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VOL. 37, No. 7

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R.S.G.B. BULLETIN

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EDITOR:

John Clarricoats, O.B.E., G6CL

DEPUTY EDITOR:

John A. Rouse, G2AHL

EDITORIAL OFFICE:

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

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Current Comment

discusses topics of the day

Project Oscar

WAS it coincidence or design that led to the satellite carrying Amateur Radio (Project Oscar) going into orbit exactly 60 years to the day after Marconi and his colleague Kemp at Signal Hill, Newfoundland, heard for the first time in the history of mankind a wireless signal that had originated from the other side of the Atlantic? Whatever the reason for the choice of December 12, 1961, the fact remains that seldom, if ever before, has Amateur Radio received such a fillip or obtained so much worth-while publicity as resulted from the launching that day of Project Oscar.

The knowledge that a capsule containing a tiny transmitter operating on a frequency close to 145 Mc/s was orbiting the earth every 91 minutes provided excitement and interest not paralleled in Amateur Radio circles since the days of the trans-Atlantic tests nearly 40 years ago.

British radio amateurs no less than their colleagues in all parts of the world have been loud in their praise of those who conceived Project Oscar and brought it out of the realms of space fiction to reality.

Reception reports began to reach New Ruskin House within a few hours of the satellite being launched with the result that by the time A.R.R.L. opened for business early in the morning of December 13 a telegram of congratulations had reached them from R.S.G.B. Headquarters. A similar telegram was despatched to the Project Oscar Centre in California. For the next two and a half weeks Mr. W. H. Allen, M.B.E. (G2UJ) and others associated with him were kept busy day and night correlating information received from United Kingdom observers.

Assuming the famous HI signal has been heard from outer space for the last time—it was reported on New Year's Eve that the transmitter batteries had failed after about 300 orbits—the question now arises, " What has been learned from the great experiment? " The organizers of the Project will no doubt need some while before they are in a position to publish an exhaustive technical treatise but we should feel sorry if there were to be a very long delay before at least an interim " down-to-earth " report is published.

Scientific data is always difficult to sift. Even more difficult is the task of assessing the value of masses of information that has been collected. There is the natural reluctance of the scientist to commit his views to paper until he is fairly sure of his facts. In the case of Oscar we hope those who sponsored the Project will take their courage in both hands and give the waiting world of Amateur Radio some idea of what has been learned from the experiment.

The interest shown in Project Oscar by scientific bodies throughout the world provided further proof of the importance such bodies attach to Amateur Radio. The R.S.G.B. appreciates in particular the interest shown by the Scientific Staff at the D.S.I.R. Radio Research Station, Slough, Bucks, who provided invaluable data about orbit times for inclusion in the Society's News Bulletins.

Project Oscar was intended to provide a challenge to radio amateurs of many lands. The fact that they answered that challenge in such an effective manner is evidence that the pioneering spirit is still very much alive today. May it long continue. J. C.

Mention the Bulletin

THE beginning of a New Year is an appropriate time to pay tribute to the host of advertisers, both large and small, who support the Society in good times and bad.

The Honorary Treasurer in his report to the members for the year ended June 30, 1961, referred to the increased revenue received from BULLETIN advertising. This increase more than offset the increased cost of producing and posting the BULLETIN to members.

Last year BULLETIN advertising revenue reached the high level of £4,296. Without that source of income it would have been necessary to increase subscription rates by nearly 10s. a head.

The fact that the Society is able to offer all of its publications for sale at very low prices is due very largely to the support received from advertisers. The recently-published *Amateur Radio Handbook*, for example, carried more than 30 pages of advertising material thus enabling the retail price to be kept down to 34s. It could easily have become 40s. if advertisers had not given it their support.

The *R.S.G.B. Amateur Radio Call Book* and *A Guide to Amateur Radio* provide further examples of the help the Society receives from advertisers. Is it too much then to ask that all members should make it a rule always to mention the BULLETIN or other Society publication when writing to advertisers?

Occasionally an advertiser is unable immediately to deliver the goods which he has advertised but, by and large, the number of complaints which reach Society Headquarters is very small indeed.

To our advertisers we say thank you for your continued support. We hope the New Year will be a bright and prosperous one for you and all who cater for the needs of radio amateurs. J. C.

An Introduction to Crystal Filters

PART I

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

WITH the ever increasing popularity of the single sideband (A3a) mode of transmission, attention is being focused on what, for the amateur, are two unusual types of networks. One is the resistor-capacitor network which will act as a 90° phase shifting device over a range of audio frequencies, and the other is the crystal filter. It is the intention of this article to review the latter in a simple manner, and so possibly elucidate some of its mysteries.

It is well known that a quartz plate when mounted between two metal electrodes and excited electrically will vibrate mechanically at a certain fixed frequency. This frequency is dependent upon the size and shape of the plate, and the position in the parent crystal from which it was cut. Although this is a mechanical vibration the effect can be represented near resonance by an equivalent electrical circuit as shown in Fig. 1.

The capacitance *Co* is the capacitance of the metal electrodes with a quartz dielectric, and includes the effect of any air gap between the electrodes and the crystal. The components *L*, *C* and *R* are governed by the cut and the dimensions of the quartz plate. Typical values of these components for an 80 kc/s crystal might be as follows:

$L = 39{\cdot}7$ H $R = 900$ ohms
$C = 0{\cdot}1$ pF $Co = 17$ pF

$$Q = \frac{\omega L}{R} = 22{,}000$$

This value of Q is much higher than any that can be obtained using inductors and capacitors with the result that

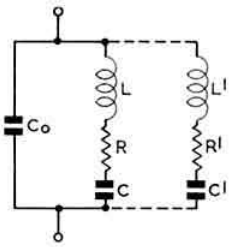


Fig. 1. Equivalent electrical circuit of crystal near resonance. Effect of spurious frequencies shown by dashed lines.

filters employing crystals are capable of high attenuations outside the passband with rapid transitions from passband to stopband.

The ratio $\frac{Co}{C}$ imposes a fundamental limitation upon the characteristics of the crystal and thus of any filter in which it is used. This ratio depends upon various electrical and mechanical constants for the quartz and has a theoretical minimum value of 140 with stray capacity increasing this figure. In practice, however, for low frequency crystals it is found that a smaller value is realizable, usually around 125 [1].

The electrical circuit of Fig. 1 will have two significant frequencies. At these frequencies, the combination will appear either as a series tuned circuit or as a parallel tuned circuit, and at other frequencies will have intermediate values of impedance. Generally the crystal resistance can be neglected since the effective Q of the crystal is high and so it is usual to plot reactance—frequency diagrams rather than impedance graphs when considering a filter response. The graph of reactance against frequency for a single crystal is shown in Fig. 2 and it is seen that as the frequency is increased a series resonance occurs (zero reactance) followed by a parallel resonance (infinite reactance). These frequencies are respectively the resonant frequency (*fr*) and the anti-resonant frequency (*fa*) of the crystal unit and are most important in the consideration of crystal filters.

Another way of expressing these significant points is to term points of zero reactance (such as *fr*) as ZEROS and points

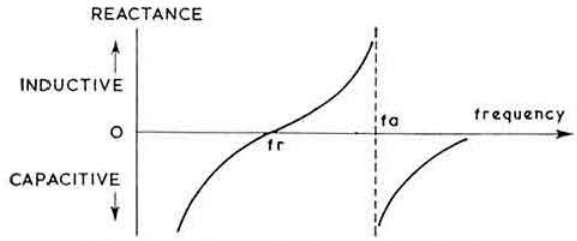
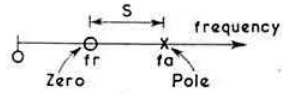


Fig. 2. Graph of reactance against frequency for crystal.

of infinite reactance (such as *fa*) as POLES. The pole-zero plot of the crystal equivalent circuit will then look like Fig. 3.

It can be shown that the pole-zero spacing, S, is related to the ratio $\frac{Co}{C}$ by the expression $S = \frac{fr}{2}\frac{C}{Co}$. From this it is obvious that any capacity added in parallel or series with

Fig. 3. Pole-zero plot of crystal.



the crystal will decrease the spacing between the resonant and the anti-resonant frequencies.

If inductance is placed in series or parallel with a crystal the opposite effect occurs. For the series case (Fig. 4), it is seen that the crystal pole remains fixed while its zero is lowered in frequency. A further zero or series resonance is also introduced higher in frequency than the crystal anti-resonant frequency. In Fig. 5 the parallel case is illustrated and here the crystal zero remains fixed while the pole is moved higher than its original frequency. As in the series case a further significant frequency is introduced, a pole, lower in frequency than the crystal zero.

Besides the main responses at *fr* and *fa*, other responses may be found. These spurious responses are higher in frequency than the parallel resonant frequency and are due to mechanical coupling within the crystal. They may be represented electrically by further series circuits (shown by

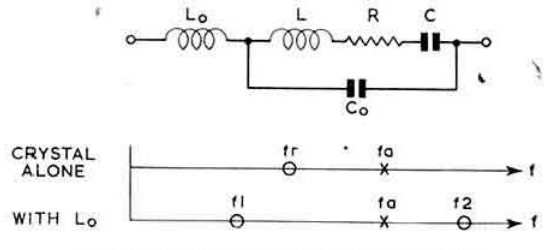


Fig. 4. Effect of inductance in series with crystal.

* *152 Kingsway, Widnes, Lancs.*

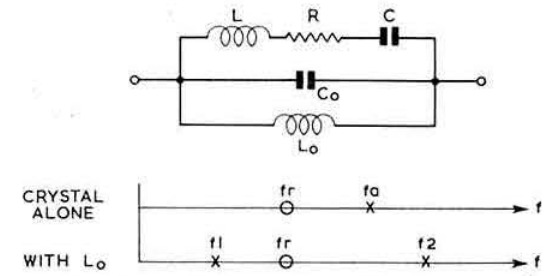


Fig. 5. Effect of inductance in parallel with crystal.

dashed lines in Fig. 1) placed in parallel with the main circuit, and their effect will be referred to later.

Having reviewed the electrical characteristics of the crystal unit and seen how these characteristics may be modified by suitably connecting inductors and capacitors, the use of these elements in filters can now be considered.

Filter Configurations

The basic filter configuration may be considered to be the lattice, or bridge circuit, since other configurations may be transformed into the lattice form by means of mathematical processes.

Crystal Gate

The simplest form of lattice filter and the one which will be used to introduce the method of finding the passband and

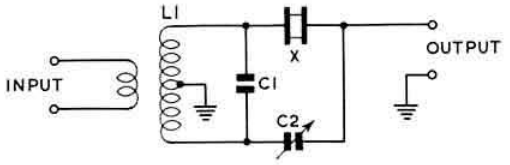


Fig. 6. Crystal gate or one-crystal lattice filter.

frequencies of infinite attenuation, is the so-called " crystal gate." This form of filter has been used for many years in communication receivers as a means of increasing the i.f. selectivity for c.w. and also to a certain extent for telephony as well.

The circuit is shown in Fig. 6 and is, to all intents and purposes, a bridge circuit. When the voltage due to the

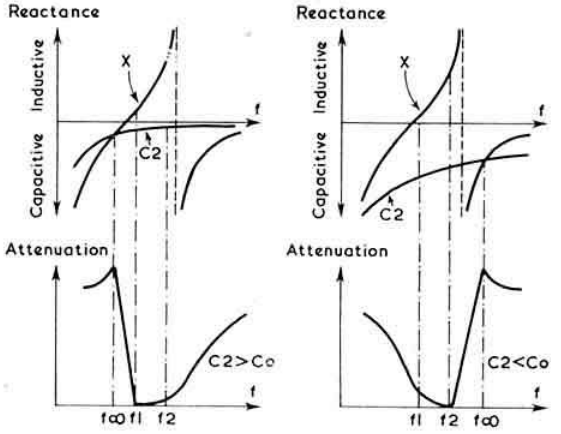


Fig. 7. Reactance-frequency and attenuation-frequency graphs for crystal-gate filter.

crystal arm is equal and opposite in polarity to the voltage due to the capacitor arm, there will be a balance and no output will be obtained. This infers that at some frequency the reactance of the crystal must be capacitive and equal to the reactance of C2. At this frequency on the attenuation-frequency curve there will appear a point of infinite attenuation. If on the other hand, the crystal reactance is inductive and numerically equal to the reactance of the capacitor, then the output voltage will be a maximum since the voltages of the two arms will add together. At other points, the outputs will vary between these extremes.

The reactance curves for the crystal and for the capacitor are shown in Fig. 7. Also included in this diagram are the appropriate attenuation-frequency curves for values of C2 greater than and less than *Co*, the crystal capacitance.

It is seen that the passband extends from a frequency *f1*, higher than the crystal resonant frequency to *f2*, a frequency just less than its anti-resonant frequency, i.e. it lies between the highest and lowest significant frequencies. The passband is only a matter of a few hundred cycles in width and will not be flat. The frequency of infinite attenuation, $f\infty$, is below the passband when C2 is greater than *Co* and higher

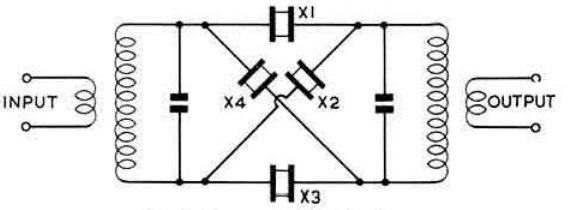


Fig. 8. Four-crystal lattice filter.

than the passband when C2 is less than *Co*. The capacitor C2 is the familiar phasing control which can be used to reject an interfering carrier near to the desired signal by adjusting the frequency of infinite attenuation to coincide with the interfering signal.

The main disadvantages of this simple form of filter are that the passband is not very wide, and also the frequency of infinite attenuation can only be placed on one side of the passband at one time. This results in the skirt on the other side sloping rather badly.

Four-Crystal Lattice

The form of lattice usually favoured in commercial practice employs four crystals as shown in Fig. 8. The coils which terminate the filter can be shown mathematically to be effectively in parallel with the crystals, thus spreading the crystal pole and zero frequencies and introducing a further pole as was indicated in Fig. 5.

If the poles and zeros produced by crystal X1 are coincident with those of crystal X3 and the poles and zeros of X2 are coincident with those of X4 then only the reactance diagram of X1 and X2 need be considered to obtain the attenuation characteristic. In the diagram of Fig. 9, the reactance of the series crystal, X1, is represented by a solid line and the reactance of X2 by a dashed line. Crystal X2 has a resonant frequency higher than X1 by the amount of the pole-zero separation. In this way one of the poles of X2 coincides with the zero of X1 and one of the poles of X1 coincides with the zero of X2. A passband then exists between the lowest and highest significant frequencies, actually lying just within these frequencies. The bandwidth can be made about 3 kc/s at frequencies up to 500 kc/s with this circuit. Two frequencies of infinite attenuation are produced, and these can be controlled to some extent by a small capacitor across one of the higher frequency crystals, as also can the flatness of the passband. However, all is not as simple as it seems with this filter. One of the main requirements is that the

crystal frequencies shall be precisely adjusted so that the zeros of the pair of series crystals are coincident with each other and with the poles of the shunt crystals. If the crystals are not closely matched, the passband will be uneven and also stopbands may appear within the passband. These factors all add up to a circuit which is not the easiest to

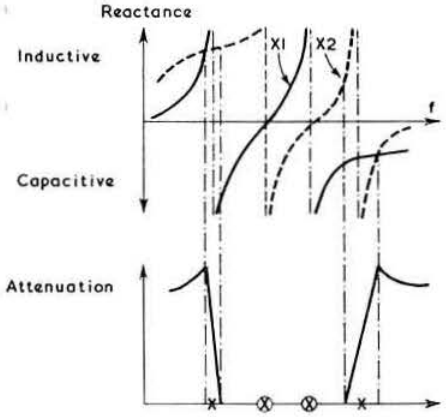


Fig. 9. Four-crystal lattice filter reactance-frequency and attentuation-frequency graphs.

adjust. In commercial practice some of the difficulties of matching are overcome by plating two sets of electrodes on a single quartz plate; the amateur has to turn to other circuit configurations to achieve the same ends.

Two-Crystal Lattice

A suitable circuit is shown in Fig. 10 and is generally called the half lattice filter, although in fact it is the unbalanced equivalent of the four-crystal lattice. The crystals X1 and X2 are the same as the series and shunt crystals in Fig. 8, and have the same frequency relationship. The reactance and attenuation diagrams are the same as for the four-crystal lattice. A capacitor C2 is placed across the higher frequency crystal to enable its pole-zero spacing to be altered slightly. In this way the crystals can be matched to give a flat passband with steep sides and a frequency of infinite attenuation above and below the passband. The circuit L1 C1 is tuned to the mid-band frequency, as also is L2 C3. For best results the input circuit should be as shown, i.e. with the inductor L1 physically centre-tapped, but this is generally difficult to arrange because of the relatively low frequencies at which these filters are used. The alternative (Fig. 11) is to artificially centre-tap by means of two capacitors in series, connected in place of C1. These capacitors are each twice the value of C1 and should be high quality silver mica types in order that the filter characteristic will not be greatly affected by temperature.

This method is usually satisfactory but could be contributory to some attentuation in the passband, since there is

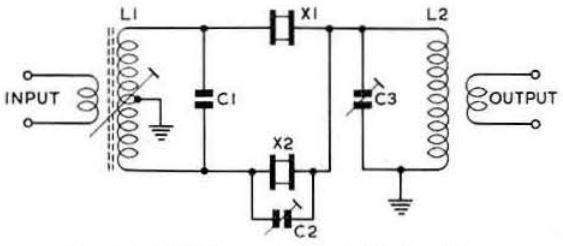


Fig. 10. Half-lattice or two-crystal lattice filter.

a relatively high current demand when one crystal is series resonant. This will tend to unbalance the input circuit which is high impedance and so balanced for voltage only.

Using surplus FT241 type crystals, the input impedance of this filter configuration will be about 250 K ohms for a one per cent bandwidth at the frequencies employed, around 300 to 500 kc/s. This frequency range allows most normal i.f. transformers to be used as input matching devices and pole-zero spreading inductors when modified as in Fig. 11. The comments in the next section on dissipation should be borne in mind when assessing the suitability of any particular transformer, since several factors influence the choice.

The crystals employed should be measured and adjusted so that the relevant poles and zeros are on the same frequency, within a few cycles. Care should also be taken to ensure that all the crystals show approximately the same activity. This is an indication of their Q and since the frequencies of the crystals in a half-lattice filter differ by only 1·5 kc/s or so, it is also an indication of their series resistance. If desired, the series resistance can be measured directly as described later in the measurements section. The series resistances and hence the Q values are only important in that a large difference between crystals will affect the transmission through the filter and, to a lesser extent, the slope of the skirts of the passband. However these are not very critical parameters and differences in series resistance of up to 30 per cent should provide acceptable results.

The half-lattice filter has been very popular for some time, since the use of i.f. transformers for input and output coupling devices and the availability of suitable crystals simplifies construction. It is also quite tolerant of circuit constants so that by appropriate juggling of the transformer tuning slugs

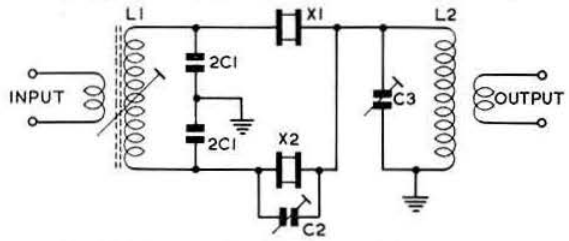


Fig. 11. Two-crystal lattice with capacitive centre-tap.

and the capacitor in shunt with the high frequency crystal it is possible to achieve attenuations greater than 35db over the stopbands with very little dip in the passband.

Where a higher attenuation in the stopband is required, two or more sections may be placed in cascade so that their effects will be additive. This procedure allows less critical adjustment of the filter, although even so it must be laid out carefully if capacitive coupling round the filter is to be avoided and high attenuations achieved.

Dissipation and Termination

Since the properties of these filters depend upon the extremely high Q factors of quartz crystals it may be wondered what effect the Q of the inductors used in the filter has on the overall characteristics. Owing to their high Q factors, crystals can be considered dissipation-less compared with coils, and so the actual filter without terminations does not introduce loss within the passband. Any inductors in series or parallel with a crystal can be transformed mathematically to become part of the terminations; thus this concept of a dissipationless filter is true for any filter. This treatment leads to the view that the attenuation outside the passband is mainly dependent upon the filter and any loss within the passband is due to the terminations.

