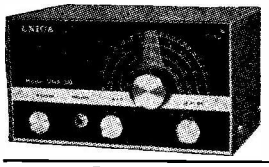
4/-

The SHORT WAVE Magazine

VOL. XXVI JANUARY, 1969 NUMBER 11



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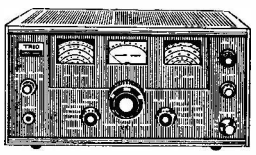

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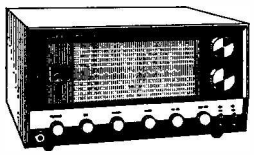

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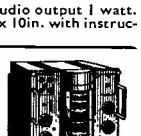

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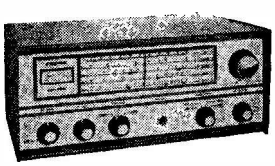

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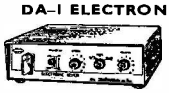

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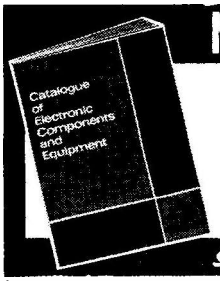

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200μA	32/6	20mA	25/–	5A	DC	25/–	
500μA	27/6	50mA	25/–	3v	DC	25/–	
50-0-50μA	35/–	100mA	25/–	10v	DC	25/–	
100-0-100μA	32/6	150mA	25/–	20v	DC	25/–	
500-0-500μA	25/–	200mA	25/–	50v	DC	25/–	500v DC 22/6 150v AC 25/–
1-0-1mA	25/–	300mA	25/–	100v	DC	25/–	750v DC 22/6 300v AC 25/–
1mA	25/–	500mA	25/–	150v	DC	25/–	15v AC 22/6 500v AC 25/–
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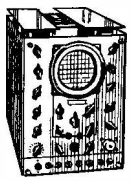

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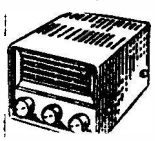

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SHORT WAVE MAGAZINE

(GB3SWM)

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CONTENTS

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT WAVE Magazine

EDITORIAL

Prospects

One of the most encouraging phenomena in the world of radionics at the present time is the rising tide of "young interest" in Amateur Radio. From our general correspondence, it is easy to gauge these tendencies, and it is evident that a great many schoolboy-beginners are taking the Radio Amateurs' Examination in their stride, so to speak, with no immediate intention of coming on the air—this is something to be kept for "later on," which usually means when they have learnt enough Morse to pass that Test!

In the main, however, it is still from our army of SWL's (many of whom are very experienced on the receiving side) that newcomers are recruited to the ranks of radio amateurs, and it is these SWL's who need guidance and encouragement. It is here that local Club groups can do so much to help, advise and enthuse beginners—and it is to the credit of many Clubs, up and down the country, that they make special arrangements to cater for the needs of their SWL members. And this month is the tenth anniversary of our own "SWL" feature.

The coming year, with all the interesting and exciting prospects that it holds for radio amateurs—the improving DX conditions; the rise in the MUF; the availability of ten, six and four metres for inter-Continental and cross-band working; and the launching of the Oscars—means that 1969 will be outstanding in the memory of those radio amateurs fortunate enough to be able to join in all these activities.

And to all our readers and trade friends
—at home and across the seas—
Every Good Wish for the New Year

Austin Forsyth, G6FO.

TRANSCEIVER FOR THE LF BANDS

COMPACT DESIGN FOR /A WORKING, PORTABLE OPERATION, STAND-BY OR MAIN STATION

F. G. RAYER, A.I.E.R.E. (G3OGR)

THE ease with which a transceiver can be used at an alternative address is a great advantage for anyone who takes equipment on holiday, or occasionally works /A. Everything is in one box. It is only necessary to plug in microphone, mains and some kind of aerial—probably a temporary, end-fed wire. The transceiver described here is for 10 watts input on 160, and 12 watts on 80 metres, but fits a case only 10 x 7½ x 7in., inside dimensions, and is thus a reasonable single-unit station to transport, or operate in any room at home.

The brief specification is as follows:

Power Pack: EZ81 supplying 300v. at 120 mA, and OA2 voltage stabiliser for the VFO.

Receiver: 6BA6 RF amplifier, ECH81 mixer, 6BA6 IF amplifier with double IFT coupling, 6AT6 for detection, AVC and audio amplification. Bandspread tuning of 160 and 80 metres. Panel aerial trimmer, RF gain and AF gain controls.

Audio Amplifier/Modulator: 12AU7 microphone amplifier, followed by 2/6BW6 for high-level modulation, or operating speaker at reduced power.

Transmitter RF Section: EF91 stabilised VFO covering 1·75-2·0 mc. EF91 buffer/doubler. 5763 PA with *pi*-tank.

Metering: 0-5 mA panel meter operating as S-meter on "receive," and reading 0-50 mA PA cathode current on "transmit."

This combination has been found very satisfactory. The receiver has good sensitivity and selectivity, while the transmitter output and modulation are fully up to the expected level. In terms of operating convenience and results, the transceiver has proved to be much more satisfactory than earlier transceivers having a mediocre receiver and other limitations.

Constructional Points

Construction was on a *Home Radio* (*Mitcham*) "universal chassis" because side and rear members can be taken off to simplify wiring, and an extra 10 x 3in. runner can be bolted across to strengthen the whole and form compartments 10 x 3¼in. at the rear, and 10 x 3¾in. at the front. The whole chassis is 10 x 7in. and 3in. deep. The panel is 7½in. high, supported by 4 x 5in. brackets bolted to panel and chassis.

The VFO box is made from a 6 x 2in. "universal chassis" runner. Each flange has a 90-degree section removed 1¾in. from the end. Bending then produces a U-shaped box 1¾in. high, 2¼in. wide and 2in. deep, the front and back of which can be closed by securing 2½ x 1¾in. plates with self-tapping screws.

A holder for the EF91 is bolted on top of the box. The front plate is fixed on and the VFO is wired up complete. Flying leads are provided, to pass through the chassis. These were white for heater, yellow for screen grid, and blue for anode. If necessary, a check can be made that frequency coverage will be satisfactory. The box is then bolted to the chassis by its flanges, and the back plate is screwed on.

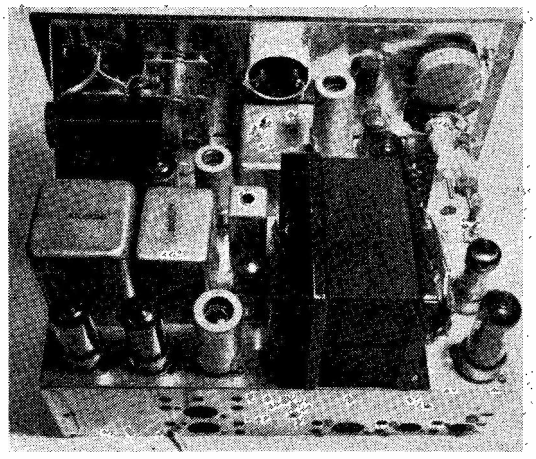
VFO Calibration

To avoid experiment and allow suitable band coverage at once, the VFO has three 1% capacitors, and a ready-made coil. (This does not mean other coils could not be used, subject to the usual adjustment, if needed.)

Final calibration of the VFO is left until all construction is finished. The coil core is then rotated until coverage is from 1·75 mc to 2·0 mc, with a trifle to spare each end, and the core is locked with a 6 BA nut.

A receiver and 100 kc crystal marker were used for calibration. The transceiver "Net" switch is closed, the receiver is set at 2·0 mc with the aid of the crystal marker, then the VFO is tuned to zero beat with the crystal. VC1 is almost fully open for 2·0 mc. The procedure is repeated for 1·9 and 1·8 mc.

The receiver is then tuned to 3·5, 3·6, 3·7 and 3·8 mc, and the VFO calibrated at these points, by securing zero-beat with the 100 kc crystal harmonic. The 3·6 and 3·8 mc points will (or should) be the same as the 1·8 and 1·9 mc markings. The 3·7 point agrees with 1·85 mc or 1850 kc for Top Band, 1·95 mc being found at 3·9 mc on the receiver, but not of course being included in the 80-metre band markings. Intermediate markings can be estimated,



View inside the G3OGR Transceiver.

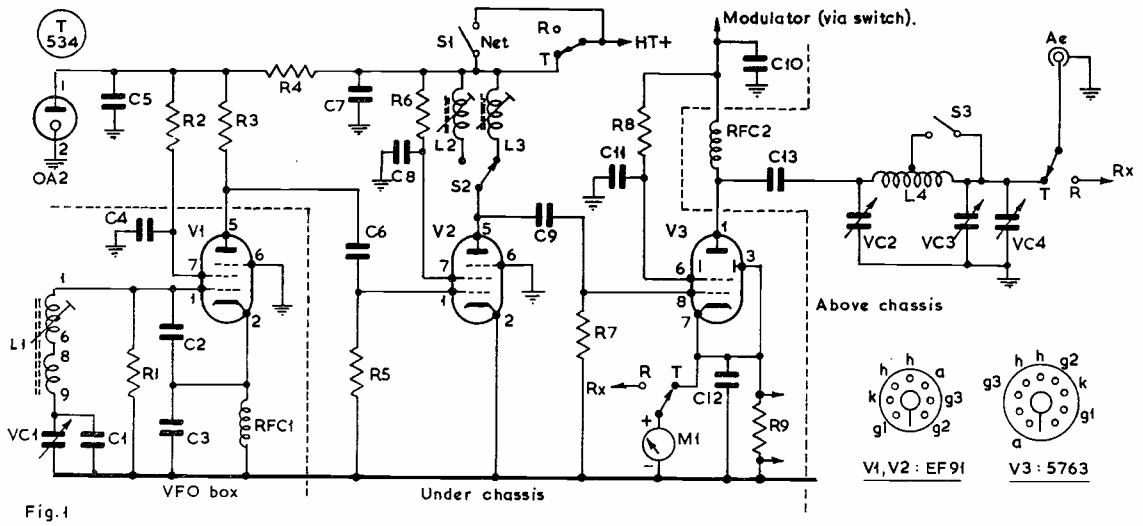


Fig. 1. RF Section, Transmitter, G3OGR Transceiver.

or obtained by listening to higher harmonics of the VFO.

Buffer Stage

Closing the "net" switch (Fig. 1) applies HT to V1 and V2, with the transceiver on "receive." This allows netting the receiver on the VFO frequency by observing the S-meter.

The buffer anode switch S2, Fig. 1, selects L2 or L3. L2 was a *Denco* "Red" (oscillator) coil Range 2. The small winding is removed, and 28 turns are unwound from the larger winding, the end being re-soldered to its pin. With the VFO at about 3·65 mc, rotate the core of L2 until a meter temporarily between R7 and chassis shows maximum grid current. This should be around 2-3 mA.

L3 is the *Denco* "Blue" Range 2 coil, with the smaller winding removed. Its core is adjusted for maximum grid current at about 1·9 mc. These coils are mounted near V2 and S2, under the chassis.

PA Stage

Cathode and grid circuits are wired under the chassis, Fig. 1. A lead from tag 1 passes immediately up through a hole, so that RFC2, C13 and other tank circuit components are *above* the chassis. This ensures screening.

C10, C11 and C12 are taken directly from the points concerned to adjacent tags bolted to the chassis. Shunt R9 is of such a value that the meter reads 0-50 mA. It can be calculated in the usual way (meter coil resistance/N— 1, where N is the number of times the scale is to be multiplied) or found by trial. For the latter method, it is convenient to have power off. A testmeter, battery, and potentiometer can then be placed in series, and clipped from tag 7 of V3, to the chassis; R9 is then adjusted until M reads 0-50 mA. Care is taken not to pass excess current through M when the shunt is disconnected.

The actual values of VC2 and VC3/4 are not important, except that larger values will match a greater range of aerials than smaller capacitors. VC3/4 can be a compact component with very close spacing, but a *miniature* condenser should not be used for VC2.

A tag strip supports RFC2. A lead from VC3/VC4 passes directly down to the transmit/receive switch, the nearest set of contacts being used.

Speech Amplifier and Modulator

Fig. 2 on p.672 is the circuit of this part of the transceiver. V1A and V1B are a 12AU7, connected so that cathode current flows through the

Table of Values

Fig. 1. Transmitter RF Section, G3OGR Transceiver

C1	= 150 $\mu\mu$F, 1% silver mica	R9	= meter shunt
C2, C3	= ·001 μF, 1% silver mica	L1	= *Denco* Yellow, Range 3
C4, C12	= ·01 μF	L2	= *Denco* Red, Range 2
C5	= ·002 μF	L3	= *Denco* Blue, Range 2
C6, C9	= 100 $\mu\mu$F	L4	= 70t. 24g. enam., 1in. dia., centre tapped
C7, C8	= ·01 μF	RFC1	= Min. cored 2·5 mH RF choke
C10, C11, C13	= ·001 μF, mica	RFC2	= 2·5 mH 60 mA choke
VC1	= 75 $\mu\mu$F, var.	S1	= toggle on-off
VC2	= 365 $\mu\mu$F, or near	S2	= 1-pole 2-way wafer
VC3, VC3, VC4	= 2/500 $\mu\mu$F, BC type	S3	= toggle on-off
R1, R5	= 100,000 ohms, ½-w.	OA2	= voltage regulator
R2	= 47,000 ohms, ½-w.	V1, V2	= EF91
R3, R6, R7	= 22,000 ohms, ½-w.	V3	= 5763
R4	= 15,000 ohms, 2w.		
R8	= 6,800 ohms, 3w.		

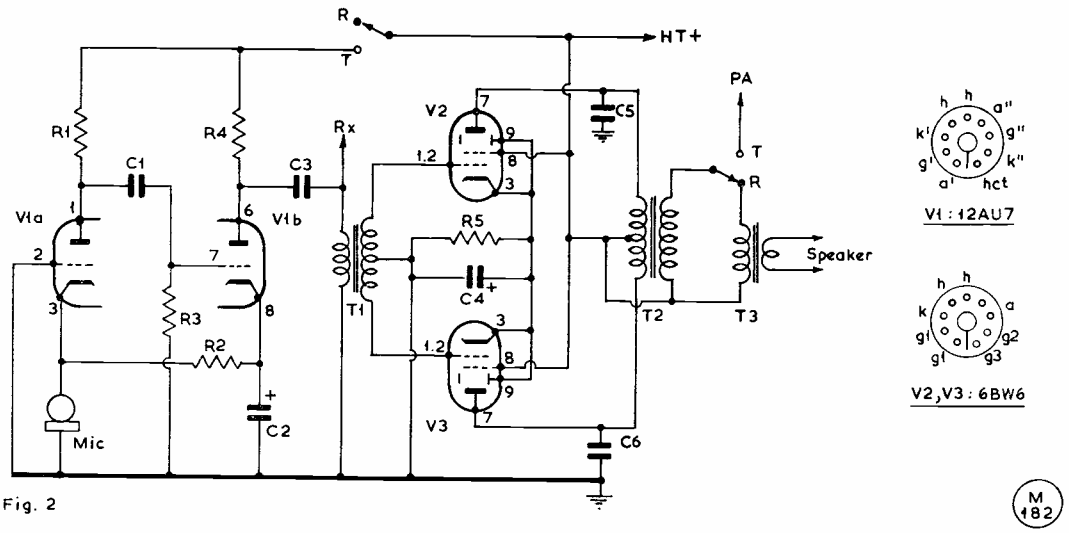


Fig. 2

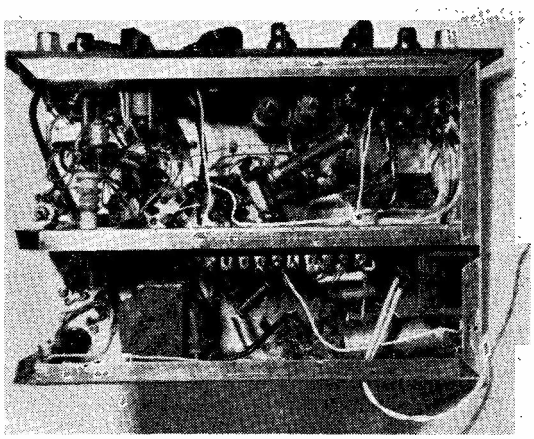
Fig. 2. Audio Amplifier and Modulator, Transceiver.

carbon microphone. (This was to suit a carbon mike it was wished to utilise.)

For a *crystal* microphone, a 12AX7 should be substituted, and connected as a conventional 2-stage audio amplifier. It has been found satisfactory to employ V1A with a 2·2 megohm grid resistor and cathode to chassis (contact potential bias), and have a 2·2K bias resistor for V1B. R1 and R4 are then 270K each. Grid circuits should be screened, and a 47 $\mu\mu$F capacitor placed across the crystal microphone co-axial socket.

HT is applied to V1A/V1B only on "transmit," as it was found unnecessary to have available further audio amplification, for reception.

T1 and T2 were actually surplus (ex-SCR522) transformers. The currently available *Radiospares* 1:3 intervalve type transformer is suitable for T1.



General arrangement under chassis.

Table of Values

Fig. 2. Audio Amplifier and Modulator

C1	= ·01 μF	V2, V3	= 6BW6
C2	= 50 μF, 12v.	T1	= Push-pull input, ratio 3 : 1
C3	= 0·1 μF	T2	= Modulation xformer, ratio 1·5 : 1
C4	= 50 μF, 50v.	T3	= Speaker former ratio about 40 : 1 or 60 : 1 for 2-3 ohm speaker
C5, C6	= ·001 μF		
R1	= 100,000 ohms, 1w.		
R2	= 1,000 ohms, ½-2.		
R3	= 470,000 ohms, ½-w.		
R4	= 47,000 ohms, 1w.		
R5	= 470 ohms, 2w.		
V1A, V1B	= 12AU7 (*see text*)		

In this case, an "artificial" secondary centre-tap (not shown in Fig. 2) could be provided by connecting two 270K 5% resistors in series across the secondary, their junction going to chassis. Various modulation transformers for a 5763 or similar PA, and able to handle 5 or 6 watts of audio (such as the *Woden* UMØ), are also available for T2. T3 is a small receiver type 40:1 or similar speaker transformer, for speaker matching on "receive."

The amplifier can be tested by temporarily joining T2 and T3 as for receive and speaking in the microphone. The speaker must be well clear to avoid feedback.

Receiver

Fig. 3 is the circuit of the receiver section. VC1 is a single-gang panel mounted capacitor, allowing correct aerial tuning or trimming with any aerial. VC2/VC3 are ganged, operated with a ball drive, for mixer and oscillator tuning.

L1, L3 and L5 are for the 80m. band, with L2, L4 and L6 for 160 metres. Experiments incorporating the PA tank coil for receiver aerial tuning, instead

of L1 and L2, gave much less freedom from 2nd channel interference, so this idea was not pursued.

L2 and L4 each have 32 turns removed from the tuned winding, the wire then being soldered to the pin. L6 has 20 turns removed. With suitable adjustment of the cores and T2 and T4, this allows the 160m. band to be covered with a little to spare. L1, L3 and L5 are not modified, and suitable coverage of the 80m. band is obtained by adjusting the cores and T1 and T3.

VR1 controls RF gain, while VR2 is the audio gain or volume control. AVC is applied to V1 and V3, and with the transceiver switched to "receive" the meter reads V3 cathode current, with meter shunt R15, Fig. 3. This resistor R15 is adjusted so that the meter shows full-scale with the aerial removed.

The six cores of IFT1, 2 and 3 are all peaked for optimum sensitivity, which is also maximum dip on the meter. VC1 can also be adjusted by the meter. Also peak L3 core around 3·6 mc, T1 at 3·8 mc, L4 core near 1·8 mc, and T2 on 2·0 mc.

By-pass capacitors (C2, C3, C4, C5, etc.) go directly from the points concerned to chassis. Condensers such as C1, C7 and C8 are taken directly from the valveholder tags to the nearer switch contacts. R1, R3, R5, etc., have short connections to the holder tags. R13 and C15 were close tag 1 of V4, with a screened lead from C15 to VR2.

One pole of the transmit/receive switch connects the aerial to the receiver section aerial circuit (L1 or L2). Another pole applies HT to the receiver section at "receive" only. C17 is permanently connected to the input transformer T1, Fig. 2.

The receiver should be found to have quite a good degree of selectivity and sensitivity. As only a small loudspeaker is incorporated and the 2/6BW6 output stage can supply much more audio power than required, VR2 is generally kept turned well

Table of Values

Fig. 3. Receiver section for the G3OGR Transceiver

C1, C8	= 100 $\mu\mu$F	R1, R10	= 1 megohm, ½-w.
C2, C3, C4, C5	= ·05 μF	R2, R9	= 68 ohms, ½-w.
C6, C11, C12, C13	= 0·1 μF	R3, R5, R7	= 47,000 ohms, ½-w.
C7	= 500 $\mu\mu$F	R4, R8, R11	= 33,000 ohms, ½-w.
C9	= 10 $\mu\mu$F	R6	= 150 ohms, ½-w.
C10	= 300 $\mu\mu$F	R12	= 220,000 ohms, ½-w.
C14	= 200 $\mu\mu$F	R13	= 8·2 megohm, ½-w.
C15	= ·01 μF	R14	= 1,200 ohms, 1w.
C16	= 8 μF, 350v.	R15	= meter shunt
C17	= ·02 μF	VR1	= 1,000-ohm potentiometer
VC1	= 50 $\mu\mu$F, panel trimmer	VR2	= 1 megohn log. potentiometer
VC2, VC3	= twin-gang, 20 $\mu\mu$F	V1, V3	= 6BA6
T1, T2, T3, T4	= Trimmers, 30 $\mu\mu$F	V2	= ECH81
		V4	= 6AT6

Coils, all *Denco* type. L1, Blue, Range 3; L2, Blue, Range 2; L3, Yellow, Range 3; L4, Yellow, Range 2; L5, Red, Range 3; and L6, Red. Range 2. IFT1 and IFT2, "1st IF" 470 kc type; IFT3, 470 kc, diode stage type.

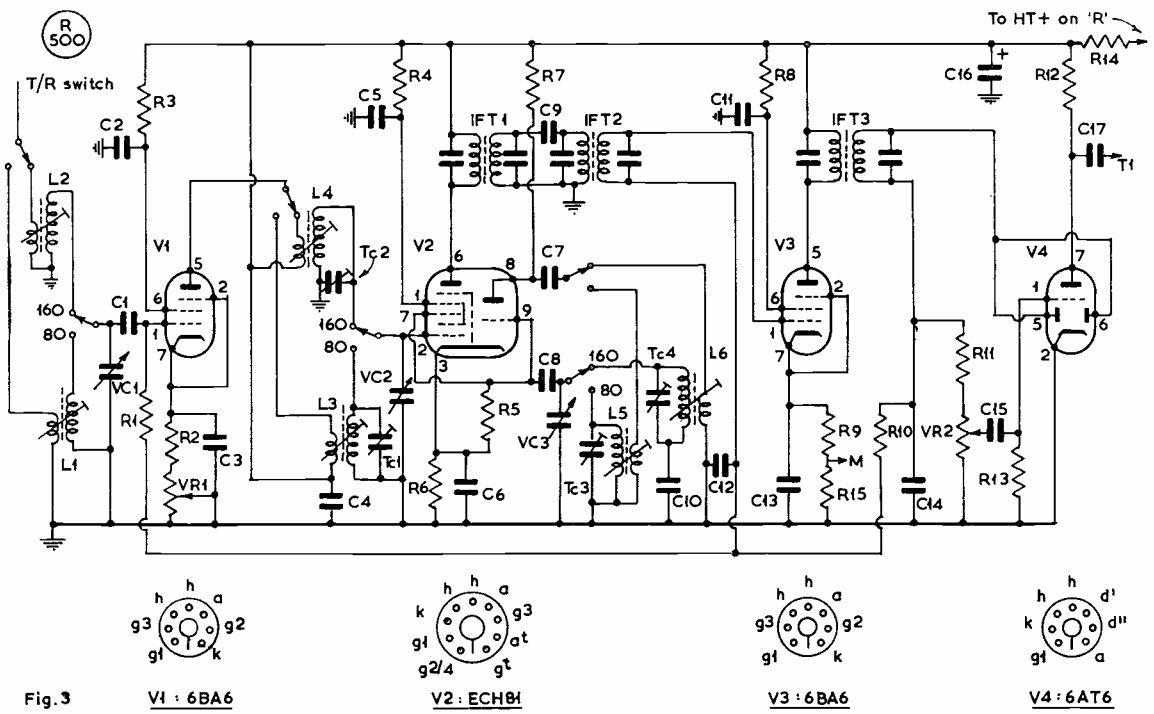


Fig. 3 V1 : 6BA6 V2 : ECH81 V3 : 6BA6 V4 : 6AT6

Fig 3. Receiver Section, G3OGR Transceiver.

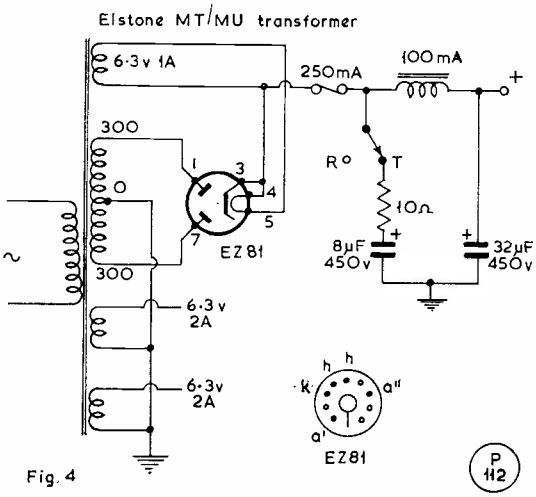


Fig. 4. Power Supply for the Transceiver.

back. Strong signals give about half-scale reading on the tuning meter.

Power Supply

This is shown in Fig. 4, and uses an easily-obtainable mains transformer (*Elstone* MT/MU). The full 300v. was required on "Transmit" with the PA drawing 30-45 mA. But on "receive" a somewhat lower voltage was preferred. With capacitor input, the HT line voltage tended to rise on "receive," which was the opposite to that required. To avoid introducing a dropping resistor, one pole of the T/R switch changes the rectifier from capacitor input to choke input. This idea proved very satisfactory, resulting in a HT line supply of about 230v. on the receiver, and 300v. to the Tx. The 10-ohm resistor reduces sparking at this section of the switch.

One 2A. secondary supplies EF91 VFO, EF91 buffer, 6BA6 RF and IF stages, ECH81, and 6AT6 (1·8A in all). The other 2 amp. winding is used for the microphone amplifier and modulator, and 5763PA (total 1·95A). The EZ81 has its own 1A. winding.

A 3-core flexible cord runs to a 13A. type plug carrying a 2A. fuse in the L (red) conductor. "Green is for safety," earthing to the large pin, and N (neutral) is black.

Switching

This should be clear, but is summarised here. HT is always present on the 2/6BW6 stage. On "transmit" circuits are made as follows:

HT to V1 and V2, Fig. 1.
HT to V1A/V1B and to PA from T2, Fig. 2.
8 μF capacitor in circuit, Fig. 4.
Aerial to tank coil L4, Fig. 1.
Meter to V3 cathode, Fig. 1.

