/SU (18.30), VP4BY (12.11), VP5BL (12.22), VR6AC (06.00), VK0s (15.00—18.00), VS6CL (10.23), XE1CV (15.15), XZ2SY (16.00), XW8AS (12.42), YN1AW (14.14), YV5AFF (14.00), YV0AA (14.13), YS1MS (14.29), 3V8BL (17.31), 5H3GC (16.00), 6O1DRS (14.44), 9M2CR (15.19), 9Q5AJ (18.29).

A fair crop of signals has been produced by **21 Mc/s** but nothing really exciting in the way of DX. As in previous months the band has been open on the South and South Easterly paths and also to the West Indies and surrounding area. **G3AAE** mentions MP4TAC (12.00), and TU2AC (09.50) on a.m. with 5R8AD (11.20) on c.w. **A.2340** (Plymouth) logged CO8JK (13.25), EA6AR (13.01), EP2AT (14.42), FA2VB (10.17), KG1GC (16.25), KZ5EZ (15.54), VE3BQL/SU (08.26), VP6WR (15.13), 9M2FX (15.35), together with a number of semi-DX stations. At the time of writing Angus, 5N2AMS, had at last received all the documents necessary for his trip to Gabon. When this DXpedition materializes there will undoubtedly be considerable activity on a.m. on this band.

The **28 Mc/s** band has again been disappointing and our sole reporter, A.2340, logged CR7, EA8, PY5, VQ2, ZC4 and ZE1 all between 11.00—16.00, which gives a fair indication of what might be heard on this band.

* * *

Correspondents are thanked for their letters and reports and their co-operation is much appreciated. Acknowledgements are made to the *DX'press*, the West Gulf DX Club *Bulletin* and *DX* (W4KVX).

Please send your letters and reports for the next issue to arrive at R.S.G.B. Headquarters not later than February 20.

**LONDON U.H.F. GROUP**

will meet at the Whitehall Hotel, Bloomsbury Square, London, W.C.1.

**at 7.30 p.m. on Thursday, March 1, 1962**

All v.h.f. and u.h.f. enthusiasts welcome.

# Single Sideband

By G. R. B. THORNLEY (G2DAF)*

A SINGLE tone input into an s.s.b. transmitter drives the linear amplifier at one frequency. The amplifier output is a pure c.w. signal exactly the same as the output of a telegraph transmitter under key-down conditions. As such it is possible to ascertain by meter readings the performance of the amplifier at maximum signal (p.e.p.) conditions. However, information on the linearity of the amplifier is lacking. In order to study linearity thoroughly by observation of the amplifier output, some means must be provided which will vary the output level from zero to maximum signal with a regular pattern that is easily interpreted. A simple means of obtaining an output signal is to use two audio tones of equal amplitude to modulate the sideband transmitter.† The resultant (or beat between the two r.f. signals) produces a regular pattern, which, when observed on an oscilloscope, has the appearance of a carrier 100 per cent amplitude modulated by a series of half sine waves.‡

**TABLE 1**

**H.T. Supply Voltages**

| 500 | 500-750 | 750-1250 | 1500-2000 | 2000-3000 |
|---|---|---|---|---|
| 2E26<br>829B | 6146<br>807<br>1625 | TT21<br>807<br>1625<br>805<br>811A<br>4-65A<br>4X150A<br>EL38 | 813<br>4-125A<br>4X150A<br>304TL<br>4X250B | 304TL<br>4-250A<br>4-400A<br>PL-6569 |

## Two-Tone Power Relationships

A test of this nature is called a " two-tone " test, and is often referred to in discussions of s.s.b. linear amplifier operation. This test enables the linearity of the amplifier to be studied in detail, because the waveform is regular, recurrent, and one from which deviations are quite easily interpreted. The pattern can be observed on the oscilloscope while the operating parameters of the amplifier are adjusted for the most linear operation and finally the drive and the loading can be adjusted to determine the point at which the amplifier output is the maximum without departure from linearity. When these conditions are determined the various meter readings are noted and the relevant power relationships calculated.

For a standard two-frequency test signal the relationships are as follows:

$$\textit{D.C. anode current } (I_a) = \frac{2\, I_{a\ peak}}{\pi^2}$$

$$\textit{Anode input watts } (W_{in}) = \frac{2\, I_{a\ peak}\, V_a}{\pi^2}$$

$$\textit{Average output watts } (W_{mean}) = \frac{I_{a\ peak} \times (V_a - V_{a\ min})}{8}$$

$$\textit{Peak output watts } (W_{out})(p.e.p.) = \frac{I_{a\ peak} \times (V_a - V_{a\ min})}{4}$$

$$\textit{Anode efficiency } (Eff) = \left(\frac{\pi}{4}\right)^2 \frac{(V_a - V_{a\ min})}{V_a}$$

* *5 Janice Drive, Fulwood, Preston, Lancashire*

† In practice it is not necessary to use two audio signal generators—one is sufficient. The other driving frequency is obtained by inserting carrier or unbalancing the modulator.

‡ This is shown in Figs. 2 and 3 in the January BULLETIN.

## Which Linear Amplifier Do You Recommend?

Although single sideband has now been in use by British amateurs for more than ten years, there is not as yet any linear power amplifier arrangement that has shown itself to be superior either in performance or characteristics to an extent where it has become accepted as a standard particularly suitable for the requirements of s.s.b. In fact, the newcomer to single sideband seeking advice on this subject soon finds that the variety and types of linear amplifiers in use are legion, and that almost every operator considers that his own particular circuit and valve combination has characteristics that make it a " must."

In addition to this, some of the advantages claimed for certain circuit arrangements are not based on accurate experimental work and/or measurement procedure, or have arisen because of unconscious exaggeration—perhaps even wishful thinking—or have been based on inaccurate information given in some of the single sideband literature that has been published in the past. An example of this is the wrong but widely held belief that one of the major advantages of grounded grid operation is that the whole of the driving power appears in the output and is a " free " addition over and above the output that would be obtained using the conventional grid driven mode.

There is also some confusion in regard to the drive requirements for passive grid operation and many amateurs have been deterred from trying this excellent method because of doubt as to whether the output available from their existing exciter would be sufficient fully to drive the p.a.

There is also the choice to be made between one big valve, or two or more smaller ones, and the further decision, push-pull or parallel operation? Finally, the performance of the power amplifier cannot be evaluated by consideration of the amplifier alone: the amplifier has to be driven and it must be intimately connected to the driver valve. If the input impedance varies over the driving cycle, the varying load reflected back to the driver anode circuit can cause flat topping and distortion of the waveform from an exciter that is known to transmit a low distortion high quality signal when it is working directly into the aerial.

In addition to the many letters received from BULLETIN readers asking for help and advice, many amateurs discuss

**TABLE 2**

**Basic Method of Operation**

| Driving Power (P.E.P.) output) | Tuned Grid AB1 | Tuned Grid AB2 | Passive Grid | Cathode Driven (Grounded Grid) |
|---|---|---|---|---|
| 5 watts | 2E26<br>6146<br>4-65A<br>4X150A<br>807 1625<br>TT21<br>EL38 | 829B | | |
| 10 watts | 4-125A<br>813 | 807 1625<br>4-65A<br>813<br>4-125A | | |
| 25 watts | 304TL | 805<br>811A | 813<br>4-65A<br>4-125A<br>4X150A | |
| 50 watts | | 304TL | 805<br>811A<br>4-250A<br>4-400A | 813<br>4-125A<br>4X150A<br>805 (X2)<br>811A (X2) |
| 100 watts | | | 304TL<br>PL6569 | 304TL<br>811A (X4)<br>805 (X4)<br>PL6569 |

problems and ask for information in contacts with G2DAF on the 80m band. The information required covers all aspects of single sideband—reception as well as transmission—but the question that appears to have been most often asked is, " Which linear amplifier do you recommend? "

Unfortunately there is no easy reply to this because the type of linear amplifier that would be most suitable is dependent on circumstances that vary from one operator to another. In fact, the choice must be made by the operator himself because it is inherently a personal one. However, it is possible to give an indirect answer to the question by outlining a simple " design consideration " procedure as follows:

(i) Determine the h.t. supply voltage that is to be used. (This may be from an existing power pack, or may depend on the use of components that are already available, or it may be determined by considerations of safety, i.e., many amateurs fight shy of using voltages much above 750.)
(ii) Determine the driving power that is available from the exciter. (This can be obtained from the manufacturers' data for the driver valve in use, or can be measured into a dummy load, or approximated by lighting a suitable lamp load.)
(iii) By reference to Table 1, chose a valve suitable for the h.t. supply available.
(iv) By reference to Table 2, decide on the basic method of operation suitable for the driving power that is available.

The values given in Tables 1 and 2 are approximations intended to serve as a guide. In Table 2 the " Driving Power " includes (*a*) The grid circuit and coupling losses, (*b*) The input damping losses of the valve, (*c*) The loss in the grid circuit swamping resistor, (*d*) The grid current which may flow, (*e*) In the grounded grid application, the percentage of driving power that appears in the output circuit as " feed through power." The driving power for the valve shown in the class AB1 column assumes a grid swamping resistor of 2,000 ohms. (This is the value recommended by the Mullard organization.)

As the input impedance of a grounded grid amplifier is a function of the peak cathode current, the driving power required will be greater for four valves than for two. The number of valves in use is indicated by (×4) or by (×2). It is assumed in all cases that where two or more valves are used in the amplifier, they are operated in parallel.

Having decided on the type of valve that is most suitable for the h.t. supply and driving power available, the valve manufacturers' data can be consulted for the p.e.p. output rating. If this is less than the total output required it will be necessary to run two, three or four valves in parallel. To give two examples: (i) The choice of valve type is 6146 with a 750 volts h.t. supply. The required maximum signal power output (p.e.p.) is 200 watts. This will require four valves in parallel. (ii) The choice of valve type is 813 with a 2,000 volt supply. The required output is 400 watts p.e.p. This can be obtained with two valves in class AB2.

### Basic Circuit Considerations

As a guide to the choice of basic methods of operation given in Table 2, the main advantages and disadvantages can be sumarized as follows:

#### Tuned Grid, Class AB1

***Advantages***

(*a*) Low driving power.
(*b*) As there is no grid current the load on the driver valve is constant.
(*c*) There is no problem of grid bias supply regulation.
(*d*) Good linearity and low distortion.

***Disadvantages***

(*a*) Requires tuned grid input circuit and associated switching or plug-in coils for multi-band operation.
(*b*) Amplifier must be neutralized.
(*c*) Lower efficiency than class AB2 operation.

#### Tuned Grid, Class AB2

***Advantages***

(*a*) Less driving power than passive grid or cathode driven operation.
(*b*) Higher efficiency than class AB1.
(*c*) Greater power output.

***Disadvantages***

(*a*) Requires tuned grid input circuit.
(*b*) Amplifier must be neutralized.
(*c*) Because of wide changes in input impedance due to grid current flow there is a varying load on the driver valve.
(*d*) Bias supply must be very " stiff " (have good regulation.)
(*e*) Varying load on driver valve may cause envelope distortion with possibility of increased harmonic output and difficulty with TVI.

#### Passive Grid

***Advantages***

(*a*) No tuned grid circuit.
(*b*) Due to relatively low value of passive grid resistor, high level of grid damping makes neutralizing unnecessary.
(*c*) Constant load on driver valve.
(*d*) Compact layout and simplicity of tuning.
(*e*) Clean signal with low distortion level.
(*f*) Simple circuitry and construction lending itself readily to compact layout without feedback troubles.

***Disadvantages***

(*a*) Requires higher driving power than tuned grid operation.

#### Cathode Driven

***Advantages***

(*a*) No tuned grid circuit.
(*b*) No neutralizing. (This may be necessary on 10 metres.)
(*c*) Good linearity due to inherent negative feedback.
(*d*) A small proportion of the driving power appears in the anode circuit as " feed-through power."

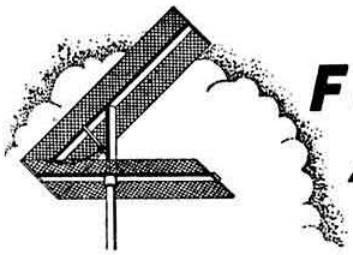
***Disadvantages***

(*a*) High driving power—greater than the other methods.
(*b*) Isolation of the heater circuit with ferrite chokes or special low capacity wound heater transformer.
(*c*) Wide variation in input impedance throughout the driving cycle causing peak limiting and distortion of the envelope *at the driver valve.*
(*d*) The necessity for a high-*C* tuned cathode circuit to stabilize the load impedance as seen by the driver valve and overcome the disadvantage of (*c*).
(*e*) In practice, with the type of valves commonly used by United Kingdom amateurs, the power output appears to be the same or slightly less than that for passive grid operation. The active anode current flows through the cathode circuit and produces across the cathode impedance a voltage which decreases the exciting voltage. This corresponds to negative feedback, and it is possible that the loss due to this feedback can be roughly equal to the feed-through power—the net gain is then zero.

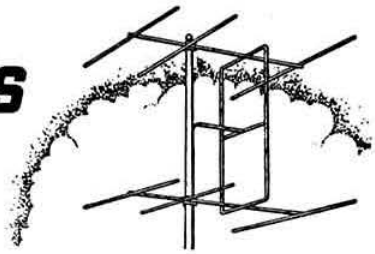
---

### Mullard Stereophonic Amplifiers

A LEAFLET (ref. TP456) describing the design and construction of two stereophonic amplifiers using the new audio pentode type ECL86 may be obtained from Mullard Ltd., T.S.D., Mullard House, Torrington Place, London, W.C.1. One of the designs is for a 10 watt high quality stereo amplifier, the other for an inexpensive 3 watt per channel unit.



# FOUR METRES AND DOWN



By F. G. LAMBETH (G2AIW)*

FURTHER information on his moon reflection experiments has been received from G2HCG who reports that the EME path has been proved practicable given the required aerial gain, transmitter power, receiver sensitivity, and bandwidth. These calculations amount to a receiver noise factor of 4db, transmitter power input of 1 kW, receiver bandwidth of 400 c/s and aerial gain of 26db.

The aerial is the main problem, and no matter what configuration is used it finishes up 40 ft. square. When it is considered that it has to rotate in elevation as well as azimuth it becomes quite a fearsome beast. The actual aerial system used for the initial tests comprised 12 standard J-Beam slot fed double-8 2m aerials spaced two wavelengths in all directions. This gives the required 26db (400 times power gain, i.e. some 300 kW E.R.P.) but it does not allow for the one item which cannot be calculated, i.e. polarization shift from the ionosphere. This could only be found out by trial. Initial results show that the return signal is definitely not horizontally polarized as transmitted; the polarization would seem to be rotating and the return echo depends on being in-phase with the rotation. The next step will be to use circular polarization. The rotation direction of a circularly polarized signal is reversed upon reflection, therefore helix type aerials are not suitable. The answer is crossed Yagi arrays fed in quadrature which do accept the opposite of the transmitted direction of rotation. The optimum configuration of aerial design, bearing in mind the conflicting requirements of gain and size appears, to be 12 aerials, each of 14db gain. Experiments to ensure this figure are now under way. The frequency of operation is 144·32 Mc/s with a pulse width of one second, and call-signs at appropriate intervals. The original aerials suffered in the recent gales, which has caused quicker progress in the evolution of the later arrays.

### French Contests and Awards

The French society, R.E.F., will be holding v.h.f. contests on the following dates:

| | |
|---|---|
| March 3-4 | National V.H.F. Contest on 144 Mc/s. |
| May 5-6 | Coupe du R.E.F. V.H.F. Contests on 144, 432 and 1296 Mc/s. |
| May 26-27 | Region I U.H.F. Contest on 432 and 1296 Mc/s. |
| July 7-8 | Mobile and Portable Contest on 144 Mc/s. |

R.E.F. offers the D.D.F.M. (Diplome des Departments Français de la Metropole) in the following classes:

" D.D.F.M. V.H.F. 20 " (25 QSLs from 20 French Departments).

" D.D.F.M. V.H.F. 30 " (35 QSLs from 30 French Departments).

" D.D.F.M. V.H.F. 40 " (50 QSLs from 40 French Departments).

Contacts must have been made after June 30, 1957, minimum reports being 338 or 33A (aurora) or 45 (phone): it is not necessary to send all evidence to R.E.F. but only a list verified by the applicant's National V.H.F. Manager. For the two higher grades, only new departments and stations must be justified in the same manner. Applications, with one International Reply Coupon, should be sent to R.E.F., Box 42-01, Paris R.P., France.

