

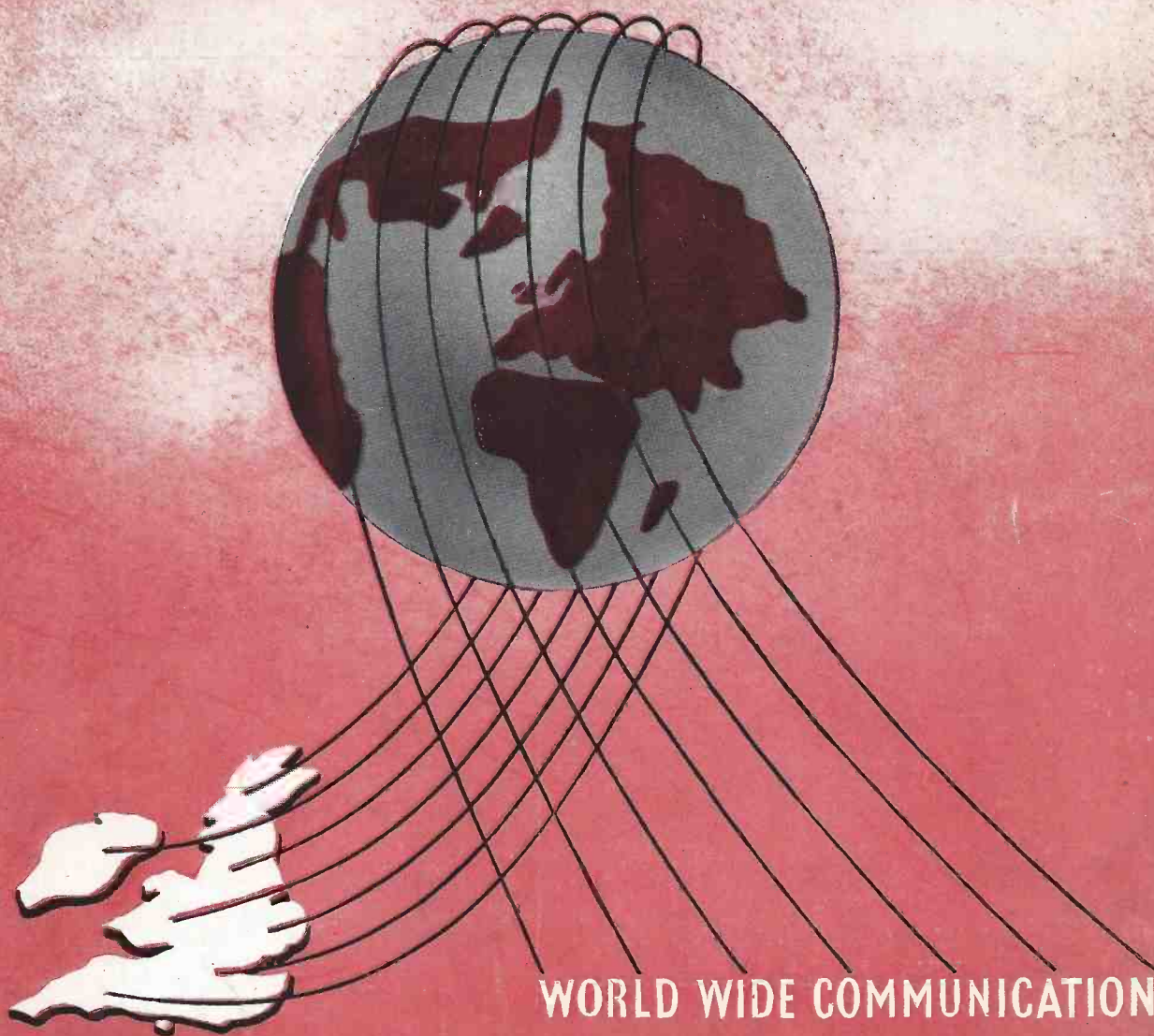
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*The*  
**SHORT WAVE**  
*Magazine*

VOL. XII

DECEMBER, 1954 *Cover*

NUMBER 10



WORLD WIDE COMMUNICATION

# H. WHITAKER G3SJ

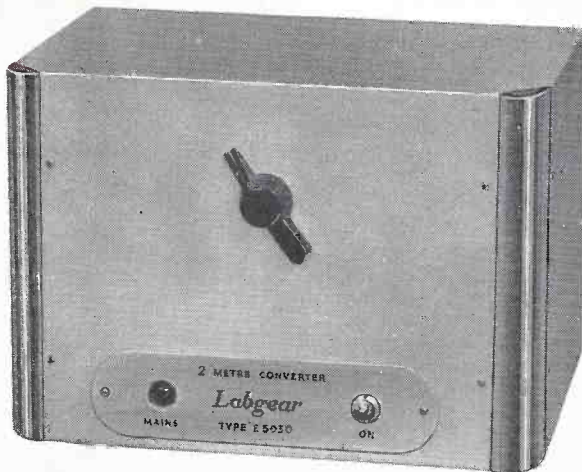
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control

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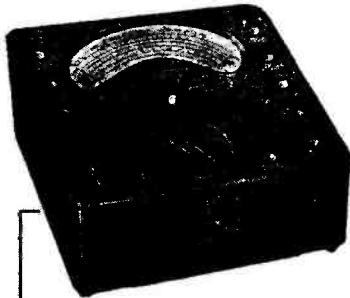


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D.C. VOLTAGE	A.C. VOLTAGE
0-75 millivolts	0-5 volts
0-5 volts	0-25 "
0-25 "	0-100 "
0-100 "	0-250 "
0-250 "	0-500 "
0-500 "	
D.C. CURRENT	RESISTANCE
0-2.5 milliamps	0-20,000 ohms
0-5 "	0-100,000 "
0-25 "	0-500,000 "
0-100 "	0-2 megohms
0-500 "	0-5 "
	0-10 "

## THE UNIVERSAL AVOMINOR

A small but highly accurate instrument for measuring A.C. and D.C. voltage, D.C. current, and also resistance. It provides 22 ranges of readings on a 3-inch scale, the required range being selected by plugging the leads supplied into appropriately marked sockets. An accurate moving-coil movement is employed, and the total resistance of the meter is 200,000 ohms. The instrument is self-contained for resistance measurements up to 20,000 ohms and, by using an external source of voltage, the resistance ranges can be extended up to 10 megohms. The ohms compensator for incorrect voltage works on all ranges. The instrument is suitable for use as an output meter when the A.C. voltage ranges are being used.

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Nett weight : 18 ozs.

Complete with leads, interchangeable prods and crocodile clips, and instruction book.

Price : £10 : 10 : 0

## THE D.C. AVOMINOR

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0- 3 milliamps.
0- 6 "
0- 30 "
0-120 "
VOLTAGE
0- 6 volts.
0- 12 "
0- 60 "
0-120 "
0-300 "
0-600 "
RESISTANCE
0- 10,000 ohms
0- 60,000 "
0-600,000 "
0-3 megohms



A conveniently compact 2½-inch moving coil precision meter for making D.C. measurements of milliamps, volts and ohms. The total resistance of the meter is 100,000 ohms, and full scale deflection of 300 v. or 600 v. is obtained for a current consumption of 3mA. or 6mA. respectively

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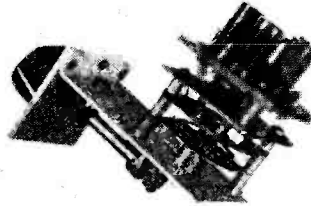
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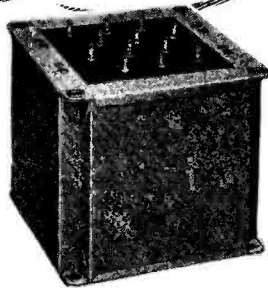
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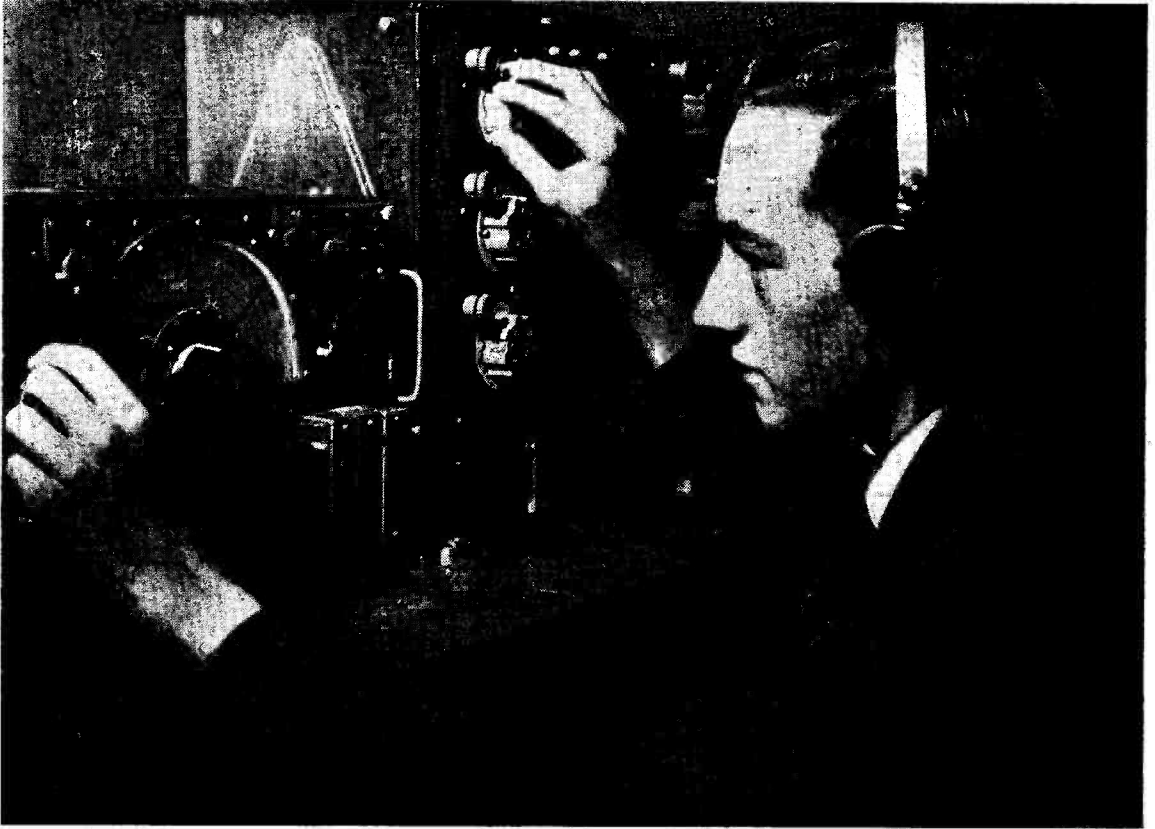
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10 x 8 x 2 1/2	7/6	15 x 10 x 2 1/2	10/6
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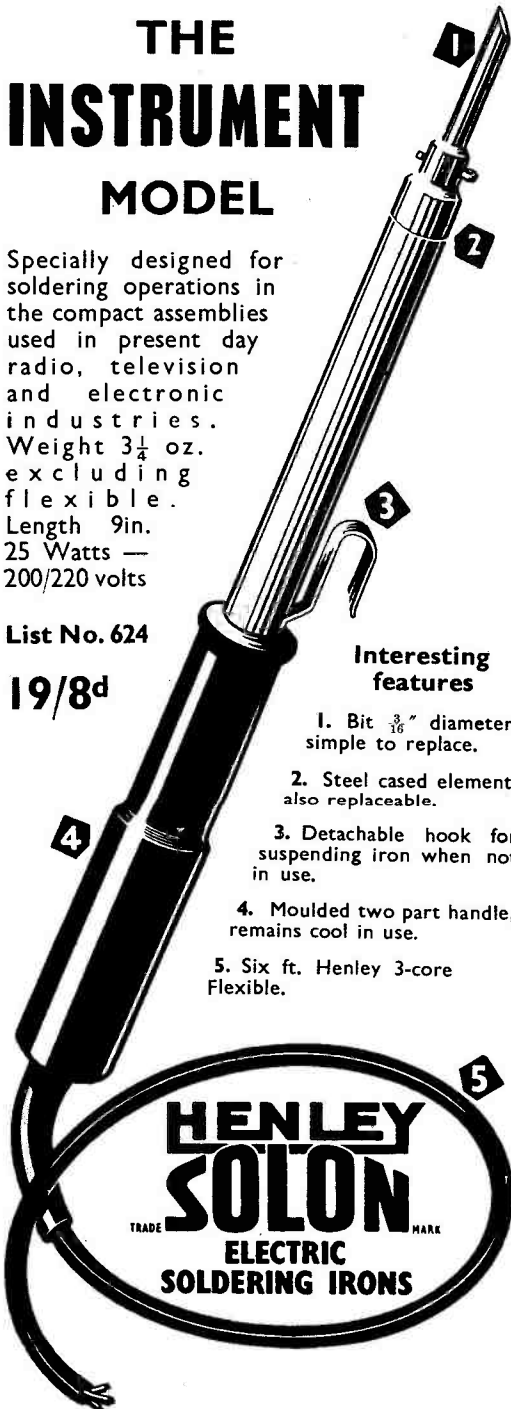
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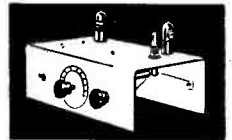
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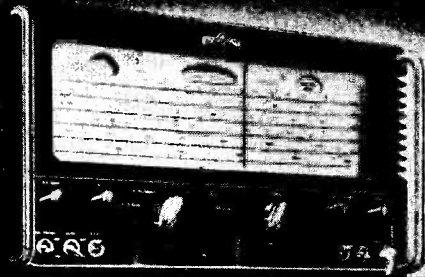
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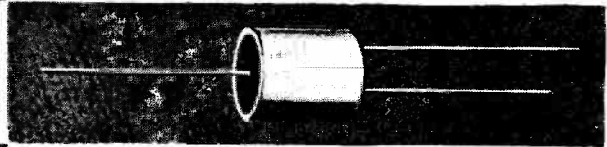
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**INDEX TO  
ADVERTISERS**

# SHORT WAVE MAGAZINE

|                             | PAGE             |
|-----------------------------|------------------|
| Adcola                      | 584              |
| Altham Radio                | 583              |
| Anglin, J. T.               | 584              |
| Automatic Coil              | 529              |
| Brooks Crystals, Ltd.       | <i>cover ii.</i> |
| Brown, S. G.                | 532              |
| Candler System              | 581              |
| Clydesdale Supply Co., Ltd. | 579              |
| E.M.I. Institutes           | 532              |
| Foyle                       | 581              |
| G.E.C.                      | 534              |
| Harris, P.                  | 580              |
| Henleys                     | 532              |
| Henry's                     | <i>cover iv</i>  |
| Home Radio                  | 582              |
| Labgear                     | <i>cover ii</i>  |
| Light Soldering Dev.        | 584              |
| Lyons Radio                 | 582              |
| Miller's Radio              | 584              |
| Minimitter                  | 580              |
| Multicore                   | 533              |
| Proops                      | <i>cover iii</i> |
| R.A.F.                      | 531              |
| Rollet, H.                  | 584              |
| Small Advertisements        | 580-584          |
| Smith, H. L.                | 530              |
| Southern Radio              | 579              |
| Stratton & Co., Ltd.        | 533              |
| S.W.M. Publications Dept.   | 578              |
| Universal Electronics       | 579              |
| Venners                     | 536              |
| Whitaker                    | <i>cover ii</i>  |
| Woden                       | 530              |
| Woolley's Radio             | 530              |
| World Radio Handbook        | 581              |
| Young                       | 536              |

VOL. XII

DECEMBER 1954

No. 136

## CONTENTS

|                                                                      | Page |
|----------------------------------------------------------------------|------|
| <b>Editorial</b>                                                     | 537  |
| <b>Practical Harmonic Checker</b> , by N. P. Spooner (G2NS)          | 538  |
| <b>Some HRO Modifications</b> , by A. F. Ward (VQ4FB)                | 542  |
| <b>Practical Use of Relays</b> , by A. D. Taylor (G8PG)              | 545  |
| <b>John Ambrose Fleming—Commemoration</b>                            | 547  |
| <b>Feedback Audio Amplifier</b> , by W. E. Corlett, Grad.Brit.J.R.E. | 548  |
| <b>DX Commentary</b> , by L. H. Thomas, M.B.E. (G6QB)                | 550  |
| <b>Transistor Topics</b>                                             | 556  |
| <b>Letters to The Editor</b>                                         | 560  |
| <b>VHF Bands</b> , by A. J. Devon                                    | 563  |
| <b>VHF Weather—The Concluding Survey</b><br>by A. H. Hooper (G3EGB)  | 568  |
| <b>Amateur Radio Exhibition—1954</b>                                 | 571  |
| <b>New QTH's</b>                                                     | 572  |
| <b>Random Jottings</b> , by <i>The Old Timer</i>                     | 573  |
| <b>The Other Man's Station—G6BS</b>                                  | 574  |
| <b>The Month with the Clubs—From Reports</b>                         | 575  |

*Managing Editor* : AUSTIN FORSYTH, O.B.E. (G6FO)

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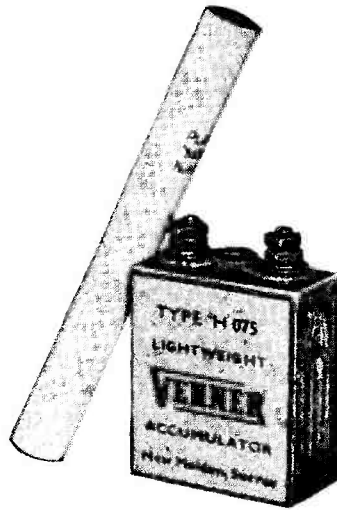
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*The*  
**SHORT WAVE**  
*Magazine*

**Christmas**

Every year at this time it is our pleasure to send those who may glance over this space our greetings and good wishes for the Christmas season.

We number our readers in all corners of the world, from Russia to Alaska and from Greenland to the Antarctic. Many will not be seeing these lines until well on in the New Year. In the realm of Amateur Radio, however, time and space are hardly ever factors of any great significance—for radio amateurs girdle the earth and are in constant communication. And it is in this realm of Amateur Radio that the true spirit of Christmas still lives.

So once again we are glad to have the opportunity of offering our good wishes for their happiness and our thanks for their support to all our readers at home and abroad.

*From the Managing Editor and Staff of*

**SHORT WAVE MAGAZINE**

# Practical Harmonic Detector

COVERING TELEVISION FREQUENCIES

N. P. SPOONER (G2NS)

*Under present-day conditions, one of the first things the amateur must do—unless he is prepared to accept operating restrictions—is to make sure that he is not radiating any sort of harmonic on or near the local TV channels. If the transmitter is innocent of harmonic radiation at a level sufficient to be noticeable in nearby TV receivers, then any TVI effect that is produced must be due to mixing or IF blocking in the TV receiver itself. In such a case, as matters stand at present the GPO will take the line that the trouble should be cleared by the owner of the receiver, subject to certain conditions. From all points of view, therefore, a sensitive and accurately calibrated Harmonic Detector is a very useful, not to say an essential, piece of equipment for any operator who wishes to be unrestricted in his on-the-air activity. With*

**S**OME amateurs will sadly admit that TV has waved its black-magic wand to such purpose that their old methods of construction have been confounded and they now perform many reluctant acts of reverence to King Co-ax. Others maintain that they prefer to keep off the air during the hours of muted merriment

*the steadily improving conditions on the HF communication bands, there will be much more going on during the evenings, and having to shut down for TVI will be found very irksome. This article gives the necessary information for the construction and calibration of a Harmonic Detector, with which it should be possible to set about clearing any possible transmitter interference on the local TV channels. — Editor.*

because the production of harmonic energy in the anode circuit of every PA is still a necessity for good efficiency.

The point overlooked in connection with this, however, is that while the wand of TV turns friendly harmonics into hunted witches these need not be radiated haphazardly, as of old. Detecting the presence and curbing the vitality of these offenders often calls for considerable patience: a lethargic type might well be tempted to let viewers' screens do the detecting for him. By then, of course, all is lost, and everyone is vexed because the job was not first tackled at its source, in the station. Unfortunately, an innocent sleuth in the VHF regions is apt to become discouraged by such common difficulties as instability and inaccurate calibration.

The present description of a simple and stable all-channel Harmonic Detector may therefore interest and encourage TVI-conscious readers who like to be warned when energy is being generated on an unauthorised frequency. In the writer's case, the question of what to build the proposed Detector in or on was quickly solved by a disused RF27 chassis

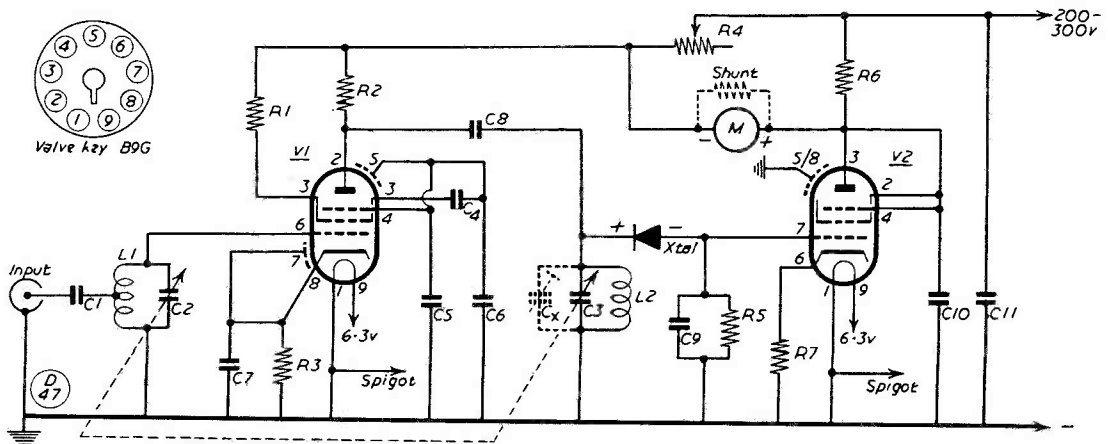
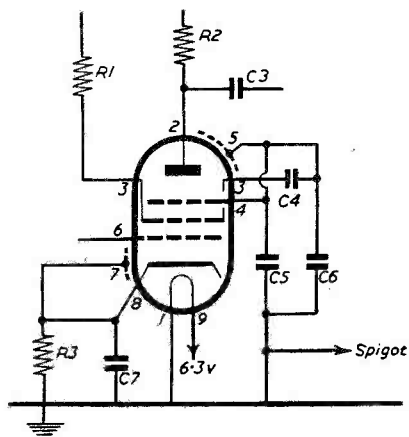


Fig. 1. Circuit complete of the Transmitter Harmonic Checker described by G2NS. It can be made up in any convenient way provided the precautions discussed in the text are taken. An instrument of this sort, covering the potent TV frequencies, enables the transmitter to be checked for harmonics with certainty and accuracy.



DETAIL OF RF VALVE CONNECTIONS

- Pin 1 — Heater, to chassis and spigot
- Pin 2 — Anode, to R2 and C8
- Pin 3 — Screen-grid, to R1 and through C4 to Pin 5
- Pin 4 — Suppressor and shield, through C5 to chassis
- Pin 5 — Shield, through C6 to chassis
- Pin 6 — Control grid, to C2 and L1
- Pin 7 — Shield, to pin 8
- Pin 8 — Cathode, to chassis through R3 and C7
- Pin 9 — Heater, to 6.3v. supply.

Shielding plates to be positioned across chassis and passing between pins 4 and 5, 8 and 9 of V1 and V2

Fig. 2. As explained in the text, it is advisable to adopt this connection sequence for the EF54 (VR136) in the RF stage of the Harmonic Checker.

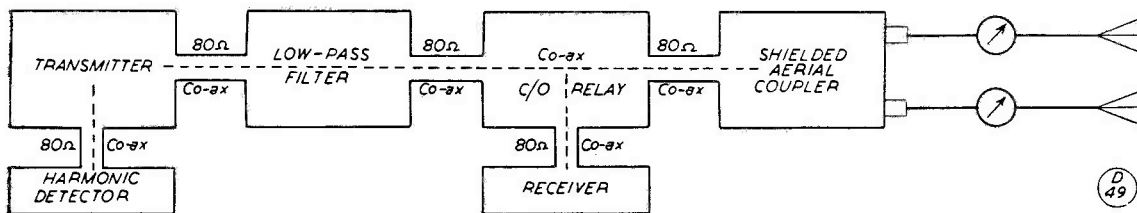


Fig. 3. Block schematic of a station layout for harmonic suppression and checking. Fig. 3A shows an alternative insertion point for the harmonic checker.

that had already provided good homes for ten and two-metre converters. These excellent little RF units were used by the RAF with Gee airborne equipment during the war and they have been available on the surplus market for some years. They are still readily to be had (at very reasonable prices) by all who would equip themselves with an illuminated slow-motion dial, coupled variable condensers, ceramic B9G valve holders, an EF54 valve, a quantity of 500  $\mu\mu\text{F}$  mica condensers and a

sturdy, silver-plated copper-on-steel chassis in which numerous soldering anchors are ready placed in strategic positions—all of value in the construction of the proposed Detector. (And, indeed, of many useful round-the-shack items.) Stripping the remainder will produce a spare EF54 and other useful parts, such as an EC52 and numerous fixed condensers and resistors.

Construction

If the original condensers are intact, so much the better, but if any vanes have already been peeled off for conversions then it is suggested that an attempt at replacement of the original variables be made. The ideal for the present job would be a couple of the same (reference 10C/13602), having 9 fixed and 10 moving plates with a maximum capacity of 75  $\mu\mu\text{F}$ . If only one of these originals can be obtained, then perhaps a 10C/13601 will be found for the RF anode tuning. Although this is an original 2-gang 75 x 75  $\mu\mu\text{F}$  variable, only one section would be used and it is thought that, stripped from RF units, they are still circulating freely.