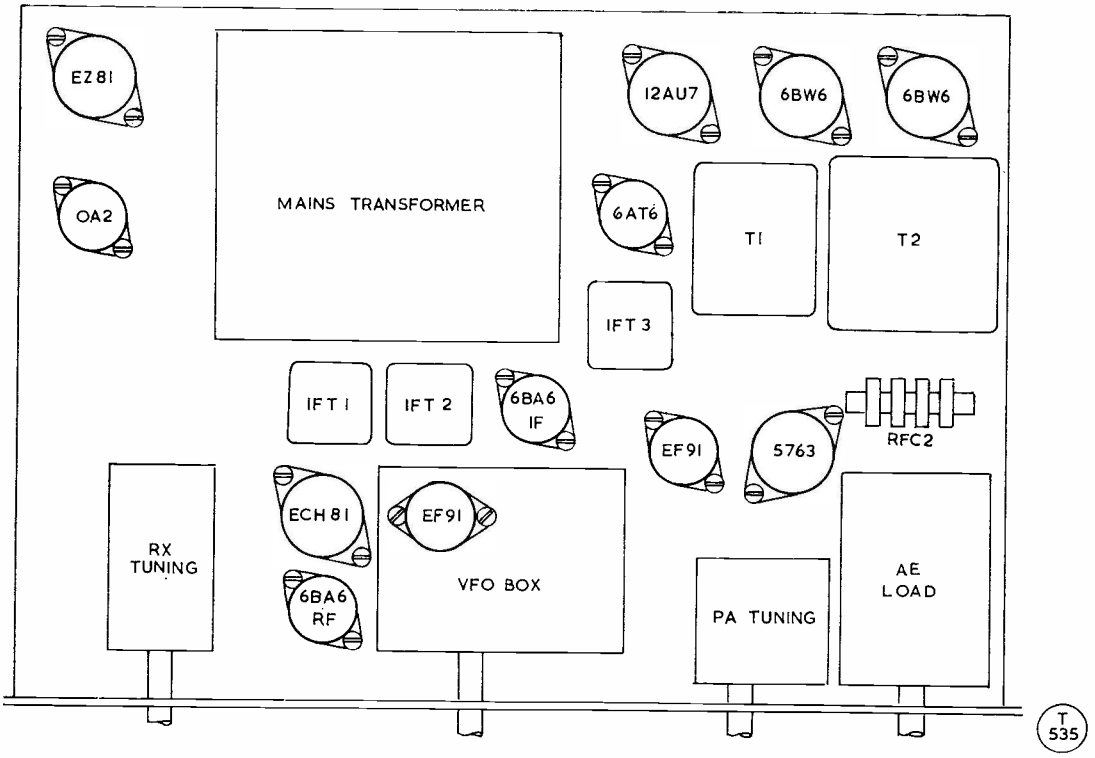


Fig. 5. General Chassis Layout for the Transceiver

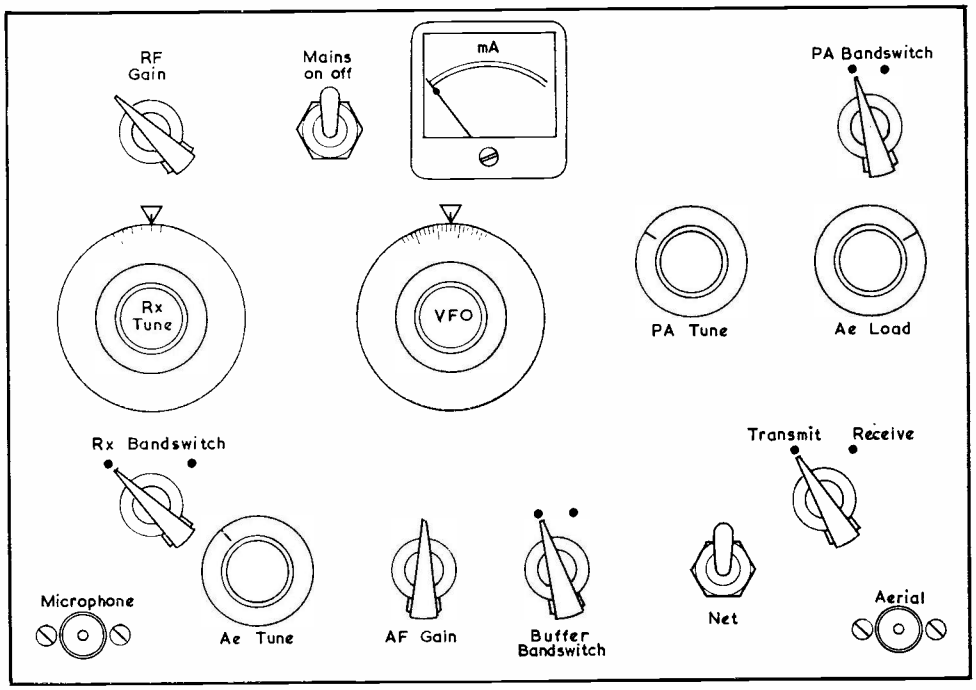


Fig. 6. Panel Layout and Controls, G3OGR Transceiver.

On " receive " the following circuits are made:

HT to receiver, Fig. 3.
Aerial to receiver, Fig. 1.
T2 to T3, Fig. 2.
Meter to IF stage, Figs. 1 and 3.

The band switch had two wafers, each 4-pole 2-way. The front wafer was used for L1 and L2 circuits, and rear wafer for L3, L4, L5 and L6. It is helpful to put in coloured leads to identify these and other circuits, and to solder connections to the least accessible tags first. Some wiring is greatly eased by taking off the side members of the chassis.

S2 selects L2 for 80 metres, and L3 (Fig. 1) for 160m., while S3 shorts half of L4 for 80m. S1 applies H2 to V1 and V2, Fig. 1, with the T/R switch at " receive."

Constructional Notes

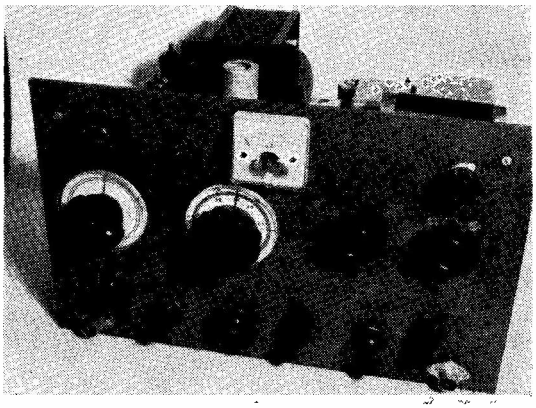
Figs. 5 and 6 give the panel and chassis layout. Various heater and other circuits need to pass through the 10 x 3in. runner which divides the under-chassis space. To allow for this, eight $\frac{1}{4}$-in. holes were punched in its length, near the chassis, before bolting it in.

All the mains transformer leads pass through a single hole, fitted with a half-inch grommet. Small holes for other leads can be drilled as need arises.

The case probably depends on what is available or can be easily made. The one shown allows the transceiver to be inserted from the back, afterwards closed by screwing on expanded metal. A small PM speaker fits near the OA2.

Operating Details

A station to be answered, or suitable spot for transmission, is found with the receiver. The buffer and PA bandswitches should be placed for the same band as that of the receiver, and with the " net " switch closed, the VFO can be adjusted to the same frequency. If another signal is not present, this can be done by watching the panel meter. The presence of a beating signal will also cause the usual



Panel view, showing general layout.

heterodyne.

With VC3/4 closed, switch to "transmit" and adjust VC2 (PA anode tuning) for a dip in cathode current. PA input is increased by opening VC3/4, re-adjusting VC2 for minimum current, in the usual manner. A first test is probably best made with an artificial aerial load. If a 15-watt 200/250v. household lamp is used for this purpose, it should light quite brightly with 10-12 watts DC input to the PA.

Since the meter switching places the instrument in the cathode circuit, the *total* cathode current is shown, not PA anode current alone. This can be allowed for by deducting a round figure of 10 mA, *e.g.*, assume 40 mA cathode current will correspond to 30 mA anode current. Or preferably include a testmeter temporarily between RFC2 and T2, load into the 15w. lamp for the wanted anode current, and note down the cathode current, which will in future be the tuning up point for this input.

To place the meter in the PA anode circuit, the T/R switch would need an extra pole, and also break-before-make contacts, and such a switch was not available.

Aerials can be of usual type—probably an 80m. dipole, or end-fed wire. The latter can be employed on both bands. Many good contacts have been obtained with quite short and low aerials, but QSO's over 100 miles or so have generally resulted when using a wire at least approaching a half-wave on 80m.—that is, some 120ft. or so. Should a temporary aerial not allow satisfactory loading of the transmitter, the simplest immediately available cure is to insert a loading coil between transmitter and aerial lead. This coil can be pile-wound with single flex, if necessary. About 30 turns 2in. or 3in. in diameter can be tried for 80 metres and 50 or 60 turns for 160m. This may well bring the feed impedance within the range of the transmitter output, or the loading coil may have to be modified until this is found to be so.

For regular use at the fixed QTH, a reasonably effective aerial is best erected, with an aerial tuner if the aerial needs this.

MORE ABOUT SIMPLIFYING RTTY CONTROL

IMPROVING THE LOCAL FACILITIES

J. D. HECK (G3WGM)

THE writer was very interested to see G8LT's article on RTTY Station Control in the November SHORT WAVE MAGAZINE. Readers may be interested to know of the variations that exist between G8LT's system and the arrangement adopted at G3WGM, in use for some time, which in many respects is otherwise quite similar.

There are two main differences. These are:

(1) Send/receive switches are fitted to all sources generating a signal in the loop, *i.e.*, teleprinter keyboard, auto-transmitter, and terminal unit.

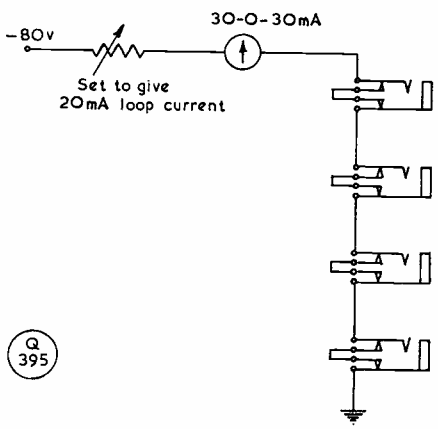
(2) Two completely seperate loops are available, the inter-connection between the loops and the various pieces of RTTY equipment being effected by means of close-circuit jack sockets.

The first difference means that when changing from one signal source to another, no additional switching is necessary apart from stopping the tape in the auto-transmitter, or switching off the signal from the terminal unit. It is also possible to have any number of signal sources plugged into a loop at any one time.

The second difference provides a very much more flexible arrangement for operation of the equipment. It is not normally necessary, however, to change any of the plugs during a contact, as they are set up at the start of the QSO for whatever mode required, *e.g.*, simplex, half-duplex, of full-duplex.

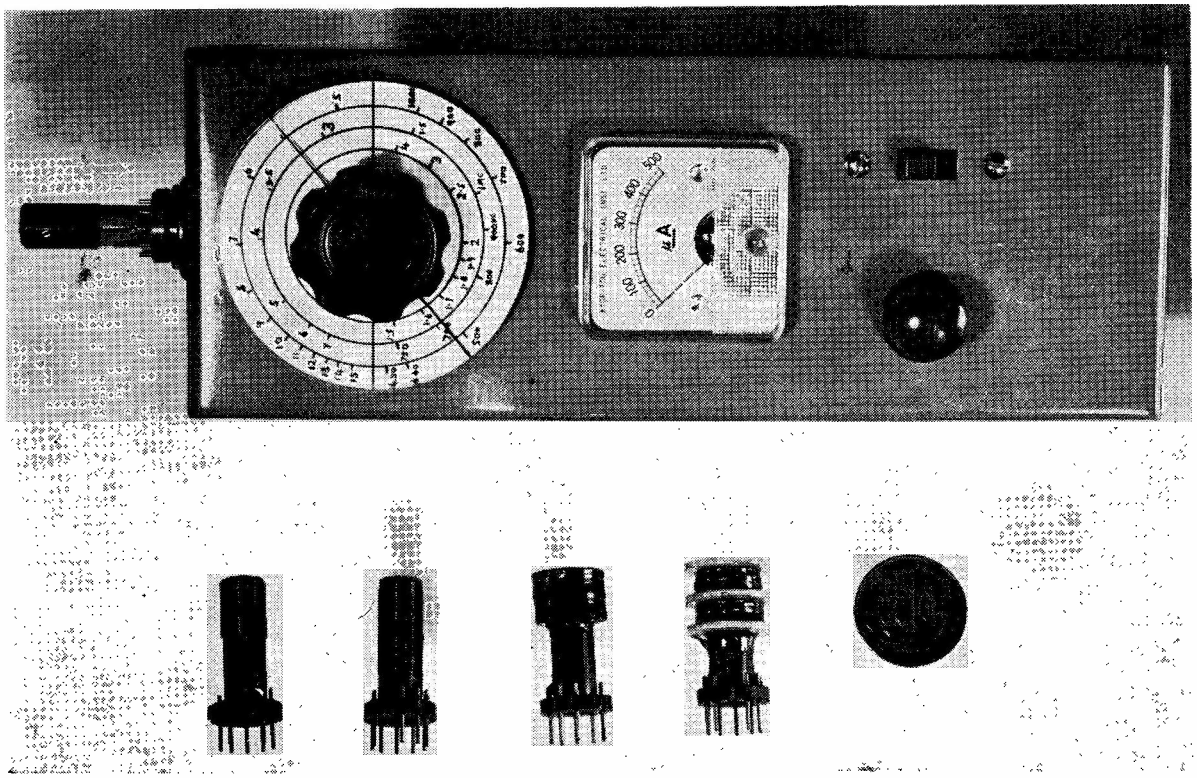
A typical loop is shown in the diagram. When no-signal is applied to it, *via* one of the jacks from the keyboard, auto-Tx, or the terminal unit, it is kept in the "mark" condition by the −80 volts to prevent the teleprinter from racing.

This arrangement provides very good facilities for duplex operation. On half-duplex, local copy is taken on the same teleprinter on which copy from the distant station is received, and hence it is not possible to receive copy while actually depressing a key. However, since no switching whatsoever is required between "transmit" and "receive," instantaneous break-in is possible. With two completely separate loops the station can be operated on full-duplex, during which no local copy is taken (or if it is, on a separate teleprinter). In this case,



one loop is used for " transmit " and the other for " receive."

The availability of two loops also opens up a very convenient facility for " off-line perforating." In this process, paper tape is punched with the RTTY signal to be transmitted, while the incoming message is being printed out from the distant station. Thus, when the other station passes transmission over, the pre-punched tape can be put into the auto-transmitter and sent off at fully RTTY speed, equivalent to 66 w.p.m. by hand sent Morse! With two loops it is possible to use one for the incoming signal and the other for perforating the reply, using a reperforator. The advantage of this method of off-line perforating is that the keyboard of the main teleprinter is available for keying the reperforator, and thus it is very much easier to keep an eye on the incoming copy—first, to read it, and secondly to make sure that it is still printing correctly.



Above is the Instrument described in the text following

A GATE-DIP OSCILLATOR

USING A FIELD-EFFECT TRANSISTOR

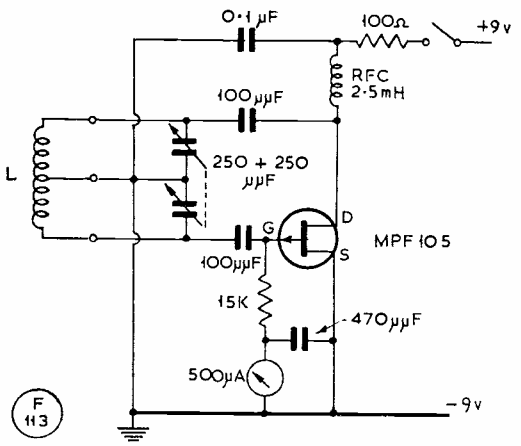
R. J. HULBERT (G3SRY)

THE writer had been quite satisfied with the performance of his valved GDO, in use for some years, but was finding its weight, and the necessary mains lead, embarrassing. The business of trailing out a long extension mains lead, merely to check the resonant frequency of a new aerial, /M whip or whatever had become pointless in this age of semiconductors.

At the time when the unit shown here was conceived, some samples of *Motorola* MPF105 field-effect transistors were available. These had been obtained for use in a new VFO (for a Mobile transmitter) and greatly encouraged by success, the devices were tried in a number of development circuits. The first approach to a gate-dip oscillator was to remove the valve from the existing equipment, and wire in the FET. After slight modifications, and the addition of a 9v. battery, the GDO was switched on, with immediate results, the oscillator's behaviour being almost identical with that of the valved version.

Since the original case was rather large, due to containing a mains power unit, a completely new instrument was constructed. Originally, a variable resistor was included, in series with the meter. This has since been found to be unnecessary, and has therefore been deleted from the circuit. In the absence of this component, the new GDO fits into a standard 6 x 3 x 2 inch aluminium housing.

[over



Circuit of the FET gate-dip oscilator

Circuit Description

The FET used is an inexpensive audio type. Therefore it is hardly surprising that the indicated gate current falls off above 15 mc. The frequency coverage of this instrument is 450 kc—15 mc, in five overlapping bands. The circuit operates as a Colpitts oscillator on the two HF ranges, but is modified on the three LF ranges by centre tapping the coils. This increases the feedback on these bands. The transistor used is the *Motorola* MPF105. This is an inexpensive, plastic-encapsulated "n" channel field-effect transistor, intended for audio applications.

In this circuit, the oscillator behaves very well up to 15 mc, and will continue to oscillate to over 100 mc. The use of an FET intended for HF or VHF would undoubtably improve matters. It must be remembered, however, that VHF operation primarily of this circuit will not be satisfactory, largely because of the wide capacity swing of the condenser. (A gang-capacitor with a smaller swing would be useless at low frequencies.)

The oscillator is surprisingly tolerant of voltage changes, frequency shift being only a couple of kc for a reduction of 3 volts. It is recommended that the battery be changed when the 6-volt point is reached, since below this voltage there is insufficient meter reading. The battery is a small PP3 type, and can be contained within the case.

Coil Details

The coils are wound on Denco $\frac{3}{8}$in. diameter polystyrene plug-in coil formers. These formers are fitted with a B9A base, which conveniently plugs into a standard valve socket. The correct Denco is fitted to the three HF coils. In the case of Range 3, the slug is screwed fully home, then backed off to reduce the meter reading, and the frequency coverage is adjusted to that stated. The odd behaviour of this coil is explained by the fact that, at this frequency, the oscillator cannot decide whether the circuit is Hartley or Colpitts! The slug is controlling the Hartley feedback element, since it varies the inductance ratio of the two halves of the coil. Once set, the coil is removed, and the slug locked by pouring a small quantity of polystyrene varnish down the inside of the former. Ranges 4 and 5 also have slugs, but these are screwed fully home and locked. It is permissible to adjust these slugs for frequency coverage, if required, since the meter reading will not show the large variations of Range 3. After the coils are wound and varnished, the polystyrene nuts are removed, and the threaded portions sawn off, complete with the threaded brass slug support (where fitted). The GDO can be calibrated by the usual means.

Conclusion

This GDO represents a real improvement over the old valved model; it is light, portable, and ever ready. The low frequency ranges have proved most useful in identifying odd coils and IF transformers of unknown origin. Finding the resonant frequency of a mobile whip can now be carried out quickly, without the bother of long extension mains leads.

TABLE OF COIL DATA

Coil 1 — 450 kc to 1·0 mc, 200 + 200 turns 35g. enam. in two piles $\frac{1}{16}$in. wide, with $\frac{1}{16}$in. gap between sections.

Coil 2 — 750 kc to 1·5 mc, 120 + 120 turns 35g. enam. in two piles $\frac{1}{8}$in. wide, $\frac{1}{16}$in. gap between sections.

Coil 3 — 1·5 to 4·0 mc, 110 turns 37g. enam., close wound and centre-tapped, with slug.

Coil 4 — 3·0 to 7·0 mc, 52 turns 32g. enam. close-wound, on slugged former.

Coil 5 — 5·0 to 15 mc, 30 turns 28g. enam. close-wound, slugged former.

All coils are wound on $\frac{3}{8}$in. diameter *Denco* polystyrene formers, standard B9A base. Variations of coil dimensions would be possible for other frequency ranges.

The Burndept battery-operated VHF walkie-talkie, specially designed for communication where mains are not available for battery charging. The BE.347 consists essentially of a microphone/speaker unit and a Tx/Rx working on the UHF "business radio" band, using standard Ever-Ready U2 cells which will give from 35 to 50 hours of operation, depending upon how much "transmission" is involved. Complete in its carrying case, the weight of the Burndept BE.347 is only 55 ounces.

VHF BANDS

A. H. DORMER, G3DAH

NOT altogether unexpectedly, this month has not produced very much in the way of an opening on any of the VHF bands. Pressure stabilised at just under 1020 mB from November 10 till November 25, when there was a drop to 1000 mB, followed by a slow rise to 1020 mB again, which has continued until the time of writing, December 12. Pressure changes need associated temperature *and* humidity changes to produce good propagation at VHF and these we have not had. Poor conditions and lack of activity characterised the Four-Metre Contest on December 1, and these factors contributed to the general comment heard on the band that the contest was very much inclined to drag towards the end, when operators were really scratching around for new stations to work. The impression gained was that these " local " contests are too long and would be better confined to a Sunday morning, say from 9 a.m. to 1 p.m., which would also meet the limitations imposed upon some operators in certain parts of the country, who have considerable TVI problems on 70 mc.

Monday, December 2 saw a bit of a lift on all VHF bands with the major DX axis again North/South, although EU contacts were made from the South and the Midlands on both 70 cm. and two metres. PAØKWY was an outstanding CW signal for some time late in the evening, and ON4HN was very good on 70 cm. phone earlier. Conditions remained " on the verge of being good " for the next few days, but it was not until Sunday, December 8 that an EU opening occurred, with DJ/DL at reasonable strength for two hours or so around 1900z. Several stations in the Midlands had a contact with DC6QP, one of the stronger signals, but very few managed it with DL8KV/M who was mobile with four watts of SSB on Two from " EK01b." One of the lucky ones was G8BNR (St. Albans) who got a 5 & 4 report for a QSO of around the 360 mile-mark at 1835z. These contacts had all the marks of ducting, since the far end was confined to the Aachen area, with the exception of DL8KV/M, and even he was on the same relative bearing from the Midlands. Signals were certainly better north of London than they were in the South and East.

* * *

There appeared to be no repetition of the October 31/November 1 auroral activity after a 28-day interval although WWV issued an Ionospheric Warning on December 5 and there was a fade-out on the HF bands at that time. However, disturbed conditions are predicted for the next week or so and who knows, we may be lucky.

An interesting callsign which has appeared on two metres several times recently has been that of WA1JZB/AM who has been putting in 5 & 9 signals over much of the country, from Cornwall to Norwich and the Midlands. Those operators with a VFO have had an advantage here as the airborne receiver was only tunable over a limited range, although several transmitting frequencies appeared to be available. It is understood that these flights are likely to be fairly regular, and with an antenna at several thousand feet, most of us should have a chance!

Another aerial at several thousand feet was that of the latest in the *ARTOB* series, which was launched from Hanover on November 11 and was aloft until around 1200z on that day. PAØ, DJ/DL and HB9 were heard taking advantage of the path, but no G contacts seem to have been made although the transponded signals at the top end of the two-metre band were quite strong.

Changes have become necessary in the arrangements for the launching of these balloons. Hanover is no longer to be the only launching site and ascents will be made from other areas according to the prevailing wind conditions, so that the landings should always occur in the Hanover region. Longer flights will be possible for the 1969 series, of which ten are planned, by arranging that, at a height of 15,000 metres, gas will be released from the balloon so that a slow descent is achieved. Warning of the launchings will still be given by DLØDN and DLØDA on 80m. and by DL3YBA on 145·5 mc on Friday evenings. In the event of unfavourable weather conditions, the start will be postponed for one week. A translator for 70 cm. to 144 mc with an output of one watt is under construction and will be launched from the Munich area. The *ARTOB* team is prepared to launch apparatus constructed by other agencies, so here is a possible Club project.

VHFCC Awards

All Tables have been compiled again this month to show the latest claims by band and *in toto*. In spite of the fact that the closing date for these Awards has been announced each month with the Tables, enquiries are still being received, the answer to which is that the Tables do *not* close with the next issue of SHORT WAVE MAGAZINE but on December 31, 1968. Claims should be sent in promptly after that date so that the final results can be determined in time for publication in the February, 1969 issue. The new Tables start again on January 1 on the same basis as heretofore.

Awards this month go to G3FVC, G3UIK and G3NLR, all for two-metre operations. Congratulations!

G3FVC, located at Maidenhead in Berkshire, first started on two metres in January 1966, on the insistence of one of the locals, G3MEV, and since then has had 230 individual contacts on the band. His interests are not confined to two metres as he is a keen CW man on the HF bands also, but the previous QTH in the West Country

did not lend itself too well to efficient VHF working. The present set-up is a 6CW4/ECC84 cascode into a Command receiver tuning 4-6 mc, and ten to twleve watts to a QQV03-10 into an 8-ele Yagi at 24ft. Best DX is to the Pyrenees and two contacts with OK, which is not bad going with fairly low power! Eight countries and thirty-five counties have been worked to date. Future plans include the construction of an FET converter to feed into the station main receiver, a Drake 2B, although this will mean sacrificing the self-contained compactness of the present installation. Eric finds VHF a pleasant relaxation after ". . . the bad manners on the HF bands which make my blood boil," and enjoys local or semi-local contacts free from QRM and the weird noises to be heard elsewhere, but puts in a plea for more CW operation on the bands, particularly when phone conditions are not all that good. He holds two other licences in addition to his own—G3WKX on behalf of the Maidenhead & District Amateur Radio Club, of which he is the hon. secretary, and G3XPL for the Slough College of Technology, where he is a lecturer in geography.

Oliver Heggs, G3NLR, operates from Wilmslow in Cheshire and runs an 829B with an input of 50/60 watts to a five-element Yagi at 38ft. The QTH is 180ft. a.s.l. The modulator is a pair of 807's with a crystal mike and the receiving set-up uses a grounded-grid RF stage into a three-stage tunable converter covering an IF of 16-18 mc into an AR88D. This gear is also used for satellite tracking work on 136-137 mc in conjunction with a 9ft. diameter dish, which was to be used to follow the *Apollo* 8 vehicle due for launch over the Christmas period. Oliver's interest is not confined to VHF as he also operates Top Band.

John Young, G3UIK, operates from London and is another multi-licence holder as he has the City University licence, G3UCU, and is indeed honorary president of their Amateur Radio Society. He first became interested in Amateur Radio while still at school at Paisley and passed the R.A.E. in 1948 while studying electrical engineering at Glasgow University. He recalls that he was the only candidate on that occasion and shared the examination room with a gentleman who was answering a paper on theoretical plumbing—an obvious starter for the high-power, two-metre linear stakes! It was not until the radio club at the University was formed in 1965 that John got down seriously to the business of absorbing Morse to get his licence, since when he has been exclusively on Two. The transmitter runs 15 watts input to a QQV03-10, plate-and-screen modu-

THREE-BAND ANNUAL VHF TABLE

January to December, 1968

SCORES BY BANDS

FOUR METRES

Station	Counties	Countries	Total
G3OHH	48	7	55
G3LAS	41	5	46
G3DAH	26	2	28
EI6AS	17	7	24
G2AXI	18	2	20
G3COJ	10	3	13
G3FIJ	3	1	4

TWO METRES

Station	Counties	Countries	Total
G3DAH	52	15	67
G3LAS	51	15	66
G8BBB	53	13	66
G3COJ	44	9	53
G8AAZ	38	8	46
G8BNR	35	6	41
G8BJK	33	6	39
G8AEJ	32	7	39
G2AXI	34	4	38
EI6AS	32	6	38
G8APZ	33	5	38
G8AUE	33	4	37
G8AUN	26	8	34
G3AHB	28	5	33
G2AIW	27	4	31
G8APJ	20	4	24
G8BJC	16	4	20
G3FIJ	16	3	19
G3FXW	15	4	19
G8APX	16	2	18
GC8AAZ	14	4	18
G8AYN	13	1	14

SEVENTY CENTIMETRES

Station	Counties	Countries	Total
G8AEJ	37	8	45
G8BBB	32	6	38
G8AUE	29	3	32
G3COJ	22	3	25
G3LAS	17	3	20
G3FIJ	17	2	19
G8AAZ	16	1	17
G3XFW	11	2	13
G8APX	11	2	13
G3DAH	10	2	12
G3AHB	7	2	9
G8APZ	8	1	9
G8APJ	6	1	7
G8AYN	5	1	6
G2AXI	5	1	6

lated by two 6AQ5's. The receiver is a G3HBW-type FET converter tuning 28-30 mc, into an AR88D and the beam a six-over-six slot at 35ft. Best DX to date has been to OZ and this on phone. John is looking for GM, his native country, but has been unlucky so far. The score stands at 352 stations in 37 counties with a QSL return rate of just under 50%. Portable operations have included the trip to Gleniffer Braes last summer and, once the locals had got used to hearing an S9 signal one megacycle lower than usual, many enjoyable QSO's resulted. A return trip is planned over this Christmas, and for those interested, the frequency will be 145·8 mc. Future intentions include a PA stage with a QQV06-40 for Two and a sideband filter-type exciter for the HF bands, with the intention of playing this into a transverter at a later date. A useful addition to the station is a recording barograph which is conscientiously rewound, recharted and reinked every Monday morning and by means of which openings are confidently predicted—occasionally, he says, with success!

For those who are interested in these Awards, details can be found in the April and May 1968 issues of SHORT WAVE MAGAZINE.

SSB VHF

The RSGB Lecture Meeting on November 15 was devoted to a review of SSB systems used on VHF with emphasis on the need to minimise the radiation of unwanted signals both within and outside the band. The aim is to see that in-band signals are at least 90 dB down on the wanted signal.

Just how the average amateur with no laboratory equipment can measure 90 dB down is the big question, but by following certain broad lines in the design and operation of the apparatus it is possible to go quite a long way towards ensuring that the output of spurii approaches this figure without the need for precise measurement. It is, in any case, a figure at which to aim and not a hard-and-fast specification. Among amateurs, the more usual method of producing SSB on two metres is by means of the transverter or translator principle, whereby an SSB signal is taken from a commercial or home-constructed prime mover and mixed with a locally generated oscillation to give a sum product of around 145·4 mc. The choice of injection and signal frequencies has an important bearing on the purity of the output signal. For example, there is a very good case against using 29 mc as the sideband drive frequency since not only does its fifth harmonic come out in the band, but also most HF /SSB transmitters tend to have a higher level of spurious products in their outputs when operating on this frequency, due to reduced selectivity in their internal tuned circuits compared with, say, 14 mc. Agreed, the use of a 29 mc SSB input means that the final local oscillator frequency becomes 116 mc and therefore easier to discriminate against in subsequent tuned circuits than would be the case if 14 mc and 131 mc were used. But by having a carefully adjusted balanced mixer (unbalanced mixers are definitely *not* to be recommended) and a minimum of four tuned circuits between the mixer and the aerial it should be possible to come very near to the target of 90 dB down. This assumes that the tuned circuits are not all capacity coupled. If they are, a great deal more protection will be required. The ideal would be to couple them inductively and use an efficient filter tuned to the oscillator injection frequency. Inevitably, the mixer will introduce some unwanted products of the frequencies applied to it, but by operating it as nearly as possible under Class-A conditions, and by filtering its output and the output of the prime mover, much can be done to clean up the radiated signal.