### Meteor Showers

At the Turin Conference OE6AP undertook to provide a full list of meteor shower dates and it is reproduced below. Some of these are minor showers, but in any case it is the most comprehensive list we have seen so far. Southern hemisphere showers are included.

| | | | |
|---|---|---|---|
| Jan. 3/4 | Quadrantids | July 18/30 | Capricornids |
| | | July 25 | Aurigids |
| Jan. 17 | Cygnids | July 25/ | |
| Feb. 5/10 | Aurigids | Aug. 4 | Perseids |
| March 10/12 | Bootids | July 28 | Delta Aquarids |
| March 20 | Coma Berenice | July 29 | A Piscis Austral |
| March 25 | Hydraids | Aug. 10/15 | Perseids |
| April 3 | Virginids | Aug. 16 | Cygnids |
| | | Aug. 18 | Cepheids |
| April 22 | Lyrids | Aug. 21/23 | Draconids |
| May 5/6 | Eta-Aquarids | Aug. 31 | Aurigids |
| May 7/13 | Piscids | Sept. 8 | Sculptorids |
| May 11/24 | May-Herculids | Sept. 12 | Piscids |
| May 20/21 | O-Cetids | Sept. 16 | September Perseids |
| May 30 | May-Pegasids | | |
| June 4/5 | Zeta-Perseids | Sept. 22 | September Aurigids |
| June 7/8 | Arietids | | |
| June 8/9 | Librids | Oct 2 | Quadrantids |
| June 14 | Scorpio-Sagittarids | Oct. 9 | Oct. Draconids |
| | | Oct. 9 | Giaconbinids |
| June 25 | 54-Perseids | Oct. 20/23 | Orionids |
| June 28 | June-Draconids | Oct. 12/23 | Arietids |
| July 1/2 | Beta-Taurids | Nov. 13. | Taurids |
| July 12 | Alpha-Orionids | Nov. 14 | Bielids |
| July 12 | Yps-Geminids | Nov. 16/17 | Leonids |
| July 12 | Lambda-Geminids | Nov. 23 | Andromedids |
| | | Dec. 12/15 | Geminids |
| July 14 | Cygnids | Dec. 22 | Ursids |

PA0QC reports that PA0OKH carried out experiments with OH1NL during the Geminids in December. A few pings and one short burst were received. However, as it appeared that frequency measuring between the two stations did not exactly agree, the frequency was corrected for the Quadrantids in January and the call and report of the Finnish station were received. In December OH1NL received both calls and the Dutch report. During the Quadrantids OH1NL received both calls several times but no report. PA0OKH also tested with OE6AP and HG5KBP and received pings and short bursts from both.

PA0OKH operates the following equipment. Transmitter —QQE06/40, 80 watts output which will be followed by a TB3/750 9·9 triode (output 300/400 watts) as soon as official permission has been obtained. The aerial is a 10-element long Yagi. The receiver comprises a 6CW4-EC80 converter

* *R.S.G.B. V.H.F. Manager, 21 Bridge Way, Whitton, Twickenham, Middlesex.*

with a noise factor of approximately 2 followed by an AR88. A panoramic adaptor is available but has not been found very useful in practice.

The transmitter is automatically keyed with the help of a tape recorder at a speed of 20 w.p.m. but this will be increased later. The above equipment is a joint effort of PA0OKH, PA0EZ, PA0LQ and PA0QC. PA0OKH is interested in making skeds and his address is Dr. ir L. OngKichong, Fresiaplein 7, Wassenaar.

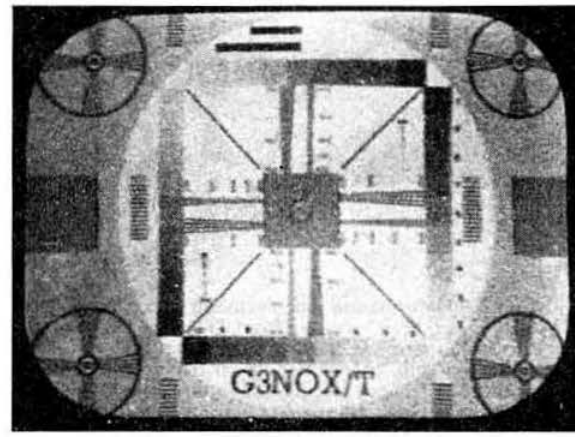
### Seventy Centimetres

**G3KKD/T** (Ely) has sent some interesting photographs, of TV pictures received from G3NOX/T at a distance of about 51 miles. The pictures were received at Sutton St. James, Lincs, on December 23. The receiving equipment comprised an A.2521 r.f. stage, crystal mixer (G3BKQ type) into a TV i.f. of 29 Mc/s and a 64 element stack with reflectors at 76 ft. above ground (84 ft. a.s.l.).

LA1FA, LA2F, LA4RD, LA4YC and LA9T are all now active on 430 Mc/s.

**G3LTF** (Galleywood) worked G3ILX on 70cm for the first time on December 17 at a distance of 240 miles. G2CIW was also worked. On December 19 there was a QSO with G5YV (70cm both ways this time), but the signals were much weaker. On the 21st G3MNQ was worked (RS58) also G2CIW and G3KPT. G2CIW was worked again on the 22nd. During January 2-4, meteor scatter tests were carried out with OK2WCG who has not heard, however, and it is not yet known what happened at the OK end. January 5 brought another QSO with G2CIW. During the Saturday night sked with G3CCH it is found that G3LTF can always get a 70cm signal through; indeed 70cm seems quite reliable even when 2m is really bad. The p.a. stage on 70cm at G3LTF is now a 4X250A.

The cascode amplifier detailed in Figs. 1 and 2 (supplied by G6JP) uses A.2599 and A.2521 valves to provide a gain of 21·5db with a noise factor of 6·9 for a bandwidth of




**Picture received from G3NOX/T by G3KKD/T on December 23, 1961**

12 Mc/s at 430 Mc/s. The power requirements are 180 volts at 32 mA. and 6·3 volts at 0·6 amp. The h.t. feed to each valve should be adjusted to 16 mA. This may require small alterations in the values of R1 and R2 depending on the actual h.t. voltage available.

The chassis should be made of high conductivity material, preferably copper. Silver plating may also be of some assistance in achieving a good noise factor and gain.

### Two Metre News

**G3FUR** (Stamford) reports after four years and is very welcome. The station is active on 145·61 Mc/s with 35 watts to a QQV03/20A, the aerial being a 6-over-6. The " home brew " triple conversion receiver has a built-in 6CW4 and

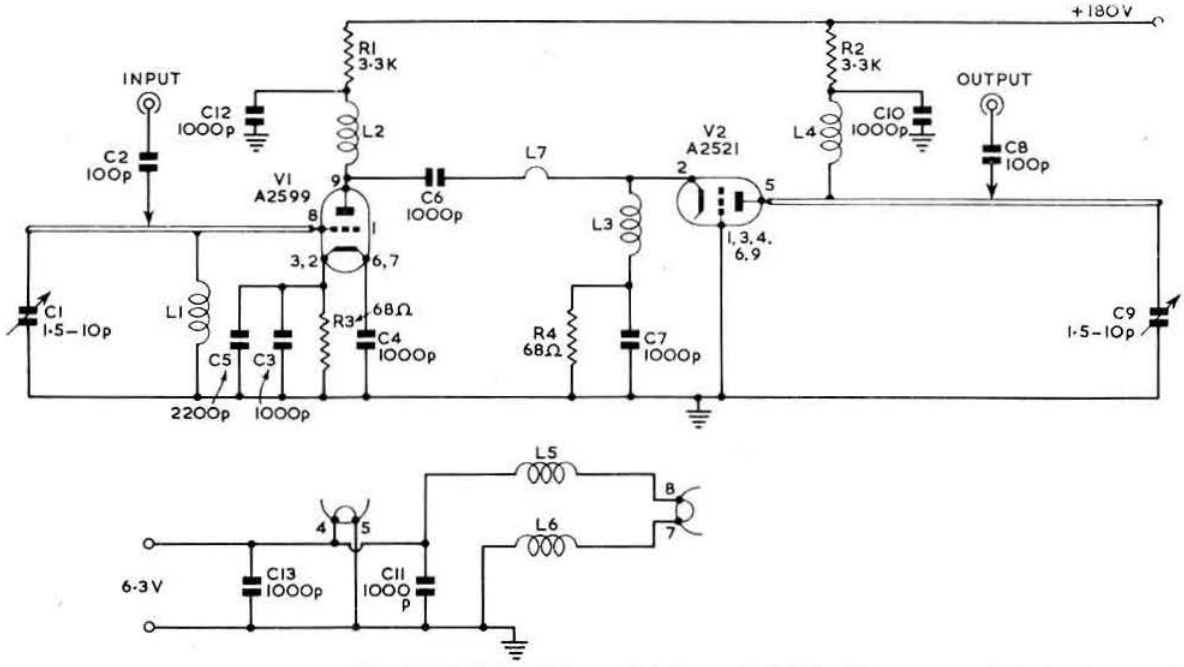



**Fig. 1. Circuit diagram of a cascode amplifier for 430 Mc/s. L1-L6 are r.f chokes made of 10 in. of 34 s.w.g. enamelled wire close wound on a 5 mm. former; L7 is a ¾ turn of 18 s.w.g., 0·35 in. internal diameter. All capacitors should be ceramic type. C5, C10, C11, C12, C13 are feedthrough type though C5 is not used as such.**

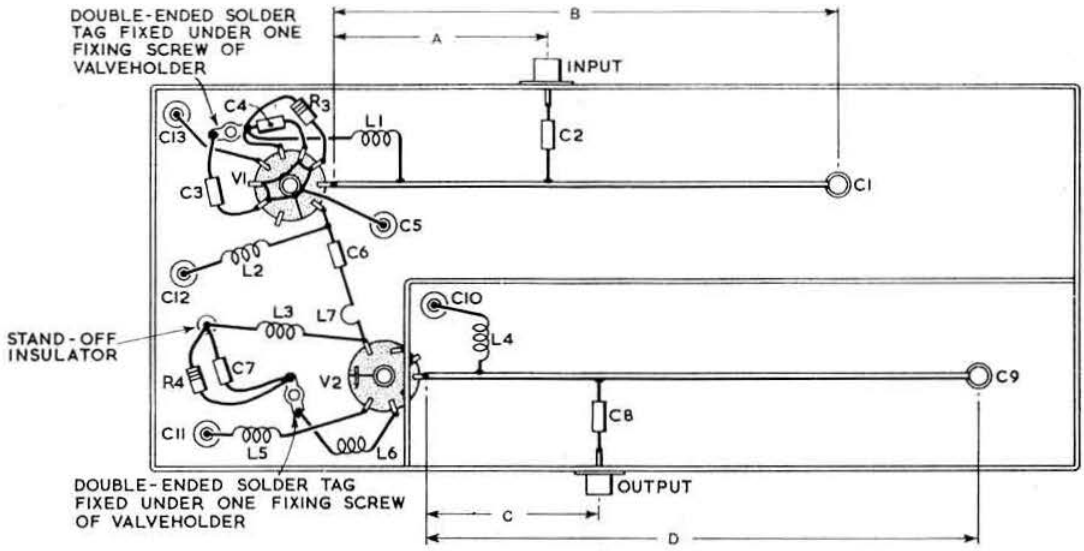



**Fig. 2. Layout of the components (approximately to scale) in the 430 Mc/s cascode amplifier. The measurements of the lines are as follows: A-1.5 in.; B-4.25 in.; C-2.375 in.; D-6.25 in. The material used for the lines is $\frac{1}{8}$ in. copper mounted $\frac{1}{4}$ in. above the chassis. Silver plating is desirable.**

E88CC converter. G3FUR successfully missed all the recent tropo and auroral openings and the first QSOs were not made until October 19, when the openings were apparently dying out. However, since then more than 30 counties have been worked, but only three countries—G, GW and GC, the latter two during a spell of good conditions on December 19. Since then little or nothing has been worked over 100 miles. The most active " locals " seem to be G3EDD (nr. Cambridge), G3MNQ (nr. Nottingham), the best one G2JF who appears always audible, and G3ILD who pops up under quite poor conditions. A weekly sked is in operation with G3HRH on Sunday mornings.

**G3EDD** (Gt. Wilbraham, Cambs) says that apart from himself G2XV and G3III are the only ones working regularly out of the county during the evenings and weekends, but G3DGI has his aerial array nearly finished and will shortly join the trio. G3PSA and G3KRL are now operating at lunch time on weekdays as /A from Pye Telecommunications.

**G3LTF** (Galleywood) found conditions almost as bad as he could remember, with even skeds breaking down, although this was partly due to the fact that the aerial has to be wound down when winds are high. The 10-over-10 Yagis and 48 element array for 70cm present quite a wind resistance. In spite of all this, however, there were various odd and sometimes interesting QSOs. One on December 18 was a duplex 2m/70cm contact with G5YV on 2m. During the Geminids shower, SP2RO is reported to have heard G3LTF but there are no details yet. The SP runs 750 watts to a 10 element Yagi.

It is reported that SM5CAY and UA1NA (Leningrad) recently had a contact on 2m via the aurora (from S.S.A. *QTC*).

CT1CO (Lisbon) is active on 144·040, 144·900, 145·350 and 145·900 Mc/s and looking for QSOs. You never know—sporadic *E* may do this one day!

### G4LX's Auroral Report for December 1961

Once again, there is only one report on the month's happenings. Aurora started on the afternoon of December 1, when the band was wide open in Sweden. Stations were heard and worked in various areas of Sweden and the following signals got through to SM6PU: GM, DJ, DL, DM, LA, OZ, UR2 and OH. Conditions continued good throughout December 2 when QSOs were made with OH0RJ, LA4YG, SM5CRR, OH2HK and others. The usual DJ, DM, DL, LA, OZ and UR2 stations were heard. Again on December 3 the same stations were heard or worked but the auroral conditions were dying down, although they continued spasmodically throughout December 5 and 6. On December 11 there was another small opening local to SM. Other smaller openings were noted on December 23, 28, 29, 30 and 31, but no contacts were made.

### Four Metres

**G3EDD** (Gt. Wilbraham, Cambs) recently became active on this band " more out of curiosity than anything else " and says that G3DGI and G3III will also be on shortly. The information for which he asks is a list of other countries licensed for the band: as far as we know only EI and possibly PA have allocations on the 4m band apart, of course, from all the G countries. No countries have allocations close to the band, the French having lost their 72 Mc/s assignment.

* * *

Well, the very dreary conditions of recent weeks, with few breaks, do not appear to show many healthy signs yet but we can only hope that " Spring is not far behind." Better luck next time perhaps and the writer hopes for a few more reports than hitherto.

### R.S.G.B. V.H.F. BEACON STATION GB3VHF

The frequency of the Society's v.h.f. beacon transmitter at Wrotham Hill, Kent, when measured by the B.B.C. Frequency Checking Station, was as follows (nominal frequency 144·50 Mc/s).

| Date | Time | Error |
|---|---|---|
| January 2, 1962 | 12.00 G.M.T. | 1,925 c/s high |
| January 9, 1962 | 12.55 G.M.T. | 1,692 c/s high |
| January 16, 1962 | 12.00 G.M.T. | 1,800 c/s high |
| January 23, 1962 | 12.44 G.M.T. | 1,725 c/s high |

The station is in operation from 06.30-23.59 G.M.T. daily, but may be on for the full 24 hours for test purposes from time to time.

# Project Oscar

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

SO far as *Oscar I* is concerned, the experiment is over. The transmitter in the satellite failed prematurely, it is true, but not before there was time to complete most of the main objectives of the investigation. To ascertain just how much was achieved we must await the findings of the Project Oscar Association after they have digested the literally thousands of reports which have poured into Sunnyvale, California, from amateurs in all parts of the world.

To continue the story from last month's report which, due to the unavoidably early date on which it had to be prepared, was very incomplete, *Oscar* continued transmitting normally until at least the 261st. revolution, during which it crossed 50° North latitude 15·2° to the West at about 10.56 G.M.T. on December 29. Quoting from G2AOX's report, signals reached a maximum of 8db over noise and the " HI-rate " (the time in seconds to transmit 10 " HI's ") was 16·3. Eight revolutions later, and on the same day, the satellite came within range at 22.43 G.M.T., 7·2° East, with a HI-rate of 21·5 and 12db above noise. It was noted, however, that the frequency had fallen somewhat and was of the order of 10 kc/s lower than its previous value of 144·984 Mc/s.

The next day, on revolution 276, the frequency had dropped to 144·966 Mc/s and the HI-rate had fallen to 24·4. Due, however, to a very near pass (0·4° East) signals were strong—20db above noise—but not quite so potent as on previous near approaches when strengths of 28 to 30db had been noted by the same observer. This revolution was the last time that the now familiar " HI " signal was heard, for on the next round, at 11.16 G.M.T. on December 30, the keying system had failed to the extent that only a pair of " II's " was being transmitted. The pass was 22·6° West and the strength a mere 4db above noise.

A number of stations heard the signal, now a continuous and somewhat bubbly note on approximately 144·96 Mc/s, on revolution 285 at 23.05 G.M.T. on December 30. Although this was a near pass, 0·1° to the East, strength at G2AOX was no more than 3db and it was obvious that the continuous drain on the batteries had reduced the radiated power to a small fraction of the original 100 milliwatts.

The writer logged the signal at 23.23 G.M.T. on December 31 at a maximum of S5 and with sudden jumps in frequency; this was confirmed by G5LK and G3LAR. The D.S.I.R. prediction was for a pass 6·8° to the West and bearings indicated that this direction was correct. The signal was again heard by G2UJ, and undoubtedly by others, for about one minute at 22.11 G.M.T. on January 1 and was by this time extremely weak and only just above noise. What appears to have been the last hearing of *Oscar I* was the reception by G2DQ (Danbury Common, near Chelmsford) of a signal showing the characteristic Doppler effect 09.24 G.M.T. on January 3. G2DQ reported a weak but fairly pure c.w. note which was audible for several minutes. This was revolution 339, and the D.S.I.R. prediction was Southbound, 3·6° West at 09.24 G.M.T.

There seems little doubt that the failure of the transmitter was due to an unexpectedly high temperature in the package. Whether this was a consequence of radiation absorbed from the sun or the result of the orbit at its nearest point to the earth (approximately 150 miles) bringing the satellite within the upper tenuous reaches of the atmosphere is not known, but the *Oscar Newsletter*, issued by the Project Oscar Association on December 21, said that telemetry information provided by the keying rate indicated that *Oscar* was " running a fever," measurements having indicated a package temperature of 125° F.