This harping upon the untouched originals is because they are of the value required, are already in place and coupled together, and they

Table of Values

Fig. 1. Circuit of Transmitter Harmonic Detector

|         |                                  |                                  |
|---------|----------------------------------|----------------------------------|
| C1      | = 10 $\mu\mu\text{F}$            | chassis, passing                 |
| C2, C3  | 75 $\mu\mu\text{F}$ each, ganged | between pins 4/5                 |
|         | (See text), variables            | and 8/9 of V1 and                |
| CX      | 4-21 $\mu\mu\text{F}$ trimmer    | V2                               |
|         | (See text)                       |                                  |
| C4, C5, |                                  | Input = Belling Lee Co-ax        |
| C6, C7, |                                  | Socket                           |
| C9,     |                                  | Xtal = Crystal Diode, any        |
| C10     | = 500 $\mu\mu\text{F}$ , mica    | type                             |
| C8      | = 100 $\mu\mu\text{F}$           | M = 0.1 millimeter               |
| C11     | = .01 $\mu\text{F}$ , mica       | Shunt = Across meter (See        |
| R1      | = 13,000 ohms, $\frac{1}{2}$ -w. | text)                            |
| R2      | = 10,000 ohms, 1-w.              | L1 = 5 turns 18g. tinned,        |
| R3      | = 150 ohms, $\frac{1}{2}$ -w.    | self supporting,                 |
| R4      | = 500 ohms, variable             | occupying $\frac{1}{2}$ -in. in- |
| R5      | = 2.2 megohms, $\frac{1}{2}$ -w. | side diam. $\frac{3}{8}$ -in.    |
| R6      | = 330 ohms, $\frac{1}{2}$ -w.    | Tap 2 turns from                 |
| R7      | = 390 ohms, $\frac{1}{2}$ -w.    | earthly end                      |
| V1      | = EF54 (VR136)                   | L2 = 5 turns 18g. tinned,        |
| V2      | = EF50 (VR91)                    | self supporting,                 |
|         | Valve Shields across             | occupying $\frac{1}{2}$ -in. in- |
|         |                                  | side diam. $\frac{3}{8}$ -in.    |

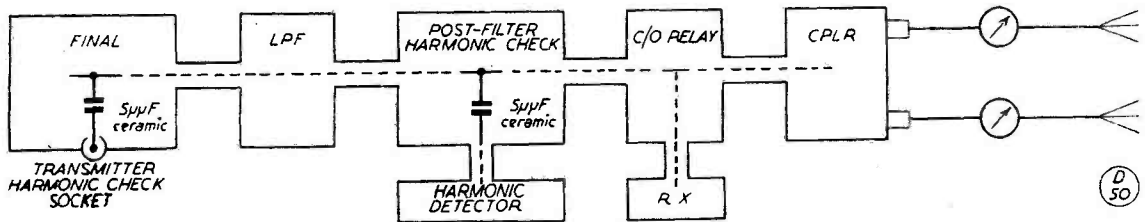


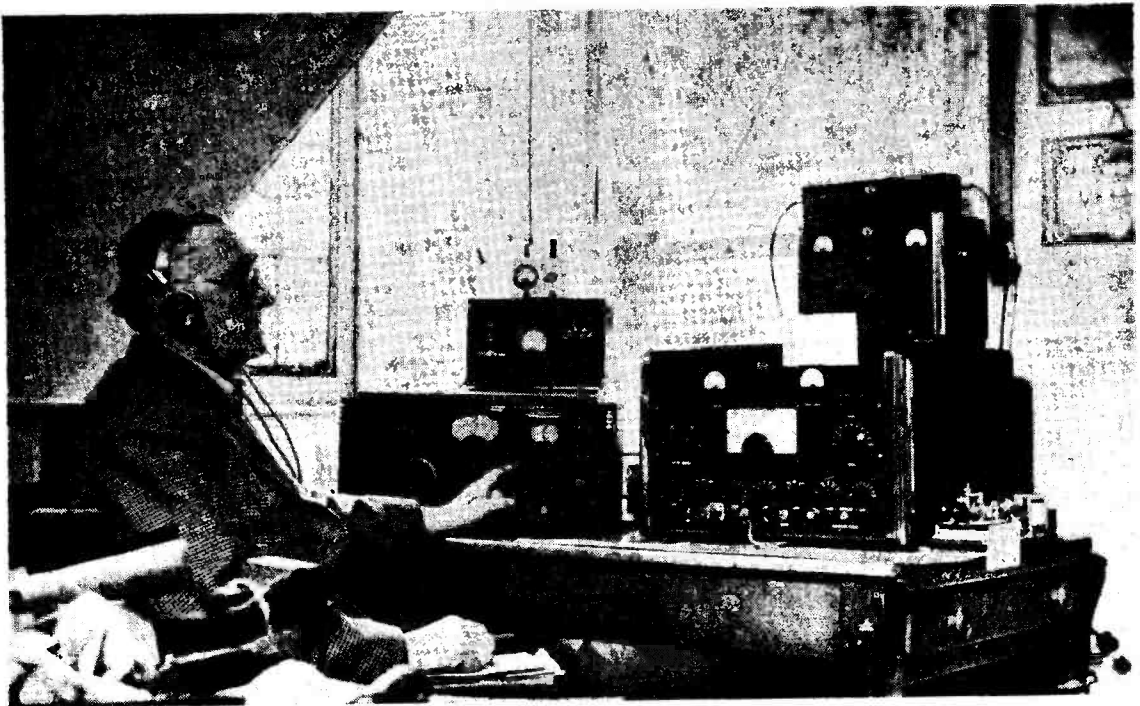
Fig. 3A. The harmonic checker can be inserted after the low-pass filter in the transmitter output line, when it will show the effectiveness of the filter system. (See Fig. 3B).

make for ease in tracking. The writer, with only one of the 10C/13602's, had, for the second one, to botch up a similar type (2-gang, no reference number) with 10 fixed and 11 moving plates. Finding tracking was awkward, two plates had then to be pinched off to give 8 fixed and 9 moving, with a 4-21  $\mu\text{F}$  trimmer in parallel, as shown by Cx in the circuit.

At the frequencies being handled, the slight re-positioning of an earth lead or an insufficiency of de-coupling condensers can make all the difference between complete docility and crazy instability. It is therefore wise to duplicate the original condenser-to-chassis leads which, in the 10C/13602, is from the tag of

the end-plate situated nearest the tuning dial down to the nearby soldering anchor, and, in the 2-gang 10C/13601, from the tag of the centre-plate dividing the two sections down to the soldering anchor immediately below.

The complete Harmonic Detector consists of an EF54 (VR 136) RF stage, a crystal diode rectifier (any type), and a triode-strapped EF50 (VR91) meter amplifier stage. The 0-1 millimeter is placed in a bridge circuit of which two obvious arms contain the zero-adjuster R4 and the arm-resistor R6, while the two "hidden" arms contain the internal resistances of V1 and V2. The present 0-1 millimeter gives a full-scale deflection on 5



Our well-known contributor, G2NS of Bournemouth. At one time with the old Eastern Telegraph Company, that forcing-ground for first-class telegraphists, G2NS served in the 1914-'18 war as an infantry captain. He then went out to South America, and was successively with a Brazilian meat company in the Matto Grosso, and later with a mining concern. G2NS served in the Royal Observer Corps during the last war and, since 1946, describes himself as "ruminating on the vagaries of TV1."

mV at the LF end of the TV channel range and 10 mV at the HF end (the characteristics of the mongrel crystal-diode in use no doubt being responsible). With the bridge resistor values given for R4 and R6 the meter will indicate less than 1 mV and can be connected to a TV aerial in a strong-signal area for a check on the dial calibration and comparison with the strength of the offending harmonic. Greater sensitivity can be obtained by doubling or trebling the values of both R4 and R6.

To prevent damage to the meter, which will wrap its pointer round the stop on strong harmonics from the transmitter under test, a resistor equal in value to or, if necessary, one twice that of the resistance of the meter, should be used as a shunt. Clips connected to the meter terminals save much fiddling and provide an easy method of shunt insertion and removal. The shunt should always be used when feeding a strange harmonic of unknown strength into the Detector input for the first time. In the interests of stability the wiring of the EF54 high-gain RF valve shown in Fig. 2 should be closely followed.

TABLE B. DIAL CALIBRATION

| DIAL (DEGREES) | FREQUENCY (MC) | DIAL (DEGREES) | FREQUENCY (MC) |
|----------------|----------------|----------------|----------------|
| 0              | 71             | 10             | 68.5           |
| 20             | 65             | 30             | 61.25          |
| 40             | 58.5           | 50             | 56             |
| 60             | 54             | 70             | 51.75          |
| 80             | 50             | 90             | 48.5           |
| 100            | 47             | 110            | 45.75          |
| 120            | 44.5           | 130            | 43.25          |
| 140            | 42             | 150            | 41.25          |
| 160            | 40             | 170            | 39.3           |
| 180            | 39.25          |                |                |

The TV channel coverage is 41.5 to 66.75 mc (this being the BBC range) while the Harmonic Checker is designed to cover 39.25-71.0 mc—as obtained on the author's version. A graph could be drawn to give at-a-glance readings.

TABLE A. TVI ASSESSMENT

| TV CHANNEL      | TV STATION                                              | DETECTOR DIAL (IN DEGREES) | TVI SUSPECT (BAND & HARMONIC)   |
|-----------------|---------------------------------------------------------|----------------------------|---------------------------------|
| (1)<br>London   | Alexandra Palace                                        | Vision — 45 mc — 116       | 3.5 mc (11 and 12)<br>7 mc (6)  |
|                 | (Belfast)<br>(Glencairn)                                | Sound — 41.5 mc — 146      | 14 mc (3)<br>21 mc (2)          |
| (2)<br>North    | Holme Moss                                              | Vision — 51.75 mc — 70     | 3.5 mc (13 and 14)              |
|                 | (Tavistock)                                             | Sound — 48.25 mc — 92      | 7 mc (7)                        |
| (3)<br>Scotland | Kirk o'Shotts                                           | Vision — 56.75 mc — 47     | 3.5 mc (14, 15, 16)<br>7 mc (8) |
|                 | (Isle of Wight)<br>(Truleigh Hill)                      | Sound — 53.25 mc — 62      | 14 mc (4)<br>28 mc (2)          |
| (4)<br>Midland  | Sutton Coldfield                                        | Vision — 61.75 mc — 28     | 3.5 mc (16 and 17)<br>7 mc (8)  |
|                 | (Aberdeen)                                              | Sound — 58.25 mc — 40      | 28 mc (2)                       |
| (5)<br>West     | Wenvoe                                                  | Vision — 66.75 mc — 14     | 3.5 mc (18 and 19)<br>7 mc (9)  |
|                 | (Newcastle-on-Tyne)<br>Pontop Pike<br>(Douglas, I.O.M.) | Sound — 63.25 mc — 24      | 21 mc (3)                       |

Bracketed figures in the 4th column refer to the order of harmonic. It should be noted that, in outer fringe areas, unsuppressed 160-metre transmissions might also cause TVI.

## Operation

After checking the wiring-up, arrangements should be made to calibrate the Detector with a borrowed signal generator that covers the TV channels, or it should be taken along to the sympathetic owner of one. In either case, and before calibration is commenced, the valves are allowed to warm up and HT is switched on without connection to the signal generator so that the meter can be adjusted to read zero by means of R4. Once set, this should hold good and calibration can be carried out by inter-connecting with a short length of coax. When in use in the station the Detector is left plugged into the harmonic check socket of the transmitter, so that it will give immediate warning whenever the harmonic danger level is reached, as previously discovered from local conditions. This connection to the transmitter is by a short length of coax and the result indicated on the meter is, of course, the harmonic strength that leaves the transmitter and has not yet experienced the sobering influence of the low-pass filter.

To learn the degree of "stuffing" knocked out by the filter itself, a duplication of the writer's device shown in Fig. 3B can be inserted

between the filter and the change-over relay or the aerial coupler. The tale then told by the meter is the one that is being radiated from the aerial system, with a small allowance for the slight extra attenuation the aerial coupler will cause.

For internal witch-hunting in the transmitter, a suitable length of coax terminating in a probe loop is plugged into the Detector input socket. In all cases, the PA is correctly tuned, a harmonic trap is correctly set, a filter is correctly adjusted, when the indicating meter shows the optimum has been reached and the pointer drops to its lowest reading. The stronger the offending harmonic, the higher the meter reads. Table A is self-explanatory and as will be seen, every TV channel is fully covered.

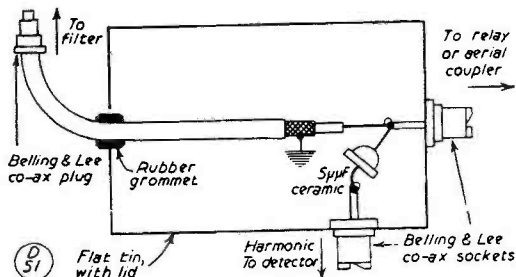


Fig. 3B. Details of post-filter insertion connections for the Harmonic Checker. A very small capacity is tapped off the main RF feed-line, and the inter-connection made in a screening box.

In conclusion, acknowledgments and thanks are due to P. J. Towgood, a local VHF worker, for circuitry suggestions and accurate calibration with his Advance signal generator.

## Some HRO Modifications

BANDSPREAD ON  
FOURTEEN METRES, AND  
NOISE LIMITING

A. F. WARD (VQ4FB)

*A great many HRO's, of varying degrees of age and effectiveness, modified and unmodified, are in use at amateur stations throughout the world. This article describes two worth-while modifications, one of which will be of particular interest to those about to look over the awakening 21 mc band.—Editor.*

**T**HE writer's HRO, although rather an ancient model, performs very well on all bands up to 28 mc. But it was lacking not only bandspread on 21 mc, but also a noise limiter.

This article describes a very simple modification to obtain adequate bandspread, and also discusses an efficient noise-limiter, of the combined series-shunt type. The coil modification does not involve adding turns, nor cutting any of the wires in the coil cans. And if required, the coils can be "unmodified" in a matter of minutes to give the original coverage.

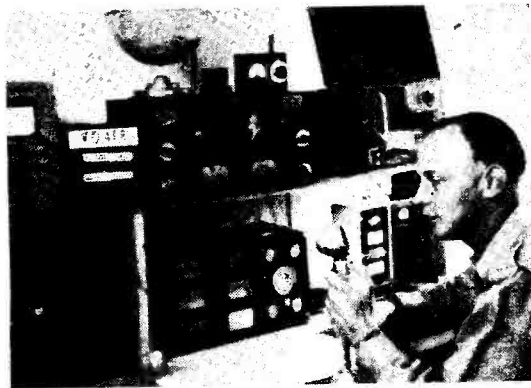
The requirement is a 14-30 mc HRO coil pack, which in the writer's case was originally bandspread for 10 metres. It will be noticed that on the coil packs for the HRO the bandspread trimmers are on the left-hand side

(T1, T3, T5, T7), and the general-coverage trimmers are on the right-hand side (T2, T4, T6, T8), when looking down on the coil pack, as suggested by the sketch at Fig 1.

All that the modification calls for is putting a 50  $\mu$ F silvered mica condenser, preferably of better than 5% tolerance, across each bandspread trimmer in the coil pack.

To avoid confusion when replacing the coil cans in the frame, it is advisable to remove and modify each coil unit separately, replacing the one before starting on the next—alternatively, to number the coils on the insulating block before dismantling.

**Alignment.** The signal generator, or other source of 21-22 mc signal or frequency marker, should itself be carefully checked up against a known frequency standard, so that the band



VQ4FB operating the equipment mentioned in his article. He is ex-G3CAT and VU2AT, and is now signals officer at Police Divisional Hq., Meru, Kenya. He is active on all bands 3.5 to 28 mc, with a 67-foot aerial.



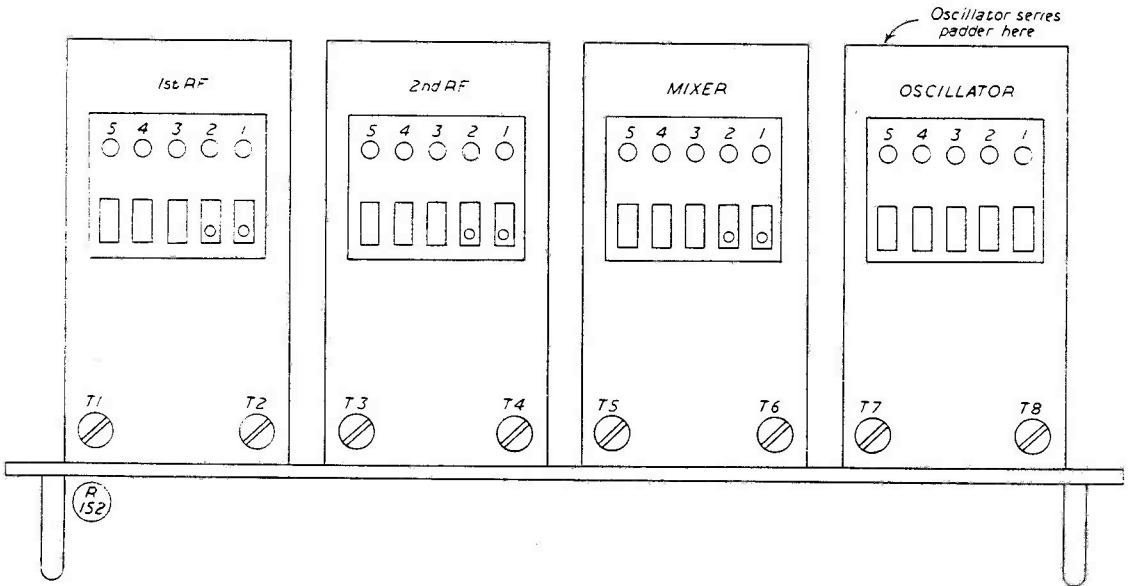


Fig. 1. Locating the trimmers in a standard HRO coil pack. Details are given in the text as to the adjustment of these trimmers.

limits can be determined with certainty and accuracy. Then the general-coverage trimmers T2, T4, T6, T8 as in Fig. 1 should be adjusted to correspond with the calibration chart on the front of the coil pack, making sure that the oscillator is tuned on the *high side*, i.e., the image appears 912 kc lower in frequency. (This of course also applies when lining up the HRO on any other band.)

After the general-coverage has been correctly set up, the bandspread adjustment is carried out in the following manner :

Set the oscillator series padder (located at the back of the oscillator coil can) until 21.00 mc corresponds to a dial reading of 10 ; then swing the dial to a reading of 450, and adjust T7 to give a beat at 21.58 mc. Then, with the tuning dial set to 210 degrees, which should be 21.20 mc, peak up trimmers T1, T3 and T5 for maximum "sharsh." Repeat and re-check on this procedure, making sure the calibration points are correctly established.

A calibration chart, as produced by the author, is given in Fig. 2. It will be seen that a smooth and accurate curve can be obtained with careful adjustment. This calibration chart can then be inserted in the appropriate window of the coil pack.

Usually, HRO coil packs will be found

to have been manufactured to quite close tolerances, so that in many cases the calibration chart as given here will be sufficiently accurate for the whole band, provided the procedure suggested is followed. Incidentally, a useful calibration point of high accuracy is the BBC overseas broadcasting station on 21474 kc, which should appear at a dial reading of about 380 degrees.

After carrying out the modification as described, the writer obtained a measured sensitivity as good as that given by the other

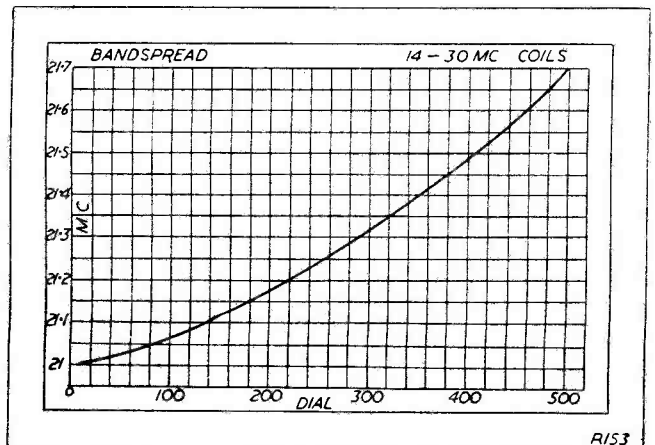


Fig. 2. The calibration chart for the 21 mc hand, derived from the coil pack modified as described in the text.

## Table of Values

Fig. 3. Noise Limiter for the HRO.

|                   |                       |
|-------------------|-----------------------|
| C11 = 10 $\mu$ F  | R12, R19 = 0.5 megohm |
| C12 = 100 $\mu$ F | R13 = 50,000 ohms     |
| C13 = 250 $\mu$ F | R14 = 0.25 megohm     |
| C14 = 0.1 $\mu$ F | R20 = 800 ohms        |
| C15 = .01 $\mu$ F | RA* = 1 megohm        |
| CA* = .05 $\mu$ F | RB* = 1 megohm        |
|                   | (see text).           |

\*Components for Noise Limiter.

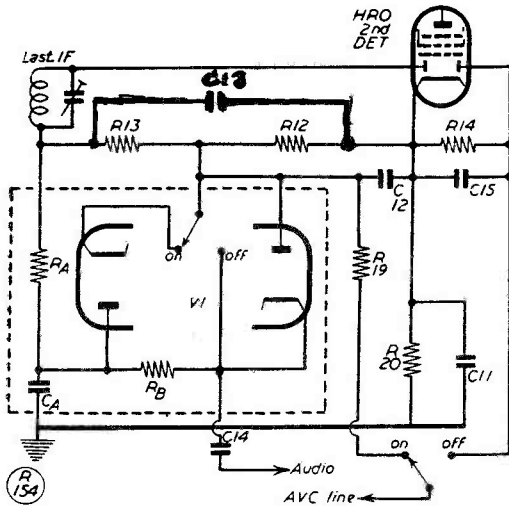


Fig. 3. The noise-limiter described by VQ4FB, fitted to an HRO. All items within the dotted square are for the NL; others marked are the existing HRO components. Some experiment with the value of Rb may be called for (see text).

bandsread coils for the receiver, *i.e.*, 7, 14 and 28 mc.

### Noise Limiter

This also is a very simple modification, requiring only one connection to be broken in the receiver itself. As the principle of operation of noise limiters of this type is well-known, it is not proposed to go into the theory of it—enough to say that the limiter as fitted to the author's HRO works effectively. See Fig. 3.

A type 6H6 valve was used, but an Osram D77 could be substituted if desired. The valve-holder is mounted on a small bracket on the rear drop of the chassis, near the second IF transformer, and the toggle switch is fitted on the front panel on the left-hand side, about 5 ins. from the edge and just over 3 ins. down from the top of the panel; in this position, the switch—which is the on-off control for the noise limiter—does not impede adjustment of the trimmers T1, T2.

It was not thought necessary, nor found desirable, to make the limiting adjustable; but if this is required, it can be accomplished by substituting a 680,000-ohm potentiometer for R12 and R13 in Fig. 3. (It should be noted that in this diagram items R12-R20 and C11-C15 are existing components; items for the noise limiter itself are within the dotted square and are separately identified.) However, variable limiting is not recommended, because (a) It adds to the complexity of the device, and

(b) The limiter appears to work very well as it stands!

After the unit has been assembled on its small bracket, it can be tested by breaking the connection from C14 to R12-R13, and wiring in as shown in Fig. 3.

Some slight distortion of phone signals may be noticed when the limiter is switched in: this is quite normal, but those who wish to decrease this distortion (and reduce the effectiveness of the limiter!) can experiment with the value of Rb. Any value between 0.5 and 2.2 megohms will work at Rb; in the writer's case, 1 megohm was found to give the best results.

This HRO, modified as described here, forms the receiving side of station VQ4FB. It is used with a modified B2 transmitter, and with a VFO and simple modulator, the whole makes a very compact station, as can be seen from the accompanying photograph.

### RCA VALVE MANUAL

We have received a copy of the new 320-page *RCA Receiving Tube Manual*, the latest edition of which is designated RC-17. It contains detailed information on all RCA receiving valves and cathode-ray tubes (a total of more than 500 items) with a useful section on circuits, giving values and essential engineering data. Information on valve types individually is, of course, as usual, fully detailed. The first 65 pages of this new *Manual* discuss the theory and application of radio valves, written in an easy-to-understand style, and alone make it a very useful reference book. The *RCA Receiving Tube Manual*, RC-17, is obtainable in this country from: RCA Photophone, Ltd., 36 Woodstock Grove, Shepherds Bush, London, W.12, price 8s. 0d. post free.

### IDEA — CHRISTMAS GIFT

You may have an overseas contact whose friendship you value, or someone—interested in Amateur Radio—to whom you would like to make a useful present, which will be a constant reminder of your thoughtfulness. You cannot do better than buy, as your present, a 12 months' subscription to *Short Wave Magazine*. It costs but 24s., post free to any part of the world, for a year of twelve issues. Order on: The Circulation Manager, *Short Wave Magazine*, Ltd., 55 Victoria Street, London, S.W.1.

# Practical Use of Relays

## AND INTERPRETATION OF RELAY CIRCUITS

A. D. TAYLOR (G8PG)

*This useful and interesting article will serve as an introduction for those who have not yet realised all the possibilities of relays, or are using them only in simple circuits. The author also discusses the drawing convention which should properly be used to illustrate relay circuits.—Editor.*

WHILE relay circuits are bread-and-butter to the telephone engineer they often present unfamiliar problems to the radio amateur. The reason for this is not far to seek. While most amateur handbooks give an excellent selection of circuit symbols they usually deal only briefly with relays and contain no mention of the layout of relay contacts on a diagram, nor of the captions that should be used to designate the relays themselves. With the present trend towards the use of relay circuits in amateur stations, and their applications in model control work, this is a definite handicap to the amateur. The purpose of this article is to try partially to fill this gap.

### Relay Circuit Layout

In a properly drawn relay circuit the reader will be faced by a number of independently drawn coils and contacts, as shown in Fig. 1, the coils being labelled RA/4, RB/1 and so

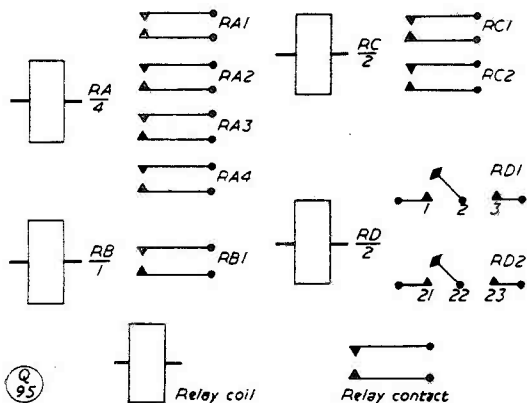


Fig. 1. The designation of coils and contacts, showing how relay nomenclature should appear on a circuit diagram.

on, and the contacts RA1, RA3, RB1, etc. To the uninitiated this may appear very confusing, but if the basis of the system is understood all becomes clear after a little study. The points to be grasped for the correct reading of the circuit are as follows :

(a) Ideally, the relay and all its contacts should be shown together at the same point on the diagram. In practice this would lead to a hopeless tangle of wires in the vicinity of the relay coil—so the coil and contacts are drawn separately at convenient positions on the diagram.

(b) Having separated the coil and its associated contacts, it is necessary to provide a method by which they can be quickly associated in the mind of the person reading the diagram. To do this, two pieces of information are necessary. These are :

- (1) The number of contacts actually associated with a given relay coil.
- (2) The designation of these contacts on the diagram.

The first piece of information is given by the designation printed alongside each relay coil and the second by the designation beside each relay contact.

As can be seen from Fig. 1, the coil designation is written almost in the form of a fraction. The letter part of this fraction (RA, RB, etc.) is the coil identification, arbitrarily chosen when the circuit is drawn up, and the figure part of the fraction indicates the number of contacts associated with the particular relay coil concerned. To take an example, the designation RC/3 alongside a relay coil indicates the coil of relay RC which has 3 contacts associated with it. As regards the individual contacts, these take the letter designation of the associated coil followed by an identification number, e.g., RC1, is "contact number 1 of relay RC," RC2 is "contact number 2 of relay RC," and so on.

(c) If the operation of the circuit is to be followed, it is essential that all the relays be drawn in the same condition—either all energised or all released. The standard convention is that all relays are drawn to the released condition. This means that all contacts shown open on the diagram will be closed when the associated relay coil is energised, and vice-versa.

### A Practical Circuit

To show the practical application of the information given in the preceding paragraphs, the relays given in Fig. 1 have been wired up in Fig. 2 to provide a simple control circuit for a phone station. A description of the circuit is as follows :

In the "receive" condition all relays are released, HT is applied to the receiver and the aerial is connected to the receiver. In the

"net" condition, the netting switch SW1 operates a relay which applies HT to the VFO/exciter stages, thus allowing netting to be carried out without radiating a signal.

In the "transmit" condition operation of the microphone pressel switch, energises three relays which switch on the VFO/exciter, PA and modulator HT supplies, energise the microphone, break the receiver HT supply and switch the aerial from the receiver to the transmitter.

The operation of the relays in the circuit will now be explained in detail, and if the explanation is read in conjunction with Fig. 2 it should provide useful practice in applying the principles outlined in the preceding paragraphs.

(A) *Receive Condition.* All relays are released. RC1 connects the HT to the receiver. RD1 and RD2 connect the aerial to the receiver.

(B) *Net Condition.* When the netting switch SW1 is closed RB/1 operates. RB1 applies HT to VFO/exciter stages. When SW1 is opened RB/1 releases, returning the circuit to the receive condition.

(C) *Transmit Condition.* When the microphone "on" switch is pressed RA/4, RC/2 and RD/2 operate. RA1 applies the VFO/exciter HT supply. RA2 puts on the PA HT supply. RA3 applies the modulator high tension. RA4 applies the microphone energising voltage. RC1 breaks the receiver HT supply. RC2 lights the "Tx On" warning lamp. RD1 and RD2 change the aerial over from the receiver to the transmitter.

When the pressel switch is opened the relays release and return the station to the "receive" condition.

### Special Relays

While selector relays are outside the scope of a short article such as this, there are several other special relays worth mentioning for their practical use in an amateur station, and these are described below.