The fundamental frequency chosen for the crystal oscillator is also important, since the use of the usual 6 or 8 mc xtals means that harmonics at these frequencies can reach the mixer and produce a plethora of spurii at the output unless very careful design precautions are taken to suppress them. It is best to use a frequency for the oscillator which is not harmonically related to the SSB injection frequency, and is not below about 30 mc. The frequency of 58 mc either as a fundamental or harmonic, should be avoided since the second and third harmonics of that frequency beating with the 29 mc SSB injection will produce an unwanted, in-band signal. There is much to be said for introducing the SSB signal at the grids of the balanced mixer in push-pull, as this will ensure some cancellation of even order harmonics which are likely to be present in the output of the HF rig, with the local

oscillator frequency in push-push or parallel, either on the grids or on the cathode of the mixer, since the subsequent suppression of harmonics at this higher frequency is then comparatively simple to achieve.

Another prolific source of unwanted products at the anode of the mixing stage is the unscreened dummy load and/or power attenuator at the output of the prime mover. These devices should always be very well screened and should incorporate the appropriate filter tB ensure that only the required SSo frequency reaches the transverter. Direct or capacity coupling here is also to be avoided wherever possible. One disadvantage of using 14 mc as the SSB injection frequency may well be that many commercial HF equipments are restricted to amateur band coverage, *i.e.*, 14-14·4 mc, and that complete coverage of the two-metre band is not then directly possible—but it only requires the use of four, or at most five, switched xtals in the transverter to overcome this objection. In any case, it is quite rare to hear an SSB station operating far from the calling frequency, and initially, one crystal channel should suffice. Split-frequency working then provides the answer to the reception problem unless one is a complete co-channel devotee.

To sum up, then, it looks as if our SSB rigs should take this sort of shape in the future: Filtered and screened output from the prime mover on 14 mc injected as a push-pull signal into the grids of a balanced mixer, with the local oscillator injection frequency derived from a crystal with a fundamental above 30 mc (avoiding 58 mc) applied in parallel. The output of the balanced mixer to pass through four, inductively-coupled circuits before reaching the antenna, and a filter to remove the crystal injection frequency. A bandpass filter in the aerial to pass only in-band signals is also an advantage. Oh well—back to the drawing board!

News Items

There have been several British/French contacts recently on 1296 Mc (23 centimetres) notably those with F1GG/P at Mont des Avalloirs and F1RJ/P at Mont Canisy. These have, for the most part, not been pre-arranged skeds and it is very encouraging to see such activity among, at least on the French side, relative newcomers to UHF. It will be recalled that the F1 operators correspond to our G8/3's. An interesting series of tests has been completed recently between F9XG, operating portable in the Pyrenees and F9BG (Toulon), over a 150-mile path. Out of 23 days of tests, signals were exchanged at good strength on 15 of them. No details of the equipment used are available, but F1GG and F1RJ both have 4ft. parabolas and varactors.

The French Amateur Radio Society, R.E.F., are sponsoring tests to establish the pattern of the incidence of Sporadic-E propagation on 144 mc. To this end, the beacon at Lannion (F3THF) will in future radiate an unmodulated carrier on 144·010 mc every day between 9 a.m. and 2 p.m. (Universal time.) The beacon QRA is " YI13d " and the exact position 03° 27′ 12″ W. and 48° 45′ 28″ N. The 220ft. high, nine-element Yagi antenna will beam East, but signals should be received quite well in this country, certainly in the South, as are those transmitted on the present F3THF frequency of 144·073 mc. It is perhaps of interest to recall that one of the first authenticated instances of Spor-E propagation on *two* metres

THREE-BAND ANNUAL VHF TABLE

January to December, 1968

Station	FOUR METRES Counties	FOUR METRES Countries	TWO METRES Counties	TWO METRES Countries	70 CENTIMETRES Counties	70 CENTIMETRES Countries	TOTAL pts.
G3LAS	41	5	51	15	17	3	132
G3DAH	26	2	52	15	10	2	107
G8BBB	—	—	53	13	32	6	104
G3COJ	10	3	44	9	22	3	91
G8AEJ	—	—	32	7	37	8	84
G8AUE	—	—	33	4	29	3	69
G2AXI	18	2	34	4	5	1	64
G8AAZ	—	—	38	8	16	1	63
EI6AS	17	7	32	6	—	—	62
G3OHH	48	7	—	—	—	—	55
G8APZ	—	—	33	5	8	1	47
G3FIJ	3	1	16	3	17	2	42
G3AHB	—	—	28	5	7	2	42
G8BNR	—	—	35	6	—	—	41
G8BJK	—	—	33	6	—	—	39
G8AUN	—	—	26	8	—	—	34
G3XFW	—	—	15	4	11	2	32
G8APJ	—	—	20	4	6	1	31
G8APX	—	—	16	2	11	2	31
G2AIW	—	—	27	4	—	—	31
G8AYN	—	—	13	1	5	1	20
G8BJC	—	—	16	4	—	—	20
GC8AAZ	—	—	14	4	—	—	18

Scores are from January to December. Position overall is shown by the total in the last column. This Table closes for the year 1968 on December 31. All claims up to that date should be sent in by January 11, for the final placings to appear in the February, 1969 issue. The Table opens again w.e.f. January 1st, 1969, and claims for the new listings should be made as they accrue.

occurred on June 14, 1959, when many British stations were able to contact Yugoslavia and Italy, the first reported contact with the latter being between G5NF (now alas QSY to GW and an impossible VHF DX site) and I1KDB. Again on July 4, 1965, U.K. operators were in 2m. contact with south-eastern Europe, stations in the west of France, with Poland and the Ukraine, and Mediterranean coastal stations with Scandinavia. It was quickly shown that a build-up of Sporadic-E over Western Germany was the reason for this astonishing phenomenon. A strange facet of this occurrence was that the German stations could only work on normal tropospheric modes at the time.

A further instance of Sporadic-E propagation on two metres occurred on June 17, 1967, when, among other records, the PAØ-YU "first" was set-up. It is noteworthy that these occurrences were all at weekends—indeed, the July 1965 occasion coincided with the IARU Contest—and it is therefore very likely that the great number of stations active at the time disclosed the condition, and that other instances have occurred on weekdays and have therefore gone unobserved or unreported. They also occurred at periods of maximum insolation (exposure to sun). While it is unlikely that the French beacon will assist amateurs in this country to any great extent to observe instances of Sporadic-E on Two, the fact that there is now a Centre for the reception and correlation of reports means that British stations can usefully participate in this investigation, which is being undertaken on the academic front by Professor Jean Mevel, the ionospheric expert at the University of Rennes. Reports should be sent to M. Serge Canivenc, F8SH, 6 rue de Pont-Hele, Kervoalen, 22- Perros-Guirec, France, as expeditiously as possible.

Turbulence in the lower ionosphere is believed to be the cause of VHF scatter propagation. This turbulence is produced by temperature inversions and other causes of pressure fluctuations in the E-layer. In this disturbed region, variations of electron density occur and these induce corresponding changes in the electric gradient, which in turn alter the effective refractive index of the region. There is also some evidence that the presence of an aurora is significant in propagation by this mode. The most effective frequency range for Sporadic-E transmission to DX lies between 30 and 50 mc, although good results have been obtained on commercial and military circuits operating as low as 25 mc and as high as 60 mc, while ZB2VHF has amply demonstrated the possibilities on 70 mc. Considerable power and aerial gain are required for high reliability of up to 99%.

Unfortunately, the formation of the patches of intense ionisation required for even 4-metre contacts by this mode is quite unpredictable, as the location and periodicity seem random. It can only be said that in our latitudes suitable conditions are more likely to be found in the summer months and over areas to the South. Only a small variation in the electronic density is required to produce the results. A turbulent region some 200 yards square and an r.m.s. fluctuation of the electronic charge density of the order of 1 in 10^4 is sufficient to account for Sporadic-E disturbances. Occurrences on 144 mc are rare, as already noted, but may not be quite as rare as we have hitherto imagined.

* * *

The South East UHF/VHF Group held their December meeting in Keynes College, University of Kent, Canterbury, on the 6th when a combined team comprising G3FZL, G3OOU and G3XFT reviewed progress in UHF/VHF techniques. Bob Burns, G3OOU, was showing some home-built equipment which included a transistor 1 mc oscillator with dividers to 5 kc, effective up to 70 cm., which looked like filling a long-felt want for an accurate signal on UHF/VHF. The next meeting of the Group is scheduled for January 24, 1969, when Tom Douglas, G3BA, will be speaking about VFO's. All interested amateurs are welcome to attend these meetings and details of the full programme for the coming year can be obtained from the hon. sec. G3DAH, *QTHR*. This column will be very pleased to print details of forthcoming meetings of similar

". . . Suppose I could try it on Two . . ."

VHF Groups in other parts of the country, as well as reports of meetings, on receipt of timely notice.

From GC8AAZ, Jersey, comes news that the GC net on Two on Sunday evenings is becoming more popular than ever before. Operations start at 1830z and participants include GC2FMV, G3CLFJ, GC8CEY, GC8ADW and GC8AAZ himself from Jersey, and from Guernsey GC2FZC, GC3KAV, GC8BMO, GC8BNV and GC3OBM —so those who still need the Channel Islands may care to note this, as most of the stations will be looking towards us from about 1930z onwards.

Forthcoming contests are the *First Two-Metre* (*SSB*) event on January 13, 1969, and the Second *Two-Metre* (*CW*) contest on January 25, 1969.

Deadline

That wraps it up for this month apart from wishing you all the best for 1969. Deadline for the next issue is **Saturday, January 11** which will give a little more time for the preparation of claims and so forth than was possible this month. Address is "VHF Bands," SHORT WAVE, MAGAZINE, BUCKINGHAM. Cheers for now and 73 de G3DAH.

FRINGE AREA HARMONIC FILTERS

NOTES ON DESIGN, FOR HOME CONSTRUCTION

G. ELLIS (G3LFZ)

WITH the increasing number of new licences being issued, it is obvious that sooner or later a high percentage of these newcomers will find themselves faced with the ever-present problem of Television Interference Suppression. Whilst in former years many excellent articles have appeared on the subject of diagnosing, filtering and suppressing TVI, every decade or so the need arises to re-activate some of this information for the benefit of our more recent brethren who do not possess these past publications (many out of print), and to revive interest amongst those of our number who require an occasional stimulant. For every amateur using a Class-C PA who wishes to work the HF bands during TV hours, the possession of a low-pass filter is a "must." It is the purpose of this article to outline the major problems where harmonic interference is concerned and to detail the design and construction of such a low-pass filter, tailor-made to suit individual cases. (A bibliography of some past articles has been appended to save hours of fruitless searching for those who possess or have access to them.)

The writer lives on the South Coast in an area which is considered "fringe" for both Crystal Palace Ch. I and Rowridge I.o.W. Ch. III, and hopelessly out of range of a low-powered slave at Brighton on Ch. II which, at his QTH, is constantly QRM'd by co-channel interference, but which is known to be used by some locals whose geographical situation denies them the use of Channels I or III (and fortuitously screens them from the co-channel interference).

The aim to produce an interference-free amateur-band transmitter in spite of the prevailing low TV field strengths led the writer to peruse many articles on TVI-proofing, some by authors whose names have become synonymous with TVI suppression. A desire to work 21 and 28 mc without recourse to the *Radio Times* (to find out what popular programmes were on!) was going to require the absolute maximum attenuation of the second harmonic from each band, and it soon became certain that no single low-pass filter would fulfil both conditions adequately. It was decided therefore to embark upon a mathematical expedition with the object of determining (*a*) The actual values of capacity and inductance needed for Channels 1 and 3, and (*b*) The values typically required for other channels and feeder impedances so that a reasonable idea of component tolerance might be obtained.

These results have been tabulated (Table 2) to enable the reader to form his own conclusions and to see at a glance the design which suits his particular circumstances best for the more common coaxial feeder impedances, without recourse to mathematics already covered by the author. The basic formulæ and mathematical examples are given later to guide readers who wish to design filters to work at impedances or frequencies other than those given here.

Construction

The only major "tools" used in the manufacture of the filters actually constructed were a multi-channel TV set, a reliably calibrated AR88, a home-built Grid Dip Oscillator (probably the most important item), and an assortment of *Radiospares* 1% tolerance capacitators from 22 $\mu\mu$F to 120 $\mu\mu$F, plus a few 0·5 $\mu\mu$F tolerance capacitators in the 2-20 $\mu\mu$F range. The station transmitter was also used to produce harmonics of calculated frequency in the TV bands to provide markers against the GDO beat.

The close-tolerance capacitors were used to calibrate required capacities from less precise capacitors at hand, which were better suited to the requirements voltage and current-wise, as follows: A coil of some 15 turns of 16g. enamelled wire was tightly wound on a ½-inch former and fixed (with glue, nail varnish or *Araldite*) as a precaution against variation of inductance whilst in use. The tails of the coil were bared and terminated within an inch of the coil on to a tagstrip with double lugged tags, so that subsequent reterminating on the other lugs of the tags would not interfere with or disturb the coil. The close-tolerance capacitors were then assembled with short leads to represent the required capacity and

[*Cont'd. p.686*

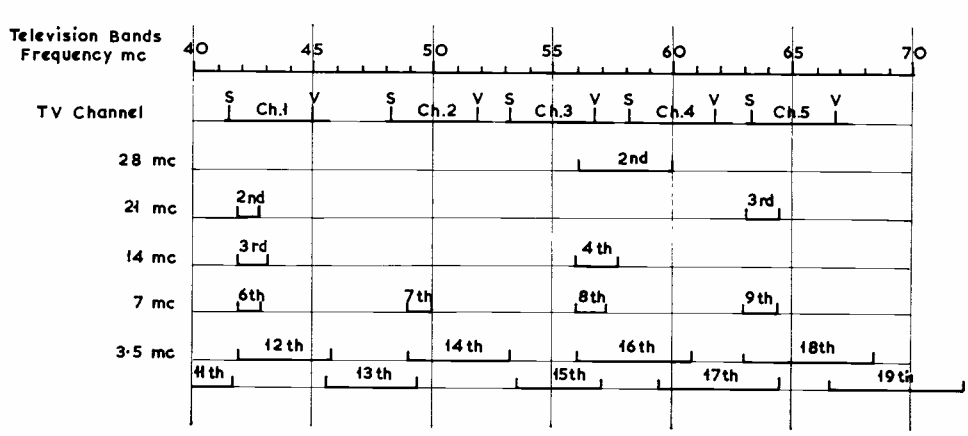


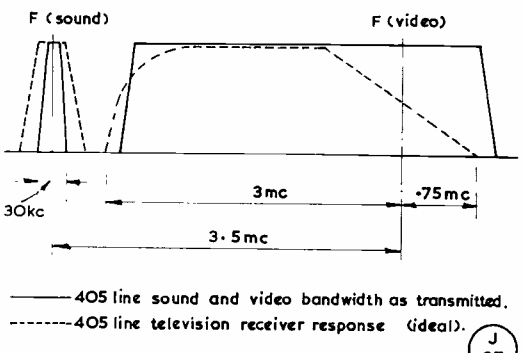
Fig. 1. Disposition of TV channels in Band I, showing their harmonic relationship with five amateur HF bands.

TABLE I

Television Channel No.	Prime Channel F(sound) mc	Prime Channel F(video) mc	F(osc) mc	Second Channel F(sound) mc	Second Channel F(video) mc
(Standard IF)	38·15	34·65	—	—	—
1	41·5	45·0	79·65	117·8	114·3
2	48·25	51·75	86·4	124·55	121·05
3	53·25	56·75	91·4	129·55	126·05
4	58·25	61·75	98·4	134·55	131·05
5	63·25	66·75	101·4	139·55	136·05
6	176·25	179·75	214·4	252·55	249·05
7	181·25	184·75	219·4	257·55	254·05
8	186·25	189·75	224·4	262·55	259·05
9	191·25	194·75	229·4	267·55	264·05
10	196·25	199·75	234·4	272·55	269·05
11	201·25	204·75	239·4	277·55	274·05
12	206·25	209·75	244·4	282·55	279·05
13	211·25	214·75	249·4	287·55	284·05

Note: Only the transmitted Prime Channel frequencies are stable. Due to incorrect setting and thermal drift, oscillator and second channel frequencies may vary from those above by many tens of kc.

Table 1. The carrier frequencies do not represent actual band edges, and the receiver sound IF bandwidth may be greater than 100 kc to overcome oscillator drift.



placed in parallel with the coil. The GDO was then used to dip the frequency of the resonant circuit thus formed, and the AR88 tuned to that frequency to mark it for the next stage of the operation. The close-tolerance capacitors were then replaced by a fixed condenser in parallel with a small variable, and the assembly tuned by the variable capacitor to resonate at the frequency "marked" by the AR88, again using the GDO. Thus, for example, a 126 $\mu\mu$F capacitor may be constructed from a 20% tolerance 100 $\mu\mu$F capacitor (on the heavy side), and a 25 $\mu\mu$F variable adjusted to the required capacity in the manner indicated. Connections must be kept to the absolute minimum length during this operation.

The coils were made from 16g. enamelled copper wire, first drawn taut to remove any bends and then wound under 30 or 40 lbs. tension on to a $\frac{1}{2}$-inch mandrel (for this purpose the composition sleeve of a P.O. type jack plug served as an excellent mandrel). Each inductor was produced separately and the

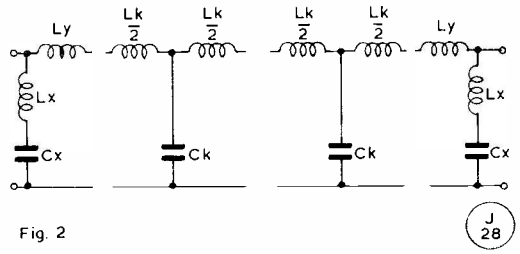


Fig. 2

Fig. 2. The Elementary Filter, and Formulae

$$(1)\ Lk = \frac{R}{\pi . Fc} \qquad (2)\ Ck = \frac{10^6}{\pi . Fc . R}$$

$$(3)\ Ly = \frac{m . Lk}{2} \qquad (4)\ Cx = \frac{m . Ck}{2}$$

$$(5)\ Lx = \frac{1-m^2}{2m} . Lk$$

where R is in ohms
C is in $\mu\mu$F
L is in μH
Fc is in Mc and is 0·8 Fx.

m is 0·6 (derived from $m = \sqrt{1 - \left(\frac{Fc}{Fx}\right)^2}$,

and is the optimum value for good impedance matching characteristics).

Notes

(1) Mathematically "correct" answers to nearest $\mu\mu$F or 0·005 μH.

(2) Once calculated, series inductances may be added together to form one inductor equal to the sum of the two individual inductances, e.g.:

$$\frac{Lk}{2} + \frac{Lk}{2} = Lk,\ Ly + \frac{Lk}{2} = La.$$

"tails" were cut and shaped with long nosed wiring pliers, according to the particular position it was required to occupy in the filter. The approximate number of turns needed for a given inductance was estimated by reference to Table 3, applied to the filter, and the coil then compressed, contracted or pruned to the correct value to resonate at a calculated frequency when placed in parallel with a known capacitance. The tolerance of the inductance thus produced was comparable with that of the capacitance, and very much closer than any guesswork. It is stressed that this adjustment must take place in the filter, using the capacitors mounted permanently in the filter, and once set must remain undisturbed.

Mounting

A well constructed and compartmented metal box complete with overlapping lid must be used to accommodate the filter and, ideally, should be copper or brass with soldered or brazed joints—but if this is impracticable a tinplate or aluminium equivalent will suffice. A sufficiently strong tinplate box with soldered joints and inter-compartment screens can be produced from a couple of larger size *Ovaltine* tins if intercepted before they reach the dustbin. If the housing is manufactured from aluminium, or otherwise not soldered, a minimum of two nuts and bolts per joint per side between case and ends or screens is recommended, and shake-proof washers are a "must," particularly where earthing tags or coaxial connectors are involved. The compartments should be $1\frac{1}{2}$-$2\frac{1}{2}$ inches cube, and be sufficient in number each to accommodate one inductance. However, two coils may be placed in one compartment provided they are mutually disposed at right-angles. The author used the diecast chassis of old "AP 56152 Filter Unit Des. 12in. stripped of their former circuitry, and with JS-1-PF (10H/4953) type coaxial connectors fitted in lieu of the original. This type of connector has been found to give far more positive and reliable contact than its more common type TV counterpart, and is more robust and much less liable to distortion when subjected to the heat required to solder two 16g. wires to it, although if a heat shunt is used, this problem is not insuperable.

A close examination of the design, construction and alignment of a representative low-pass filter will show in detail how a highly efficient device can be evolved from a few facts, formulæ and figures.

In Fig. 2 a low-pass filter is shown split into the basic elements from which the final design will emerge. Technically, the arrangement comprises two constant-k "T" centre sections, terminated with *m*-derived end sections in which the series tuned circuits Lx/Cx resonate to provide the maximum amount of attenuation in the region of the design frequency. It should perhaps be mentioned here that as many or as few "T" centre sections may be included as desired. Two *m*-derived end sections without intermediate sections may be used directly back-to-back where TV signals are locally strong, or the required degree of attenuation slight, so long

TABLE 2

T.V. Channel	Fx	Fc (m - 0·6)	Lx	Cx	Ly	$\frac{Lk}{2}$	Ck	La $\left(Ly \frac{Lk}{2}\right)$	Lk	R (Zo)	A.T. Band Harmonic*
—	Mc	Mc	μH	μμF	μH	μH	μμF	μH	μH	ohms	—
1	42	33·6	0·38	38	0·215	0·355	126	0·57	0·71	75	6 x 7 mc 3 x 14 mc 2 x 21 mc
			0·25	57	0·14	0·235	190	0·375	0·47	50	
2	49	39·2	0·325	33	0·185	0·305	108	0·49	0·61	75	7 x 7 mc
			0·215	49	0·12	0·205	162	0·325	0·41	50	
3	56	44·8	0·28	28	0·16	0·265	95	0·425	0·53	75	8 x 7 mc 4 x 14 mc 2 x 28 mc
			0·19	43	0·105	0·18	142	0·285	0·36	50	
4	58·25	46·6	0·27	27	0·155	0·255	91	0·41	0·51	75	2 x 28 (above 29 mc only)
			0·18	41	0·10	0·17	137	0·27	0·34	50	
5	63·25	50·6	0·25	25	0·14	0·235	84	0·375	0·47	75	9 x 7 mc
			0·165	38	0·095	0·155	126	0·25	0·31	50	3 x 21 mc

TABLE 2. Component values for low pass filters designed for Band I Channels 1–5 and transmitter feeder impedances of 50 and 75 ohms. See Fig. 2 for circuit.

*Note: Harmonics of 3·5 mc not shown since all channels are affected. See Fig. 1 for details.

as the simple rules of "filtery" are observed. Obviously, the more "T" centre sections included, the greater will be the losses at the pass frequencies as well as the desired attenuation in the TV portion of the spectrum—so, by way of a compromise, two intermediate sections have been chosen in the design of these filters.

The initial facts to ascertain in the design of a tailormade filter are (*a*) the local TV channels in Band I, (*b*) The HF amateur bands to be used, and (*c*) The impedance of the transmitter feeder. By reference to Fig. 1, the likely effect of radiated harmonics on local Band I TV transmissions can be estimated for the amateur bands likely to be used. For example, Channels 1, 3 and 5 areas suffer greater problems than Channels 2 and 4 areas, and should Channel 4 area amateurs forego operation above 29 mc in the ten-metre band, they should encounter no low order harmonic problems on any band from Forty to Ten, and only the 16th and 17th harmonics from frequencies in the 80-metre band.

(To be concluded)

TABLE 3

Inductance Range	Approx. no. turns 16g. ½-in. diam.
up to 0·1	3
0·1 — 0·15	4
0·15 — 0·2	5
0·2 — 0·3	6
0·3 — 0·35	7
0·35 — 0·45	8
0·45 — 0·5	9
0·5 — 0·6	10
0·6 — 0·7	11
0·7 — 0·8	12

Table 3. For estimating number of turns of 16g. enam. to half-inch diameter required for a given inductance. The number of turns finally needed—see text—will also be influenced by the inductance of the "tails."

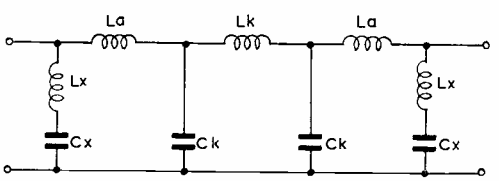


Fig. 3

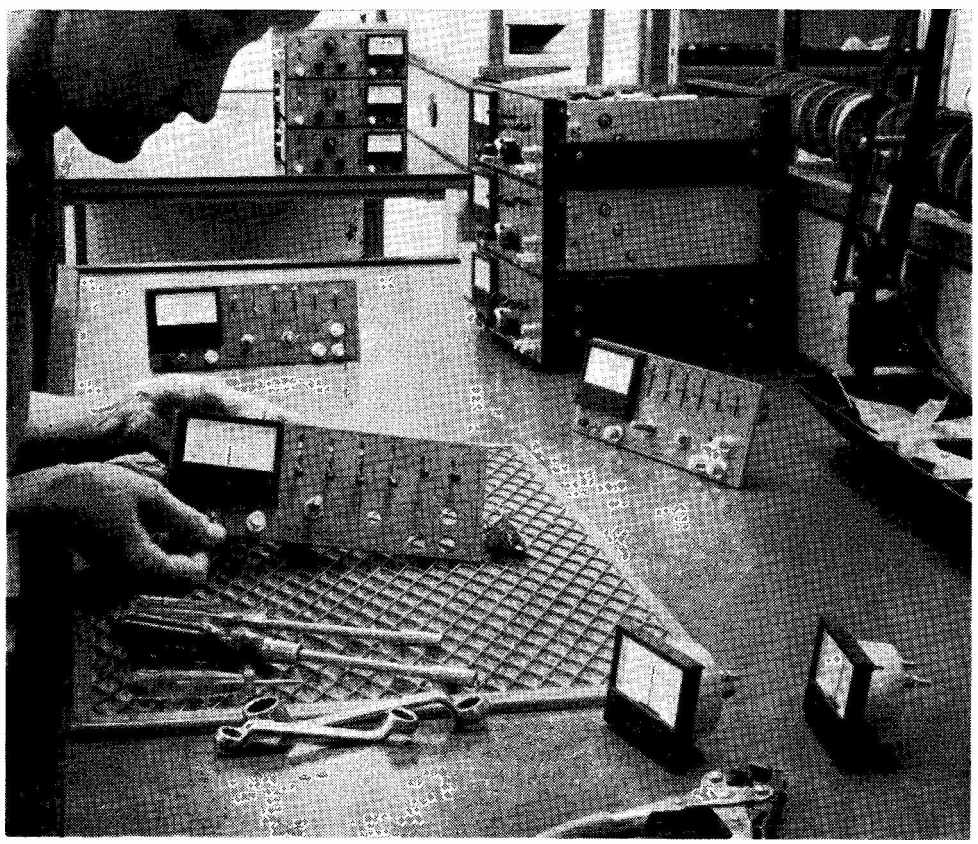
J 29

Fig. 3. Circuit for completed Filter—see Tables 2 and 3. Note that La = Ly + Lk/2. To change the circuit to a balanced configuration, the coils La and Lk should be halved in value and inserted in each leg. The inductors should be independently screened.

DEFINITION—TECHNICIAN ENGINEERS

The Institution of Electrical and Electronics Technician Engineers (which is what they call themselves), is a comparatively new organisation which offers membership under somewhat easier conditions than the qualifying requirements for the I.E.E. or the I.E.R.E. (the old Brit.I.R.E.). A lot of Service signals types became " A.M.I.E.E., M.Brit.I.R.E." on the nod just by completing the circular that came round about 1944—all that was required was to be engaged on " signals duties " in the rank of major (or equivalent) and above, and have the form counter-signed by the CSO of the Hq. Unit. Coming down to the present time, following is the definition of the Technician Engineer:

> The technician engineer is competent by virtue of his education, training and subsequent experience to exercise independent technical judgment in and assume personal responsibility for duties in the engineering field.
> His education and training is such that by the application of general principles and established techniques, he is able to understand the reasons for and purposes of the operations for which he is responsible.
> The technician engineer may perform technical duties of an established or novel character and may carry technical and managerial responsibility either independently or under the general direction of a chartered engineer or scientist. His work is at a higher level than that of the technician and is not supervised in detail. He requires the personal quality of leadership and the power of logical thought.
> The technician engineer requires an education and training appropriate to the above work. This should lead to the award of a Higher National Certificate in Electrical and/or Electronic Engineering, a Full Technological Certificate for Electrical, Electronics or Telecommunications Technicians of the City and Guilds of London Institute, or a comparable qualification.



Sifam meters being fitted to a new type of unit designed to detect and measure signals buried in the background noise. Said to be the most sensitive of its type now extant it is one of a series of modular research instruments manufactured by Brookdeal Electronics (London), with the capacity to recover a signal which is 3000 times below ambient noise. The Brookdeal Type 411 phase-sensitive detector has applications in all aspects of research, including measurements concerned with space satellite communication and laser experiment.