Writing on December 19, the Association had received 296 reports from 11 foreign countries and a later communication spoke of more than 2,500 reports having been sent in. A preliminary survey indicated that acquisition and fade-out times correlated closely among all receiving stations in the same area and that this correlation improved as experience was gained. Reception distances of around 1,400 miles maximum were of a similar order to those observed here.

It is understood that *Oscar* was recognized by the F.C.C. as being an amateur station specially licensed for automatic transmission and was allotted the call-sign W6EE.

The thanks of all observers is cordially extended to those amateurs normally operating on and around the frequency of 145 Mc/s who, with very few exceptions, either shifted their frequency or refrained from transmitting during the time that *Oscar* was in orbit. Thanks are also due to D.S.I.R. and to Ray Flavell (G3LTP) for the predictions and corrections thereto which were made available so quickly to the Society and which featured in the GB2RS News Bulletins. It is understood that, owing to pressure of work in connection with other satellites, D.S.I.R. could not devote as much effort to *Oscar* as they would have liked, and much reliance had to be placed on the many observations made by Bill Browning (G2AOX) of Hendon who devoted so much time to this work. It is certainly a tribute to the accuracy of his reports that towards the end of the story the predicted times were running within seconds of the appearance of the satellite's signals.

Finally, the writer would like to express his personal thanks to the many observers who reported. In addition to those mentioned last month, these included G2DHV, G2DQ, G2NR, G3MTI, G4LX, G5OX, G8FW, G8ML, GM3DWK, GM6IZ, GW3MFY, B.R.S.23356, A.1919 and A.2524.

* *R.S.G.B. Project Oscar Co-ordinator, 24 Arundel Road, Tunbridge Wells, Kent.*

## WESTERN UNION
### CABLEGRAM

PCD044 0C276 0 RCA153 INTL
=WUX SAN C=RLOS CALIF 28/27 12
233P PST=
=LT RADIO SOCIETY GREAT BRITAIN=
NEW RUSKIN HOUSE
LITTLE RUSSELL ST LONDON
(ENGLAND VIA WUCBLS)=
OSCAR IN NORTH-SOUTH ORBIT 145
POINT 008 MEGACYCLES
LIFTOFF 2040 GREENWICH 12
DECEMBER=
OSCAR ASSOCIATION

This cablegram, received at Society Headquarters at 9.30 a.m. on Wednesday, December 13, 1961, records the firing of the very first amateur-built orbital satellite radio transmitter OSCAR, and records the entry of world-wide Amateur Radio into the new field of space communication. Mr. R. C. Hills (G3HRH), Chairman of the V.H.F. Committee, has had the original cablegram framed and has presented it to the Society.

# Mobile Column

**By C. R. PLANT (G5CP)***

THIS is the time of year when spring cleaning is upon us and the activities of our ladies might well impel us to " have a go " at our mobile installations. It will probably be found that quite a lot of dust and dirt has accumulated and there is also the possibility that wires have become broken or disconnected. The constant vibration to which a mobile installation is subjected can cause bolts to loosen and wires to fracture and a little time spent *now* in checking these points will pay dividends in successful, trouble-free operation in the months that lie ahead. It is a wise precaution to include spring washers on all securing bolts and to tighten down solidly on all anchor bolts.

At one of last year's rallies the premier prize for the best mobile installation was awarded on two points: the rigid fixing of the equipment and the use of a microphone slung round the neck. It is easy to imagine the damage that could take place if heavy equipment resting on the rear seat of a car was, due to a collision, hurled on to the heads of the driver or passenger in front; indeed, the result might well be fatal. It is a wise precaution to see that in the future all mobile equipment is firmly fixed so that accidents of this kind may be avoided.

### Operating News

An interesting letter has been received from G3BID (London, N.W.3), one of the few mobile operators to have W.A.C. on telephony. G3BID discusses the relative merits of voice control operation compared with his system of foot switching. He has installed a second " dip " switch in the floor of the car so that by a simple foot movement the send/receive function is controlled. This is a move in the right direction because by using this method both hands remain always on the steering wheel. G3BID objects to the use of a voice operated switch on the grounds that it might well be operated by extraneous noises such as passing traffic or other voices in the car. The writer agrees that this might well be embarrassing under certain circumstances particularly if the distaff side of the family was holding forth! The microphone used is made by Mobileers Inc. and is positioned immediately in front of the mouth by means of a head band similar to that used with headphones. This permits a low gain amplifier to be used but the advantage is probably outweighed by having to use a head attachment. G3BID asked the Hon. Secretary of A.R.M.S. to send us a copy of the December 1960 *Mobile News* in which G3KVF's mobile station is fully described and we are indebted to G3FPK for his courtesy in so doing.

G5DW (Ashcott, Somerset.) reports he is at present building his fourth mobile outfit. G5DW, who operates only on 144 Mc/s says the new receiver will be completely transistorized and will include the newly released Brush ceramic transfilters for the i.f. portion and v.h.f. alloy transistors in the converter section. A further interesting experiment will be the fitting of a slot aerial mounted inside the car close to the rear window. The radiation pattern will be vertical of course in contrast to the widely used halo aerial which is horizontally polarised.

G2DCI (Sutton Coldfield, Warks.) has written to tell of an amusing incident which occurred last year when he visited Harwell. It was the day of a 144 Mc/s contest and finding a suitable position overlooking the surrounding countryside he erected a slot and reflectors and commenced transmitting. The " foreign sounding " amateur language led a well-meaning member of the public to report the matter to the local police but before they arrived on the scene G2DCI had packed up his gear and departed. There was a sequel about a month later when the local C.I.D. called to verify that G2DCI was near Harwell on the date in question and that he was licensed to operate from his car; the required proof was quickly given and the investigation closed.

G2MI (Bromley, Kent) who operates mobile from his Vauxhall Velox on Top Band only, says that he was determined to keep the equipment as inconspicuous as possible so that passenger comfort would not be affected. This was achieved by building the transmitter into a small cabinet, the line-up being Clapp v.f.o. (5763) driving a 2E26, modulated by a 12A6 driven by a 12SK7 and a crystal microphone. The receiver is a Pye Cruiser all-transistor set which also covers 3·5 Mc/s. The best contact on Top Band whilst on the move is about thirty miles on telephony; an interesting contact was with another mobile station passing through the Blackwall Tunnel; contrary to expectations a satisfactory signal was received—could the tunnel have acted as a rough and ready waveguide?


**Mobile Rallies will soon be in full swing again.**

### Mobile Rallies

Rally secretaries are asked to send details of their events to the writer in good time so that advance publicity may be given in *Mobile Column*. It will also be appreciated if a report of the rally immediately after it has taken place can be forwarded; this should include the names and call-signs of competition winners and any other interesting information. Photographs are also required.

### Can You Help?

BLIND Australian amateur Mr. William Schofield (VK6WS) of 11 Lapsley Road, Claremont, Western Australia, who seeks information on devices for tuning the final stage of his transmitter? He already possesses an American " Gimmic " consisting of a 9 volt battery, a diode and a transistor. Mr. Schofield who is 87 years of age uses a Panda Explorer transmitter with 807's in the final, a Mosley beam and a Geloso receiver. He is active on all the DX bands.

* *"Lynton," 12 Nottingham Drive, Wingerworth, Chesterfield, Derbyshire.*

# Society News

### The Society's Patron inaugurates new Tanganyika Amateur Radio Prefix

LOCAL radio amateurs were honoured when the Patron of the Radio Society of Great Britain—H.R.H. The Duke of Edinburgh K.G.—during his recent visit to Tanganyika, as the representative of Her Majesty The Queen at the Independence celebrations in Dar-es-Salaam, inaugurated the new prefix for that country by working VQ3GC on 14,300 kc/s using single sideband. This QSO occurred late in the evening of Independence Day, December 9, 1961. A special call-sign 5H3R was issued for the occasion and the station was set up in Government House with the approval of the Governor General.

After establishing contact with VQ3GC His Royal Highness exchanged reports and commented how lucky it was for c.w. operators in Tanganyika that the prefix 5H5 had not been assigned!

The station was operated manually by the Royal visitor and the contact was normal in every respect. Those present as "second operators" were VQ3PBD (now 5H3PBD), VQ3HH (now 5H3HH), VQ3HV (now 5H3HV) and VQ1TW.

The transmitter—a K.W. Electronics Viceroy—was loaned by VQ3HH, whilst the receiver—a Hammarlund

**Three of the second operators present during the Royal QSO**

HQ180 and the aerial array—a G4ZU Minibeam—belonged to VQ3FQ.

It had been hoped that during the Duke of Edinburgh's visit to the station a direct contact with the United Kingdom would be possible and the then President of the R.S.G.B. (Major-General E. S. Cole) had asked G8KS to participate in the preliminary tests and to standby for the contact at the arranged time of the visit. Unfortunately poor conditions prohibited this direct QSO and while a relay via VE7ZM was attempted this was only partly successful.

Tina Wright (VQ1TW), who is well known in East Africa as a keen c.w. operator, was responsible for the idea which led up to the Royal QSO.

Unfortunately there is no photographic record of His Royal Highness operating 5H3R but the accompanying photograph taken at the station shows three of the second operators and the equipment which was in use.

The foregoing information was supplied by Mr. Peter B. Dodd (5H3PBD, VQ1PBD, G3PBD).

### Nominations Invited for Vacant Office of Zone F Representative

MR. E. G. INGRAM (GM6IZ) having resigned from the office of Zone F Representative, nominations are invited to fill the casual vacancy. Any 10 Corporate Members resident in the Zone (Regions 12, 13, 14 and 15) may nominate any other duly qualified person resident in that Zone by delivering their nomination in writing in a single document to the Secretary, together with the written consent of such person to accept office if elected, but each such nominator shall be debarred from nominating any other person for this election.

Nomination papers must reach the Secretary by not later than 12 noon on March 15, 1962.

In the event of more than one duly qualified person being nominated for the vacancy a ballot will be conducted, details of which will be published in the April 1962 issue of the Society's Journal.

Zone F comprises Scotland and Northern Ireland.

### Committees of the Council 1962

THE following members have been invited to serve on the Committees of the Council for 1962:

**Contests.** *Council Member:* J. W. Swinnerton (G2YS). *Non-Council Members:* R. S. Biggs (G2FLG), D. A. Findlay (G3BZG), M. Harrington (B.R.S.20249), W. H. Matthews (G2CD), H. W. Rees (G3HWR), N. A. Ross (G3LAR), F. E. Woodhouse (G3DC).

**Exhibition.** *Council Members:* C. H. L. Edwards (G8TL), E. W. Yeomanson (G3IIR). *Non-Council Members:* Mrs. E. M. Edwards (B.R.S.22588), G. W. Norris (G3ICI), H. W. Rees (G3HWR), F. F. Ruth (G2BRH), C. Waterman (G3NKX), A. J. Worrall (G3IWA).

**Finance and Staff.** *Council Members:* N. Caws (G3BVG), E. S. Cole (G2EC); E. G. Ingram (GM6IZ), L. E. Newnham (G6NZ), P. H. Wade (G2BPJ), E. W. Yeomanson (G3IIR).

**G.P.O. Liaison.** *Council Members:* L. E. Newnham (G6NZ), A. O. Milne (G2MI), R. F. Stevens (G2BVN), J. W. Swinnerton (G2YS). *Non-Council Members:* H. A. M. Clark (G6OT), J. D. Kay (G3AAE).

**Golden Jubilee.** *Council Members:* N. Caws (G3BVG), E. S. Cole (G2EC), E. G. Ingram (GM6IZ). *Non-Council Members:* F. W. Fletcher (G2FUX), J. D. Kay (G3AAE).

**Membership and Representation Committee.** *Council Members:* F. K. Parker (G3FUR), F. A. Russell (G3BHS), P. H. Wade (G2BPJ), A. C. Williams (GW5VX), E. W. Yeomanson (G3IIR).

**Mobile.** *Council Members:* C. H. L. Edwards (G8TL), F. K. Parker (G3FUR), G. M. C. Stone (G3FZL), E. W. Yeomanson (G3IIR). *Non-Council Members:* J. M. Appleyard (G3JMA), G. C. Clark (G3NJL), Mrs. E. M. Edwards (B.R.S.22588), C. L. Fenton (G3ABB), H. Gates (G3KRU), N. O. Miller (G3MVV), C. L. Waterman (G3NKX).

**R.A.E.N.** *Council Members:* C. H. L. Edwards (G8TL), L. E. Newnham (G6NZ), E. W. Yeomanson (G3IIR). *Non-Council Members:* G. A. Allcock (G3ION), C. L. Fenton (G3ABB), A. C. Gee (G2UK), E. A. Matthews (G3FZW).

**Scientific Studies.** *Council Members:* R. C. Hills (G3HRH) G. M. C. Stone (G3FZL). *Non-Council Members:* W. H. Allen (G2UJ), R. Flavell (G3LTP), J. W. Mathews (G6LL), C. E. Newton (G2FKZ).

**Technical.** *Council Members:* R. C. Hills (G3HRH), R. F. Stevens (G2BVN), G. M. C. Stone (G3FZL). *Non-Council Members:* H. A. M. Clark (G6OT), D. N. Corfield (G5CD), G. C. Fox (G3AEX), G. R. Jessop (G6JP), J. W. Mathews (G6LL).

**TVI/BCI.** *Council Members:* J. W. Swinnerton (G2YS), E. W. Yeomanson (G3IIR).

**V.H.F.** *Council Members:* N. Caws (G3BVG), R. C. Hills (G3HRH), G. M. C. Stone (G3FZL). *Non-Council Members:* W. H. Allen (G2UJ), F. A. Griffiths (G3MED/T), F. E. A. Green (G3GMY), J. H. Hum (G5UM), F. G. Lambeth (G2AIW), A. L. Mynett (G3HBW).

**London Meeting**
**Friday, February 23, 1962**
**Presidential Address**
**"The Development of a Duplex Radio—Telephone System for Police Use"**
By E. G. Ingram, GM6IZ
**at the**
**Institution of Electrical Engineers, Savoy Place Victoria Embankment**
**Buffet Tea 6 p.m.** **Lecture 6.30 p m.**

### Business Reply Service

ON a number of occasions recently members have been found to be using the special Business Reply Service envelope enclosed with the September 1961 issue of the R.S.G.B. BULLETIN for purposes other than that for which it was intended—as a convenient method of making a donation to the Headquarters Fund.

The envelopes have been used for routine correspondence with Headquarters as well as for remitting subscriptions and orders for Society publications.

Members may not have realized that the Society is required to pay postage on each Business Reply Service envelope delivered to Headquarters.

### Obsolete Society Publications for disposal to Local Groups

HEADQUARTERS has for disposal free a limited quantity of the Sixth Edition of *A Guide to Amateur Radio* published in 1957 and a few copies of the 1960 edition of the *R.S.G.B. Amateur Radio Call Book*.

T.R.s and A.S.R.s who may be able to find a use for these obsolete publications are invited to write to Headquarters stating the quantities they are willing to accept. In order to offset office expenses, it would help if those who write for any of these publications would include 2/- to cover the cost of postage and packing.

### Posting Certificate

ALL copies of the January 1962 issue of the R.S.G.B. BULLETIN were posted on Monday, January 18, 1962, and the Society holds a certificate to that effect from the Hitchin, Herts, Postmaster.

### Harry Wilson (EI2W) re-elected President of I.R.T.S.

AT the Annual General Meeting of the Irish Radio Transmitters' Society held at the Ormond Hotel, Dublin on January 27, 1962, Mr. Harry Wilson (EI2W) was elected President for the second year in succession. There was an attendance of 84 at the banquet which followed the meeting.

During the evening Mr. Wilson presented the Michael Collins (EI3N) Memorial Trophy to Mr. J. B. Campbell (EI4B) who this year celebrates his Golden Jubilee as a licensed amateur (1912-1962). Mr. Campbell was interviewed prior to the dinner by Irish Television and pictures taken on that occasion were screened during the evening. Those present thus had the unique experience of seeing Mr. Campbell in two places at the same time.

Mr. Wilson who has been I.R.T.S. V.H.F. Manager for many years has resigned from that office and his place has been taken by Mr. Shane MacNamee (EI2A).

### Jean Wolff (LX1JW) Honoured

OLD friends of Jean Wolff (LX1JW) of Golf, Luxembourg, will be pleased to learn that he was recently elected President of the Federation of Telecommunication Engineers of the European Common Market. Mr. Wolff who represented the amateurs of Luxembourg at the last three I.A.R.U. Region 1 Conferences is Engineer-in-Chief of the Technical Division of the Luxembourg Posts, Telegraphs and Telephones.

### Amateur Radio Station at Centenary Gala

KYNOCH Works, Birmingham, which is the Headquarters and main factory of the Metals Division of Imperial Chemical Industries Limited, will celebrate its centenary during 1962.

A special Centenary Gala will be held at the works on Saturday, June 2 and an amateur station, G3HPP, will be one of the many features set up for the occasion. The station will be installed and operated by members of the Kynoch, Slade and Sutton Coldfield Radio Societies and other local amateurs including G3AIX, G3DNZ and G3ICX. It is hoped to operate on all bands and contacts will be welcome, particularly with stations operated by employees of the Company.

All QSOs will be confirmed by special card designed for the occasion.