Slugged relays are those in which an operating delay is introduced. They take two forms. In the magnetically-slugged relay a copper band is fitted around the coil either at the top or the bottom. When it is at the top it causes a delay in the operation of the relay, and when at the bottom a delay in the release. Therefore, according to the position of the slug, this type of relay can be used either for

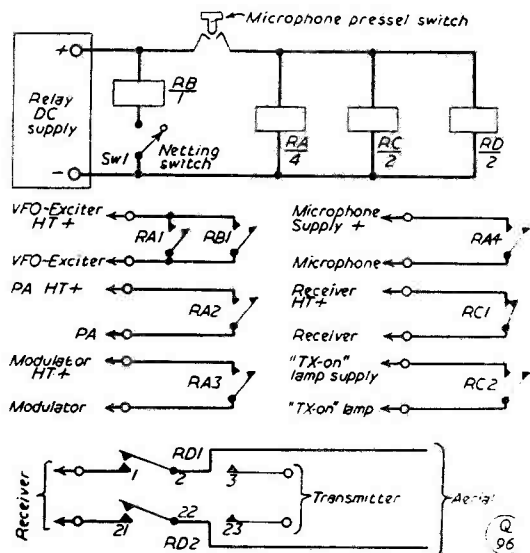


Fig. 2. Practical layout for a full station control system using relays. This diagram should be studied with Fig. 1 and the discussion in the text. Main control is on the single microphone pressel switch.

delay or holding circuits. The symbols for these relays are shown in Fig. 3(a) and 3(b).

An interesting variation of this technique is capacity slugging. If a condenser of 500-2000  $\mu$ F (the actual value depending upon the resistance of the relay coil and the time delay required) is placed across a relay coil it will be found that there is a slight delay in operation and a considerably longer delay in release. This can be applied to any relay without modifying the mechanical assembly and one application could be for holding on the VFO of a CW transmitter controlled by relays. No graphical symbol exists for this type of relay at present, but the arrangement is shown in Fig. 3(c).

A third type of particular use for interlock and similar systems requiring a long time delay is the thermal relay shown in Fig. 3(d). In this, a heater element is used to cause the expansion of a bi-metallic strip, it being possible to calculate the rate of expansion to fine limits. The expansion of the strip is used either to make or break a pair of contacts after a pre-determined time interval, the contacts in turn making or breaking the circuit under control. A common use of this type of relay is to control the application of the HT supply to a high power PA. The heater is placed across the supply to the PA valve heaters and the time delay is so arranged that

the contacts (which control the HT supply) do not close until the valve heaters have reached their normal operating temperature, thus protecting the valves from damage. Familiar domestic variants of this relay are the thermostatic controls on electric irons and refrigerators.

While far from covering the whole subject it is hoped that this article will assist those unfamiliar with relays by showing the basic principles of relay circuit reading and also how a few "surplus" relays, now so cheaply available, can be used to perform many useful functions in the amateur station.

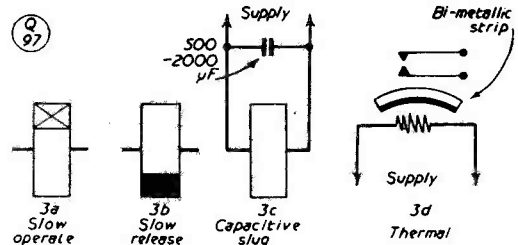


Fig. 3. In this sketch, G8PG illustrates various types of delayed-action relays, which can be applied to a number of switching problems.

## John Ambrose Fleming

### Inventor of the Thermionic Valve

#### JUBILEE COMMEMORATION OF A GREAT DISCOVERY

ONE of the greatest names in wireless, radio, electronics, telecommunications—call it what you will—is that of Ambrose Fleming, the man who invented the valve detector. This momentous event occurred in October, 1904, and on November 16 of that year Fleming obtained a patent on the thermionic valve, basically as we know it today.

His radio experiments were inspired by two factors—Edison's discovery of the unidirectional conductivity developed between two electrodes in a vacuum lamp, and Marconi's urgent need for a sensitive detector for his long-distance wireless communication circuits. Indeed, there is extant a letter from Fleming to Marconi announcing, privately, his discovery of the valve and suggesting that it be treated as *sub rosa* until patent cover had been obtained.

This immensely important pioneering and experimental work was done at University College, London, where Fleming was Professor of Electrical Engineering, a post he held with great distinction for no less than 41 years, from 1885 to 1926.

#### Early Days

In his earlier days, Fleming had himself been a student at University College, where one of his fellow-undergraduates was Alexander Graham Bell. The latter, who went to the United States and later invented the telephone, was founder of what is now the Bell Telephone Company of America.

Before going to St. John's College, Cambridge, in 1877—where he studied under the great Clerk

Maxwell—Ambrose Fleming was science master at, successively, Rossall School and Cheltenham College. He gave up the latter post on obtaining his scholarship at St. John's; he left Cambridge to take up an appointment as Professor of Physics and Mathematics at University College, Nottingham, but shortly afterwards was offered the post of electrical adviser to the Edison Electric Light Co. of London.

Fleming's decision to accept the London appointment was a momentous one, because he was brought directly into contact with what had become known as the "Edison Effect"—the problem associated with the darkening deposit, thought to be ejected from the carbon filament, which formed on the inside of the electric light bulbs of those days.

It was from his work on this problem—while with the Edison Company 20 years earlier—that Fleming derived the inspiration for his own great discovery in the October of 1904.

#### Jubilee Commemoration

Fleming's master patent was filed on November 16, 1904. On November 16, 1954, the electrical engineering laboratories of University College, London, were open for a magnificent and inspiring display of the apparatus and equipment used by Fleming, in those same rooms. The exhibits pertaining to his work were shown side-by-side with the outcome of recent electrical and electronic researches carried out in the College Laboratories. These exhibits linked, in the most convincing way possible, the achievements of today with Fleming's

own pioneering investigations.

Seeing all this, one was immediately struck by the apparent simplicity of Fleming's equipment and experimental apparatus—and not least by the straightforward and uncomplicated nature of the original Valve Patent Specification, No. 24850-1904. Another interesting exhibit covered the decrees and injunctions, relating to valve litigation, obtained in the American courts—for the originality of Fleming's work had to be defended in the United States against Lee de Forest and others, in all cases successfully. It is, in fact, most important to note that Patent No. 24850-1904 is accepted as fundamental in the U.S.A. as well as in this country, all subsequent variations of the valve being classified as no more than "improvements on the basic idea."

It is also of great interest that, from the point of view of the University of London, Fleming was not only the discoverer of the valve, but also an original thinker and inventor in other branches of electricity. He would be remembered as a great man in the field of applied science if he had never been associated with the valve at all.

Hence, the University College exhibition also covered Fleming's contribution to Photometry, involving the evolution of a standard lamp and precise evaluation of lamp efficiency; to Electrical Measurement, in which field he developed the direct-reading potentiometer and, in collaboration, the dynamometer-voltmeter; to AC theory and transformer design; and to Teaching. For it must not be forgotten that, as Professor of Electrical Engineering, teaching was his primary function while at University College. His lectures were regarded as of international significance, and probably one of the most remarkable of them all was his Marconi

Memorial Lecture of 1937, delivered by Fleming himself at the age of 88. Many senior radio and electrical engineers of today were trained by Fleming, since he was actively engaged on teaching work until the late 1920's.

Ambrose Fleming was also a writer of distinction, two of his best-known books being *Principles of Electric Wave Telegraphy* and *Fifty Years of Electricity*. Classics of their kind, they are essential to students of the history of their subjects.

#### I.E.E. Celebration

During the afternoon of November 16 last, the Institution of Electrical Engineers held a special meeting to hear three important lectures on the thermionic valve—delivered by Professor Howe, Sir Edward Appleton and Dr. J. Thomson. This meeting was opened by the Lord President of the Council, the Marquis of Salisbury, as the Minister responsible for the Department of Scientific and Industrial Research.

Thus, the achievements of a great man have been fittingly commemorated. Great, because John Ambrose Fleming, the son of humble parents, had his start in life, at the age of seventeen, as a Stock Exchange clerk. His parents could not afford the expense of his training or apprenticeship, so he got his B.Sc. of London by studying at home in the evenings. All came to him by his own unaided efforts.

He died Sir John Ambrose Fleming, M.A., D.Sc., F.R.S., on April 18, 1945, at the fine old age of 96. He retained his full faculties almost to the end, having lived to see so much of what his invention has meant for all mankind.

A.J.F.

## Feedback Audio Amplifier

PEAKING UP CW SIGNALS

W. E. CORLETT, Grad.Brit.I.R.E.

THE addition of an audio filter to a communications receiver will, in nearly all instances, greatly increase the selectivity and improve the signal-to-noise ratio by the reduction of hum and noise generated in the AF stages.

In the case of home-constructed receivers, where cost and simplicity may be of consideration, an audio filter can be used in place of the more expensive and complex crystal filter.

One such design of filter makes use of a "parallel-T" network in a negative feedback circuit. The main advantage of this circuit is that no inductances or alignment are required.

Against this, however, is the necessity for close tolerance or well-matched components. But this should be no serious drawback, as they are readily obtainable. The required values can be made up of series and/or parallel combinations, with the aid of a resistance-capacity bridge.

#### Circuit

The basic network and relative transmission characteristics of the feedback circuit are shown in Fig. 1.

The frequency of infinite attenuation is given by:<sup>(1)</sup>

$$F_0 = 1/(2\pi RC) \dots (1)$$

provided the output of the network is not loaded. This implies that the input or grid circuit of the amplifier to which the feedback is applied should have as high an impedance as possible; this includes the output of the previous stage. The network is connected from the output to the input of the amplifier, in such a manner as to produce negative feed-

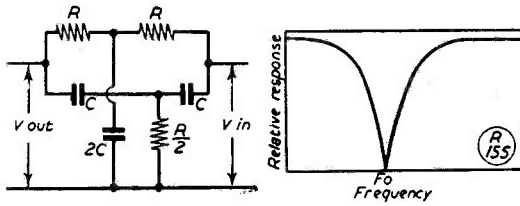


Fig. 1. The basic "parallel-T" network with its relative frequency response shown in the curve.

back. Since the feedback is infinitely attenuated at  $F_0$ , the full gain of the amplifier is developed at this frequency, falling off sharply on either side.

The choice of actual circuit value is arbitrary, provided the correct relationship is maintained; they should, however, be such that the capacitance of C is reasonably large compared with circuit strays. Values of R in the neighbourhood of 500,000 ohms are suitable.

**Practical Circuit**

Fig. 2 shows the circuit diagram of a typical AF amplifier, and the method of connecting the feedback network to the circuit. Switch S1 should be of the high quality, low-loss type. To simplify wiring, the feedback network can be assembled on a tagboard prior to connection to the amplifier.

The measured frequency response of this amplifier is shown in Fig. 2.

The foregoing filter, though of a comparatively simple nature, is capable of giving a marked improvement in CW reception. A further increase in selectivity may be obtained by the use of feedback over two or more stages, but precautions will then have to be taken to ensure stability.

In the case of two stages, the negative feedback would have to be taken from the output transformer secondary winding; this is necessary to obtain the required phase. Should the secondary be of the usual three ohms impedance, insufficient voltage may be available; a higher impedance secondary or separate feedback winding would then be required.

Over three stages the feedback is taken from the anode of the last stage to the grid of the first; in this case it may be necessary to insert a resistor in series with the "parallel-T" network to avoid instability due to excessive feedback.

It should be noted that the feedback cannot be applied to the cathode of any stage, as in normal feedback practice, since this would impose a load on the network output. The same would apply with any grid circuit fed from a cathode follower or low impedance source.

**References :**

- (1) Terman, *Radio Engineers' Handbook*, McGraw Hill Publishing Co., p. 945.

**Table of Values**

Fig. 2. Circuit of the Audio Filter.

|                                              |                            |
|----------------------------------------------|----------------------------|
| C1, C2 = 330 $\mu$ F 1% or matched           | R3 = 235,000 1% or matched |
| C3 = 660 $\mu$ F 1% or matched               | R4 = 100,000 20% 1/2-watt  |
| C4, C5 = 50 $\mu$ F 10%                      | R5 = 470,000 20% 1/2-watt  |
| C6, C9, C10 = 0.01 $\mu$ F, paper 350v. Wkg. | R6 = 500,000 potentiometer |
| C7, C11 = 25 $\mu$ F electrolytic 25v. Wkg.  | R7 = 4,700 20% 1/2-watt    |
| C8 = 8 $\mu$ F electrolytic 350v. Wkg.       | R8 = 270,000 20% 1/2-watt  |
| R1, R2 = 470,000 1% or matched               | R9 = 27,000 20% 1/2-watt   |
|                                              | R10 = 270,000 20% 1/2-watt |
|                                              | R11 = 270 20% 1-watt       |
|                                              | T1 = IF Transformer        |
|                                              | T2 = Output transformer    |
|                                              | S1 = DPST low-loss Ceramic |

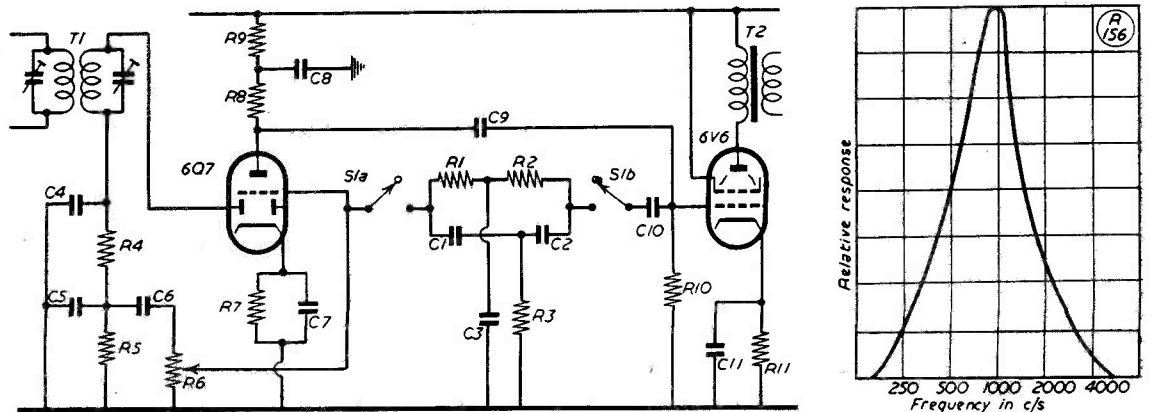


Fig. 2. Circuit of the selective audio amplifier discussed in the article, with a curve obtained under practical conditions. The feedback effect is made to accentuate a CW beat-note, enabling a very good degree of selectivity to be obtained purely on the audio side of the receiver. (The AGC circuit has been omitted for clarity; R6 is the volume control).

# DX COMMENTARY

L. H. THOMAS, M.B.E. (G6QB)

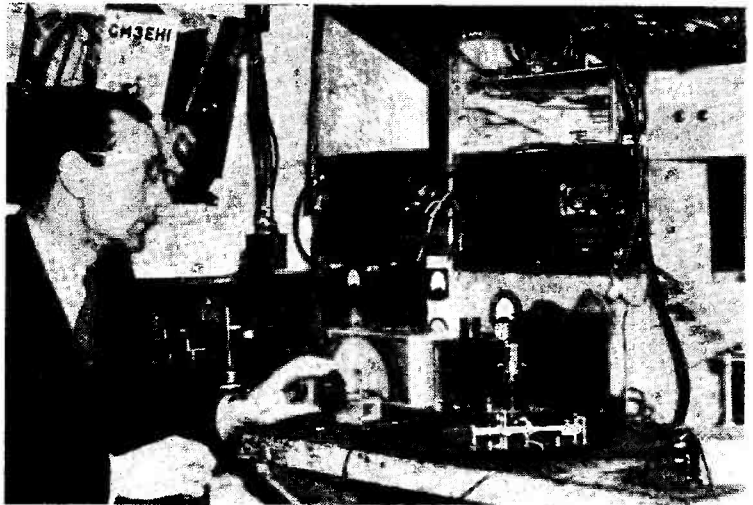
THE air of undying optimism with which we opened last month's Commentary proved fully justified, for once. Instead of letting us down flat on our backs, conditions remained at the same high level that we reported for the week-end of October 16-17. If anything, they even improved. At all events, it is pretty safe to say that we have just had a month of the *best DX conditions* that have been experienced for at least the *past two years*.

The remarkable thing is that this has applied to *all* bands. The Top Band has not suffered while the HF bands have been good, and even the VHF boys have been having a nice party.

Chief surprise, we should say, has been the really excellent state of the 21-mc band. This has turned out much better than we should have expected, bearing in mind the development of the sun-spot cycle and the state of the 14-mc band.

On 21 mc there have been really good signals from Asia and Oceania; the North Atlantic path has nearly always been open; and during a recent week-end session we heard all continents on 21 mc in the space of forty seconds or so. For those who like to check, we refer to the morning of November 7, and the six stations were ZD6BX, VS6CQ, ZL1BY, EA6AU, LU3EL and KP4KD, all coming in together, on almost the same frequency, around 1000 GMT.

But we won't jump the gun, and the full report on this band will appear in its rightful place. Once more we propose to begin at the LF end.



GM3GAB

## CALLS HEARD, WORKED and QSL'd

### Top Band Topics

More big news for Top Band DX'ers, unfortunately received about two days too late for last month's Commentary, was that VS6CQ and ZL1AH made a contact on October 19, between 0955 and 1025 GMT. ZL1AH being 499 and VS6CQ 339. VS6CZ was also heard in ZL at 229. On the previous day the stations had heard each other, but without getting a QSO. VS6CQ was using a B2 transmitter with 25 watts input, an AR88D, and a half-wave Windom. Hearty congrats all round, for yet another link between the continents of the world on the Top Band.

Several Trans-Atlantic crossings, from the U.K., have already been made this season. To quote a few: On October 10 W1BB and W2EQS both worked G6GM (Holsworthy); on October 17 W1BB worked G3PU (Weymouth); and on October 24 several W's worked TI2BX, which, though not Trans-Atlantic, is mighty interesting and gives us

another country to look for this season. YV5FL is also expected on the band, and W5WSF (Missouri) is reported to be active.

### Forthcoming Tests

W1BB is propagating the news on the other side, as always, and he has a new receiving set-up, specially peaked around 1850 kc. with two special receiving aerials. His own signal will be on 1812.5 kc. as usual. He will send reports on the hour and half-hour during the organised Tests, now right upon us. More activity than ever is expected this year, with the *Magazine Tests* (see panel) beginning on December 5 and continuing fortnightly thereafter.

G2BVN (Romford) has had a note from ZC4GF to say that he is active on Top Band and is particularly looking for G contacts.

So much for the real DX aspects of Top Band—and now to the GDY and semi-local excitements, which still attract a lot of customers.



### TRANS-ATLANTIC TESTS 1954-55 SEASON

#### Dates:

December 5 and 19, 1954  
January 2, 16 and 30, 1955  
February 13, 1955

#### Times:

##### 0500-0800 GMT

DX stations call at 0500-0505, 0510-0515, 0520-0525, and so on. Europeans call 0505-0510, 0515-0520, 0525-0530, and so on. Clocks should be synchronized by WWV on 2500 kc.

#### Frequencies:

Europeans in band 1825-1875 kc, preferably keeping to 1830-1870 kc. W/VE stations, according to location, will be in bands 1800-1825 kc, 1875-1900 kc and 1975-2000 kc. They will know where to look for us, and contacts should be carried out cross-frequency to minimise interference. All Europeans are asked to keep clear of the DX channels.

### Chasing Counties

E18J (Dublin) has worked 37 counties, but has only 15 confirmations! This is a bit hard, as he QSL's all his own contacts without fail. G3JJZ (London, S.E.6) has pushed up his score with GM3GUS and GM3EHI.

G2CZU (Bath) goes up to 44/45, although his all-time total is 62. G16YW (Belfast) is now in the nineties with his figure of 91/91, after which the going is decidedly hard . . .

G3JHH (Hounslow) was working GW5BI in September, and didn't think anything special of it until a card arrived from ZC4CA, who heard the whole QSO and sent cards to both stations! Other new ones were GM3UM (Midlothian) and GM6RI (Angus), with OK1KBZ for the sixth OK contact.

G3IGW (Halifax) has little to report, but suggests that there might be a demand for a short 160-metre phone contest. We will certainly lay one on, if the demand does warrant it—what do readers think?

G2HKU (Sheerness) had a letter from OK1KTI expressing the desire to take part in MCC and the Trans-Atlantics. We hope he did show up in MCC, and, of course, the Trans-Atlantics are free for all.

G3JBK (Bexleyheath) found it rather a dead month, but thinks

things were improving greatly just before the deadline. He remarks on the terrific signals from GM3JDR, right up in Wick—as Wick Radio, GKR, is also a terrific signal, it must be something to do with location!

G3BRL (London, W.5) worked Cambs. a long time ago but never received a QSL. The Ealing group having produced some nice portables for a Low Power Field Day, he prevailed upon some keen operators to combine a week-end joy-ride with a Cambridge QSO. So, with the co-operation of G5SX, G3IRB and G3ISM, the idea came to life, and G3IRB/P came on the air from the wanted county. The QSL was handed over, with due ceremony, at the local group's next meeting. (So . . . if you never received that card from KM6 or UAØ, you know what to do. It's quite simple, really).

G5AO (Hove) claims his WABC with 61/64, and sends his thanks to the various "expeditionaires" who helped him. He adds "Never despair about QSL cards—I have just received one from LU2AX for a QSO on August 8, 1938."

G6VC (Northfleet) is lying in wait for Anglesey, but beginning to wonder if there is such a place . . . G3ITY (Chester) will be on

the band six evenings a week (not Tuesdays) from 1900 until 2300. phone and CW, around 1838 kc. He will QSL all contacts, but will be chasing mostly for GM and GW counties.

Last month's paragraph which mentioned lots of Top Band stations calling VP4LZ prompts G3HZM (Manchester) to ask how many stations call someone that they can't hear, just because others are doing the same—and why? Presumably the bait is that they *might* have a better signal than the other fellows, and the DX station *might* possibly reply to them. But if they can't hear him, what then?

### Eighty Metres

There is less DX activity on *Eighty* than on any other band—and who can wonder, after listening round the LF end most evenings? However, a few patient souls do pull something out of this very strange bag. DL2RO (Hamburg) reports that ZS3K turned up at 0420 during the DX Contest, but what took the polish off this one was his S7 signal! 'RO also states that the "LX1CW" who has recently been active on the band is a pirate. The *real* LX1CW hopes to get back on the air, if only to contact this other one and



“. . . 'Mbonga-Mbonga only gibben us T7 . . . .”

thank him for the flood of QSL cards that he has caused.

G2YS (Filey) worked LZ1KAB for a new one, and heard OD5LX. G5BZ (Croydon) collected LZ and SU for two new ones. G3HWF (Yatesbury) operated on Eighty only during the CW section of the DX Contest, and raised 32 countries in 7 Zones. Among them were FA, IT, 9S, LZ, 4X, KP4, ZL and lots of W's. The total for the band is now 51 countries, worked in a few months. HWF says the W's were still 579 as late as 0830 on the Sunday of the Contest. He is now talking of returning to the Top Band, after broadcasting hours. BCI normally keeps him off that band!

G3JJZ continues to plug away with his QRP (12 watts), raising some of the European DX, but finding it rather hard work.

#### Forty Metres

Not much to report from *Forty*, although the band has certainly been open. The trouble is that the more it is open for us, the more troublesome does all the miscellaneous seaweed become. There are times when there isn't room for another pin in that cushion!

G5BZ kept it busy with VK, ZL, W, EA9DF, EA9AP and others. G2YS managed to raise OD5LX, EA9AP, LZ's, 4X's and LX1AS, whom he suspects might be phoney.

DL2RO finds the band much improved, and says it's worth watching after 2100 GMT and during the period 0700-0830. He has worked Y12AM, AP2K, KP4's, KV4AA and VP2KD, the latter an all-time new one. Others heard are ST2AR, ST2NG and VP7AM, although the latter says his QTH, of all places, is Trans-Jordan. During the morning periods ZL's and W's are good, and YV5DE and YV5ES are also consistent around 0800 GMT.

#### The DX on Twenty

And so to *Twenty*, where anything can happen, and generally does. Our own impressions are gained from spasmodic operating periods at all kinds of different hours on different days. They include the following: Wonderful

"hollow" signals from W6 and W7 around 1600-1700; a KR6 at 0900 with a terrific echo much louder than the signal itself (coming over the long path *via* South America, in other words); W2BCR at 1400 every day, always S9 with a healthy echo, but the right way round; an occasional welter of Far East stuff around mid-day, including JA, KA, KR6, VS6, VS1, AP, XZ and VK9.

Nice ones for G4ZU (Croydon) were VS4HK on phone, and VQ6LQ and VK9RH (Norfolk Is.) on CW. G6VC also landed VQ6LQ, who is very active around 14065 most days.

G5BZ reports VQ6LQ, T12BX, LU8ZS and "the usual stuff." DL2RO describes VQ6LQ as "dominating the band" and says that VK1DY and VK1PG were both on, but too close in frequency to the VQ6, so that they came under the barrage of calls addressed to him. Then, to crown everything, DL4MW started up his traffic-working to the States, right smack on top of VK1PG.

Many others mention the odd DX contacts on *Twenty*, but nothing of terrific interest is reported.

#### Fourteen Metres

There is no doubt about the Star Turn this month. *Fourteen*, or 21 mc, or the "new band"—call it what you will—has been the DX-hunter's paradise at week-ends. It's a pity that activity seems to be at such a low level all the week, but from early Saturday morning onwards there are no complaints.

We have already commented on hearing all continents almost simultaneously, and many others report the same sort of thing.

Several new countries have shown up, and the top scores are now well above the century. G4ZU sits atop the ladder, and some of his new ones were FY7YC, ZD3BFC, HK4DF, VS2UW, HP3FL, VK6BS, HA5KBA and EA0AC—all on phone. Gotaways were OY5GU and VK9OK.

G2YS collected ZS9I and LZ1DKP; DL2RO rolled in six new ones, comprising VS6CQ, CO2MO, ZD6BX, YV1AB,

PJ2AA and VP5SC. He now wants one for the century.

G5BZ worked a whole lot of DX, including PJ, VS6, 4S, ZD3

### TOP BAND COUNTIES LADDER (Starting Jan. 1, 1952)

| Station | Confirmed | Worked |
|---------|-----------|--------|
| GM3OM   | 93        | 95     |
| G2NJ    | 91        | 91     |
| G16YW   | 91        | 91     |
| G5JM    | 91        | 91     |
| G3HIS   | 90        | 91     |
| G5LH    | 87        | 87     |
| G6VC    | 87        | 87     |
| GM3EFS  | 85        | 86     |
| G3HDQ   | 84        | 85     |
| G3CO    | 83        | 84     |
| G3IEQ   | 81        | 86     |
| G3JEL   | 81        | 85     |
| G3HIW   | 79        | 86     |
| G3IVH   | 79        | 83     |
| G3JML   | 78        | 80     |
| G3EUK   | 75        | 82     |
| G3BRL   | 75        | 76     |
| G2AYG   | 73        | 74     |
| G3HYJ   | 71        | 77     |
| G3FTV   | 69        | 79     |
| G3JHH   | 67        | 69     |
| G3HTI   | 66        | 70     |
| G3GYR   | 64        | 66     |
| G3IOX   | 63        | 74     |
| G3JKO   | 63        | 69     |
| G3HQX   | 63        | 68     |
| G3IGW   | 62        | 76     |
| G3GZB   | 62        | 62     |
| G3GSZ   | 62        | 62     |
| G5AO    | 61        | 64     |
| G3DO    | 61        | 64     |
| G2CZH   | 60        | 62     |
| G3IND   | 60        | 60     |
| G3ITY   | 55        | 70     |
| G3HZM   | 55        | 59     |
| G8VG    | 50        | 60     |
| G3JJZ   | 48        | 54     |
| G2HKU   | 48        | 50     |
| G2CZU   | 44        | 45     |
| GM3JNW  | 43        | 56     |
| G3JBU   | 41        | 45     |
| G3JZQ   | 29        | 39     |
| G3JBK   | 27        | 40     |
| G3HMF   | 22        | 28     |
| G3JKM   | 17        | 37     |
| G3IAD   | 15        | 50     |
| E1BJ    | 15        | 37     |
| G3FTV/A | 13        | 60     |

(Phone), ZS9, HC, OA, OQØ  
(Phone), CP, VP6, ZD6, AP, YV,  
CE, VP9 and many others.