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

THIS is the time for New Year Resolutions, and in accordance with current practice, here are a few thoughts on the subject. For the dyed-in-the-wool CW man: Try a little SSB now and again. For the violently anti-CW type: Try a little key work, and keep in practice. For the DX-chaser: Try to have a rag-chew once in a while—some of the DX is getting bored with the mob of number-swappers. For the rag-chewer: Try a few snappy contacts in a contest. To all of them: Try a bit of constructional work. And may all of those who adopt these resolutions, find that the result is a new dimension in their hobby.

OK, what's the confession to make behind all this moralising? Well, E.P.E. had a SSB rig a couple or more years ago and was so fascinated by the difference between SSB and AM as a way of getting at the stuff that he has not used much else since. But a few days before writing this piece it was demonstrated that the right wrist needed exercise to complete repairs, and what more obvious exercise than paddling a key? GM3KSU was the unfortunate victim of the first essay, and the QSO was not completed. The "Chinese Morse" was too much of a good thing; between glass elbow and the wrist there was hardly a word without an erasure! But G3KFE has been using CW to a greater or lesser extent most of his amateur career, and can still read it as well as the next man; how much worse would the situation be for a chap who suddenly found his particular specialty removed from him by injury or illness; without it he may as well give up if he has shut out all other Amateur Radio angles. And if G3KFE were ever tongue-tied for some reason he would a darn sight sooner be all-CW than QRT! So it is as well for us all to adventure a little in the direction of adding another mode of transmission to the gear in the coming year, or another aspect which is either new or been dropped for years.

Changing tack rather, back to the recent discussions on TVI, and its baleful effect on the majority of operators, there are a few points which are worth considering. If the low-pass filter in the transmitter output is designed for a 75-ohm unbalanced line, it needs to be connected into a line which is just that. *But* a dipole is a balanced aerial, and should not be fed with coax, but with balanced feeder. To connect the balanced feeder into coax, one must use a balun if RF is not to appear on the outside of the coax and flow round instead of through the filter. The same argument seems to hold good for the TV aerial, and a balun on the feeder at the aerial will give the high-pass filter installed at the TV set end a sporting chance of doing its duty. As for how to make the balun, there are several 1 : 1 ratio schemes, and commercial baluns are available for the TV aerial, although those for transmitting aerials are usually designed to be relatively narrow-band.

What about the effect on other parameters of the gear? Well, there will be no increase in gain on

SIX-BAND DX TABLE
(All-Time Post War)

Station	Countries	28 mc	21 mc	14 mc	7 mc	3.5 mc	1.8 mc
W6AM	348	131	140	347	116	54	7
G2DC	335	169	307	327	165	109	20
G3DO	334	192	231	327	90	83	9
G3NOF	311	162	207	295	34	39	2
G3LZQ	254	138	155	201	72	38	8
G3IAR	219	120	158	191	87	71	12
G3iGW	204	123	152	167	122	86	42
G8DI	187	80	132	164	77	46	8
G3KOR	163	40	57	135	52	39	23
G3PQF	153	93	42	84	84	49	11
G3NYQ	147	35	70	107	40	30	21
G3VDL	137	51	100	100	45	22	—
G3SED	126	20	18	61	43	34	37
G3IDG	122	74	89	55	27	19	11
G3MDW	115	46	66	82	20	15	7
G3EJA	106	100	23	51	22	12	2
G3VPS	105	16	28	81	50	34	14
G3WJS	57	—	8	46	35	36	12
G3WPO	?	11	9	40	28	20	20

Note: Placings this month are based on the "Countries" Column.

receiver or Tx, but it is quite on the cards that the noise in the area through which the feeder has to pass between aerial and shack will be picked up less by the modified arrangement, and it may indeed be the answer to the problem of HF operation in a high-noise district.

The Tables

This month sees the last *entry* of the 1968 Tables; so for next time the Tables will have been brought up to date. March issue will contain the first display of the 1969 Tables, which should give about six weeks to get things organised and the entries in. The Six-Band Table, and Zones and Prefixes carry on as usual, but the Top Band Tables go on as detailed in this piece last month, on page 626.

Contests and Awards

There are of course contests and contests; and there are the long-term exercises which provide a sustained target to go at over a period of months, quite apart from the run-of-the mill sheepskins the object of which is to make certain stations more interesting to the DX. Geoff. Watts, who puts out the invaluable *DX News Sheet* (from 62 Belmore Road, Norwich NOR-72T) each week also does the hard work for the Islands-on-the-air Award (IOTA). This one is also a contest, in that there is a handsome prize to go to the top scorer each year in the transmitting and SWL categories. In addition, there is more silverware to be had by the chap who can collect all twelve IOTA categories. Incidentally, the rules have recently been changed somewhat for some of these. Four IRCs, or six if airmail is desired, will bring all the dope and the Directory-of-Islands; one IRC is enough to obtain replacement pages for an existing Directory. Doubtless, as with the News-sheet subscription, there are varieties of "pounds, shillings and pence" which are acceptable from G stations applying, at the usual rate.

Results of the 1967 Tops CW Club Contest are to hand. Out of 169 entries in the single-operator class only one was a G—G3LP, at 27th. In the multi-operator category there is only G3KMI, at fifth place. Just goes to show how contest-minded the G's are —but when the results are so slow coming through in the major shindigs it is still hardly surprising. Tops are "scrubbing round" the 1968 affair, while the 1969 one will be at the end of the year.

For the RTTY lads, the Italian *CQ Elettronica* magazine is sponsoring a "quickie" from 1400 to 2200 GMT on February 15 and 22. The 3·5 to 28 mc bands inclusive are usable, the contest exchange being RST plus the Zone Number. Stations in one's own Zone are good for three points, while those in other Zones score as the exchange-table wills. Multiplier for each country worked (ARRL country-list) on each band, other than one's own. The contest is open also to SWL's equipped with RTTY tackle. Logs are to contain QSO number, date, time, callsigns, countries, and of course the numbers exchanged and points claimed; and should be posted to *CQ Elettronica*, Via C. Boldrini, 22, 40121 Bologna, Italy to arrive before March 20, 1969. Prizes go by way of awards, gold medals, and free subscriptions. Further details can be obtained from the address quoted.

A couple of bits of interest connected with *CQ* next. First, results of the 1968 *CQ* WW WPX Contest, where G3NMH placed in the Top Teh—eighth to be precise. Against a winning score of 1,291,680 by ET3FMA, Hal racked up 807,275 points, which is a sight nearer the top than the scored position would indicate. A good show, and our congratulations. Our only other representative in the results sheet —which is not to say the only other U.K. entry!—is G3SZG, who placed second on Eighty in the single-band category at 28,090 points, and was followed home at fourth position by GM3VTB on 14,784 points. Again, congratulations are due.

A final reminder for the Top Band *CQ* WW Contest—starting 0001z Saturday January 25, and carrying on through to 1500z on Sunday, January 26. As W1WY points out, the problem of U.S. QRM in the "DX Alley" around 1825-1830 kc lies largely with the DX (us!) and will be kept within bounds only if the W's who call in that area are *not* worked but ignored. Let them call in the bottom end of the band, as in previous years. If we don't, the W QRM will result in wholesale loss of QSO's.

Top Band

Having shifted from his old place to Portchester, and got himself "spliced"—our congratulations—G3SED has now, after a year's absence from the world of Amateur Radio, reappeared on the bands. Three weeks after moving into the new place, he had an inverted-Vee going which has already hooked VO1FB, PJØCC, W1, W2, W3, W4, W9 and W1FZJ/KP4, all during the *CQ* WW DX Contest, in which it was noticeable that far more G's than usual were in their battle array. Mike reports on the conditions for the first 160-metre Trans-Atlantic Tests: Propagation quite reasonable and many more stations on from this side than of late years, with the usual calls appearing in the lists of W's, plus KV4FZ—which is the new guise of WØVXO. In the way of other news, G3SED mentions that EP2BQ is already hearing G's from 2200z onwards and will shortly have a crystal to make him operational on Top Band. Towards the end of the season and for next season some EU/JA Tests are being set up, with the help of W1BB, and indeed DL9KRA has already been having a few "eyeball QSO's" with the JA chaps to get things teed up.

From G2DC (Ringwood) comes the comment that there is not a lot of great DX interest on 160m. unless one is prepared to sit up late at nights or get up early. Nonetheless, Jack hooked all UK and EI,

ALL-BAND ZONES AND PREFIXES TABLE

Starting date: January 1, 1968

Station	Zones	Prefixes
G3IAR	40	392
G3LZQ	40	382
G3WSL	33	335
G3PQF	31	240
G3SED	27	134
G3VPS	26	240
G3AAQ/M	26	239
G3IDG	24	118
G3WPO	23	196
G3WJS	19	216

The neat modern station of Giovanni Lanzony, I1LAG, Via Comelico 10, Milan 20135, who became interested in Amateur Radio in 1958 and obtained his licence in November 1964. During the ruinous floods in Italy in 1966, I1LAG acted as national master-control station for the amateur emergency working and, keeping on the air for 15 days, handled more than 10,000 messages relating to relief and rescue. He is a keen DX man and takes part in most of the international contest events.

OH2HZ, HB9QA, DL9KRA, a horde of OK's, and VO1FB.

Ted, G2HKU (Sheppey) found the static quite troublesome—" quite like summer till one looks out of the shack window!"—but managed SSB QSO's with GW3UCJ, GW3UCB, GW3SRG, PAØPN and PAØSE. On the key, EI9J, GC3SVK (Guernsey), OK1ATP, OK1AES, and other OK/OL/OM stations, plus OH2KH and DL3FF, all fell into the bag, while it was pleasant to hear HB9YL back on again.

As far as your scribe was concerned, filling up the G counties list has gone on very successfully, plus the horried CW QSO already mentioned with GM3KSU, and a near miss with GI3OQR who put quite an enormous signal in one evening, but " went " while the receiver and transmitter were being warmed up for battle.

Our changes in the Tables for 1969 are queried by G3IDG (Basingstoke) who wants to know if the disqualification is to be permanent when applied. Definitely not, but it is intended, as remarked last time, that the tables should reflect *current activity*—so if you come back on the band, you can re-enter your scores. Allan would be greatly helped in this respect if certain stations in Angus, Cambridge, Alderney, and the Scillies would see fit to come across with the cards for QSO's made with them.

Cards are also the theme with GM3UVL (Glasgow), who finally received — from G3WGD — a Leicester QSL, but still awaits one for Sark.

On to G3WPO (Burgess Hill) who worked W2RAA, PX1AN, OH2KH and an " 9H1AS " who sounded suspiciously like a phoney, at S9 plus key-clicks, plus a good assortment of EU/DX and G3KFE on SSB. Tony has certain alterations to his already potent aerial system in train which he calculates should result in a signal a couple of S-units stronger over a given path, and so make the DX a little easier to work.

Remember the Broadstairs Publicity Tour last year? This time they are out on January 13-18, and G3RAD will be part of the entourage —and signing G3RAD/M in the process. Dick says they will be covering Bedford, Northampton, Watford and High Wycombe this time, which gives the chance of four counties in a rather different manner.

Forty and Eighty

From Frank Hattemore, G3WSH (Bristol) comes news of a prize specimen of the genus pirate—this one has been around on Eighty, calls himself Mario, and persists with the call " PX1GS." However, just to add insult to injury, this

monster has been telling all and sundry to " QSL via G3WSH " with the result that Frank has to shovel the things out of the way every time the postman calls. Incidentally, longer-memoried readers will remember G3WSH in his earlier guise as 6Y5FH, and, before that again, as SWL Hattemore who rarely missed out on anything.

G3VPS (Hailsham) seems to have another dose of that 70 mc mobile disease, which has reduced his activity somewhat, but he reports a couple of new countries worked on Eighty CW, in the QSO's with W1DW and a UQ2; the former made a very pleasant form of nightcap before going to bed!

A positively unique aerial has come into use in Sidcup—an RF-energised cherry-tree owned by G3FWI. Bill has been away from the HF-bands for *eighteen years*, no less, and for the past five has been a strictly Top Band Phone operator. A certain hesitation, a cynical smile, and down went the key on to 80 watts RF, which produced an enthusiastic 599 response from OK on 14 mc and proved Bill could still read the stuff at a respectable speed. Since that first experiment, which has brought old fascinations to the fore, Bill has not looked back. In the LF band context Forty was worked, producing a quite splendid QSO with CT3RX, and various interesting Russian prefixes which Bill had never met before.

TOP BAND LADDER

(G3V-- and G3W-- stations only)

Station	Counties	Countries
G3VMW	97	21
G3VGR	94	16
G3VYF	92	19
G3WUD	92	14
G3WQQ	87	16
GW3VPL	85	18
G3VLX	85	12
G3WDW	83	9
G3WPO	82	18
G3VLT	80	16
GI3WSS	78	10
G3VMK	74	19
G3VMQ	73	16
GW3WWN	67	8
G3VES	63	16
G3VOK	61	15
G3WJS	55	10
G3VPS	50	14
G3XTL	44	7
G3VWC	40	8

On to G3WSL (Chandlers Ford) who has drifted from 14 to 21 and 3·5 mc. On the former band a dipole has been erected in the roofspace, and for Eighty it has been driven as a Marconi with both legs of the coax strapped and loaded against earth. In this rather odd configuration for a 15-metre dipole, 24 countries have been worked on 80m. over the past month, including several W's.

As far as G2HKU was concerned there was nothing outside Europe to report, although an interesting one heard on Eighty was WA1JGO /LA/P, on Sideband. For 7 mc the report simply ways " Nowt!"

A rather pleased G2DC has more to say about Forty and Eighty than most, and indeed Jack is coming round to the view that Forty could well be one of our best DX allocations. The reason is not far to seek, in that with a score like the G2DC one it is not so easy to find new ones —but this month has seen PJØCC on both Forty and Eighty, plus PYØDX on Forty, to lift his band scores a bit. Other CW DX worked included, on 3·5 mc, KV4FZ, UF6CR, ZL3FZ, ZL4IE, all W call areas apart from 6 and 7, and the first three VE call areas. Forty yielded CR3BH, JA6YCU, KV4FV, PY's, all W call areas, VE1-7, VK1-3, 5A1TY, 4S7DA and ZL4BO.

Here and There

As far as G3IDG was concerned, his QSO-of-the-month was with a Novice W on 21 mc. Nothing unusual in that, you may say. But there was—it was not only that novice's first G, but his *first* QSO ever! That lad was ten years of age, and one can imagine what his pleasure and excitement must have been. Allan even had to tell him what country the prefix G stood for!

One of the snags about using a transceiver for DX-chasing is the requirement for split-frequency working; and it is believed the main reason so many of the top-flight DX-chasers use American gear is nothing more nor less than the presence of the " external VFO " unit, which gives the facility at the touch of a switch and without any need for modification to the transceiver. On the other hand, one wonders whether a better solution is to use a separate receiver as well as the transceiver to give full split-working facilities and BK. This latter approach seems to be a natural, and one can then enjoy the advantages of using British gear, with AB1 PA stages, which in themselves may be enough, with no other changes, to get rid of TVI—thus two birds with one stone! Seriously though, one would be interested to hear how the transceiver merchants are getting round the difficulty.

VK3AMM (who is Arthur Edwards, G6XJ, on holiday in Australia—*see* p.564, November) is now to be found in the CW areas of the 10-15-20m. bands most days, during the period 0700-0900z. He welcomes U.K. contacts on the key.

Ten and Fifteen

Bashing a key after all these years has proved to be absolutely fascinating for G3FWI, and Bill has tried just about every band other than 160 (from which he is a fugitive) on his bit of wire-energising-a-cherry-tree aerial. As far as Ten was concerned, it all added up to a crop of U.S. contacts, and more and more of the Russian prefixes—and a darned good time!

Now to G3WSL, who seems to have put in most time on Fifteen, coming out of the fray with ZE, ZS, VE6, VE7, CR6GO, CX1JM, VS6AA, and a few JA's, worked on CW.

G2HKU's reference to his 40-metre results applies, it would seem, also to Fifteen; but as far as the 28 mc attempts went, things looked to be rather better, with SSB accounting for Europeans, and CW for HZ1AB and 9F3USA, with PJ1CC(?) as a gotaway.

Ten to G3VPS meant KZ5 and VK5 on CW, plus ZS, using SSB. However, the VK5 came in a rather roundabout way: seems Peter got up early to work VK and possibly a first ZL on Twenty—but by 0900z it was pretty obvious that he was out of luck—so he went down to Ten and promptly hooked VK5EK first try!

G3EJA (Reading) wrote in to

Reporting the HF Bands

adjust his Table scores; it rather looks as if the meat of his energies have been directed at Ten, as he goes up by seven, the contacts being with SVØWE, EL8J, 9L1KZ, UD6BR, UJ8KAJ, ZS3LU and HL9US—which make a pretty little collection raising the 28 mc score to a round hundred.

For a long while now there has been a deafening silence from GM3JDR (Golspie), which we now find has been partly due to a major rebuild into a new shack outside—which itself had to be built—plus a distressing habit of being QRL when the letter came to be written! Nonetheless, it is a pleasure to hear once again from Don; his first bit of news is that from January he will once again be the only Sutherland station on, as GM3KGT is going to VS6. GM3JDR stuck in the main to 21 mc, and on CW his catch included HI8IBC, HK3RQ, 4A1JJD, ZS5DC, CR6GO, CX1JM, 9Y4LA, 9J2CL, TJ1QQ, YV, VK, KG6, PY2SO, UA9's, GC4LI(!), KV4FZ, U1A, UL7HA, ZS6MM, PYØDX, all W call areas, VE1-7, UL7KAA, YV5AZG, JA's, UI8AX, KZ5 and KP4. On the other hand SSB produced HL9TS, assorted JA's, KG6AAY, KØILI/KG6, ZL, UW9, HC2HM, 9X5IH, VS6AL, UP2A, U1A, PY, YV, CX, PJØMM, HI3ABB, ZF1ET, 4UØTIC, UD6BR, HR2WTA, W1-O, VE1-7, 5A3TW, VP7DL, CR8AH and VK's. Incidentally, the HR2WTA and KZ5DV contacts were followed up smartly by direct air-mail QSL cards—a nice courtesy indeed in these discourteous times.

Oft-times when G3KFE and Justin Cooper were nattering of our respective columns over a pint, J.C. would comment that a certain SWL should soon be thinking about getting a ticket—then it was R.A.E. done and Morse to come—later still, Morse passed so watch out for him hitting the bands—and then lo! G3XYP burst on the scenery from Navenby. At the time of writing, David had five weeks of operating under his belt, and had amassed sixty countries, over 28 Zones, and a total of 24 of the U.S. states, on the three HF bands. The gear is a Swan 350, and a TA-33Jr rotated by a TR-44. Interestingly enough, the beam is mounted on a crankover tower based quite closely on the 9L1HX design described in SHORT WAVE MAGAZINE for August 1966, with modifications to cope with climatic and availability conditions. Ten-metre contacts were made with HS1AF, HS3VV, MP4BGX, TJ1AU, VP2AW, 5A3TW, 7Q7WW, 9Q5DS and 9J2WR, to make a good start on the band; 21 mc was not neglected but of course there is always the matter of *time*—none-the-less all W call areas (other than W7) PY, XW8BX, and JA's have been booked in.

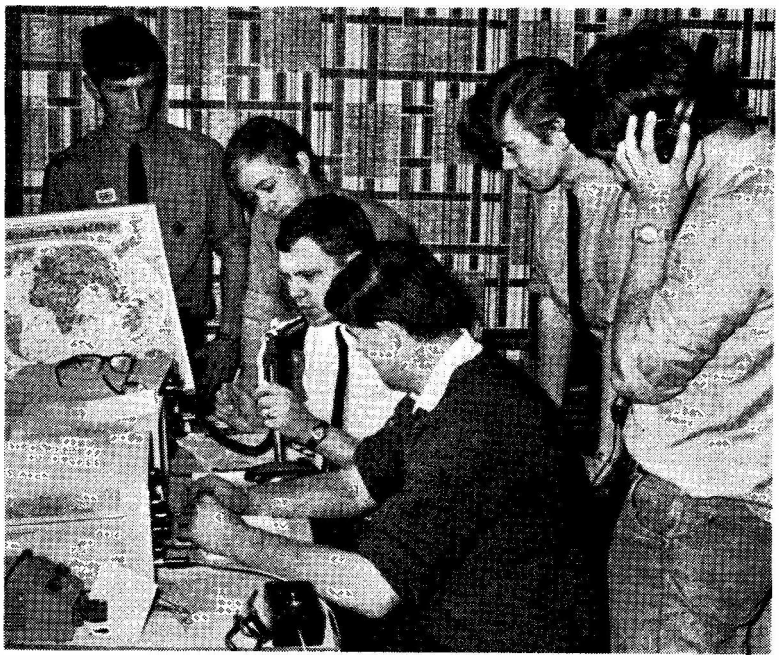
From a new one to an old-timer; G2DC has worked just about all there is to be worked on the key in Lord-knows-how-many years at the game from all sorts of places. Jack puts his list down to show how it all is done, by way of CE1AD, CR4BB, CR6GO, HP1AC, HK4ALE, PJØCC, PJ2VD, TI2PZ, UH8AE, UF5GAE, UVØKUV, VP8HJ, ZD8J, ZS5DC, ZS5XA and 9Y4LS, all worked on Fifteen, plus, for Ten, EP2BQ, LU1BB, UD6AM, UH8AE, UI8AI, VS6AA, VK's, VE's, all W call areas, ZE's, ZS's and 9J2.

From G3NOF (Yeovil) comes a gloomy assessment of the bands that could almost be summed up as "Fine—when I'm elsewhere!"—but Don rang the bell on Ten with CR2AA, PYØSP, VK2AXB, VK5DE, VK6KL and VU2GGB, plus of course the usual crop of W's. Fifteen never does make a large contribution to the G3NOF log, thanks to the gogglebox, but VK's have been heard, long-path and complete with echo, around 0800, followed by the SP opening at 1100. A good check on things, Don remarks, is to listen on 21380 kc for the VK2FA crowd in their net, which is often joined by VK9's and 9M2.

Twenty

Here let G3XYP open the scoring. David spent his evenings in this area mainly, as the morning sessions have been still dark. VK, ZL, all W call areas, including the first W7 in Montana, CO2FA, FM7WV,

Station of Bob Hooper, G3WEV, 8 Pitchcombe Gardens, Coombe Dingle, Bristol, who comes from South Africa. Main interest is on the LF bands, for which he runs a Codar A.T.5 and Heathkit RA-1, with Q-multiplier and preselector. His younger brother Jeremy is also licensed, as G3XEI —and he has another brother coming on!



G5ACX, on microphone, with G3PLY, operating GB3JOA from Wokingham, Berks., during the recent Scout DX event. They used a Heathkit SB-300/SB-400 combination, into a Mosley TA-33Jr. aerial, making 78 contacts in 42 countries in all continents.

FY7YK, HKØBMO, KR6FC, KX6FN, PYØOK, VKØJW and VQ9GA have been worked. All that, taken into account with the activity on other bands already mentioned, adds up to a pretty fair start.

G3VPS is another old "SWL" correspondent. Peter tends to hide his light, and in any case operated the LF bands for quite a while with a 19 Set, so one is quite startled to find his Six-Band Table score sitting at 105 countries worked. This month's catch include (CW) 9H1, PJØCC, ZB2 and JX, while SSB accounted for 9J2, 9H1, VK6, ZB2 and CT2. Thus over the month the countries total continued its steady rise, with four more countries added in.

A cracking signal from Gozo into the G2HKU headphones was 9H1M, worked on SSB around 0700z, as were ZL2KP, ZL3JQ, ZL3SE, ZL2AVY, ZB2A, VK7WH, KL7GME, SV1BN and EL2BC (who gave QTH as Box 251, Monrovia, Liberia).

G3FWI has been somewhat puzzled, as have so many more, by the special OM prefix used temporarily by the OK's this autumn; this was fairly well advertised in all the right places but for some reason caused, and continues to cause, quite a bit of bewilderment. Bill had a gotaway on 14 mc in the form of F6ABP/FC, heard at 1048z; and one suspects that if he had totalled up his workings on the band the result would be quite a fair old total.

Naturally, if there is anything doing on Twenty, one normally expects G2DC to be on to it in short order. Jack has been told that the Pacific stuff is "there" at around 0500z, but he says that "a combination of old age and the screws" has prevented him from taking more than academic interest. He should worry—wild horses wouldn't drag G3KFE out of bed at that time! There are times when the delights of DX are in the abstract, and this is one of them! However, to be serious for a moment, G2DC's takings this month include a daily WAC but not much else—or so he says.

As the bands open up at daybreak it is now possible, thanks to our enlightened masters, to go to work in an office too early for the band opening—which is just dandy if you've got TVI!—but G3NOF seems to have hung on until things got going, and as a result has observed that the UA's herald the start of the dawn chorus, followed by Central Europe, JA and VK, in that order; often the Central EU's are so loud as to drown out the VK's. And note you this, gentlemen—it is these same Central EU's whose time is being foisted off on to *us*. A deep-laid plot against the DX! G3NOF raised CR6GA, DU1UP, ET3REL, FO8BS, FR7ZG, HL9US, a collection of JA's, KV4FZ (who must be the original sleepless wonder), OY7ML, PJØCC, PYØOM and PYØSP, SVØWN, VE7's, VKØJW, UAØNM, VP2VW, VP8KD, VP9K, VS9MB, ZL's, ZS3AP, ZS3LU and 9Q5EJ.

Bits and Pieces

Reverting to our note on VS9MB operation, a new operator has appeared, John, who is giving G3KDB as his QSL address, whereas

TOP BAND COUNTIES LADDER

Station	Confirmed	Worked
	Phone and CW	
G2NJ	98	98
GM3UVL	97	98
G3APA	95	96
G2HKU	90	94
G3WPO	78	84
G3WQQ	74	87
G8HX	72	81
GI3WSS	66	78
G3VLX	63	85
G3IDG	55	61
G3WJS	40	78
G3VPS	27	50
G3XGD	25	54
	Phone only	
G2NJ	98	98
G3VGB	81	90
G3WPO	62	70
G3PQF	52	76

(Failure to report for three months entails removal from this Table. Claims may be made at any time.)

Colin was showing W2CTN, as mentioned last time. VS9MB is in the Maldive Islands, Gan, Zone 39. 8QALK, 8QAWA, and 8QAYL are all in Malé, in the main Maldive group, on the other side of the Equator and so in Zone 22, and indeed there are rumours that this may have separate country status. As a matter of interest, the first call belongs to VU2OLK, ex-GM3OLK, and the latter to 4S7WA and his XYL, 4S7YL, who are both now resident in Malé.

When you hear, or can work, 7O1AE, he will be quite legit. and all in order, the QTH being: Ian Dunbar, Telcomms. Dept., BP Refinery (Aden), Ltd., Box 3003, Aden, South Yemen.

One is perpetually being confused by the I prefixes. The old I1 seems to have burst out into I2, I3 and so on, over the past few months with no apparent rhyme or reason. Now, it is believed the whole thing is to be rationalised, along the lines of I1 for specials, the Islands as before (IS1, IT1, and so on) I2 Milan, I3 Venice, I4 Bologna, I5 Florence, I6 Bari, I7 Naples, I8 Reggio Calabria, I9 Piedmont, and IØ for Rome.

The objection to having YB amateurs working W's seems to have been overcome as far as the Indonesian authorities are concerned,

and so it is understood that ere long action will be taken to take YB off the American " barred " list.

So there, for the month, and for the year, you have it; let us hope and pray that 1969, both in the national context and by way of Amateur Radio, will be happier and more successful; sensible politicians(!), more DX, and no phoney DX-peditions, lids or pirates to take the taste out of our little triumphs.

Deadline for the February piece is first post **Monday, January 13,** addressed as always: CDXN, SHORT WAVE MAGAZINE, BUCKINGHAM. Till then, *73 es HNY.*

SAFETY IN THE AMATEUR STATION

The mains, and any apparatus connected to them, can be lethal unless proper precautions are taken—a statement of the obvious, maybe, but it does need re-emphasising from time to time. The first safeguard is to sort out N, L and E (" neutral," " live " and " earth ") on the mains side, and keep them sorted all through the station wiring. This means using three-pin plugs throughout, even if a two-pin connection is wanted—in the sense that when several connections are made to one socket adaptor, the " neutral " and " live " sides are always correctly joined.

Secondly, all chassis should be solidly grounded, to a good earth connection separate from the mains " E " lead. (It is a good habit always to make the earth connection first when wiring in gear.) Power packs should, of course, be fully protected (by covers or separate housing) and all HV feed points properly insulated; it is as well to fit protective terminals and to make HV connections with heavy rubber-covered cable, as used for car plug leads (these connectors and the cable can be obtained from any good service garage).

All major items of equipment should be separately controlled on the mains side through double-pole switches (these can be mounted on a separate panel, and individually labelled). The appropriate switch should be at " off " when the interior of the apparatus is being explored for any reason. When adjustments have to be made with power on—as of course is often the case—use *one hand only* (keep the other in a pocket), and have rubber mats about the place on which to stand when working on the gear.

Finally, and most important, have one large double-pole switch, which can be reached quickly, to cut power to the *whole station* in an emergency. And every member of the family should know where this switch is, and what it is for. (It is no use your young brother trying to pull you off a 2·5 kV circuit with the power still on.) The whole theme of the station layout, as regards all mains and HT circuits and connections, should be *safety*—your own, and that of others. If the correct and reasonable precautions are taken, there need never be accidents.