The loss within the passband can be of two types. The

(Continued on page 342)

A Three Band Crystal Controlled Converter

By JOHN E. HODGKINS (G3EJF)*

IN many amateur stations ex-government receivers getting on for 20 years old are still in use. Whilst these receivers are capable of giving acceptable performance on 3·5 and 7 Mc/s they are woefully inadequate on the higher frequency bands if indeed they cover them at all. The new communications receivers so widely advertised are no doubt fine pieces of equipment but their cost puts them beyond the reach of many amateurs. The would-be DXer is therefore faced with the problem of trying to improve his existing equipment but generally fights shy of the task of carrying out complicated modifications. The alternative approach is to build a converter working into the receiver at a frequency on which it it will perform reasonably well.

Thinking over the design of such a converter, the writer rejected the idea of making it tunable for three reasons: (a) it would be difficult to obtain sufficient stability, (b) it would be necessary to purchase a good (and, therefore, expensive) slow motion dial and calibrate it, and (c) operating the equipment with the tuning knob on the converter and all the other controls on the receiver would be rather like driving a car from the passenger seat. The alternative, a fixed tuned converter with a crystal controlled oscillator, overcomes these objections and can be built for £2-3. At the same time, it allows full use to be made of the mechanical side of the main receiver used as the tunable i.f.

The circuit adopted is shown in Fig. 1 and employs 6AK5 and 6J6 valves, both of which are available very cheaply, while the crystals are also readily obtainable.

The converter works into the receiver in the 4 Mc/s region, the actual ranges covered being:

14-14·35 Mc/s, tuned as 4-4·35 Mc/s.
21-21·45 Mc/s, tuned as 3·975-4·425 Mc/s.
28-29·7 Mc/s, tuned as 4-5·7 Mc/s.

The main difficulty likely to be encountered with this type of converter is breakthrough of strong signals at the tunable i.f. This is best avoided by careful screening of the converter and by the use of coaxial cable, terminated with the proper plugs and sockets, between converter and receiver. The converter should be bonded to the main receiver with thick braid. In addition, coupling between the aerial and converter r.f. stage and between r.f. stage and mixer should be as loose as possible. A separate aerial tuning unit also helps.

* 24 Beryl Avenue, Tottington, near Bury, Lancs.

Construction

The converter may conveniently be built on a chassis measuring 6 in. × 3 in. × 2 in. and fitted in a cabinet 4½ in. high. Normal constructional practices should be observed, e.g. the grid circuit of the r.f. stage should be shielded from the remainder of the converter by a below-chassis shield cut to fit snugly over the valveholder. It should be noted that the 6AK5 has two cathode pins (2 and 7), both of which should be fitted with bypass capacitors. The cathode resistor should be connected to pin 2.

In many receivers the aerial coupling coil in circuit at 4 Mc/s will resonate on one of the bands covered by the converter. When this happens the mixer will burst into self-oscillation. The correct type of inductance for L3 must be found by trial and error. At G3EJF a Wearite " P " type medium wave coil is used for L3 and no mixer oscillation occurs.

Adjustment

Correct operation of the crystal oscillator is best checked by listening to its output on a receiver. With the switch on the converter in the 14 Mc/s position adjust the core of L4 until the crystal oscillates on 10 Mc/s. On this band the stage works as a normal crystal oscillator. On the other bands the crystals oscillate on their third overtones, viz. 17·025 and 24 Mc/s for the 21 and 28 Mc/s bands respectively. With the switch at 21 Mc/s adjust L5 until stable oscillation occurs on the third overtone with *no signal* audible on the fundamental frequency. If the crystal refuses to oscillate correctly the tap on the coil should be moved a turn at a time towards the anode end. If, however, unstable oscillation tunable by adjustment of the core is obtained, the tap should be moved nearer to the crystal end of the coil. Repeat for 28 Mc/s varying the inductance of L6. Adjustment of the

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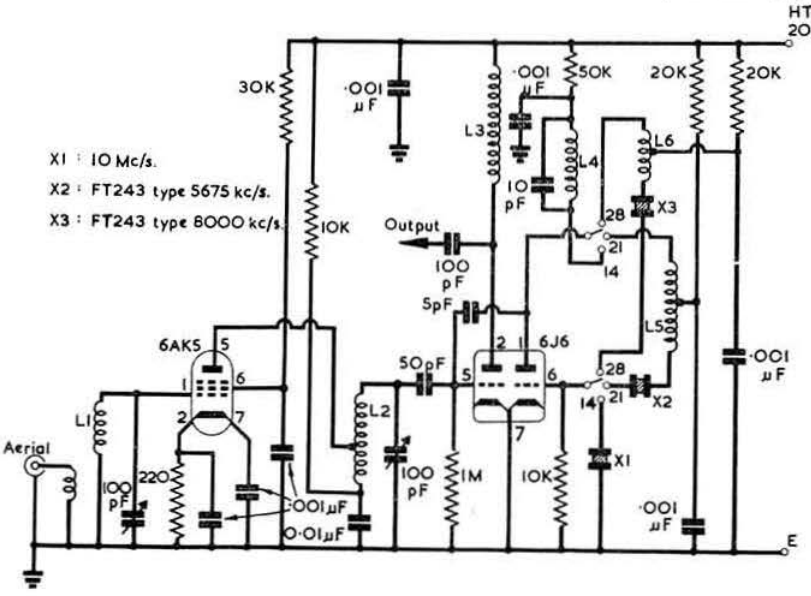


Fig. 1. Circuit of the crystal controlled converter for 14, 21 and 28 Mc/s.

L1, 8 turns 26 s.w.g. enamelled wire close wound on ¾ in. diameter former with dust-iron core with 1 turn aerial coupling link at earthy end.

L2, 7 turns 26 s.w.g. enamelled wire close wound on ¾ in. diameter former with dust-iron core and tapped 2 turns from earthy end.

L3, see text.

L4, 33 turns 26 s.w.g. enamelled wire close wound on ¾ in. diameter former with dust-iron core.

L5, 20 turns 26 s.w.g. enamelled wire tapped at 5 turns from crystal end and close wound on ¾ in. diameter former with dust-iron core.

L6, 15 turns 26 s.w.g. enamelled wire tapped at 5 turns from crystal end and close wound on ¾ in. diameter former with dust-iron core.

X1, 10,000 kc/s crystal.

X2, 5675 kc/s crystal.

X3, 8000 kc/s crystal.

The suppressor grid of the 6AK5 should be shown connected to the cathode in this diagram.

A Hybrid Oscillator—Balanced Modulator for S.S.B. Generation

By P. F. CUNDY, A.M.I.E.E. (G2MQ)*

IN the design of filter-type s.s.b. exciters, each frequency change, of which there may be three or four, consists of a local oscillator, balanced modulator and a sideband selection filter. The local oscillator, usually crystal controlled, is only required to deliver an output of a volt or two to the modulator. Valve oscillators will not work unless the amplitude is of the order of 50–100 volts, the lower voltage being obtained from a low impedance coupling winding. Each oscillator stage needs heater and anode voltage supply, with decoupling, and fairly elaborate screening to prevent radiation from the relatively high r.f. amplitude at which the local oscillator operates. Three such stages radiating fundamental and harmonics produce countless opportunities for spurious signal generation. A transistor crystal oscillator will operate quite satisfactorily at the one or two volt level and this immediately reduces the spurious signal problem by a factor of 10 to 20. It also eliminates the heater supply and by adopting the method to be described the collector supply may be obtained directly from the normally associated balanced modulator.

Transistor Amplifiers

The almost standard circuit in which to operate a transistor is shown in Fig. 1. Since the transistor is a current operated

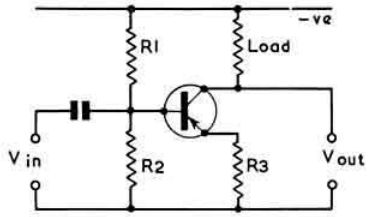


Fig. 1. Basic transistor common-emitter amplifier.

device, the emitter-base junction is permanently held in the forward conducting direction by the potential present at the junction of R1 and R2. The magnitude of this current is then controlled by the equivalent series resistance of the R1 and R2 divider and by R3. The resistance of the R1, R2 path must be low compared with any internal leakage of the transistor in the context of both sample to sample variation and temperature dependent leakage. Resistor R3 is included to determine finally the direct emitter current independent of variations of the characteristics of the emitter-base "diode." Unless bypassed, R3 causes degeneration in the signal path. In the circuit to be described the risk of omitting R3 with its bypass capacitance is small. The potential at the R1, R2 junction is chosen to suit the bias need of the valves with which it will ultimately be associated. When R3 is omitted or of low value the magnitude of the base current is mainly determined by the equivalent series resistance of R1 and R2. If this current is excessive it not only upsets the transistor operation, but also the potential of the R1, R2 junction. A series base resistor is included to limit this current and avoid these effects. A small amount of series emitter resistance is retained, unbypassed, to improve the waveform.

* *52 Highfield Close, Amersham, Bucks.*

The Transistor Crystal Oscillator

The final form of the crystal oscillator is as shown in Fig. 2. The crystal is connected in a similar manner to the Pierce valve oscillator arrangement, the crystal operating in its series resonance mode; it is only at the resonance point that the series impedance of the crystal falls low enough compared

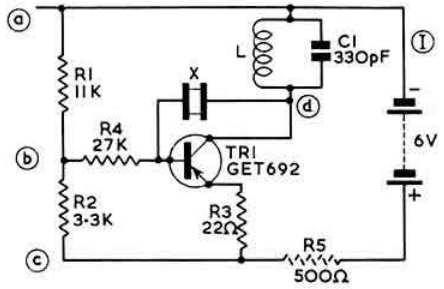


Fig. 2. Crystal oscillator based on the circuit of Fig. 1. L is one winding from a standard 465 kc/s i.f. transformer.

Approximate circuit conditions

	Supply		*R.F.*
I	4·6 mA	V_{ac}	0·5V r.m.s.
V_{ab}	2·5V	V_{ad}	3·2V r.m.s.
V_{ac}	3·7V		

to the input circuit for adequate base drive to appear. The tuned circuit is not critical; it merely provides a load across which the transistor output can be developed, but it performs best when it is resonant on the low frequency side of the crystal and with a much higher *C* than would be expected

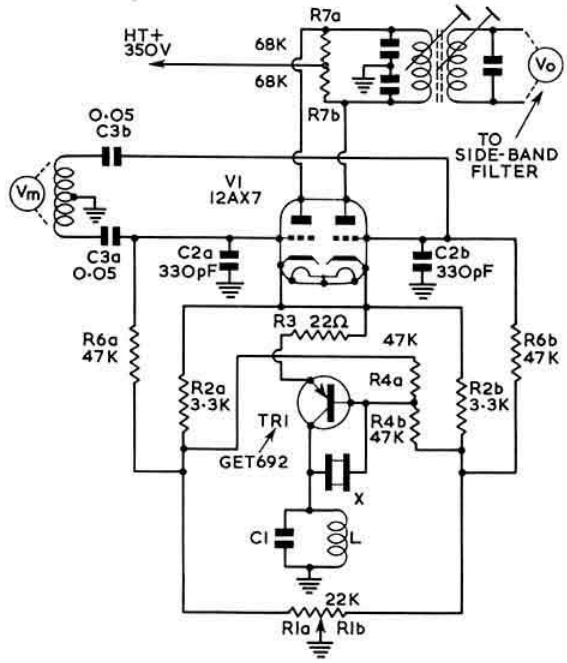


Fig. 3. Circuit of the hybrid balanced modulator. C2a, C2b, should be 330 pF if the modulation is audio: if the modulation is r.f. these capacitors resonate the input circuit. C3a, C3b, are 0·05 μF for audio modulation, proportionately less for higher frequencies. All resistors are ¼ watt rating except R7a and R7b which should be ½ watt types.

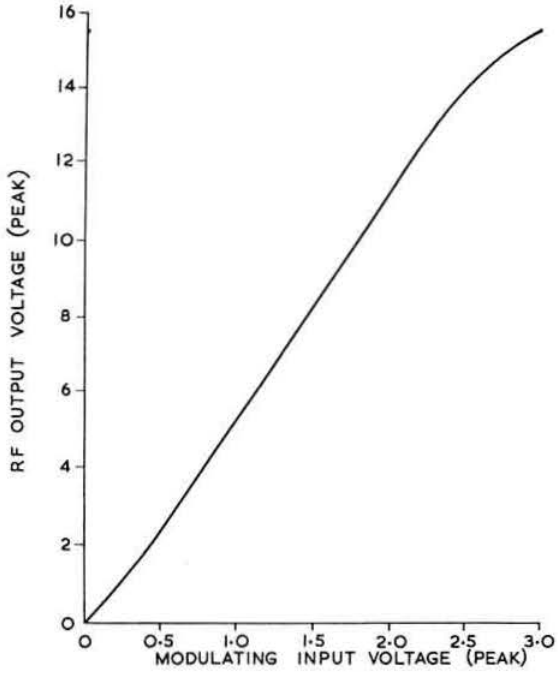


Fig. 4. Modulator input/output characteristics.

from a similar valve circuit; a coil of 0·5 to 0·6 millihenry with tuning capacitor of about 300 pF is suitable at approximately 0·5 Mc/s with proportional reductions for higher frequencies. The resistance shown dotted does not have a physical existence—it is the cathode follower output impedance from which, in the final circuit, the transistor will obtain its direct current supply. It will be found most helpful to check the operation of the oscillator stage before proceeding with further construction, using a 500 ohm resistance in the position shown dotted and a battery supply of 6 volts. The approximate direct and radio frequency voltages to be expected at various parts of the circuit are indicated. Three specimens of what are intended to be broadcast band transistors have operated perfectly satisfactorily up to 8 Mc/s with suitable adjustment of the L/C circuit. Even quite poor crystals that were difficult in valve circuits could be made to work, but for some of the more obstinate specimens the emitter series resistor had to be bypassed with a 0·1 μF capacitor, or omitted.

The Balanced Modulator

It will be seen from Fig. 2 that the current requirements of the transistor is about 2 mA from each triode and the obvious choice is for a high impedance valve such as the ECC83/12AX7. The high impedance valve offers a further advantage if a centre tapped coil for the filter input is not available. A r.f. centre tap is easily provided by two series capacitors, but resistors are needed to complete the d.c. path. These resistors can be of high value with high impedance valves and low input circuit damping will result.

The bias requirement obtained from the characteristic curves of the ECC83 is about —1·1 volts which appears at the R1, R2 junction, but in order to provide a means of exact modulator balance the network is duplicated and the 11 K ohms portions combined in one 22 K ohms preset potentiometer. If the transistor which under normal operation takes about 4·0 mA at 3·6 volts is considered to be replaced by a resistor it is possible to construct a curve from the valve characteristics giving voltage, current and power input to the transistor for any value of this equivalent resistance. This indicates that the maximum dissipation cannot exceed 21 mW which is one quarter of that permitted, and no malfunctioning is likely to damage the transistor.

The Complete Oscillator/Modulator

The complete circuit diagram of the oscillator/modulator is shown in Fig. 3; the transistor circuit of Fig. 2 being turned upside down for the convenience of circuit convention and the direction of current flow, the same component references are retained in these two diagrams. The modulating signal could be applied to just one grid thus avoiding the need for push-pull connection, but this would cause half the oscillator current to have a superimposed modulating signal, whereas the push-pull arrangements keep the total cathode current substantially constant.

In order to check linearity and signal handling capacity it is convenient accurately to balance the modulator and then apply equal d.c. bias across each of the 47 K ohms grid resistors of opposite polarity; this can be done quite easily with two 4·5 volt dry batteries and series resistors. The amount of carrier appearing across the filter input winding as a result of this controlled unbalance is read on a valve voltmeter. The result of these measurements are shown in Fig. 4, the drive voltage being the sum of the two externally applied bias potentials. From this it will be seen that a modulating signal of up to 2·5 volts peak will be accepted without distortion and that this will produce an output of 14 volts peak at the filter input.

Although originally arranged for use with 12AX7 and an h.t. supply of 350 volts, valve substitution tests have shown that the 12AT7, with a supply of 250 volts, gives an almost identical performance and may be used where the lower h.t. supply is preferred for other reasons. The layout is not critical and any arrangement following sound practice would seem satisfactory. Probably the best configuration is to arrange the oscillator circuit components around the valveholder and to enclose them in a sub-chassis screening box, but this demands modern sub-miniature components. An alternative arrangement, allowing more room, is to mount the oscillator components above chassis in a conventional i.f. transformer can and then to mount the valve between this and the filter input transformer. The latter course was the one adopted at G2MQ.

Colour Television Lecture

ON February 8, Mr. I. J. P. James, B.Sc., M.I.E.E., M.Brit.I.R.E., of E.M.I. Ltd., will lecture to the Radar and Electronics Association on Colour Television. The meeting will be held at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, and will commence at 7 p.m.

South Dorset Radio Society

THE Honorary Secretary of the newly-formed South Dorset Radio Society is now Mr. C. E. Biggs (G2TZ), 54 Prince of Wales Road, Dorchester. He has succeeded Mr. A. A. Barrett (G5UF) of Bridport, Dorchester.

RTTY

A Quarterly Review of Amateur Radio Teleprinting News and Views

By ARTHUR C. GEE (G2UK)*

SINCE the last instalment in this series, two noteworthy events have occurred. The first was the appearance of the British Amateur Radio Teleprinting Group's *RTTY Manual*. This is a book of some 85 pages of photostatically reproduced technical information on RTTY from those journals which have published material on this topic in the past year or so. In it the beginner will find all he needs to know to get on the air "RTTY-wise." It has been produced at low cost by Geoff. Allcock (G3ION) and thanks to his enterprise it can be sold at the remarkably low price of 5s. 9d. post paid, with the prospect of some profits to the Group's funds. It is available from the Hon. Secretary of the Group, and is very good value indeed. It is the only publication of its type on RTTY available this side of the Atlantic.

The other event of note was the Group's A.G.M. and "Get-together" at the "Old Rose," Medway Street, Westminster, on Saturday evening, November 25 last. This was very well attended, some 40 members enjoying beer and sandwiches and some good discussions on current RTTY problems. The liveliness of the latter speaks well for the enthusiasm of the members present and the Group can look forward to some very interesting activities during the months ahead.

Reception of RTTY

It was stated when this series of articles began, that every effort would be made, in the space available, to give some technical material on RTTY. So a few words this time on the reception of RTTY signals.

Any normal communications type receiver is suitable, provided it is really stable. The latter is very important, as will be seen in a moment. An expensive receiver is by no means necessary; the writer used a BC348 for his initial RTTY work and it proved very satisfactory, being superior in regards to freedom from drift to some much more expensive receivers he has tried since. Radioteleprinter signals have a quite distinct sound on the air. They must be tuned in with the b.f.o. on, when the characteristic two tone sound resulting, has given them the colloquial name of "jingle bells"! This is produced because the carrier, which is on continuously, is shifted in frequency by 850 c/s. When an audible note is produced by beating with the b.f.o., two distinct audio tones are produced, which, being rapidly repeated, give quite a musical sounding effect. These two audio tones are separated by sharply tuned audio filters, converted into d.c. pulses and used to "key" the teleprinter. We see, therefore, the importance of a really stable receiver.

If it drifts, the audio tones drift and so the sharply tuned audio filters cease to accept the signal and the receiver has to be constantly retuned even though the drift may be only very slight.

Once the d.c. pulses are obtained, which are now the same as those being sent by the transmitting teleprinter station, they can be used to work the receiving teleprinter. They can either be amplified and used directly to work the T/P electromagnetic receiving mechanism or they can be used to actuate a high speed relay, which in turn keys an external source of power for the T/P. The latter system is that at present mostly used by British RTTY enthusiasts.