G3HCU (Chiddingfold) kept going on phone only, and winkled out six more in the persons of 3V8AX, EA9AR, HA5KBA, OK1FC and SU1AS. Other contacts included six VK's, two ZL's, five VQ4's, three VQ5's and a whole mob of ZS's. Although these contacts were all on phone, there is no need for the CW man to worry. CW activity is increasing greatly, and many nice ones are there if you can raise them. Our own long wire seems to be rather down on some of the beam experts, but once the beamers have had their contacts the rest can generally break through!

New ones particularly noted on CW (most of them worked on the said long wire) were OA4C, XE1PJ, ZD6BX, VS6CQ, EA6AU, ZS9I, VP6CJ, LZ1KDP, EA9AP, AP2K and numerous VK's and ZL's. All these were around in the morning, before the North Atlantic path opened. There did not seem to be much variation in conditions over the five week-ends between October 16 and November 13, unless, possibly, November 6-7 was the best of the lot.

### Ten Metres

One solitary 10-metre report is to hand, from G3IDG (London, S.W.12). During the month he logged 17 countries and heard 42 different G stations on the band. (Remarkable that not one of them seems to have anything to report?) G3IDG's countries were CR6, CT, CX, DL, EA, FA, G, I, LU, OQ5, PY, Trieste, VQ2, VQ4, YU, ZD3 and ZS. He has now heard, in all, 142 countries on 10 metres.

### News from Overseas

G4ZU tells us that G2KU is now in Brunei for a couple of weeks, then proceeding to Sarawak . . . any news? ZL2ADS (Wanganui) reports that Twenty is opening up nicely for Europe, and suggests that G's with rotary beams should try both short and long paths. The change-over is erratic and sometimes very rapid.

ZB1EB (Luqa) reports that ZB1HS is back in England by now, and that ZB1AH is also due



Station ZS5NZ, Weenen, Natal, where the PA input is 100 watts and the receiver an Eddystone S.750. The steering wheel at lower right is for the 3-element rotary beam!

to return home. 1EB himself stays on Twenty and Forty, as he finds the noise on Eighty a bit much. ZB1LU and ZB1JY are "reinforcements," together with yet another RAF type who has not yet received his call.

Frank Anzalone, who used to be W2WC, has moved to Stamford, Conn., and is now on under the new call of W1WY after holding the old one for 25 years. The funny thing is that he used to be W2WY, back in the '20's. He hopes to operate on Top Band again this winter and has already got up a 400-ft. wire. At present he is only using his exciter (30 watts on 80 metres)—and he worked a G on this during the DX Contest.

VS2DJ is now in Manchester, and states that anyone who worked that call after April 18

last worked a pirate. He has been receiving sundry cards, dated after the day on which his rig was crated!

W2GT (Rochelle Park) missed out on SVØWK/SV9, and also on HKØAI, both of which hurt him a lot. He is very keen to know whether anyone has a line on PK4KS, whose picture appeared in our September issue. 'GT had many pre-war QSO's with him and has been hearing strange rumours about him since the war. Letters and return postage for an air mail reply have brought nothing. Has anyone any gen.? HKØAI's QTH, for those who want it, is Victor Abrahams, San Andres Island, Colombia.

MB9BJ (Graz) is licensed as a Club station, and operated by 14 members on Twenty only, using 35 watts to a dipole. A modu-

lated amplifier running 70-100 watts is under way, and should be ready by Christmas. Some 50 countries have been worked since May, and QSL's are always sent if asked for. Twenty-metre types who get the impression that MB9BJ is never off the air are about right—he operates 18 hours a day for 365 days a year!

VE2ATU, of Montreal, is ex-G3AUT of Rugby, and hoping to get on the air shortly for QSO's with home. ZL2GX is good enough to write us a line of thanks for the publicity given in "DX Commentary" to the recent VK/ZL Contest, remarking that conditions for it were not at all good. But the activity was there.

#### General Chat

G3GKH, ex-ZL3QC, is aboard the T.S.S. *Malayan Prince*, doing five-monthly round-the-world voyages. On the last trip he spent some pleasant hours with VS6CP and also with a few W6's in Los Angeles. In mid-Atlantic he bumped (not literally!) into Harry Lawton, of Huddersfield, in the M.V. *King Neptune*, and 73 were exchanged. (Harry Lawton had some interesting things to say in these columns two months ago.)

G3JXK is 4th radio officer on the troopship *Dilwara*, and still has hopes of being able to operate while at sea. He has an Eddy-stone 840 with him, and intends to listen on the Top Band this winter. Visits have been paid to EA8 and VP4, with a listening watch kept on 21 mc. In VP4 there were strong signals from EA, EA9, CT, F, DL, OE, SM and the like, but hardly a scratch from

G-land, either on phone or CW. Further itinerary seems to land G3JXK in Aden, around December 5, Hong Kong December 19, and Kure January 2. If anyone wants reports they are asked to specify time and frequency and drop an air letter to G3JXK—if they will send it to "DX Commentary," unaddressed, we will forward it to the particular QTH in 'JXK's list which applies at the relevant time.

On the subject of /MM's, we did hear a station on 21 mc signing "G7DW/MM"—but treated him with the usual caution!

G5LH (Horbury) is now set up on all bands from Ten to One-Sixty, band-switched and TVI-proof, and hopes to put up an extended double Zepp as a multi-band exhaler.

#### DX Strays

G2RO's DX tour proceeds. During November he was in Fiji as VR2RO. Until December 7 he should be signing VR4RO from the Solomon Islands, and between December 30 and January 10 he will become VR1RO in the Gilbert and Ellice Islands. VR5RO, Tonga, is another possibility.

Another station in the French Cameroons is due to start up in January, when FF8AN becomes FE8AN. There is also a chance of further activity from KC4, Navassa, during 1955, but probably not until the summer.

In the Southern California DX Club's *Bulletin*, always crammed with interesting DX news, we find a report of VR2BZ's recent expedition to Tokelau. ZM7: Trips are scheduled to take place every

### 21 mc MARATHON

(Starting July 1, 1952)

| STATION        | COUNTRIES |
|----------------|-----------|
| G4ZU           | 112       |
| G5BZ           | 108       |
| VQ4RF          | 108       |
| G4ZU (Phone)   | 108       |
| GW3AHN         | 106       |
| DL2RO          | 99        |
| G2WW           | 98        |
| G3HCU (Phone)  | 94        |
| G2BW           | 92        |
| G6QB           | 82        |
| GW3AHN (Phone) | 81        |
| G2BJY          | 81        |
| G2VD           | 80        |
| G2YS           | 78        |
| G3DO           | 74        |
| ZS2AT          | 70        |
| G3FXB          | 65        |
| ZB1KQ          | 64        |
| G3CMH          | 64        |
| ZB1KQ (Phone)  | 63        |
| G3CMH (Phone)  | 62        |
| 5A2CA (Phone)  | 60        |
| GM2DBX (Phone) | 42        |

three months by Sunderland F/B, of which VR2BZ is radio and radar operator. VR2BZ/ZM7 was using only 5 watts from an army transceiver running on a 12-watt battery, so don't worry if you didn't hear or work him. He is also interested in a possible VR5 trip.

From the same source we find that EA9DF hopes to go to Ifni, that another expedition to Cocos (TI9) is a possibility, and that VK1AC (Macquarrie) will shortly be VK31B once more.

#### Round Again!

It seems incredible that we have practically reached the end of another year already. As you get older time goes much more quickly! In fact, it won't be long before this Commentary has seen the passage of one complete sun-spot cycle! The past year has presumably been comparable with 1943, of which we know little.

FIVE BAND DX TABLE  
(POST WAR)

| Station | Points | Countries |         |          |          |          | Station | Points  | Countries |         |          |          |          |    |     |
|---------|--------|-----------|---------|----------|----------|----------|---------|---------|-----------|---------|----------|----------|----------|----|-----|
|         |        | 3.5<br>mc | 7<br>mc | 14<br>mc | 21<br>mc | 28<br>mc |         |         | 3.5<br>mc | 7<br>mc | 14<br>mc | 21<br>mc | 28<br>mc |    |     |
| DL7AA   | 649    | 85        | 154     | 216      | 90       | 104      | 221     | G2YS    | 397       | 55      | 75       | 143      | 78       | 46 | 160 |
| G6QB    | 598    | 52        | 108     | 221      | 82       | 135      | 235     | G2BW    | 360       | 24      | 57       | 144      | 92       | 43 | 161 |
| G5BZ    | 573    | 62        | 111     | 227      | 108      | 65       | 230     | GM2DBX* | 337       | 27      | 31       | 156      | 42       | 81 | 167 |
| G2VD    | 511    | 48        | 94      | 180      | 80       | 109      | 189     | ZB1KQ   | 284       | 6       | 34       | 118      | 64       | 62 | 139 |
| G4ZU    | 499    | 12        | 45      | 210      | 112      | 120      | 214     | G8VG    | 280       | 36      | 76       | 124      | 18       | 26 | 141 |
| G2WW    | 488    | 23        | 70      | 190      | 98       | 107      | 198     | G3IAD   | 207       | 26      | 83       | 93       | 4        | 1  | 125 |
| G3DO    | 449    | 24        | 46      | 198      | 74       | 107      | 222     | G2DHV   | 177       | 20      | 23       | 108      | 11       | 15 | 112 |

\* (Phone)



At the summer meeting of the Bavarian group of the DARC (German Amateur Radio Society), in Munich. In the front row, from right to left: OE3RE, F9DW, DL1WA (president, DARC), HAXD, DL3DC, DL1JB (secretary, DARC), DL3FM (of VHF fame), and DL3JE. It is not known if any G's were present on this occasion, which coincided with an exhibition in Munich in July.

most of us having been rather too busy to bother about DX at that time; but there certainly has been a terrific improvement during these last months, and at least we know that we have some mighty interesting times to look forward to.

With these cheerful thoughts uppermost in our mind, we recollect that this is the last time we

shall be seeing you before Christmas. So, although the festive season is still some way off, we wish you all "MX" with the heartiest greetings that print will carry. May your DX continue to improve; may your tree be festooned with ZM7 and VR9 cards; and may all your stockings be filled with 150-watt rigs, fully TVI-proofed.

Deadline for the next issue is first post on Thursday, December 16, certain, addressed, as usual, to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. It will be essential to catch this date, because of the holiday dislocation. Until the next issue, then, we say "Merry Christmas. Happy New Year—and BCNU with all possible 73."

#### "IDXL SINCERE VYFBDX"

While not trying to be humorous at the expense of that extraordinary circular so many people have received recently—after all, we could not start to write the same sort of thing in Japanese—we would nevertheless counsel readers to reflect that they are being asked to send a subscription to an anonymous body with a Kyoto box number address, in support of a proposed organisation for which there can be no possible need, even if it did not originate in Japan with its proceedings apparently to be conducted in pidgin-English. Anyone who falls for this will be strong for "the international goodwill" through "More Funny DXing"—or is looking for a good laugh at the rate of 30 IRC's (or two American dollars) for "Regurar membership."

#### RADIO AMATEUR CALL BOOK

The Fall (Autumn) edition of the *Radio Amateur Call Book* is now available, in the usual two versions—complete, and also less the American listings. The 22-page G Section of the *Call Book* is the largest yet published, containing in its 64 columns the addresses of 8,000 licensed amateur stations in the British Isles; all QTH's and changes of address as notified in the "New QTH" feature in *Short Wave Magazine*, up to and including our July 1954 issue, are included in the new *Call Book*. The full edition costs 27s. post free, and the abridged edition (covering the whole world less *only* the Americans) is 10s. post free. Immediate delivery on order to: The Circulation Manager, *Short Wave Magazine*, Ltd., 55 Victoria Street, London, S.W.1.

# TRANSISTOR TOPICS

## An Historical Note

### Practical Local Calling Circuit

ALTHOUGH transistors, as we know them today, were invented in the Bell Telephone Laboratories in 1948, similar devices have appeared in the past. As early as 1910, W. H. Eccles demonstrated to the Physical Society a galena crystal oscillating. M. Podliasky, writing in *Radio Electricité* in early 1924, describes a similar device. About the same time the Russian O. Lossev (possibly in collaboration with M. Podliasky ?) was getting TTX results over a mile or so. It is difficult at this distance of time to get the full facts, but there seems little doubt that the old maxim, "There is nothing new under the sun," still holds! We hope to repeat some of these earlier experiments as a matter of historical interest, and the results will be published in due course.

The possibilities of a calling circuit were suggested in "Transistor Topics" in the September issue of *Short Wave Magazine*. By this we envisage a small box of simple electronics which will, to a greater or lesser extent, fulfil the following conditions:

- It shall be capable of setting off an alarm to indicate that a local station has come on the air and wants a QSO.
- Can be left running for indefinite periods without appreciable cost.
- Can be left running for indefinite periods without attention.
- Can differentiate between wanted and unwanted signals.

It is quite conceivable that such a device could be made using valves. For example, a relay in the S-meter circuit could be arranged to close when a local station came up on the frequency. This would mean, of course, that the receiver would be left on for long periods so that condition (b) is not fulfilled. It is the fact that transistors are so well suited to meet this condition that has led to a serious investigation along these lines.

In the apparatus to be described, the total drain under quiescent conditions is less than 25 mW. The

### Table of Values

Figs. 1 and 3. Transistor Calling Circuit.

|                                 |                          |
|---------------------------------|--------------------------|
| C1, C3 = 50 $\mu$ F air trimmer | up from earthy end       |
| C2 = 500 $\mu$ F tuning         | A/2 = Stripped 3,000-ohm |
| C4 = See text                   | relay, pair close-       |
| R = 1,000 ohms                  | circuit contacts (see    |
| VR1 = 1,000 ohms                | text)                    |
| VR2 = 25,000 ohms               | G = G.E.C. GET-1 point-  |
| RFC = 2.5 mH RF choke           | contact transistor       |
| L = Coil for 1.8 mc             | M1 = 0.5 mA meter        |
| band, tapped 1/5th              | M2 = To read 0-10 volts  |

## N.P.L. Demonstration Report

### TTX News and Activity

other results look hopeful, although (c) has not been fully proved yet, nor has any fancy scheme for (d) been tried. The apparatus responds to any signal on the right frequency of strength equal to or greater than the wanted one.

### The Circuit

In starting anything new, and mostly anything to do with transistors is new (but see para 1!), the simpler the circuit the better. To gain experience and to get some facts and figures, the circuit in Fig. 1 was evolved.

**Mode of Operation** To understand the mode of operation of this circuit, it is necessary to grasp the effect of the base resistance VR1 in the diagram. A few curves (see Fig. 2) have been plotted to illustrate this, using the set-up shown in Fig. 3. The main point to notice is that if the base resistance is increased beyond a certain value, a very rapid increase in collector current results. The slope of the curve is even negative at some points. In fact, with  $V_c$  about 4 volts, a slight increase of base resistance above 700 ohms causes the collector current to jump from 1 to 3 mA. The reason for this has already been explained in "Transistor Topics" (p.164.

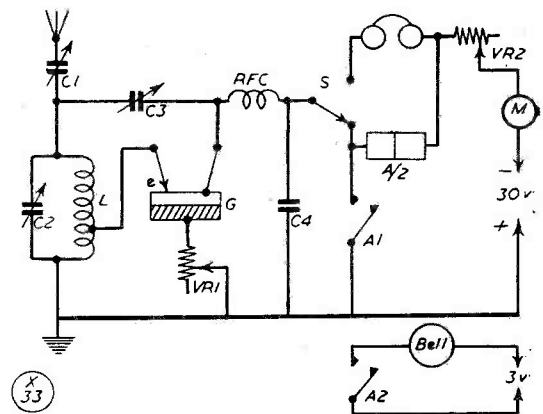


Fig. 1. Circuit of the local calling device, which is basically a transistor receiver; it can be so adjusted that the relay will close and ring a calling bell when a local 160-metre station comes up on the frequency. Thus, the arrangement can be used as the basis of a calling system on a Top Band net. With the circuit as shown, reliable operation is being obtained at distances of about a mile. Taking an input of 25 mW and allowing for continuous running, with mains electricity at 1d. a unit, the cost of operating such a device would be less than a halfpenny a year!

May issue *Short Wave Magazine*) in connection with the base-tuned oscillator. The action is this: A current flowing through the base resistance will cause a positive bias to be applied to the emitter. This, by virtue of the transistor action, will cause a greater current to flow through the collector. The collector current passing through the base produces a further increase in bias, and so on. Given the right conditions, the process is cumulative, and up goes the collector current to a value only limited by the series resistance in the collector circuit. It is important, for the safety of the transistor, that, in any circuit of this type, the maximum possible current is within the permissible limits quoted by the makers. Between 5 and 10 mA would be a safe value for a home-made transistor.

In the circuit of Fig. 3, the resistance in the emitter limits the emitter current, and more rapid and extensive changes are possible if it is reduced. The foregoing does *not* apply to junction transistors, as they have an  $\alpha$  of less than one. The actual curves were taken on a GET-2, and they would be different in value though similar in shape for a GET-1, such as is used in Fig. 1.

An external change in the emitter current will also produce a change in the collector current, bias and working point. If the operating point is set just below the sharp rise, a *very small increase in emitter current will produce a relatively enormous increase in collector current*. A tuned circuit feeding the emitter may be regarded as a simple crystal receiver (the emitter-base being the crystal diode). If tuned to a signal, a small rectified current flows which will cause an increase in collector current. If this is sufficient to take the collector current round the bend in the curve, it is possible to get changes of several

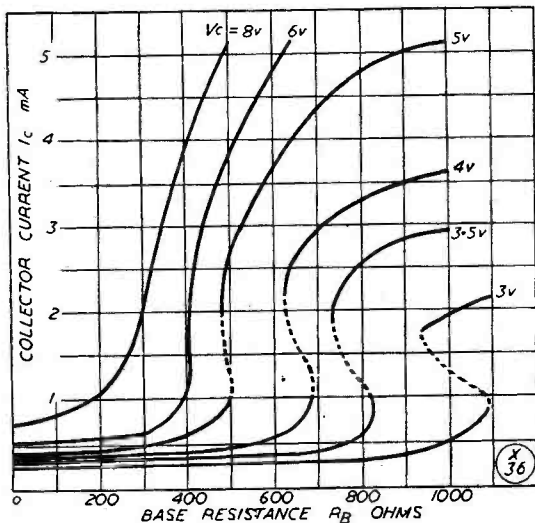


Fig. 2. These curves show how the base resistance in a point-contact transistor circuit influences the collector current. The sudden changes can be made to operate a sensitive relay in the collector arm of the transistor. The transistor used to obtain these curves was a GET-2, and the effect illustrated here is that which makes the calling circuit of Fig. 1 a practical proposition.

### SPTTX DEMONSTRATION FOR N.P.L.

Arising from correspondence between the Editor of *Short Wave Magazine* and Sir Edward Bullard, Director of the National Physical Laboratory, Teddington, Mr. A. J. Garratt of the N.P.L. visited Buckingham on Wednesday, October 27, for the purpose of witnessing a demonstration of the G3HMO daylight-powered transistor transmitter.

Fortunately, the sun was shining fairly strongly, and the photo-electric cell battery was giving ample output—about 2 mA at 4 volts—to energise the transmitter. Having made his own observations and measurements, Mr. Garratt then listened to two-way CW contacts with G5RZ (Leighton Buzzard, 15 miles) at 1505, and with G3IYX (Bradwell, Bucks., 7½ miles) at 1515 GMT. The daylight-powered transmitter signals on 1820 kc were reported as RST-559 in Leighton Buzzard and RST-569 in Bradwell.

These contacts, though pre-arranged, were initiated on the transistor transmitter running on the photo-cell battery alone, and were carried through under normal band conditions, with quite troublesome interference on the frequency.

On behalf of the N.P.L., Mr. Garratt expressed himself as entirely satisfied with the Test, and this account of the demonstration—given by J. M. Osborne, M.A. (G3HMO) and Austin Forsyth, O.B.E. (G6FO), Editor of *Short Wave Magazine*—has been approved for publication by the Director of the National Physical Laboratory.

milliamps—more than enough to close a relay.

It should now be clear how the circuit of Fig. 1 operates. The resistance VR1 is set so that the current is a little below the steep part of the curve. On tuning in a carrier, an increase in collector current is noticed, which is dependent on the strength of the carrier and the setting of VR1. By judicious adjustment of VR1, a setting can be obtained which will close the relay when tuning in the desired carrier, but which will not work on weaker signals.

**Relay.** The relay used for the job has been made fairly sensitive and closes at about 1 mA. To enable consistent operation, two contacts are employed, A1 and A2—see Fig. 1. A1 closes first and is wired so that the relay by-passes the transistor and increases the energising current. This pulls the relay hard over, which closes A2 securely and rings

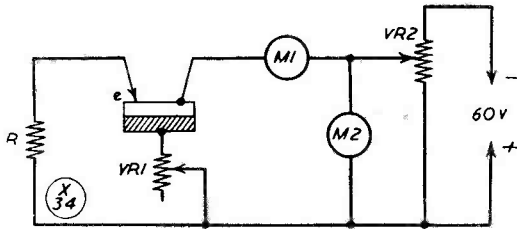


Fig. 3. The set-up used to take out the curves plotted in Fig. 2. The apparatus is based on the Transistor Tester and Processor described in our April issue, with a calibrated resistor incorporated in the base arm.

the bell. If A1 was used alone to operate the bell, the very small energising current might not be sufficient to get reliable contact.

The relay is a standard PO type stripped from a piece of "surplus" equipment. It has a 3000-ohm coil. To get the desired sensitivity, all unnecessary contacts were removed and the remaining two carefully adjusted so that A1 closes before A2 has any pressure acting on it. The relay was mounted vertically, so that the weight of the armature assisted the closing of A1; it operates on 1 mA, and A2 is firmly held by 3 to 4 mA through the coil.

#### Setting-up Procedure

First set VR2 to pass about 0.6 mA. Then increase VR1 until the current starts to rise gradually to about 0.7 mA or so. Any further increase will bring about that sudden jump in collector current to 2 or 3 mA. Back-off VR1 to a little below this critical point. With phones on, the circuit becomes a simple receiver and the station required can be tuned in the normal manner. A little reaction may be applied by means of C3, but it should not be brought too near the point of oscillation. While tuning through the signal, increases in collector current should be observed, and these should be brought to a maximum by adjusting the aerial coupling. Bringing the aerial itself to resonance by means of a separate aerial tuning circuit also helps in bringing up the desired signal.

The relay is now switched in to replace the headset. With a good aerial-earth system, big enough changes to close the relay are obtainable from local amateur stations on the 160-metre band—and also, for help in setting up, from local broadcast stations. To find whether the signal is having the desired effect, either tune through the signal or, if the tuning has been set, open and close the aerial switch. To reset after the relay has been triggered, interrupt the battery and, if necessary, reduce VR1.

The key to success is the correct setting of VR1, and ideally it should be a good variable resistance with a graduated scale.

**Reliability.** While the circuit has been proved in practice, it has not been tried over long periods. The possibility of serious drift in working conditions, particularly that due to changes in room temperature, has yet to be investigated.

Once or twice unaccountable false triggering has

been noticed, and it is believed that static or switching transients in the house mains may have been responsible. It is possible that a suitable condenser C4, as indicated in Fig. 1, may help to eliminate the effect of peaky interference. Preferably, it should not by-pass all audio, however, as full modulation of the calling station's carrier is sometimes helpful in getting the alarm to go.

There are all sorts of possible lines of development to improve selectivity and reliability. G3CCA (Leicester) has been doing some very promising work on calling circuits and with a two-stage receiver, HF and Det., using GET-2's, he has found that he can get a change of 0.4 mA from G31ZS at about 1½ miles. This is to be amplified by a DC-coupled stage to operate a counting circuit which will trip the relay on the right count. The calling station makes nine dashes of two seconds each and the relay will go over.

This will operate:—

- (1) A small transistor audio oscillator feeding a speaker.
- (2) The main receiver switch.
- (3) The main transmitter switch.

Any reader who has had experience of such devices or who has any brain-waves along these lines is invited to send them in. The techniques used in model control may prove useful. The next step, however, at the writer's station, will be to build a

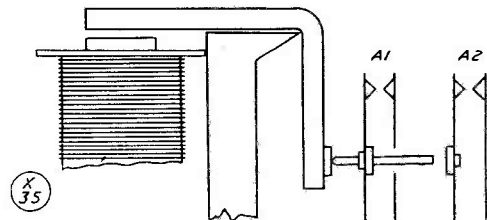


Fig. 4. Close-up of the contact adjustment for the relay used in Fig. 1, which is an ordinary 3,000-ohm GPO type with all unnecessary tongues removed. The first contact A1 makes on 1 mA and is used to increase the energising current in order to close A2 more securely; the warning or calling circuit—which can be a bell, lamp or buzzer—is wired across A2.

small power-pack so that the device may be left on continuously (except for Sunday afternoons!). A small 30-volt transformer, a metal rectifier and a few condensers are all that are required for the power unit.

#### Transistor Activity

G31YX is still active with his original transistor (an STC type) in the transmitter, and tests with an OC50 have not proved successful. The STC transistor has had an interesting career and had been ruined before ever being used on Top Band. G31YX succeeded in reforming it with 32  $\mu$ F charged to 67½ volts. Initially, the input of 40 mW gave good results, but, after some full-power trials, it was found that reducing the input from 85 mW to 50 mW resulted in the report from G6FO (7 miles) dropping



from S6/7 to S3. In fact, the transistor will no longer oscillate on less than 50 mW.

G3CCA has improved the superhet receiver by incorporating an S-meter and a calling circuit which responds to a 1000-cycle tone for 5 seconds. He says that G3IZS also has a calling circuit using a GET-2. Unfortunately, he gives no details of the results and circuits; comparison with the practical circuit as described in this article would prove interesting. G3CCA suggests that we should publish details of all known active TTX stations, somewhat on the lines of the 70-centimetre station list in "VHF Bands." We are quite willing to do this if operators interested will send us in full details of their TTX and receiving equipment.

The Leicester group still continue to call "CQ-TTX" on 1850 kc and look for replies plus or minus 15 kc. G3CCA is also operational on 14 mc and has made local contacts. He hopes to get DX results (Trans-Atlantic?) soon.

G3CSZ (Birkenhead) is successfully on 7010 kc with one of his home-made transistors, and has worked G3FOO locally; some tests with the transistor working CO/Doubler to 14020 and CO/Tripler to 21030 kc, were not so successful. Though there was some RF indication, it was not sufficient to be discernible at G3FOO. However, as G3CSZ points out, these negative results are not the last word, because even local QRO signals attenuate considerably on the HF bands, and it is often a matter of having the right sort of aerial. G3CSZ accordingly has in mind a 100 mW transistor transmitter for the improving HF DX conditions.

On the 160-metre band he has now worked a total of 12 different local and semi-local stations, and finds he can hold his own on the Wyrall Net. Incidentally, G3CSZ remarks that he always tunes up his TTX on the S-meter of his communication receiver, in the BFO-off condition; a very good indication for correct output adjustment is given by this method. G4AP, involved in moving, hopes to be active again in a few weeks from now.



"... Am on candle-light here OM ..."

The Contact Table will appear again as soon as more information is received. Unfortunately, we are lacking details of many interesting QSO's. TTX'ers are asked to look back to the Table on p.390 of the September issue of *Short Wave Magazine*. We should be grateful if readers who mention any TTX contacts—their own or others—would give with their report all relevant information for inclusion in the Table. Even interesting short-distance QSO's can be included, for the Table is not, repeat not, competitive.

The last date for reports to be included in the January issue is December 15. All reports of activity with transistors, home-made or commercial, news of TTX contacts (and requests for phosphor bronze wire) should be addressed to "Transistor Topics," c/o The Editor, *Short Wave Magazine*, 55 Victoria Street, London, S.W.1.