W. D. CLAGUE, G2BSA

The death of Douglas Clague, G2BSA, of Looe, Cornwall, at the age of 71, was reported in the *Magazine* for October 1968. He was a retired chemist and his estate has recently been proved at £106,175 on which the duty paid was £44,068. At the time of his death, G2BSA was president of the R.A.I.B.C.

THE TWENTY-THIRD MCC

The Magazine Top-Band Club Contest
November 9-10, 1968

ANY handicapping system is at the mercy of the unpredictable—and the one used for MCC as much as any. None of the invigilators would have said that Top Band was in especially good fettle on the evening of November 9, or even on the following day, but there is not much doubt that conditions for GDX were good enough to upset the applecart and put the Southerners out of the running.

The winners for 1968, **Moray Firth,** GM3TKV, scored 825 points; this compared with a winning score of 641 in the 1967 MCC (for *Burslem*) with almost the same number of logs entered, and compares also with a score 227 points lower for *Moray Firth*, enough to take them into second place in 1967.

As for the runners-up, it was touch-and-go whether it would be **Manchester University** (G3VUM), who eventually got the verdict with 698 points, or **Kirkcaldy,** who took third place with 695, signing GM3PFQ. For the record, Manchester University placed thirteenth last year with a score of 482 and Kirkcaldy held third with 580 points.

Down at the other end of the Table, the records show the wooden-spoon score to have been 46 last year, and so, oddly enough, it was this year, too. However, it could be said that any Club which equalled last year's score this year could expect to go down the Table, give or take a little, by about *twenty* places!

A word about the logging and invigilating: As ever, there were quite a few invigilators listening in various parts of the country (sometimes in landline contact with each other with reference to a particular station) *plus* the cross-check on information given by the logs themselves, which are gone through pretty closely, with of course the check logs. This year we received one from GM3RCS, *Radio Club of Scotland*, because they didn't think it good enough for a formal entry (they would have been far from disgraced if they had put it in!) but it served well as a check. Then of course, we had " the institution," which comes in each year from D. L. A. Law of Leicester, who rarely misses what goes on during MCC.

As far as the entered logs were concerned, the situation was not as good as it should have been. One of the leading stations took an awful pasting in the checking, and fell by 32 points; all the first three claimants lost points. Sometimes, this was because of nothing more than bad handwriting. Then there were the errors that need not have appeared had the logs been carefully checked before sending, such as mistakes in the Club coding, obvious by looking at the logs for each day. The number of these mistakes far out-numbered the errors of inability to copy Morse.

Each year the faces change, and absentees are noticed. During the Contest period itself one was aware of the absence of last year's winner, Burslem. And of G3BMY from the single-pointers—although the mystery of where *he* was hiding was easily solved by listening to a certain Club call rather carefully! When the entries come in, there is always the feeling of surprise that calls one heard " going like a bomb " in the Contest have failed to come up with a log; two such were *East Barnet, G3RPB*, and *Marconi Apprentices, G3JTW*, both of whom seemed to be heading for high scores during the battle.

Single-point contacts can often make a big difference to the final placings, and quite a few calls were noted as making a serious attempt to work a lot of the Clubs: G3LIQ, G3IAR, G3VLX, GM3OOK all were noted in several logs, as was G3ABG, with a sprinkling of OK, OM, OL, PAØ, 3AØ, and DL stations. An interesting one was G3VFA in Broadstairs, who seemed to be laying down a pretty hefty signal all over the country—and who could be expected to have been using a " Joystick," considering it is the Partridge Electronics callsign.

Several groups—including one of your invigilators and SWL Law—got all tangled up in the mess of Beastly Summer Time *versus* GMT. This meant that beady eyes were cast on the band a few minutes before the start, to note how things were going on. Apart from a few stations getting well and truly muddled up over time, one noted here and there the odd " CQ MCC " launched before the starting time and carried on till after, so as to monopolise a clear frequency. At least one such was quite definitely able to listen-through but did not answer until " time " was called.

Quality of Signal

As always, there were a few notes that were less than perfect, and here and there one heard the odd prize out-and-outer. But it must be said that although, for example, GM3TKV was criticised early on by one invigilator (for " Baghdad Morse "), he was heard later with a clean signal by another, and certainly he was getting T9 all the time. G3XNS/A sounded very rough at one stage, but cleaned up later on. And comments about the G3JTW signal by one were not borne out by another, and could probably have been purely proximity effects. So it can be said that there was nobody operating with a deliberately dirty note, and those who may have had them took appropriate action to clear things up.

Equipment Used

Here one must first of all think in terms of Aerials,

because it was by these that the Big Boys produced their signals. For instance, GM3TKV had a choice of three: A 96-foot vertical base loaded; a folded dipole coax fed at 45 feet; and a horizontal dipole at 96 feet, also coax fed, each lined up to cover different parts of the country. Runners-up *Manchester University* had their half-wave aerial no less than 160 feet in the air at one end! Against this, a dipole at 35 feet seems so modest—all the more credit to *Kirkcaldy*, GM3PFQ, for such a fine score. *Spen Valley*, G3VMW, ran an inverted-Vee with the apex at 80ft., worked against an earth-mat of no mean size. Keele's dipole was 75 feet high—no wonder these chaps, signing G3UOK, got S9 from all over the country.

On the other side of the coin, knowing how important the aerial is to the Big Signal, one was saddened to hear some of the back-markers putting up a bleat about "excess power." The mathematics show that, providing you have an aerial system that will get you out, there is very little difference between 10 watts and 100 watts, on any band.

In the way of ingenious improvisation, one was

TABLE I

Positions and Scores, Twenty-Third MCC

PLACE	CLUB	CALL	REGION	POINTS	PLACE	CLUB	CALL	REGION	POINTS
1	Moray Firth	GM3TKV	GM	825	51	Echelford 'B'	G3JUL	S	330
2	Manchester University	G3VUM	N	698	52	Mid-Sussex	G3BZO	S	329
3	Kirkcaldy	GM3PFQ	GM	695	53	Manchester University 'B'	G3VDB	N	313
4	Spen Valley	G3VMW	N	661	54	Grimsby	G3VIP	M	312
5	Stourbridge	G6OI	M	608	55	Nailsworth	G3VVV	S	311
6	Keele University	G3UOK	M	604	56	Brighton Tech. Coll.	G3TCB	S	309
7	Verulam 'B'	G3NOH	S	599	57	East Cheam	G3MEH	S	308
8	Kings Norton	G3GVA	M	596	58	Wirral	G3NWR	M	304
9	Maidstone	G3TRF	S	594		Salisbury	G3FKF	S	304
10	West Riding Contest	G3VTY	N	583	60	Crystal Palace	G3VCP	S	303
11	Govt. Comms. H.Q.	G3SSO	S	575		Crawley 'B'	G3TNO	S	303
12	Sheffield	G4JW	N	559	62	Fareham	G3VEF	S	298
13	Surrey	G3SRC	S	558	63	Farnborough	G3XCH	S	294
	Stockport	G6UQ	M	558	64	Chippenham	G3VRE	S	289
15	Woking	G3POI	S	552	65	Gosport	G3RQK	S	279
	Oxford	G3RBP	S	552	66	Crawley 'C'	G3PHG	S	265
17	South Manchester	G3FVA	N	520	67	Painton	G3PHC	M	259
18	Leicester	G3LRS	M	505	68	Ampfield Contest	G3JFY	S	258
19	Leyland Hundred	G3GGS	N	486	69	Conway Valley	GW3HGL	GW	257
20	Coventry	G2ASF	M	482	70	Lincoln	G3IXH	M	252
21	STC, Harlow	G3NIS	S	463	71	Bishops Stortford	G3RGA	S	233
22	Torbay	G3NJA	S	461	72	University Coll. Bangor	GW3UCB	GW	230
23	Hallamshire	G3KVG	N	446		Reigate 'B'	G3XOQ	S	230
24	Luton	G3XZD	M	442	73	Echelford 'A'	G3UES	S	229
25	Staffs. Coll. of Tech.	G3VZI	M	435		Greenford	G3VMD	S	229
26	Liverpool	G3AHD	N	433	76	Isle of Wight	G3SKY	S	227
27	Salop	G3SRT	M	429		Southdown	G3WQK	S	227
28	Leyton & Walthamstow	G3WHY	S	427		Jersey, C.I.	GC3DVC	GC	227
29	Crawley 'A'	G3WJC	S	425	79	Wessex	G3WGV	S	220
30	East Surrey	G3OVL	S	422	80	Verulam 'A'	G3VER	S	217
	Stoke-on-Trent	G3GBU	M	422	81	Sheffield University	G3UOS	N	214
32	Nottingham	G3EKW	M	416	82	Macclesfield	G3LDT	M	212
33	Edgware	G3ASR	S	406	83	Clifton	G3GHN	S	197
34	Hereford	G3WNO	M	405	84	Rugby	G3BXF	M	194
35	Cambridge	G6UW	M	403	85	Mansfield	G3GQC	M	192
36	Vange (Basildon)	G3PRU	S	402	86	Bromsgrove	G3VGG	M	185
37	Chesham	G3MDG	S	385	87	Purley 'A'	G3FTQ	S	184
38	Reigate 'A'	G3REI	S	378	98	Bradford G.S.	G3MHB	N	181
	Chester	G3GIZ	M	378	99	Purley 'B'	G3XMW	S	172
40	Ealing	G3UUP	S	377	90	Bangor	GI3RXQ	GI	161
41	Crawley 'D'	G3XNS	S	372	91	Mid-Herts	G3WGC	S	147
42	Cardiff Contest	GW3XEJ	GW	364	92	Shefford	G3ROL	M	142
43	Nuneaton	G3XJU	M	363	93	Blackwood	GW6GW	GW	136
44	Otley	G3XNO	N	355	94	Barking	G3XBF	S	129
	Cheshunt	G3TZZ	S	355	95	Worthing	G3WOR	S	127
	Stevenage	G3SAD	S	355	96	Newark	G3ELJ	M	104
47	Worcester	G3GJL	M	346	97	Yeovil	G3CMH	S	95
48	Wimbledon	G3WIM	S	343	98	Pudsey	G3XEP	N	66
	Norfolk	G3PXT	M	343	99	R. Aux. A.F. Northwood	G3RVH	S	46
50	Bristol University	G3KAC	S	342					

The Cambridge Group entry for MCC, with G3VNQ on the key and G3UEW logging. Signing G6UW, the old University callsign, a score of 403 points put them into 35th place. Their other operators were G3WUW, G3VCR and GI3RCB.

amused at the East Cheam crowd, who operated from a site normally only used for VHF *chez* G3MEH. To get going on Top Band, they lifted the mast, complete with beams, on to a lump of plastic, disconnected the VHF feeders at the shack end, and fed the mast *via* a loading coil against earth; it was good enough to make the locals complain of receiver-blocking. They scored 308 points.

Turning to the station end of the equipment used, by far the most noticeable thing was the acceleration in the trend to employing transceivers on the one hand, and on the other, the virtual disappearance of the good old HRO, which not so many years ago was by far the most popular receiver in this Contest. *Moray Firth* were all home-brew, with a 6BW6 PA stage, keyed by grid-blocking, and alongside it GM3UKG's version of the G2DAF receiver, *plus* a double-conversion job by GM3KHH. *Manchester University* used a KW-2000A with a Q-multiplier. *Kirkcaldy* had a 2E26 in the PA, driven by EF91-EF91 in the exciter for transmission, with an Eddystone S.750 to do the receiving job. At *Spen Valley*, transistors were used to drive a 5763 PA, while the receiving side was taken care of by an Eddystone 888A and an AR88D. *Keele University* (who seem to have had some of the operators from last year's winning Burslem side) had KW2000A-*plus*-Drake R4A tackle to run up their score—and in that context it is perhaps interesting to note that a Burslem operator was at the sharp-end for *Manchester University*, second in the final placing.

Lower down the tables, a variety of gear was used, mainly KW-2000A transceivers, a couple of Project '66 transceivers cross-coupled at Kings Norton (G3GVA) and another at Staffs. College of Technology (G3VZI), the latter backed up by an RA-1 receiver, and a reserve station consisting of Eddystone 880/2 and K.W. Vespa. Receivers ranged from the AR88, HRO, through several Drake types (R4A, R4B, 2B), Sommerkamp FR-100B, Eddystone EA-12, through to Racal RA-17 and Collins 75A-4. Transmitters included quite a crop of home-built (mostly keyed by grid-blocking) together with the odd all-transistor job, Codar AT-5's and K.W. Vespa and Vanguards.

Operating Techniques

Like the curate's egg—good in parts, but always sporting. Quite a lot of Clubs were pretty obviously netting to the *wrong* side of zero-beat from the crystal peak at the other end—how many times have we all done it in the heat of the moment, especially on an unfamiliar rig—and quite a few operators using the KW-2000 forgot just how one goes about (*a*) Sending a clean CW signal, and (*b*) How to net dead on the other chap's frequency. Often there were aberrations, such as the odd call 500 cycles *off* the correct frequency. This year, the invigilators gained the impression that MCC was spread out more than previously, up to as high as 1890 kc. As usual, there was far too much use of *BK* as a substitute for a callsign, rather than in its correct form, meaning that "I am equipped for listening-through." This misuse resulted in several points being written down for QSO's which appeared in three, or even four, logs as a claimed contact!

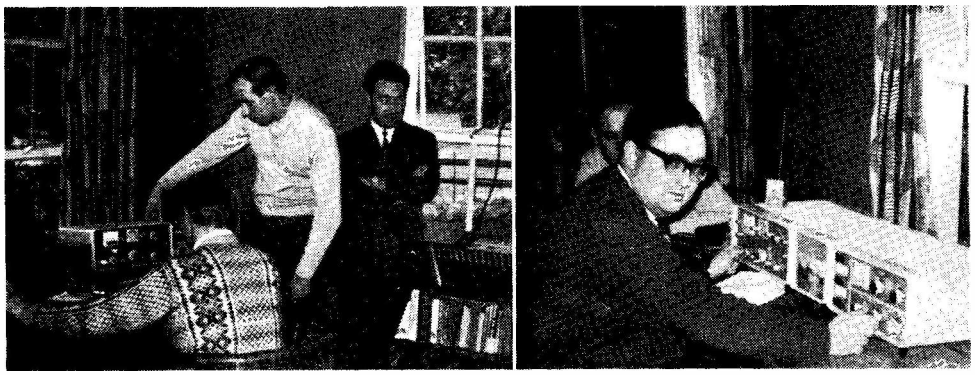
The Scoring System

It is by now understood that as well as being a battle for the Top Spot, MCC is intended to give the regions a chance to compete internally, one Club against another. But it seems desirable at this point to discuss in some detail the way in which the present scoring balance and multipliers are calculated.

TABLE II

Top Scorers in the Regions

	Southern	
1	Verulam 'B' (G3NOH)	599
2	Maidstone (G3TRF)	594
3	Govt. Communications (G3SSO)	575
	Northern	
1	Manchester University (G3VUM)	698
2	Spen Valley (G3VMW)	661
3	West Riding Contest (G3VTY)	583
	Scotland	
1	Moray Firth (GM3TKV)	825
2	Kirkcaldy (GM3PFQ)	695
	Midland	
1	Stourbridge (G6OI)	608
2	Keele University (G3UOK)	604
3	Kings Norton (G3GVA)	596
	Wales	
1	Cardiff Contest (GW3XEJ)	364
2	Conway Valley (GW3HGL)	257
3	University Coll., Bangor (GW3UCB)	230
	GI/GD	
1	Bangor (GI3RXQ)	161
	GC	
1	Jersey (GC3DVC)	227

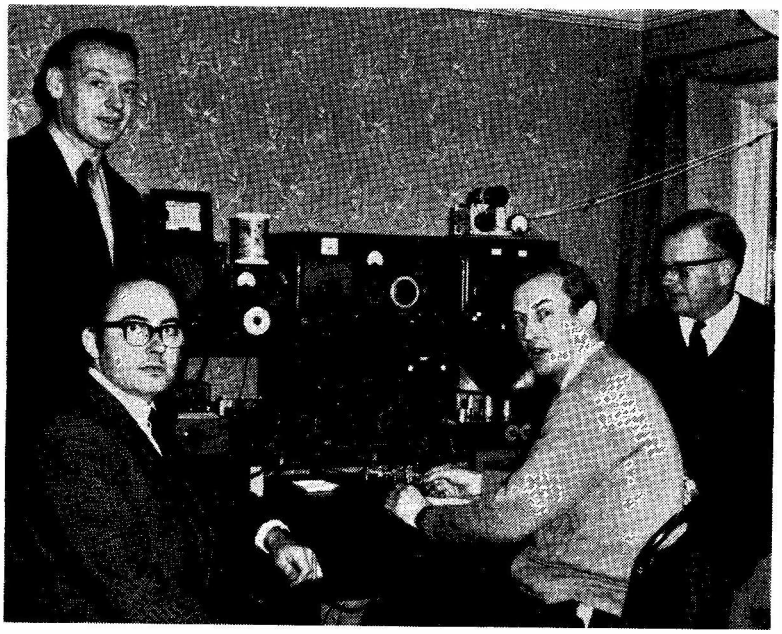


Not actually an MCC picture, but an impression of the two stations put on for J-O-T-A under callsign GB3GP, Gilwell Park, the Scout Hq. in East London. On right, G3TZZ operating the HF station, and at left G3SVK busy at the LF position, with G3VUE and G8BAM. On 160m. W1BB/1 was worked and, all in all, some 395 contacts were made, in 55 countries, half of which were with Scout stations.

If one thinks about it, a station in the South of England can start by working off other Southerners in the early part of the time allocated, and, as the 160-metre band changes fully over to " night-time " conditions, will hear and go after the DX. Now, the Scottish stations (in particular those in the Far North), have to contend with different time conditions as far as the onset of DX working is concerned—as much as a couple of hours up in Shetland—plus the fact that they cannot do much in the way of peeling off the locals (because in GM there are not many Top Band locals) while they wait for the band to open to the South in anything like a big way. Four hours is just about the shortest time that gives the Southern stations a chance to work 'em all, while not being long enough to let the GM's make full use of their multiplier and score a runaway victory. If conditions are bad, then a Southerner should win—recall Racal and Maidstone in 1965?—while average conditions make it an open guess. But if the band is in very good shape the Scots have the edge.

However, there is another factor in the equation, and that is the *desire* to win, come hell or high water. It does seem as though a far larger proportion of the dour Northerners and Scots enter the Contest seriously than do the folk down South; and often the effort which could have placed a southern Club high in the lists is dissipated in running another station and hence generating local QRM—well, it's just a thought. [*over*

For MCC, the Kings Norton group operated as G3GVA/A, placing 8th with 596 points. Operators were G3GVA, G3RGD, G8AX and G3GBS (who took the picture). Oddly enough, Kings Norton also came 8th in the 1967 MCC, but then with 523 points—even the increase of 73 pts. this time did not improve their position, showing that there was a larger entry and even hotter competition this year.



The Leyland Hundred (a district of Lancashire) entry for the 1968 MCC signed G3GGS, making 486 points for 19th place (last year they were 10th, with 504 pts.). Operators seen here, left to right, are: G3RFN, G3RFT, G3GGS and G3AZI. Their gear consisted of a Command Tx, BC-348 receiver and a 272ft. wire, centre-fed, at 35ft.

For Bishops Stortford, the station signing G3RGA scored 233 points, for 71st position out of the 99 MCC entries this year. The other operators were G3VWC and G3XYI, the G3RGA gear being a KW-2000A (on the QRP notch) coupled through an ATU to a half-wave aerial at 40ft.

The GDX Entries

Quite a few of interest appeared in the logs. A noticeable one was GC3DVC/A, giving J01 as identification, and putting a very good signal all over the country, but being somewhat overlooked in the welter of S9 stuff. As a matter of interest, the Jersey entry was signed, and some of the operating done, by that old Coventry stalwart Bert Chater, GC2LU as he now is.

Both Jersey and the Isle of Wight, G3SKY, intend to be in there again next year and to improve on this year's score. They share 76th place.

Unlike previous years, when the EI/GI representatives have been noticeable by their absence, this time they were quite definitely present and dishing out reports: Ballymena, GI3FFF, appeared in many logs, as also did Bangor, signing GI3RXQ and getting pretty well all round the country.

From Wales, MCC operation was going on at GW6GW, Blackwood; GW3UCB, University College of Wales, Bangor; GW3HGL, Conway Valley; and Cardiff Contest, who signed GW3XEJ.

The Bangor (Northern Ireland) Club station signed GI3RXQ for MCC, and the chaps making their 161 points for Ulster were, left to right, GI2FHN, GI3OLJ and GI3TLT. They ran a home-built Tx with TT11 PA, and as Rx a "Commander." They had a 300ft. vertical aerial supported by balloons for the first session on November 9 (which must have been a lot of fun for everybody!) but for the second day went on to a dipole at 35 feet.

Some of the Comments

Plenty of these, some grave, some light-hearted . . . Cannot put in an entry—aerials wouldn't work (*Radio Club of Scotland*) . . . Morale crashed after two hours of the worst conditions ever known here (*Moray Firth*) . . . Must get the centre up another ten feet for next year and do a little better (*Kirkcaldy*) . . . Operating done by G3XAQ while I was soothing irate parents suffering from TVI for some reason (*Spen Valley*) . . . Only three QSO's within 20 miles (*Keele University*) . . . Rotatable half-wave dipole at 45 feet (*Verulam*) . . . MCC is always the next event of note after Bonfire Night! (*Kings Norton*) . . . Lots of people don't know what "*net*" means (*West Riding Contest*) . . . Highlight, working

The Torbay chaps signed G3NJA/A during MCC, those concerned being, left to right: SWL Mike Weston, G3LHJ, G3GDW and SWL David Weston. Their very creditable score of 461 points got them into 22nd place in the field of nearly 100 MCC entries.

with unusual ease, 3AØAG, Monte Carlo, who sounded genuine (*Govt. Communications, Cheltenham*) . . . Such big aerials are used these days that distance is no disadvantage (*Stockport*) . . . We were often confused with G3RPB (*Oxford, G3RBP*) . . . Thanks for such a wonderful contest (*South Manchester*) . . . Hope the present formula is retained; it seems an ideal compromise (*Leyland Hundred*) . . . Like the scoring system, keep it as it is! (*Torbay*) . . . A transceiver minus the tuning knob is not the best of tools (*Hallamshire*) . . . Marvelled at times at some of the signal strengths heard (*Crawley*) . . . Relay trouble made us QRT for 1¾ hours on Saturday (*Nottingham*) . . . Frustrating intermittent fault on the Saturday rather held us back (*Hereford*) . . . Trouble with our own keys—nobody could use anyone else's! Then great difficulty in getting replies when using the straight key (*Cambridge*) . . . Bug key failed us too! (*Vange*) . . . Still a number of keys with surplus dits! (*Reigate*).

One signal sounded like a Class-D into an 813 (*Stevenage*) . . . A multiplier of 1·5 to 1·7 would be fairer to us (*Norfolk*) . . . Unfortunately, I lost one of the scraps of paper, and with it about six QSO's—three operators in a shack four by four by six ! ! (*Bristol University*) . . . Most of the operators should be out of hospital in time for next year's event! (*Mid-Sussex*) . . . Never operate T/B from home; all that wire *appals* me! (GI3VDB, for *Manchester University* "*B*") . . . Still don't like the scoring system (*Grimsby*) . . . Pride of place to G3BVM's El-Bug; it involves fourteen valves (*Gosport*) . . . All the Painton Club members involved enjoyed the contest, and will be there again next year (*Painton, Northampton*).

The Training Aspect

There seem to be three approaches to MCC: either an all-out attempt to win, an entry for amusement only, or an entry with a view to "blooding" operators for other battles. We have discussed the first alternative before, and the second needs no comment, but the "training" concept is rather more important. In the first place a successful contest operator will usually be a good operator under normal conditions, and hence cause less QRM on the bands. In addition, his reflexes, his Morse speed, and his concentration, all will be improved, the shortcomings of the gear will be noticed, and the logging problem will be realised. This is where the old hand steps into the picture, to show how the paperwork can be organised, what can be done to the rig, and so on; but the youngsters should be made to do the operating themselves, and never allowed to just sit back and watch, because unless they take part it is highly unlikely they will benefit.

And talking of benefits, most of the competitors would have gained a lot by a close study of SWL Law's check-log. Not only was it a model of readability and accuracy, but he had time to note the odd aberration and to see the funny side of a situation—such as two stations on top of each other sending CQ, and using BK—but not hearing each other till they went over, the follow up QSO being 599 both ways! Incidentally, SWL Law is the first person ever to remark (to this writer's knowledge), on the undoubted fact that a good check on the well being of an HRO receiver is given by lifting the lid and sniffing the innards for a snug and comfortable smell, which instantly changes if the receiver ails.

And there you have the story for the 23rd MCC. In the Tables may be seen the scores, the regional winners and runners-up. Our thanks to all who took part and submitted Logs. We hope to repeat the event in twelve months' time. From your "Club Secretary"—every good wish for the New Year.

SPECIAL PREFIX FOR WALES?

In connection with the Investiture, later this year, of H.R.H. Prince Charles as Prince of Wales—the 21st in the direct line since 1301 A.D.—it has been suggested that a special prefix (temporarily to take the place of GW) should be available to Welsh amateurs to mark the occasion. Of course, in the current atmosphere of half-baked "Welsh nationalism and protest" to which we are now being subjected, there will be those who would regard any such suggestion as "an insult to the Welsh nation." Never mind—we understand that the matter of a special prefix for Wales to mark the Investiture is under consideration—we are sure that the great majority of GW's will be proud to use it, if they are fortunate enough to have it granted.

CITY & GUILDS COURSE IN COMPUTER PROGRAMMING

We are informed that the City & Guilds of London Institute will shortly be introducing a syllabus leading to a certificate of national standard in Computer Programming. It seems that the "private education" in this esoteric field has been (to put it at its lowest) somewhat uneven and not altogether satisfactory. Because there has been no accepted national standard, the shortage of properly qualified computer-programming staff has become severe. A City & Guilds Certificate in the subject will put it on a rational basis.

SCIENCE MUSEUM, GB2SM—RTTY

We are asked to say that the working Amateur Radio station at the Science Museum, signing GB2SM and regularly operational on the HF bands under the direction of Geoffrey Voller, G3JUL, is now fitted for radio teletype (RTTY). Normally, activity periods for GB2SM are 1030-1100 and 1500-1530z, Mondays to Fridays, on any band 28 to 3·5 mc, depending on conditions and what happens to be going. Stations able to work in the RTTY mode are invited to write for skeds—which may be possible outside the times mentioned—to The Assistant Keeper, Radio Collection, Science Museum, South Kensington, London, S.W.7. (*Tel: 01-589 6371*).

• • • SWL • • •

SHORT WAVE LISTENER FEATURE

THE TENTH YEAR OF "SWL" — MANY LICENSED AMATEURS OF TODAY NURTURED ON THIS FEATURE — SOME TECHNICAL NOTES — READERS' NEWS, VIEWS AND COMMENTS ON HAPPENINGS ROUND THE AMATEUR BANDS — THE HPX LADDER

By Justin Cooper

HELLO again! And it's a very special greeting this time, in that this is the tenth anniversary of the first appearance of the "SWL" feature in the *Magazine*, during which it has had three conductors. Over the decade something like 500 readers have made the transition from SWL to licensed amateur, and the vast majority have proved the adage that a good apprenticeship in the SWL game is the way to get the best out of operating on the bands. Those ex-readers of this column worked by your scribe in their early days have been noticeably more confident in their procedure than the chaps who have come straight on the air from R.A.E. and Morse with no serious listening-time during their learning. It was always the intention that this piece should be of practical service to Amateur Radio, without in any way plugging the licence theme.

The idea of "SWL" as a regular *Magazine* feature was first proposed by the late Tommy Thomas, G6QB (for many years a valued member of the SHORT WAVE MAGAZINE organisation) and it was he who wrote the original "SWL" contributions. They were an immediate success and, at that time, brought us a circulation increase of nearly 16 per cent, representing about 4,000 new readers. Over the years, we have tried to keep to his formula—which was, simply, to give SWL's what they wanted to read about, in the way of the technique of listening on the amateur bands. This takes a great deal more know-how than may be supposed and your present scribe would be the first to admit that he is still feeling his way.

* * *

Now, to a survey of matters technical—something we have not done for a considerable time.

A. Vest (*Durham*) has first pick, with his remark that he finds his CR-100 not too good for receiving SSB; he seems to feel that the answer is a product detector. Not necessarily so, as if the receiver itself is not capable of "cleaning up" a sideband signal, the product detector will not solve the problem by itself. What is usually lacking is BFO injection, but adding more coupling is often only to make the BFO pull badly. A good way to deal with this difficulty is to inject the BFO signal into an earlier stage in the IF strip, in exactly the same manner as is done on the last IF stage at present. If an SSB signal will not resolve easily, and there are others on the band that will, then it is a pretty fair bet that either the RF/IF gain is set up too high for the signal, or that the signal itself is poor. A big, clean, signal resolves perfectly, but the chap with the bad SSB signal is often extremely difficult to sort out—and usually all that is the matter is that he needs to back off the microphone gain or talk more quietly!