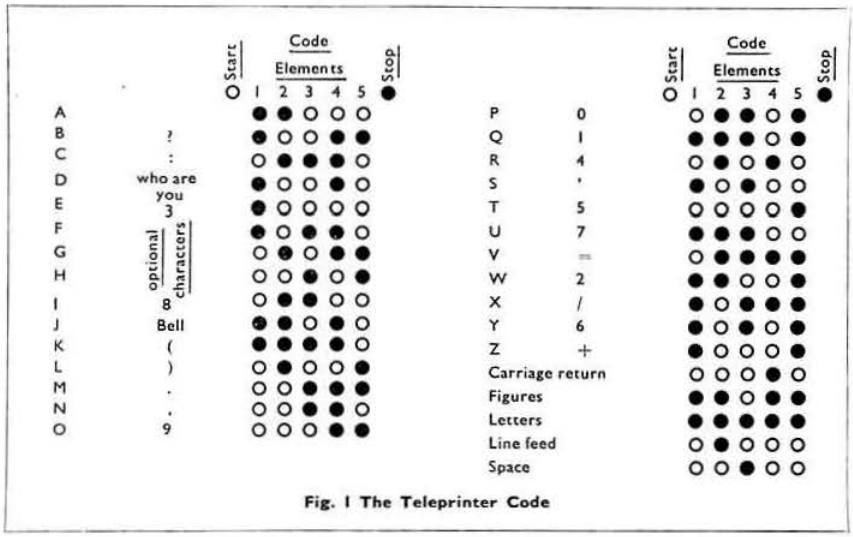


Fig. 1 The Teleprinter Code

The audio tones could of course be sent by a normal phone transmitter, simply feeding the output from a two tone audio oscillator into the modulator of the transmitter. This method is in fact used on the v.h.f's., and is designated a.f.s.k.—audio frequency shift keying. This method has certain disadvantages compared with the previously described f.s.k.—frequency shift keying—method over ionospherically propagated radio paths.

The teleprinter code is shown in Fig. 1. As was mentioned earlier, it consists of groups of five impulses in various permutations, the overall time-length of each group being the same.

So it can be seen that all that is needed to convert the normal Amateur Radio station for radio teleprinting is, on the receiving side, a unit to separate the tones from the receiver and convert them into d.c. pulses and on the transmitting side, a unit either to shift the carrier frequency by a few hundred c/s or if we are interested in 2m, a two tone audio oscillator to feed into the transmitter modulator. In the April issue it is proposed to deal in more detail with the receiver unit or Terminal Unit—abbreviated to "T.U." in RTTY parlance—as it is called.

* *Hon. Secretary, British Amateur Radio Teleprinting Group, "East Keal," Romany Road, Oulton Broad, Lowestoft, Suffolk.*

Single Sideband

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

IN the relevant G.P.O. regulations the allowable peak r.f. voltage output from a sideband transmitter is twice that of the unmodulated a.m. transmitter running at 150 watts input and operating with an overall efficiency of 66 per cent. This means that the two transmitters are put on the same basis in regard to allowable peak r.f. voltage and therefore the permissible peak r.f. power output.

The operating conditions in regard to the 150 watt input a.m. transmitter have been considered and last month it was shown that with an overall efficiency of 66 per cent the p.e.p. (peak envelope power) output of the a.m. transmitter was 400 watts. This, then, so far as s.s.b. operators are concerned, is the maximum legal power output—400 watts p.e.p.—and constitutes the limit to which the power amplifier may be operated. Of further consideration is the fact that the s.s.b. transmitter is rated on r.f. power *output*. This in practice is of considerable importance because if the sideband transmitter had been rated on the same p.e.p. *input* as the a.m. transmitter the limit would have been 600 watts p.e.p. The existing regulation means that the s.s.b. linear amplifier can be operated at a lower efficiency (in class A or AB1) without penalizing the operator, i.e. an AB1 amplifier with an overall efficiency of 50 per cent and 400 watts p.e.p. output would be running at a p.e.p. input of 800 watts, and this would still be within the licence conditions. This means that an operator who elects to run his amplifier at a lower efficiency in the interests of radiating a clean signal with a low order of intermodulation distortion and the minimum amount of splatter and harmonic output and the least possibility of broadcast and television interference, is not penalized for doing so.

This point is particularly stressed because the experience of the last 10 years has shown that an overdriven s.s.b. linear amplifier is to be avoided at all costs. It can create interference that is much worse than that from the most badly run and overmodulated a.m. power amplifier. Had the regulation been one of maximum input power there might have been the temptation to run the amplifier in class B with a low standing anode current in order to obtain the maximum efficiency, and to drive it to the limit the valve could take. Under the existing regulations there is every encouragement to use a big valve or valves and run them lightly, at lower efficiency, in the most linear manner.

S.S.B. Output Power

The 150 watt d.c. input a.m. transmitter with an overall efficiency of 66 per cent has a p.e.p. output of 400 watts. However, the effective or mean power output with a single tone sine wave modulation is 150 watts. Of this available power output 100 watts is generating the carrier which is of constant amplitude and unaffected by the absence or presence of modulation. The remaining 50 watts is the total sideband power and it is this part of the signal, and this part only, that carries the intelligence. Under voice modulation conditions the input is not a sine wave but the peaky wave form of speech. It is generally considered that the peak to mean ratio of the average voice is 3 to 1 and if this figure is accepted the mean sideband power of the 150 watt d.c. input a.m. transmitter under the conditions of normal voice operation is 17 watts.†

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

† Speech clipping and compression circuits can reduce this ratio to 2 to 1 or even lower. However this type of circuitry has never become popular and is not normally used by the majority of amateurs.

Having defined the maximum power output of the sideband transmitter it will be of interest to see how the modulation envelope and the mean power output under sine wave and voice modulation for the same p.e.p. output of 400 watts compares with that of the a.m. transmission.

A single tone modulation of 1 kc/s into an a.m. transmitter produces two sidebands, each spaced 1 kc/s above and below the carrier frequency. The maximum voltage of each sideband is one half of that of the carrier. As these three components of the transmitter output wave are r.f. on different frequencies they run in and out of phase with each other and the resultant effect in terms of voltage can be seen on a cathode ray oscilloscope as a modulation envelope. As there is no carrier output from an s.s.b. transmitter because the carrier has been " suppressed " at the balanced modulator, a single tone input into the audio section does not produce a modulation envelope—instead it drives the linear amplifier with r.f. displaced 1 kc/s above or below the nominal carrier frequency (depending on which sideband the transmitter is radiating) and the transmitter output is a pure c.w. signal. In fact the same kind of output as the a.m. transmitter when it is *not* modulated. This is shown in Fig. 1. If the audio gain control is advanced sufficiently the p.a. can be driven to 400 watts p.e.p. output, and assuming that the

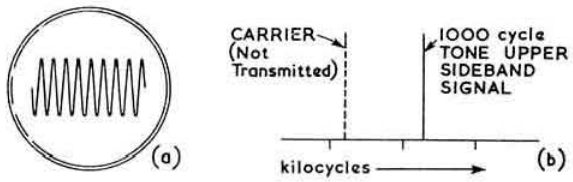


Fig. 1. R.F. output of s.s.b. transmitter with single-tone modulation. (a) Oscilloscope pattern; (b) Spectrum for 1,000 cycle tone.

transmitter output was being absorbed into a 100 ohm dummy load in the same way as the a.m. transmitter considered last month the r.f. ammeter would read 2 amps. It is obvious from this that under these conditions the average or mean power output is the same as the p.e.p.—they are both 400 watts.

At first sight it would appear that if a single tone sine wave input to the a.m. transmitter produces a mean power output of 150 watts and exactly the same tone input to the s.s.b. transmitter produces a mean power output of 400 watts, there is something grossly unfair about the licence regulations. However, this is not so. A single tone input into an s.s.b. transmitter can only be used for amplifier adjustment and power measurement purposes—it is quite useless for anything else because it cannot convey any intelligence. Under normal voice operation on the air, a condition where the mean output power is equal to the peak envelope output power never exists.

It is obvious then that any comparison of output power under single tone input conditions is completely meaningless, and that the only reasonable condition for comparison would be where the s.s.b. transmitter was also producing a fundamental modulation envelope. This condition arises when the power amplifier is being driven with two frequencies of equal amplitude—under two-tone input conditions—and this is the nearest approach it is possible to get to the classical modulation envelope shape of the a.m. transmitter. Very loosely one audio input could be considered as producing a carrier and the other audio tone as modulating it, but this supposition would be incorrect. The repetition rate of the envelope peaks is neither of the two input frequencies, but is in fact the difference frequency, the beat, between the two. The generation of this two-tone envelope is shown clearly by the diagrams in Fig. 2.

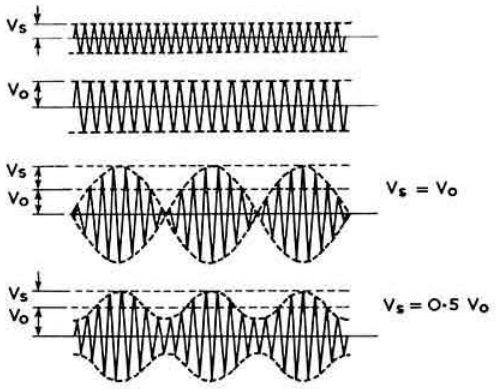
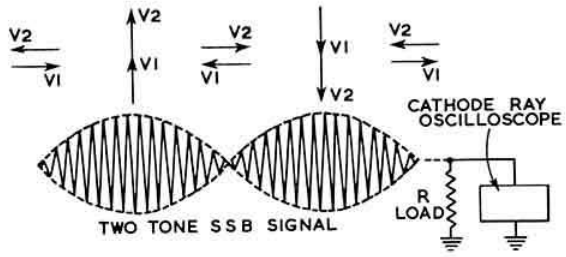


Fig. 2. Typical heterodyne waves, showing how the combining of two waves of slightly different frequencies results in a wave which pulsates in amplitude at the difference frequency of the component waves, and how the wave shape of the envelope of the resultant wave depends upon the relative amplitudes of the two components.

The Two-Tone Envelope

To the sideband operator the two-tone envelope is of special importance because it is from this envelope that the power output from an s.s.b. system is usually determined. An s.s.b. transmitter is rated in p.e.p. output with the power measured with a two equal-tone test signal. With such a signal the actual watts dissipated in the load are one half the p.e.p. The generation of this two-tone envelope can be shown clearly with vectors representing the two audio frequencies as shown in Fig. 3. When the two vectors are opposite in phase the envelope voltage is zero. When the two vectors are exactly in phase, the envelope value is maximum. This generates the half sine-wave shape of the two-tone s.s.b. envelope which has a repetition frequency equal to the difference between the two audio tones.

When the half sine-wave signal is fed into a load, an r.m.s. calibrated cathode ray oscilloscope across the load indicates the r.m.s. value of the peak envelope voltage. This c.r.o. deflection is equal to the in-phase sum of $V1 + V2$, where $V1$ and $V2$ are the r.m.s. voltages of the two tones. Since $V1 = V2$, the p.e.p. $= (2V1)^2/R$ or $(2V2)^2/R$. The mean power dissipated in the load must equal the sum of the power represented by each tone, $V1^2/R + V2^2/R = 2V1^2/R$ or $2V2^2/R$. Therefore, with a two equal-tone s.s.b. test signal, the mean power dissipated in the load is equal to 0·5 of the p.e.p., and the power in each tone is equal to 0·25 of the



$V_{(cro)} = (V_1 + V_2)$ with V_1 and V_2 in phase and r.m.s. values.
P.E.P. $= V^2_{(cro)}/R_{Load} = 4V_1^2/R$ or $4V_2^2/R$
where $V_1 = V_2$
$P_{Mean} = V_1^2/R + V_2^2/R = 2V_1^2/R$ or $2V_2^2/R$.
Therefore: (1) P.E.P. $= V^2_{(cro)}/R$
(2) $P_{Mean} = \frac{1}{2}$P.E.P.
(3) $P_{Tone\ 1}$ or $P_{Tone\ 2} = \frac{1}{4}$P.E.P.

Fig. 3. Power measurement from two-tone s.s.b. test signal.

p.e.p. The peak envelope power can be determined from the relationship, p.e.p. $= V^2(c.r.o.)/R$. The mean power can be determined from the relationship, $P_{mean} = \frac{1}{2}V^2(c.r.o.)/R$. Similar measurements can be made using an r.f. ammeter in series with the load instead of the c.r.o. across the load. The analysis can be carried further to show that with a three equal-tone s.s.b. test signal, the power in each tone is one-ninth of the p.e.p., and the mean power dissipated in the load is one-third the p.e.p.; with a four equal-tone test signal the power in each tone is one-sixteenth of the p.e.p., and the mean power is one-quarter the p.e.p. and so on.

Fundamental Envelope Comparison

We know that with the a.m. transmitter running to the full licensed ratings and an overall efficiency of 66 per cent the mean power output under conditions producing a fundamental modulation envelope (single-tone input) is 150 watts and of this output power 50 watts is in the sidebands and conveying the intelligence. It is also known that with the s.s.b. transmitter running to the same rating of 400 watts p.e.p., under conditions producing a fundamental modulation envelope (two-tone input) the mean power output is 200 watts, and of this output power the whole of it is in the sideband and conveying intelligence. Under speech conditions—assuming a peak to mean ratio of 3 to 1—the a.m.

TABLE I

Operating Condition	A.M. Transmitter (150 watts d.c. input)	S.S.B. Transmitter (Peak envelope voltage = twice that from 150 W input class C amplifier)
P.E.P. Output (Single tone sine wave modulation)	P.E.P. = 400 watts	P.E.P. = 400 watts
Total Output (Fundamental modulation envelope)	P_{mean} = 150 watts	P_{mean} = 200 watts
Sideband Output (Fundamental modulation envelope)	P_{mean} = 50 watts	P_{mean} = 200 watts
Sideband Output (Normal speech modulation)	P_{mean} = 17 watts	P_{mean} = 67 watts

transmitter mean sideband power is approximately 17 watts (one third of 50) and the s.s.b. transmitter mean sideband power is approximately 67 watts (one third of 200).

It could of course be argued that the mean sideband power of the s.s.b. transmitter is not the quoted figure of 67 watts but should be 133 watts (one third of 400). However, it is hardly likely that under normal speech conditions the transmitter would ever be modulated with one single audio frequency—even for the most minute period of time. The human voice is so complex, with its peaky wave-form and simultaneous tones and harmonics, it is unlikely that any condition could arise where the instantaneous power output exceeded 200 watts. If this is agreed, then the figure of a mean power output of 67 watts, using normal voice modulation without clipping or peak limiting, is an acceptable one.

It is also clear from all this that any comparison of a.m. and s.s.b. in terms of sideband power is extremely difficult. The two systems of transmission are so widely different it is not possible to find any common denominator that will serve as a basis and allow an exact comparison. All we can do as amateurs is consider the two transmissions and the operating conditions required in the power amplifier, on the basis of the maximum licensed p.e.p. output which is the same for both methods. This can then be related to the known factors that apply under tone input and voice operation conditions. These are shown in Table 1.

Test Report

The Drake 2-B Communications Receiver

REVIEWED BY R. F. STEVENS (G2BVN)*

The Drake Communications Receiver with its companion Q multiplier/loudspeaker.

THE Model 2-B communications receiver manufactured by the R. L. Drake Company of Miamisburg, Ohio, U.S.A., is the third and latest version of the original receiver produced several years ago and which was known as the Type 1-A. This equipment caused considerable interest in trans-Atlantic amateur circles by its unorthodox appearance, excellent performance and moderate price. The latest version, whilst of conventional mechanical design, exhibits the other characteristics of its predecessor and is apparently finding ready acceptance by overseas operators.

The 2-B is a triple conversion superhet with a crystal controlled first oscillator and an extremely stable variable oscillator tuning the same 600 kc/s range for all bands. Selectivity is achieved by a variable bandwidth *L-C* filter at the final i.f. of 50 kc/s. Other features include a dual time constant a.g.c. system, a choice of either a diode or product detector, passband tuning on each of the three variable bandwidths of 0·5, 2·1 and 3·6 kc/s, and a series noise limiter for a.m. reception. There is also provision for optional accessories such as a *Q* Multiplier and a crystal calibrator. Physically, the receiver is small, measuring 12 in. wide, 7 in. high and 9 in. deep, and weighs 14½ lb. The power consumption is 40 watts from a 120 V a.c. supply. Full operating and maintenance instructions are given in the very adequate 30-page manual.

Circuit

From the block diagram (Fig. 1) it will be seen that the r.f. stage employs a 6BZ6 semi-remote cutoff pentode and the tuned circuits have one dual control. This stage is followed by a low noise mixer/crystal oscillator using a 6U8, which in turn feeds a variable oscillator/mixer utilizing a 6BE6 and which covers a tuning range of 3955 to 4555 kc/s for all bands. The output frequency of 455 kc/s from the second mixer is passed to another 6BE6 and converted to 50 kc/s for presentation to the passband tuner/filter. The three bandwidths are selected by a switch whilst a concentric tuning control allows the passband to be varied between 47 and 53 kc/s without any change of shape. A 6BA6 i.f. amplifier is followed by a detector which can be either a diode type for a.m. (one section of a 6BF6 valve) or a combined product detector and b.f.o. using a 6BE6. The remaining sections of the 6BF6 function as a.g.c. amplifier and rectifier. The circuitry incorporates time constants of 0·75 and 0·025 second discharge, and the a.g.c. line is brought out to a terminal at the rear of the chassis which allows connection of a suitable capacitor to obtain a longer time constant if desired. The three sections of the 8BN8 valve are employed as a series noise limiter, bias rectifier and a.f. amplifier. The audio output valve is a 6AQ5 giving a maximum power of 1 watt, whilst a 6X4 is used in a full wave rectifier circuit supplying the h.t. rail of 150 volts.

A combination *Q* Multiplier and loudspeaker is available; the former providing facilities for the rejection of heterodynes or peaking a c.w. signal. An accessory crystal calibrator provides 100 kc/s markers throughout the tuning range of the receiver, and is mounted inside the equipment. The crystals supplied with the Model 2-B provide coverage for the following bands: 3·5 to 4·1 Mc/s; 6·9 to 7·5 Mc/s; 13·9 to 14·5 Mc/s; 20·9 to 21·5 Mc/s and 28·5 to 29·1 Mc/s.

* *Member, Technical Committee.*

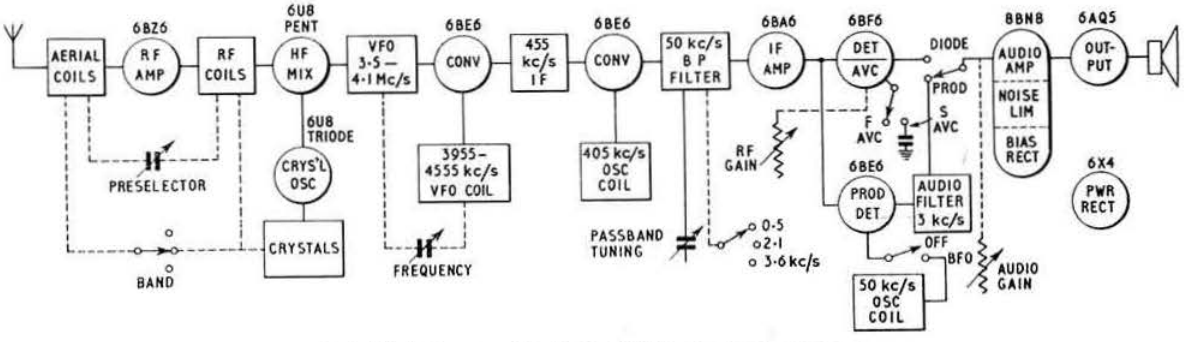


Fig. 1. Block diagram of the Drake 2-B Communications Receiver.

Two further amateur band ranges are available with crystals providing coverage for the remaining portions of the 28 to 29·7 Mc/s band, whilst five universal ranges of 600 kc/s each may be selected between 3 and 30 Mc/s by the choice of suitable crystals. This provides a total of twelve 600 kc/s bands which may be selected from the front panel. Internal spurious responses, always a problem in this type of receiver, are held to a level which is less than an equivalent 1 μV signal. The dial calibration is marked at intervals of 10 kc/s, with 1 kc/s vernier dial divisions on the rim of the tuning knob, both of these being adjustable for calibration purposes. The S meter, which is operative on all modes, forms part of a bridge circuit in the anodes of the r.f. and i.f. amplifiers. However, after the S meter had been calibrated in accordance with the instruction manual it was found that only a local signal would produce an S9 reading.