### ROBERT FORD, AC4RF

Many readers will recall that when the Chinese Communists annexed Thibet at the end of 1950, there was grave anxiety as to the fate of Robert Ford, AC4RF, a British subject and an ex-RAF wireless operator employed by the Thibetan government. He was taken prisoner by the Chinese, and held on the usual vague charges, to which it was later alleged that he had "confessed." In the middle of 1953, Robert Ford was known to be alive in Chungking, and since May this year his parents (who live in Burton-on-Trent) have had one letter from him. Recently, the matter was raised in the House of Lords by Lord Vansittart, who asked what was being done by the British Government to effect Ford's release. The reply for the Government was

by Lord Reading, who said that the case had not escaped attention and that, in fact, since November, 1950, representations on Robert Ford's behalf had been made to Peking on no less than twenty separate occasions, the latest being in October of this year. When Lord Vansittart suggested that economic pressure might be put upon the Chinese to expedite matters, the reply was that "If there was anything substantial to be done in that way, it would have been taken into account."

During the period prior to November, 1950, AC4RF was active from Lhasa on the DX bands; QSL cards from him are of more than usual interest. It is much to be hoped that this intrepid young man, who is only 26, will soon be released.

# Letters to the Editor

Letters published are those which seem to us to be of general interest, but should not be read as necessarily being in accordance with our own views on the subject. We welcome readers' comments.

## "LINES OF THOUGHT"

SIR.—In his article in the November issue, A.J.D. asks, in effect, "why not the 829 for a PA stage, instead of a pair of 807's?" If A.J.D. will peruse the advertisement columns, he would get his answer; a pair of 807's cost 17s. 6d. and an 829 about £3. Bearing in mind that the average amateur (especially if he is a family man) is financially somewhat restricted, even if funds are available for the initial purchase, there remains the bogey of replacement cost. And that, A.J.D., is why not the 829 and other exotic (and expensive) types.

C. E. Pellatt, G2FAQ, 101 Boundary Road, Chatham, Kent.

Of course, G2FAQ is quite right about prices—and he can be assured that A.J.D. knows all prices, too! But that is no reason why it should not be suggested, for those who can afford more expensive equipment, how their gear can be modernised. It is all a question of degree—there are plenty of amateurs to whom an 807 is an expensive luxury and who, while they would like to possess a communications receiver, have to be content with something much simpler.—Editor.

## CORNER FOR THE SWL

SIR.—While I have little to criticise in SHORT WAVE MAGAZINE, might I suggest that you pay a bit more attention to the SWL, for after all SWL's are as much concerned with and interested in the short waves as are licensed operators. In particular, could you consider running a regular SWL section in your contests?

M.E.S. Birch, Walkington Park, Beverley, E. Yorks.

SWL's are always free to enter our contests and, if sufficient entries were to be received, we should be glad to give them a

separate listing. As to the larger issue of devoting some Magazine space to SWL interests, that is a matter which is under constant consideration, and in which we must be largely guided by the opinions of the main body of our readers.—Editor.

## "THE FOLDED GROUND PLANE"

SIR.—I am grateful to G3FCW ("Letters," p.497, November) for bringing to light the error in my Fig. 3 on p.433 of the October issue; this was a quite inexcusable mistake on my part. As G3FCW remarks, for a 150-ohm input impedance, both elements of the radiator should be of the same diameter, and, in fact, of the same material. Thus, the 12 SWG wire should be replaced by tubing similar to that used for the secondary element.

An analysis of a folded ground-plane using elements of different diameters is highly complicated; factors affecting the design are relative diameters of the elements, relative conductivity of materials used for the elements, ratio of element diameter to physical height, and mutual impedance between the elements, itself largely dependent upon spacing. However, as a penance, I am offering a curve which shows input impedance plotted against the ratio of element diameters, and this will be a guide for those wishing to experiment with a folded ground-plane of the type discussed in my article. The curve as given here applies to a radiator for 14.2 mc, assumes an element spacing of 1/100th of the wavelength, and holds good for secondary elements of diameters between  $\frac{1}{4}$  and 2 ins. For use on higher or lower frequency bands, all dimensions should be scaled down or up accordingly. I must emphasise that the calculations can only be approximate,

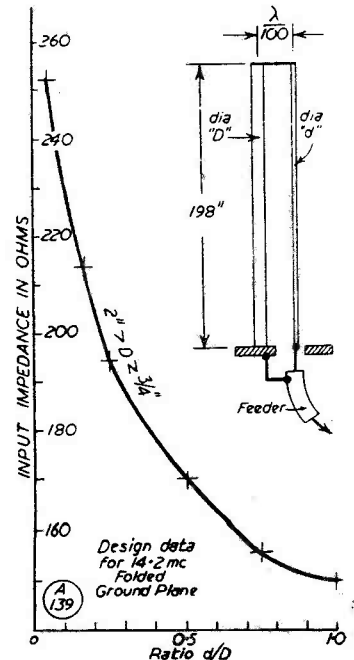
and hence the data should be used with discretion.

J. C. Belcher, G3FCS, 8 Windsor Road, Monkseaton, Whitley Bay, Northumberland,

## CALL-SIGN SEQUENCE

SIR.—With reference to your paragraph on p.484 of the November issue of the Magazine, regarding the sequence of call-signs. I would like to point out that though G3KAA has the first call in the "K" 3-letter sequence, I was actually the first operator to be issued with a "K" call-sign. I was licensed on December 31, 1953, and it may no doubt come as a surprise to others if they hear a "K" station using phone from (I hope) the early part of 1955. But I can assure yourself, and them, that I am no pirate.

C. T. Maboney, G3KCM, 439 High Road, Chiswick, London, W.4.



Graph discussed by G3FCS.

### NEW WORLD RECORD FOR G5BY

SIR.—Although I am not at present active on the amateur bands, I am still hard at it in a somewhat different sphere of radio. Subject to official confirmation by the Royal Aero Club and the International Aeronautical Federation, I established a new world's duration record for radio-controlled powered model aircraft on October 7, with a controlled flight of 2 hours 31 minutes 20 seconds, against the standing record of 1 hour 40 minutes 35 seconds.

Such attempts have to be observed by two time-keepers with stop watches; the model must rise off the ground under its own power and land, at the end of the flight, within a radius of 500 metres of the take-off point. Only one transmitter is allowed for control, and this has to remain stationary throughout the flight.

The receiver in my model is a single 1S4 in a super-regenerative circuit, operating at 54v. HT from a mercury battery, and gives 2mA anode current change, at up to  $\frac{1}{2}$ -mile. to operate a relay. The transmitter is CC with about  $3\frac{1}{2}$ w. input to the final stage, which feeds a  $\frac{1}{4}$ -wave vertical rod. The operating frequency is 26.96 mc. Venner light-weight accumulators supply power for the Rx valve filament and the rudder actuator motor, and the rudder is proportionally controlled by variable mark-space pulsing.

The model, of which I send you a photograph, is of my own design and construction and measures 5 ft. across the wings; it is powered by a Mills 1.3 cc. diesel engine; the all-up weight is 61 ozs. Last summer, with a smaller model, I twice set up new British records.

H. L. O'Heffernan, G5BY, Furzey Close, Thurlestone, Nr. Kingsbridge, S. Devon.

### MEASURING NOISE FACTOR

SIR.—In the method of noise-figure measurement used by many amateurs, it would appear that an indicator is connected to the output of the receiver under test, and the noise-generator then switched on and adjusted to double the noise power output. This simple

process is as outlined by your contemporary "QST," which has said that "This method, though not strictly accurate, is sufficient for most amateur purposes." This is incorrect, as will be shown.

The "QST" method takes no account of the law of the 2nd detector in the receiver, and gives an extremely optimistic reading, since only a small amount of noise-voltage is sufficient to increase the output by the required ratio. In adjusting the writer's two-metre converter by this method, a noise figure of 2 dB was obtained, whereas the noise factor when measured by the accurate method was 5 dB, a much more plausible figure (happily improved by adjustments to 3 dB!). A simple way of making an accurate measurement is as follows:

(1) With noise generator connected, but not switched on, set the audio and gain controls (AGC off) to a convenient level, being careful that the receiver is not being overloaded. Take the reading on the output indicator;

(2) Switch on the NG, advance anode current control till a convenient second reading is obtained on the output indicator, note this

reading, and call it  $f_1$ ;

(3) Reduce the receiver RF gain control until the noise output is reduced to the original reading. Now advance the NG control to bring the output up again to the second reading. Note the noise-generator reading and call this  $f_2$ ;

(4) The true noise factor is then given by

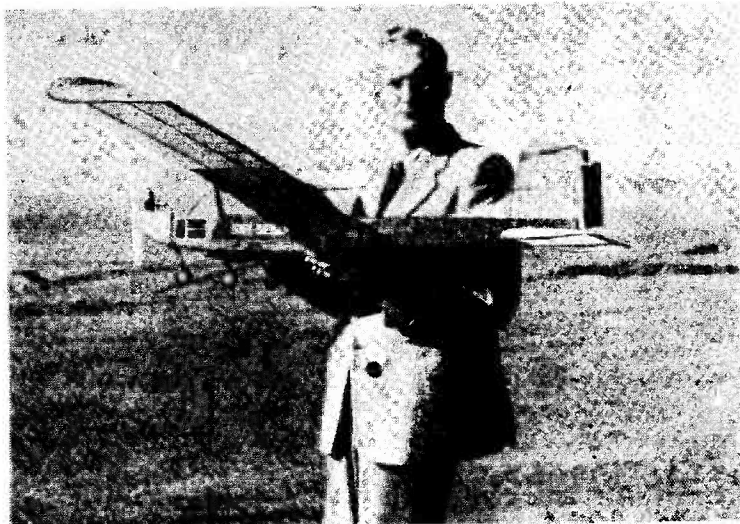
$$\frac{f_1^2}{f_2 - 2f_1}$$

It will be seen that unless an accurate method of noise measurement is employed, quotation of receiver noise figures are useless as a basis for comparison.

W. H. Hill, G8BP, A.T. & E. (Bridgnorth), Ltd., Bridgnorth, Salop.

### "NOISE IN THE AERIAL"

SIR.—I was most interested in this article in your November issue. I well remember coming across the effects described by your contributor when in Germany some years back, where coronal discharge via aerials is very prevalent; thunderstorms are frequent, with the consequent presence of high charge-potentials between cloud and earth, which occurs even more frequently, and for longer periods. A commonly-



This photograph illustrates the letter from G5BY in an adjoining column. An amateur with a world-wide reputation and a long record, going back to the 1920's, of successes on the HF and VHF bands, G5BY has been living in South Devon since the end of the war. He was very active on the VHF bands until he took up the radio control of model aircraft. Hilton has now established himself as a leader in this new field, and all who know him will want to congratulate G5BY on his outstanding success.

used aerial in Germany, for BC reception, is the rod or whip, and this type is most prone to the phenomenon. Such aerials may be compared with the lightning discharger (often wrongly called lightning "conductor"). Telefunken's studied the problem and apparently decided that a lot of the trouble could be avoided, or rendered less frequent, if all sharp points could be eliminated, and rod aerials were actually produced with either a ball-end or a ring termination.

The upper ends of vertical dipoles could be similarly effected, and treated in the same way. Less

prone, perhaps, because of the lower comparative height, are the ends of horizontal aerials or dipoles, but the treatment would be the same.

It might be thought that an aerial system could be protected by an adjacent discharger provided for the purpose; to some extent, this is true, but re-radiation from the guard rod might affect the characteristics of the aerial system itself. The problem, where it exists, should be treated on the straight-forward basis of anti-coronal protection, as implied by your contributor. This will raise the potential value at which dis-

charge will make itself noticeable; the golden rule is to raise the discharge-potential value of your own electrode, letting something else take the discharge or flash-over, if that is possible. Spherical brass door-knobs (ex-junk stores) should not be despised, and 4-in. copper valve-flouts, as used in cisterns, are useful. But do not put brass or copper on aluminium unless the joint is fully protected against moisture and atmospheric corrosion—or the ball will eventually fall off, having contributed a lot of new noise before it does so!

H. T. Stott, S-M.I.R.E., G2COT, G9ABY.  
Technical Director, A. F. Bulgin & Co., Ltd.,  
Barking, Essex.

### TVI IN THE STATES

We hear that the FCC has recently required that all American TV transmitters be fitted with a low-pass filter in the PA, good enough to suppress all harmonics. A typical filter of this kind consists of 6-inch copper "coaxial line" about 12 foot long—and costs nearly £600! (From "Southern Californian DX Club" *Bulletin*).

### CLAUDE LYONS, LTD.—NEW ADDRESS

For a great many years, the firm of Claude Lyons, Ltd., has been well known in the radio industry as an importer of quality radio products and a source of supply for a wide range of specialised equipment. (There must be some readers of this piece who remember, for instance, the "Clarostat," circa 1926). Expansion of business has demanded more accommodation and better stocking facilities, so Claude Lyons, Ltd., are now to be found at Valley Works, Ware Road, Hoddesdon, Herts., at the junction of the A602 and A10 main roads. (Telephone: Hoddesdon 3007-9).

### RADIO LICENCE FEES ILLEGAL!

The interesting judgment, delivered in the Chancery Court on November 15, in the case of Davey, Paxman & Co., Ltd., of Colchester, versus the General Post Office, has been widely (and wildly) commented upon in the national press. Briefly, it was to the effect that the P.M.G. had no business to be charging licence fees for a mobile radio transmission system. The wider implications were that the G.P.O. had no right to collect radio licence fees from anybody at all, and that a total of some £400 million has, over the years, been illegally extracted. The court's decision rested upon the simple fact that Parliament had never given the G.P.O. authority to collect such fees—the odd thing is that it has taken so long for somebody (in this case a public-spirited firm prepared to go to the trouble and expense of launching an action against the Crown) to catch up

on the Post Office! However, it need not be thought that this judgment is going to let anybody off anything—even convictions for not having paid licence fees. The whole matter is going to be put right quite easily, for the Post Office, by the immediate introduction and quick passage of an "enabling Act" which will legalise the position.

### OBITUARY NOTICES

We much regret to report the recent death of Arthur Brookson, G3IP, of Wellingborough, Northants., at the age of 54. He gained his first experience of radio while serving with the old Royal Flying Corps in the 1914-18 war. He was a newspaper photographer by calling and, since going to Wellingborough in 1951, he had been active on the LF bands. He leaves a widow and daughter, to whom we offer our condolences.

\* \* \*

We also very much regret to have to record the passing of Ralph Bloxam, GM6LS, of Edinburgh, who died suddenly on October 28, in London, while awaiting admission to hospital. GM6LS was a well-known Old Timer who had been licensed as 5LS in South London as early as 1922. He served in both wars, in the RFC as a pilot in 1918, and in the RAF in the last war as a signals officer at home and overseas. He had lived in Edinburgh since 1933, and was always active on the HF bands. In May, 1950, he was featured in our "Portrait Gallery" series, and was an occasional contributor to the Magazine. His wife pre-deceased GM6LS by only six weeks; his son Wallace, also a radio enthusiast, to whom we offer our sincere sympathy and condolences, is at present in America.

(Overseas journals please copy)

THOUGH the volume of reports this month does not suggest great activity or good conditions, nor do the claims for the Tables (a total of 15 only) come up to the high levels of recent months. The fact is that conditions have been quite good for GDY during most of the period. It is also probable that the unavoidably tight deadline for this month decided not a few correspondents to "leave it until next time."

Nevertheless, there is plenty to discuss. This is the season of the year for schedules. At a period of normally low activity on VHF, when people tend to switch on less frequently — either because the shack is cold, or they are busy on construction, or it is more comfortable by the fire, or they are "looking over the other bands for a change," or whatever—it is only by regular schedule-keeping that the paths can be tested.

The interesting and significant fact is that those who *do* run schedules find they have no difficulty in working over quite considerable distances, very often when absolutely nothing else is to be heard on the band.

#### Examples

A keen exponent of regular operation, despite the weather, the season of the year, the time of day and activity in general, is G6LI, of Grimsby. He has been keeping in contact, at 0800 GMT daily, with PE1PL (The Hague). The distance is 186 miles, across an all-sea path, with both stations only a few feet above sea-level. Their results are extraordinarily interesting. Between October 11 and November 13 inclusive, out of 29 possible days (six days were "not used" for various local reasons) contact was obtained on 29 occasions, a 100% result. Signal levels varied from RST-569 to 329 at G6LI, and from 559 to 219 at PE1PL. Only seven of the QSO's were rated worse than R5 at either end.

Broadly, the general picture was that weather conditions were never stable for more than 12 hours on end throughout the period, an excessively low barometer gave worst radio conditions, and the

# VHF BANDS

A. J. DEVON

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Activity and Conditions—

Winter Schedule Keeping—

Proposed New Band Plan  
for Seventycems—

Station Reports and The Tables—

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best results were obtained when the glass had started to fall from a high reading.

As G6LI remarks, these results show (as G5YV/PE1PL have also proved) that a North Sea path exists nearly always, and that winter weather does not necessarily paralyse long-distance communication on the two-metre band. Of course, it has to be remembered that the PE1PL group use an exceptionally high-gain beam and plenty of power, so that they automatically give a lot of help to any station they work. But even at that, a path has to exist for signals to get across, and that is what the G6LI/PE1PL result proves. They are continuing the schedule on a daily basis until the Spring, and we hope to be able to summarise their results each month in this space.

Then there is another interesting schedule that has recently been established—over a 150-mile landward path this time, between G5MA (Ashted, Surrey) and G5CP (Chesterfield, Derbys.), at about 2245 each evening (TV close-down). Out of 20 attempts

to November 14, they made it 18 times, and on the two occasions when no actual QSO could be effected, Bob was heard at G5CP.

All this makes it pretty obvious that when general activity is low and interest appears to be waning, the keen VHF man can still make good use of the band, and the opportunities that do occur, by maintaining a few regular schedules. These can be daily, in daylight or dark, or two or three times a week—this must depend upon individual convenience. But the point is that they should be *regular*, and they should be *reported*.

We shall, of course, be very glad to notify, in this space, all such regular schedules on the VHF bands.

#### Change of Policy

As readers will gather from this month's "VHF Weather" survey, it has been decided to discontinue the regular Wx analysis and discussion of each month's results. Your A.J.D and G3EGB, with old-man Editor (who had to be brought into it), feel that so much has now been published in the *Magazine* tying up weather conditions with VHF results that most operators taking a real interest in the mechanism of VHF propagation can work things out for themselves—so G3EGB will henceforth only come in when something unusual happens, or there is some important result or phenomenon to discuss.

A tribute to G3EGB's work is paid elsewhere, but it is fitting that we should record, under this heading, an appreciation of his labours in this field, previously almost unexplored and certainly but little understood either in amateur or professional radio circles. Your A.J.D. can testify to the labour involved in breaking down and correlating a mass of readings and observations, which G3EGB has done every month for so long, then reducing the whole to a discussion in understandable language—for in the ordinary way, the terminology of the meteorological world is not easily grasped by the non-professional.

Meteorology has been described as an "inexact science." G3EGB has at least succeeded in making its workings understood, and the possibilities clear, in the VHF field.

### Band Plan for Seventycycles

G3FZL (London, S.E.23), a well-known worker on the 430 mc band, has offered some new thinking as regards band planning for 70 cm. Briefly, his contention is that 432-438 mc is too wide a band to search for weak signals, and that it would be easier for everyone and more practical if the G search area could be reduced to two megacycles of the band. To implement this, G3FZL suggests a frequency allocation by areas on the same basis as the Zones were worked out on Two Metres.

He gives good reasons for adopting 433-435 mc as the G working band for CC transmission, pointing out that the Continentals are grouped in the area 434-435 mc. One obvious drawback is, of course, the usual one that practically everybody would be involved in a crystal change if the G3FZL plan is adopted on an area basis. For instance, he puts London and Home Counties (Zone J) in 433.85-434.25 mc, whereas at present their tripled frequencies (from two metres) work out at 434.55-435.75 mc; similarly, he suggests 433.20-433.40 mc for the northerly G's (Zone C on two metres), who now triple into the area 432.60-433.20 mc.

From the operating point of view, adoption of such a plan would mean that for some cross-band contacts and in nearly all cases of a quick change-over from two metres to 70 centimetres (as when doing a DX test), a change of fundamental crystal frequency would be involved, with re-tuning all through—unless an entirely separate transmitter is in use for each band.

On the other hand, narrowing the effective band-width to two megacycles has obvious advantages. (We have already found that 2 mc is amply wide enough on two metres, where there are at least ten times as many potentially active stations as there are on 70 cm). It might be held by some

## TWO-METRE ACTIVITY REPORT

(Lists of stations heard and worked are requested for this section, set out in the form shown below, with call signs in alphabetical and numerical order).

G3CVO, Great Baddow, Essex.  
NGR 52/732047.

WORKED: G2BCB, 2CZS, 2WJ, 3ANB, 3BSU, 3DRP, 3GDR, 3IEX, 3IJJ, 3IJW, 3VI, 3WP, 4AC, 4MW, 4OT, 5BD, 5YV, 6CW, 6LL, 6NB, 8KW, 8LN, 8RW.  
HEARD: G2AIW, 2FJS, 2XV, 3BK, 3DO, 3DOV, 3FNL, 3GHO, 3GJZ, 3GWB, 3HWJ, 3IOO, 3JDX, 3JMA, 3MV, 4AC/A, 5CP, 5OL, 6AG, 6TA, 6XM, 6YP, 6YU.

G3ITF, Basingstoke.

WORKED: G2YB, 3EJA, 3JFR, 3IJH, 6AG, 6TA.  
HEARD: G2AIW, 2DVD, 3FAN, 3GHO, 3HXS, 6KD, 6NB, 8VZ. (October 22-24 only).

G3FYY, London, N.W.2.

WORKED: G2BMI, 2HDZ, 3AEX, 3BII, 3DF, 3DPB, 3GHO, 4MW, 5KW, 5MA/P, 6TA, 8PX. (October 16-November 10).

SWL, London, S.W.18.

HEARD: G2AHP, 2AIH, 2CZS, 2DP, 2DTO, 2DVD,

2MV, 2YB, 3ADA, 3BGU, 3CLW, 3COW, 3DF, 3DVQ, 3EGV, 3EYV, 3FUH, 3FYY, 3GHI, 3GHO, 3GMJ, 3GSM, 3GVX, 3HWJ, 3IAM, 3IEX, 3ISA, 3WW, 3XC/A, 4CI, 4CW, 5CP, 5DS, 5KW, 5MA/P (Rutland), 6AG, 6OH, 6TA, 6XH, 8DX, 8KW, 8RW, GC3EBK. (October 16-November 7).

G2CZS, Chelmsford, Essex.

WORKED: G2BCB, 2UN, 3ANB, 3BTC, 3CLW, 3CVO, 3DBP, 3DF, 3DO, 3FAN, 3GDR, 3GJZ, 3IEX, 3IT, 3VI, 3WW, 4AC/A, 4AJ, 5AM, 5BD, 5DT, 5TZ, 5UM, 6CW, 6LL, 6NB, 6TA, 6YP, 8KW, 8LN, 8RW.  
HEARD: G2DJM, 2KF, 2YB, 3FIH, 3GNJ, 3GSM, 5YV, 6XM, 6W8UH. (October 17-November 14).

G3IOE, Newcastle-on-Tyne 3.

WORKED: G2DRA, 2FJR, 3CCH, 3ENS, 3IUD, 4SA, 5BD, 5BM, 5CP, 5YV, 6LI, 6NB, 6PJ, 6XA, 6XM, 6XX, 6M2BDQ/P.  
HEARD: G3WW, 5HK, 6UJ, 6M3EGW. (To November 11).

SWL, Bridgend, Glam.

HEARD: G2ADZ, 3QV, 3AUS, 3DLU, 3FAN, 3FIH, 3IGJ, 5MA, 5TZ, 6AG, 6NB, 6W3EJM, 5BI, 8SU, 8UH.

G3CKQ, Rugby, Warks.

WORKED: G2ATK, 3ABA, 3AZT, 3BJQ, 3CRH, 3FNW, 3FUW, 3HAZ, 5SK, 6CW, 6NB, 6XA, 6YU, 8VN.  
HEARD: G2AOK, 2BFT, 2FXK, 2HCG, 2YB, 3DO, 3FIH, 3GHO, 4SA, 6AG, 6XM, 8PX, 8SC.

G8VN, Rugby, Warks.

WORKED: G2AOK, 2ATK, 2COP, 2FJR, 2FNW, 2FXK, 2YB, 3ABA, 3AZT, 3BJQ, 3BKQ, 3CKQ, 3CRH, 3DBP, 3DKF, 3DJX, 3EJO, 3EPW, 3FFC, 3FUW, 3GHO, 3GPT, 3HAZ, 3IOO, 3JZG, 5CP, 5JU, 5JO, 5ML, 5SK, 5TZ, 6AG, 6CW, 6YU, 8BP, 8PX.  
HEARD: G2BTF, 2BVM, 2FTS, 2HCG, 2HOP, 2NM, 3APY, 3ARX, 3DO, 3ENS, 3FAN, 3FGT, 3IER, 3IT, 3IUD, 3JFR, 3WS, 5MA, 5LI, 5YV, 6FK, 6NB, 6XM. (October 17 to November 12).

that at this stage of development an actual band plan on a zonal basis is not necessary for 430 mc. Up to a point, this is true, but we know from experience that (a) 430 mc will become much more populated as time goes on, necessitating some sort of a band plan eventually, and (b) The more stations there are on the band when the time comes to move into zones, the more difficult and unpopular a change of crystal frequency will be.

Then, again, if it is agreed that a two-megacycle area is the right sort of band-width on which to operate on 430 mc, but that no particular zoning scheme is called for, which 2 mc in the 430 mc band as a whole is to be chosen?

Not easy, is it? And the worst way of solving the problem would be an ill-considered snap decision, taken at some sectional meeting at which all interests were not represented. Your A.J.D. has made up his own mind about all this, but does not propose, at this juncture, to put forward his opinion. Rather, we would ask that all who are using, or contemplate using, 70 centimetres would consider the matter carefully and let us have their views.

### Interesting /M Contact

On the evening of Wednesday, November 3, G2ATK/M and G2HCG/M were returning northwards from London, by different routes and quite unaware of each other—until G2ATK/M put out a CQ right in the Edgware Road, to which G2HCG/M, heading for the A5, instantly responded! G2ATK/M was routing via Tring, Aylesbury and Buckingham, for Birmingham, and G2HCG/M was on the St. Albans-Dunstable-Bletchley road, making for Northampton.

From their VHF-equipped cars, they maintained easy contact while travelling at a normal speed for the road conditions; later, both mobiles were picked up by G6FO (Maids Moreton, Bucks.) and worked two-way while they approached Buckingham on diverging routes; thereafter, contact G6FO-G2ATK/M was held for nearly an hour with no difficulty, till G2ATK/M had been brought right under the G6FO beam—for a quick personal QSO, a cup of something warm, and a feline quadruped from the G6FO menagerie for Trevor and his XYL to take home with them!