How to make aerials stay up in a breeze when the far end is attached to a tree is a regular problem. There is a solution, which is to have a pulley at the top of the tree, through which the halyard runs. Instead of tying the downhaul to the tree somewhere, tie it to a bucket of stones or other suitable weight, which hangs free, so that as the tree waves about the tension on the aerial is constant and only the bucket goes up and down. Another way, if the aerial wire is relatively thin, is to use the nylon-cored and PVC coated lacing-twine, such as *Suflex*, as the halyard with a good length between the aerial insulator and the point to which the lower end is belayed, to take advantage of its elasticity. A third point to remember is that if the wire has a bend in it, through an insulator, it should be firmly attached *to* this insulator, and not allowed to run freely; quite apart from the flexing at the bend, the mechanical stresses at this point can be very high indeed, as a consideration of the parallelogram of forces will show. *N. Taylor* (*North Wembley*) mentions this problem in his letter, and as a result has an aerial with a large number of joins! Yet another method is to introduce, into the aerial support lines, one or two of those "bungy" cords, as used for strapping luggage. A common source of supply is the local Woolworth's.

It is really quite surprising how many folk, your conductor included, who were fooled into thinking the receiver had packed up by the wipe-out in conditions at the end of October; however, *G. Dover* (*Nottingham*) has a different kind of problem, in an untunable teletype interference which troubles him on Fifteen and Twenty mainly, and which is cured by the use of an aerial tuner. The receiver is not mentioned, but one could hazard a guess that it is either breakthrough *at* the IF of signals picked up on the aerial, or malalignment. The former

condition is often a design failure, as for instance in the IF breakthrough noticeable on Top Band with receivers of some types having 1·6 mc IF's. Any signal on the aerial terminal at 1·6 mc will be passed through the RF and mixer stages to appear as a signal at 1·6 mc in the IF, because there is not much attenuation of 1·6 mc signals by 1·8 mc tuned circuits; in most receivers of this type a suitable trap has to be engineered into the front-end to make sure the 1·6 mc signal which may appear on the aerial cannot get into the receiver, and in general-coverage receivers there is always a gap in the tuning around the IF, for the same reason.

From *S. Culnane* (*Harrow*) we gather he was pushed into SWL by the interest of his friend, Neil Taylor. Steve has a problem with the CR-45K receiver he uses, in that the BBC Radio 1 and Radio 4 signals are plastered all over Top Band and Eighty. The answer to this could well be the use of an ATU, and if that is not enough, a wave-trap at each of the offending frequencies will help.

* * *

A justifiably pleased *Stewart Foster* (*Lincoln*) writes in to bring his HPX ladder total up to 1013, which looks like something near a record. Unlike previous correspondents who have reached the thousand and then bowed out, Stewart intends to carry on for a while, albeit not so intensely, and wait for some competition. However, his two friends from the Lincoln group who looked to be the most likely competitors have both bowed out—*David Rollitt* (*Navenby*) has now become G3XYP and already has VK/ZL, W6, and a lot of other DX booked into the log, and *Bill Felton* (*Lincoln*) also made the grade, in his case the call being G3XZF. To all three, our congratulations.

Another one to deserve praise is now the holder of G8CEF—*D. Walsh*, who writes in from *Ingatestone*, although his previous reports came in from Carrick-on-Suir in EI-land. Des seems to have settled down and is on the look-out for VHF gear of a price appropriate to his pocket; a Pye Ranger or similar for a start, and as soon as he can he intends to try and persuade some of the crowd back home to come on the two-metre band for a QSO. Des would like to get in touch with any of the local SWL or licensed types; his address is Sedan, Stock Lane, Ingatestone, Essex.

Once again a letter without a name on it anywhere other than " Brian," and so once more a dive into the archives to find out who it might be—*B. Geary* (*Leicester*), who has been laid up for a while and so has time to spend listening and doing his paperwork. Brian wants to know if there is a DX club in the area which he can join; there is the Leicester Radio Society and there are quite a few DX-types in the gang.

Back in December 1964, G3HTA did an article in the *Magazine* on a receiver which became very popular as a basis for home-construction, indeed one of the most popular designs ever to appear in SHORT WAVE MAGAZINE. *P. Gould* (*Tiptree*) uses such a one, home built, and backs it up by a Star SR-40 for general-coverage working. Aerials are a 100 foot end-fed and, for 21 mc, a groundplane. This gear brings him into the ladder at 211 for a first entry.

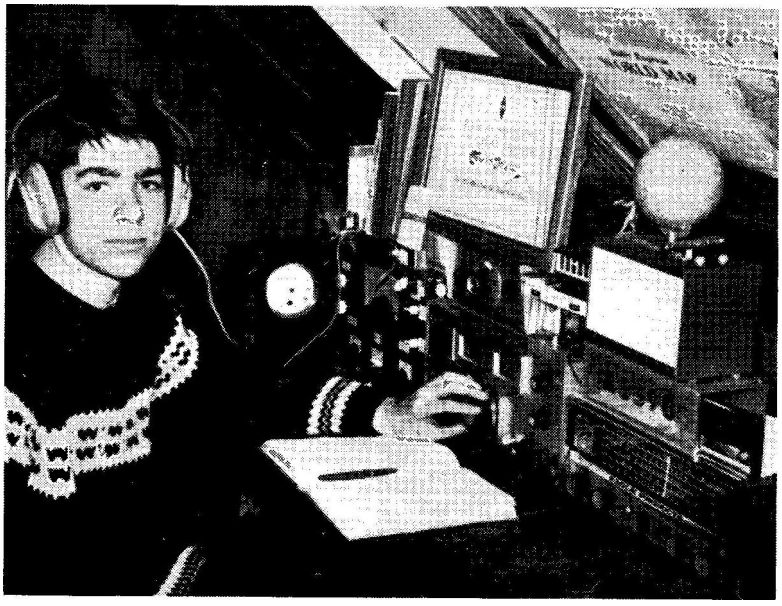
Now on to *C. Ekberg* (*Grimsby*) takes up up on the remarks last time about Morse, naturally enough, as he is hoping to pass the last hurdle himself and be on the air by the time the next piece appears. Charles is a little troubled that he should be advised to keep away from the key until so late a stage in his learning, and wonders whether he has not helped himself by using the key so much while teaching himself the Code. It need not necessarily do damage to one's " fist "—but, if one is sending on the oscillator at an early stage, it should always be taped and listened to very critically indeed on the playback, so that any incipient bad faults of character-formation or " swing " in the sending can be noted and corrected. It is worth while to learn to send Morse in the manner in which the good Samuel intended. Quite apart from anything else it is far easier to read at higher speed than poor Morse, and will improve one's return in contacts over the air.

Incidentally, while on the subject of Morse, the lads with the good fists all send in the correct manner. The trick is to imagine the key-knob and the elbow as a couple of supports, and to key by depressing the wrist, rather than to operate with a stiff plank of arm from the elbow paddling the key up and down with the fingers. One can imagine the right way as being rather as though one has no use of fingers or elbows other than as pivots; it feels a little unnatural at first, but goes a long way to make possible sending clearly and rapidly without fatigue.

Possibly the longest-surviving entrant on the HPX Table is *A. W. Nielson* (*Glasgow*) who explains that his own idleness has resulted in a twelve-foot air gap in the feeders since last January, and an intermittent fault in the receiver for at least the last couple of years. But, and here is the interesting point, analysis of his results in the *CQ* WW Contest shows that listening over the same number of hours produced comparable results when taken over the five bands, allowing for the inevitable difference in conditions from band to band. What is the explanation? One would suspect that, for a starter, QRM under the contest conditions would ensure that any signal which was weak enough to be near the receiver's bottom limit would be sunk without trace anyway. Secondly, there is a factor of increasing ability with experience, and thirdly, on some bands at least, the stump-end of aerial may actually prevent losses by being a better match to the receiver, and hence passing on a larger proportion of what it itself picks up! And, of course, there is the last one that SWL Nielson remarks on—the rising tide of assorted noises of every sort which seem to surround his shack and blot out desirable DX; weaker signals, and a larger proportion of the aerial sitting in the noise field around the house add up to a situation where AGC and noise limiter are having harder and harder work to do, and fall down on that work more often.

Mrs. G. E. Austin (*Bearsted*) makes another large leap in the ladder; she mentions a QSO in which a VE7/YB1 was explaining the trials and tribulations involved in getting his licence, including birth certificate and just about everything bar the kitchen sink!

Having decided not to bring the receiver up to his digs. in Morecambe, *J. Fitzgerald* (*Gt. Missenden*)



The SWL station operated by Robert Dinning, Bloakholms Farm, Dunlop, Ayrshire, Scotland. Bob first became interested in Amateur Radio at the age of 13, when he made contact with local GM3NZC. Running a HA-350 with PR-30X and RQ-10, 200 countries have been heard, favourite bands being 10 and 15 metres. His aerial system includes two dipoles for 20m., a Joystick and a 350ft. Vee 50 feet high, all fed into the Rx side through Z-match units.

succumbed to temptation and did just that; so now he has Forty, Twenty, and Eighty to amuse himself with. A new list is not worth starting as it rather looks as though his next term of training will take him to Ashton-in-Makerfield.

R.A.E. Point

A nice shiny AR-88 graces the shack table of *T. Walsh* (*Elland*), and, indeed, nearly covers it completely. Tony wonders what proportion of amateurs who pass R.A.E. actually go the whole hog and get a ticket of one sort or another. Difficult to say, but about half those who start the course for R.A.E. never get as far as the exam. Of those who take the exam, rather more than half pass; of those who pass R.A.E., one would estimate that rather *less* than half actually come up with a call within a period of, say, three years. What it all means is that for every hundred who take the trouble to start on a course, only about a dozen can be expected actually to come up on the bands—and about a third of *them* will be G8-type calls! Very frustrating, this, for the chap who is the course lecturer!

D. Palmer (*Fareham*) has tuned up his Pye Ranger on 144·7 mc, and erected a five-element Yagi, but has, as yet, heard nothing. The reason, he thinks, is that his battery is flat, and no charger is available. If one is prepared to " float " the battery across the charger on a near-permanent basis, one can get away with relatively low charging rates, and indeed your scribe remembers a trickle-charger made up by series'ing heater windings, using a single GJ5M as the rectifier, with the bits all loose in an old shoe-box, that did yeoman service for a couple of years or more! And nowadays one can get low-rate chargers quite cheaply, often from Woolworth's.

The use of the RF-24 Unit for conversion of the 21 and 28 mc bands to a range the surplus-type receivers can cope with is a good idea. *S. Haseldine* (*West Bridgford*) has done just this, and a crystal-controlled conversion at that. The cost of the exercise is claimed to be under a pound; and Steve has copies of the details and circuit changes available to anyone who cares to send him an s.a.e., at 31 Ellesmere Road, West Bridgford, Notts.

R. C. Waterman (*Aberlady*) no sooner said, in the last piece, that he had more time, than his teachers thought otherwise, and pushed his nose firmly back to the grindstone, so firmly indeed that his life for the next couple of years has been programmed into eating, sleeping, studying, and a little SWL'ing in the odd corners! A small query on prefixes is best answered by pointing out the number of TJ1's in the current *Call Book*. They are certainly valid.

Last time out Tony Walsh was wondering how many people take R.A.E. by self-training in one manner or another. *R. Hyde* (*Oakham*) is one of these, in his case because of his job; in the RAF they have a nasty knack of posting you just after you have completed arrangements to sit the exam and have done half the classes! So, for Roger it is hard work and study in his spare time, and we wish him every success in his efforts.

R. Allisett (*Guernsey*) has persuaded his father to make him a nice bench which is being installed in a well insulated (sound- *and* heat-insulated) shack up in the loft, where he can play wireless to his heart's content. Not a bad idea, at that, since Dick likes to listen to all the noises on Forty, and pick out the DX calls from the bathwater-imitations.

* * *

As usual, there is quite a batch of HPX queries, some of which have already been dealt with. However, U1A seems to have stirred up interest in so many letters it would be impossible to mention all the names. This one

was a special, put on for a contest mainly, by the Russians.

M. A. Lount (*Leicester*) has feelings of doubt about a CT5BD—and so has your scribe! Tony also worries—quite unnecessarily—over 5W1AS in Western Samoa.

N. Crampton of *Romford* is a little doubtful of the status of LA4LJ/L, heard on Twenty. Your J.C. has not heard him, but sees no real reason to suspect anything wrong. Anyone with any details, please step forward!

Just up the road from Romford is *Ilford*, where *M. Toms* has his lair. Mike has gone all VHF-minded but did pop back to the HF regions for a listen during the *CQ* WW DX Contest. Ten metres produced 165 prefixes in 75 countries over four or five hours of listening. The final tally of thirteen hours with the headphones on came to 1100 stations in 101 countries and 280 prefixes. Changing tack a little, Mike mentions hearing, on 80m., a station signing 4UØTIC, and claiming to be at the Turin Information Centre. Does anyone have anything on this one? A doubtful starter, one would think, and one could almost guess who the operator was—but let us wait and see who or what was right or wrong!

Those OM's seem to have worried quite a lot of folk. The Czechoslovak 50th Anniversary celebrations were to last till December 15, so by the time this piece is read the OM prefix will be history—but that doesn't alter its goodness!

Changing direction once again, we have a first entry and letter from *P. Taylor* (*Sydenham*) who mentions that he has an old Eddystone 358X receiver which he got cheaply, because the outer case bore a clear tide-mark to indicate how poorly it had been stored! However, after a lot of toil it is now perking on all bands.

Once an issue we get a rocket from somebody! This time it comes from *R. Eva* (*Birmingham, 22A*) who complains we called him " Era " last time. So we did, because we couldn't read his writing, and so the relief was great when it was realised that Robert sometimes can't read his *own* fist! In the course of a very interesting letter he mentions ZL4BX as one of the biggest and most consistent DX signals he has heard, and Robert wondered if anyone knew what ZL4BX has in the way of tackle to generate this potent signal.

Mechanical failures are luckily rare, but *I. Poole* (*Leeds*) managed to have one in his converter. Seems a switch went, and sparks so generated gave audible and visual warning something was amiss. *D. S. Henry* (*North Berwick*) at the beginning of the period changed to D. S. Henry (*Edinburgh*) by the end, with more room for the gear, lots more for aerials, and an open location. David has re-submitted his entire list and so we take his amended scores into the tables.

* * *

The question of the behaviour of the 28 mc band is taken up by *H. M. Graham* (*Harefield*) who has compared it with an equivalent period, and comes to the conclusion that it has definitely been below par, although coming back to life again at the time he wrote.

Talking of Ten, *J. E. Jenkinson* (*Oxford*) has spent a lot of time on that band of late, as a result of being loaned an S.27 Hallicrafters receiver. Quite a fine tool, this receiver, covering the lower VHF area, and styled very similarly to the more-famous SX-28 of the same marque. As we all have been when first encountering an opening on 10 metres, John was fascinated by the way in which it appears shut and then suddenly opens up to somewhere-or-other surprising, with R5S9 signals. This interesting phenomenon, which so endears the band to so many people, is, one suspects, largely man-made, by activity or lack of it!

This one we really must mention: *G. J. Smithies* (*Brighouse*) really intended to make a good start in the HPX table—he comes in at 813 prefixes, no less! However, although there is no covering letter with the entry, your scribe suspects he has been around quite a time, and has even appeared before in the Table?

D. Bushell (*Bristol*) is the third " different " entry we have had from him—and with the move from Evesham he has had to revert from AR88 to a GR-64 as his receiver, which change Dave views with disfavour.

HPX LADDER

(Starting January 1, 1960)

SWL	PREFIXES
PHONE ONLY	
S. Foster (Lincoln)	1013
D. Rollitt (Navenby)	977
A. W. Nielson (Glasgow)	916
J. Singleton (Hull)	878
G. J. Smithies (Brighouse)	813
W. Felton (Lincoln)	805
J. Fitzgerald (Gt. Missenden)	681
R. G. Preston (Norwich)	679
M. G. Toms (Ilford)	672
M. A. Lount (Leicester)	667
B. Geary (Leicester)	662
D. Skidmore (Derby)	651
C. P. Davis (Leicester)	647
R. Allisett (Guernsey)	642
A. Hydes (Enfield)	621
W. Moncrieff (Hampton)	620
I. Poole (Leeds)	614
N. Henbrey (Northiam)	604
J. P. Scragg (Stockport)	584
Mrs. M. Worbey (Dartford)	563
R. Woods (Slough)	560
G. Dover (Nottingham)	535
D. Sapsworth (East Ham)	534
W. C. Torode (London, W.C.1)	513
K. Plumridge (Eastleigh)	506
J. Edwards (London, S.E.20)	504
D. Henbrey (Northiam)	490
H. M. Graham (Harefield)	481
C. J. A. Morgan (Wallsend)	480
S. Haseldine (W. Bridgford)	462
N. Whiting (Leeds)	457
I. Cooper (Alnwick)	455
R. Walters (Etwall)	453
L. Harwood (Wirral)	452
D. S. Henry (Edinburgh, 4)	433
D. Palmer (Fareham)	432
M. Broadway (Chelmsford)	432
J. E. Jenkinson (Oxford)	425
R. Bagwell (Frimley)	415
S. Cusworth (Wakefield)	415
D. Robinson (Birmingham, 26)	412
T. J. Bucknell (St. Albans)	409
D. L. Hill (Edinburgh, 4)	408
D. Reynolds (Dudley)	406
Mrs. G. E. Austin (Bearsted)	404
L. Rowland (Birkenhead)	403
A. Pyne (Budleigh Salterton)	400
R. A. Gape (Leigh-on-Sea)	391
N. Peacock (Tonbridge)	369
R. C. Waterman (E. Lothian)	366
I. Gildersleeve (Newton Abbot)	366
M. L. Jones (Leamington Spa)	356
B. Gilbert (Aylesbury)	353
T. W. Hyder (Southampton)	350
J. Seddon (Manchester)	345
J. M. Dunnett (Singapore)	343
R. Bence (Cardiff)	340
A. Wood (Husthwaite)	334
H. N. Plumridge (Eastleigh)	332
A. Walsh (Elland)	329
B. G. Bashford (Worthing)	317
G. W. Brind (Kingston-on-Thames)	316
D. Whalley (Corsham)	312
S. M. Phillips (Dukinfield)	303
J. Austin (Birkenhead)	300
R. C. Ray (Bushey Heath)	296
K. Haywood (Manchester)	281
D. Holbrook (Newport, I.o.W.)	281
S. Jassel (Newcastle-on-Tyne)	280
C. Shearing (St. Agnes, Cornwall)	279
D. J. C. Bushell (Cirencester)	281
R. Schofield (Liverpool)	273
S. Culnane (Harrow)	268
Rev. D. P. Brewster (Oxford)	265
P. Levitt (Worksop)	265
R. W. Jones (Bristol)	258
D. Fromberg	257
C. R. Adams (Manchester)	253
D. Moule (Frinton-on-Sea)	239
R. Lewis (Oswestry)	235
D. J. Porter (Harrow)	233
P. Taylor (Sydenham)	232
G. K. Upton (Nottingham)	220
R. Eva (Birmingham)	218
N. P. Taylor (Oswestry)	213
J. Marchmont (Sharnbrook)	213
C. Burrows (Gidea Park)	212
P. Gould (Tiptree)	211
P. Wilkinson (Exeter)	209
N. Crampton (Romford)	207
C. Jones (Mold)	202
CW ONLY	
P. Cayless (Exeter)	501
J. Dunnett (Singapore)	453
A. Vest (Durham)	373
R. Hyde (Oakham)	372
J. Edwards (Penge)	266
C. P. Davis (Leicester)	250
M. A. Lount (Leicester)	242
I. Cooper (Alnwick)	240
R. Lewis (Oswestry)	228

(NOTE: *Listings include only recent claims. Failure to report for two consecutive issues of " SWL " will entail removal from the Table. Next list, March issue, for which the deadline will be January 17.*)

But, to be fair, there is a vast difference between, say, an AR88 and the GR-64, in that the latter is quite firmly built down into the lower-price range, whereas up to very recent years the AR88 was always regarded as the Rolls-Royce of receivers.

Quite simple equipment and aerials often give very good results at VHF. This has been the experience of *R. Walters* (*Etwall*) who recently bought a 144 mc converter and a five-element beam; so far he has heard stations out to 120 miles, with G3COJ as best DX.

S. M. Phillips (*Dukinfield*) is strictly limited to AM reception by his receiver, but by the use of an external oscillator coupled into the front-end is managing to resolve SSB quite well on 80 and 40 metres. For some reason is it not quite so effective on 14 and 21 mc but should nonetheless produce quite a large improvement in the score shown in future months.

Moving house is always a chore for anybody, and particularly an amateur. Things are damaged, new aerials do not work out as planned, TVI rears its ugly head, and the XYL *always* wants something doing just when one is sneaking away to the shack! This being the common experience, we can sympathise with *C. R. Adams* (*Cheadle*) who is recovering his breath after such a move. To make the situation even more trying, the local Technical College lost Colin's R.A.E. application, and he had to go there and do personal battle with them about it.

Which seems as good a point as any to wish success to all those who sat the R.A.E. in December, with the hope that none of them have chewed their fingers down too far waiting for the results! (Those fingers will be needed to pass the Morse test!)

Sign-Off

And there you have it. Lots of other letters came in with entries for the HPX Table and general chat. They could not be discussed due to the pressure on space, but all HPX claims have been taken in. Thus we acknowledge letters and cards from: *J. Singleton* (*Hull*); *R. C. Ray* (*Bushey Heath*); *L. Harwood* (*Wirral*); *T. Bucknell* (*St. Albans*); *N. Crampton* (*Romford*); *J. Marchant* (*Sharnbrook*); *D. Reynolds* (*Dudley*); *A. Pyne* (*Budleigh Salterton*); *C. Shearing* (*St. Agnes, Cornwall*); *D. Moule* (*Frinton-on-Sea*); *J. Seddon* (*Manchester*); *R. Bence* (*Cardiff*); *R. Woods* (*Slough*); *T. W. Hyder* (*Hythe, Southampton*); *K. Haywood* (*Manchester*); *D. Robinson* (*Birmingham, 26*); *D. Whalley* (*Corsham*); *W. Moncrieff* (*Hampton*); *D. Porter* (*Harrow*); *C. Morgan* (*Wallsend*); *N. and D. Henbrey* (*Northiam*); *M. Broadway* (*Chelmsford*), *C. Burrows* (*Romford*); *D. Fromberg* (*address not given*) *and K. Plumridge* (*Eastleigh*).

To all our readers we wish the very best for the coming year—and let us hope that, for all of us, it may be an improvement on the terrible year of 1968, both on the bands and off them. Your letters and Table entries for the next piece should be posted to arrive by **January 17, 1969,** addressed as ever to "SWL," SHORT WAVE MAGAZINE, BUCKINGHAM. We look forward to hearing from you all.

SWL's PSE NOTE !

Closing date for the next "SWL," in our March issue publishing on February 28, is January 17. This may seem early but it is in fact the latest date we can allow, having regard to all the other work that has to be done in preparing each issue. For every appearance of "SWL" (which comes out in alternate issues), a certain number of letters come in too late for coverage. This is as much a disappointment for us as it must be for the correspondents concerned. So, if you miss January 17—and, really, there is no reason why you should !—the next date after for "SWL" (in the May issue) will be March 14, and surely there is no reason why you should miss that ! The address is simply: "SWL," Short Wave Magazine, Buckingham.

SLANT ON THE QSL

The circulation of QSL cards has been a prime interest in the Amateur Radio context for more than 40 years—and G2UV (Wembley, Middx.), who was first to think of sending a printed card in confirmation of a contact, is still actively on the air. But in recent years, the QSL card has become a somewhat exaggerated and not-always-wanted manifestation of goodwill. It has been calculated that the total number of QSL cards now being circulated through the QSL bureaux of the world cannot be much less than *ten million* a year! Many of these cards are originated by eager SWL's—and, regrettably, numerous of them are of no interest or value to the recipient. To take a practical example: About a month or so ago, a batch of 22 cards arrived for a reader through the QSL bureau. They covered DX working on CW over a period of three years, 1965-'68, and included two duplicates. Six of these cards were from EU/SWL's who, in spite of the fact that the contacts reported were being made at DX on the 7 and 14 mc bands, evidently thought that a return-card would be justified. Of course, it is not. Apart from the waste involved in responding to QSL's in such circumstances, it would merely clutter up the bureaux and prostitute the whole idea of QSL card exchange—which is to send a card when it is wanted.

JOIN YOUR LOCAL CLUB

In practically all populous districts of the U.K. there is usually an active Amateur Radio club locally—in some places, like Bristol, Birmingham and Manchester, two or three. Any SWL, and particularly beginners,

should always at least investigate the possibility of becoming a regular member of the local Club. It is the easiest and pleasantest way of making progress, because the more experienced members are usually only too glad to pass on their knowledge and expertise. To find out if there is a Club within reach of where you live, look over the Panel of Club Secretaries, which appears in the "Month with The Clubs" feature in every issue of SHORT WAVE MAGAZINE (except in January, when we are reporting MCC). Not all active Clubs are covered each month—it is a matter of checking over the Club Secretary list in three or four recent issues to see if there is one in your neighbourhood. Then, it is just a matter of writing to the honorary secretary, to introduce yourself and ask for details of meetings, subscription and so forth. This is one of the purposes of the Club Secretary panel we publish monthly in the *Magazine*.

CORRECTION—"RTTY STATION CONTROL"

In Part II of his article appearing in our December issue, G8LT points out that in the circuit of Fig. 6 on p.610, the value of current to the right of resistor R should be adjusted to 10 mA, and not as shown. Similarly, the balancing current in the other winding ought to have been given as 20 mA. And the 1st line of the paragraph above the picture on p.609 should read "If this is, say, 10 mA to the right . . ."

PICTURES FOR PUBLICATION

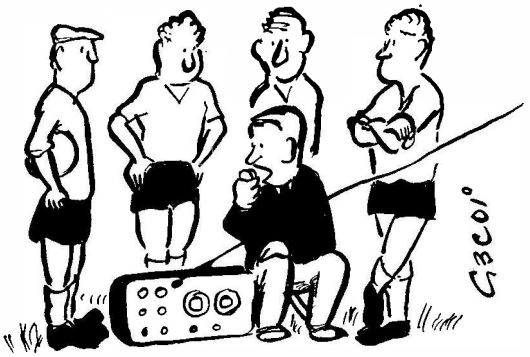
In any issue of SHORT WAVE MAGAZINE, we use a good many photographs—hence, we are always in the market for pictures of radio amateur interest. Prints (and they should be prints and *not* negatives) are preferred, of about post-card size, and must be of good quality—dim or smudgy reproductions are of no use. The details relating to the picture should be on a *separate sheet* and not scribbled on its back—there are "technical reasons" for this. The professional way to send in a picture is to attach the data sheet lightly to the back of the photograph, so that it can be detached easily. All pictures we can use are paid for, immediately on publication. They should be addressed: Editor, SHORT WAVE MAGAZINE, BUCKINGHAM, and packed to avoid crumpling in the post. A cardboard stiffener is advisable, and the envelope should be marked "Photograph—Please do not bend or fold."

ROYAL SIGNALS AMATEUR RADIO SOCIETY

All three Services have internal radio amateur organisations of their own, offering membership to anyone interested in Amateur Radio having affiliations within the orbit of the Service concerned. One such is the Royal Signals A.R.S., the recent AGM of which discloses some interesting facts: First is that they have received an *ex-gratia* payment of £200 from Signals Corps funds; that membership has been stabilised at 550, following "a rather drastic pruning to produce a keener and more virile membership" (now standing at 450 paid-up); and that the current balance sheet shows a loss on operations of £116. This heavy deficit, and that foreseen, is found to be largely due to (*a*) The cost of producing *Mercury*, the journal of the Royal Signals A.R.S., and (*b*) What is known as their Awards Scheme, under which an (expensive) plaque and certificate could be gained for operating proficiency; this cost the Society about £80 in their last financial year, and is now being revised to make it more financially viable. To cover the deficit on *Mercury*, some increases have had to be made in membership fees—all of which illustrates that, these days, anything worth having has got to be paid for, somehow. There is no such concept as "it costs you nothing" (unless you are already paying a big subscription for all the "privileges of membership"). The treasurer and field secretary of the Royal Signals Amateur Radio Society is Capt. and Quartermaster R. A. Webb, R. Signals (G3EKL), 30th Signal Regt., Blandford Camp, Blandford Forum, Dorset.

MAGAZINE MAILING

Now that the two-tier system has settled down, it would seem from surveys we have made that, in the main, direct subscribers are getting their copy by the Saturday—posting being on Thursday morning, as usual. This is in accordance with the Post Office undertaking about the delivery of what they are pleased to call "second-class mail." Any direct subscriber who receives his copy later than Saturday is advised to take the matter up immediately with his local head postmaster, showing the wrapper, untorn, as evidence—it will be post-marked with the Thursday date. As we have explained from time to time over the years, it is the addressee who should lodge the complaint, as this enables the Post Office to check back through the system to the point of despatch.



". . . say they want their goal posts back when we QRT . . ."