Operation

The receiver has been used for the reception of all modes of transmission and naturally the 3·6 kc/s bandwidth position provides the most faithful reproduction of a.m. signals, whilst the 2·1 kc/s position is optimum for s.s.b. The 500 c/s bandwidth enables c.w. signals to be read through heavy QRM, and when the *Q* Multiplier is used this can provide true single signal reception. At any position of the bandwidth switch the passband tuning control allows selection of upper or lower sideband without readjustment of the main tuning control. Sideband signals are as easy to tune as their a.m. counterparts, and in the event of heavy QRM the 500 c/s bandwidth is usable although obviously speech quality suffers. The adjacent channel selectivity is steep sided and approaches that provided by mechanical filters whilst the passbands are continuously movable above and below the fixed b.f.o. frequency of 50 kc/s. The bandwidth at 60db down on the three selectivity positions is 2·75 kc/s, 7·5 kc/s, and 10·5 kc/s respectively.

It is desirable that a receiver capable of high selectivity should also have good frequency stability and in this respect the Model 2-B is second to none. The manufacturers claim a warm-up drift of less than 400 c/s, and a shift of less than 100 cycles after this initial period; experience has given no grounds for argument with these figures, which are the result of the use of a crystal controlled first oscillator and a carefully designed low frequency variable escillator.

A review of this nature can only deal briefly with the salient points of the equipment used and many details must be left unmentioned, but it should be said that the feel of the main tuning control, which is coupled by a cord drive to the dial mechanism, left something to be desired and a geared flywheel arrangement would be preferred. The mains transformer in the receiver is designed for 60 c/s operation which probably accounts for a large proportion of the heat radiated from this component. However, during an extended period of operation the Model 2-B gave every satisfaction and is highly recommended as a communications receiver of outstanding performance. The latter, in the experience of the writer, has been excelled only by a receiver the cost of which was roughly three times that of the Drake product.

The Model 2-B receiver reviewed was supplied by K.W. Electronics Ltd. of Vanguard Works, Heath Street, Dartford, Kent, and costs £138, including the crystal calibrator and loudspeaker/*Q* Multiplier.

The G4ZU FB-5 Aerial

THE type of bead required for the G4ZU FB-5 aerial described in *Technical Topics* on page 283 of the December issue of the BULLETIN is Mullard B4 pattern FX1308 and not FX1300 as mentioned.

An Introduction to Crystal Filters

(Continued from page 334)

first is frequency sensitive and gives rise to an uneven passband; the second provides a constant loss and can be considered as a purely resistive effect. This latter loss is of little consequence, since it can be made good in any amplifier associated with the filter, by merely increasing its gain.

The former type, however, is a little more difficult to eliminate as it usually results in a deep dip in the middle of the passband. This effect can be due to two causes, the first being that the pole of the l.f. crystal does not coincide with the zero of the h.f. crystal. Any dip due to this can only be fully eliminated by ensuring that these two frequencies do coincide. The second cause arises when the dynamic impedance of the input tuned circuit at resonance is comparable with the input impedance of the filter, thus lowering the effective impedance across which the signal is developed. If the dip becomes more than about 6db below the maximum response of the filter, the distortion of signals passed through the filter is most noticeable. By using inductors having relatively high *Q* factors it is possible to adjust the terminations so that the dip in the passband is well below this figure and thus a reasonable flat response may be obtained. A coil of 1·8mH having a *Q* value of 50 or greater would enable this state of affairs to be achieved at 465 kc/s with the half-lattice filter described. However, since the dynamic impedance of the coil depends upon the frequency and the inductance as well as the *Q* factor, it is not possible to generalise. A far better guide to the values required in any particular case can be obtained by considering the dynamic impedance of the tuned circuit and comparing it with the filter input impedance in the passband.

If Z_d is the dynamic impedance, then $Z_d = L/CR$ where L, C and R relate to the tuned circuit, and $Q = \frac{L}{R}\omega$ Hence $Z_d = 2\pi f_o QL$ where f_o is the resonant frequency of the tuned circuit. Now for least dip in the passband the dynamic impedance should be several times greater than the filter input impedance, but if this is not possible, an absolute limit for satisfactory operation can be considered to be when Z_d equals the filter input impedance.

A Three Band Crystal Controlled Converter

(Continued from page 335)

amount of oscillator output on any band may be made by altering the value of h.t. dropping resistor to the coil concerned.

Once the crystal oscillator is functioning satisfactory, L1 and L2 should be adjusted so that signals on all three bands may be peaked with the 100 pF tuning capacitors. The 14 Mc/s band should resonate near the maximum capacity of these capacitors and 28 Mc/s near minimum capacity. Once set up for a given band no further adjustment should be necessary, all tuning being carried out on the main receiver.

Results

The converter has been in regular use by the writer for five years working into a CR100. The combination gives excellent results from the stability point of view and the sensitivity appears to be very good. The converter has also been used with other receivers during recent National Field Days with complete reliability and has earned the approval of all who have used it.

Since this article was written it has been pointed out that under certain conditions harmonics from the crystal oscillator may cause TVI. Reducing the HT voltage to the circuit concerned by increasing the value of the dropping resistance together with further decoupling of the HT line will effect a cure.

THE MONTH ON THE AIR

A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

By R. F. STEVENS (G2BVN)*

CONDITIONS during the preceding weeks have not provoked any favourable comment, and one can only hope that the advent of the longer days will bring some comfort to the DXer. To many however, the present conditions will not come as a surprise for the depression was forecast by G3AAE in *M.O.T.A.* as long ago as August 1959.

The penultimate paragraph of *M.O.T.A.* in recent issues has caused enquiries as to the availability of the periodicals mentioned, and perhaps further information might assist a member of the family wishing to invest in a subscription for the OM. *DX'press* is sponsored by the Dutch national society V.E.R.O.N., on whose behalf PA0s 'FX, 'LOU and 'VDV produce an extremely informative and reliable weekly bulletin for the modest cost of £1 p.a. The *West Gulf DX Club Bulletin* is another weekly publication of which W5ABY is the present editor, the annual subscription, including air mail delivery, being $12. Although DX news is covered mainly from the North American angle there is a good deal of worthwhile news to be found. *DX Magazine*, produced by W4KVX, is a more ambitious project generally running to about 20 pages with 40 issues a year, and giving full coverage to most aspects of DX working. The annual dues are $7 by surface mail and $17.50 by air mail. The *DX'er*, the magazine of the North Californian DX Club and edited by K6CQM, is a monthly production providing much interesting information not found elsewhere. Obviously a monthly journal is at a disadvantage where current happenings are concerned and the sources mentioned above provide invaluable information for the ardent DX chaser.

News from Overseas

VP8GO is the call recently allocated to John Juleff now active on 21 and 28 Mc/s, and looking for contacts with the United Kingdom around 20.00. Operation is mainly on a.m. using a home-built transmitter and an AR88 receiver, and it is hoped to borrow a quad aerial. VP8GO, who anticipates being at Port Stanley for about two years, recently had the pleasure of a meeting with Peter Hobbs (G3LET) then on his way to Signy Island from where he is now active on c.w. and s.s.b. using the call **VP8GQ**. QSLs for the latter station should be sent to G3PAG who will be despatching replies when cards have been printed and the logs have been received from VP8GQ.

From Nigeria, **5N2JKO** reports the absence on leave of 5N2s BRG, KHK, ATU, IJS, HHT with RJO going in March. 5N2JAH is now on s.s.b. after being QRT for two years, and will be returning to his Lagos QTH this month. VP5LG has applied for a licence and in due time will be active using s.s.b. from a KWM-2. After his TY2AA affray, 5N2AMS has been comparatively inactive due to touring and power supply troubles. Angus has obtained permission to operate from Gabon, but as yet there is no information on the call-sign allocated. Ex-ZD2GWS is at Ekona in the new Federal Republic of the Cameroon, but has not yet obtained a licence. In the c.w. section of the *CQ* Contest 5N2LKZ scored 780,000 points, whilst 5N2JKO collected 434,000, which was less than last year. 'JKO hopes to be in possession of a beam early in 1962, and 'RSB is using a ferrite bead loaded dipole. 'JKO mentions that he is now sending out QSLs to all new contacts, which he finds to be the quickest method of dealing with this chore.

VS4RS, Ron Skelton, formerly G3IHP, is now active from Sarawak, mainly on a.m. on 21 and 14 Mc/s. Several G stations have been worked on 21 Mc/s around 10.00 but conditions have not been favourable. Ron reports contacts with many DXotic Pacific stations but very little from Europe or Africa. It is hoped to have a 21 Mc/s beam in operation very shortly. It is believed that neither VS5GS nor VS5WF will now send out QSLs.

The **Hong Kong Amateur Radio Transmitting Society** held its 31st anniversary dinner recently, and amongst those present were guests from Laos, Burma and Singapore. The recipient of the President's Trophy was Paul Hsu, VS6EP. The Hon. Secretary, VS6EK, mentions the Chinese style banquet of 12 courses which preceded the presentation.

DXpeditions

UA0BP/0 made only 40 contacts with European stations during his recent period of operation from **Zone 19** using s.s.b. Of this number 10 were from DL, nine from G, two each from HB9, ON4, OH, and SM, with one each from PA0, OZ and I, three from UB5, six from UA and UQ2AN. Altogether UA0BP made 584 contacts with 471 stations in 65 countries, and regrets that very poor conditions prevented

Aref Mansour (OD5CN) of Beirut, Lebanon, uses a Collins KWM-1 and a Johnson Pacemaker linear. OD5CN is active on s.s.b. and c.w. on all h.f. bands.

** Please send all reports to R.S.G.B. Headquarters to arrive not later than January 19.*

better results. Ros mentions the help he received from many stations particularly MP4BBW, VU2NR and VK2NN.

After a spell of operation at **FY7YI** the portable s.s.b. transmitter belonging to HB9TL was despatched to FM7WQ. Future scheduled stops include FG7XE, VP1WS and PJ2ME. The proposed trip to Tobago did not take place as VE6BY took along his own transmitter.

Prefixes

There have been a large number of changes in the prefixes used by the newly created sovereign states in Africa, of which the majority formerly formed part of the French empire. An up-to-date list of the republics and their prefixes follows:

Cameroon TJ	Madagascar 5R8
Central African TL8	Mali TZ
Congo (Brazzaville) TN8	Mauretania 5T5
Congo (Leopoldville) 9Q5	Niger 5U7
Ivory Coast TU2	Senegal 6W8
Dahomey TY2	Sudan ST2
Gabon TR8	Tchad TT8
Guinea 7G1	Togo 5V
Upper Volta XT2	

Following the granting of independence to Tanganyika the prefix was changed from VQ3 to 5H3.

Contests

In the complete **Honor Roll** listings of the **DXCC** which recently appeared in *QST*, the highest score of 315 countries was shared by W2AGW and W3JNN. The highest placed Commonwealth station is ZL1HY with 306, and United Kingdom operators with 300 or more to their credit include G3AAM, G4CP and G6ZO. Other high scorers include: GM3EST (292); G3FKM (288); G3AAE (284); G5VT (279); G3DO (273); G3YF (271); G6RH and G8KS (270). In the telephony only section PY2CK takes pride of place with 314, the two leading United Kingdom stations being G5VT (273) and G2PL (272).

The first weekends of the **1962 A.R.R.L. DX Competition** will take place during February, viz.: 2 to 4, telephony, and 16 to 18, c.w. A summary of the rules will be found in this issue.

The **Sixth Annual *CQ* W.W. S.S.B. Contest** will take place from 12.00 March 24 to 18.00 March 25. Copies of the rules, to which there have been several changes, and log sheets, are available upon receipt of a large s.a.e. sent to G2BVN.

The ***CQ* 160 Metre W.W. C.W. Contest** will be held from 02.00 February 24 to 14.00 February 25. A summary of the rules follows: (i) A c.w. only contest. (ii) Contacts between W/VE/VO and the rest of the world . . . 10 points per QSO. QSOs between stations in the same country shall score two points, and QSOs with other countries, except W/VE/VO, shall score five points. (iii) A multiplier of one for each state, Canadian province and country worked. (iv) Final score is total points times total multiplier. (v) Logs should be postmarked not later than March 15 and be sent to *CQ Magazine*, 160 Contest, 300 West 43rd St., New York 36, N.Y., U.S.A.

The **Quarter Century Wireless Association** will hold its fifth annual QSO party starting at 23.00 Friday February 9 and ending at 23.00 February 11. Participation may be on any mode and on all bands from 3·5 to 28 Mc/s. At the present time there are over 3000 QCWA members.

The 13th **YL/OM Contest** will take place from 18.00 February 24 to 05.00 February 26 (telephony) and from 18.00 March 10 to 05.00 March 12 (c.w.). All OM, YL and XYL operators throughout the world are invited to participate. The exchange between stations should consist of a QSO number, RS or RST report and A.R.R.L. section or country. The phone and c.w. sections are run as separate contests. One point is scored for each station worked YL to OM or OM to YL, and the final score consists of the number of QSOs times the number of different A.R.R.L. sections and countries worked. For stations running less than 150 watts input there is a low power multiplier of 1·25. Logs must be sent to K2JYZ, Lillian C. Byrne, to arrive not later than April 8.

The Annual **U.S.S.R. Contest** will be held from 21.00 on May 5 to 21.00 on May 6. This contest is for c.w. only on all bands from 3·5 to 28 Mc/s. A copy of the rules in Russian is held by G2BVN who would be pleased to hear from any reader willing to translate the vital sections.

Conditions during the **R.S.G.B. 21/28 Mc/s** contest were poor, and serial numbers heard were well below the level of previous years. G3MWG found it hard going but received a QSL from VE3BQL/SU within a week, which provided some compensation.

Awards

The **Ex-G Radio Club** announce a certificate for short wave listeners, the basic requirement being that listeners in the United Kingdom shall submit reports on eight W/K members (no more than two from any one call area), four VE members and two members outside the United States and Canada. The award is administered in the United Kingdom by G2CWL, and membership lists can be obtained from G3NUY on receipt of a s.a.e. At the present time the membership of the club is approximately 60, the frequencies used for the net meetings being 3810, 14,010, 14,270 and 21,445 kc/s.

Le Club des Jeunes Operateurs of Montreal is sponsoring a new certificate, the **"Certificat de l'Ile de Montreal"** (C.I.M.), requiring (for United Kingdom stations) proof of contact with six stations located on the island of Montreal. Log extracts and 50 cents (or equivalent) should be sent to club station VE2JC, 7199 De Gaspe Ave., Montreal, Canada.

The **Directory of Certificates**, produced by K6BX on a non-profit basis, may be ordered through G2BVN. The annual subscription covering the initial Directory and three supplements during the first year is 30/-. The latest issue contains the data on over 650 awards.

DX Briefs

G3OFK, who also held the calls **VU2RG** and **AP2N**, is now in the United Kingdom and does not anticipate further

QTH Corner

FA2VO	A. Vallejo, 24 Ave. du Gen. Leclerc, Mostaganem, Algeria.
FG7XL	J-P. Tendron, 64 rue Frebault, Pointe-a-Pitre, Guadeloupe.
FR7ZF	J. Banet, Tampon 600, Ile de la Reunion.
HH2PL	P.O. Box 943, Port-au-Prince, Haiti.
KC4AAE	via K0YKJ.
OD5CY	P.O. Box 4946, Beirut, Lebanon.
SP5ZK	Z. Kupczyk, P.O. Box 888, Warsaw, 1, Poland.
TA2BK	via DJ2PJ, 16 Moltbestr., Nienburg-Weser, West Germany.
TT8AG	via W3KVQ.
VK9AD	via VK3CX, 8 Mangarra Road, Canterbury, E.7, Australia.
VP2SY	P.O. Box 80, St. Vincent, B.W.I.
VP2VJ	A. Swain, Road Town, Tortola, British Virgin Islands.
VP4RS	Union Village, Blaxton Bay, Trinidad.
VP5WB	W. E. Bell, c/o Barclays Bank DCO, Box 22, Spanish Town, Jamaica.
VP8GQ	via G3PAG.
VS4RS	R. Skelton, ACT, P. & T., Sibu, Sarawak.
YA1AN	via DL3AR.
ZD1JWC	J. Collins, U.S. Embassy, Freetown, Sierre Leone.
5A3BC	Box 6, Barce, Libya.
5A3CAD	via W2CTN.
5H3PBD	P.O. Box 9053, Dar-es-Salaam, Tanganyika.
5R8CM	F. Payet, c/o M. F. Nabonne, Canohés, Pyrenees, France.
6W8BQ	via W9RKP.
6W8DD	P.O. Box 199, Dakar, Senegal.
6W8DF	P.O. Box 3033, Dakar.
9Q5AAA	via W2HMJ.

* * *

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

overseas commitments. Any operator lacking a QSL for the VU or AP calls may write to 19 High Ash Avenue, Alwoodley Estate, Alwoodley, Leeds, 17, Yorks.

G3NVM at present Chief Radio Officer on the *TSS Carla*, sailing in Asian waters, will deal with outstanding QSLs on return to his home QTH in London.

A note from the Swedish National Society states that **SM5BXI** operating from *M/S Bonjour* in the Baltic is a pirate. The operator once held this call but subsequently allowed it to lapse and it was reissued to an operator in the second Swedish district (SM2BXI).

GW3PNZ is the present call of ex-**VP3RW** who is now settled at Colwyn Bay, and is active using a Vanguard transmitter. All QSLs for VP3RW contacts should go to W2CTN. (G3MWG.)

VE3AXQ would like to make schedules with stations in the Channel Islands and the Isle of Man, any band and c.w. or telephony. 'AXQ receives good signals from Europe on 7 Mc/s between 23.00 and 02.00 (G3MWG).

ON5 prefixes are now being heard on the bands, the permutations on the ON4 series presumably having been exhausted.

Several members report excellent service from F9IL, the awards manager of the R.E.F., QSLs being returned within a very few days.

There are many operators undertaking QSL duties on behalf of DX stations who, owing to various reasons, are unable to deal satisfactorily and speedily with this problem. It is known that in a number of cases the QSL manager has met the bill for the printing of the cards, but their generosity should not have to extend to cover postal charges in addition. When sending cards to a QSL manager please enclose a self-addressed envelope with sufficient reply stamps or IRC, bearing in mind that three or four of the latter are generally required for air mail service.

TA2BK gladdened G2FFO with a swift and attractive QSL. The card came via DJ2PJ and the address will be found in *QTH Corner*.

Eric Dowdeswell, **ST2AR**, who has been off the air for some months, does not at the present see any chance of a resumption of activity, but is rebuilding his equipment in anticipation of the day. Eric sends best wishes for 1962 to his many friends, and we on our part will hope to hear him on the air again very soon.

A late note from Angus, **5N2AMS**, gives the bad news that his equipment suffered severe damage during the Dahomey trip, both electrically, when three transformers gave up the ghost, and mechanically, when some equipment fell out of the station wagon. Angus is busy doing repair work and hopes to be on the air before too long. This incident has not deterred him from the proposed Gabon trip for which the permission, but no call, has been received.

MP4BBW, who is now up to 225 confirmed on s.s.b., will shortly be operational on 7 and 3·5 Mc/s, using a beam on the former band. Preparing for the worst of the sunspot cycle Ian is also now equipped for 144 Mc/s. Colin Richards, who is now in Malaya after a spell at home as GW3JET, signs **9M2CR**, and was contacted by 'BBW at 15.50 on 14,280 kc/s. Colin will be remembered for his s.s.b. activity from East and West Pakistan as AP2CR.

Band Reports

The **1·8 Mc/s** band has produced some trans-Atlantic DX on a number of days during the past month, and early starters were W2FYT heard at 22.55 by **B.R.S.19107** (Beckenham) and K2DGT was worked by G6BQ at 23.57. At the other end of the scale East Coast Ws were audible on occasion as late as 07.30. However all that had gone before was overshadowed by an excellent opening on December 17, when the band was alive up to 08.30. **B.R.S.20317** (Bromley) recorded 14 stations definitely identified, the outstanding signals being W1BB/1, W9PNE and W8JIN, all qualifying for reports of RST 5·7/8·9. The call areas heard by our reporter on this morning were W1, W2, W3, W4, W8, W9 and VO1. W1PPN was being worked at 08.25, and **G3OQT** (Romford) was pleased to receive a 339 report from this station at 07.45. Other United States stations heard by 'OQT include W1s, W2s, W3FBV K3GNC, W7UFB (Wyoming), W8s, W9VO and W9PNE. Other countries worked on this band were UB5WF (04.12), UO5AA (05.40), both by G3OGT, EI7AF and EI9J (running only 1½ watts). **B.R.S.19107** also logged the UO5, making his 46th country heard on this band. Conditions certainly seem to be improving and from the times quoted in the reports it may well be that the band has on occasion been open all night. It was fortunate that the exceptional day coincided with a Trans-Atlantic Test date, and further tests are scheduled for January 21, February 4 and 18. In addition to the Wyoming station heard by **G3OQT**, W7ZZR was known to be on the band, and was logged by B.R.S.19107 when in contact with W2NRM at 05.05. These are the first reports of signals from the seventh call area this season, and, it is hoped, the forerunners of many others.