## CONTESTS DIARY

February 16-18 - A.R.R.L. DX Contest (c.w.)
February 24-25 - First 1·8 Mc/s Contest (see page 360, January 1962)
February 24-25 - CQ 160m. Contest (c.w.) (see page 344, January 1962)
February 24-25 - R.E.F. Contest (c.w.)
March 2-4 - A.R.R.L. DX Contest (Telephony) (see page 360, January 1962)
March 3-4 - 144 Mc/s Open Contest (see page 360, January 1962)
Listeners' V.H.F. Receiving Contest (see page 360, January 1962)
March 10-11 - B.E.R.U. Contests (for rules see pages 306 and 307, December 1961)
March 10-11 - YL/OM Contest (c.w.) (see page 344, January 1962)
March 16-18 - A.R.R.L. DX Contest (c.w.) (see page 360, January 1962)
March 24-25 - CQ WW S.S.B. Contest (see page 394)

| | | |
|---|---|---|
| April 7—8 | — | Low Power Contest. |
| April 7—8 | — | International Millenium SP Contest (c.w.). |
| April 14—15 | — | International Millenium SP Contest (Telephony). |
| April 14—15 | — | R.E.F. Contest (Telephony). |
| April 15 | — | D/F Qualifying Event. |
| April 28—29 | — | V.E.R.O.N. PACC (c.w.). |
| April 29 | — | First 420 Mc/s Contest. |
| April 29 | — | D/F Qualifying Event (Birmingham). |
| May 5—6 | — | V.E.R.O.N. PACC (Telephony). |
| May 5—6 | — | U.S.S.R. DX Contest. |
| May 6 | — | First 144 Mc/s Field Day. * |
| May 13 | — | D/F Qualifying Event. |
| May 27 | — | D/F Qualifying Event. |
| June 2—3 | — | National Field Day. (see page 359) |
| June 16—17 | — | 70 Mc/s Contest. |
| June 24 | — | D/F Qualifying Event. 1250 Mc/s Tests. |
| July 7—8 | — | Second 420 Mc/s Contest. * |
| July 15 | — | D/F Qualifying Event. |
| July 22 | — | Second 144 Mc/s Field Day. |
| September 1—2 | — | Region 1 I.A.R.U. V.H.F. Contest. |
| September 9 | — | D/F National Final. |
| September 16 | — | Low Power Field Day. |
| October 7 | — | R.A.E.N. Rally. |
| October 27—28 | — | R.S.G.B. 7 Mc/s DX Contest. |
| November 10—11 | — | Second 1·8 Mc/s Contest. |
| December 1—2 | — | R.S.G.B. 21/28 Mc/s Telephony Contests. |

**To coincide with I.A.R.U. Region 1 V.H.F. Contest dates.*

## Headquarters Fund—List No. 5

THE following is the fifth list of those who had contributed to the Headquarters Fund up to January 31, 1962.

W. L. Hitchings (G3HWL), Hans-Erland Larsson (SM7COS), A. Mallinder (G3JUY), D. G. Burge (B.R.S.23200), Mrs. D. O. Aburrow, M. B. Aburrow (G3KWE), W. A. Mills (GW3LJP), D. A. J. Stenhouse-Simpson (A.2899), C. H. Bennett (B.R.S.21943), J. W. Hayes (GW3FPH), R. H. Newland (G3VW), G. J. McGee (G3MDM), A. Mercer (GM3EGU), M. T. Bland (B.R.S.24640), R. Grant (B.R.S.23203), Ainsdale Radio Club, J. L. Koenreich (OD5CL), P. Bowles (G3ECM), W. H. Moore (G3CUC), J. J. Wilcox (A.2207), P. B. Gaunt (B.R.S.22477), C. H. Bullivant (G3DIC), R. C. Pine (A.2919), H. M. Hague (A.2249), F. C. Beadle (G3KLI), D. P. L. May (G2BB), H. G. Collin (G2DQ), C. H. N. Elliott (B.R.S.15699), W/Cdr. A. P. Morgan (G8DV), R. A. Hargreaves (G3OHH), D. C. Symonds (B.R.S.23387), R. Hicklin (G3LWA), R. Eldridge (B.R.S.24654), L. J. Halford (G3ILH), H. W. Daly (G2VZ), N. F. Burton (ex-VS9ANB), R. P. Cole (G6RC), R. Jones (GW3JI), J. Swanson (W5PM), A. D. Naylor (G3GHI), Royal Air Force Amateur Radio Society (G8FC), E. G. Nurse (G5NR), E. Gaukrodger (G6GU), C. M. Harding (A.2568), B. W. Henderson (B.R.S.21739), D. W. Smith, T. I. Mitchell (A.2952), Umar Din (B.C.R.S.1105), R. G. Timms (G3JUC), J. C. Smith (A.2576), F. G. England (GM3GCM), Enfield R.S.G.B. Group, B. Taylor (B.C.R.S.1083), J. R. Gazeley (B.R.S.20533), S. D. Ward (G3HBM), A. C. Bryant (B.R.S.3999), G. S. Samways (G6OH), G. S. Garrett (G3IJW), R. Mason (A.2878), A. J. W. Rozelaar (B.R.S.4590), R. E. P. Spencer (A.2674), F. S. Peacock (MP4BDC), W. W. Turner (B.R.S.23028), C. H. Chorley (G5YH). **Total amount contributed to date £1,236 1s. 8d.**

## Wireless World Diaries

HEADQUARTERS has for disposal a very small quantity of the 1962 Wireless World Diary. These are now offered at 2/6 each, post free.

## QRA Locator Maps

COPIES of the British Isles QRA Locator Maps are now available from Headquarters, price 2/6 post paid.

## Pirates Fined

ON December 18, 1961, at Bishop Auckland Magistrates' Court, James Mahaffey of 36 Bridge Street, Bishop Auckland, Co. Durham, pleaded guilty to a charge of using wireless telegraphy apparatus without the necessary licence. He was fined £25 and ordered to pay £5 5s. advocate's fees.

At Skipton Magistrates' Court on January 26, 1962, Howard Aspinall of Raikeswood Crescent, Skipton, was fined £15 for using a radio transmitter without a licence and was ordered to pay £10 costs.

At Nottingham Magistrates' Court on January 22, 1962, Robin Kenneth Todd of 146 Hungerhill Road, Nottingham, pleaded guilty to using wireless telegraphy equipment without the necessary licence. He was fined £10, ordered to pay £2 2s. advocate's fee and to forfeit the apparatus.

## Appeals for Rare Drugs

MEMBERS are reminded that the policy of the British Red Cross Society is not to accept requests for rare drugs from individual radio amateurs even when such requests are passed on to them via the police authorities. The British Red Cross Society recommend that when a United Kingdom amateur is asked by a foreign amateur to accept a message for a rare drug he should advise the sender to contact his National Red Cross Society.

Only requests from, or through, National Red Cross Societies, can be dealt with by the British Red Cross Society and any drugs obtained would be sent to the National Red Cross Society concerned.

## Stolen from K.W. Electronics Ltd.

ON February 5, 1962, a Hammarlund HQ110 receiver, serial No. 8026, was stolen from K.W. Electronics Ltd., Vanguard Works, 1 Heath Street, Dartford, Kent. Any information regarding this equipment should be sent to the Managing Director, Mr. R. G. Shears (G8KW).

## R.S.G.B. QSL Bureau Sub-Managers

THE following is a list of the R.S.G.B. QSL Bureau Sub-Managers showing the call-sign groups for which they are responsible:

| | |
|---|---|
| **G2 and DL2 calls:** | **G. Verrill (G3IEC), 10 Seahorse Street, Gosport, Hants. (Certificates Manager.)** |
| **G3, 4 and 5 two-letter calls & GC** | **E. G. Allen (G3DRN), 65a Melbury Gardens, London, S.W.20.** |
| **G6 and G8 calls:** | **A. J. Mathews (G6QM), 62 Ashlands Road, Hesters Way Estate, Cheltenham.** |
| **G3AAA-BZZ:** | **C. C. Olley (G3AIZ), 157 Wanstead Park Road, Ilford, Essex.** |
| **G3CAA-DZZ:** | **C. A. Bradbury (B.R.S. 1066), 13 Salisbury Avenue, Cheltenham.** |
| **G3EAA-HZZ:** | **W. J. Green (G3FBA), 790 Rochester Way, Sidcup, Kent.** |
| **G3IAA-KZZ, B.R.S. and A numbers** | **T. D. J. Miles (G3NXR), 7 Hampden Road, Wantage, Berks.** |
| **G3LAA-MZZ:** | **C. Harrington (B.R.S. 2292), 91 Brabazon Road, Hounslow, Middlesex.** |
| **G3NAA-NZZ:** | **C. R. Emary (G5GH), 133 Fairlands Road, Thornton Heath, Surrey.** |
| **G3OAA-PZZ:** | **F. Ellesmere (G3LGP), 244 Portland Street, Southport, Lancashire.** |
| **GD calls:** | **T. R. Moore (GD3ENK), "Glyn Moar," St. John's, Isle of Man.** |
| **GI calls:** | **W. H. Martin (GI5HV), "Swallow Lodge," Greenisland, Co. Antrim, Northern Ireland.** |
| **GM calls:** | **D. Macadie (GM6MD), 154 Kingsacre Road, Glasgow, S.4.** |
| **GW calls:** | **J. L. Reid (GW3ANU), 28 Waterston Road, Gabalfa, Cardiff.** |

Envelopes for the *collection* of cards may be sent direct to the Sub-Manager concerned or to the QSL Manager (Mr. A. O. Milne). **Outgoing cards should NOT be sent to the Sub-Manager** unless they are in the call-sign group for which he holds envelopes. For example, the holder of a G3J-call may send cards for calls in the series G3IAA-G3KZZ to his own Sub-Manager, together with envelopes for the collection of cards, but he should not send to him cards in any other call-sign series. Sending cards for general distribution to the Sub-Managers only involves the cards in delay and the Society in needless expense.

Mr. Milne's address is 29 Kechill Gardens, Bromley, Kent.

# Silent Keys

### Mr. W. N. HALL (B.R.S.17479)

Heartfelt sympathies are extended to Mr. W. S. Hall (G2AOL) of Meopham, Kent, who recently lost his mother and father (Mr W. N. Hall, B.R.S.17479) within a period of three days. Mr. Hall Senior derived much happiness from Amateur Radio in a quiet way. He was a keen listener and always proud when he was able to report to his son that he had heard a new prefix.

G2AOL frequently operated /A from his father's home, a fact which gave Mr. Hall Senior much pleasure.

Mr. Hall had been a member of the Society since August 1948.

### MR. CECIL SYMONDS (G5OV)

His many friends, particularly in the Cambridge and Huntingdon areas, will be very grieved to hear of the passing, on January 24, 1962, of Mr. Cecil Symonds (G5OV) of Over, Cambs. Cecil became ill while on a visit to his son in Malaya some three or four years ago, and had steadily declined in health since then.

He was a great believer in "do-it-yourself," and all his very efficient gear was of his own design and making. Always using very low power and a series of rhombics, he consistently maintained his contacts with friends living in the Far East, even when conditions appeared to be quite hopeless.

Above all he was a man whom everyone liked and respected. To his widow and son John we extend our very sincere sympathy.

S. J. G.

### Mr. A. H. WILSON (G2WN)

It is our sad duty to record the death, on December 24, 1961, at the age of 78, of Mr. Albert H. Wilson (G2WN) at his home in Fenton after a long illness. His amateur activities commenced in 1908 in co-operation with the late G3VG. G2WN was a founder member of the Stoke-on-Trent Amateur Radio Society. By profession he was a watchmaker, and his home-built station was a masterpiece of fine construction. He served as a radio operator during both world wars.

To his two sons and four daughters, the members of the Stoke-on-Trent Amateur Radio Society and of the Stoke-on-Trent R.S.G.B. Group offer their deepest sympathy.

V.J.R.

# Council Proceedings

*Résumé of the Minutes of the Proceedings at a Meeting of the Council of the Radio Society of Great Britain, held at New Ruskin House, Little Russell Street, London, W.C.1, on Friday, December 15, 1961, at 6 p.m.*

*Present:* The President (Major-General E. S. Cole in the Chair), Messrs. N. Caws, C. H. L. Edwards, K. E. S. Ellis, R. C. Hills, E. G. Ingram, J. D. Kay, A. O. Milne, L. E. Newnham, F. A. Russell, P. H. Wade, A. C. Williams, E. W. Yeomanson (Members of the Council) and John Clarricoats (General Secretary).

*Apologies.* Apologies for absence were submitted from Mr. F. K. Parker, Mr. G. M. C. Stone and Dr. Smith-Rose.

* * *

*The Radio Amateur's Reference Book*

It was agreed to invite Mr. G. R. Jessop (G6JP) to proceed with the preparation of the manuscript of a new Society publication to be called *The Radio Amateur's Reference Book*.

*The Amateur Radio Handbook*

Due to very heavy demands for the *Handbook*, it was agreed to place an order immediately for a reprinting of 5,000 copies.

*Testgear Components (London) Ltd.*

It was reported that members were still experiencing difficulty due to the inability of Testgear Components (London) Ltd. to supply from stock certain crystals which had been advertised in recent issues of the R.S.G.B. BULLETIN.

It was agreed that a member of the Council should call on the firm to discuss the difficulties which had arisen.

*Marconi 60th Anniversary Celebrations*

The President reported upon the final arrangements which were made by the Cornwall R.S.G.B. Group and the Cornwall Radio and Television Club in connection with the Marconi 60th Anniversary celebrations. The B.B.C. sound and television services had covered the formalities on December 12, 1961, and useful publicity had accrued to the Society.

*Headquarters Fund*

It was reported that £1,118.2.5 had been donated to date.

*Regional Representatives Conference*

The Secretary submitted a comprehensive Report of the Regional Representatives Conference held on November 18, 1961.

It was agreed to defer full consideration of the Report until the January 1962 meeting, when attention would then be given specifically to those points which require the attention of the Council.

*Membership*

*Resolved* (i) to elect 155 Corporate Members and 58 Associates; (ii) to grant Corporate membership to 14 Associates who had applied for transfer.

*Applications for Affiliation*

*Resolved* to grant affiliation to the Basingstoke Amateur Radio Club and the Kirkwall and District Amateur Radio Club.

*Supplementary Report of the Council*

*Resolved* that a Supplementary Report of the Council be read to the members present at the Annual General Meeting on December 16, 1961, and that the Report be published in the January 1962 issue of the R.S.G.B. BULLETIN.

*Council Election 1962*

The Secretary reported that in the ballot for the office of President, Mr. E. G. Ingram polled 838 votes and Mr. H. A. Bartlett 831 votes. The scrutineers had, however, drawn attention to the fact that if seven ballot papers which had been signed were counted as valid Mr Bartlett would have polled an equal number of votes to the number of votes polled by Mr. Ingram. The Secretary stated that neither the Society's Articles of Association nor the ballot paper itself indicate that a Council ballot is to be secret nor is any indication given that a ballot paper which is signed will be disqualified.

The President stated that the Society's legal advisers had considered the point referred to by the Secretary and had advised that the seven papers are valid and that the votes should be counted.

The President referred to Article 62, which places the onus upon the Chairman at an A.G.M. to give a casting vote if an equality of votes has been reported.

*Resolved* (by six votes to five) that the seven voting papers which had been signed should be accepted and that the seven votes recorded thereon should be added to the total of 831 standing in the name of Mr. H. A. Bartlett.

*QSL Bureau*

Mr. Milne in his capacity as R.S.G.B. QSL Manager submitted a Report covering the work of the Bureau during 1961.

*Resolved* (i) to place on record the thanks of the Council to Mr. Milne for his continued services to the Society as QSL Manager; (ii) to receive the Report prepared by Mr. Milne; (iii) to authorize payment of honoraria to a total sum of £89.5.0 to 12 Sub-Managers.

*Christmas Boxes*

*Resolved* to make Christmas gifts in kind to the members of the staff.

*Call Book*

*Resolved* to make a gift in kind to Miss Gadsden in appreciation of her services to the Society in connection with the preparation of material for the last four editions of the *R.S.G.B. Amateur Radio Call Book*.

*R.S.G.B. Bulletin*

*Resolved* to inform the Technical Committee and to advise the Editorial staff that it is proposed not to publish regular 64 page issues of the R.S.G.B. BULLETIN until January 1963.

*Reports of Committees*

The Minutes of meetings of the following Committees were submitted as Reports:

| | |
|---|---|
| Scientific Studies Committee | November 13, 1961 |
| V.H.F. Committee | November 27, 1961 |
| Exhibition Committee | December 1, 1961 |

*Resolved* to receive the Reports and the Recommendations contained therein.

* * *

*Retiring President and Members of Council*

Mr. Wade on behalf of his colleagues proposed that the thanks of the Council should be recorded to the President for the excellent manner in which he had conducted the affairs of the Society during the year now ending. The proposal was duly seconded and it was *Resolved* accordingly.

Mr. Hills, on behalf of his colleagues, proposed that the thanks of the Council should be recorded to Messrs. K. E. S. Ellis and J. D. Kay, who would be retiring from the Council at the end of the year. Both had served the Society well and their presence at Council meetings would be missed. The proposal was duly seconded and it was *Resolved* accordingly.

*The meeting terminated at 10 p.m.*

## Receipts

RECEIPTS for subscriptions paid by cheque, bankers' order or postal order are not now issued unless specially requested. Receipts are drawn, however, and kept on file at Headquarters for six months.