THE R.A.E.—QUESTIONS AND ANSWERS

FOR THE NEWCOMER TO AMATEUR RADIO

The treatment here is of the Radio Amateurs' Examination for May 1968, by way of guidance for the next R.A.E., to be held in May this year. Note that both Part I questions are always obligatory—and can be answered easily if the Licence Regulations have been studied carefully. Though in Part II there is a choice of six out of eight questions, here all have been answered to illustrate how they can be tackled. For the average candidate, these answers have been expanded rather more than might be advisable within the time allowed; normally, a candidate could allot himself only about 20 minutes per question. Some otherwise well-prepared candidates lose marks through misuse of English, or vague phrases; all abbreviations and approximations should be identified, and formulae quoted accurately. Candidates should follow the instructions on the Paper carefully; answering more than the required number of questions does not produce more marks. In brief, what a candidate has to do is to show the Examiner that the questions chosen are fully understood, and could be enlarged upon if necessary. Long and detailed explanatory answers are not usually required. The R.A.E. is Subject No. 55 in the City & Guilds of London Examinations Syllabus and its pass-certificate is the basic qualification for an AT-station licence in the U.K.—Editor.

PART I

Qu. 1| What are the conditions of the Amateur (Sound) Licence as regards:

(a) Frequency control and measurement,

(b) The entries to be made in the log,

(c) The classes of emission permissible in the amateur bands between 3·5 mc and 29·7 mc,

(d) The maximum DC input power permissible in these bands? (15 marks)

Answer (1)

(*a*) A satisfactory means of measuring frequency is required so as to ensure that the signal transmitted is always within the amateur band; in addition, a satisfactory method of stabilising the frequency of the transmitter is called for. Thus, the accuracy tolerance on frequency measurement required varies from band to band, and on whether one is at the middle of a band or at its edges.

(*b*) Entries are to be made in a station log, not of loose-leaf construction, indelibly, showing: Date, time in GMT of every call (including interference tests, made from the station) the callsign of every station called or contracted, time of closing down the station in GMT, and the address if operating from a temporary or alternate location. In addition, if the operator is not the licensee, then the operator must sign his full name and callsign (or serial number of his amateur certificate).

(*c*) The classes of emission permitted in the bands 3·5 mc to 29·7 mc, are as follows: A1, A2, A3, A3a, A3h, A3j, F1, F2, and F3, where these symbols have the meaning attached to them by the Telecommunications Convention.

(*d*) The maximum DC input to the anode circuit of the last stage of the transmitter (the PA), shall not be greater than 150 watts.

Qu. 2| Describe two types of spurious emissions, which can be emitted by radio transmitters. Explain how they can be suppressed to such a level that they cause no undue interference with any other wireless telegraphy. (15 marks)

Answer (2)

Harmonics of the transmitted frequency are an inevitable result of the use of a PA stage running in Class-C, and appear at the output terminals as signals of multiples of the transmitted frequency; they may be reduced by correct design of the PA tank circuit, and by operating the latter into a properly matched transmission line through a low-pass filter. In addition, extensive screening and filtering of all leads (other than the aerial) entering or leaving the enclosure around the transmitter, is required.

Parasitic oscillations may be defined as unwanted oscillations at frequencies which are widely different from the transmitted frequency, usually at VHF or very low frequencies. The former are suppressed by careful attention to layout, and by fitting anode and/or grid "stoppers." These usually comprise a few turns of wire wound round a low-value resistor of suitable wattage, which are wired in series with the relevant pin of the valve, as close to the pin or top cap as may be. Occasionally, the stoppers used are ferrite beads slipped over the offending leads at the valve end. Low-frequency parasitics are usually noted as rough signals spaced a few kilocycles away from the carrier; they may be caused by shock excitation due to transients of modulation, by the use of RF chokes of similar characteristics in both grid and anode circuits, or by parasitic oscillation of the modulator. Over-modulation is to be avoided anyway, but the grid and anode RF chokes should be of different type even though of similar value electrically, so that any internal resonances may be of different frequencies for grid and anode. The modulator may be dealt with by good layout, and by the fitting of grid and anode stoppers, low value resistors in grid and anode circuits right at the valve pin. Taming parasitics is mainly a matter of defining the type of oscillation and experiment with values of stoppers for a particular conbination of layout and components.

[over

PART II

Any six questions to be answered in this Part.

Qu. 3/ Describe the construction of a triode thermionic valve. Explain how the anode current is controlled by the potential of the grid with respect to the cathode, assuming that the anode potential remains constant.

What is meant by the mutual conductance *of the thermionic valve.* (*10 marks*)

Answer (3)

Fig. 1 shows the construction pictorially. Within the evacuated glass envelope, we see a cathode, which surrounds a wire which is arranged to be heated sufficiently to raise the cathode to such a temperature that electrons are emitted. The heater is insulated from all other electrodes as well as the cathode. Around the cathode but separate from it are the mesh of wires called the grid, and around this again the anode. Above the structure, within the envelope, may be seen the " getter," an element which is made to absorb any included gas after the envelope has been sealed, by " firing " from

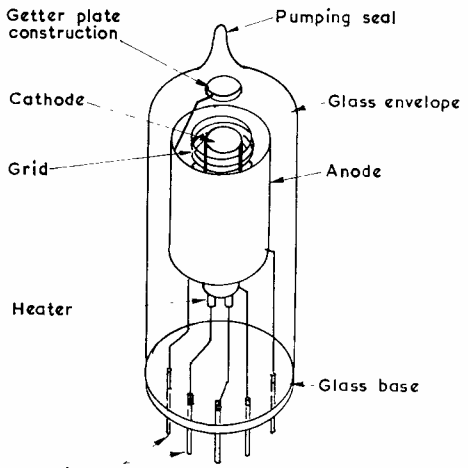


Fig. 1

Q 388

outside the envelope—the result being the silvering which can be seen on part of the envelope. Thus, electrons emitted by the cathode have to pass the grid on the way to the anode. The working may be considered as follows: Electrons are of negative charge, by definition. The grid normally is held negative and the anode highly positive. If the grid potential is around zero with respect to the cathode there is very little restriction of the flow of electrons from cathode to anode. As the grid is made steadily more negative with respect to cathode, so the influence of the negative grid upon the negative electrons tends to increase and repel them back into the " space charge " around the cathode. Still further increase in the negative voltage on the grid increases the effect until a situation is reached where the path from cathode to anode is completely blocked by the grid, a condition where the valve is said to be " cut off," and no anode current flows. Thus, anode current is controlled by the grid; but as electrons do not fall into the grid, due to the repulsion of like forces, no current flows in the grid, unless and until the latter is driven positive. Thus, under the normal state there is only voltage and no current at the grid, and so it uses no power in its control of the anode current.

Mutual conductance can be defined as the ratio of change of anode current for change of grid volts, and is measured in milliamps per volt; typical values for valves found in the radio amateur station would be in the range from about 1·5 to 20 ma/V.

Qu. 4/ What do you understand by the flow of electric current in a circuit? State and define the practical units of (a) quantity of electricity, (b) current flow of electricity. A current of 250 mA flows in a circuit. What quantity of electricity will pass a given point in 10 seconds? (*10 marks*)

Answer (4)

The flow of electric current can be regarded as the enforced movement of electrons around the circuit.

The unit of quantity of electricity is the coulomb, which is approximately equivalent to the charge on 6 x 10^{18} electrons.

The unit of current flow is a quantity of electricity flowing in unit time; one ampere being equal to one coulomb per second.

If 250 mA flows for ten seconds we have a quantity of ·25 x 10 coulombs, *i.e.* 2·5 coulombs.

Qu. 5/ What is meant by the piezo-electric effect of a quartz crystal?

With the aid of a circuit diagram explain the action of a crystal oscillator. (*10 marks*)

Answer (5)

Quartz has the property of developing a voltage across the faces of a crystal under mechanical deformation, or of deforming when a voltage is applied across the faces. When placed in a suitable circuit, the crystal can be made to behave as a resonator of extremely high " Q " due to this property; either the series or the parallel resonance mode may be used, depending on the type of crystal and circuit.

A simple crystal oscillator is diagrammed at Fig. 2, known as the Pierce-Colpitts oscillator. A resistor is sometimes used as the anode load, but is bad practice due to the risk of spurious outputs caused by the crystal having more than one resonant frequency, and so a tuned circuit is preferable; this may also be used to obtain output at a harmonic of the crystal frequency by tuning to the latter frequency. The crystal operates at a frequency just below its parallel resonance, and its equivalent inductance resonates with the anode-to-grid and grid-to-ground capacitances. Thus, when voltage is applied to the valve, the crystal vibrates and feeds

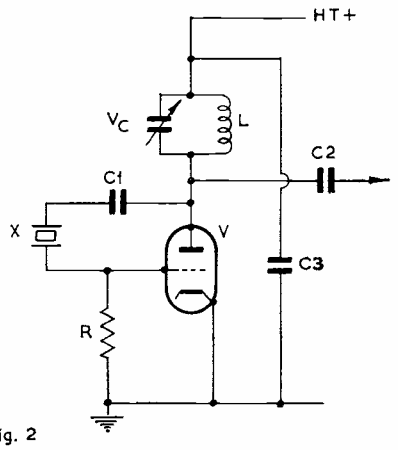


Fig. 2 Q 389

energy to the grid, as long as the anode load is resistive or slightly on the low-capacity side of resonance. Should the high-capacitance side of resonance be selected, the phase of the feedback will be reversed and oscillation will stop. In practice, to obtain good starting the low-capacitance side of resonance is always tuned, just sufficiently to start the crystal and get adequate output. This circuit should only be used with X-cut or similar crystals, and *never* with AT- or BT-cut types, or the crystal will surely be damaged.

Qu. 6/ Describe how the impedance of a parallel tuned, or rejector, circuit, varies with frequency near resonance. Sketch a curve to illustrate your answer.

What is the dynamic resistance (impedance) offered by a rejector circuit at resonance if the circuit consists of a capacitor of 50 $\mu\mu$F and an inductor of 10 μH which has an RF resistance of 10 ohms? *(10 marks)*

Answer (6)

On either side of the resonance point the impedance of the circuit is complex, and comprises a resistive and

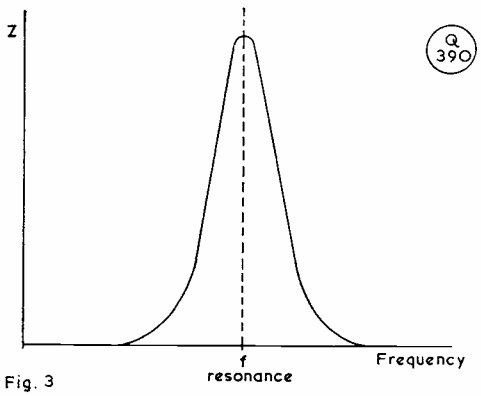


Fig. 3 Q 390

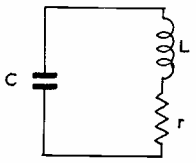


Fig 4A

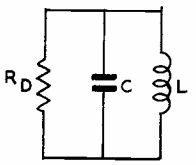


Fig 4B Q 391

reactive component. Near resonance, the reactive components due to capacitor and inductor become almost equal in magnitude and at resonance do indeed cancel completely; thus, at resonance the circuit displays a high resistive impedance, which becomes complex and lower on either side of the resonance. The height of the peak as shown in Fig. 3 depends on the amount of resistance present in the practical circuit to cause losses, and in a perfect circuit would be infinite. A measure of the " goodness " of the circuit in this context is " Q " which is defined as the ratio of reactance to resistance, *i.e.:* $\frac{\omega L}{R}$ or $\frac{1}{\omega CR}$ in the case of the capacitor, where F is the frequency.

The parallel-tuned circuit given has resistance in series with the inductor; by a transform this can be made to look like an equivalent resistance R_D in shunt with a perfect coil and capacitor, where R_D is known as the dynamic resistance—see Fig. 4A and 4B. It is now required to find the value of R_D.

Now, at resonance, $\omega L = \frac{1}{\omega C}$, by definition.

Therefore, $R_D = \frac{L}{Cr} = \frac{10\ \mu H}{50\ \mu\mu F \times 10}$ ohms

$$R_D = \frac{10 \times 10^{-6}}{50 \times 10^{-12} \times 10} = \frac{10^6}{50} = 20{,}000 \text{ ohms}$$

Qu. 7/ Describe with the aid of a circuit diagram the action of the output stage of a receiver.

Explain how the audio output impedance of the stage is matched to the impedance of the loudspeaker. *(10 marks)*

Answer (7)

See Fig. 5 (*p.712*). AF input is fed to the stage across the ends of the potentiometer V_R, and a proportion taken off to the grid of the valve; thus the potentiometer, which is of logarithmic law, is being used as a volume control. The signal at the grid is found to control the flow of current in the anode circuit, which is a transformer, the secondary of which is coupled to the loudspeaker. Output pentodes and tetrodes are usually so designed that the screen can be connected directed to the HT line as shown, and as the grid is tied to the ground, the required grid bias is given to the grid by lifting the cathode above earth; the level of bias is the average voltage drop across the cathode resistor, R_K, the resistor

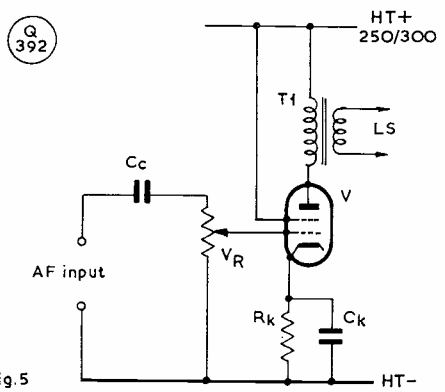


Fig.5

being decoupled by a capacitance C_K having low reactance to audio frequencies; typically $C_K = 50\ \mu F$ and $R_K = 300$ ohms. The value for the optimum load is found from the tables or calculated and the transformer turns-ratio is selected to match this to the loudspeaker impedance. The turns-ratio will be given by

$$N_P / N_S = \sqrt{Z_P / Z_S}$$

For example, if the optimum load impedance is 5000 ohms and the loudspeaker a 5-ohm component, then the turns-ratio will be

$$\sqrt{\frac{5000}{5}} = 31{\cdot}6 \text{ to } 1, \textit{ say}, 32 : 1.$$

Qu. 8/ What ranges are normally obtainable in winter when using an amateur transmitter in daylight on (a) 1·9 mc, (b) 7 mc, (c) 14 mc? What differences would you expect to find in summer? (10 marks)

Answer (8)

It is difficult to give any precise answer to this question, as the normal range on any given band will depend to an enormous extent on the location and the aerial system. However, certain basic trends may be described. On 1·9 mc, the normal daylight range will be that obtainable from the ground-wave, of the order 30-100 miles. On 7 mc, coverage will be given of most of the U.K. and Europe; skip-distance will be non-existent in many cases, so that as the ground-wave signals come to their end a first indication of high-angle skywave reception appears, with consequent tendencies to fading when more distant signals are steady. Behaviour is to a great extent modified by the state of the sunspot cycle; at its trough, the band may well have the occasional trans-continental signal audible. However, normally the long-distance signals would be looked for on 14 mc, where there will usually be quite a marked skip zone, with ground-wave giving reception out to a few miles, then a gap until the first-hop signals appear from distances up to 2000 miles or so. Signals from greater distances will be multi-hop paths, being reflected from the ionosphere to ground several times *en route*. Thus, coverage of the whole world may well be seen in the course of a day with a good aerial system.

Summertime will see, in general, a decline in the maximum usable frequency, with resulting possible lack of signals at 14 mc when the trough of the sunspot cycle is reached. In addition, noise will often be more of a problem; thus the pattern would be, with 14 mc "dead," 7 mc and 1·9 mc relatively unaffected but communication distances restricted by high noise levels swamping the weaker signals, the latter effect being more pronounced in tropical areas.

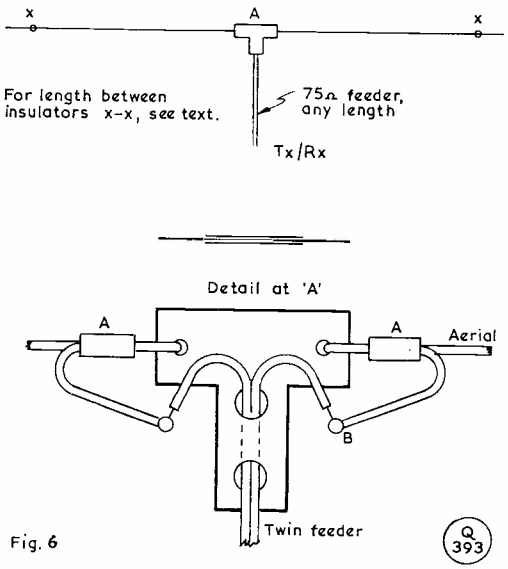


Fig. 6

Qu. 9/ Describe carefully, with diagrams, the construction of a dipole aerial and feeder for the 7 mc band. How would you ensure the dipole acted as an effective radiator? (10 marks)

Answer (9)

The length of a half-wave aerial or dipole for a given frequency is given by the formula length *equals* 468/F(mc) in feet. For a design frequency of 7050 kc this would give a length overall of 66ft. 4in. This length of heavy —say, 14g. hard-drawn copper wire—will be measured out, and a couple of feet over allowed for making off to insulators. It should then be accurately divided into two equal pieces. One end of each piece of wire thus obtained is made off to an insulator of a type suitable for attachment to a halyard running over the pulley at the top of the mast. We now have the problem of connecting the wire to the feeder, which will be of low-impedance *twin* construction. Although coaxial

cable of the correct value impedance is often used, it is not strictly correct to feed it directly on to the aerial proper without interposing a balance-to-unbalance transformer (*balun*), even if often done with no ill-effects observable. Perhaps the best way of securing the feeder to the two arms of the dipole is by use of a tee-piece, as shown in Fig. 6. Feeders should hang at right angles to the line of the aerial (vertically downwards) as far as possible, before turning away to take their route into the room where the apparatus is installed.

In order to make the aerial as effective as may be, it should be erected as high as possible (not less than one half-wave if that can be achieved) and in any event as clear of obstructions, buildings, telephone and power wires, metalwork and so on as is possible. Should there be such disturbing elements in the vicinity, the characteristics of the aerial may change markedly, and attention may have to be given to the *length* until the dipole is resistive at the design frequency; the feed impedance may also fall to a level which results in measures having to be taken to reduce standing waves. The end insulators have to be of high quality, as they are at points of high voltage as well as high mechanical stress; the centre insulator is not so important from the electrical point of view, because a dipole is fed at low impedance, but it is of the utmost importance that construction be such as to take all mechanical stress and strain off the soldered connections (which should have a coat of paint over them), and above all to prevent the moisture getting to the open ends of the feeder. After a liberal coating with a moisture sealant, it is as well to tape over the whole centre joint to ensure good sealing, with particular reference to points A and B in Fig. 6.

Qu. 10/ Describe the use of a cathode-ray oscilloscope as a modulation monitor for a radio-telephony transmitter. Show with the aid of a block diagram how the oscilloscope is coupled to the transmitter. Sketch the waveforms you would expect from a double-sideband amplitude modulated wave (A3) with (a) 70% modulation, (b) 100% modulation, (c) over 100% modulation, when modulated with a sine wave. (*10 marks*)

Answer (10)

The exact approach to be adopted is the same in each case, but is modified in detail depending on whether the Y-amplifier of the 'scope is capable of dealing with the frequency of the transmitter RF output. Assuming that it is, all that is needed is to provide a coaxial connector near the output tank circuit, or, possibly more conveniently, in the aerial coupler. A coaxial connection is then made from the connector to the oscilloscope. Switching on the 'scope and setting up the Y-amplifier will show whether enough signal can be obtained to deflect the trace when a short pick-up wire inside the transmitter is connected and brought near to the tank coil. If the response of the 'scope is such that this gives no result, the connection will have to be made *directly* to the Y-plates; in this case, the pick-up wire may have

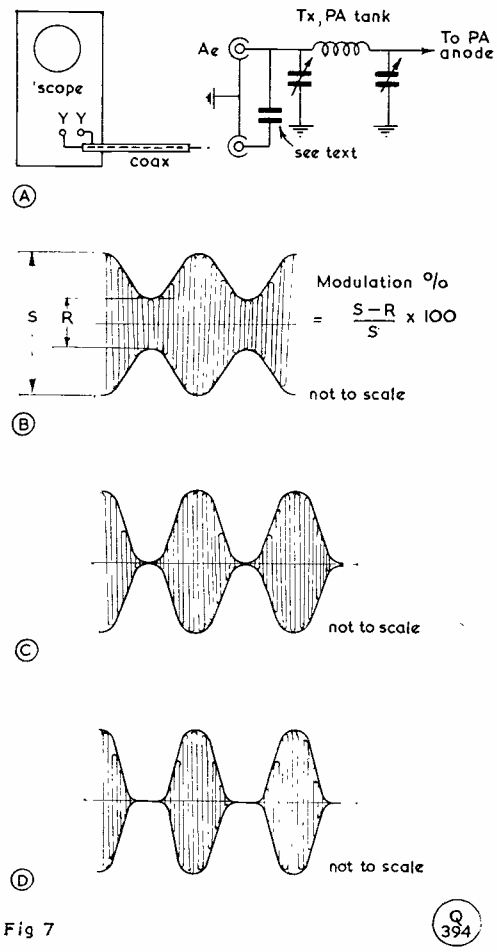


Fig 7

Q 394

to be connected directly to the tank circuit by a capacitor of suitable size and rating. A block diagram appears at Fig. 7A. A sine-wave modulating signal injected into the AF stages would then modulate the carrier as shown in Fig. 7B, 7C, and 7D. It will be found that the average amateur oscilloscope will need to be connected directly to the Y-plates, with the possible exception of monitoring 1·9 and 3·5 mc signals; if the direct connection is used, it is essential to consult the circuit diagram to ensure no risk of damage to the scope or user occurs. Answers to (a), (b), (c) are as B, C and D above.

Note: Copies of the R.A.E. Question Papers for the years 1966-'67-'68 are available as one set, price 2s., and the syllabus for Subject No. 55 is 1s. 6d., all post free, from the Sales Section, City & Guilds of London Institute, 76 Portland Place, London, W.1, quoting "Subject No. 55." Following is a suggested list of books, obtainable from us, suitable for

R.A.E. study or reading: *Amateur Radio* (26s. 6d.); *Guide to Amateur Radio* (6s. 7d.); *Radio Amateur Examination Manual* (5s. 9d.); *Short Wave Radio and The Ionosphere* (11s. 9d.) and—for a standard text—the *Radio Communication Handbook* (69s.). Prices quoted are post free, from stock for immediate delivery, and orders with remittance should be sent to: Publications Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

" U.K. CITIZEN BAND SOCIETY "

We are informed that a body under this title is campaigning actively for the introduction of a U.K. " Citizens' Radio Service," all-same the Citizens' Band facilities which have for long been available in the United States—and in the same frequency area, 27 mc, just LF of our 10-metre band. Our information is that the U.S. Federal Communications Commission (F.C.C.), the controlling authority over there, now wishes the idea of a Citizens' Band had never been thought of—the on-the-air abuses in America have become a by-word. However, there is always something to be said for any extension in the context of communication, personal or within a community, by radio or any other means. The contact-man in connection with the U.K. Citizen Band Society is K. Gates, G3PHS, 253D Coulsdon Road, Caterham, Surrey.

" THE OTHER MAN's STATION "

This has always been a popular *Magazine* feature—indeed, it was started in our pre-war days, under the same title. What we require is, first, a good photograph in black-and-white, and secondly, a description of the station, its history in the Amateur Radio context, and such personal notes about the operator himself as are of interest for publication. If preferred, all this can be " in own words," as we write the story to fit the space. All offerings for " The Other Man's Station " are paid for at full rates immediately on appearance. Material for this feature should be addressed to: Editor, SHORT WAVE MAGAZINE, BUCKINGHAM. (Add " England " if you are writing from outside this country.)

SMALL ADVERTISEMENT COLUMNS

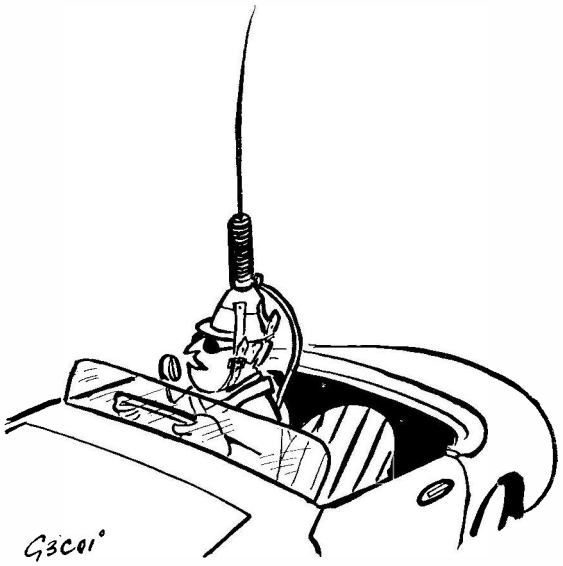
These continue to be of widespread interest and each month there is a large carry-over of readers' notices received too late for the current issue. For years now, the Reader Small Advertisement section of SHORT WAVE MAGAZINE has been the medium through which—by the natural law of supply and demand—the second-hand value of a wide range of equipment has become established. In other words, whether you want to buy, sell or exchange, you cannot do better than use our small advertising columns, disposing of £1,000's worth of apparatus each month. While we cannot guarantee results, what we do say is that advertising in SHORT WAVE MAGAZINE ensures the widest possible coverage of the Amateur Radio interest in the U.K. Rates for reader advertising—which have remained unchanged for the last two decades—are nominal and nowadays barely meet the cost of processing and setting in print. The minimum charge is 5s. (allowing 20 words, to include QTH), and 3d. a word thereafter. If **bold face** (like this) is required, add 25% to the total. For a box number, the additional charge is 1s. 6d. (which, these days, hardly pays the postage on replies!). Small advertisements should be carefully drafted (to save our space and your money), using the accepted abbreviations. If there is any doubt about the wordage to charge, we can be trusted to fill in a blank cheque for the correct amount—extraordinary as it may seem, many people *do* leave this to us! (It is advisable to endorse and initial the cheque " not over 20s.," or whatever maximum amount seems reasonable.) We can *not* accept small advertisements over the telephone—they should be sent in, with remittance, to: Small Advertisement Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1—and as early in the month as possible " for the next issue."

MOBILE RALLY DATES — 1969

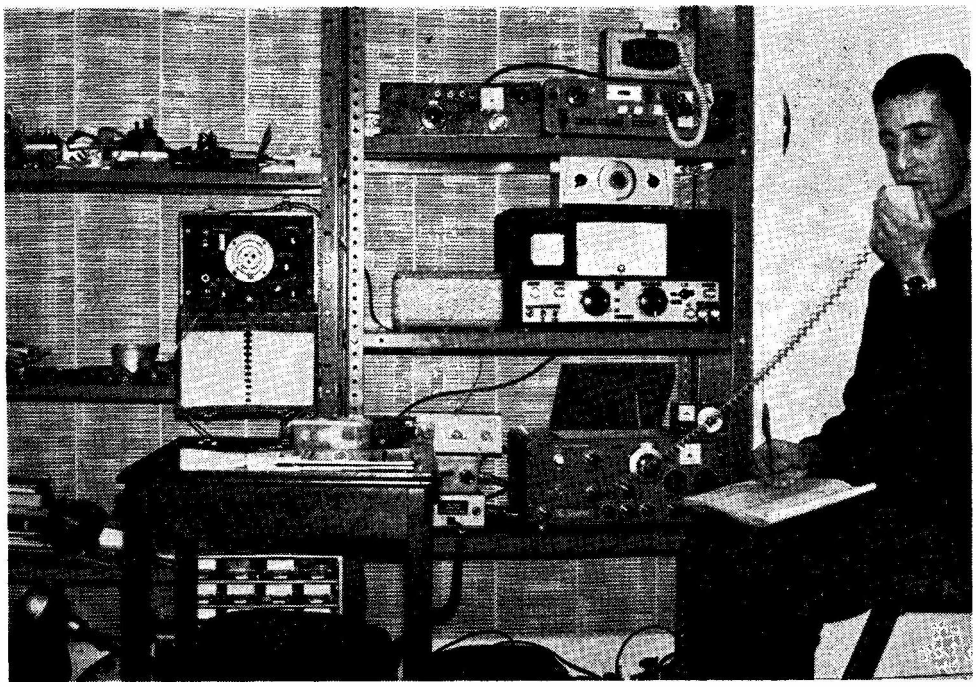
For the information of those organising Mobile Rallies, following are the dates for some of the principal meetings, as already notified to us:

April 20, Midlands Rally at Drayton Park, Staffs.; *May 18*, Northern Mobile Rally; *June 1*, Amateur Radio Mobile Society (A.R.M.S.) Rally; *June 29*, West of England Rally at Longleat, Wilts.; *July 6*, South Shields, Co. Durham; and *August 17*, Derby Mobile Rally.

We can only list meetings as notified to us direct. To avoid clashing, they should be arranged and sent in as soon as possible.



" . . . Well, I didn't want to make holes in the body . . ."



THE OTHER MAN'S STATION G3RJI

AS in the example of modern buildings, the need to conserve space often discourages a table-top lay-out, and there is an increasing tendency nowadays to build " upwards " in the amateur station, utilising the versatile *Dexion* framework.

This is well illustrated by the layout-of G3RJI, owned and operated by Alan Paul, at 9 Dale Gardens, Woodford Green, Essex. At present, interest is centred primarily on Top Band Phone, and a lusty signal is radiated by the " Sphynx " Sideband transmitter, seen in use. This, coupled with a half-wave end-fed aerial means there are few parts of the British Isles in which G3RJI's penetrating voice—usually reckoned as worth another stage of audio!—has not been heard. The best DX so far is to ZC4.