Conditions on **3·5 Mc/s** have also improved, and B.R.S.20317 added four new ones to his score on this band in the shape of HV1CN and HC1AGI (06.50-08.25) on c.w. with 3A2DE (19.45) and TG9AD (06.45) on s.s.b. Other DX stations reported on this band were 7G1A (05.20), ZL1PV, ZL3JT, KV4CI (23.50), VK5KO (19.30), together with unusual European calls in the form of IT1TAI, OY2H, TF5TP, UA9CM, UA2AT, 4X4WF and 5A1TW, all on c.w. A large number of signals from the U.S.A. have been heard, the outstanding feature of these being the relatively late hour at which the stations were readable. Late comers include: W6GTI and K6VUH (07.10), W5MCO (07.15), W9HUZ (09.20) and W9WNV (09.22). The s.s.b. activity around 3·8 Mc/s has produced some interesting calls, the earliest DX station heard being 4X4IX at 18.15. Other loggings by our reporters B.R.S.19107 and 20317 include: HZ1AB (19.00), PJ2AA (23.40), UC2AA (21.44), VK3AHO (19.00), VO1DN (19.52), YV5ANS (07.30), ZC4PC (20.00), and 3V8CA (23.40). GI6TK, on s.s.b., was heard working ZE2KL, on a.m., at 19.35, and there has been the usual crop of United States stations, outstanding being K4BG and K9CIL with five and seven signals at 09.00. HR3HH (06.00 to 08.45) and HR5LA (Honduras) have both been worked from the United Kingdom, whilst VS9AAC has been very active around 22.00-23.00, all on s.s.b.

The **7 Mc/s** band has contained a worthwhile amount of DX none of which, however, can be really classed as outstanding. The best hour for Asian stations seems to be around 18.00-19.00 with VKs at any time between 17.00 and 22.00. VK3ADB was heard at 16.20, an unusually early appearance, with VK0VK from Wilkes Land heard at 17.00-18.00. Stations from ZS1, ZS2 and ZS6 have been heard between 17.30 and 21.30, and ZS1JA (on s.s.b.) has worked many United Kingdom stations between 18.30-21.30. Other Africans include 6W8DD (21.50) and 7G1A, 5N2LKZ and 9G1DT, the last three at around 05.00. Morning DX includes KZ5TD (09.30), PY9DM (07.45), VK3APJ (08.15), XE1MM (06.30), ZB2AD (07.30) and ZL3GU (07.50). The listings above were culled from the logs of B.R.S.19107 and 20317, whilst 5N2JKO mentions that signals on this band are often stronger than on 14 Mc/s but that the heavy QRM makes contacts difficult. Many of the rarer U,S.S.R. call areas can be heard during the evenings and UA0KYA in Zone 23 was worked at 23.30.

Conditions on **14 Mc/s** have again been very variable without producing any exotic DX. **5N2JKO** reports regular Pacific openings at 06.30-07.30 and 21.00-22.00, but these times unfortunately are not applicable in current United Kingdom conditions. 5N2JKO mentions that at one time in the *CQ* Contest the only stations that could be heard were

KX6BU, ZK1AR and a KA. Continuing our survey of the c.w. section **G3AAE** offers EP2BK (08.40), KC4AAE (20.10), KC6BD (East Carolines, 08.50), MP4MAH (14.00), SU1IM (15.30), TT8AJ (19.15), VP8DG (20.00), VP8FV (Halley Bay, 20.20), VK0VK (17.05), 4S7EC (15.30), 5H3HZ (15.54), 5R8AD (15.42) and 9U5DS (19.00). Early morning specialist **G8PL** records a disappointing month and a heard/worked listing gives us 06.00-07.00 EP2BK, OD5CY, TI2WA, TU2AL, UH8BO, UI8KTA, UJ8KAA, UL7NB, VS9AGV and 5U7AC; 07.00-08.00 EL4A, HV1CN, JT1KAA, SV0WI (Rhodes), UM8KAA, TT8AA, 5A3BC, 5N2RSB, 7G1A and 9G1DE, the last mentioned saying that he would be returning to the United Kingdom this month. A rare one heard at 10.00 was AC4AK. Turning now to the high end of the band, **MP4BBW** reports s.s.b. contacts with AP2AD (13.18), DU7IM (11.41), FK8AC (11.50), HS1K (16.06), HK1QQ (13.37), KM6BI (05.05), K6CQV/KS6 (05.30), PJ2AA (12.40), UF6FB (08.08), UL7HB (11.57), UI8AG (11.01), UM8KAB (11.07), VR6AC (05.58), XZ2NS (11.08), XW8AS (13.33), 5H3GC (15.28), 5N2JAH (18.18), 6O1DRS (18.30) and 9M2GA (14.42). French St. Martin was activated under the call FS7RT whilst the same operator, Reg Tibbetts, also signed PJ2MC from the Dutch portion of the Island. Both these stations were worked from the United Kingdom around 10.00-11.00. At the time that these notes were being written the band showed some signs of reawakening, and it is hoped that with the lengthening of the hours of daylight conditions will improve.

The **21 Mc/s** band has been disappointing and little has been heard except the nearer " regulars " and some DX in a East/South-East direction. AP2MR (08.50), UA1KAE (09.10, his first time on this band), VQ8BC (12.20), VS4RS (09.00), the operator being also G3IHP, 4S7NE (09.35) and 5H3PBD (12.50), certainly a dream call for c.w. operation! All these appeared in the log of **G3AAE.** From the other end of the path **5N2JKO** reports that this band has been open to the U.S.A. from 14.00 to 19.00, but that European signal strengths have been very poor. Mike did however manage a QSO with XW8AL at 16.30 on a.m.

28 Mc/s does not bear a mention except to say that the frequency allocation still exists, and one can only hope that some DX will show up before the sunspot minimum takes over.

* * *

In addition to the regular sources of information, your scribe offers his thanks to MP4BBW, 5N2JKO, G3AAE, G8PL, B.R.S.19107 and 20317 for news and views. Information for the next issue should be sent to R.S.G.B. Headquarters to arrive not later than **January 19.**

CONTESTS DIARY

January 28	–	144 Mc/s C.W. Contest (For rules, see page 308, December, 1961)
February 2–4	–	A.R.R.L. DX Contest (Telephony) (see page 359)
February 3–4	–	Affiliated Societies' Contest
February 9–11	–	QCWA QSO Party
February 16–18	–	A.R.R.L. DX Contest (c.w.)
February 24–25	–	First 1.8 Mc/s Contest (see page 360)
February 24–25	–	CQ 160m. Contest (c.w.) (see page 344)

March 2—4	—	A.R.R.L. DX Contest (Telephony) (see page 359).
March 3—4	—	144 Mc/s Open Contest (see page 360). Listeners' V.H.F. Receiving Contest (see page 360).
March 10—11	—	B.E.R.U. Contests (for rules see pages 306 and 307, December 1961).
March 10—11	—	YL/OM Contest (c.w.) (see page 344).
March 16—18	—	A.R.R.L. DX Contest (c.w.) (see page 359).
March 24—25	—	CQ WW S.S.B. Contest (see page 344).
April 7—8	—	Low Power Contest.
April 15	—	D/F Qualifying Event.
April 28—29	—	V.E.R.O.N. PACC (c.w.).
April 29	—	First 420 Mc/s Contest.
April 29	—	D/F Qualifying Event.
May 5—6	—	V.E.R.O.N. PACC (Telephony).
May 5—6	—	U.S.S.R. DX Contest.
May 6	—	First 144 Mc/s Field Day. *
May 13	—	D/F Qualifying Event.
May 27	—	D/F Qualifying Event.
June 2—3	—	National Field Day. (see page 359)
June 16—17	—	70 Mc/s Contest.
June 24	—	D/F Qualifying Event. 1250 Mc/s Tests.
July 7—8	—	Second 420 Mc/s Contest. *
July 15	—	D/F Qualifying Event.
July 22	—	Second 144 Mc/s Field Day.
September 1—2	—	Region 1 I.A.R.U. V.H.F. Contest.
September 9	—	D/F National Final.
September 16	—	Low Power Field Day.
October 7	—	R.A.E.N. Rally.
October 27—28	—	R.S.G.B. 7 Mc/s DX Contest.
November 10—11	—	Second 1·8 Mc/s Contest.
December 1—2	—	R.S.G.B. 21/28 Mc/s Telephony Contests.

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

Belgian RTTY Activity

NEWS is to hand that RTTY activity is about to start in Belgium. ON4HW expects to be on the air soon. He is awaiting a suitable relay to complete his T.U. ON4UM, ON4WI, ON4VI and ON5AJ are all interested and it looks as though they will form the nucleus of a Belgian RTTY Group. Belgian RTTY activity will bring the number of European countries in which there is regular RTTY activity up to five, i.e., PA, DL, OZ, LA and ON.

Old Timers Please Note

A FASCINATING new book, *A Pictorial Album of Wireless and Radio*, 1905-1928, by Harold S. Greenwood (W6MEA), has just been published. It is filled with photographs of many types of old-time wireless apparatus, including valves and complete sets. Old timers, in particular, will enjoy browsing through the 200 pages of Mr. Greenwood's book which is made doubly interesting by the reproduction of a number of early advertisements for wireless gear.

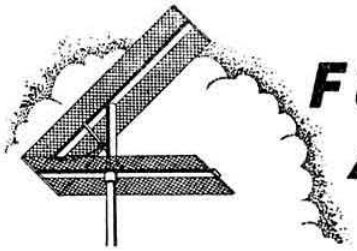
Autographed copies of the book can be obtained (price $3.00 post paid), direct from the author at 2341 Ivyland, Arcadia, California, U.S.A.

Transmitter Ordered for G.P.O. Satellite Communications Project

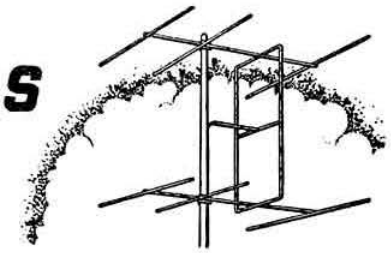
STANDARD Telephones and Cables Limited have been awarded a contract for the supply of a transmitter for use by the G.P.O. in satellite communication experiments to be carried out this year in co-operation with the American authorities.

The equipment will be installed in a room built into the 85 ft. diameter steerable aerial now being erected at a site on Goonhilly Down, in Cornwall. The transmitter will operate in the 2,000 Mc/s band, and will deliver a frequency-modulated output of 10 kW. The construction programme calls for the whole transmitter to be installed and fully operational by April, 1962.

An active repeater communication satellite to be launched by the U.S.A. authorities will enable tests to be conducted on television transmission and two-way speech communication between Cornwall and the American ground station at Rumford, Maine.



FOUR METRES AND DOWN



By F. G. LAMBETH (G2AIW)*

QUITE a lot has been heard lately about Finnish activity on 2m and it was a pleasure to learn from OH2HK, V.H.F. Manager of S.R.A.L., that activity is now becoming very much brighter. The star station is, of course, OH1NL who holds one end of the European meteor scatter record with HB9RG and has worked G3HBW. OH stations (including the OH0s on Aäland Islands) are very enthusiastic and always looking for Gs. They are now working Scandinavia, Russia and Germany stations fairly regularly. So far 70 cm is only providing local QSOs, but they have ideas for later about this, too!

F9ND has sent a list of "firsts" called for by the Turin Conference, and he again asks for information regarding the first F/G contact via auroral propagation. It is thought that this took place during January 1957 but has apparently never been officially claimed. Anyone with a record of any QSOs with F9IR, F3YE and/or F3JN (or possibly even with someone else) by aurora around that date or earlier is asked to write to G2AIW so that the claim may be confirmed.

Region I V.H.F. Contest

It is understood from SM5MN that the following entries (including check logs) were received for the I.A.R.U. Region I V.H.F. Contest, 1961.

D (DL, DJ, DM)	125	YU	22	OH	1
OK	124	OZ	20	EI	1
I	94	HB	14	UR	1
PA	50	OE	13	HE	1
F	43	ON	9	MI	1
G etc.	26	SM	9		
SP	24	FA	2		

The figures indicate very lively interest in Central and Eastern Europe, with a growing enthusiasm round the edges, but the United Kingdom still does not seem to make a large entry; it's a pity, and we should do better than this. Can anyone give some good reason why British operators do not enter? Plenty of them are active during these events.

Two Metre News and Views

G3MTI (Gt. Malvern) made some measurements of losses on 200 ft. of feeder, and found that contacts with 46 counties and 8 countries during the last year were made with only 0·7 watt r.f. input to the 4-over-4 beam!

G3LTN (Weyhill) had a mobile QSO with G5ZT/M whilst the latter was driving up and down Hay Tor, Devon. New stations contacted include G3MNW (Farnborough), G3PJI (Southampton) and G3PNA (Bletchingly).

A.2524 (Wolverhampton) is now studying c.w. and hopes to sit the test in January. In the meantime he has heard many stations, including GB3VHF and southern stations by tropo, GI3GXP and others on c.w. and G3KFD and GI3FJA on s.s.b.

G5QA (Exeter) is continuing his sked with GW3ATM and G3OYM/T and they have never yet failed to hook up. A few more counties have been worked on 2m and the total is 22 since September 1.

GM3POK (Edinburgh 10) received his licence on November 22 and the same evening appeared on 2m. His first QSO ever was GM2TW (near Falkirk) followed in fairly quick succession by GM3BCD, GM3LCP, GM3EGW, GM3DDE and GM3UM. The rig runs 25 watts to an 832 feeding a 7 element beam. The receiver is a cascode converter (ECC88, 6AK5, 6J6 and 12AT7 with an NC81X as the tunable i.f.). Reports will be very welcome.

G3LTF (Galleywood) has little to report except that at the middle of December the band was beginning to open a little for the Continent and to Northern G. On November 18 he worked GM3EGW at S7 on phone. A sked with SP2RO was fruitless and the Geminids were very poor this year.

B.R.S.21476 (Shrewsbury) has found the band pretty dead except for locals and semi-locals. December 17 did show a great improvement, however, and London area stations were heard, the most notable being G5MA and G3MSL; G5TN (Weston-super-Mare) was also a good signal.

GM2FHH (Aberdeen) noted a good auroral opening on December 1 from 13.55 to 15.00 G.M.T. when GB3VHF, SM6PU, OZ7IGY, DJ5HG, GM4HR, GM3GUI were heard and/or worked. GM3GUI was heard again via the aurora at 22.15 G.M.T. at 44A. On the night of December 18 conditions were excellent for GM right down to the Border. The barometer was 1036 mb. The weather was calm and hazy with Angus and Midlothian stations easy to work.

G4LX's Auroral Report for November 1961

There was little evidence of aurora during November, SM6PU being the only observer to report. On November 7 a solid QSO took place between SM6PU and SM3AKW, and this was repeated on November 12. SM3LS, SM4CDO and SM5BSZ were heard on November 7 but no QSO resulted. On November 18 SM6PU had an auroral QSO with LA4YG.

G3MED who is now in the south cannot come on for the time being because of power difficulties. When these are ironed out, he should put out a potent signal. Portable operation is also planned.

Four Metre News

G3LTN (Weyhill) has completed a new transmitter

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

The frequency of the Society's v.h.f. beacon transmitter at Wrotham Hill, Kent, when measured by the B.B.C. Frequency Checking Station, was as follows (nominal frequency 144.50 Mc/s).

Date	Time	Error
December 5, 1961	11.55 G.M.T.	910 c/s high
December 12, 1961	11.22 G.M.T.	796 c/s high
December 19, 1961	12.00 G.M.T.	1,526 c/s high
December 26, 1961	12.09 G.M.T.	2055 kc/s high

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

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

comprising 6AM5, 5763 and 6146 at an input of 50 watts to a 4 element Yagi at 25 ft. The receiver is a cascode 6BQ7A (Withers) to a BC454. So far, there have been QSOs with G3EHY and G3MPS; G3NDF has been heard. G3LTN thinks that this band is for Sunday mornings only and even then there are few stations.

EI2W is on 70·662 Mc/s and as this puts another country on the 4m map, please look towards Dublin.

B.R.S.21476 (Shrewsbury) heard G3EHM and G3AYT in QSO on December 17. The c.c. converter uses a 6AK5 triode—ECC85 cascode r.f. end which has been adjusted for maximum s/n ratio with a noise generator. A 6J4WA g.g. preamp is also available which has also been adjusted for best noise factor, but this seems to be inferior to the 6AK5/ECC85 arrangement since utilizing the preamplifier ahead of the main converter definitely degrades the s/n ratio. It would therefore appear that as far as 70 Mc/s is concerned (and setting aside the use of more expensive valves like E88CC, 417A, A2521 types) that the 6AK5 triode followed by ECC85 cascode arrangements seem pretty well unbeatable for sensitivity and low noise.

Seventy Centimetres

G3LTF worked ON4HN on November 18 and called ON4HC (who was 589) without result.

G5QA hopes to be starting a new crystal controlled converter soon and has promised a report—if it works.

G3LQR/T (Dedham, Essex) sends some frequencies of 70 cm stations known by him to be operating from East Anglia. No Norfolk stations are known; if there are any will they please disclose themselves? Skeds would also be welcomed by G3LQR/T.

	Frequency	Power Output
G3LQR/T	434·45 Mc/s	30 watts
G3FIJ	433·9 Mc/s	30 watts
G4AC	435·75 Mc/s	3 watts
G3PJE/T	434·15 Mc/s	5 watts
G3NJO/T	433·8 Mc/s	30 watts
G3NOX/T	434·3 Mc/s	100 watts
G3LTF	435·05 Mc/s	30 watts

New Polish Band Plan

A new plan for the 144 Mc/s band has recently been drawn up by the Polish National Society, PZK. The band is now divided as follows:

144·000—144·025 Mc/s Special
144·025—144·200 Mc/s SP3
144·200—144·450 Mc/s SP6
144·450—144·700 Mc/s SP2
144·700—144·950 Mc/s SP4, SP5
144·950—145·000 Mc/s Special
145·050—145·200 Mc/s SP1
145·000—145·700 Mc/s SP9
145·700—145·975 Mc/s SP7, SP8
145·975—146·000 Mc/s Special

The Polish radio districts are shown in the map on page 295 of the December issue.

There is considerable activity in SP3, 5 and 9 with fair activity in SP4 and 6. There is little in SP2 and SP7.

SP5PO, who supplied the above information, will be on 2m shortly using s.s.b. to a 14 element Yagi.

LONDON U.H.F. GROUP

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

at 7.30 p.m. on Thursday, February 1, 1962.

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

Project Oscar

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

THE *Oscar* satellite carrying a 0·1 watt transmitter radiating in the 2m amateur band was successfully launched from Vandenberg Air Force Base in California as part of a *Discoverer 36* firing at 20.40 G.M.T. on Tuesday, December 12. Operating height was attained at 21.06 G.M.T. and two hours later *Oscar* separated as planned from the main space capsule which was, incidentally, brought back to earth and recovered after making a number of circuits of the globe. *Oscar* continued on its own polar orbit which brings it into radio range of any part of the earth's surface four times in each 24 hours. Orbit time is approximately 91·7 minutes, so adjacent tracks are just over 23 degrees apart.

The first report of signals from *Oscar*—" HI " in c.w.—came from G3OSS (Finchley, London N.3) who heard them at 00.55 G.M.T. on Wednesday morning, December 13. Strength was well over S9 at maximum, building up and dying away rapidly in both cases as the satellite approached and receded on a course from S.S.E. to E.N.E. Doppler shift of frequency due to the high velocity of the satellite was most noticeable and was measured by G3GDR (Abbots Langley) as about 7 kc/s. G3OSS again logged the signal at a similar strength between 02.27 and 02.35 G.M.T. on the same morning when the course was S.E. to N.W. Details of reception were passed immediately to W1FRR on 80 metre s.s.b. for onward transmission to the Project Oscar Association in the United States.