All this was totally unexpected

**TWO METRES**

**ALL-TIME COUNTIES WORKED LIST**

Starting Figure, 14  
From Fixed QTH Only

| Worked | Station                                                             |
|--------|---------------------------------------------------------------------|
| 71     | G5YV                                                                |
| 68     | G3BW                                                                |
| 64     | G6NB                                                                |
| 62     | EI2W (209), G3BLP (630)                                             |
| 59     | G3EHY, G4SA                                                         |
| 58     | G8OU                                                                |
| 57     | G2OI (349), G8SB                                                    |
| 56     | G3CCH (257), G3GHO                                                  |
| 55     | G2FJR, G2HIF, G3WW, G5BM, GW5MQ                                     |
| 54     | G3IUD (201)                                                         |
| 53     | G2AJ (519), G2HDZ (416), G3FAN, G4CI                                |
| 52     | G2NH, G3IOO, G5BD, G5DS (565), G6XX, GW2ADZ                         |
| 50     | G3ABA                                                               |
| 49     | G5MA                                                                |
| 47     | G5WP                                                                |
| 46     | G4HT (476), G5BY, G5ML (280), G6YU (205)                            |
| 45     | G2XC, G6XM (356)                                                    |
| 44     | G3BK, G3HAZ (262), G8DA                                             |
| 43     | G2AHP (456), G3BA, G3COJ, G4RO, G5DF                                |
| 42     | G3GSE (424)                                                         |
| 41     | G2DVD, G2FQP, G3DMU, G3FIH, G6CI (184)                              |
| 40     | G3BNC, G3CGO, G3DO (260), G3HWJ, G5JU, G8KL                         |
| 39     | G2IQ, G3GBO (434), G3HBW, G3VM, G8IL (325)                          |
| 38     | G2FCL (234), G3APY, G3WS (183), G6TA (331)                          |
| 37     | G2DDD, G2FNV, G2FZU (180), G3DLU                                    |
| 36     | G2DCI (155), G2HOP, G3CXD, G6CB (312), G8IP                         |
| 35     | G3BJQ, G3FZL, G3HCU (224)                                           |
| 34     | G3BKQ, G5MR (230), G8IC                                             |
| 33     | G3FYY (187)                                                         |
| 32     | G2CZS (178), G2FVD, G3IER, G8OY, G8VN (147), G8RV                   |
| 31     | G3HXO, G5RP                                                         |
| 30     | G3FRY, G3GOP (208), G3GVF (129), G3IRA, G5NF, GM3DIQ, GM3EGW, GW8UH |
| 29     | G3AGS, G3AKU, G3FIJ (194)                                           |
| 28     | G8DL, GM3BDA                                                        |
| 27     | G3DAH, G3ISA (160), G6GR, G13GQB                                    |
| 26     | G3AEP, G3CFR (125), G3SM (211), G4LX, G4MR (189)                    |
| 25     | G3JMA, G5SK, G6PJ                                                   |
| 24     | G3CVO (190), G3FD, G3FXG, G3FXR                                     |
| 23     | G3CWW (260), G5PY, GW3GWA                                           |
| 22     | G3AGR (135), G3ASG (150), G3BPM, G3HIL                              |
| 21     | G2AOL (110), G3DVQ, G3IWI, G6XY                                     |
| 20     | G3EYV, G3HSD, G3IOE, G3YH                                           |
| 19     | G3FEX (118), G3GCX, G5LQ (176)                                      |
| 18     | G3DBP, G8NM, GC2CNC                                                 |
| 17     | G3CKQ                                                               |
| 16     | G3FRE, G5AM                                                         |
| 15     | G2BRR, G2DRA, G3IWA                                                 |
| 14     | G2DHV, G3CYY                                                        |

and quite unpremeditated—had it been in any way planned, it would not have worked. The travelling contact G2ATK/M - G2HCG/M was probably the very first such QSO between G two-metre mobiles. (Note: We say "G two-metre" mobiles; it has been done often enough in the States, and there have been G inter-mobile QSO'S on other bands).

Both G2ATK and G2HCG have taken an enormous amount of trouble with their mobile equipment, and their results show how effective it is and what an interesting and useful field of activity is offered by /M working on VHF.

**G3BKQ Converter on Two**

Following the note in this space last month, Guy ON4BZ comes in with some comments on his version of the G3BKQ converter as constructed for two metres. He says that "at first taste on the air" the converter seemed much better than any other tried because of the extremely low noise-level when receiving strong signals—rather like listening on a dead band with an 0-V-3. is Guy's graphic illustration!

Feeling that real sensitivity was lacking and that the input coupling could be improved, ON4BZ has put on a 6J4 RF stage, connected GGT with cathode input and the plate of the 6J4 taken to the hot end of the mixer cavity through 47  $\mu$ F. This produced an overall NF of 3 dB and an impression of much greater sensitivity, while a cathode follower became necessary on the 1F output side to limit the amplification.

ON4BZ says that his first measurements gave a noise-figure of 7 to 8 dB, and ventures the opinion that perhaps G3BKQ's NF values on 430 mc were optimistic, due to his noise generator. We hope to be able to give fuller details of the whole converter, as

now being used by ON4BZ, in an early issue.

**Some Station Reports**

G6NF (Croydon) goes up one, with G3EGV of Farnborough worked for Hants., in the 70-centimetre Counties table, and wishes that the London stations active on 430 mc would send in their results so that we could have a clearer picture of what is actually happening on the band. (And so does A.J.D.).

G3CVO (Great Baddow, Essex) is not so busy on ATV that he has not had time to re-equip himself with a CC cascode converter for two metres, and he also has a new transmitter under construction. The G3CVO composite beam assembly—a 4/4 for Two with a 16-ele stack for 70 cm, both mounted on the same mast at the same height, and facing the same way—has occasioned some head-scratching and frowning among the VHF fraternity. Nevertheless, it does work. G3CVO reports G3VI (Braintree) as a new station, says that activity peaks around 1900 each evening, and that a local two-metre net starts at 1100 on Sundays. He also passes on greetings from our old friend ex-G3GBO, who is now VQ4EV and whose responsibility it is to keep the Kenya Police at Nanyuki on the VHF air.

G3CKQ (Rugby) comes in at 17C in the All-Time and says that poor activity has shortened his lists. G2DRA (Harrogate), who missed last month's dead-line, asks if he can "push in" at the bottom of All-Time Counties" and says his ambition is to work EI2W, G3BW and any GW!

G3ITF intends to come on from his Worksp QTH, which is the RAF station in that locality, and is busy getting the gear together; this will give him two stations, the other being at home in Basingstoke.

G3FYY (London, N.W.2) returns to the attack about Berwick and Berwick - on - Tweed — yes, two different places, the latter being in Northumberland, and just to confuse the issue still further, the town of North Berwick is in the county of East Lothian; Berwick itself is a Scottish county. And

*Note: Figures in brackets after call are number of different stations worked on Two Metres. Starting figure for this classification, 100 stations worked. QSL cards are not required to verify for entry into this Table. On working 14C or more, a list showing stations and counties should be sent, and thereafter added to as more counties are worked.*

again in answer to G3FYY, the GPO does not *allot* GM (or GW) in these border-line cases, but leaves it to the amateur concerned to ask for the prefix he prefers; this is wisdom, for it keeps the GPO out of any geographical controversy!

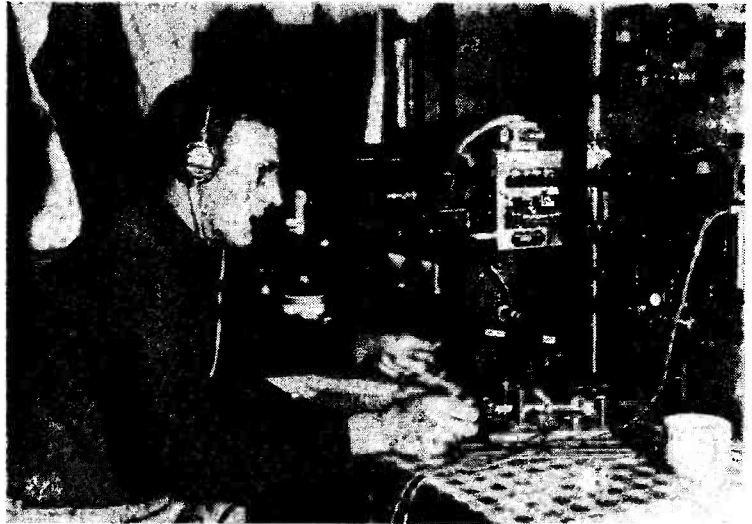
G2CZS (Chelmsford) gives October 17 and November 4 as good evenings; he was receiving G3GNJ and GW8UH on the 17th (both called without avail) and getting strong, steady signals from Midlands stations on the latter evening.

G3IOE (Newcastle), who apologises to G3GHO but says he does need his supper (*see* last month's comment), has worked G4SA, G5BM, G5CP and G6XA for new stations, and goes to 20C in the All-Time. G3IOE attributes his improved results largely to having gone QRO to 120 watts; this has made contacts easier and more certain, and for him two metres "is now much more fun." On

**TWO METRES  
COUNTIES WORKED SINCE  
SEPTEMBER 1, 1954**  
Starting Figure, 14  
From Home QTH only

| Worked | Station            |
|--------|--------------------|
| 40     | G5YV               |
| 33     | G3GHO              |
| 30     | G2FJR              |
| 25     | G3WW, G6TA         |
| 23     | G2DVD, G3FIH       |
| 22     | G3FYY, G5MA        |
| 21     | G2CZS, G3BJQ, G8VN |
| 20     | G3DO, G3DVQ, G3HWJ |
| 19     | G5BM               |
| 18     | G3DBP              |
| 16     | G3IER              |
| 15     | G5DS               |
| 14     | GM3DIQ             |

*Note: This Annual Counties Worked Table opened on September 1st, 1954 and will run for the twelve months to August 31, 1955. All operators who work 14 or more Counties on Two Metres are eligible for entry in the Table. The first list sent should give stations worked for the counties claimed; thereafter, additional claims need show only counties worked as they accrue. QSL cards are not required for entry in this table.*



The HB1PO set-up on the St. Gotthard last August. Above, HB9PO himself, on watch. Below, HB9NL with his eye on the plate meter of the main transmitter. They operated on Eighty and Twenty, as well as on VHF.

the Rx side, he has reverted to a G2IQ converter with a 12AT7 in the oscillator and finds this gives a better result with an IF of 8 mc than his CC converter tuning 24-26 mc on the S.640. G3IOE also comments on the excellence of G3CCH's SSB signal on two metres, and considers it very nearly as effective, for readability, as a CW signal.

Bob G5MA (Ashted) is at 22C in the Annual, and reports recent contacts with such northerners as G2IQ, G3IOO, G3IUD and

G6XM. G8VN (Rugby) gives the period November 1-7 as having been very good, with exceptionally strong signals from G5TZ (I.o.W.) on November 5—this also is reported by our SWL correspondent in Bridgend, S. Wales. In Rugby, G5TZ was consistently strong all the evening, but apparently he had the band almost to himself that session, it being Firework Night. However, he did work G2XV, G3IOO and G5BD, all GDY for any station in the Isle of Wight. On November 7, G3GPT (near



Preston, Lancs.) was coming in very well at G8VN—all this has helped the latter to the 21st step in Annual Counties.

G5CP (Chesterfield, N. Derbys.) has got his card from PE1PL and now awaits the same from F8MX. He has a CC cascade with an AR88, and is running a pair of HK24G's in the PA of the two-metre transmitter. G5CP says that he is very anxious to work stations to the west, north-west and south-west, and asks for schedules "at any time."

Clarke of GM3DIQ is now removed to Edinburgh, and will be off the two-metre air until such time as he can find somewhere permanent to live; this move means that he and GM3DDE will be able to resume their old partnership, both at work and on VHF.

G3IER (Cheltenham) moves in the All-Time, and mentions contacts with G3EHY, G3GPT and GW5BI under high-pressure bar conditions.

G3HHY, who operates from Solihull but is for much of his time in London, is another who missed last month's dead-line. Of particular interest in his report is the fact that he has discovered the merits of the neutralised 6AK5 as an RF amplifier, followed by a Z77 GGT stage, saying that both he and G3BA have been getting very good results with this arrangement. Curiously enough, we have a converter on these very same principles under test at the moment, and a full constructional article will probably appear in the next issue. G3HHY mentions a noise figure of around 4 dB with his version—ours gives an overall NF of 3.9 dB, and a gain of 33 dB from aerial to mixer grid.

### SEVENTY CENTIMETRES ALL-TIME COUNTIES WORKED

Starting Figure, 4

| Worked | Station      |
|--------|--------------|
| 26     | GW2ADZ       |
| 23     | G3BKQ        |
| 16     | G2XV         |
| 15     | G4RO         |
| 14     | G3HBW, G6NF  |
| 13     | G3IOO        |
| 11     | G2HDZ, G5YV  |
| 7      | G2HDY        |
| 6      | G3FAN, G3JMA |
| 5      | G3FUL, G3IRW |
| 4      | G2DDD, G3IGY |

*On working four Counties or more on the 70-centimetre band, a list showing stations and counties should be sent in for this Table, and thereafter new counties worked notified as they accrue*

G3HHY remarks that he will be "popping up as usual" between December 18 and January 2, from Solihull.

#### This and That

For those who may be interested—and we know that some are—OK1KAX and OK1KRC (both Klub stations operating under the peculiar Communist licensing system) claim a new world's record of 125 miles for the 25-centimetre or 1215 mc band, though no details are given as to when-and-where, and what was used.

As it happens, some fairly intensive experimental work is going forward on this band in G circles known to your A.J.D., and it is hoped—but not promised—that a constructional article on a cast-iron transmitter design for 25 cm will be forth-

coming in due course. Oh, yes, we know that there must be a receiver to go with it, and that is in hand, too.

DL2XK near Hanover, though only recently licensed, is a keen VHF man, equipped for two metres and in touch with the locals. He describes himself as "a DL2 always on the look-out for G's."

#### VHF Century Club

Our latest member is G3IUD, Wilmslow, Cheshire, who gains VHF Century Club Certificate No. 174. His cards include four for "different stations" worked on 70 centimetres, and, to the best of A.J.D.'s recollection, this is the first time anyone claiming VHFCC has shown cards for the 430 mc band.

#### Season's Greetings

The year has passed so very fast and A.J.D. grows old, but he hopes to be here for many a year before his bones grow cold!

He thanks you all for your support and sends his Christmas greeting, and says he must have your report in good time for next meeting! (*Stop it!*—Ed.) But it's Christmas, isn't it?

Well, anyway, the dead-line for the next issue must be **Thursday, December 16, certain**—earlier than usual because we have the Christmas delays with which to contend, and have still to be out on time in January. So send it all to: A. J. Devon, "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. With every good wish for Christmas and the New Year to all who read this piece, and with you again on January 7, all being well. Urs as ever. A.J.D.

### BROADCAST RECEIVING LICENCES

13,527,864 broadcast receiving licences, including 3,677,796 for television, and 245,836 for sets fitted in cars, were current in Great Britain and Northern Ireland at the end of September, 1954.

During the month, the number of television licences increased by 144,098, as compared with 76,970 during the previous month.

Much of this increase is due to the operation of the Post Office's new television detector cars. They

have not yet had time to visit more than a few towns, but wherever they have gone they have very quickly proved their effectiveness in detection. In two towns 1,023 and 994 new television licences were taken out during a period which usually yields only about 400 in each town! Everywhere the vans have been the sale of licences has at least doubled; in one district in London sales have gone up nearly five times, from 390 to 1,760. (*Marvellous, isn't it!*)

# VHF WEATHER REPORT

## THE CONCLUDING SURVEY

A. H. HOOPER (G3EGB)

It was with our issue for February 1953 that the author of this feature commenced his labours for SHORT WAVE MAGAZINE in the field of VHF propagation. Since then, he has contributed a regular series of most informative articles on the problem of VHF DX working. His studies, fortified by the practical results—as reported in “VHF Bands” each month—obtained by the great body of VHF operators, have done a great deal to make the mechanism of VHF propagation plain to all. In fact, those who have been following this series should now be able to predict, with reasonable certainty, the onset of

an immediate spell of good VHF conditions. This alone is a great achievement on the part of G3EGB. His studies have been the first of their kind ever published, in that he has been able to relate practice directly with theory over an adequate period of time, and to discuss results with an immediacy only possible because of the data he was able to obtain from “VHF Bands” on the one hand and from his own sources of meteorological information on the other. Since the pattern is now established, it has been decided, with the agreement of G3EGB, that his future contributions on the subject of the Weather and VHF Propagation should be at intervals dictated by conditions and results—that is to say, summaries or analyses on those occasions when something particularly interesting happens, either to merit discussion or require explanation. All readers will join us in thanking G3EGB for his stimulating and scholarly contributions over the past two years.—EDITOR.

**T**HIS final report of the present series is given over to a general review of our experiences and results.

We found last year that widespread VHF DX was associated with anticyclonic conditions, arising either from a large slow-moving high-pressure system or with a north-eastwards extension of the Azores high-pressure system towards Scandinavia. On such occasions we enjoyed both DX and fine weather. This year, unhappily, static high-pressure systems for us were rare, tending in general to lie well to the south over France, while cyclonic circulations passed over us in interminable succession.

### Results

Occasions which could be described as DX spells have been ascertained from AJD's monthly summary. Table I shows the result.

TABLE I

|                                |   |   |   |           |
|--------------------------------|---|---|---|-----------|
| Duration of Spells in Days ... | 1 | 2 | 3 |           |
| Number of cases ...            | 5 | 1 | 2 | = 13 days |

In addition, there were a further 21 days when DX occurred over isolated paths rather than over substantial areas. Confining our attention to DX spells of two days or more, the total in days for each year, from 1949, of such spells is 7, 17, 23, 38, 34 and 8. One suspects that, were 1949 equipment still in use, then this year's total would have been the lowest of all! In debating the chances of a good season next year, we can only look at the above figures—there are no others—note that for four years in six DX has occurred more than twice as frequently as in this year, and hope that the figures bear a usable relation with long-term averages.

In arranging these figures, it became apparent that while some operators never fail to exploit everything that develops, it may be as long as two days after the arrival of a useful reflecting layer before activity becomes general. This was the case, for example, with the first spell of both this year and last. With visible signs of such conditions provided, it is a pity

that these opportunities are missed.

### Research

It is clear that, for the European region, the predominating cause of anomalous propagation at VHF is the presence, as an extensive “reflecting” layer, of a marked discontinuity in the change of radio refractive index with height. Charts of the type included in each “VHF Weather Report” have been prepared as a daily routine and the properties of the layers studied. Their intensity was estimated for convenience on a four-point scale without regard to air temperature, and was necessarily influenced by instrumental differences between the equipment of one country and another. It was found that anomalous propagation was associated with “strong” layers, but less frequently with “average” layers. The latter effect was explored and found to vary seasonally. In winter, for example, “average” layers were usually ineffective, even when extensive and stable. This has already been discussed theoretically (*Short Wave Magazine*, March 1954, p.44). Table II shows in tens of percent, the *ineffective* reflecting layers in two-monthly periods, together with the corresponding mean temperatures for Kew.

TABLE 2

| Period, 1953/54       | N-D | J-F | M-A | M-J | J-A | S-O |
|-----------------------|-----|-----|-----|-----|-----|-----|
| Ineffective Layers, % | 90  | 90  | 80  | 40  | 40  | 20  |
| Mean Temperature, F   | 48  | 38  | 46  | 56  | 60  | 56  |

It can be seen that air temperature is important in determining the strength of reflection effects, as envisaged last March. Here, then, is one of the causes of the seasonal trend of anomalous propagation. As we know, VHF DX can occur in mid-winter—when other factors are enough to compensate for the low temperature. It is, however, rare.

In that “strong” layers, as determined, are a reliable guide to anomalous propagation, the frequency of their occurrence over the European region has been examined for the 16 months from

June 1953. Fig. 1 shows the result of this work and exhibits a number of interesting features. There was a decrease northwards over the British Isles from about 13% along the South Coast down to 3% at the extremity of Scotland. As one would expect, because of its proximity to the Azores anticyclone, the most favoured area was the Biscay coast of France. Over a vast area of Europe, VHF reflecting layers developed on more than 9% of all evenings. Finally, it will be observed that the implied path for maximum EDX is the direction south-west/north-east from Brittany, over the Channel towards Sweden. This result was predicted (*Short Wave Magazine*, July 1953, p.308) from weather charts of 1951-52 when dealing with one of the longest possible paths in Europe, i.e. Azores-Sweden. Support for the possibility of this path is now given by the observations over four successive years. At 2100 miles it would be a notable achievement.

It has been shown (*Short Wave Magazine*, August '54, p.344) that RRI discontinuities are due mainly to the moisture structure of the atmosphere. It is in the measurement of moisture that "radiosonde" apparatus is least accurate. Results vary considerably between instruments of different types. It is the writer's opinion that there were actually more instances of strong reflecting layers occurring over Sweden than were revealed by soundings. While one would expect a reduction due to increasing latitude—as for the British Isles—it is considered that the reduction is unlikely to be as rapid as that shown in the figure over the Kattegat and, therefore, that SM stations are better situated than the chart suggests.

Turning now from favourable areas to favourable dates, it will be remembered that this was discussed last February. Of the two dates then given as favourable, one (June 6) proved to be so this year, while the other (March 2) was not. This year's results have been incorporated to yield the following dates:

DX Spells, (for amusement only):  
 Grade I June 6 (5 years in the last 6)  
 Grade II March 2 } (4 years in the last 6)  
           October 9 }  
 All dates  $\pm$  5 days.

Poor periods, with DX unlikely, remain as September 24 and August 5-23.

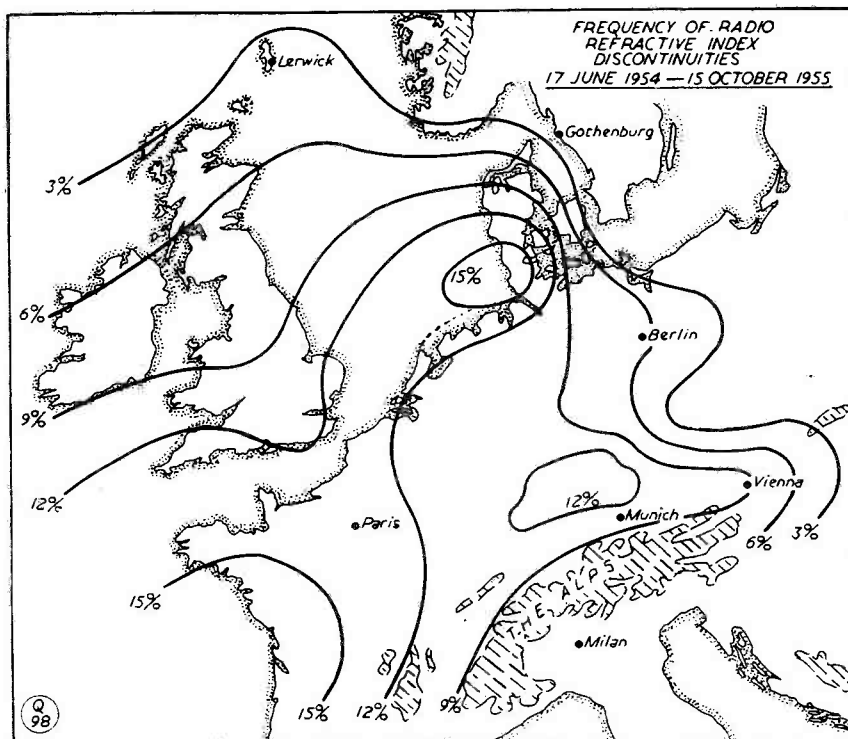


Fig. 1. Showing the percentage occurrence of strongly-marked RRI discontinuities—which form the reflecting layers for VHF signals—over a period of 16 months; estimates were made daily, and the period covers a good and a poor season. It can be seen from this chart that the southern counties of England get DX conditions on VHF about twice as frequently as does southern Scotland.

### Barometric Pressure

We have been looking at barometric pressure each month to see whether it is a useful indicator of anomalous propagation. Last year's results suggested that it could be used in a negative sense only. There was no pressure limit greater than which daily values foretold VHF DX. If the pressure was less than about 1018 mb, DX was unlikely. This year brought exceptions to this condition, when DX was experienced with values of about 1010 millibars. Since the former value was in agreement with experience in two other countries, and to lower it would limit rejected occasions still further, it seems best to retain the present value as a pointer to conditions and to accept the very occasional loss that is entailed. Since the value of 1018 mb is a mean sea level value and pressure varies rapidly with height, Table III has been prepared. It shows, for various heights above M.S.L., the pressure values at those heights corresponding to our critical value. These values are for a temperature of 60°F. The effect of departures from this temperature can be ignored.

### Local Prediction

Let us see what can be done in the way of local

prediction. It is a question of sufficient weather sense for assessing conditions in the immediate vicinity and of viewing a television or other weather chart to assess direction and extent.

For inland refraction in the surface layers, those VHF operators lying within high-pressure areas and finding rapidly-clearing or clear skies, together with decreasing wind in the early evening, can expect a radiation inversion to develop and anomalous propagation to extend over inland paths. If the phenomenon is prolonged, then a reflection process may ultimately set in over short distances.

For refraction over a sea path, amateurs operating coastal stations in the warmer months of the year and finding themselves towards the edge of a high-pressure system with a fresh wind blowing out to sea (or from the sea in the case of narrow channels) can expect a daylight sea path to develop.

Finally, with a high-pressure system with fine weather, cloud rapidly disappearing or non-existent during early afternoon, or with a thin stratified layer of cloud, it is likely that a reflecting layer has formed—unless the MSL pressure is less than 1018 mb or the temperature less than about 50°F. Always, to determine the likely extent of the layer, a weather chart is necessary.

During the last two years the writer, for one, has learned much about anomalous propagation. With the aid of your reports, many different effects have been identified and, for those who may be interested, a summary is appended. We have between us demonstrated that assessments of anomalous propagation at VHF can be made from meteorological data with usable accuracy. The next step of forecasting propagation conditions does not appear too great. There remains one problem. It has been shown (*Short Wave Magazine*, November 1953, p.560) that single-hop reflections are limited to a distance of about 250 miles. With VHF DX in excess of 700 miles on record, the claim that reflection is so small that single-hop paths are the most that can be expected is difficult to sustain. Sporadic-E has been suggested as the explanation. If this is so, then it is remarkable that the Sporadic-E effect at many tens

TABLE 3

| Height Above MSL, Ft. |      | 0     | 100   | 200   | 300   | 400   | 500   | 600   | 700   | 800   | 900   | 1000  |
|-----------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Critical              | mb.  | 1018  | 1014  | 1011  | 1007  | 1003  | 1000  | 996   | 992   | 989   | 985   | 982   |
| pressure              | ins. | 30.07 | 29.96 | 29.85 | 29.74 | 29.63 | 29.52 | 29.42 | 29.31 | 29.20 | 29.10 | 29.00 |

of kilometres coincides to such a great extent with the phenomenon of subsidence occurring at less than two kilometres altitude. Signals are exchanged only within the area covered by the subsidence layer and are usually strong and steady. The coincidence would be great, and the writer prefers to believe that reflection intensities have been under-estimated and that double- and triple-hop paths are, in fact, achieved. No doubt time will clarify this point.

The writer is indebted to all who have assisted with reports and to the Director, Meteorological Office, London, for permission to make use of data gained from official publications.

## APPENDIX

**Regional Effects**

SHORT WAVE MAGAZINE

|                                 |          |       |
|---------------------------------|----------|-------|
| Mediterranean and Middle East   | June 54  | p.234 |
| Malaya ... ..                   | Oct. 54  | 458   |
| Alpine Barrier ... ..           | July 53  | 308   |
| Selected Paths from U.K. ...    | July 53  | 306   |
| Trans-Atlantic Tests ... ..     | Aug. 53  | 365   |
|                                 | Sept. 53 | 436   |
|                                 | May 53   | 168   |
| Reflecting Layers and Mountains | Dec. 53  | 621   |
|                                 | July 54  | 292   |

**Radio Refraction Structure**

|                                                       |          |     |
|-------------------------------------------------------|----------|-----|
| Refraction Magnitudes, Aerial Angles ... ..           | Nov. 53  | 560 |
| Temperature Limitation on Reflection intensity ... .. | Mar. 54  | 44  |
| Origin of RRI Discontinuities ...                     | Aug. 54  | 344 |
| Double Reflecting Layer ... ..                        | Sept. 54 | 404 |
| Destruction of Reflecting Layer by a Front ... ..     | May 54   | 176 |
| Refraction due to Advection ...                       | June 54  | 234 |
|                                                       | July 54  | 293 |

**Diffraction**

|                              |         |     |
|------------------------------|---------|-----|
| Analysis of 1953 results ... | Nov. 54 | 514 |
|                              | Feb. 54 | 748 |

**XTAL XCHANGE**

Those who may wish to exchange crystals have free use of this space. Offers should be set out in the form shown below, on a separate slip headed "Xtal Xchange—Free Insertion," and all negotiations conducted direct.

**GM3HZX, 66 Rosslyn Street, Kirkcaldy, Fife.**  
Has U.S. FT-241-A 400 kc bar, octal base. Wants any amateur band crystal, 3500-3600 kc preferred.