The Eddystone S.640 has been extensively rebuilt on modern lines, and now bears little resemblance to the original. Alterations entailed a very necessary product detector, no less than five IF transformers in cascade, and a half-lattice crystal filter with shunt crystals. The receiver is stabilised by series-connected zener diodes, and incorporates fast or slow AGC, and, of course, selectable USB or LSB. The addition of a Q-multiplier gives selectivity more than adequate for CW working.

Being very much an outdoor man, almost as much operation is done as G3RJI/M, or /A from some suitable high location, as from the shack. For this purpose a converted HP-18 in conjunction with a mini-halo gives a good account of itself. Having respect for his car, G3RJI fixes the halo to the roof with an outside ceramic magnet which lives up to its limpet-like reputation.

As mobile activity on 160 metres is high, a start has been made on a solid-state transmitter, and it is hoped ultimately to run the full permitted power. The prototype can be seen on the top shelf, next to the HP18.

All in all, G3RJI is marching with the times, and he is usually in on the ground-floor with the latest techniques.

NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. callsigns, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the U.K. section 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.

G3VAA, A. Wang, 69 Cole Park Road, Twickenham, Middlesex. (*Tel. 01-892 4843.*)

GM3VAA, A. Wang (*ex-GM8AHP*), 66 St. Andrews Drive, Glasgow, S.1. (*Tel. 041-427 0298.*)

G3WRY, A. C. Tabberer, 32 Russell Road, Liverpool. L18 1EA.

G3XRS, Leicester Royal Signals Amateur Radio Club, c/o K. G. Sullivan, 930 Regional Troop, Royal Signals (V) T & AVR Centre, Brentwood Road, Leicester. LE2 6AE.

GW3XRZ, W. Mawston, 95 Baring-Gould Way, Haverfordwest, Pembs. (*Tel. Haverfordwest 2241 or 2744.*)

G3XSN, B. Donn, 7 Thurne Way, Liverpool. L25 4SQ.

G3XSV, A. F. Hydes, 6 Glenbrook North, Cotswold Way, Enfield, Middlesex.

G3XTD, H. F. Speight, 44 Lockers Park Lane, Hemel Hempstead, Herts.

G3XTV, C. D. Parker, 15 Hill Avenue, Grantham, Lincs.

G3XUD, P. Kirby, 10 St. James Drive, Horsforth, Leeds, Yorkshire. LS18 5QX.

G3XUH, R. E. Pearson, 24 St. Saviours Close, Bamber Bridge, Preston, Lancs. PR5 6AH. (*Tel. Preston 36063.*)

G3XUR, C. T. C. Foster, 46 Laxton Road, Taunton, Somerset.

GM3XUW, R. Johnston, 236 Telford Road, Edinburgh 4.

G3XVA, D. A. Pickles, 15 Durham Terrace, Bradford 8, Yorkshire.

G3XVL, C. J. McCarthy, 387 London Road, Westcliff-on-Sea, Essex. (*Tel. Southend-on-Sea 42430.*)

G3XVS, R. C. Kitching, 20 Adel Park Gardens, Leeds 16, Yorkshire. (*Tel. Leeds 673836.*)

G3XVU, M. E. Garner, 13 Kingsdale Avenue, Drighlington, Bradford, Yorkshire.

G3XWG, D. R. Glover (*ZL2AYI*), 39 St. Albans Road, Upper Fulwood, Sheffield 10, Yorkshire.

G3XWH, R. Horton, 14 Stoney Lane, Lightcliffe, Halifax, Yorkshire. (*Tel. Halifax 22602.*)

G3XWP, J. Dobie, 1 Tudor Close, Chessington, Surrey. (*Tel. 01-397 5552.*)

G3XWS, C. W. Stedman, 10 Wychwood Avenue, Luton, Beds. (*Tel. Luton 27789.*)

G3XXC, K. G. Rigelsford, 67 Fillebrook Road, Leytonstone, London, E.11.

G3XXK, J. F. H. Dark, 12 Stocks Green Road, Hildenborough, Kent.

G3XXQ, L. Dixon, 41 Heathwell Road, Newcastle - on - Tyne, Northumberland. NE15 7UQ.

G3XXR, R. Higton, 5 Brian Avenue, Dalton, Huddersfield, Yorkshire. HD5 8DX.

G3XYB, G. Maitland, 2 Alresford Road, Shanklin, Isle of Wight.

GM3XYG, M. George, 100 Redford Loan, Edinburgh, 13.

G3XYL, Mrs. Barbara Janes, M.A., Hillside, Bushcomb Lane, Woodmancote, Cheltenham, Glos. GL52 4QL. (*Tel. Bishops Cleeve 2229.*)

G3XYV, I. G. Cooper, Wingrove House, Dispensary Street, Alnwick, Northumberland.

G3XZF, W. Felton, 4 Eastfield Close, Welton, Lincoln.

G8BTR, J. K. Law, 6 Dale Croft Rise, Allerton, Bradford, Yorkshire. (*Tel. Bradford 41252.*)

G8BWE, J. Reeves, 9 Tudor Close, Walton, Stone, Staffs.

G8BWG, N. Toovey, 11 Broad Hey, Romiley, Cheshire. (*Tel. 061-430 2482.*)

G8BXR, R. Bickley, 11 Red Bank, Market Drayton, Shropshire.

G8BZN, D. V. Goadby, 9 Beechwood Avenue, Burbage, Hinckley, Leics.

G8BZQ, S. V. Davis, 3 Hay Hill, Orchard Hills, Walsall, Staffs.

GM8BZX, F. D. Hall, 45 Priory Cottages, Lunanhead, by Forfar, Angus.

G8CEX, B. J. Turner, 225 Westborough Road, Westcliff-on-Sea, Essex.

G8CEZ, R. A. Fuller, 45 Marleyfield Way, Cheltenham Road, East, Gloucester. GL3 1JW.

G8CFI, J. X. Downs, Alpha, Woodside, Duxbury, Chorley, Lancs. (*Tel. Chorley 3175.*)

CHANGE OF ADDRESS

G3FQN, R. F. Gilding, B.E.M. No. 1 Flat, 64 Regency Square, Brighton, Sussex. BN1 2FF.

G3IZK, A. J. Hagon, 13 Byron Drive, Wickham Bishops, Essex.

G3MOO, J. L. Franklin, 62 Moorcroft Crescent, Ribbleton, Preston, Lancs.

G3NKS, D. Thom, 6 Bracken Close, Copthorne, Sussex.

G3NRB, N. H. Kempt, Pinnocks Mead, Throcking Road, Cottered, Herts.

G3NUE, G. Tibbetts, Spinney Cottage, Tunnel Hill, Upton-on-Severn, Worcester. (*Tel. Upton 2766.*)

G3POY, H. E. Smith, Gowles, Long Mill Lane, Crouch, Borough Green, Sevenoaks, Kent. (*Tel. Borough Green 3485.*)

G3RKF, T. Roeves, 10 Northcourt, Heath Road, Leighton Buzzard, Beds.

G3RNL, B. A. Watling, 280 Clay Hill Road, Vange, Basildon, Essex.

G3SED, M. Devereux, 36 Pentland Rise, Portchester, Hants.

G3SID, M. P. Fox, 43 The Avenue, Kew Gardens, Richmond, Surrey.

GW3TCE, A. H. Howard, 36 Mold Road, Ewloe, Deeside, Flints. (*Tel. Hawarden 2839.*)

GW3TSH/A, R. J. Wilcox, c/o Students Union, Coleg Brifysgol, Parc Singleton, Abertawe, Sir Morgannwg.

GM3UCI, G. McCallum, 5 Law Hill Road, Law, Carluke, Lanarks.

G3VND, R. Stevenson, 7 Gloucester Gardens, Cockfosters, Herts.

G3WBP, J. D. Broadley, 4 Yeo Road, Chivenor, Barnstaple, N. Devon.

G3XNE, A. F. Smyth (*ex-DL5YY*), 339 S.U., R.A.F. Digby, Lincoln, Lincs.

G8BFM, A. J. Whittaker, 7 Chatsworth Court, Hucknall, Nottingham. NG15 7NS.

G8DH, A. D. McKenzie, 58-A Elderton Road, Westcliff-on-Sea, Essex.

SMALL ADVERTISEMENTS

(" SITUATIONS " AND " TRADE ")

9d. per word, minimum charge 12/-. No series discount. All charges payable with order. Insertions of radio interest only accepted. Add 25% for Bold Face (Heavy Type). No responsibility accepted for errors. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, London, S.W.1.

TRADE

FEBRUARY Issue due for publication on January 31. Single-copy orders, 4s. post free, should reach us by Wednesday 29th, for despatch on Thursday 30th. Add 3d. (total 4s. 3d.) for "1st class mail" if desired.—Circulation Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

QSL Cards: Two-colour, attractive design, variable features, from £3 3s. per 1,000 (inclusive). Send foolscap s.a.e. for samples.—ARA Press, 46 Moat Avenue, Green Lane, Coventry.

QSL Cards and Log Books, GPO approved, cheapest and best. Prompt delivery.—Samples from Atkinson Bros., Printers, Looe, Cornwall.

SERVICE SHEETS: On Radio, Television and Tape Recorders, 1925-1968 models, from 1s. each by return post, with free fault-finding guide. Catalogue covering 6,000 models, 2s. 6d. Please include s.a.e. with enquiries.—**Hamilton Radio, 54 London Road, Bexhill, Sussex.**

QSL CARDS: Attractive two-colour designs, 25s. per 100. Send s.a.e. for samples.—G3OYI, 16 Banks, Honley, Huddersfield, Yorkshire.

HAS Anyone designed or developed a compact 2 mc radio-telephone suitable for use on the marine band, but is short of capital to manufacture or market the design? If so, please write.—Box No. 4719, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

QSL Cards for Tx and SWL. Send s.a.e. for samples, stating which type required. Prices from 12s. 6d. per 100, purchase tax and post paid. **—Beaumont, G5YV, 8 Ashfield Avenue, Morley, Leeds.**

WANTED: All types of Receivers—AR88, CR-100, Eddystone, etc., etc.—**The Amateur Radio Shop, 13 Chapel Hill, Huddersfield, Yorkshire.**

QSL Sample, excellent range at right price, also Log Books at 7s.—Bailey & Co., Greenfield Place, Weston-super-Mare, Somerset.

READERS ADVERTISEMENTS

3d. per word, minimum charge 5/-, payable with order. Add 25% for Bold Face (Heavy Type). Please write clearly, using full punctuation and recognised abbreviations. No responsibility accepted for transcription errors. Box Numbers 1/6 Extra. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, London, S.W.1.

WANTED: Heathkit GC-1U Mohican receiver. Must be in good condition and working order.—Bennett, 13 Dickinson Road, Formby, Liverpool L37-4BX.

OFFERING: BC-348 receiver, with PSU, speaker and headphones, ideal of SWL. Partly constructed 50-watt Tx, for 10 to 160 metres, with Geloso 4/101 VFO, no PSU. Power unit for K.W. Valiant Tx (would suit foregoing Tx). ATU for 52 set. Delivery arranged.—Sweeney, G3TFS, 58 Grosvenor Road, Epsom Downs, Surrey.

SMALL ADVERTISEMENTS, READERS—*continued*

WANTED: Scrap CR-100 for rebuild, case and dial to be OK.—De Courcy, 27 Highbury Avenue, Salisbury, Wilts.

FOR SALE: Heathkit HW-12, 80-metre Transceiver with HP-23 PSU, £45. Prefer buyer inspects and collects.—Kellaway, G3RTE, 12 Coker Hill, West Coker (231), Yeovil, Somerset.

EXCHANGE or Sell: Complete fishing-tackle outfit, value £14, for Codar CR-70A receiver. Send s.a.e. for details of fishing gear.—Lucas, 19 Mayswood Road, Wootton Wawen, Solihull, Warwickshire.

SELLING: TVI-proof transmitter, 70 watts plate modulated, 75 watts T9x CW, switched 3.5 to 30 mc; table unit VFO/WBC/PA (pi-tuning), with separate unit for power, speech amplifier and modulator. Neat desk control box with pressel switch for netting, plus paddle switch (left for phone, centre for Rx, right for CW, with indicator lights). Built in valve keyer and PA limiter. Chassis and panel $\frac{1}{8}$in. aluminium, PA screened in copper box; attractive appearance, black crackle finish with chrome handles. Stable, hum free, excellent quality and utterly reliable. Callers to inspect/operate but will deliver free to 50 miles. Price £27.—Wyatt, 17 Harbour View Road, Parkstone (2368), Dorset.

FOR SALE: Heathkit DX-100U transmitter, price £50 or reasonable offer.—Smith, G3HFO, 7 The Byeways, Surbiton Surrey. (Tel.: 01-399 9526).

SELL or PART EXCHANGE: R.C.A. AR88D in excellent condition. Two-metre converter, TW, used twice. Preselector. Trio receiver 500 kc to 148 mc. All items offered cheaply. Would accept portable Rx, or EC-10, etc. in part exchange.—Goodbody, Dagenham Supplies, Selinas Lane, Dagenham, Essex. (Tel.: 01-592 7800).

WANTED: R.216 receiver, in good condition and working order.—Dunlop, Ballycreen, Ballynahinch, Co. Down, Northern Ireland.

GETTING Married: So must dispose of Heathkit Oscilloscope Model OS-1 (less handbook), £20 or near offer. Also Heathkit valve voltmeter, Model V7-AU, price £12 including manual.—Ibberson, 34 Lime Avenue, Greenstead Estate, Colchester, Essex.

WANTED: Hamgear Preselector Type PM-1, or a Codar PR-30X. Reasonably priced, please!—Williams, 11 Cedar Avenue, Sleaford, Lincs.

FOR SALE: Collins TCS-12, unmodified and complete with PSU. Also a Valradio DC/AC converter, 24v. DC in, 230v. AC output. (Surrey).—Box No. 4730, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Ultra 12in. BBC-1/ITV Television, mains, less than a year old, £30. Buyer to collect Essex.—Box No. 4731, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FIRST Offer of £55 secures a Lafayette HA-350 in mint condition, 240v. version, cost 75 guineas. Buyer collects.—Adkins, G3SEV, 14 Buckingham Road, Tring, Herts.

WANTED: Urgently, table PSU's, speakers and coil packs for HRO Senior receivers.—Edwards, 42 Kingswall, Malmesbury, Wilts.

FOR SALE: M. & G. SSB Transceiver, for 20-80-160m., 90 watts p.e.p., AC/PSU with metal rectifiers, very neat and compact, in grey/blue hammer finish, cost about £100 new, asking £50 as this specimen is in very good condition.—Hurst, 7 The Laurels, Burnside, Fleet, Hants.

REAL Bargain! Tiger TR-300 Tx, in excellent condition, with new valves, price £60 or nearest offer, delivered Devon-Cornwall-Somerset area.—Tremain, St. Issey, Wadebridge, Cornwall.

SMALL ADVERTISEMENTS, READERS—*continued*

WANTED: For cash, Sommerkamp FT-500DX. Must be in FB condition.—Sullivan, G3KYF, 14 Wigston Road, Blaby, Leicester, LE8-3FU.

CLEARING Shack: Receivers SP-600JX6, coverage 540 kc to 54 mc; SX-62, 540 kc to 109 mc; National NC-77X; BC-348, £12 10s.; R.1155, £5. APR-4 receiver, covering 38 to 1,000 mc. Also signal generators, megger, USM-45 for 50-11,000 mc; spares AR-88, HRO, BC-221, gear-box, trimming tools, dials, crystals, manuals and valves. Pse include s.a.e with enquiries.—Wright, 249 Sandy Lane, Hindley, Wigan (55948), Lancs.

AVAILABLE at Godshill, Isle of Wight: Bed-breakfast accommodation with evening meal; hot and cold in all rooms; TV lounge; and children welcome. Also an all-electric 4-berth caravan, with main water and flush you-know. Write for terms.—Berden, G3RND, Bridgecourt Farmhouse, Godshill (606), Ventnor, Isle of Wight.

FOR SALE: B2 transmitter, unmodified, with coils, crystals, key and original PSU, price £5. Also a Pye "Dolphin" radio-telephone, with built in 12v. generator, working, but a Tx fault to clear, £8. (South Coast).—Box No. 4733, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

BARGAIN: Collins 75A-2 modified to 75A-4, at £110. K.W. Viceroy Mk. IIIB CW/SSB transmitter, price £85. Both these items in excellent condition.—Ring Harris, G3XSL, Formby (Lancs.) 72544.

SELLING: Codar CR-45 TRF Rx, as new and factory built, with coils to cover 600 kc to 30 mc, and manual; ideal for a beginner, price £7.—Ring Watson, Farningham (Kent), 2239.

FOR SALE: Fully transistorised two-metre converter, incorporating AF186 RF stage, IF tuning 3·9 to 5·9 mc, built into 2oz. tobacco tin, price £6 including post/packing.—Williamson, G3WGU, 3 Beaufort Avenue, Bispham, Blackpool, Lancs. (Tel: 53126 after 7.0 p.m.).

SWAN 350, Series II, with AC/PSU, includes upper and lower Sideband xtals, ALC, ANL, crystal calibrator, sockets for Vox and 22 Adaptor, very little used and in excellent condition. Price £205 or near offer. Free delivery to 50 miles. Phone to view and discuss.—Ring Hutchinson, G3VGH, York 69245 (QTHR).

FOR SALE: Eddystone 670C receiver, frequency ranges 150 to 350 kc and 500 kc to 30 mc, in excellent condition, price £35.—Morgan, 718 Kenton Lane, Harrow Weald, Harrow, Middlesex. (Tel: 01-954 3314).

OFFERING £15 for "Princess" home-built transmitter, model in good working condition. Also wanted a Heathkit Mohican or similar Rx, need not be working, state price. (West Wales).—Box No. 4732, Short Wave Magazine, Ltd., 55 Victoria Street, London S.W.1.

BREAKING QRO VHF Gear: All good clean stuff, part carriage/post as given in brackets. **Transformers:** 2300-1850-0-1850-2300v. 450 mA, 70s. (20s.); choke to suit, 15s. (8s.); 530-0-530v. 200 mA, 20s. (5s.). **Capacitors,** paper, rated 3 kV: 8 mF, 35s. (8s.); 4 mF, 30s. (6s.). **Valves:** 4-125A with base, 35s. (3s.); EF91, 1s. (6d.), six for 6s. (post paid). Stamp for lists.—**Smith, GM3WHT, Schoolhouse, Urafirth, Heylor, Shetland.**

SELLING: Lafayette HA-500 amateur-band receiver, in excellent condition; would suit keen SWL. Price £35 or near offer.—Cooney, G3XQG, 10 Ruskin Avenue, Dalton-in-Furness, Lancs.

WANTED: In good working order, a 19 Set, or similar, with mains PSU; full details, pse.—Swift, 341 Walsall Road, Stone Cross, West Bromwich, Staffs.

FOR SALE: Hallicrafters SX-24 Communications Receiver, in excellent condition. Price £20 only, with free delivery to 25 miles.—Jones, 34 Cheyne Walk, Horley (3123), Surrey.

SMALL ADVERTISEMENTS, READERS—*continued*

EXCHANGE or Sell: Hallicrafters S.76 receiver, coverage 540 kc to 34 mc with bandspread over 10 to 80m. bands; comprises 11-valve double superhet, IF's 1·6 mc and 50 kc, 5-posn. selectivity, for 200-250v. AC; offers over £35, or would Exchange (with cash) for Eddystone 888A or similar receiver.—Snowden, Swainsea Lane, Pickering, Yorkshire.

SELLING: Trio TS-500 and PSU, new, 10 hours' use only, £175. Also Trio 9R-59DE communication Rx, new, at £35; Hallicrafters S.27 Rx, coverage 28 to 143 mc, £20. Hunts R/C Bridge, £5. Commercial signal tracer, 60s. (All these items carriage paid.) Offers or W.H.Y. for quantity 813, 808, 4304 (DET-12) valves, and various CRT's. Wanted: QQV06-40A.—Ingram, 14 Endsleigh Place, Plymouth, Devon.

FOR SALE: Mosley Commando SSB Tx, at £70. AR-22 rotator, with etceteras, £20. M. & G. Transceiver for 20-80-160m., £45. Heathkit GR-54, £30. Heathkit Type OS-2 'Scope, £20. Olympic Z-match, £10.—Worthington, G3COI, Foxhills, Orton Lane, Penn, Wolverhampton, Staffs. (Tel. Wombourn 2288.)

DISPOSING: Heathkit SB-301E amateur band Rx (incorporating CW filter), and SB-401E Sideband Tx. Both in perfect working order, aligned and tested by Daystrom and still under guarantee. Price £275 or sensible offer.—Barry, 15 Fairlawn Court, Acton Lane, London, W.4.

SURPLUS polypropylene non-rotting rope, 5/16in. dia., can flex to one inch circle, breaking strain 1980lbs. Send callsign and s.a.e. for sample.—Powell, GW3HUM, 21 Tanybryn Estate, Valley, Anglesey, North Wales.

FOR SALE: National HRO receiver, coil packs for 100 kc to 30 mc, including bandspread 10-20-40-80-160m. bands, with S-meter and PSU, also if required RF-24 Unit as converter/pre-amp. for 10-15-20m., price £15. Hallicrafters S.27 VHF AM/FM receiver, bit rough through bad storage, offers? Marconi TF-390G Signal Generator, 16 to 150 mc, complete with original manual and calibration charts, valves, etc., price £10. Vortexion Super 50-watt public address amplifier, for microphone or pick-up input, incorporating high-quality multi-radio output transformer, £10. Acoustical 30-watt audio amplifier, 230v. AC, £5. Ardente 10-watt audio amplifier, 12v. DC input, complete with microphone, ideal /M modulator, £5. Collaro 4T-200 transcription deck, less cartridge, 50s. Valves: New 813, 17s. 6d.; 811, U19, TZ-40, 12s. 6d. each; new 6AL5, W.77 at 3s. 6d., also many others, s.a.e. for list. Delivery free to about 50 miles.—Davies, G3CXJ, 13 Lovett Road, Copnor, Portsmouth, Hants. PO3-5EU.

SELLING: K.W. (Phase II) Vanguard, with 6146 PA, coverage 10 to 160m., AM/CW, in perfect working order and appearance, would deliver to any reasonable distance for £35 (or less if buyer collects). Only reason for sale, gone Sideband.—Uttley, G3MWK, 42 Birchington Avenue, Birchencliffe, Huddersfield, Yorkshire. (Ring Halifax 54175 during business hours.)

SALE: Trio Receiver Model 9R-59, in very good condition, £18. Also a Hunts R/C Bridge Type CRB/3, condition as new, £10. Carriage extra.—Grigg, G3PRX,72 Elmstone Road, Rainham, Kent.

OFFERING: An Eddystone 840A receiver, covering 500 kc to 30 mc (10 to 600 metres), complete with S-meter and isolation transformer, and in excellent condition, at £23 or a near offer.—Gorrill, 30 Ashburnham Road, Furnace Green, Crawley, Sussex.

WANTED: Communications receiver in good working order and condition. Full details and price asked.—Taylor, 14 Cleveland Road, Hale, Cheshire.

WANTED: Faulty CR-100 Receiver, any condition acceptable, even incomplete. Please state price. Will arrange collection anywhere.—Bentley, 27 De Vere Gardens, Cranbrook, Ilford, Essex. (Tel. 01-554 6631.)

SMALL ADVERTISEMENTS, READERS—*continued*

SALE: Marconi CR-100 receiver, working on all bands, cabinet clean and re-lettered, complete with handbook, price £9 10s. plus carriage.—Jones, 14 Shakespeare Drive, Caldicot, Newport, Mon., South Wales.

TRANSISTORISED Two-Metre Converters. Low-noise AF239 front end, HC-6U type crystal, IF tuning range 20-22 mc, built into 4in. x 3in. x 1¼in. aluminium case. Price £9, plus 3s. post/packing.—Grigg, G3PRX, 72 Elmstone Road, Rainham, Kent.

WANTED: Sommerkamp FR-100B or similar modern receiver, must be in mint condition. Details and price, pse. (South Wales).—Box No. 4734, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

OFFERS Invited: For a Hammarlund HQ-170A VHF receiver, brand new in its carton, with manual. Also other items For Sale: Walters Pre-Amp., 60s.; HRO-60 type cabinet, with fittings, £5; Gonsett 3001 Clipper, Tymeter Clock, new, £5; World Clock, £5. Manuals for Johnson Invader, National NC-100, B. & W. 5100-B and 51SB-B, Hallicrafters SX-28A, HA-2, SX-101A. New Hallicrafters SX-101A dial, 30s. Pse send s.a.e. with enquiries. (West Midlands).—Box No. 4735, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SELLING: An Eddystone 888A receiver, with S-meter and speaker, all in really excellent condition, asking only £50.—Goldsmith, Verulam Amateur Radio Club, Salisbury Hall, London Colney, St. Albans, Herts.

FOR SALE: Creed 75B (repeat, 75B) Teleprinter, in immaculate condition, works-overhauled and not used since, with instructions and servicing manual. Offers invited. (South Coast.) — Box No. 4717, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Two Westinghouse stabilisers (CVT's), 300 VA, with third-harmonic filters, £5 each. Foster CVT, 600 VA, with ditto filter, £7. S.T.C. Attenuators, DC to 100 mc (new price, £40 pair), Type 74600A, 0-10 dB steps in 1 dB steps; Type 74600B, 0-100 dB in 10 dB steps, push button, two pairs in 19in. panels, £8 pair; one pair separate, £7 10s.; all for 75 ohms. Also one pair 74600E/F, separate, for 50 ohms, £7 10s. Numerator Type 1146B, 4-digit counter, positive or negative polarity, 20 or 100 mS. Paralysis Discriminator, volts 10 to 60, powered, 19in. case, 60s. Amplifier Type 1031B, 2/807 in output for recorder, large 1 mA meter, with PSU, 19in. case, clean, £5. Modulator Type 67 (radar), powered and cased, clean, 60s. Test Set Type 219, Pulse Generator, 0·5 to 5·0 microS, 0·1 mV to 10v., 10/50 volt pulses, 500-cycle to 10 kc repetition rate, with PSU, in cabinet and very clean, 60s. AWRE power supply Type 187, 300-400v. adjustable at 100 mA, regulated, and others, on 19-in. panel with circuit, £5. Decca-1000 projection TV set, 3ft. x 4ft. picture, two additional optical units, in wheeled wooden cabinet, with service manual, not working, 60s. Buyer collects, or agrees transport, 30 miles south-west London.—Box No. 4736, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FEBRUARY Issue will appear on Friday, January 31. Single-copy orders should reach us by Wednesday 29th latest, for despatch on Thursday 30th. Price 4s., or 4s. 3d. for "first class" mail.—Circulation Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Complete Station, comprising 52 Set (100 watt Tx, 10 watts on 160m.) and receiver, with AC/PSU for both units, coax'ed ATU's, press-to-talk control, in excellent condition, with handbook, spares (813), etc., price £40, buyer to collect.—Ring Taylor 01-398 2220 (London), after 6.30 p.m.

SMALL ADVERTISEMENTS, READERS—*continued*

SELLING: Leak Stereo 20, new and unused, £20. Taylor Type 45B Valve Tester, £5.—Cornish, 4 North Street, Wellington (2739), Somerset.

EXCHANGE: Jordon-Watts high fidelity bass reflex enclosure system, with cash adjustment, FOR good communications receiver. Also available a Jordon-Watts infinite-baffle bookcase speaker; any offers or exchanges? — Lumb, 53 Queensway, Wallasey, Cheshire.

SELLING: Aerial insulators, glass, ribbed, 7in. long, brand new, 4s. each post free. Also some xtals, at 4s. each post free. Send s.a.e. with enquiries.—Webster, Citadel 138, Parklands, Little Sutton, Cheshire, L66-3QD.

FOR SALE: Complete 10-80m. 50-watt AM/CW station, comprising home built Tx, ATU and SWR bridge, Heathkit RA-1 receiver with matching speaker and calibrator, asking £65 or near offer. Buyer inspects but will deliver to within 50 miles London. — Bean, G3TJQ, 51 Heathfield Square, Wandsworth, London, S.W.18. (Tel. 01-874 1227, evenings.)

SELLING: Hallicrafters S.27 receiver, coverage 28 to 143 mc, AM/FM/CW, in very good condition, £25. Also AN/APR-4 video receiver with three tuning units covering 38 to 1000 mc, continuous; bandwidth 600 kc or 4 mc, IF 30 mc, outputs for IF, video and phones, complete with leads and auto-transformer; ideal Rx for TV/DX, has received TV from Russia. Price £60 or near offer.—Ring Dykes, 01-300 4825, evenings or weekends.

SALE: KW-2000 Transceiver, with AC/PSU, £135. HW-12A (80-metre) transceiver with neat home-built PSU and Heath speaker unit, £45. HRO receiver with PSU and speaker, £10. Type IO-12U Heathkit Oscilloscope, £28. Jap. semi-auto bug key, 30s. Codar A.T.5, £12. Two spare hand keys, ARRL and SSB handbooks, and others, free to SWL's but postage not paid. Please contact after January 15.—Heaton, G3UGX, Worston House, Nr. Clitheroe, Lancs.

WANTED: By South Coast Radio Club, an HRO Senior receiver, with or without coil packs but must be in first-class condition. Write or phone hon. secretary. — Rampton, G3VFI, 23 Oxford Close, Fareham (3120), Hants.

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