Later the same day signals were well received in many parts of the country and the B.B.C. Frequency Checking Station at Tatsfield measured the frequency as 144·984 Mc/s —16 kc/s lower than the provisional figure of 145·0 Mc/s previously advised.

The D.S.I.R. Radio Research Station at Slough soon had sufficient data to feed into their computer and produce orbit predictions which were kindly made available to the Society by December 15, and these proved extremely valuable.

Reports have been received from G2AOX, G3COJ, G3GRA, G3HBW, G3HRH, G3JAM, G5LK, B.R.S.20533 and A.1795 but so far there is no record of signals being received by any form of DX propagation i.e. when the satellite was appreciably below the horizon. Needless to say such observations would be particularly interesting.

Very few measurements of Doppler shift have so far been reported, but an amount of 7500 cycles is mentioned by G3JAM (Woodford Green, Essex) for the transit heard between 00.47 and 45 sec. and 00.55 and 20 sec. on December 16. He noted on that occasion that signals reached a peak of S9 one minute after they were first heard, the course being S.S.E. to N.N.E. and, according to D.S.I.R., crossing the latitude of 50 deg. North 6·9 deg. to the East.

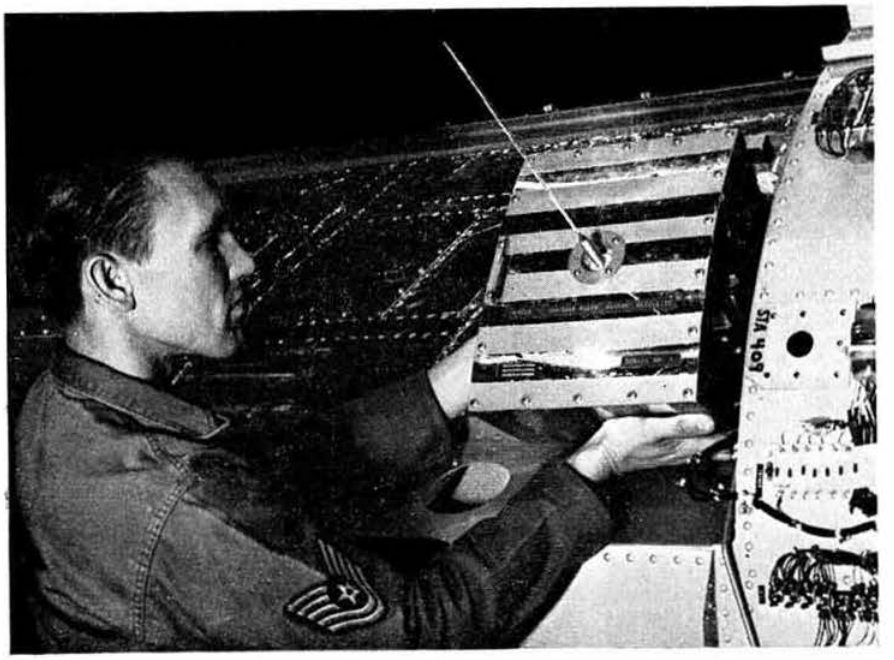
The period during which signals are heard during any particular pass varies according to the actual course of the satellite in respect to the receiver and may lie between three or four minutes and nearly ten minutes i.e. approximately one-ninth of the total orbit or some 2900 miles. Observations by G3JAM indicate reception at times when *Oscar* was well to the east of Berlin and at others over mid-Atlantic. Not a bad performance for 0·1 watt!

Slowed-down tape recordings reveal that the keying, which is very fast, is almost perfect in formation with a faint trace of chirp. The " HI-rate " (the time taken for ten " HIs " to be sent by the satellite) has varied from 6·2 to 11·4 seconds.

It has been noticed by the writer that signals always seem to be about S3 when first heard approaching but can be followed right into the noise when receding from the station. Some rapid fluctuations in strength are noticeable, particularly when the signal is strongest, but no " bursts" were heard after the signal has disappeared smoothly into the noise. Signals were last reported on January 2.

Listeners are thanked most sincerely for their reports, often given in considerable detail.

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



The Oscar I satellite being loaded on to the Discoverer 36 rocket at Vandenberg Air Force Base, California. The transmitter comprised a transistor crystal oscillator on 72·5 Mc/s, a transistor amplifier and a "Varicap" diode doubler to 145 Mc/s, with a power output to the 19 in. quarter wave monopole of about 100 milliwatts. The oscillator was keyed in the base circuit by a transistor multivibrator and counters with diode logic. Power was derived from mercury batteries and the complete unit measured 12 in. × 10 in. × 8 in. excluding the aerial shown in this picture. Reports indicate reliable reception up to a distance of about 1400 miles from the satellite path.

(Photo by courtesy of U.S. Information Service)

Mobile Column

By C. R. PLANT (G5CP)*

THE number of Mobile Licences issued in Great Britain now exceeds 1,000 and a survey of band occupancy shows that operation is regularly taking place on all bands from 1·8 to 144 Mc/s. Top Band is by far the most popular with 3·5 and 144 Mc/s competing for second place. At the bottom of the list is 70 Mc/s which seems to have only a few adherents and these appear to be mainly in Yorkshire; the writer has heard G3DSA (York) calling mobile stations on this band. News of operation on this and other bands will be very useful and form subject matter for future publication.

Fire Hazards

One of the greatest dangers in operating a mobile installation is the possibility of fire; this is usually caused by a failure of the cable insulation. In order to minimise the chance of fire occurring it is recommended that a suitably rated fuse be installed close to the battery, inserted in the unearthed feeder line; in modern cars this is usually the negative feed. It is also a wise precaution to carry a fire extinguisher of the type recommended for the control of electrical fires; this should be clipped into a suitable mounting bracket fixed in an accessible position to facilitate speedy withdrawal in emergency. The writer had an alarming experience some years ago whilst travelling from home to North Wales. The boot was packed to capacity with luggage and radio equipment and the car was travelling at a steady pace when suddenly there was a strong smell of burning rubber. A hurried examination showed that the origin of the trouble was in the boot where underneath the luggage a main cable had rubbed against the car steelwork causing a short circuit. The absence of a fuse had allowed a heavy current to flow causing the copper conductor to reach a white hot temperature and so burning away about a yard of the rubber covering. The prompt use of a fire extinguisher prevented further damage, apart from burned fingers which caused G5CP to remember the incident for several days. This event clearly demonstrated the possible danger and since that time a totally enclosed fuse has formed an integral part of all outgoing feeds from the battery to the radio equipment.

Car Batteries

Whilst on the subject of batteries perhaps a few words mainly concerned with maintenance will not be out of place. Many mobile operators consider it a wise precaution to carry an additional battery to supplement the already overloaded car accumulator. The writer cannot imagine anything worse than to be placed in a position where the battery has run down and no local assistance is available; the comments of even the most co-operative XYL would be illuminating under these circumstances! It is good economics regularly to check the electrolyte to see that the plates are well covered and the specific gravity of the acid when the battery is fully charged reading 1·250 with a voltage of 2·1 or slightly more when taken off charge. At all times the battery terminals should be kept clean and lightly greased with petroleum jelly; the use of anti-creep washers obtainable at most garages, is very helpful in keeping the terminals free from corrosion. Never let a battery stand in a discharged condition because the lead sulphate which forms on both positive and negative plates during discharge very quickly becomes insoluble, thus making charging difficult with a consequent reduction in battery capacity. If ever it becomes necessary to store a battery for a few months, first of all charge at a slow rate for one to two days and if all the cells are found to be gassing freely and the hydrometer reading 1·250, it is then safe to put the battery into store. A short charge at monthly intervals will serve to keep the battery in good condition for up to six months but beyond this time a total discharge should take place through a lamp or other resistance followed by a normal charge at the maker's recommended rate. A good axiom to remember is that "A battery worked is better than a battery stored," even under the best conditions and care. Many amateurs carelessly assume that if a second battery, perhaps located in the car boot, is connected in parallel with the car battery, the charging current will divide into two equal parts. Due to the extremely low internal resistance of a lead acid battery the resistance of the connecting cable has a significant effect; in the writer's case when a charging rate of 15 amps is shown on the car ammeter the differential is 12/3 in favour of the car battery. This ratio could be improved if a heavy copper section was used but the neatness of the installation would be lost and the ease of boost charging from a unit located in the home garage makes the latter a more attractive proposition.

Operating News

A letter has been received from G6IF (High Wycombe, Bucks.) in which he describes his mobile equipment which is housed in a Vauxhall Victor Estate Van. The receiver is a KW76 and the transmitter home built covering all bands 1·8 to 28 Mc/s. It was this installation that won the concours d'elegance at Longleat in 1960. The performance to date has certainly been outstanding, all continents with the exception of Oceania having been worked on phone; a ZL or VK would make a fine New Year present for G6IF.

Tufnol in the Making

A 16mm. colour film with sound accompaniment, running for 25 minutes, describing the manufacture and testing of Tufnol, may be borrowed by R.S.G.B. Groups and Affiliated Societies from Tufnol Ltd., Ellison House, 11 Connaught Place, London, W.2.

An unusual exhibition at the Lincoln Hamfest and Mobile Rally in September 1961 was this Bloodhound Missile Display unit. Members of the Lincoln Short Wave Club in the picture include G3GKI, G3ESR, G3GEW and G3BCA.

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

Supplementary Report of the Council*

THE Report which follows deals with some of the more important events and happenings that have taken place since June 30, 1961.

The Amateur Radio Handbook

The publication on November 16, 1961, of the third edition of the *Amateur Radio Handbook*, brought to fruition the efforts of a great many members who had pooled their knowledge and experience in order to allow the Society to present to the world of Amateur Radio the most up-to-date work of its kind in existence today.

The Council records its thanks to all who helped with the production of this edition and in particular to Mr. John A. Rouse (G2AHL), who undertook the duties of Editor as from January 1961. The Council also wishes to express its gratitude to the printers of the *Handbook* (Loxley Bros. Ltd.) for the great efforts they made during the autumn in order to adhere to a mid-November publication date.

It is particularly satisfactory to record that nearly 3,000 members took advantage of the Council's pre-publication offer, but because it was not possible to meet all such orders prior to the opening of the Radio Hobbies Exhibition the Council decided, with much reluctance, not to place the *Handbook* on sale on the Society's stand. Had it been placed on sale at the Exhibition, many members who had sent in pre-publication orders to Headquarters would have received their copies some while after those who had purchased a copy at the Exhibition. This, in the view of a majority of the Council, would have been unfair. Although the *Handbook* was not on sale at the Exhibition nearly 300 members took advantage during the Exhibition period of the pre-publication offer. The total sold to date is about 3,600.

The Council has now authorised the placing of an order for a second printing.

Other New Publications

The 1962 Edition of the *R.S.G.B. Amateur Radio Call Book* contained for the first time a list of Amateur (Sound Mobile) Licence holders to a total of 1,030 calls, whilst the call-sign record contained more than 2,000 amendments and additions to the 1961 edition. The *Call Book* was published on the opening day of the Radio Hobbies Exhibition, and within four days nearly 2,000 copies had been sold.

Also published on the opening day of the Hobbies Exhibition was a new Society publication, *Communication Receiver Design Considerations*, based on a series of articles by Mr. G. R. B. Thornley (G2DAF) which had previously appeared in the R.S.G.B. BULLETIN. Over half the first printing of 1,000 copies was sold during the Exhibition.

Exhibitions

The Society's stand at the National Radio and Television Show at Earls Court (August 23 to September 2, 1961) again attracted much attention. During the ten days of the show 93 new members were enrolled.

The R.S.G.B. Radio Hobbies Exhibition, held once again in the Old Hall of the Royal Horticultural Society, London (November 23 to November 26, 1961), was opened by Mr. Henry Loomis (Director of Voice of America) in the presence of a large and distinguished gathering. The Exhibition attracted good attendances including a great number of provincial members. Many new items of equipment were on display, whilst the workmanship shown by those who submitted entries for the home construction competitions was of a very high standard. The Horace Freeman Trophy for the best Group or Affiliated Society exhibit was won by the Enfield and District Group.

The organization of the Society's stands at Earls Court and at the Royal Horticultural Hall was in the hands of the Exhibition Committee (Chairman, Mr. C. H. L. Edwards, A.M.I.E.E., G8TL), whilst the management of the stands at both Exhibitions was undertaken by Mr.F.F.Ruth (G2BRH).

Regional Representatives' Conference

On November 18, 1961, a Conference was held in London, which all Regional Representatives were invited to attend to meet the President and Council. Thirteen of the 16 Regional Representatives were present. A comprehensive report prepared by the General Secretary is now being studied by the Council with a view to carrying into effect many of the proposals and suggestions put forward at the Conference.

The two-way exchange of views and opinions proved to be of great value both to the R.R.s and to the Council.

Official Regional Meetings

Official Regional Meetings were held in Ayr (Region 14) on September 10, Cardiff (Region 10) on September 16, Newbury (Region 17) on October 1, and in Cheltenham (Region 6) on October 8. Attendances at these meetings were reasonably satisfactory, but did not approach the attendances recorded at some of the Mobile Rallies.

National Mobile Rally

A National Mobile Rally sponsored by the Society was held at Woburn Abbey, Beds., on September 10 when a very large attendance was recorded. The Rally was organized by the recently constituted Mobile Committee (Chairman, Mr. C. H. L. Edwards, A.M.I.E.E., G8TL). In addition to the National Mobile Rally, a number of highly successful rallies organized by local R.S.G.B. groups and affiliated societies took place during the summer months.

Golden Jubilee Celebrations

The Golden Jubilee Celebrations Committee under the chairmanship of the President (Major-General E. S. Cole, C.B., C.B.E.) has analysed the replies received from the questionnaire inserted in the April issue of the R.S.G.B. BULLETIN, and is putting forward proposals to the Council, based on the views of members, for celebrating in an appropriate manner the 50th anniversary of the formation of the London Wireless Club, forerunner of the Wireless Society of London, and the Radio Society of Great Britain.

The Council wishes to thank the 1,370 members who returned the questionnaire.

Headquarters Fund

The September issue of the Society's Journal carried a personal letter from the President to all members in which he invited support for a fund to establish new Headquarters. Up to the end of November 1961, the sum of £1,095.14.11 had been donated, for which the Council records its thanks to all donors.

Licence Matters

As the result of discussions between representatives of the Society and the G.P.O., the Radio Services Department announced in September that a limited number of amateurs were being authorized for a period of two years to use the narrow band (slow scan) transmission system on all amateur frequencies from 28 Mc/s upwards subject to the usual restrictions in respect to the band 144-145 Mc/s. At the same time it was announced that Radio Teleprinting was to be permitted generally on all bands except 1·8-2 Mc/s. This new facility also followed negotiations between the Society and the G.P.O.

* Read to the members present at the Annual General Meeting of the Society held on December 16, 1961.

Annual General Meeting

Minutes of the 35th Annual General Meeting of the Radio Society of Great Britain held at Over-Seas House, Park Place, St. James's Street, London, W.1, on Saturday, December 16, 1961, at 2.30 p.m.

Present: The President (Major-General E. S. Cole, C.B., C.B.E. in the Chair), the Penultimate Past President (Dr. R. L. Smith-Rose, C.B.E.), the Honorary Treasurer (Mr. N. Caws, F.C.A.), the Executive Vice-President (Mr. E. G. Ingram), Messrs. C. H. L. Edwards, A.M.I.E.E., R. C. Hills, B.Sc.(Eng), A.M.Brit.I.R.E., L. E. Newnham, B.Sc., G. M. C. Stone, A.M.I.E.E., A.M.Brit.I.R.E., P. H. Wade, and E. W. Yeomanson (Members of the Council). Mr. John Clarricoats, O.B.E. (General Secretary and Editor), Mr. John A. Rouse (Deputy Editor) and Miss May Gadsden (Assistant Secretary). About 60 other members were present.

Apologies: Apologies for absence were received from Messrs. K. E. S. Ellis, J. D. Kay, A. O. Milne, F. K. Parker, F. A. Russell and A. C. Williams (Members of the Council), H. A. Bartlett and V. M. Desmond (Past Presidents) and J. A. Plowman (winner of the Courtenay Price Trophy).

* * *

Notice Convening the Meeting

The General Secretary read the notice convening the meeting.

Minutes

It was moved by Mr. G. Leicester, seconded by Mr. J. W. Swinnerton, and RESOLVED that the Minutes of the thirty-fourth Annual General Meeting, as published in the January 1961 issue of the R.S.G.B. BULLETIN be approved and signed.

Annual Report of the Council

It was moved by the President and RESOLVED that the Annual Report of the Council as published in the November 1961 issue of the R.S.G.B. BULLETIN be received and adopted.

The General Secretary read to the meeting a short Supplementary Report of the Council dealing with events and happenings that had taken place since July 1, 1961. (The Report is published on page 351.)

The President reported briefly on the recent activities of the Cornwall R.S.G.B. Group and members of the Cornish Radio and Television Club in connection with the Marconi Sixtieth Anniversary Celebrations at Poldhu. Major-General Cole spoke of the valuable assistance rendered by Marconi's Wireless Telegraph Co. Ltd. and to the messages of good-will which were sent from the Poldhu station to the station operated by the Newfoundland Radio Amateurs at St. John's, Newfoundland.

The President also reported that a satellite carrying amateur radio equipment (Project OSCAR) went into orbit on December 12, 1961 (the Sixtieth Anniversary of the day when signals were first transmitted across the Atlantic) and that amateurs in the United Kingdom had already furnished useful information to the OSCAR Project Centre in California. The Society had sent congratulations to those responsible for bringing the project to fruition.

Report of the Hon. Treasurer and the Audited Accounts

Before formally moving the adoption of his Report the Hon. Treasurer (Mr. Caws) explained to the members the reasons for the more important increases and decreases of the various items in the Income and Expenditure Account and the Balance Sheet as compared with the previous year. Mr. Caws also drew attention to a small typographical error in the printed accounts—the reference on page 4 to 3 per cent Savings Bonds should have read 1955/1965 and not 1955/1956.

Mr. Caws made special reference to the loss which had been recorded on the Cambridge Convention. The Council had assumed an attendance of about 400 whereas only 204 people attended.

Mr. Caws commented on the fact that although the cost of printing and posting had increased by nearly £400 the nett cost of producing the BULLETIN had been about £100 less than in the previous year due to an increase of about £500 in advertising revenue. Mr. Caws remarked that this state of affairs may not, however, continue.

Mr. Caws informed the meeting that the Council had decided after very careful consideration that the annual subscription rate to be paid as from July 1, 1962, should be increased from 30s. to 35s. in the case of Home Corporate members and from 28s. to 35s. in the case of Overseas Corporate Members. The Council were anxious to offer members a larger BULLETIN each month but this cannot be done whilst subscriptions remain at their present level. The Council had given careful consideration to suggestions that the annual subscription rate to be paid by Associates should be increased but it had been decided not to change the rate. The Council were, however, proposing to recommend to the membership that the Associate grade should apply only to persons under 18 years of age. Mr. Caws explained that this change can only be brought about by amending the Articles of Association. The Council hoped to submit to the members at a Special General Meeting next December proposals for amending certain of the Society's Articles of Association.

Mr. Caws then moved, Mr. Jessop seconded, and it was RESOLVED unanimously that the Report of the Honorary Treasurer and the Audited Accounts for the year ended June 30, 1961, be approved and adopted.

Election of Council

The President informed the meeting that the scrutineers of the Ballot for the office of President had reported that Mr. E. G. Ingram had polled 838 votes and Mr. H. A. Bartlett 831 votes. They had, however, drawn attention to the fact that seven papers recording votes in favour of Mr. Bartlett had been signed. If these had been accepted the two candidates would have polled an equal number of votes.

A legal opinion had been taken about the seven signed papers and the Council had been advised that the papers should be accepted. It had been pointed out that neither the Articles of Association nor the Ballot Paper make any reference to the fact that Ballot Papers which are signed shall be rejected. The Council had, therefore, agreed that the papers should be accepted.