**ZB1EB, 75 A.M.O., RAF, Luqa, B.F.P.O.51.**  
Has crystals 5730, 6010, 6021, 6270, and 6790 kc. 2-pin ½-in. mounting. Wants any frequency 3515-3580, 7000-7150 or 14000-14350 kc, same mounting.

**PYE MARINE LIMITED**

Because of the vast increase in the marine radio and electronic business conducted by the Pye Group of Companies through their subsidiary, Rees Mace Marine Ltd., the name of that company has been changed to: Pye Marine Limited. The constitution of the company and its board of directors remain the same, but for increased efficiency it has also been decided to centralise the administration, sales and manufacturing at the new factory at Oulton Works, Lowestoft, Suffolk (*Oulton Broad 425*), where all correspondence should be addressed. Lowestoft has been chosen as the headquarters because of its close proximity to the sea and the fishing industry.

## AMATEUR RADIO EXHIBITION—1954

### SURVEY AND BRIEF REPORT

THE Eighth Annual AMATEUR RADIO EXHIBITION was held at the Royal Hotel, Woburn Place, London, W.C.1, from November 24 to 27. It was opened by Mr. H. Faulkner, C.M.G., B.Sc., M.I.E.E., who, before he retired, was a senior executive of the General Post Office and is now Director of the Telecommunication Engineering and Manufacturing Association.

In the course of his remarks, Mr. Faulkner referred to the important contribution of amateurs in the field of electronics and drew attention to the excellent support this year's Exhibition was having from Trade and Service interests as acknowledging that contribution.

Indeed, it can be said that the 1954 Amateur Radio Exhibition—managed by Mr. P. A. Thorogood, G4KD, on behalf of the sponsors, the Radio Society of Great Britain—was more useful and interesting than some of its recent predecessors; it was better attended, too, not only by radio amateurs themselves, but also by members of the general public interested in radio for its own sake. There was even a sprinkling of trade buyers, as there were some important new products to be seen on manufacturers' stands.

#### Show Report

A total of 15 commercial exhibitors took stands, together with two publishers, and there were also displays by the War Office and the Air Ministry. It is a matter for regret that this year the Royal Navy and the G.P.O. Engineering Dept. were not represented.

Among interesting exhibits, one noticed the amateur band transmitters and transmitter foundation units offered by Labgear, Panda and Minimitter. These attracted much attention, and we understand that satisfactory business was done. Labgear were showing a newly-designed band-switched table-top transmitter running 150 watts, covering 3.5 to 28 mc, which embodies harmonic reduction; they also showed a range of TVI filters and chokes.

On the test equipment front, Automatic Coil and Taylor had fine displays. It is interesting to note that the famous AVO Model 7 can now be supplied for use by blind amateurs. Taylor's had on show a new oscilloscope, Model 31A, using a 4-in. CRT, with a time-base range of 10 cycles to 500 kc and an amplifier covering 10 cycles to 6 mc.

Pye's demonstrated some excellent examples of mobile radio equipment, as used under the broad heading of "business radio," and Philpotts—who specialise in chassis and cabinet work of all descriptions—now have some very nice cabinet designs which should be of interest to those engaged in miniaturising their gear.

Other interesting practical items to be seen round the trade stands were a varied range of relays (by

Magnetic Devices, Ltd.) and of RF plug-socket connectors for rack-mounted units (Power Controls, Ltd.).

The G.E.C. displayed a number of valves specially designed for VHF and FM reception, as well as some of their smaller transmitting valves; also to be seen on this stand were interesting examples of G.E.C. germanium diodes and triodes (transistors). One of the "attractive items" in the G.E.C. display was the famous BRT-400 communications receiver, re-styled, and a range of microphones.

Also exhibiting were Cosmocord with their Acos microphones and pick-ups, English Electric showing a range of special-purpose valves (including klystrons and magnetrons), Enthoven with their new LV soldering iron, Grundig demonstrating their TK9 portable tape recorder, and Brimar with valves and CR tubes.

The Army and Royal Air Force stands were designed to have a "recruiting appeal" and were well done, and Iliffe & Sons, Ltd., publishers of our respected contemporary, *Wireless World*, had a good display of their books and publications of radio interest.

#### Amateur-Built Apparatus

As in previous years, there was a very fine collection of amateur-built equipment on show, much of it of particular interest to the majority of visitors because it was apparatus specifically designed for Amateur Radio purpose or operation—which involves requirements not always met by the commercial product.

It is impossible here to describe and discuss everything that was to be seen, but of outstanding interest was the 70-centimetre apparatus and the SSB equipment—the latter having become something of a cult supported by an increasing number of devoted practitioners.

All the amateur-built equipment—which included the ATV gear shown by the Royles, father and son, G2WJ/T—was of a very high standard of construction, reflecting the greatest credit on those responsible. It can be said that, as in previous years, many a visiting amateur went home in a state of extreme dissatisfaction with his own station!

Finally, we are glad to add that the Transistor display on our stand attracted its fair share of interest and attention—and, once again, it was a pleasure to meet so many of our readers.

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#### MICRO-WAVE RADIO LINK IN CANADA

Following on the highly successful micro-wave link provided by the G.E.C. for carrying European TV across the Alps, the General Electric Co., Ltd., has secured the contract to supply micro-wave radio relay equipment to carry TV in Canada, between London and Windsor in the Province of Ontario.

# NEW QTH'S

This space is available for the publication of the addresses of all holders of new U.K. call signs, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the quarterly issue of the "RADIO AMATEUR CALL BOOK" in preparation. QTH's are inserted as they are received, up to the limit of the space allowance each month. Please write clearly and address on a separate slip to QTH Section.

- DL2WB**, L.A.C. Barlow. Signals Squadron. R.A.F. Station. Wunstorf, 2nd T.A.F., B.A.O.R.5.
- DL2XK**, J. Bays. Decimeter Site. Obernkirchen. Sandsteinbr. 1. Hanover. Germany.
- EI8V**, J. A. Quish. Upper Cork Street. Mitchelstown. Co. Cork.
- G2HKF**, H. O. Wills, 47 Hall Avenue. Rushden. Northants. (Tel.: *Rushden 3075*).
- GW2HNR**, P. M. Rosay. Fairford, Smithy Lane. Pentre Buchan, Nr. Wrexham, Denbs.
- G3CSZ**, C. Hubbard, 104 Highfield South, Rock Ferry, Birkenhead, Cheshire. (Tel.: *Rock Ferry 2840*).
- GM3INK**, R. R. Hammond, 76 Thornwood Avenue. Glasgow, W.1.
- G3JIY**, G. L. Treece, 30 Loudoun Street, Rose Hill. Derby.
- G3JQM**, R. E. Robins, 71 Mowleaze, Barwick, Yeovil. Somerset.
- G3JVL**, M. H. Walters, 56 Hogarth Gardens. Heston, Hounslow. Middlesex.
- G3JVZ**, R. F. Taylor, 3 Netherpark Drive, Gidea Park, Essex.
- G3JWI**, R. M. Page-Jones, 216 Northgate, Cottingham. E. Yorkshire. (Tel.: *Cottingham 45130*).
- G3JWK**, K. W. Starnes, 12 Hickings Lane, Stapleford, Notts.
- G3JWV**, F/Lt. J. J. Snee. Officers' Mess, R.A.F. Station, Hemswell. Nr. Gainsborough, Lincs. (Tel.: *Hemswell 256*).
- G3JXF**, N. W. Curtis, 43 Wellington Road, Mablethorpe, Lincs.
- G3JXJ**, H. J. Wall, 52 Cranmer Street, Nottingham. Notts.
- G3JXN**, J. E. Tindle, 10a Stanhope Road, Highgate, London, N.6. (Tel.: *MOUview 9024*).
- G3JXU**, D. G. Chatfield, 42 Perry Street, Northampton. Northants.
- G3JYA**, F/Sgt. E. A. Smith, 48 A.M.Q., R.A.F. Station, Hemswell, Nr. Gainsborough, Lincs.
- G3JYH**, J. B. Harding, 16 Junction Road, Norton-on-Tees. Co. Durham.
- G3JYM**, R. J. Faloon, 74 Pine-wood Green, Iver Heath, Bucks. (Tel.: *Iver 1035*).
- G3JYO**, W. J. Grainger, 27 Arundel Crescent, Solihull, Nr. Birmingham.
- G3JYP**, W. B. Capstick, Lockholme, Battlebarrow, Appleby, Westmorland. (Tel.: *Appleby 155*).
- GM3JYU**, R. Taylor, 3 Craigmount Street, Kirkintilloch, Nr. Glasgow.
- G3JZF**, J. E. Smith, 53 Woolmore Road, Erdington, Birmingham, 23.
- G3JZK**, G. T. Sassoon, Heytesbury House, Warminster, Wilts.
- GM3JZK**, G. T. Sassoon, Ben Buie Lodge, Lochbuie, Isle of Mull.

## CHANGE OF ADDRESS

- G2ADZ**, H. W. Parker (ex-*GW2ADZ*), Penguins, Pool Lane, Woolacombe, N. Devon.
- G2ARX**, W. H. Banks, 110 Bramhall Lane, Stockport, Cheshire.
- G2FXG**, A. S. Green, Sunnylands, Warden Road, Totland Bay, Isle of Wight.
- G2TA**, R. C. Ray, 1 Queen's Walk, Wealdstone, Middlesex.
- G3ABG**, C. J. Morris, D.F.M., 24 Walhouse Street, Cannock, Staffs.
- G3AWK**, R. F. Gough, 2 Valley Road, Inham Nook, Chilwell, Notts.
- GM3BCL**, A. G. Anderson, B.Sc., Helford, Pitfodles, Aberdeen. (Tel.: *Aberdeen 47181*).
- GW3BH**, W. H. Miller (ex-*G3BH*), Pen-y-Bryn, Gellifor, Llangynhafal, Denbigh.
- G3BYY**, E. W. Elliott, 48 Haydon Hall Drive, Eastcott, Pinner, Middlesex.
- G3CHN**, R. V. Thorn, Sunrise, Fivelanes, Marldon, Paignton, Devon.
- G3CIM**, S. A. Denney, 15 Spey Way, Rise Park, Romford, Essex.
- G3EFI**, P. J. Powell, 221 Hatfield Road, Bolton, Lincs.
- G3EFR**, F. Simpson, 12 Bethune Avenue West, First Lane, Hessele, E. Yorkshire.
- G3GJM**, F. W. Clarke, 87 Red-hatch Drive, Earley, Reading, Berks.
- G3GPQ**, B. J. Killick, 122 High Street, Boston, Lincs.
- GW3HAW**, E. W. Jones, 58 Westward Rise, Barry, Glam.
- G3HKO**, D. A. Wood, 3 Cromwell Parade, Scarborough, Yorkshire.
- GM3HMW**, W. J. Cain, 16 Bridge Street, Stranraer, Wigtownshire.
- G3HOI**, H. B. Heath, Sgts' Mess, R.A.F. Station, Compton Bassett, Calne, Wilts.
- G3ICH**, 3204779, Cpl. Pitt, P.N., No. 2 A.M.Q., R.A.F. Station, Digby, Lincs.
- G3IHZ**, A. S. Burden, 1 Repton Manor Road, Ashford, Kent.
- G3JAA**, Mrs. P. J. Pitt, No. 2 A.M.Q., R.A.F. Station, Digby, Lincs.
- G3JES**, I. Bolton, 8 Dickens Avenue, Sturry Road, Canterbury, Kent.
- G3JLH**, I. L. Hampton, 14 Hillview Road, Winton, Bourne-mouth, Hants.
- G3WL**, S. A. Rance, Glenside, Rollis Park Road, Oreston, Plymouth, Devon.
- G4AP**, J. G. Rooke, Stafford House, High Street, Wootton Bassett, Wilts.
- GC6FQ**, Col. P. A. O. Northey (ex-*G6FQ*), Pendean, Mont Felard, Jersey.

## CORRECTION

- G3BXY**, T. Murnane, 19 Western End, Newbury, Berks.
- GM3JUF**, A. McEachen, 240 Gladsmuir Road, Hillington, Glasgow, S.W.2.

**N**OW and then a tragedy, reported in a newspaper or radio journal, reminds us that ours is—or can be—a dangerous game. We are all in the presence of lethal voltages for the whole time that we are either operating or building gear, and the amazing thing is that there are so very few accidents, fatal or otherwise. This is a great tribute to the average amateur's common-sense, practical knowledge and respect for high voltages. One could truthfully say that playing around with a PA chassis, in close proximity to 1000 volts of DC, was a more risky occupation than, say, making a pet of a poisonous snake . . . if you are on your own and the volts bite you, the chances are that you will not be able to apply your own antidote. The important thing is to remember this *all* the time, and to adhere to the time-honoured and sensible practices that are so often mentioned; such as working with one hand in your pocket, avoiding bare concrete floors like the plague, switching both sides of the mains, and connecting N, L, E correctly.

### KILLED BY 115 VOLTS

An amazing case is reported in the October *QST* concerning a W5, only fourteen years of age, who was killed when his aerial fell on him. It was connected to a relay operating from the 115-volt line; the switch was in the earthy side of this line instead of the "hot" side; and a lead from the relay coil had fouled the relay frame, which was not connected to a really low-resistance earth. The aerial fell on Mike Seiders, W5AIZ, while he was standing bare-footed in a flower bed—and it killed him. This, mark you, with the mains *switched off*. We quote this case at length as a tragic reminder that we are all playing with fire for part of the time, and a combination of unusual circumstances could possibly outwit the most careful of us at almost any moment. You simply cannot afford to stop thinking about safety, at any time you are in the shack—or, it seems, outside it. Check up on all that



mains wiring, too, from time to time, with your mind on the possible danger of fire as well as sudden death.

### TRAFFIC JAMS

We don't like restrictive practices, and when we read that the Minister of Transport proposes to keep the traffic flowing, not by improving the roads but by forbidding certain uses of private cars, we are duly indignant. When it comes to our own bands, however, and we come across the menace of "traffic" permanently occupying several frequencies, we side with the Minister of Transport. We cannot increase the number of channels, so we are in favour of reducing the amount of traffic. We refer, of course, to certain notorious DL's, TA's, CN's and other such, all Americans, and all of whom use a considerable amount of power to keep a slice of a narrow band permanently ringing to the tune of "Darling, I still love you very much" and similar sentiments. We cannot possibly criticise the W's for handling traffic in their own country, where the FCC laws allow it; but we feel that when they are stationed abroad they should be subject to the same regulations as the amateurs in their "host" country.

### IS IT CLEVER ?

In any case, we remember a very famous radio engineer whose dictum was "Send it by radio if

no other method is available; otherwise, don't." This was his plan for preventing chaos in the ether, and the present-day state of affairs is the outcome for all those who have ignored his warning. Apart from querying whether all that indescribable noise between 7000 and 7500 kc achieves any useful purpose whatever (for *anybody*), we wonder whether the amateur bands should ever be used for non-amateur traffic. Send messages madly to other amateurs all over the world, by all means; but don't accept messages from non-amateurs, for transmission to non-amateurs, thus cluttering up the precious kilocycles that do, at present, belong to amateurs. As for the short-wave propaganda broadcasting with its inevitable host of parasites in the form of jammers—words really do fail us this time. When you hear a Pakistani station broadcasting in Spanish, and an Argentine station beaming propaganda in German, lunacy seems just around the corner.

### USE THE HANDLE !

Lest this page should give the impression of undiluted gloom (and one admits that this month's collation has not been too cheerful so far), we close with a bright suggestion from one of our cynical and not-always-helpful friends. Since the name is so important these days, he says, why not sign with it, and only give call-sign if requested? On CW we should hear "Chas Chas Chas de Fred Fred Fred" and on phone, "Calling Sid, calling Sid . . . this is Joe. Joe—J as in Joe, O as in Oh, and E as on the end of Joe." And so on. If, by any chance, Sid didn't know which Joe it was, he could always ask for his call-sign. Unfortunately, our national identity numbers have now been scrapped, or we could have retained those, making call-signs unnecessary. In fact, the only disadvantage of the suggested system is that Christian names are really too short to justify the use of those fine, resonant, important-sounding phonetics. No more "Gee Number Three X-Ray Yokohama Zanzibar"!

# THE OTHER MAN'S STATION

**G6BS**

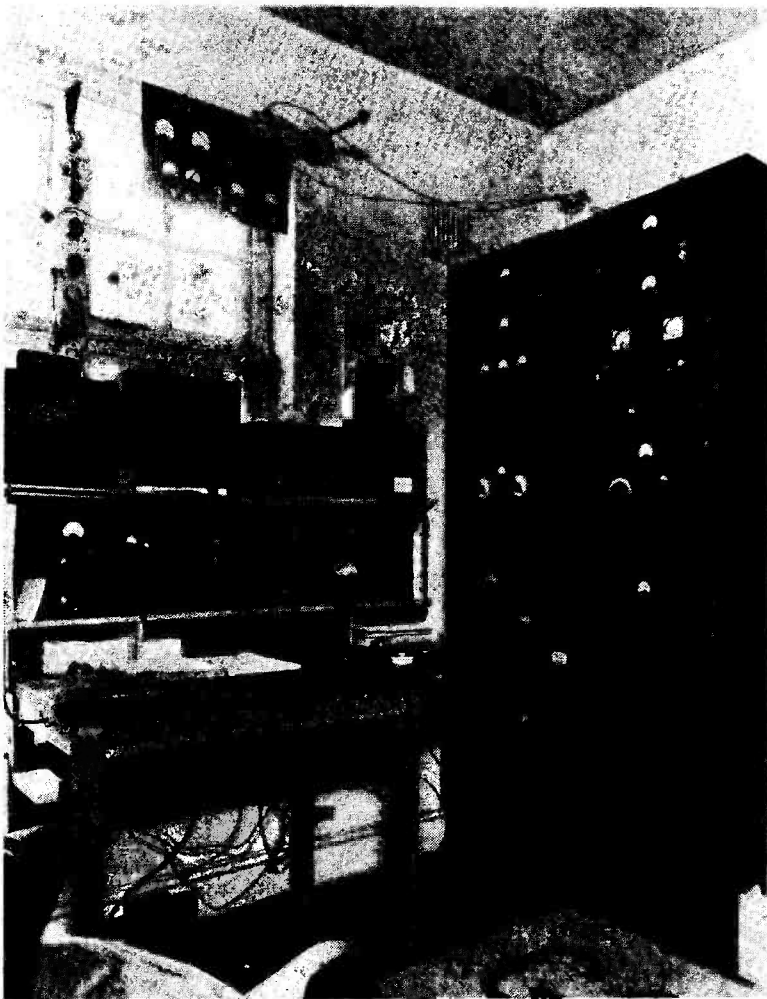
**T**HIS fine layout is that of G6BS—the station of B. M. Scudamore, 96 Hinton Way, Great Shelford, Nr. Cambridge, first licensed on May 21, 1925, and in active operation ever since.

From the earliest TPTG transmitter with a single LS5B or LS6A valve, the equipment has now developed into a pair of 813's on all main bands. The photograph shows two matching transmitters; that on the right is for 80 and 40 metres, while the one on the left can be operated on 20, 14 and 10 metres. In both sets, the final amplifier consists of a pair of 813's. Each transmitter runs 150 watts, either CW or phone, and modulation is by a pair of TZ40's in Class-B; an Acos crystal microphone feeds into a four-stage speech amplifier (bottom left panel in rack), terminating in a pair of 6L6's to drive the main modulator.

Frequency control is by VFO with its fundamental on the 160-metre band, output being taken through two buffer stages which can be switched to either transmitter; full provision is made for the use of crystal control when necessary.

On the receiving side, G6BS runs two HRO's with a DB-20 Preselector, and a 100/1000 kc oscillator gives crystal check points through all bands.

G6BS is fortunate in possessing something of an "aerial farm" to make the most of his equipment;



he has half-wave Zepp-fed aerials for Eighty and Forty, with three dipoles for each of the other three bands. All aerials are switch selected, and they are arranged to give coverage over most areas of the world.

The station is relay-controlled throughout, both for aerial and transmitter switching. As might be imagined, DX is the main interest at G6BS and, as our photograph shows, the comfort of the operator while pursuing it has also been studied. Since the war 219 countries have been worked—105 on the 21 mc band and all on phone, and 106 on 7 mc CW. Many of the major DX awards are held by G6BS and are displayed round the station. With the improvement in DX conditions on the HF bands, we can expect that he will be adding to these trophies.



# THE MONTH WITH THE CLUBS

By "Club Secretary"

(Dead-line for February Issue: JANUARY 14, 1955)

FIRST of all, may your "Club Secretary" send you his good wishes for Christmas and the New Year, with the hope that Club activity may flourish and expand as never before. By the time this is published, the Ninth "MCC" will be a thing of the past — no more than a memory of last-minute rush, aerial troubles, cups of tea, log-sheets and the occasional triumphant cry of "Got him!" We hope that all participants thoroughly enjoyed themselves (as they usually manage to do, despite the odd grouse here and there). We also hope that all the logs are in the post or all ready for it, as they are due in our hands (see Rules) by first post on Monday, December 6.

Will Club Secretaries please note that they should not send in any normal Club Notes next month. This space will be devoted entirely to a review of "MCC" and, of course, the results. Club Notes will be resumed on a normal basis in the February issue, for which the deadline will be January 14.

*Stop Press:* During the first week-end of MCC, November 20-21, a total of 25 Club stations was heard in action in the Contest.

## Club Activities

For the past few months we have based the first part of this feature on some common activity among the Clubs, and have attempted to discuss it in the light of the way in which the various Clubs handle it. This month we must confess that we find no common denominator among the reports received, so we will simply go ahead with the news as supplied to us by the various intrepid Secretaries.

*Bradford and Spen Valley* are combining forces in a joint Quiz, to be held at Cleckheaton on December 15. Bradford are the guests on this occasion; at the end of October the latter Club had a Stand at the Bingley Hobbies Exhibition, when no less than 4,000 visitors saw them in action.

During November *Chester* heard talks on Low Pass Filters, Interference Suppression, and A Sensitive Valve Voltmeter. Recent events at *Clifton* were a Junk Sale, a series of Basic Radio lectures, and a description and demonstration of a miniaturised transmitter/receiver by G3BCM.

*Coventry* held their AGM and elected G5GR President, G3RF Chairman, G3HDB Secretary, and G3HDP Treasurer. *Dartmouth* report continued activity all through the summer months, with the Club station G3JEV active on 14 mc. The Annual Field Day and the Receiving Contest were well supported, and it

is hoped that G3JEV will be operating on the Top Band throughout the winter. Contacts with other Clubs will be appreciated.

*Derby* continues its weekly meetings every Wednesday at the Clubroom in the School of Arts and Crafts, Green Lane. On December 12 they will be holding a local Top Band Contest for the G5YY Trophy. This runs from 0800-1200 and 1800-2200, CW only. RST reports and a progressive serial number are exchanged, and the co-operation of all Top Band operators will be welcomed.

At the *Leicester* AGM G2RI was elected Hon. Founder-President, in recognition of twenty-five years of unbroken service to the Society. G2CFC is President, G3DVP Chairman, and Mr. W. N. Wibberley Secretary. The Society will be taking part in the above-mentioned contest on December 12.

*Liverpool's* Annual D-F Contest for the Malcolm Cohen Cup was won by a team comprising G3IQO, G3JMQ and G3JPJ. G3AKW and company took the visitors' prize. The Construction Contest was won by G3JIR, with G3ETH collecting second prize. The Annual Hamfest is fixed for January 28 at the Mitre Hotel, Liverpool.

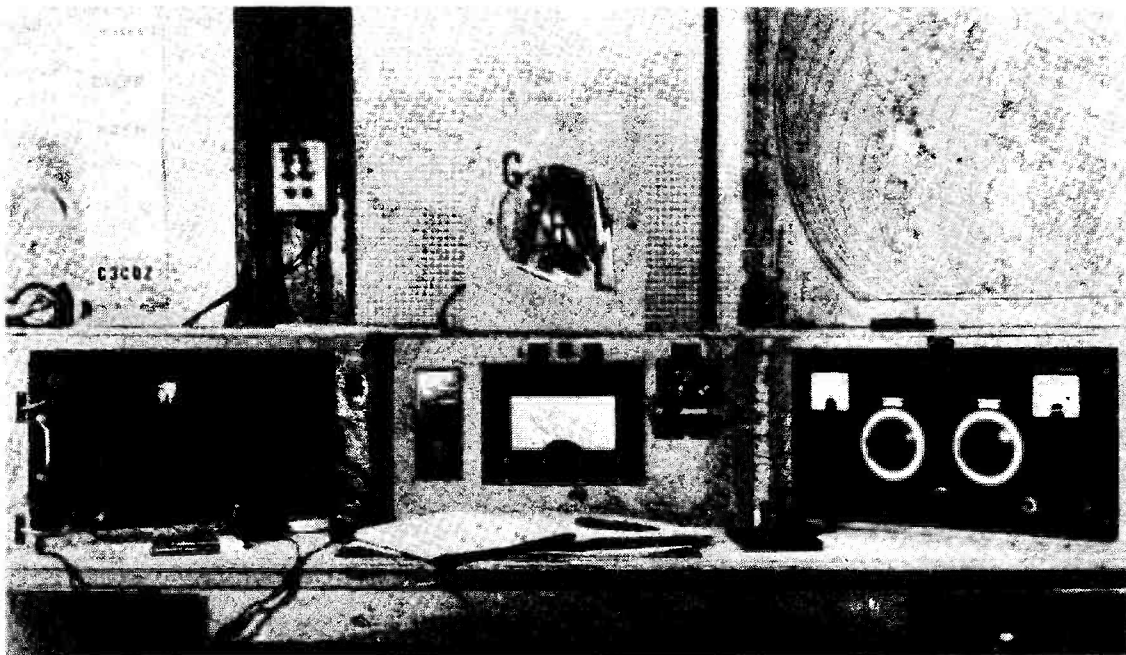
*Newark* continues its winter programme with a meeting on December 5 (Sunday) at the Northern Hotel (7 p.m.). Mr. A. Hall will talk on Valve Voltmeters, and there will be practical demonstrations. Arrangements for the Christmas Social Evening, at the same venue, are in hand, and details are available from the Secretary.

At *Northampton*, we are told, the Club possesses a good selection of Test Gear which is available to members. At present they are building gear for the LF bands, and their station G3GWB should shortly be heard thereon. Morse classes are also held weekly at the Club Rooms, Allen's Pram Works, 8 Duke Street.

*North-West Ireland* reports that it has been "tenaciously clinging to life" for the past five years, with occasional outbreaks of activity. They have now decided to hold a monthly meeting at a local café, on

### NORTH-WEST MANCHESTER ANNUAL GET-TOGETHER

Once again it is proposed to hold this event, which will take place on Saturday, December 18, in the form of a Hot-Pot Supper and Smoking Concert. The venue will be Irelams-oth-Height Conservative Club and it will be a "stag-party." Full details from G3HNT, on Top Band most evenings, or Tel. Swinton 2807.



**G3HXL**, in London's Dockland — actually the station of the radio section of the Port of London Authority Staff Club, situated at Millwall Dock. **G3HXL** is very well equipped, with an excellent workshop, and is financed entirely by the Staff Club. The only drawback is a DC power supply, which has to be "put through a roller" to get the necessary AC. Members of the radio section are interested in all sides of Amateur Radio activity, and **G3HXL** is on the air most Thursday evenings in the 80-metre band. A transmitter will shortly be available to enable them to join local nets on the Top Band.

the first Tuesday of each month instead of Saturdays, as before. Details from the Secretary (see panel).

**Reading** announces a special demonstration of Hi-Fi Equipment by Messrs. Dynatron Radio on December 11. This meeting will be held at the Central Public Library — members are asked to note this meeting place.

On December 14, **G5RV** will lecture to **Romford** on the Suppression of TVI. Visitors will be welcomed. The normal programme of Junk Sales, "On the Air" evenings and discussions continues.

At **Slade** the shield presented by **G2AK** in commemoration of the 25th anniversary of the granting of his transmitting licence has been awarded by the committee — to **G2AK**, in recognition of recent services to the Society. The donor thus becomes the first holder of the shield.