## 5 Ack R Trophies

MEMBERS are reminded that the contest for the 5 Ack R Trophies (Junior and Senior) is open to all resident in the East London District. This is an annual event for the piece of Amateur Radio equipment judged to be best in the two sections. Entry forms may be obtained from the T.R.s or from the District Secretary, A. J. Reynolds (G3NNK), 107 Brian Road, Chadwell Heath, Essex. The closing date for entries is March 31, 1962 and should be sent to the D.R., M. A. C. McBrayne (G3KGU), 25 Purlieu Way, Theydon Bois, Essex.

## GB2RS SCHEDULE

**R.S.G.B. News Bulletins are transmitted on Sundays in accordance with the following schedule:**

| Frequency | Time | Location of Station |
|---|---|---|
| 3600 kc/s | 9.30 a.m. | South East England |
| | 10 a.m. | Severn Area |
| | 10.30 a.m. | North Midlands |
| | 11 a.m. | North East England |
| | 11.30 a.m. | South West Scotland |
| | 12.00 | North East Scotland |
| 145·55 Mc/s | 11.15 a.m. | Beaming south-east from Leeds |
| | 11.30 a.m. | Beaming south-west from Leeds |
| | 11.45 a.m. | Beaming north from Leeds |
| 145·3—145·4 Mc/s | 12 noon | Beaming north from South East England |
| | 12.15 p.m. | Beaming west from South East England |

**News items for inclusion in the bulletins should reach Headquarters not later than first post on the Thursday preceding transmission. Reports from Affiliated Societies and from non-affiliated societies in process of formation will be welcome.**

# Letters to the Editor . . .

Neither the Editor nor the Council of the Radio Society of Great Britain can accept responsibility for views expressed by correspondents. Letters for inclusion in this feature should be concise and preferably not more than 200 words in length.

### Praise for the Handbook

DEAR SIR,—I am taking the opportunity of writing to congratulate John Rouse and his team on the very excellent *Amateur Radio Handbook*. It is without doubt the finest and most useful book available to the amateur today. I am sure it will be of use to both the old timer and the newcomer.

I was too young when the Second Edition was available, so I cannot compare it with the present edition and I have had to make do with the American counterparts since I started up in Amateur Radio. Although the basic principles are the same the world over, in actual practice Amateur Radio in this country differs in many ways from that in, say, the U.S.A., and this is where the *R.S.G.B. Handbook* scores. Articles I have had to search for through years of back numbers of the BULLETIN, I now have at my fingertips. Although the *Handbook* is by no means a series of BULLETIN article reprints, it contains just the ones that are of most interest and practical use to the amateur. The price, by present day standards, is really very modest and the book is excellent value for money; I shall have no hesitation in recommending it to all my amateur friends.

The only small complaint, and it is a very small one, is that it was not available for sale on the R.S.G.B. stand at the Radio Hobbies Exhibition, because I am sure thousands of copies would have been sold to members and non-members alike. Congratulations on a very fine job to all concerned.

Yours faithfully,
BRYAN HAYES (G3JBU)

Northampton.

### Headquarters Fund

DEAR SIR,—While accepting and supporting the ideas in our President's September message, I strongly disagree with some of Mr. Childs' views. The membership as a whole should not provide club facilities for those who reside near H.Q.

Lecture meetings, etc., should be organized and above all financed by local groups to their requirements.

Location of H.Q. should be on a good public transport route from the centre of London.

Cater for cars, but do not treat as unwanted, members who have neither their own, nor the use of their employer's cars.

A suitable property might well be a better investment for accumulated funds, than those now held.

I am more concerned with running costs than the purchase price. There should be no real difficulty if we all respond to the appeal and accumulated funds are used to the extent of a first mortgage.

Wishing the project all success.

Yours sincerely,
S. W. MALIN (B.R.S. 3520)

Wallasey, Cheshire.

### The Importance of Frequency Modulation

DEAR SIR,—Is it generally realized that frequency modulation is the one modulation system which allows the receiving end to increase the effective modulation of a signal? We amateurs are permitted a deviation of 2·5 kc/s; on 14 Mc/s this represents a change of 0·018 per cent of the carrier frequency for maximum amplitude of modulation. If one changes the received signal frequency to, say, 50 kc/s, then the 2·5 kc/s represents a deviation of 5 per cent of carrier frequency. A typical v.h.f. f.m. broadcast receiver having an i.f. of 10·7 Mc/s, receiving broadcasts with 75 kc/s deviation, is working on a deviation representing 0·7 per cent of the carrier frequency. The amateur who converts the output of his 465 kc/s i.f. to 50 kc/s is thus much better off from the point of view of efficiency than the man using his broadcast receiver, and moreover the amateur will be using narrow band i.f. couplings with excellent selectivity and gain, which are denied the broadcast receiver.

The one difficult component is the discriminator coil. A wideband discriminator following a narrow band i.f. is useless. The response slope should be such that the linear part just covers the plus and minus 2·5 kc/s deviation and no more. Using modern Ferroxcube such a discriminator can easily be made to give outputs of more than 30 volts peak-to-peak without amplification, for all signals above the threshold of the limiter. The Travis type amplitude discriminator is probably the easiest to make and adjust for this service.

The whole secret of using n.b.f.m. lies in the receiver. Judging by the way the amateur fraternity has taken up s.s.b., in spite of its complexity and controversial advantages, I am continually surprised that so little interest is shown in the far simpler n.b.f.m., whose advantages are well known and fully exploited by commercial telegraphy stations using frequency shift keying. Possibly the system has got a bad name because people *will* try to receive it by detuning receivers designed for detection of amplitude modulation to one side of the pass band, thus throwing away all the advantages of f.m., and, incidentally, using a non-linear detecting device.

Yours faithfully,
Newport Pagnell, Bucks. N. H. SEDGWICK (G8WV)

### The 80 metre "Magic Circle"

DEAR SIR,—Single sideband operation in the 80 metre band in the United Kingdom seems to have become a "closed shop" and as difficult to get into as the Magic Circle. It is very hard to identify anyone as few stations seem to use call-signs, or put out a CQ call (I believe VE3BWY has previously made comments in the BULLETIN on this point). Even when identified many stations seem reluctant to indulge in a QSO with anyone not a member of their particular "Magic Circle."

Last winter I operated from both the Irish Republic and Germany on 80 metre s.s.b., and was continually "cold-shouldered" by British s.s.b. stations. I know from the few contacts I did have with G stations that I was putting in a good signal, but few G's apparently want to talk to DJ's or EI's, and I felt like a social outcast. Calling CQ in German or French brought in many replies, but many a "CQ G" went unanswered.

This winter I have been operating from various countries around the Middle East using efficient aerial systems and inputs of up to 2 kW. p.e.p., but although I can hear many G's at strengths of up to S9 plus, I still cannot work them, even with a rare call-sign. Europeans by the score answer my calls, but G's are very few and far between.

I have encountered another group of 80 metre s.s.b. operators in G-land recently, they are the so-called "DX gang." Unfortunately DX as far as they are concerned is the United States, and they appear to spend their entire time listening above 3800 kc/s, without ever checking their own channel for calls from operators, such as myself, who are just as far away as the East Coast of the U.S.A., and I should have thought, just as much DX.

In closing I would like to ask all 80 metre s.s.b. operators in the United Kingdom to be a bit more sociable to newcomers, and to listen carefully on their own channel for calls from distant stations outside of the U.S.A.

Yours faithfully,
Beirut, Lebanon. BRYAN A. BISLEY
(EI5AI, EP2BG, MP4BDA, MP4DAC, MP4MAB, MP4QAO, MP4TAE, VQ4IO, ZC4BB, G3OFI, etc).

### The Joys of S.S.B. Reception

DEAR SIR,—Having just returned to Amateur Radio after an absence of several years, I am now sampling for the first time the "joys" of s.s.b. reception. Although I am only using a normal communication receiver, a short article in a contemporary journal on tuning s.s.b. has enabled me to resolve what sounded most like "Bill and Ben, the Flower Pot Men" before their voices broke, into something that is quite readable. And I must say that listening to the various conversations and "nets" has taught me more radio in a few hours than all the a.m. did in months.

But, who are these voices that give out all this knowledge? I have just listened to "Dick and Don" and one or two other voices, which chipped in from time to time, for just short of two hours, when I had to switch off—and not once in the whole period did I hear a call-sign, or station identification. Are they the secret society boys, or have I to add another stage to my receiver which will tell me who I am listening to?

Yours truly,
Larkhall, Lanarkshire. ERIC A. LOMAX (B.R.S.1579)

### Exhibition Aftermath

DEAR SIR,—The Council must have been sorely tempted to allow the sale of the *Amateur Radio Handbook* at the Radio Hobbies Exhibition instead of honouring pre-publication orders by members who took advantage of the offer. No one need envy the Council their task in reaching a decision in a delicate situation.

My own copy reached me on the Saturday prior to the opening of the Exhibition, so I quite expected to see a brisk business in sales of the *Handbook* there. I was on duty at one of the other stands on the first two days, and it was pitiable to see the atmosphere of disappointment the absence of the *Handbook* created. This made me feel that I (and perhaps many others), would gladly have waited a little while for my ordered copy in order that the Society should not suffer the severe financial loss that must have been incurred by not having the book on sale at the Exhibition. A great pity, and surely a bitter disappointment for all who had tried so hard to make this publication available at the right time. (Not to worry—the first printing of 5,000 has been sold and orders are piling up for a reprinting—due to appear next month —Ed.)

Might I also suggest that if the next Radio Hobbies Exhibition is held at the Royal Horticultural Hall, the R.S.G.B. stand is located in the main body of the Hall in a more prominent position instead of being tucked away in one of the two wings? The general artificial lighting of the Hall is not exactly dazzling, and the Society stand was positively dismal. The R.S.G.B. stand should, surely, be the centre-piece of the Exhibition, lighted and dressed as befits its importance.

Finally, I wonder who regards radio amateurs as fabulously and filthily rich and able to afford the fantastic prices charged in the buffet? Each year the prices seem to go up and up; this last time, tea and " wads " for oneself and a few friends cost almost a small fortune, necessitating having one's pocket's bulging with folding money or having enormous holes burned in the small-change side. Presumably none who visit the Exhibition use it as an excuse for a bender, so why should they be rendered utterly and completely broke by being abstemious!

Yours sincerely,

St. Leonards-on-Sea, Sussex. W. E. THOMPSON (G3MQT).

### Alterations to WBCN Award

DEAR SIR,—Since the Republic of South Africa came into being on May 31, 1961, the advisability of the South African Radio League sponsoring the " Worked British Commonwealth of Nations " certificate has been discussed by the Council of the South African Radio League.

It has been decided that awards will be issued for contacts fulfilling the conditions made before May 31, 1962, as this date has been decided upon by the United Kingdom and South African Governments for implementation of the agreement for official purposes.

It should be noted that awards will be issued after that date for contacts made before May 31, 1962, and all QSL cards forwarded must clearly state the date of the contact.

Yours faithfully,

L. P. GERTENBACH (2S1HW).
*Awards Manager*

### Council Elections

DEAR SIR,—I note with considerable interest the drawn result of the poll for President. For the first time I was eligible to vote at this election, but I knew nothing about either candidate other than the printed summary. So I used the usual method adopted by pools fans. I used a dart instead of a pin and dropped it on to the ballot paper, so picking my candidate. The trouble is, I cannot now remember which name it chose—but certainly a different wobble as I let go would have altered the result, even if only to confirm the new President without a casting vote.

Seriously, though, can anyone suggest a better method when nothing is known about candidates? A non-return only results in accusations of apathy!

Yours faithfully,

Wraysbury, Middx. DAVID J. CROSBY (B.R.S. 23221).

# Forthcoming Events

**Details for inclusion in this feature should be sent to the appropriate Regional Representatives by the 18th of the month preceding publication. T R.s and club secretaries are reminded that the information submitted must include the date, time and venue of the meeting and, whenever possible, details of the lecture or other event being arranged. Regional Representatives are requested to set out the copy, preferably typed double spaced, in the style used below Standing instructions for more than three months ahead cannot be accepted.**

## DATES FOR YOUR DIARY

**February 23.**—Presidential Address.
**March 23.**—London Lecture Meeting (V.H.F. Symposium).
**April 29.**—North Midlands Mobile Rally.
**May 6.**—South Eastern Counties Mobile Rally.
**June 17.**—Longleat Mobile Rally.
**June 24.**—Bridlington Mobile Rally and Hamfest.
**June 24.**—A.R.M.S. Rally at Barford St. John.
**July 8.**—South Shields Mobile Rally.
**August 19.**—Derby Mobile Rally.
**September 8—**B.A.T.C. Amateur Television Convention, Conway Hall, London, W.C.1.
**September 16.**—Lincoln Hamfest and Mobile Rally.
**October 20-21.**—Jamboree-on-the-Air.

### REGION 1

**Ainsdale (A.R.C.).**—Wednesdays, 8 p.m., 37 Hawthorne Grove, Southport.
**Blackburn.**—Fridays, 8 p.m., West View Hotel, Revidge Road.
**Blackpool (B. & F.A.R.S.).**—Tuesdays, 8 p.m., Squires Gate Holiday Camp.
**Bury (B.R.S.).**—February 13 (Talk by Harry Whalley, G2HW), March 13 (Quiz, Bury Radio Society v. Eccles Radio Society), 8 p.m., Knowsley Hotel, Kay Gardens.
**Chester.**—Tuesdays, 8 p.m., Y.M.C.A.
**Liverpool (L. & D.A.R.S.).**—Tuesdays, 8 p.m., Gladstone Mission Hall, Queens Drive, Stoneycroft.
**Macclesfield.**—February 20, March 6, 20, 42 Jordongate.
**Manchester (M. & D.A.R.S.).**—Wednesdays, 7.30 p.m., King George VI Club, North Road, Moston, Manchester, 10. **(S.M.R.C.).**—Fridays, 7.30 p.m., Fallowfield Bowling and Lawn Tennis Club, 81 Wellington Road, Fallowfield, Manchester, 14.
**Morecambe.**—March 7, 125 Regent Road.
**Preston (P.A.R.S.).**—February 27, March 13, 27, 7.30 p.m. (all meetings include Morse practice commencing 7.30 p.m.), St. Paul's School, Pole Street.
**Southport (S.R.S.).**—Thursdays, 8 p.m., The Esplanade.
**Stockport (S.R.S.).**—February 28, March 14, 28, 8 p.m., The Blossoms Hotel, Buxton Road.
**Wirral (W.A.R.S.).**—February 21 (Film Show), March 7 ("Transistor D.F. Receiver," by G3EGX), March 21 (Constructional Contest), 7.45 p.m., 15 Balls Road, Claughton, Birkenhead.

### REGION 2

**Barnsley (B. & D.A.R.C.).**—February 23 ("High Frequency Crystal Filters" by H. H. Eyre, G5KM), March 9 (Junk Sale), 7.30 p.m., King George Hotel, Peel Street.
**Bradford.**—February 27 (Display of Members' Gear), March 13 ("Audio Amplifier Design and Construction" by P. J. Barowitz, G3LZW), 7.30 p.m., 66 Little Horton Lane.
**Halifax (Northern Heights).**—February 21 ("Interlaken Holiday" by G6BX), March 7 (Informal), Sportsman Inn, Ogden.

### REGION 3

**Birmingham (M.A.R.S.).**—February 20, 7.30 p.m. ("Eddystone Receivers" by a representative of Stratton and Co. Ltd.), March 20 (Film: "Visit to Moscow" by G. J. R. Ellison), Midland Institute, Paradise Street. **(Slade).**—February 23 (Sale of Surplus Equipment), March 23 (Film Show), 7.45 p.m., The Church House, High Street Erdington. March 9, Mullard Film Meeting, Bennett Hall, Y.M.C.A., Snow Hill. **(South).**—February 15, March 15, 7.30 p.m., Friend's Institute, Moseley Road, Birmingham.
**Coventry and District.**—February 21 ("U.H.F. and S.H.F. Links" by B. Wilson), March 21 ("V.H.F. Communications" by D. Drybrough), 7.30 p.m., Main Lecture Room, Training Centre, G.E.C. Telephone Works, Stoke, Coventry. **(C.A.R.S.)** February 19 (Station Description by G2LU), February 26 (R.A.E. Question Night), 7.30 p.m., R.A.F.A. Club, Holyhead Road, Coventry.
**Stourbridge.**—March 6 (A.G.M. and Film Show), 7.45 p.m., Foley College, Hagley Road, Stourbridge.
**Wolverhampton.**—February 26 ("V.H.F./U.H.F. Aerials" by G3HAZ), March 12 (Home Constructed Equipment Competition), 8 p.m., Neachells Cottage, Stockwell End, Tettenhall.