The President then explained that when equality of votes is recorded the Chairman of the Annual General Meeting is required in accordance with Article 62 to give his casting vote in favour of one of the candidates.

The President stated that he had given long and careful consideration to the matter and had decided to give his casting vote in favour of the Executive Vice-President, Mr. E. G. Ingram.

The President informed the meeting that the scrutineers had suggested that in future Ballot Papers should give a clear indication on the point which had now arisen.

Mr. F. W. Fletcher, one of the three scrutineers, drew attention to Article 27 which refers to the constitution of the Council. He pointed out that as from January 1, 1962, Mr.

Ingram will be holding the office of President as well as that of Zonal Representative whilst Mr. Caws will be holding the office of Executive Vice-President as well as that of Honorary Treasurer.

The President stated that the point raised by Mr. Fletcher was under active consideration and would be discussed by the Council early in the New Year.

The President then announced that the result of the ballot to fill the two vacancies which will occur on December 31, 1961, among the Ordinary Members of the Council, was as follows:

R. E. G. Caws	569 votes
D. Deacon	635 votes
G. A. Leicester	373 votes
R. F. Stevens	965 votes
J. W. Swinnerton	763 votes

He declared Messrs. Stevens and Swinnerton elected.

The President stated that Mr. N. Caws and Mr. P. Wade had been elected without opposition to the offices of Executive Vice-President and Zone A Representative respectively and he declared them duly elected.

The President reported that 1680 ballot papers had been accepted and 14 rejected but seven of the rejected papers had now been accepted. He thanked the scrutineers (Mr. F. W. Fletcher, Mr. A. L. Browning and Miss B. Fletcher) for their services. The President congratulated the successful candidates and on behalf of those present thanked the retiring members of Council (Dr. Smith-Rose, Mr. Ellis and Mr. Kay) for their past services to the Society.

The President announced that the following members of the Council had not been required to stand for election in their respective offices:

Major-General E. S. Cole ..	Retiring President
Messrs. C. H. L. Edwards, R. C. Hills, A. O. Milne, L. E. Newnham and G. M. C. Stone ..	Ordinary Members
Messrs. E. G. Ingram, F. K. Parker, F. A. Russell, A. C. Williams and E. W. Yeomanson	Zonal Representatives

Auditors

It was moved by Mr. Caws, seconded by Mr. Newton, and RESOLVED that Edward Moore & Sons be re-appointed Auditors for the year to June 30, 1962, at a fee of 100 guineas.

Thanks to Staff

The President thanked the General Secretary (Mr. John Clarricoats), the Deputy Editor (Mr. John A. Rouse), and the Assistant Secretary (Miss May Gadsden) for the work they had done for the Society during the year, much of it in their own time.

The Meeting terminated at 3.30 p.m.

Informal Discussion

Headquarters Fund

Mr. Caws referred to the receipt of a resolution which had been received from the East London Group. The offer of help would be considered by the Council. Mr. Levi raised points regarding the proposal to establish new Headquarters. He sought information on the borrowing powers of the Council, the proposed size of the new Headquarters, whether it is proposed to purchase or rent the accommodation, whether the question of taking out a mortgage had been considered. Mr. Caws explained that most of the points raised by Mr. Levi had been discussed in a general way by the Council but it was too early yet to give much definite information. Mr. Swinnerton suggested that an approach might be made to the Ministry of Education for financial assistance.

Mr. Thorogood suggested that an approach should be made to the Ministry of Works with a view to ascertaining whether property in Regents Park is available. He considered that the Society would have to pay £22,000—£25,000 for a suitable property in Central London. If members would donate one year's subscription to the Society the financial aspects of the problem would be largely solved. The Secretary referred to a *Current Comment* on the Headquarters Fund which he had written for the December issue of the R.S.G.B. BULLETIN. Mr. Levi considered that the President's letter and the statement published in the September issue of the BULLETIN did not give sufficient information about what is to be done. He believed that several insurance companies would finance the project at an interest rate of 6 per cent spread over 30 years.

The President agreed that the Council during 1962 should consider giving more specific information to the membership on what it is proposed to do, using three or four hypothetical cases for illustration. Mr. Fletcher, speaking as Secretary of the London Members' Luncheon Club, remarked that overseas visitors are not impressed with the present facilities for entertaining them at Headquarters.

The President stated that the Council appreciated the difficulties referred to by Mr. Fletcher and it was for that reason efforts were being made to provide better accommodation where visitors could be made more welcome.

Mr. Margolis suggested that the Church Commissioners should be approached for accommodation. He mentioned that during the next six months various types of rectories are expected to come on to the property market.

Mr. Caws thanked the various speakers for their comments and suggestions and stated that he receives details of properties for disposal from several agents.

Mr. Rayner enquired whether the Council would be able properly to maintain new premises. The President stated that this matter had already been taken note of by the Council.

Mr. Shaw suggested that the new Headquarters should be in the Provinces. He had in mind Nottingham.

The President stated that no decision had been taken on the question of the location of the new Headquarters.

Society Publications

Mr. Newton congratulated the Council on the quality of the various publications now offered to members and the general public. He congratulated Mr. Rouse and all others associated with him in the production of the new *Handbook*.

Associates

Mr. Wolfenden expressed the hope that the Council would give consideration to the case of students over 21.

Borrowing Powers

In connection with a point raised earlier during the discussion on Headquarters Fund, Mr. Fletcher mentioned that the Memorandum of Association permits the Council to borrow money from outside sources at a figure higher than 5 per cent. The 5 per cent restriction applies only to members.

Mr. Caws agreed with the view expressed by Mr. Fletcher.

Subscriptions

Mr. Caws stated in reply to a point raised by Mr. Thorogood that the revenue from increased subscriptions would be used in the main to provide a larger BULLETIN. It was not possible at the present time to set aside income specifically for new Headquarters.

Joint Sharing of Accommodation

Mr. Savage enquired whether the Council had considered

the possibility of sharing new premises with another organization. Mr. Caws stated that the matter had been considered and as recently as November last it had been hoped to begin informal discussions with another society but since then the organization concerned had obtained a long lease on its present premises.

R.S.G.B. Bulletin

Mr. Tomalin enquired whether the larger issues of the BULLETIN would contain 16 pages of additional technical material.

Mr. Stone stated that it was hoped that most of the additional space available would be used for technical material but he explained some of the difficulties facing the editorial staff and Technical Committee in obtaining sound material. He urged all members continually to be on the look out for good material for articles.

* * *

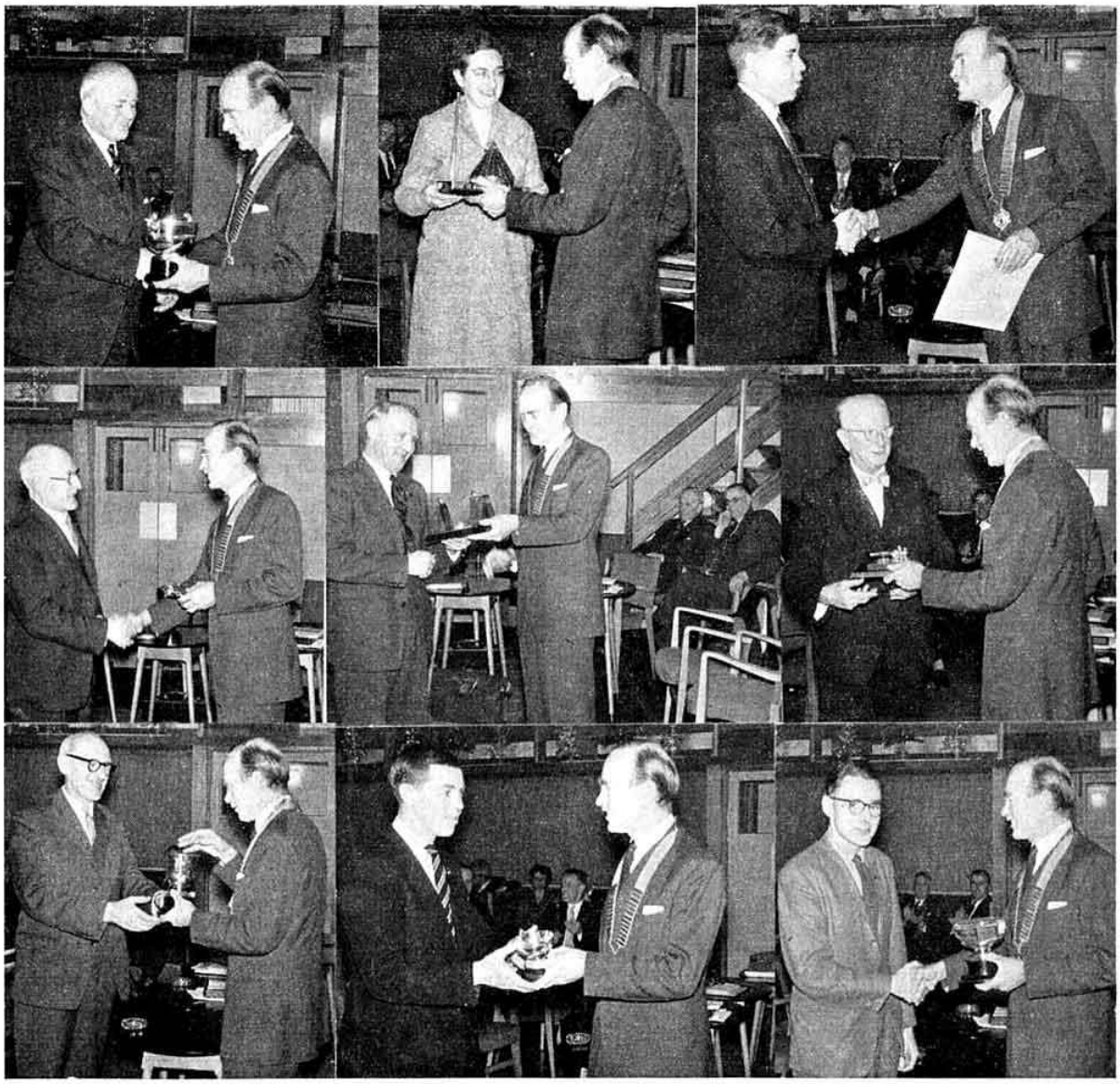
The discussion ended at 4 p.m.

* * *

Presentation of Trophies

At the conclusion of the informal discussion which

(*Continued on page 358*)



Following the Annual General Meeting on December 16, 1961, the President (Major-General E. S. Cole, G2EC) presented a number of trophies and awards. From left to right, Dr. R. L. Smith-Rose (Founders' Trophy), Mrs. H. J. Crane, G3GOX (Houston Fergus Trophy), John Gazeley, B.R.S.20533 (Bevan Swift Memorial Prize); second row, G. A. Jeapes, G2XV (miniature cup), C. E. Dixon, B.R.S. 21632 of Cannock Chase Amatuer Radio Society (Bristol Trophy), T. A. St. Johnston, G6UT (Calcutta Key); (bottom row) P. W. Winsford, G4DC (Mitchell-Milling Trophy), R. B. I. Rutherford, A.1495 (Metcalfe Trophy) and W. E. Wilkinson, B.R.S.20317 (B.E.R.U. Receiving Rose Bowl) *(Photos by G2AHL)*

Society News

Cardiff O.R.M.

THE Region 10 Official Regional Meeting was held at the Park Hotel, Cardiff, on September 16, 1961. Council was represented by Mr. Geoff Stone (G3FZL), Mr. C. H. L. Edwards (G8TL) and Mr. A. Williams (GW5VX), the Zonal Representative. It was the intention of the President to attend, but unforeseen circumstances prevented this. The total attendance was 118, including strong contingents from Weston-super-Mare and Hereford.

The business meeting produced the usual lively discussions, and the many points raised were ably dealt with by the Council representatives. Mr. Stone in particular gave an account of the work of the Technical Committee, and enlarged upon the amount of v.h.f. work being carried out. Particular interest was shown in the proposal to institute a fund towards the provision of a new Headquarters building, and Mr. Edwards gave an account of the position as it existed at that time.

After an interval for high tea, the raffle prizes were distributed, and it was again possible to ensure that everyone attending received a prize. Concurrently there was a distribution of chocolates to the ladies attending.

As it was not possible for the President to give the lecture scheduled, Mr. Stone stepped into the breach and gave a talk on the more elementary aspects of 2m working, with a bias towards those who are taking initial steps on this band. This talk was widely appreciated and did undoubtedly cause quite a number of people to take up v.h.f. activity.

A competition for home-constructed equipment, with three cash prizes, was won by Mr. Dick Church (GW3HCH) with his very advanced crystal-controlled communication receiver, second prize being won by Mr. W. M. Lee (GW3MFY) with a transistor 2m converter and third prize by Mr. T. J. Brooke (GW3GHC) with a crystal-controlled receiver front end. The standard of equipment entered was notably high.

A small but extremely interesting show of commercial equipment was given by Messrs. Electroniques of Felixstowe and Messrs. Withers (Electronics). Many manufacturers contributed trade literature on a very generous scale.

The thanks of the Regional Representative, Mr. C. H. Parsons (GW8NP) who organized the event, are extended to all who helped make the meeting such a success, and to the many donors of raffle prizes and literature. GW8NP.

Ballot Results

THE ballots which were conducted in Regions 5, 7 and 10, for the office of Regional Representative, resulted as follows:

REGION 5		
	T. A. T. Davies (G2ALL)*	Nil votes.
	S. J. Granfield (G5BQ)	14 votes. Elected.
REGION 7		
	F. G. Lambeth (G2AIW)*	18 votes
	P. A. Thorogood (G4KD)	86 votes. Elected.
REGION 10		
	H. G. Hughes (GW4CG)	20 votes
	C. H. Parsons (GW8NP)*	43 votes. Elected.

* *Retiring Regional Representative.*

Headquarters Fund—List No. 4

THE following is the fourth list of those who had contributed to the Headquarters Fund up to December 31, 1961:

P. Bailey (VQ4KPB), W. Bullock (B.R.S.21627), S. Allen (G8TR), C. Turner (G8NL), B. W. East (G3NNZ), F. W. Pallant (B.R.S.24517), N. P. Haskins (G8JR), S. Harle (G3MEA), T. I. Kennedy (GM3OYO), J. R. Garrett-Pegge (G3MI), R. D. Holland (G3KZ), M. H. Duke (VS6BJ/G3KVU), T. Hodson (B.R.S.23105), I. J. P. James (G5IJ), D. Broadbridge (B.R.S.23094), C. H. Parsons (GW8NP), South Manchester Hot Pot Supper. Total amount contributed to date: £1208/14/5.

Gravesend Trophy

AT the Annual General Meeting of the Society held on December 16, 1961, a representative of the Gravesend Radio Society formally handed to the President the new Gravesend Trophy which will be awarded to the runners-up in future N.F.D. events.

Major-General E. S. Cole, C.B., C.B.E. (G2EC) receiving the Gravesend Trophy from a representative of the Gravesend Radio Society.

CQ de GM6IZ

Greetings and good luck to all members of the Radio Society of Great Britain and to all radio amateurs throughout the world. May 1962 see the fulfilment of many of your ideals and may continued co-operation in all facets of our hobby serve as a basis for lasting friendships and a better appreciation by us of the various problems which beset us in other walks of life both nationally and internationally.

73,
E. G. ("TED") INGRAM
Aberdeen. 1st January, 1962 *President*

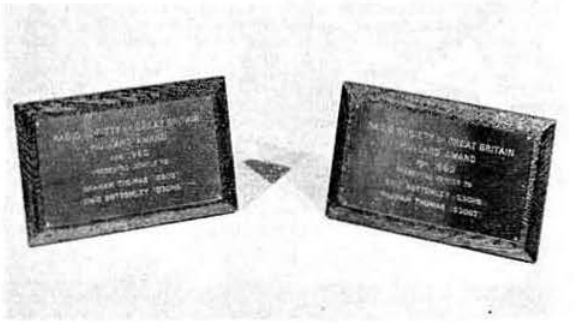
Members of the Stourbridge and District Amateur Radio Society with Major-General E. S. Cole (G2EC) after the R.S.G.B. Annual General Meeting on December 16, 1961. Stourbridge won both the Edgware Trophy and the National Field Day Shield in 1961. Alec H:ggins, G8GF (Region 3 Representative) is at the left of the picture. *(Photo by G2AHL)*

R.S.G.B. Bulletin—December 1961 Posting Certificate

ALL copies of the December 1961 issue of the R.S.G.B BULLETIN were posted on Monday, December 18, 1961 and the Society holds a certificate to that effect from the Hitchin, Herts., Postmaster.

Christmas and New Year Greetings

THE General Secretary thanks all members who were kind enough to send Christmas and New Year greetings to him and to the members of Heaquarters Staff. The many expressions of goodwill were warmly appreciated.



The handsome plaques donated by Mullard Ltd. to Graham Thomas (G3OGT) and Enid Bottomley (G3OHB), joint winners of the Mullard Award for 1960.

A.R.R.L. Handbook

THE 39th (1962) Edition of *The Radio Amateur's Handbook* will be published next month and supplies are expected to reach R.S.G.B. Headquarters during March. The list price of the new edition has been increased from $4.50 to $5.00 a copy, equivalent to 36/- (38/6 post paid) in the United Kingdom.

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

Iniquitous Charges

THE Italian National Society (A.R.I.) report that the Italian Government has imposed a new tax of about $55.00 (£24) for each new Amateur Radio licence and an annual renewal fee of between $21 and $26 (£9-£11).

Amateurs the world over will sympathise with their Italian colleagues and will extend best wishes to A.R.I. in their efforts to persuade the Italian licence issuing authorities to adopt a more reasonable attitude towards Amateur Radio.

MULLARD AWARD 1961 NOMINATIONS INVITED

THE terms and conditions governing the Mullard Award, are as follows:

(1) *The Award is offered annually by Mullard Limited during the pleasure of the Directors of that Company.*

(2) *The Award will take the form of a gift in kind (preferably electronic or electrical apparatus and/or books) to the value of £25, and a plaque.*

(3) *The Award will be made to the member of the Radio Society of Great Britain resident in the United Kingdom who (in the opinion of a Committee consisting of three representatives of Mullard Limited and three representatives of the Council of the Radio Society of Great Britain) has, through the medium of Amateur Radio during the preceding calendar year, rendered outstanding personal service to the community by his own endeavour or by his own example of fortitude and courage.*

(4) *The presentation of the Award will take place during the month of April each year on a date and at a place to be decided by the Committee.*

(5) *In January of each year, the Radio Society of Great Britain shall, through its Official journal, invite nominations for the Award. Each such nomination shall be supported by at least three Corporate Members of the Society and shall be accompanied by a brief factual account of the personal service rendered by the nominee.*

In accordance with Rule 5, the Council invites nominations for consideration for the Mullard Award for 1961. Such nominations should be sent in writing to the General Secretary at R.S.G.B. Headquarters to arrive not later than February 14, 1962.

The Poldhu Story

FROM the *West Briton*, Truro, newspaper, we learn that it was 86-year-old Mr. Charles Tonkin of Mullion, Cornwall, who officially opened the Amateur Radio station GB3MSA installed at the Poldhu Hotel last month in connection with the Marconi 60th Anniversary celebrations and operated by members of the Cornwall R.S.G.B. Group and of the Cornish Radio and Television Club.

Mr. Tonkin was employed at the original Poldhu station almost continuously from the time it was first opened at the turn of the century until it was finally closed down a few years before the last war.

Among the guests at the official opening ceremony on December 12, 1961, were the High Sheriff of Cornwall (Mr. G. Romney Fox) and Mr. H. A. Bartlett (G5QA) of Exeter (a Past President of the R.S.G.B.) as well as representatives of the Marconi Company and senior Post Office officials.

After the opening ceremony messages were read by Mr. J. N. Watson (G3AET) from the Postmaster General (Mr. J. R. Bevins, M.P.) and from the Chairman and Board of Marconi's Wireless Telegraph Co. Ltd. The message from Mr. Bevins said the Postmaster General shared with the Prime Minister of Newfoundland the great pleasure of honouring an occasion which in so short a time had resulted in the establishment of a world-wide network of radio communications.

The message from the Marconi Company stated they remembered with pride their illustrious founder and his great feat.

It is understood that although the Poldhu station GB3MSA managed to work more than 400 other amateur stations, including a station only six miles from Signal Hill, Newfoundland, the special amateur station VO1MSA was not contacted. The messages of greeting were eventually relayed through two other Canadian stations.