Recent events at **Southend** were a lecture on Spot Wobble in TV Receivers and a lecture-demonstration on FM Reception, using the BBC transmission from Wrotham. It is planned to visit Barking Power Station early in the New Year, on a Friday evening. Numbers will be limited — applications should be made now.

A high level of activity is reported by **Stockport**, with recent visits to Holme Moss and the Cotton Research Station at Shirley Institute, where the electron microscope was demonstrated. RAE classes have started again, and coming events are a lecture on "Tours

**Note** : No normal reports next month on account of the MCC Survey and Results. **Dead-line** for next regular reports, **January 14, 1955**.

#### NAMES AND ADDRESSES OF CLUB SECRETARIES REPORTING IN THIS ISSUE :

**BRADFORD** : F. J. Davies, 39 Pullan Avenue, Bradford 2.  
**CHESTER** : N. Richardson, 23 St. Mary's Road, Dodeleston, Chester.  
**CLIFTON** : C. H. Bullivant, G3DIC, 25 St. Fillans Road, London, S.E.6.  
**COVENTRY** : J. H. Whithy, 11 St. Patrick's Road, Coventry.  
**DARTMOUTH** : B. Farleigh, G4RJ, Montpelier, Lower Contour Road, Kingswear.  
**DERBY** : F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.  
**LEEDS** : B. A. Payne, 454 Kirkstall Road, Leeds 4.  
**LEICESTER** : W. N. Wibberley, 21 Pauline Avenue, Belgrave, Leeds.  
**LIVERPOOL** : A. D. H. Looney, 81 Alstonfield Road, Knotty Ash, Liverpool 14.  
**NEWARK** : J. R. Clayton, 160 Wolsey Road, Newark.  
**NORTHAMPTON** : A. J. Kightley, 23 Garrick Road, Northampton.  
**NORTH-WEST IRELAND** : W. R. Edwards, 108 Spencer Road, Waterside, Londonderry.  
**READING** : L. Hensford, G2BHS, 30 Boston Avenue, Reading.  
**ROMFORD** : N. Miller, 18 Mascalls Gardens, Brentwood.  
**SLADE** : C. N. Smart, 110 Woolmore Road, Birmingham 23.  
**SOUTHEND** : J. H. Barrance, M.B.E., G3BUJ, 49 Swanage Road, Southend.  
**SOUTH MANCHESTER** : M. Barnsley, G3HZM, 17 Cross Street, Bradford, Manchester 11.  
**SPEN VALLEY** : N. Pride, 100 Raikes Lane, Birstall, near Leeds.  
**STOCKPORT** : G. R. Phillips, G3FYE, 7 Germans Buildings, Buxton Road, Stockport.  
**SUTTON AND CHEAM** : F. J. Harris, G2BOF, 143 Collingwood Road, Sutton, Surrey.  
**WARRINGTON** : G. H. Flood, 32 Capesthorpe Road, Orford, Warrington.  
**WELLINGBOROUGH** : J. Graves, 1 Millers Close, Finedon, Wellingborough.  
**WEST LANC'S** : S. Turner, G3JUB, 5 Balfie Street, Seaforth, Liverpool, 21.  
**WIRRAL** : A. C. Wattleworth, 17 Iris Avenue, Cloughton, Birkenhead.

in Central America" (December 8) and a Hot-Pot Supper (December 15).

**Sutton and Cheam** have fixed their annual dinner for Saturday, March 12, at the "usual venue". Details can be obtained from the hon. secretary. A constructional contest has been arranged for February, and plans are in hand for a social evening, probably consisting of a visit to an ice show, this also to take place in February. The next meeting, on December 21 at the Harrow Inn, Cheam, will be a Christmas jollification and junk sale.

A demonstration of Radio Control for Models was given at **Warrington** by Mr. W. Sansom with his home-built motor launch. Mr. A. H. Pearson described the GPO Auto-Selector unit, and Mr. G. Leigh gave a talk on Valve Voltmeters. The Inter-Club Top Band Contest was won by G3CSG (Wirral) with G3ELL (Liverpool) second and G3ITY (Chester) third. The Cup will be presented at Wirral's Annual Dinner.

**Wellingborough** report to us for the first time. Membership is small, but the Club meets every Thursday at 7.30 p.m. A Morse class and a series of lectures has been planned, and it is hoped to arrange visits to other Clubs and to places of interest in the vicinity.

**West Lancashire** have their winter programme in full swing, with lectures, RAE Classes and a Christmas party all planned. An informal farewell party was held for G3JND, ex-VQ3DN, who has now sailed for Tasmania. He was made a life member of the Club.

#### CHANGE OF NAME

The firm of R. Lowther, Ltd., is now known as Arrell Electrical Accessories, Ltd., this change being designed to identify the name of the company with the trade mark "Arrell," now so widely known in the radio industry. The chairman is Mr. L. W. Townsend, and the address of Arrell Electrical Accessories, Ltd., is Vincent Works, New Islington, Manchester, 4.

#### NEW HIGH SPEED DECADE COUNTER TUBE

The Communications and Industrial Valve Department of Mullard Ltd. has recently introduced a high speed decade counter tube of novel design. This tube, the E1T, is of the hard-vacuum type, and is, therefore, capable of much higher counting speeds than cold-cathode gas-filled decade counters. The actual counting rate is limited only by the associated circuitry, and counts of 30,000 per second are readily attainable.

The E1T can be used in all normal industrial batching and counting operations, and, in addition, it is particularly suitable for high speed computing purposes in business machines, telecommunications gear, and radiation counters.

The basis of the Mullard E1T is a ribbon-shaped electron beam which can be deflected into ten well-defined positions by the input signals. In any of these ten positions the beam passes through one of ten apertures in a cylindrical anode and impinges on a fluorescent screen, causing a spot of light to appear opposite the appropriate figure ("0" to "9") marked on the tube envelope. As the last position is passed

#### News in Brief

**BRADFORD** : December 15, Joint Quiz with Spenn Valley, at Cleckheaton. December 28, "The Electron," by G2BOO.

**CLIFTON** : Fridays, 7.30 p.m., at 225 New Cross Road, London, S.E.14.

**LEEDS** : December 8, Talk by Mr. E. W. Morris ; December 15, Circuit Copying, by Mr. E. Sollitt ; January 5, Questions and Answers.

**LIVERPOOL** : Tuesdays at St. Barnabas Hall, Penny Lane.

**ROMFORD** : Tuesdays, 8.15 p.m., at R.A.F.A. House, 18 Carlton Road, Romford.

**SLADE** : December 10, Television Transmission Systems (Pye lecture-demonstration). December 24, no meeting.

**SOUTH MANCHESTER** : December 17, Instruments used in the Electrical Engineering Industry (G6DN) ; December 31, No meeting ; January 14, Lecture.

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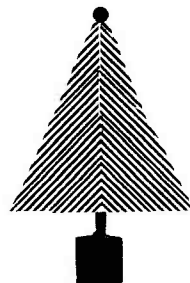
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**BRIDGE MEGGERS.** An invaluable testing set comprising a Meg. insulation tester and a complete Wheatstone bridge for measuring resistance. Incorporating a constant pressure hand generator, a direct reading ohmmeter which also serves as the galvanometer for the Wheatstone bridge, a direct reading adjustable resistance and the necessary ratio and change-over switches. Testing voltage 250v. Insulation range 0/100 megohms. Resistance measuring range 0.01 ohms to 999.9K ohms. In good condition and supplied in leather carrying case. PRICE 21/.

**TWO-RANGE POCKET VOLTMETERS.** Moving coil, 345 ohms per volt, 2 $\frac{1}{2}$  ins. dia. Calibrated 0/15v. and 0/250v. D.C. Fitted with test lead and prods. An accurate meter, as new in carrying case. PRICE ONLY 12/6, post 1/3.

**AMMETERS.** 0/20 amps full scale deflection, moving coil type, 2 $\frac{1}{2}$  ins. dia. metal cased hermetically sealed. Uncalibrated, two thirds of the scale is painted green and marked "Charging" and the last third painted red. PRICE ONLY 7/9, post 9d.  
0/14 amps, moving iron, 4 $\frac{1}{2}$  ins. dia. panel mounting projection pattern. First grade meter in maker's carton as new. SPECIAL PRICE ONLY 12/6, post 2/-.

**WAVEMETERS TYPE W. 1239.** Frequency coverage 39 to 51 Mc/s. Rectifier type employing one each of the following valves VR92, 6J5, Vi103, 6X5. The tuning control is fitted with a Muir-head slow-motion drive with a calibrated white escutcheon and vernier scale. Contains its own built-in Power Pack for A.C. mains operation from 200/250v. 50cps. Housed in copper lined wooden instrument cases 15 $\frac{1}{2}$  x 10 $\frac{1}{2}$  x 9 ins. with hinged lid. A useful addition to any Test Room or Laboratory or as an inexpensive basis for constructing other test gear. Condition is as new and unused. Supplied in maker's transit case. PRICE ONLY 69/6, carriage 6/6.

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SMALL ADVERTISEMENTS, READERS—continued

**AR 88LF.** manual. S-meter. good condition. £45. Delivery 50 miles of Bedfordshire after inspection.—Box 1512, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**CR 100.** very good performer. £22 10s.; 12 6V6GT. £2 10s.—Box 1514, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**Q-MAX VHF CONVERTER.** 60-200 mc. just overhauled by makers. Q-Max GDO. 1.5 to 300 mc. unused. Offers?—Box 1513, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**WANTED:** BC-348 or similar, with generator preferred, for mobile use; cash or part-exchange. Have VRL Rx and Xtal Calibrator in rack. HRO Senior, 4 coils B.S., 40 and 80 metres. SCR-522 Tx. modified and working on two metres. P/P and mike. Weston Test Meter and Analyzer in case; also MCR1 complete. — Smith, 160 Butler Street, M/C 4.

**WANTED** urgently. Gen. Book for R.109; borrow or buy. Also valves ARP2 and AR8.—Profaze, 40 Seafeld Road, Arnos Grove, London, N.11.

**VACUUM Rectifiers U19/23.** suitable replacement for GU50, 15/- pair. Many other valves. Send s.a.e. for list.—Jeapes, 129 Cambridge Road, Trumpington, Cambs.

**WANTED:** Scrap BC-342 for spares; RF Section and dial not essential.—Price and condition to: G3110, 16 Bancroft Road, Bexhill.

**T1131 PA** with 2 VT62's. C43 spares. SCR-522 transmitter chassis. Bendix TA12 transmitter 813, TZ40's, 866's. All cheaply for quick disposal.—Box 1519, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**CLOSING DOWN:** CR100, good, no cabinet, £13; 100-watt transmitter, 13-valve, VFO. CW/Phone, push-button control (slight testing needed); cost £53; £25 or offer. NEW Labgear W/B multiplier, £3 10s. Class-D wavemeter, AC. £4. Many others, including LP filter, harmonic filter, valves, magazines, etc.; s.a.e. list; carriage extra.—F. Glynn, 13 Station Road, East Grinstead.

**TU 5B, VFO/PA.** 6V6/807, metered, 70/-; 400v. P/Pack, 30/-; Eddystone speaker, 20/-; Brown's "F" Phones, 10/-; AVO Minor, 40/-; 866's, 7/6; 1000 kc Xtal, 10/-; Eddystone-type cabinet/chassis, 17" x 10", 10/-; Carriage extra.—27 Lulworth Drive, Leeds 15.

**AR 88D,** mint condition, appearance as new, with S-meter, manual and speaker. £70. Also **EDDYSTONE 740,** practically unused and as brand-new, with speaker. £32. London area.—Box 1517, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**FOR SALE:** HRO. 9 coils, power/pack, £24 10s.; CR100 in good condition, £17 10s.; LM7 Frequency Meter, £15; Valves, 6AG7, 6K8, 6Y6, at 6/-; 5R4GY, 5U4, 6V6G, 6G6G, 5Z4, at 5/6. Following boxed: 829 at £1 10s.; Txvalves TZ40 at 17/6; 1SE at 17/6; 813 at 45/-; 387 at 7/-.—Box 1521, Short Wave Magazine, Ltd., 55 Victoria Street, S.W.1.

**FOR SALE:** Complete set HRO Coils; 80, 40, F 20, 10, bandsread; 0.9-2050, 7-14, 3.5-7.3, 14-30 mc general coverage; spare 80, 40, 10, bandsread. Best offers?—Box 1520, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.



SMALL ADVERTISEMENTS, READERS—*continued*

**F**OR SALE: CR100, £17 10s.; Scott Laboratories Communication Receiver. £20; BC1147, £32 10s.—Box 1522, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**F**OR SALE: CR100 Receiver, £17 10s... or exchange, with cash adjustment, for BC221 frequency meter. **VALVES FOR SALE:** 829, 832, at 25/-; TZ40, 809, 811, 810, 803, 35T, at 17/6; 5R4G7, VR150, 807, 6SN7, at 6/-; EF91, EF92, 6C4, 6AL5, at 5/-.—Box 1515, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**W**ODEN POTTED, 750-0-750, 250 mA Woden potted filament transformer, 2.5-2.5, 3.75-3.75, tapped primaries. Also small transformers; cheap.—Offers: 2 Cliff Road, Gardeis, Leeds.

**S**ALE: AR77E with handbook, good condition, £22; matching speaker, £2; AVO 40, as new, £8; Avominor, £3; Terris model 22a Signal Generator, as new, £30.—Box 1518, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**W**ANTED: 456 kc Xtal for AR88D. **FOR SALE:** LM7 Frequency Meter, £15; HRO receiver, 8 coils and power/pack, £25; SX17 receiver, £17 10s.—Box 1516, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**S**ALE: S640, built-in preselector (EF91), controlled from front panel; EF54 RF; 6BA6 extra 1F; fine condition, performance, manual; £21.—Edwards, 20 Fairway, Leigh-on-Sea, Essex.

**W**ANTED: *CQ*, January, March, April, June, November, December 1945, May 1946; *Radio* before 1936; *R/9* before April 1935; *QST* before 1924. Any *QTC*, *Ham Chatter*, *XTAL*, most *Radio ZS*, *Amateur Radio*, many *Break In*, *Calling CQ* (de-Soto).—G31DG, 95 Ramsden Road, London, S.W.12.

**S**ALE: B36 Manual, 6 spare valves, good condition.—Apply to R. G. Steel, 35 Worsley Avenue, off Hilton Lane, Little Hulton, Walkden, nr. Bolton.

**H**ALLICRAFTERS S38, condition excellent, £15. Handbooks: HRO, 15/-; SCR522, 25/-; Variac, 300 watts, £3 10s.; pair 866A, 22/-; Sound Sales 5 kW transformer, tapped every thousand, 45/-; Carriage extra.—G2AC, Sleepy Hollow, Headley, Bordon, Hants.

**W**ANTED: Eddystone 358X Crystal Filter Unit, BFO switch, dial plate, flywheel drive, cabinet and handles. — G3JBU, 7 Western Terrace, Northampton.

**R**ECEIVERS for sale: R1155N with separate AC power/output unit, in fine condition; MCR1 portable Rx, AC/DC/Batt., all coils, power/pack.—Offers to GM3JNW, 45 Ochil Street, Alloa, Clackmannanshire.

**U**NIVERSAL Avominor, case, £5; Goodmans Axion Twelve, £4; Remington Fivesome Razor, £4; Imperial "Good Companion" Typewriter, £15, Carriage extra. **WANTED:** UM2, TU26B, Xtals Top Band, Standards, American Bug, AM switch, type 77 10FB/259.—G31XA, Seal Point, Radford Cemele, Warks.

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SMALL ADVERTISEMENTS, READERS—*continued*

**DECCOLA** Parts for sale; receiver chassis. Hi-Fi amplifier. power/pack. auto-change table; bargain. £25. Also three 12" Goodman's Axion Speakers at £5 each; basis for radiogram.—G3JVA, 9 Cedar Avenue, Sidcup. (*Footscray 6746*).

**FOR SALE:** (4) HK257B/4E27, new; re-packed for post; offers? **WANTED:** (2) 456 kc Xtals for HRO.—Box 1524, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**A MATEUR SELLING UP,** offers for sale BC-348, modified for mains; R1481, modified for 10-metre reception; also 5-metre Converter and 10-inch Amplion loudspeaker in case. Prefer to sell *en bloc*.—J. B. Rogers, 25 Blading Road, S.W.2. (*Tel: Tulse Hill 7002, evenings*).

**TYPEWRITER.** Underwood, completely overhauled, perfect; exchange good Communications Receiver. **SALE:** R1481, new, £5; RCA speech amplifier, modified, £10; Gram, amplifier, £4 10s.; Collins TCS receiver, £5; signal generator, T20, £4 10s.; BC221, £25.—39, Kingsbury Road, Birmingham 24.

**TWO-METER CONVERTER.** 6J6, 85/-; Commercial Yagi, 35/-; City Slicker, 40/-; 75-w. Phone Tx, offers? Class-D Wavemeter, AC, 95/-; Acos Mic, 30, new, 38/-; 200 valves, 1½v.-25v. filaments, including 829, 832, QV4-07, EF50, PX25, 8012 110v. Sunbeam Shaver, 35/-; Nearest offers accepted. **WANTED:** Domestic Radio, Gram equipment, Tape deck, Camera, etc.—22 Wellington Road, Oxtou, Birkenhead, Ches.

**WANTED:** Communications Receiver, Electronic Bug Key and Class-D Wavemeter Xtal.—Details, please, to G3IUV, 16 Stanbury Road, Bristol, 3.

**FOR SALE:** Eddystone Receiver, Model 740, as new; nearest offer to £27 accepted.—Hermitage, Marlow, Bucks.

**FOR SALE:** Eddystone Communications Receiver S740; good condition; one owner; £23 or nearest offer.—Haile, 11 Brunswick Road, Coventry.

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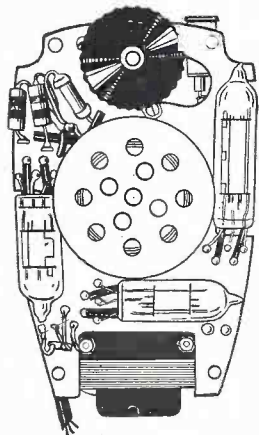
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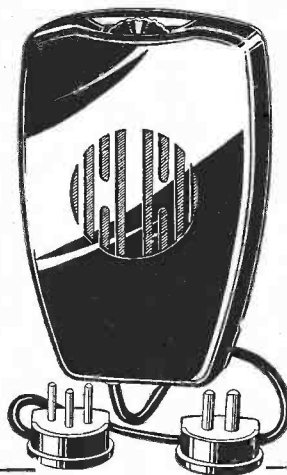
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1R5, 1S5, 1T4, 1S4, or (3S4 or 3V4)... 27/6 "

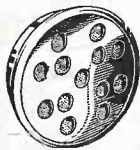
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| 1R5 ... 7/6  | 6V6GT 7/6     | EY51 ... 12/-     | VR150/30 8/6   |
| 1S4 ... 7/6  | 6AG7 ... 12/6 | EK32 ... 6/6      | CK510AX 5/-    |
| 1S5 ... 7/6  | 12A6 ... 7/6  | EF91 ... 9/-      | DI ... 2/-     |
| 1T4 ... 7/6  | 12AT6 8/-     | EL33 ... 10/-     | AC6PEN 6/6     |
| 1C5 ... 8/-  | 12AT7 9/-     | EL32 ... 7/6      | EFL90 ... 10/6 |
| 3A4 ... 9/-  | 12AU6 9/-     | EL41 ... 11/-     | EC80 10/6      |
| 3V4 ... 7/6  | 12BA6 9/-     | EF50 ... 10/-     | P2 ... 3/6     |
| 354 ... 7/6  | 12BE6 10/-    | Red Syl. ... 10/- | PCC84 12/6     |
| 5Z3G ... 8/6 | 12K7GT 8/6    | EF50 ... 5/-      | PCF82 12/6     |
| 5U4G 8/6     | 12K8GT 8/6    | EM34 10/-         | PEN25 6/6      |
| 5Z4G ... 8/6 | 12Q7GT 8/6    | EZ40 ... 10/-     | PEN46 7/6      |
| 6A7G ... 8/6 | 12SA7GT 8/6   | EZ80 ... 10/-     | QP21 ... 6/6   |
| 6AC7 ... 6/6 | 12SQ7GT 8/6   | 5P2 ... 8/6       | SP61 ... 4/6   |
| 6ABG ... 8/6 | 12S17 8/6     | V92 ... 8/6       | SP41 ... 4/6   |
| 6AM6 9/-     | 12SK7 8/6     | TDD2A 8/6         | HL2 ... 6/6    |
| 6B8 ... 7/6  | 12SR7 7/6     | DK40 ... 9/-      | HL23/D 6       |
| 6CSGT 5/-    | 25Z6GT 8/6    | UF41 ... 11/-     | VP23 ... 6     |
| 6C6 ... 6/6  | 25Z5 ... 8/6  | UL41 ... 11/-     | VP41 ... 7 3   |
| 6D6 ... 6/6  | 35Z4GT 8/6    | UY41 11/-         | U22 ... 8/6    |
| 6E6 ... 6/6  | 35Z5GT 8/6    | 4D1 ... 4/-       | ATP4 4/6       |
| 6G6G 6/6     | 35W4 8/6      | 8D2 ... 4/-       | TP22 ... 8/6   |
| 6H6GT 5/-    | 25A6 ... 8/6  | 9D2 ... 4/-       | TH233 10/-     |
| 6J5GT 5/-    | 35L6GT 8/6    | D41 ... 5/-       | 4IMP 7/6       |
| 6J6 ... 9/-  | 50B5 ... 10/- | KT2 ... 5/-       | 42SP 6/-       |
| 6AK5 9/-     | 50L6GT 8/6    | U52 ... 8/6       | 2155G 4/-      |
| 6I7G ... 6/6 | 50C5 ... 10/- | U19 ... 10/-      | MS/PEN 7/6     |
| 6K7G 6/6     | 42 ... 8/6    | Y63 8/6           | MS/PEN B 7/6   |
| 6K8G ... 9/- | 43 ... 8/6    | MU14 8/6          | VT501 7/6      |
| 6L6G 10/-    | 75 ... 8/6    | PL81 ... 11/-     | AC/PEN(7) 10/- |
| 6U5 ... 7/6  | 80 ... 8/6    | PL82 ... 10/-     | PENDD4020 10/- |
| 6U5G 7/6     | 866A ... 15/- | PX25 12/6         | FC13C 10/6     |
| 6N7G 7/6     | TZ40 3/6      | PY82 8/6          | VP4(7) 8/6     |
| 6Q7GT 8/6    | 931A ... 50/- | PY82 8/6          | U19 ... 10/-   |
| 6S7GT 8/6    | EA50 ... 2/-  | KT33C 10/-        | 803 ... 25/-   |
| 6X4 ... 8/6  | EABC80 10/-   | KT66 12/6         | 805 ... 30/-   |
| 6X5G 8/6     | ECC85 10/-    | GU50 12/6         | 810 ... 30/-   |
| 6SA7GT 8/6   | ECH35 12/-    | XP2V ... 4/-      |                |
| 6SQ7GT 8/6   | EP41 ... 11/- | XH (1.5) 4/-      |                |

**U.S.A. INDICATOR UNIT TYPE BC929A**

Complete with 3BPI and Holder, also Screen. 2-6SN7GT, 2-6H6GT, 6X5GT-2X2-6G6. Resistors, V/Controls, Condensers, etc. Ideal for 'Scope. Black crackle case, 14in. x 9in. x 9in. 65/-, carriage 5/- AS NEW.

**MORSE PRACTICE BUZZER**

Complete with tapper and 4-volt buzzer on base board, 6/-, brand new. Post paid.

**CRYSTALS**

200 kc/s, 2-pin (U.S.A.) ... 10/-

465 kc/s, 2-pin (U.S.A.) ... 10/-

500 kc/s, 2-pin (British) ... 15/-

**RECORDING TAPE (G.E.C.)**

600 feet reels, 10/-.

**T.C.C.** 1 5/7,000 v. wkg. Type CP58QO, Bakelite Case, 7/6 each.

**VOLTMETERS**

|             |                         |      |
|-------------|-------------------------|------|
| 6 V         | M.C. 2 1/2" Projection  | 10/- |
| 15 V (50c)  | M.I. 2 1/2" Flush       | 10/- |
| 20 V        | M.C. 2" Square          | 7/6  |
| 150 V       | M.C. 2 1/2" Flush       | 10/- |
| 300 V (50c) | A.C. Projection 5" Dial | 50/- |

**AMP-METERS**

|                   |                        |      |
|-------------------|------------------------|------|
| 500 mA            | T/C 2" Square          | 6/-  |
| 1A                | M.C. 2 1/2" Projection | 10/- |
| 3A                | T/C 2" Square          | 6/-  |
| 6A                | T/C 2 1/2" Flush       | 7/6  |
| 15A M.I. (50 c/s) | Projection             | 21/- |
| 20A M.I. (50 c/s) | 2 1/2" Flush Mtg.      | 10/- |
| 30A               | M.C. 2" Square         | 7/6  |
| 20A               | M.C. 2" Round          | 7/6  |

**MILLIAMMETERS**

|        |                   |      |
|--------|-------------------|------|
| 500 μA | M.C. 2" Round     | 15/- |
| 1 mA   | M.C. 2" Square    | 17/6 |
| 1 mA   | M.C. 2 1/2" Flush | 22/6 |
| 1 mA   | M.C. 2" Desk      | 25/- |
| 5 mA   | M.C. 2" Square    | 7/6  |
| 10 mA  | M.C. 2 1/2" Flush | 10/- |
| 30 mA  | M.C. 2" Round     | 7/6  |
| 30 mA  | M.C. 2 1/2" Flush | 10/- |
| 50 mA  | M.C. 2" Square    | 7/6  |
| 150 mA | M.C. 2" Square    | 7/6  |
| 200 mA | M.C. 2 1/2" Flush | 10/- |
| 500 mA | M.C. 2 1/2" Flush | 10/- |
| G.E.C. | 1 mA Meter Rect.  | 10/- |

28-page Catalogue, 3d. Open Mon.-Sat. 9-6. Thurs. 1 p.m.

**INDICATOR UNIT TYPE 182A**

This unit contains VCR517 Cathode Ray 6in. tube, complete with Mu-metal screen, 3 EF50, 4 SP61 and 1 5U4G valves, V/W volume controls, resistors and condensers. Suitable either for basis of T/V or Oscilloscope. "Radio Constructor" Scope constructional circuit included. 67/6 (plus 7/6 carr.).

**CATHODE RAY TUBES**  
(Brand New)

VCR97 (slight cut-off) ... 15/-

VCR97, guaranteed full T/V picture ... 40/-

VCR517C, guaranteed full T/V picture ... 35/-

VCR139A, guaranteed full T/V picture ... 35/-

3BPI guaranteed full T/V picture ... 30/-

Carr. and packing on all tubes, 2/-.

**DENCO F.M. FEEDER UNIT**

Finest Audio available. Complete kit of parts, including drilled chassis. 5 valves: types 6AM6, 12AH8, EB91 and 2 6AB6. Also complete circuit and wiring diagram. £6/7/6. Or assembled and aligned, £8/10/-. Alignment only, 10/-.

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Receiver 27/73. This is a six-valve superhet receiver with 465 kc/s I.F.s. Complete with all valves: 2 EF39, 1 EK32, 2 EF36, 1 EBC33. In brand new condition with full conversion data. SPECIAL OFFER, 27/6, plus 2/6 carriage.

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Brand new in sealed cartons, these contain 6 EF50's, 5 EA50's, 1 SP61, a host of condensers, resistors, transformers, chokes, relays, switches, 7 pots and 5 smoothing condensers. Size 18in. x 8 1/2in. x 7 1/2in. Only 59/6, carriage free.

**RCA 931A PHOTO-ELECTRIC CELL AND MULTIPLIER**

For facsimile transmission, flying spot telecine transmission and research, involving low light-levels, 9-stage multiplier. Brand new and guaranteed, only £2/10. Special 11-pin base, 2/- Data sheets supplied. Replacements for Mazda 27M1 and 27M2.