### REGION 4

**Derby (D. & D.A.R.S.).**—February 17 (Annual Dinner & Dance), February 21 (Open Night), February 28 (Film Show), March 7 (Surplus Sale), March 14 (Talk on Timber), 7.30 p.m., Room No. 4, 119 Green Lane, Derby.
**Grantham (G. & D.A.R.S.).**—Mondays, 7.30 p.m., Club Rooms (rear of Manners Arms Hotel), London Road, Grantham.
**Grimsby (A.R.S.).**—Alternate Thursdays, 8 p.m., R.A.F.A. Headquarters, Abbey Drive West, Grimsby.
**Leicester (L.R.S.).**—Mondays, 7.30 p.m., Club Rooms, Old Hall Farm, Braunstone Lane, Leicester.
**Lincoln (L.S.W.C.).**—Fortnightly, Wednesdays, 7.30 p.m., Lincoln Technical College, Cathedral Street, Lincoln.
**Melton Mowbray (M.M.A.R.S.).**—March 1 (Any Questions?), March 29 (Radio Control of Models, by D. Hoff, G3AWM). 7.30 p.m., St. John Ambulance Hall, Asfordby Hill, Melton Mowbray, Leicester.
**Nottingham (A.R.C.N.).**—Tuesdays and Thursdays, 7.30 p.m., Community Centre, Woodthorpe House, Mansfield Road, Sherwood, Nottingham.
**Northampton (N.S.W.C.).**—Thursdays, 7 p.m., Allen's Pram Works, 8 Duke Street, Northampton.
**Peterborough (A.R.S.).**—March 2 ("Aerials"), April 6 ("Interference Suppression"), 7.15 p.m., Technical College, Eastfield Road.
**Retford & Worksop (N.N.A.R.S.).**—Tuesdays (Beginners), Thursdays (Club), March 1 (Radio and Television Interference, by F. C. Ward, G2CVV), 7.30 p.m., Club Rooms, Victoria Institute, Eastgate, Worksop.

### REGION 5

**Cambridge (C. & D.A.R.C.).**—Alternate Fridays, 7.30 p.m., Club H.Q., Corporation Yard, Victoria Road.
**March (M. & D.R.A.S.).**—Tuesdays, 7.30 p.m., Police Headquarters.
**Shefford (S. & D.A.R.S.).**—Thursdays, 7.30 p.m., Digswell House, Shefford.

### REGION 6

**Cheltenham.**—First Thursday in each month, 8 p.m., Great Western Hotel, Clarence Street.
**High Wycombe (Chiltern A.R.C.).**—February 22 (Recorded lecture on "Musique Concrete"), 8 p.m., British Legion Hall, St. Mary Street.
**Wolverton (W.D.R.C.).**—First Friday in each month, 7.30 p.m., Science and Arts Institute, Church Street.

**LONDON MEMBERS' LUNCHEON CLUB**

**will meet at the Bedford Corner Hotel, Bayley Street, Tottenham Court Road,**

**at 12.30 p.m. on Friday, February 16, March 16 and April 13, 1962.**

**Telephone table reservations to HOL 7373 prior to day of luncheon. Visiting amateurs especially welcome.**

### REGION 7

**Acton, Brentford and Chiswick (A., B. and C.R.C.).**—February 20 ("Transistorized Communication Receiver" by A. Mynett, G3HBW), 7.30 p.m., A.E.U. Rooms, 66 High Road, Chiswick.
**Barnet (B.R.C.).**—February 27 ("Transistor Radio Components," by Mr. May), March 27 ("Receivers," by G2UJ), April 24 ("Modes of Transmission," by G3BWQ), 8 p.m., Red Lion Hotel, High Street, Barnet.
**Bexleyheath (N.K.R.S.).**—February 22, March 8, March 22 (Dr. A. C. Gee, G2UK, on "RTTY"), 8 p.m., Congregational Hall, nr. Clock Tower, Bexleyheath.
**Ealing.**—Sundays, 11 a.m., A.B.C. Restaurant, Ealing Broadway, W.5.
**East Ham.**—Tuesdays, fortnightly, 8 p.m., Leigh Road, East Ham.
**East London District.**—March 11 ("S.S.B." by G. Brown, G5BJ), 2.30 p.m., Lambourne Rooms, Ilford Town Hall.
**Edgware & Hendon (E. & D.R.S.).**—Second and fourth Mondays in each month, 8 p.m., John Keeble Hall, Church Close, Deans Lane, Edgware.
**Enfield.**—February 22 ("Power Supplies" by John Worrall, G3IWA), March 22 ("Quartz Crystals," by S.T. & C. Ltd.), 7.30 p.m., George Spicer School, Southbury Road, Enfield.
**Harlow.**—Tuesdays, 7.30 p.m., rear of G3ERN (G. E. Read), High Street, Harlow.
**Holloway (G.R.S.).**—Mondays, Tuesdays and Wednesdays (R.A.E. and Morse), 7 p.m., Friday (Club), 7.30 p.m., Montem School, Hornsey Road, Holloway, N.7.
**Ilford.**—Thursdays, 8 p.m., 579 High Road, Ilford (nr. Seven Kings Station).
**Kingston.**—Lectures alternate Thursdays, Theory and Morse Classes weekly, 7.45 p.m., Y.M.C.A. Eden Street, Kingston (Morse at 2, Sunray Avenue, Tolworth).
**Mitcham (M. & D.R.S.).**—Lectures alternate Fridays, 8 p.m., Morse classes, 7 p.m., "The Cannons", Madeira Road, Mitcham. February 23—A.G.M.
**New Cross (C.A.R.S.).**—Fridays, 7.30 p.m., Sundays, 11.30 a.m., Wednesdays (Morse Practice), 8 p.m., 225 New Cross Road, S.E.14.
**Paddington (P. & D.A.R.S.).**—Wednesdays, 7.30 p.m., Beauchamp Lodge, 2 Warwick Crescent, W.2.
**Romford (R. & D.R.S.).**—Tuesdays, 8.15 p.m., R.A.F.A. House, 18 Carlton Road, Romford.
**Science Museum (C.S.R.S.).**—February 20, (Recorded Lecture on "Aerials" by F. Charman, G6CJ), March 6 ("Silicon and Selenium Rectifiers," by S.T. & C. Ltd.), 6 p.m., Science Museum, South Kensington.
**Southgate and District.**—March 8 ("Interference," by a representative of Belling and Lee Ltd.), 8 p.m., Arnos School, Wilmer Way, N.14.
**Sutton and Cheam (S. & C.R.S.).**—Every third Tuesday, The Harrow, High Street, Cheam.

### REGION 8

**Crawley (C.A.R.C.).**—February 24, Annual Dinner at "The Apple Tree," West Green. February 28 ("Miniature Aerial Demonstration," by F. J. Charman, B.E.M., G6CJ), 8 p.m., West Green Centre. March 14—informal, for details contact G3FRV.
**Tunbridge Wells (W.K.A.R.S.).**—February 23 (Audio Night), March 9 (N.F.D. Planning), March 23 (Film Show), 7.30 p.m., Culverden House, Culverden Park Road. February 28, visit to Crawley Radio Society; cars leave Assembly Hall, Tunbridge Wells, at 7 p.m.

### REGION 9

**Bath.**—March 12, 7.30 p.m., Committee Room, Bath Technical College, Lower Borough Walls, Bath.
**Bideford.**—First Thursday in each month, 7.30 p.m., alternately at T. G. Ward (G2FKO), 38

Clovelly Road (phone Bideford 964), and D. H. Jones (G3BO), Rosebank, Westcombe (phone Bideford 550).

**Bristol.**—March 16, 7.15 p.m., Carwardines Restaurant, Baldwin Street, Bristol 1.

**Dorchester (S.D.R.S.).**—First Friday in each month, 7.30 p.m., alternately at the Labour Rooms, West Walks, Dorchester, and the Waverley Hotel, Westham, Weymouth. March meeting at Dorchester.

**Exeter.**—First Tuesday in each month, 7.30 p.m., Y.M.C.A., St. David's Hill, Exeter.

**Falmouth (C.R. & T.C.).**—First Wednesday in each month, Y.M.C.A., Falmouth.

**Plymouth (P.R.C.).**—Tuesdays, 7.30 p.m., Virginia House Settlement, St. Andrews Cross, Plymouth.

**Torquay.**—March 11, 7.30 p.m. (" Mobile Working "), Y.M.C.A., The Castle, Torquay.

**Torquay (Y.A.R.C.).**—Wednesdays, 7.30 p.m., Grove House, Preston Road, Yeovil.

**Weston-super-Mare.**—First Tuesday in each month, 7.15 p.m., Technical College, Lower Church Road, Weston-super-Mare.

### REGION 10

**Cardiff.**—March 12. (Quiz), 7.30 p.m., T.A. Centre, Park Street, Cardiff.

**Penarth.**—Last Monday in each month, 7.30 p.m., R.A.F.A. Club, Windsor Road, Penarth.

### REGION 14

**Ayrshire.**—Third Sunday in each month, 7.30 p.m., Royal Hotel, Prestwick.

**Falkirk.**—Last Thursday in each month, 7.30 p.m., Comely Park School, Falkirk.

**Motherwell.**—Third Friday in each month, 7.30 p.m., Carfin Hall, Motherwell.

### REGION 16

**Chelmsford.**—First Tuesday in each month, 7.30 p.m., Marconi College, Arbour Lane.

### REGION 17

**Portsmouth.**—Wednesdays, 7.30 p.m., Room 3, The Community Centre, Twyford Avenue.

**Southampton.**—March 10 (" V.H.F. Beacon Transmitters," by G. M. C. Stone, G3FZL), 7 p.m., Engineering Lecture Theatre, Lanchester Building, University of Southampton, University Road, Southampton.

# Regional and Club News

**Bristol.**—There was an attendance of 47 members and visitors at the January meeting when the G5FS Memorial Trophy was presented to Richard Prior (G3MTG) for the best lecture in 1961. A most interesting talk on crystal filters was given by P. K. Wall of Standard Telephones and Cables Ltd. The Group will next meet on February 16—see *Forthcoming Events.*

**Cambridge and District Amateur Radio Club.**—The club headquarters at the Corporation Yard, Victoria Road, Cambridge, is now open for members' use each evening (Sunday excepted) at 7.30 p.m. when a committee member is in attendance. The premises have ample parking space, a club-room, and a " shack " with workshop facilities. The club call-sign is G3PKF. University or other visiting amateurs are particularly welcome.

**Coventry and District.**—A short series of lectures will be given by representatives of The General Electric Co. Ltd., on February 21 (" U.H.F. and S.H.F. Radio Links "), March 21 (" V.H.F. Communications ") and April 18 (" Micro-miniaturization "). Accommodation is limited and those wishing to attend should contact the *Town Representative:* John L. Boyce (B.R.S.19512), 73 Maida Vale Crescent, Coventry.

**Crawley Amateur Radio Club.**—At the A.G.M. the following were elected: *Chairman:* J. C. Graham (G3TR); *Hon. Treasurer:* J. A. Parsons (B.R.S.22560); *Hon. Secretary:* R. G. B. Vaughan (G3FRV), 9 Hawkins Road, Tilgate, Crawley; *Committee Members:* A. J. Gibbs (G3PHG), M. J. Underhill (G3LHZ) and R. F. Fautley (G3ASG). Membership showed a healthy increase during the year. The Annual Dinner is arranged for February 24, while on February 28 F. J. Charman, B.E.M. (G6CJ), will present his well-known aerial demonstrations. Visitors will be most welcome at both these events, and may obtain further details from the Hon. Secretary.

**M. A. Niman (G3LGN) demonstrates his transistor D/F receiver to another enthusiast at a recent meeting of the Northern Heights Amateur Radio Society.**

*(Photo by Ben Wade)*

**East London.**—Members attending the monthly meetings at Ilford Town Hall are enjoying an excellent series of talks. In January, J. T. Brown of Aveley Electric Ltd., lectured on " Power Transistors " to a most enthusiastic audience. *District Representatives:* M. McBrayne, 25 Purlieu Way, Theydon Bois, Essex.

**Farnborough Technical College Radio Society.**—Classes in preparation for the R.A.E. and Morse Test are held on Monday and Wednesday evenings at the college. The society is licensed with the call-sign G3POW. Details of the regular meetings may be obtained from the *Chairman:* Dr. D. M. Manley (G3OWF), 8 Abbotswood, Guildford, Surrey.

**Manchester and District Amateur Radio Society.**—Since the society was re-organized in 1959, membership has risen from about 20 to more than 100. At the recent A.G.M. the following were elected: *Chairman:* M. Niman (G3LGN); *Hon. Treasurer:* F. Collinge (G3LGC); *Hon. Secretary:* A. B. Langfield, 2 Rowland Street, Moston, Manchester 10; *Committee Members:* G. C. Eyres (G8OJ), V. Mee (G3PJK), A. D. Camp (G3MYR); W. Mason, D. Bradshaw, S. Webb and S. Andrew. The Constructors' Competition was judged by I. D. Auchterlonie (G6OM) and E. G. Houldsworth (G6NM). First in the adult section was G3PJK with his G2DAF-type receiver, second G3MYR with a sub-miniature Top Band mobile transmitter and third G8OJ with a high pass filter. H. Tyreman came first in the junior section with a metal detector, followed by B. Jackson (square wave oscillator) and N. Smith (multimeter). Meetings are held at the King George VI Club, Moston, on Wednesdays at 7.30 p.m.

**March and District Radio Amateur Society.**—The lecture and demonstration by Ian Waters (G3KKD/T), which had been arranged for January 2, had to be postponed owing to the very severe weather and will now take place in April or May, on a date to be announced later. A 64 element array is being erected at the headquarters. The society will soon be in a position to have its own transmitting equipment on the air with the call-sign G3PMH.

**Northern Heights Amateur Radio Society.**—Recent events have included a well-attended dinner. Meetings at the Sportsman Inn, Ogden, have been arranged for 7.45 p.m. on February 21 (" Interlaken Holiday," by G6BX, illustrated with slides), March 7 (Informal), and March 21 (" Mobile Gear " by G3GJV). *Hon. Secretary:* A. Robinson (G3MDW), Candy Cabin, Ogden, Halifax.

**North Notts Amateur Radio Society.**—There was an attendance of 41 at the very successful Annual Dinner held at the Golden Ball Hotel, Worksop, in December. Forthcoming arrangements include participation in the local Rotary Club's Hobbies Exhibition. Plans include a 150 watt h.f. transmitter, a Top Band station and RTTY operation. Among the exhibits will be a vintage spark transmitter which is in working order. The *Hon. Secretary* (E. W. Badger, G3OZN, 20 Tennyson Drive, Worksop) will be pleased to hear from other clubs with a view to exchange visits and lectures.

**Paddington and District Radio Society.**—At the first A.G.M. held last month, the President, D. S. Jewiss, reported on the progress during the year, mentioning particularly participation in the

Little Venice Festival and the *Short Wave Magazine* Contest and the monthly newsletter *Keyklix*. The Beauchamp Lodge Award was presented by the Chairman, Bill Bailin, to Messrs. L. Hogan and R. Wood in recognition of their outstanding services to the society. The following were elected to the Committee for the year 1962/63: *President:* D. S. Jewiss; *Chairman:* J. E. Alban (G3JEA); *Vice-Chairman:* S. Acton; *Hon. Treasurer:* S. W. Legg (G3KNL); *Hon. Secretary:* N. A. Lambert (G3LVK), 2 Warwick Crescent, Paddington, London, W.2; *Committee Members:* A. E. Court, L. A. Kippin (G8PL) and E. W. Holt (G3MHQ).

**Purley and District Amateur Radio Club.**—An exhibition of members' home-constructed equipment will be held at the Railwaymen's Hall, Whytecliffe Road, Purley, on March 16 commencing at 8 p.m. Prizes will be awarded for the best equipment in each class. Visitors will be most welcome and are asked to note that access to the Hall is by the side entrance. Meetings are held on the first and third Friday in each month. *Hon. Secretary:* E. R. Honeywood (G3GKF), 105 Whytecliffe Road, Purley.

**Reigate Amateur Transmitting Society.**—At the third A.G.M. in January, it was reported that the membership had risen to 35, 17 of whom hold call-signs. The following were elected for the year 1962: *Chairman:* J. Duckworth (G3FM); *Hon Treasurer:* G. E. Mac'Krell (G3KAX); *Hon Secretary:* F. D. Thom (G3NKT), 12 Willow Road, Redhill; *Contests Secretary:* D. Thom (G3NKS); *Committee Members:* P. D. Lucas (G3JDN), P. Seaman and R. Wells; *Hon. Auditor:* R. Eldridge. At the meeting at The Tower, Redhill, on February 17 at 7.30 p.m., G3GVV will talk about some unusual radio gear and the Army Emergency Reserve. On March 17, G3FRV will lecture on "Mobile Operation."

**Rhondda Valley Radio Society.**—The first year since the society was reformed has recently been completed, a highly successful year of activity which included many visits, two field day events, discussions and practical work. Meetings are held on Thursday evenings commencing at 7.30 p.m. A dinner is being arranged for March 1 and further information is available from the *Hon. Secretary:* A. Chapman, Royal Hotel, Trealaw, Rhondda.

**South Dorset Radio Society.** The society has recently become affiliated to the R.S.G.B. Next meeting, March 2, at Labour Rooms, West Walks, Dorchester. *Hon. Secretary:* C. E. Biggs (G2TZ), 54 Prince of Wales Road, Dorchester, Dorset.

**Southampton.**—Tickets for the Annual Dinner and Social to be held at the Cotswold Hotel, on February 17, at 7.30 p.m., may be obtained, price 21s. each, from P. A. L. Shoosmith (G3MDH), 7 Fairfield Close, Hythe. At the meeting on March 10, G. M. C. Stone (G3FZL) will be the speaker.

**Southend and District Radio Society.**—At the A.G.M. in January the following were elected: *President:* J. E. Clark; *Vice-Presidents:* E. K. Cole, C.B.E., A. W. Martin, M.B.E., W. J. B. Fitch; *Chairman*—G. C. Collop (G3AXN); *Vice-Chairman*—J. L. Goss (G3ILG); *Hon Treasurer:* E. H. Bridges; *Hon. Secretary*—Mrs. P. M. C. Collop, 53 Beedell Avenue, Westcliffe-on-Sea; *Ass. Hon. Secretary*—J. R. Crellin (G3LYX); *Hon. Technical Adviser*—A. C. Wadsworth (G3NPF); *Committee:* A. Parks (G3NFZ), H. Trunley and J. R. Whybrow. The society has been in existence for 41 years and two Founder Members were present at the A.G.M. Meetings are held fortnightly and the future programme includes the Pocock and Hudson Cup competitions for home-constructed equipment. Visits have been arranged to places of interest and it is hoped to organize several lectures and a social function during the year. New members, whether licensed or short-wave listeners, are welcome and full details can be obtained from the Hon. Secretary.

**Spen Valley Amateur Radio Society.**—There was an attendance of 68 at the Annual Dinner held at the Park Cafe, Batley, on January 6, when the guest speaker was P. H. Wade (G2BPJ), R.S.G.B. Zone 2 Representative, accompanied by Mrs. Wade. The Swindon Cup was presented to G. A. Perrins (G3BFP). Meetings at the Gomersal Hill Top Infants School are arranged for February 28 ("More Aerial Problems" by G3IBN) and March 14 ("Radio Astronomy" by L. Dougherty) at 7.30 p.m.

**Stockport Radio Society.**—Activity continues at a high level, forthcoming arrangements include a lecture on computers by G3NUQ on February 28, the A.G.M. on March 14 and a talk entitled "Receiver Servicing" on March 28. Joel Weaving (G3OWW) has been elected chairman in succession to Albert Evans who has resigned owing to pressure of business. A c.w. section has been formed to foster interest in the art. *Hon. Secretary:* G. R. Phillips (G3FYE), 7 Germans Buildings, Buxton Road, Stockport.

**Thames Valley Amateur Radio Transmitters' Society.**—Despite snow and ice, the A.G.M. was held on January 6. The President Leslie Cooper (G5LC), reviewed another successful year during which there had been an excellent series of well-attended lectures. The Junior Section was progressing well. The future programme includes a number of outdoor events including one for mobile enthusiasts. Details of meetings at the Carnarvon Castle Hotel, Hampton Court, may be obtained from the *Hon. Secretary:* Ken Rogers (G3AIU), 21 Links Road, Epsom.

## County Representatives

THE following are additions to the list of County Representatives published in the December 1960 issue.

REGION 9 CORNWALL
J. N. WATSON (G3AET), 24 St. John's Terrace, Devoran, nr. Truro.

REGION 14—AYR, BUTE, DUMFRIES, KIRKCUDBRIGHT and WIGTOWN
D. TANNOCK (GM2BUD), 45 Sunnyside Crescent, Mauchline, Ayrshire.

FOR business reasons Mr. C. N. Chapman (G2HDR), has resigned as County Representative for Bristol. Nominations for his successor signed by five Corporate Members resident within the City and County of Bristol should be sent to reach Headquarters not later than March 24, 1962.

## Town Representatives

THE following are additions to the list of Town Representatives published in the December 1961 issue.

REGION 2—YORKSHIRE EAST
HULL
C. S. NORMAN (G3FCY), 30 Oldstead Avenue, Inglemire Lane.

REGION 3—STAFFORDSHIRE
STOKE-ON-TRENT
V. J. REYNOLDS (G3COY), 90 Princes Road, Hartshill.

REGION 4—DERBYSHIRE
DERBY
J. ANTHONY (G3KQF), 10 Manor Road, Borrowash.

NORTHAMPTONSHIRE
PETERBOROUGH
D. BYRNE (G3KPO), Jersey House, Eye.

REGION 7—LONDON NORTH
SOUTHGATE, FINCHLEY and DISTRICT GROUP
R. PEDDER (G3NEE), 6 Greenall Close, Cheshunt, Herts.

REGION 9—DEVONSHIRE
EXETER
P. M. E. PAVEY (G3NFT), 45 Mincing Lake Road, Stoke Hill.

REGION 14—AYRSHIRE
AYR
J. WILSON (GM3KJF), 3 Whitehill Crescent, Annbank Station.

The address of Mr. P. A. L. Shoosmith (G3MDH), Town Representative for Southampton, is now 7 Fairfield Close, Hythe, Southampton, and not 31 as published in the December 1961 issue.

## Affiliated Societies

THE following is an addition to the list of Affiliated Societies published in the August 1961 issue.

FARNBOROUGH TECHNICAL COLLEGE—c/o N. Anscombe, Hon. Secretary, Farnborough Technical College, Boundary Road, Farnborough, Hants.

The Hon. Secretary of the Lichfield Amateur Radio Society is now G. Seward (G3PBK), 51 Long Bridge Road, Lichfield, Staffs.

## Affiliated Society Representatives

THE following are additions to the list of Affiliated Societies Representatives published in the December 1961 issue.

AINSDALE RADIO CLUB
R. J. Woodroffe (G2DQX), 72 Burnely Road, Ainsdale, Southport, Lancs.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY
Bernard J. C. Brown (G3JFD), 196 Abbey Street, Derby.

NORTH KENT RADIO SOCIETY
C. J. Leal (G3ISX), 1 Deepdene Road, Welling, Kent.

STOKE-ON-TRENT AMATEUR RADIO SOCIETY
V. J. Reynolds (G3COY), 90 Princes Road, Hartshill, Stoke-on-Trent, Staffs.

STOURBRIDGE AND DISTRICT AMATEUR RADIO SOCIETY
F. A. Bills (G3CLG), 48 Church Avenue, Vicarage Road, Amblecote.

# CLASSIFIED ADVERTISEMENTS

**ADVERTISEMENT RATES. Members' Private Advertisements 3d.** per word, minimum charge **5s. Trade Advertisements 9d. per word,** minimum charge **12s.** All capitals **1s.** per word, minimum charge **18s.** Write clearly. No responsibility accepted for errors. Use of Box number **1s. 6d.** extra. Send copy to **Sawell & Sons Ltd., 4 Ludgate Circus, London, E.C.4.**

## SITUATIONS VACANT

BBC requires Engineers for its Planning and Installation Department. The work includes planning transmitter and/or aerial installations at L.F., H.F., V.H.F. and U.H.F. transmitting stations, liaison with equipment manufacturers during the design and production stages, and experimental investigations on new transmitting equipment and aerial systems for Television and Sound broadcasting. The posts are based in London with visits to sites as may be necessary. Applicants (British Subjects) who should state their preference for transmitter or aerial work, must be qualified Engineers and an engineering degree or equivalent qualification would be an added advantage. For the junior posts experience in transmitter or aerial design and installation is not essential, but applicants should be able to write clear reports and to use their initiative and technical knowledge. The posts are in two grades, and according to qualifications and experience, successful candidates will be appointed at a commencing salary between £1,230 p.a. and £1,540 p.a. in scales having a maximum salary of £1,555 p.a. and £1,780 p.a. Applicants with special technical qualifications and experience in supervising aerial and/or transmitter development would be considered for a post in a higher grade with a salary maximum of £2,225 p.a. Write for application form to Engineering Recruitment officer, Broadcasting House, London, W.1, quoting reference 62E.409RSGB.

**TEST ENGINEERS** required for varied and interesting work. Applications are invited from those with previous industrial experience of testing radio communications, receivers and transmitters; successful applicants will be offered permanent positions on the Company's staff. Excellent working conditions, pension scheme, 5 day week. Salaries commensurate with qualifications and experience. Apply in writing, giving full details to Personnel Officer, Redifon Ltd., Broomhill Road, Wandsworth, S.W.18.

**Electronic Wirers**

**Electronic Testers**

**Wiring Inspectors**

**These and many other interesting posts are available in this expanding company. Apply to: The Personnel Manager,**

**RANK CINTEL LIMITED**

**Worsley Bridge Road, Lower Sydenham, S.E.26**

The Company is situated next to Lower Sydenham Station. The 180 bus stops outside our entrance and many other bus routes are quite close.

**TESTERS**

Required for interesting work on L.F. and H.F. Transmitters. Previous fault finding experience essential. The positions available would be of special interest to persons employed in the fault finding and repair of television, who are keen to establish themselves in a position that offers:

★ SATISFYING EMPLOYMENT
★ 5 DAY WEEK
★ GOOD PROSPECTS OF ADVANCEMENT
★ STAFF STATUS
★ SICK PAY
★ GENEROUS SALARY

*Apply:*

**MULTITONE ELECTRIC CO. LTD.**

12-20 Underwood Street, London, N.1
(Close Old Street Underground Station)

## OFFICIAL APPOINTMENTS

**AIR MINISTRY** have vacancies for CIVILIAN RADIO TECHNICIANS at R.A.F. Sealand, Cheshire; R.A.F. Carlisle, and other R.A.F. stations throughout the United Kingdom, for the servicing, repair, modification and testing of air and ground radio and radar equipment. Commencing salary (National) (according to age) is £630 to £810 p.a., maximum salary £930 p.a. Rates are subject to small deduction at certain provincial stations. A limited number of houses may be available for renting at West Kirby, some 15 miles from Sealand. Apply to Air Ministry, C.E.3h, Princes House, Kingsway, London, W.C.2, or to any Employment Exchange, quoting City O/N 2427.

**MEDICAL RESEARCH COUNCIL** have a vacancy for a TECHNICIAN at the Rheumatism Research Unit, Canadian Red Cross Memorial Hospital, Taplow, nr. Maidenhead, to assist in the development of electrical and mechanical recording apparatus. A practical and theoretical knowledge of electronic and mechanical engineering is essential. Salary in the range £595 to £720 p.a. Applications stating age, qualifications and experience, with copies of three recent testimonials to the Hospital Secretary.

## PERSONAL

**QSL CARDS.** G.P.O. approved log books, cheapest, best, prompt delivery. Samples.—Atkinson Bros., Printers, Looe, Cornwall.

## WANTED

**WANTED FOR CASH.**—Good clean communication receivers and s.s.b. equipment. Please state price.—Short Wave (Hull) Radio, 30-32 Princes Avenue, Hull. (Telephone 18953.)

**WANTED.**—All types of communication receivers, test equipment, tape recorders, amplifiers, etc. Prompt cash payment.—Details to R.T. & I. Service, 254 Grove Green Road, Leytonstone, London, E.11. (LEYton 4986.)

**WANTED 811's OR 811A's.**—State quantity and price.—Sale—2 Transceivers No. 88, with valves and crystals, £1 5s. each.—GM3BQA, 19 Edinburgh Road, Cockenzie.

**AMATEUR** just returned from abroad would like to buy gear, especially AR88D and TVI proofed s.s.b. a.m. rig, also Avo or similar meter. Prices and details to—N. P. Henry, 19 High Ash Avenue, Alwoodley, Leeds 17.

**WANTED**—Teleprinter with keyboard. Tape, page or reperf; type. Working order not essential so long as the main " bits " are there.—G3FTI, " The Rosery," 7 Eltham Park Gardens, Eltham, S.E.9.

**URGENTLY WANTED.**—10m. coil for H.R.O. Going abroad. Please state price.—Benjamin (G3MNB), 21 Ridley Road, Forest Gate, E.7.

## WANTED (continued)

**ANY TYPE** of miniature or suitcase R/X or T/X used by the Polish, French, Dutch Resistance-Movements, such as types: A.1, 58/1, 51/1, etc., and handbooks, publications relating to same.—M. Gee, 11 Whitehorse Lane, Stepney, London, E.1.

## EXCHANGE

**" WIZARD "** Model-makers' Metal Turning Lathe, with ½ h.p. motor and three-speed drive, 12 cutting tools, Allen keys, 2¼ in. metal vice, 4 in. face plate, ¼ in. drill chuck; approximate measurements: length 12 in., traverse 8 in., spread 3 in.; 4-jaw chuck, 2 in. gap. Will exchange for HRO Senior, complete and in good condition.—W. Bassi, 24 Newport Road, Cardiff, Glam.

**EXCHANGE, SELL,** BC454B 3-6 Mc/s. 20s.; 19-set plus variometer 50s.; valves, components. Want ART-13 data, 22 set data. S.A.E. Buying, selling lists.—Mitchell, Congreave House, Aldermaston.

## FOR SALE—PRIVATE

**DX100U** fitted Heathkit modification for linear operation. Used very little since professionally built two months ago. Inspection invited, collection preferred. £75.—G3OPJ, 25 Morris Road, South Nutfield, Surrey. Telephone Nutfield Ridge 3334.

**MINIMITTER** transmitter factory-built, 120 watts am/cw, £60. AR88D receiver, S-meter, £45. Both first-class condition. Sell together at £95.—G3EIX, 6 Mildmays, Danbury, Chelmsford, Essex. Tel.: DANBURY 720.

**AR88D.**—Matching speaker, fitted 'S' meter, fitted minimitter Multi-Q manual and some spare valves. Good condition. Delivered up to 50 miles, £35, or near offer.—B. M. Crook, 23 Radley Road, Abingdon, Berks.

**JOHNSON VIKING INVADER.**—Mint condition, 200 watts s.s.b./c.w., 90 watts a.m., with autotransformer, £250.—G5RP, Old Gaol House, Abingdon, Berks. Telephone 380.

**AR88D.**—With speaker and handbook. Good condition. Delivered free, South Devon and Cornwall. £25.—4 Westbourne Terrace, Saltash, Cornwall.

**FIRST CLASS VHF** Receiver type 1392, unmodified and complete with 15 valves, 'S' meter, etc. Covers 95 to 150 Mc/s, £3 10s., carriage paid.—Beadle, 6 Chapel Cottages, Thearne, Nr. Beverley, Yorks.

**2 METRE** Nuvistor pre-amplifiers. Built-in p.s.u. Silver plated chassis. £5 o.n.o., also Nuvistor converter, built-in p.s.u., Xtal controlled. Silver plated chassis, I.F. 28-30 Mc/s. £8 10s. o.n.o. Deliver 50 miles immediately. G3OPX, 5 Weir Hall Gardens, Edmonton, London, N.18.

**CR 100** complete but unwired! Great opportunity to acquire this famous receiver; just needs wiring-up. Circuit and alignment instructions supplied. £10 or offers. Delivered 30 miles or collected from G3JMG, 23, Charnock Wood Road, Sheffield, 12. Tel. 396902.

**GEAR OF LATE JOHN PODD—G3OWT.** AR88D, £55; AR77E, £30; both excellent condition. HRO/MX with 8 coils and power pack, £15. Avo Valve Tester (two units) with manuals. Taylor Sig-genny. Wavemeter BC221, 6 ft. rack all of T1131 less P.A. and P.A. power—5 cwt., with photo's and diagrams. Also ZC1 TX/RX. Serious offers please for unpriced gear. All carriage extra. S.a.e. to W. E. Harris, G3DPH, 4 Glanville Place, Kesgrave, Ipswich.

**PROTOTYPE.** Author wishes dispose TX, July 1960 BULLETIN Crystal/mixer VFO, 14-21-28 Mc/s A1, 120 watts. QQVO6/40A P.A. superb performance and reliability. With P.S.U., £32 or £28 alone. Offers.—Gearing, 21 Rastall Avenue, London, S.W.2.

**GENUINE BARGAINS.**—Two RCA communication receivers AR88D, excellent condition and performance, £23 each, no offers. Buyers collect Croydon area.—Box No. X.7042, c/o R.S.G.B. BULLETIN, 4 Ludgate Circus, London, E.C.4.

**CUBICAL QUAD,** 3 band, new, unused, £12. Panadaptor 455 kc/s. spare 5AP1, £28. Prefer buyer collects. Box No. X.7043, c/o R.S.G.B. BULLETIN, 4 Ludgate Circus, London, E.C.4.

**Z.C.I. MK.I.** Modified top band, needs attention, £5 or exchange H.R.O. coils 10m, 40m, B.S.—G3MNB, 21 Ridley Road, E.7.

## FOR SALE—PRIVATE (continued)

**TIGER TR200.** 813 PA. Perfect condition. £70 o.n.o.—GM3LHV, 6 Clackmae Grove, Edinburgh, 9.

## FOR SALE—TRADE

**METALWORK.**—All types of cabinets, chassis, racks, etc., to your own specifications.—Philpott's Metalworks Ltd. (G4BI), Chapman Street, Loughborough.



## INDEX TO ADVERTISERS

Printed in Great Britain for the RADIO SOCIETY OF GREAT BRITAIN, New Ruskin House, Little Russell Street, London, W.C.1 by Loxley Brothers Limited, Letchworth, Hertfordshire

# THIS MONTH'S BARGAINS

## AERIAL EQUIPMENT

**TWIN FEEDER:** 300 ohm twin ribbon feeder, similar K25, 6d. per yard. K35B Telcon (round), 1/6 per yard. Postage 1/6 any length.

**COPPER WIRE:** 14G H/D 140 ft., 17/-; 70 ft., 8/6. Post and packing 2/-. Other lengths *pro rata*.

**RIBBED GLASS,** 3" aerial insulators, 1/9 each. P. & P. 1/6 up to 12.

**CERAMIC FEEDER SPREADERS,** 6" type F.S., 10d. each. P. & P. 2/- up to 12.

**CERAMIC "T" PIECES,** type A.T. for centre of dipoles, 1/6 each. P. & P. 1/-.

**2 METRE BEAM 5 ELEMENT W.S. YAGI.** Complete in box with 1" to 2¼" mast head bracket. **PRICE 49/-.** P. & P. 3/6.

**SUPER AERAXIAL CABLE.** 75 ohm, 300 watts, very low loss, 1/8 per yard. P. & P. 2/-. **50 ohm,** 300 watt coax, very low loss, 1/9 yd., P.& P. 2/-.

**TOUGH POLYTHENE LINE,** type MLI (100 lbs.), 2d. per yd. or 12/6 per 100 yds. Type ML2 (220 lbs.), 4d. per yd. or 25/- per 100 yds., post free. Ideal for Guys, L.W. Supports, Halyards, etc.

**NEW MOSLEY POWER BEAMS** *Write for details.*

# BAND CHECKER MONITOR

This new, sensitive, absorption wavemeter is fitted with a 0-500 microammeter and is also a most useful phone monitor. Covers 3·5 - 35 Mc/s. in 3 switched bands. **A "MUST" AT ONLY 3 Gns.**

**SCREENED MICROPHONE CABLE,** 1st grade, 9d. yard. Plus postage.

**12 CORE SCREENED CABLE** 2/- yard.

**10 CORE (5 PAIRS) SCREENED CABLE** 1/8 yard. All plus 1/6 P. and P.

**GELOSO V.F.O. UNITS Type 4/102** with new dial and escutcheon. Output on 80, 40, 20, 15 and 10 metres. For 2–807 or 6146 tubes. Only **£8 . 5 . 0.** Set of valves **24/-** post free.

**ABSORPTION WAVEMETERS:** 3·00 to 35·00 Mc/s in 3 Switched Bands, 3·5, 7, 14, 21 and 28 Mc/s Ham Bands, marked on scale. Complete with indicator bulb. **A MUST** for any Ham shack. **Only 22/6,** POST FREE.

**HEADPHONES DHR5B** (very sensitive) 2,000 ohms, **22/6.** P. & P. 1/6.

**NATIONAL HRO CRYSTAL FILTER UNITS,** 455 kc/s with crystal. Sel. and phasing controls. New boxed. Only 19/6. P. & P. 1/6.

**B.I. 8 μF**
1200 volt d.c. wkg. capacitors **12/6** each, postage and packing 2/-.

**RACK MOUNTING PANELS:** 19" × 5¼", 7", 8¾", or 10½", black crackle finish, **5/9, 6/6, 7/6, 9/-** respectively, postage and packing 2/-.

**VARIABLE CONDENSERS.** All brass with Ceramic end Plates and Ball Race Bearings, 50 pf, **5/9;** 100—**6/6;** 160—**7/6;** 240—**8/6;** and 300 pf, **9/6.** Extension for ganging. P. & P. 1/-.

★ *PLEASE PRINT YOUR NAME AND ADDRESS*

# CHAS. H. YOUNG LTD.

**DEPT. 'B', 110 DALE END, BIRMINGHAM 4**

*Telephone (all depts.) : Central 1635*

**Brand new, individually checked and guaranteed**

# VALVES

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AL60 .. | 6/- | EB34 .. | 1/6 | EF71 .. | 6/6 | PL81 .. | 9/- | VR99 .. | 8/- | 6AQ5 .. | 7/- | 6X5GT .. | 5/- | 77 .. | 6/- | 6120 .. | 4/- |
| AR8 .. | 5/- | EB91 .. | 3/9 | EF72 .. | 5/- | PL82 .. | 8/- | VR105/30 | 7/6 | 6AT6 .. | 5/- | 6Y6G .. | 6/- | 78 .. | 7/- | 7193 .. | 1/9 |
| ARDD5 .. | 2/- | EBC41 .. | 7/9 | EF83 .. | 10/- | PL83 .. | 10/- | VR150/30 | 7/3 | 6B7 .. | 5/6 | 6Z4 .. | 5/6 | 80 .. | 5/6 | 7475 .. | 3/- |
| ARP3 .. | 3/- | EBC90 .. | 5/- | EF85 .. | 6/6 | PL84 .. | 8/- | VT4C .. | 25/- | 6B8G .. | 2/6 | 7B7 .. | 7/6 | 81 .. | 9/- | 8013A .. | 25/- |
| ARP4 .. | 3/6 | EC52 .. | 8/- | EF86 .. | 7/- | PL500 .. | 10/- | VU39 .. | 6/- | 6C4 .. | 2/6 | 7H7 .. | 7/3 | 82 .. | 8/- | 8020 .. | 10/- |
| ARP12 .. | 2/9 | EC70 .. | 10/- | EF89 .. | 3/6 | PL504 .. | 12/6 | W21 .. | 7/- | 6C5 .. | 6/- | 7C6 .. | 7/- | 83V .. | 9/- | 9001 .. | 3/- |
| ARP21 .. | 5/6 | EC90 .. | 20/- | EF91 .. | 3/6 | PL505 .. | 15/- | X66 .. | 8/- | 6C6G .. | 3/- | 7C7 .. | 6/6 | 84 .. | 8/- | 9002 .. | 5/6 |
| ARP24 .. | 3/6 | ECC81 .. | 5/6 | EF92 .. | 3/- | PM2 .. | 6/- | Y63 .. | 5/- | 6C8G .. | 5/- | 7Q7 .. | 7/- | 85A1 .. | 9/- | 9003 .. | 6/- |
| ARP34 .. | 4/- | ECC82 .. | 6/6 | EL32 .. | 3/9 | PM2A .. | 6/9 | Y65 .. | 4/- | 6D6 .. | 4/- | 7V7 .. | 5/- | 85A3 .. | 15/- | 9004 .. | 2/6 |
| ARTH2 .. | 7/- | ECC83 .. | 7/- | EL33 .. | 8/- | PM12M .. | 7/- | Y66 .. | 8/- | 6F6G .. | 4/- | 7Y4 .. | 6/- | 89 .. | 6/- | 9006 .. | 2/6 |
| ATP4 .. | 2/9 | ECC84 .. | 7/- | EL34 .. | 6/- | PM22 .. | 8/- | Z31 .. | 6/- | 6F7 .. | 5/- | 7Z4 .. | 4/6 | 210VPT7-pin | 2/6 | Cathode Ray Tubes: | |
| ATP7 .. | 5/6 | ECC85 .. | 8/- | EL41 .. | 7/- | PM24M .. | 6/9 | 1A3 .. | 3/- | 6F8G .. | 5/- | 8D2 .. | 2/6 | 250TH .. | £9 | | |
| AU1 .. | 5/- | ECC91 .. | 4/- | EL42 .. | 8/- | PM26 .. | 7/3 | 1A5GT .. | 5/- | 6F12 .. | 4/6 | 9D2 .. | 3/- | 350B .. | 8/- | ACR1 .. | 15/- |
| AU4 .. | 5/- | ECF82 .. | 8/6 | EL84 .. | 7/- | PZ1-35 .. | 9/- | 1C5GT .. | 7/6 | 6F17 .. | 5/- | 12A6 .. | 2/6 | 353A .. | 15/- | CV1596(09J) | 55/- |
| AW3 .. | 4/- | ECH42 .. | 7/6 | EL91 .. | 4/6 | PZ30 .. | 6/9 | 1D8GT .. | 6/- | 6G6G .. | 2/6 | 12AH7 .. | 5/- | 705A .. | 15/- | O9D .. | 50/- |
| AZ31 .. | 8/- | ECH81 .. | 7/9 | EM80 .. | 8/- | PZ35 .. | 9/- | 1E7G .. | 7/6 | 6H6M .. | 1/6 | 12AT7 .. | 5/6 | 713B .. | 60/- | 3FP7 .. | 25/- |
| B84A .. | 5/6 | ECL80 .. | 8/- | EM84 .. | 9/- | QP21 .. | 6/- | 1G6GT .. | 6/- | 6J5 .. | 3/6 | 12AU6 .. | 9/- | 717A .. | 8/6 | 5BP1 .. | 35/- |
| BT45 .. | 15/- | ECL82 .. | 9/- | EM87 .. | 7/6 | QP25 .. | 5/3 | 1L4 .. | 3/6 | 6J6 .. | 4/3 | 12AU7 .. | 6/- | 801 .. | 6/- | 5CP1 .. | 42/6 |
| BT98 .. | 20/- | EF22 .. | 7/- | EY86 .. | 7/- | QS75/20 .. | 6/9 | 1LD5 .. | 5/- | 6J6 .. | 4/3 | 12AZ7 .. | 7/- | 803 .. | 22/6 | 5FP7 .. | 45/- |
| BT83 .. | 22/6 | EF36 .. | 3/6 | EY88 .. | 7/- | QS95/10 .. | 6/9 | 1R5 .. | 6/- | 6J7G .. | 5/- | 12C8 .. | 3/- | 804 .. | 55/- | 7BP7 .. | 40/- |
| CV54 .. | 5/- | EF37A .. | 8/- | EZ40 .. | 6/9 | QS108/45 | 6/9 | 1S5 .. | 5/9 | 6K6GT .. | 6/- | 12E1 .. | 22/6 | 805 .. | 30/- | 12DP7 .. | 60/- |
| CV264 .. | 20/- | EF39 .. | 4/- | EZ41 .. | 6/9 | QV04/7 .. | 12/6 | 1T4 .. | 4/- | 6K7G .. | 2/3 | 12H6 .. | 2/- | 807AMER | 6/- | VCRX258 (with | |
| CY31 .. | 7/6 | EF50 .. | 2/6 | EZ80 .. | 6/- | R10 .. | 12/6 | 1W4 .. | 6/- | 6K7GT .. | 4/9 | 12K7GT .. | 4/6 | 807BR .. | 6/- | scanningcoil) | 45/- |
| D41 .. | 3/3 | EF54 .. | 3/3 | EZ81 .. | 6/9 | R11 .. | 2/6 | 2A3 .. | 5/- | 6K8G .. | 5/9 | 12K8M .. | 7/6 | 808 .. | 8/- | VCR138 .. | 30/- |
| D77 .. | 4/3 | EF55 .. | 5/- | FW4/500 | 6/6 | R16 .. | 2/6 | 2A5 .. | 6/- | 6K8GT .. | 8/3 | 12J5GT .. | 3/6 | 813 .. | 60/- | VCR39A .. | 35/- |
| DA30 .. | 12/6 | EF73 .. | 6/- | GL6 .. | 6/- | RK34 .. | 2/6 | 2A6 .. | 7/- | 6K8M .. | 8/6 | 12Q7GT .. | 4/4 | 815 .. | 40/- | Photo Tubes: | |
| DAF70 .. | 35/- | EF80 .. | 5/6 | GL6GT .. | 6/- | RK35 .. | 10/- | 2C34 .. | 2/6 | 6L5G .. | 6/- | 12SA7 .. | 7/6 | 816 .. | 30/- | CMG8 .. | 9/- |
| DAF91 .. | 6/- | EF85 .. | 6/6 | GL8A .. | 6/- | RK60 .. | 6/6 | 2X2 .. | 4/- | 6L6 .. | 9/- | 12SC7 .. | 4/- | 826 .. | 10/- | GS16 .. | 12/6 |
| DAF96 .. | 7/6 | EF86 .. | 7/- | GL8B .. | 6/- | RL12P35 .. | 7/6 | 3A4 .. | 5/- | 6L6G .. | 6/6 | 12SG7 .. | 4/- | 829A .. | 30/- | Special Valves: | |
| DD41 .. | 4/- | EF89 .. | 7/9 | GL8C .. | 6/- | RL37 .. | 7/6 | 3B7 .. | 5/- | 6L7G .. | 4/6 | 12SH7 .. | 3/- | 832 .. | 15/- | 2J31 .. | 45/- |
| DET5 .. | 15/- | EF91 .. | 3/6 | GL8D .. | 6/- | RL84 .. | 8/- | 3B24 .. | 5/- | 6L34 .. | 4/6 | 12SJ7 .. | 5/- | 832A .. | 35/- | 3A/1481 .. | 45/- |
| DET19 .. | 3/6 | EF92 .. | 3/- | GL41 .. | 7/- | RM1 .. | 7/- | 3B28(829B) | 60/- | 6N7G .. | 5/9 | 12SK7 .. | 3/6 | 843 .. | 7/4 | 3J/170/E | £35 |
| DF22 .. | 7/- | EF95 .. | 5/- | GL42 .. | 8/- | RM2 .. | 6/- | 3Q4 .. | 6/- | 6N7GT .. | 6/- | 12SL7 .. | 7/- | 866A .. | 10/- | 3J192/E | £37/10 |
| DF39 .. | 4/- | EL32 .. | 3/9 | GL84 .. | 7/- | RM3 .. | 6/- | 3Q5GT .. | 9/- | 6Q7G .. | 6/- | 12SN7 .. | 8/- | 872A .. | 20/- | 4J31 .. | £35 |
| DF72 .. | 7/6 | EL33 .. | 8/- | GZ30 .. | 7/- | RM4 .. | 6/- | 3S4 .. | 5/- | 6R7 .. | 6/- | 12SR7 .. | 6/- | 930 .. | 8/- | 4J50 .. | £35 |
| DF91 .. | 3/3 | EL35 .. | 6/- | GZ32 .. | 9/- | RM4T .. | 6/- | 3V4 .. | 6/- | 6SA7 .. | 6/- | 15D2 .. | 6/- | 954 .. | 4/- | 5D21 .. | £3 |
| DF96 .. | 7/3 | EL41 .. | 8/- | GZ34 .. | 7/- | S2 .. | 4/- | 5T4 .. | 9/- | 6SC7G .. | 4/6 | 20A2 .. | 17/6 | 955 .. | 2/6 | 723A/B .. | 50/- |
| DK96 .. | 7/3 | EL42 .. | 8/- | HL23DD | 8/- | SP13C .. | 4/6 | 5U4G .. | 5/- | 6SC7GT .. | 5/- | 21B6 .. | 9/- | 956 .. | 2/- | 725A .. | 30/- |
| DL92 .. | 6/- | EL84 .. | 7/- | HL23DD/T | 8/- | SP41 .. | 2/6 | 5V4G .. | 8/- | 6SG7 .. | 5/- | 30 .. | 5/- | 957 .. | 5/- | 726A .. | 27/6 |
| DL94 .. | 6/- | EL85 .. | 10/- | HL23/DD | 8/- | SP61 .. | 2/- | 5Y3GT .. | 6/- | 6SH7 .. | 3/- | 35L6GT .. | 8/- | 958A .. | 5/- | ACT6 .. | 160/- |
| DL96 .. | 8/- | EL91 .. | 4/6 | HVR2 .. | 12/6 | SP2 .. | 4/- | 5Z4 .. | 8/6 | 6SJ7 .. | 5/6 | 35T .. | 17/6 | 1616 .. | 3/- | ACT9 .. | £12/10 |
| EA50 .. | 1/6 | EM80 .. | 8/- | HVR2A .. | 12/6 | SP41 .. | 2/6 | 5Z4G .. | 8/- | 6SJ7G .. | 5/9 | 35Z4GT .. | 7/- | 1619 .. | 5/- | CV193 .. | 30/- |
| EABC80 | 7/3 | EM84 .. | 9/- | HYS2 .. | 6/- | SP61 .. | 2/- | 6AB7 .. | 4/- | 6SJ7Y .. | 6/6 | 37 .. | 4/- | 1623 .. | 6/- | CV980 .. | 3/- |
| EAC91 .. | 4/6 | EN31 .. | 15/- | KT2 .. | 8/- | SP2150A | 4/9 | 6AC7 .. | 3/- | 6SK7 .. | 5/3 | 38 .. | 4/- | 1626 .. | 4/6 | FSU77 .. | 200/- |
| | | | | KT3 .. | 8/- | TP25 .. | 15/- | 6AG5 .. | 3/- | 6SL7GT .. | 6/6 | 58 .. | 6/- | 1629 .. | 4/6 | KR6/3 .. | £4 |
| | | | | KT32 .. | 8/- | TP26 .. | 16/- | 6AG7 .. | 6/- | 6SN7GT .. | 4/6 | 59 .. | 6/- | 4043C .. | 13/6 | LS7B .. | 30/- |
| | | | | KT33C .. | 4/- | TT11 .. | 3/- | 6AJ7 .. | 4/3 | 6SQ7 .. | 6/- | 75 .. | 5/6 | 6064 .. | 10/- | WL417A | 15/- |
| | | | | KT34 .. | 6/3 | TZ20 .. | 16/- | 6AK5 .. | 5/- | 6SS7 .. | 6/- | 76 .. | 5/- | | | | |
| | | | | KT63 .. | 5/- | U12/14 .. | 8/- | 6AK7 .. | 7/6 | 6V6G .. | 4/6 | | | | | | |
| | | | | KT76 .. | 10/- | U17 .. | 5/- | 6AM5 .. | 5/- | 6V6GT .. | 5/- | | | | | | |
| | | | | KTW62 .. | 7/6 | U18 .. | 6/6 | 6AM6 .. | 4/- | 6X4 .. | 5/- | | | | | | |
| | | | | KTW63 .. | 6/6 | U19 .. | 10/6 | | | | | | | | | | |

*MANY OTHERS IN STOCK include Cathode Ray Tubes and Special Valves*

All U.K. orders below 10/- P. & P. 1/-; over 10/- 2/6; orders over £3 P. & P. free. C.O.D. 2/6 extra. Overseas Postage extra at cost.

# P. C. RADIO LTD.

**170 GOLDHAWK RD., W.12**

**SHEpherds Bush 4946**

**IF UNDELIVERED** Return to:— R.S.G.B., NEW RUSKIN HOUSE, LITTLE RUSSELL STREET, W.C.1

**IF UNDELIVERED** Return to:— R.S.G.B., NEW RUSKIN HOUSE, LITTLE RUSSELL STREET W.C.1