During the period December 9 to 17 four transmitters were in operation from the Poldhu site and at one particular period 22 stations in the U.S.A., Canada, Venezuela and other countries were worked in 45 minutes.

It is regretted that up to the time this issue closed for press no direct information had been received from the organizers of the Poldhu station GB3MSA. It is known, however, that the organizers received invaluable assistance from the War Office, Marconi's Wireless Telegraph Co. Ltd. and a number of other radio concerns, all of whom receive the warm thanks of radio amateurs everywhere for their splendid co-operation.

* * *

MR. F. N. Sutherland, C.B.E., Managing Director of Marconi's Wireless Telegraph Co. Ltd. was the host at a cocktail party given by his Company on December 12, 1961, in the Science Museum, South Kensington, London, to mark the 60th anniversary of the occasion when wireless signals transmitted from Poldhu, Cornwall, were heard for the first time on the other side of the Atlantic. Among the pioneers present at the Science Museum were Captain H. J. Round (designer of the famous Round valve), Mr. C. S. Franklin (of beam aerial fame) and Mr. R. D. Bangay (author of *Elementary Principles of Wireless Telegraphy* first publighed in 1914). The guests included the President of the R.S.G.B. (Major General E. S. Cole, C.B., C.B.E.) and the General Secretary who is seen in the accompanying photograph with Captain Round (left), Mr. Franklin (centre) and Mr. Bangay (right).

During the evening the voice of the late Senatore Marconi (first Honorary Member of the R.S.G.B.) was heard describing some of his early wireless experiments as part of an exhibition, entitled " The Poldhu Story," arranged by Mr. G. R. M. Garrett (G5CS), Head of the Communications Department of the Science Museum.

Silent Keys

JOHN PODD (G3OWT)

It is with deep regret that we record the death, as a result of a motor accident on an icy road, of Mr. John Podd (G3OWT) of Ipswich, on December 19, 1961. Although only licensed in April last, John was already well known on 80m. and was a keen supporter of R.A.E.N.

To his daughter, son-in-law and granddaughter we express our sympathy in their tragic loss. W. E. H. H.

G. B. C. SMYTH (G3GNJ)

The death occurred on November 28, 1961, at Bristol of Mr. G. B. C. (Cliff) Smyth (G3GNJ). Cliff was first licensed soon after the Second World War and was very active on most amateur bands.

His station was built in real ship-shape and Bristol fashion and was the result of intense interest in Amateur Radio communication. His cheerful conversation will be greatly missed by local members on the lower frequency bands.

To his wife and son Michael, who worked with him as a team in his amateur activities, the Bristol R.S.G.B. Group offer their deepest sympathy. R. E. G.

Postal Delays

THE General Secretary much regrets the inconvenience caused to members by the " work to rule " methods adopted by certain Post Office employees. When this issue finally closed for press on January 10, 1962, R.S.G.B. Headquarters, in common with other business concerns in Central London, was being very seriously affected by the " go slow " measures.

In an attempt to help the Post Office statements of account for subscriptions due on January 1, 1962, were held back until later in the month but orders for Society publications were dealt with as soon as possible after receipt.

This issue of the BULLETIN will no doubt reach members several days late unless the " go slow " has ended by the time publication is due to take place.

The " work to rule " has disorganized the weekly R.S.G.B. News Bulletins. Since Christmas scripts have been prepared and posted on Wednesdays but it is doubtful whether they have reached all News Readers on time.

Can You Help?

● B. R. Smith (G3NNM), Anvil Corner, 1 Belle Vue Road, Herne Bay, Kent, who requires information on the U.S. Navy Receiver type RAY5?

Council Proceedings

Résumé of the Minutes of the Proceedings at a Meeting of the Council of the Radio Society of Great Britain, held at New Ruskin House, Little Russell Street, London, W.C.1, on Monday, November 20th, 1961, at 6 p.m.

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

* * *

Amateur Radio Handbook
It was reported that a further sum of £415.6.0 had been paid to contributors to the *Handbook*.
Resolved (i) to pay to a member of Council the sum of £25, for the purchase of the copyright material he contributed to the *Handbook* before he was elected a member of the Council; (ii) to award honoraria totalling £251.5.0 to 14 other members who had assisted with the *Handbook*.
It was reported (*a*) that the sum of £752 had previously been paid to *Handbook* contributors and that *Handbook* costs up to October 31, 1961, totalled £2,520; (*b*) that more than 2,000 pre-publication orders had been received to date.

News Bulletin Service
It was reported that Mr. Sherrit (GM3EOJ) had resigned from the team of news readers.
Resolved (i) to accept with regret Mr. Sherrit's resignation, (ii) to record a vote of thanks to Mr. Sherrit for his past services, (iii) to invite Mr. L. Hardie (GM2FHH) to join the team of news readers for North East Scotland.

Marconi 60th Anniversary
Mr. F. A. Russell (Zone D Representative) reported upon a meeting he had had with Mr. John Watson (G3AET) when the arrangements being made by the Cornwall R.S.G.B. Group to establish an Amateur Radio station at Poldhu were discussed in detail. (The station was set up in connection with the Marconi 60th anniversary celebrations.—Ed).

Membership
Resolved (i) to elect 110 Corporate Members and 39 Associates; (ii) to grant Corporate membership to 10 Associates who had applied for transfer.
It was agreed to ask the Finance and Staff Committee to consider the case of Old Age Pensioners who are prevented from remaining in membership due to lack of financial resources.

Applications for Affiliation
Resolved to grant affiliation to Farnborough Technical College Radio Society and the Tees Side Amateur Radio Club.

I.A.R.U. Region I Division
The audited accounts of I.A.R.U. Region I Division for the year to December 31, 1960, were submitted.
Resolved to receive the audited accounts for the year 1960.

Headquarters Fund
Resolved (i) that Barclays Bank Ltd. shall be appointed Bankers of the R.S.G.B. Headquarters Fund; (ii) that all monies standing to the credit of the Fund shall be transferred to Barclays Bank Deposit Account.

V.H.F. Beacon Station
It was reported that the G.P.O. had agreed to the establishment of a V.H.F. Beacon Station at Redruth, Cornwall.

Region 10 O.R.M.
It was reported that a profit of £6.10.5 had been obtained on the recently-held O.R.M. in Cardiff, and that this sum had been placed to the credit of the Region 10 Fund.

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

Golden Jubilee Celebrations	October 24, 1961
TVI/BCI	October 25, 1961
Exhibition	October 30, November 11, 1961
Technical	November 1, 1961
Contests	November 10, 1961

Resolved (i) to receive the Reports; (ii) to accept and adopt the Recommendations contained therein. (The Recommendations dealt with a proposal of the TVI/BCI Committee that the Society should endeavour to negotiate a special radio policy with a firm of insurance brokers and various Contest matters).
It was reported that a new Society publication, *Communication Receiver Design Considerations*, had been published that day and that the 1962 edition of the *R.S.G.B. Amateur Radio Call Book* was due to be published on November 21, 1961.
It was agreed to pu'lish a statement giving the chief reasons why points are deducted from contest entries. (The statement was published in the December 1961 issue.—Ed).

The meeting terminated at 9.50 p.m.

Presentation of Trophies

(Continued from page 354)

followed the Annual General Meeting the President (Major-General E. S. Cole, C.B., C.B.E.) presented the following trophies and awards:
Founder's Trophy—Dr. R. L. Smith-Rose. Calcutta Key—Mr. T. A. St. Johnston, G6UT. Norman Keith Adams Prize—Mr. F. C. Judd, G2BCX. Bevan Swift Memorial Prize—Mr. J. Gazeley, B.R.S.20533. Houston Fergus Trophy—Mrs. H. J. Crane, G3GOX. Mitchell Milling Trophy—Mr. P. W. Winsford, G4DC. Somerset Trophy—Mr. H. J. M. Box, G6BQ. Metcalfe Trophy—Mr. R. B. I. Rutherford, A.1495. Whitworth Trophy—Mr. S. J. Pilkington, G3NNT. Horace Freeman Trophy—Enfield & District R.S.G.B. Group. B.E.R.U. Receiving Trophy—Mr. W. E. Wilkinson, B.R.S.20317. Edgware Trophy—Stourbridge & District Amateur Radio Society. National Field Day Shield and Miniature—Stourbridge & District Amateur Radio Society. National Field Day Miniature—Gravesend Radio Society. Bristol Trophy—Cannock Chase Amateur Radio Society. Miniature Trophies—Messrs. P. W. Winsford, G4DC; G. A. Jeapes, G2XV; H. Boakes, G8SB and P. K. Blair, G3LTF.

Bulletin Stencil Plates

IT occasionally happens that a stencil plate used for the preparation of a particular BULLETIN wrapper becomes worn or loses ink, with the result that the Post Office experience difficulty in tracing the address.

Members who notice that the address on the wrapper used for their copy of the BULLETIN is indistinct, or in any way faulty, are asked to advise Headquarters.

Representation

THE following are additions to the list of Town Representatives published in the December 1961 issue:
REGION 1—LANCASHIRE
BURY AND ROSSENDALE
J. E. Hodgkins (G3EJF), 24 Beryl Avenue, Tottington, near Bury.
REGION 7—LONDON NORTH
ENFIELD AND DISTRICT
J. R. Gazeley (B.R.S.20533), 192 Haselbury Road, Edmonton, London, N.9.

Affiliated Societies Representatives

THE following are additions to the list of Affiliated Societies Representatives published in the December 1961 issue:
BASINGSTOKE AMATEUR RADIO CLUB: P. J. Sterry (G3CBU), Ashley, Orchard Avenue, Basingstoke.
NEWBURY AND DISTRICT AMATEUR RADIO SOCIETY: J. A. Gale (G3LLK), Wild Hedges, Crookham Common, Newbury.
STOCKPORT RADIO SOCIETY: E. C. Wigzell (B.R.S.18465), 54 Clarendon Road, Hazel Grove, near Stockport, Cheshire.

Affiliated Societies

THE following are additions to the list published in the August 1961 edition:
BASINGSTOKE AMATEUR RADIO CLUB, c/o P. Jackson, 11 Oaklands Way, Winklebury, Basingstoke, Hants.
KIRKWALL AND DISTRICT AMATEUR RADIO SOCIETY, c/o A. B. Wylie, 7 Garrioch Street, Kirkwall, Orkney.
TEES SIDE AMATEUR RADIO CLUB, c/o Allan L. Taylor, 12 Endsleigh Drive, Acklam, Middlesbrough, Yorks.

Change of Address

The Secretary of the Halifax & District Amateur Radio Society is now A. SUNTER, 24 Booth Fold, Luddenden Foot, Halifax, Yorks.

Rules for National Field Day 1962

RULES for N.F.D. 1962 are as follows:

1. **Duration.** The Contest will commence at 17.00 G.M.T. on Saturday, June 2, and end at 17.00 G.M.T. on Sunday, June 3, 1962.

2. **Eligible Entrants.** Any group of members within the British Isles, which for the purposes of the contest comprise the prefix zones G, GC, GD, GI, GM and GW, may enter. The group may be a local R.S.G.B. group, a club or an Affiliated Society.

3. **Operators.** Operators of portable stations competing in the contest must each hold a current British Isles (G.P.O.) Amateur (Sound) Licence and must be fully paid-up Corporate Members of the R.S.G.B. at the time of the contest.

4. **Stations.** Each competing group will be permitted to place two stations ("A" and "B") in operation. "A" stations must select any three of the six frequency bands in use in the contest (1·8, 3·5, 7, 14, 21 and 28 Mc/s); the other three frequency bands will be allocated to the "B" station, i.e., no group may operate two stations on any one frequency band. Both stations may operate from the same site or from different sites, provided that they are located within the agreed limits of the area covered by their Regional Representative. It will be permissible for two groups within a single region, each operating a single station, to amalgamate for the purpose of scoring; if this is done, frequency bands must be allocated between the two stations as detailed above. Single-station entries will be accepted from stations operating on not more than three of the frequency bands listed above.

5. **Licences.** Each station must be licensed to use a different call-sign.

6. **Applications.** Each group intending to compete must notify the R.S.G.B. Contests Committee, 28-30 Little Russell Street, London, W.C.1, of the name of the group, location and the name and full postal address (in **BLOCK LETTERS** please) of the T.R., A.R., A.S.R., or member responsible for their entry, not later than **TUESDAY, MAY 1, 1962.** Stationery and the latest information on the contest will be sent to this member.

Details should be set out as follows:
Call-sign station "A".....Call-sign station "B".....
The bands to be used by these stations are:

Band	1·8 Mc/s	3·5 Mc/s	7 Mc/s	14 Mc/s	21 Mc/s	28 Mc/s
Call-sign						

7. **Tents.** Stations must be operated from tents.

8. **Apparatus.** No apparatus may be erected on the site prior to 12.00 G.M.T. on June 2, 1962. This rule includes aerials and aerial fittings as well as tented accommodations for the stations, but does not apply to a tent to be used for storage purposes.

9. **Aerials.** Any aerials may be used, subject to the following limitations:
   (*a*) All aerials must be constructed from wire of total cross-sectional area not greater than 14 s.w.g. with the exception, however, that vertical radiators of any construction may be used.
   (*b*) No part of the aerials shall exceed a height of 45 ft. above ground level.

10. **Transmitters and Receivers.** Equipment at any "A" or "B" station must not exceed three transmitters and one receiver. Reserve equipment may be kept available, but not connected.

11. **Power Input.** Total d.c. input power to the anode circuit of the valve or valves energizing the aerial, or to any previous stage of the transmitter, **shall not exceed 10 watts.**

12. **Power Supply.** Power for any part of the station shall not be derived from supply mains.

13. **Type of Emission.** The contest is restricted to the use of c.w. (A1) only.

14. **Contest Exchanges.** An exchange of reports must be made and acknowledged before points may be claimed. In contacts made by competing stations the report must include a rising serial number commencing with 001 and increasing by one with each successive contact, irrespective of band, made by the station (e.g. RST579001, etc.), and such serial numbers, both incoming and outgoing, together with signal reports, must be entered on the log sheets. Proof of contacts may be required.

15. **Contacts.** Only one contact with each specific station, whether fixed, portable or mobile, may count for points on each band during the contest. Duplicate contacts should be logged without claim for points.

16. **Group Contacts.** Points must not be claimed for contacts made by a competing station with other stations within its own town or area or with members of its own group, whether fixed, portable or mobile.

17. **Scoring.** Points will be scored on the following basis:

(*a*) Fixed stations in the British Isles	1 point
(*b*) Fixed stations in the rest of Europe including Eire ...	2 points
(*c*) Fixed stations outside Europe	3 points
(*d*) Fixed stations in the British Commonwealth and Empire	6 points
(*e*) Portable and mobile stations in the British Isles ...	*3 points
(*f*) Portable and mobile stations in the rest of Europe including Eire	4 points
(*g*) Portable and mobile stations outside Europe ...	6 points
(*h*) Portable and mobile stations in the British Commonwealth and Empire	12 points

* An additional 2 points may be claimed on **1·8 Mc/s and 3·5 Mc/s ONLY** for contacts with a portable or mobile station in any other British Isles prefix zone (e.g., GM-G, GM-GD, G-GI, GW-GC contacts on 1·8 and 3·5 Mc/s score 5 points). The six British Isles prefix zones are listed in Rule 2.

18. **Summary Sheets.** An entry will be accepted as valid only if the completed summary sheet has been signed by the T.R., A.R., A.S.R., or member whose name has been notified to the Contests Committee in accordance with Rule 6, who will be solely responsible for the conduct of the event within his group, however constituted.

19. **Operators' Signatures.** Contacts made by an operator whose personal signature does not appear on the cover sheet(s) of the appropriate log(s) may be disallowed.

20. **Entries.** Each station's entry shall consist of extracts from the station log on the printed log sheet, **a separate sheet being submitted for each band worked,** together with a cover sheet for each band, and a summary sheet. The points claimed must be totalled for each band. Forms for this purpose will be supplied by Headquarters. Entries must be addressed to the R.S.G.B. Contests Committee, 28-30 Little Russell Street, London, W.C.1, **postmarked not later then June 18, 1962. LOGS MUST BE KEPT AND ENTRIES SUBMITTED IN G.M.T.**

21. In addition to the ***National Field Day Trophy*** and miniature replica, which will be awarded to the group obtaining the highest combined score, **miniature replicas** will be awarded to the groups with the highest score on each frequency band.

22. **A certificate** will be awarded to each of the following:
   (*a*) The chief operator of the overseas station whose check log shows that he contributed the most points to competitors.
   (*b*) The non-transmitting British Isles member whose check log is adjudged the most useful by the Contests Committee.

23. The ***Scottish N.F.D. Trophy*** will be awarded to the Scottish group scoring the highest number of points.

24. The ***Bristol Trophy*** will be awarded to the group which, having entered only one station, shall obtain the highest number of points in comparison with other groups entering on a similar basis.

25. **Care of Trophies.** The Trophies will be handed to the representatives of the groups concerned, who will be responsible for their safe keeping until their return is requested by R.S.G.B. Headquarters.

Grafton Radio Society

THE Annual Christmas Party of the Grafton Radio Society took place on December 2, 1961, at the Royal Hotel, Woburn Place, London, W.C.1, and was supported by about 100 members and friends. Among those present were R.S.G.B. Council Members Ray Hills (G3HRH), Geoff Stone (G3FZL) and Eric Yeomanson (G3IIR), with their ladies, the General Secretary of the R.S.G.B. and Miss May Gadsden, and Mr. Ian Nicholson, Head of the Films and Lectures Division of Mullard Ltd. with Mrs. Nicholson.

The Party was organized by Mr. A. W. H. Wennell (G2CJN) (Hon. Secretary of the Grafton Radio Society) who had the active support of the President (Mr. John Clarke, G2AAN) and Mr. F. D. M. Sloan (G3ONS).

R.S.G.B. Tape Recorded Lecture Library

APPLICATIONS from R.S.G.B. Groups, Affiliated Societies and Clubs, to borrow tape recorded lectures should be sent to the Hon. Librarian, Mr. N. C. Ta'Bois (G3HWG), 81 Snakes Lane, Woodford Green, Essex, as far in advance as possible. A list of the recordings available may be obtained from Headquarters.

Can You Help?

● L. O. Tully, 120 Victoria Street, Fairfield S3, Brisbane, Queensland, Australia, who requires the circuit diagram and any other information on the MCR1 receiver?

● D. Byrne (G3KPO), Jersey House, Eye, Peterborough, who requires the circuit and other details of the original Jason f.m. tuner?

● C. B. Raithby (G8GI), School House, Martin, Lincoln, who requires the manual for the Marconi receiver type CR150/4?

CONTEST NEWS

— RESULTS —— REPORTS —— RULES —

First 1·8 Mc/s Contest 1962

THE rules for this contest, which will be " short," are as follows.

When: 21.00 G.M.T. on Saturday, February 24 to 03.00 G.M.T. on Sunday, February 25, 1962.

Eligible Entrants: All fully paid-up Corporate Members of the R.S.G.B. resident in G, GC, GD, GI, GM and GW.

Contacts: C.w. (A1) contacts only in the 1·8 to 2 Mc/s band.

Scoring: Contacts with stations in the British Isles (G, GC, GD, GI, GM and GW) will score one point only; contacts with stations outside the British Isles will score *three* points.

Contest Exchanges: RST reports followed by the contact number starting with 001. All reports must be acknowledged with " R."

Logs: (*a*) Must be tabulated in columns headed (in this order) " Date/Time G.M.T.", " Call-sign of station worked," " My report on his signals and serial number sent," " His report on my signals and serial number received," " Claimed Score."

(*b*) **The cover sheet must be made out in accordance with R.S.G.B. Contests Rule 5. The declaration must be signed.**

(*c*) Entries must be postmarked not later than **Monday, March 12, 1962.**

Power Input: The power input to the *final* stage or any preceding stage of the transmitter must not exceed 10 watts.

Awards: At the discretion of the Council of the R.S.G.B., the **Somerset Trophy** will be awarded to the winner and certificates of merit to the stations placed second and third. In addition, the **Maitland Trophy** will be awarded to the Scottish station with the highest aggregate number of points in this contest combined with the Second 1·8 Mc/s Contest 1961. A certificate of merit will be awarded to the non-transmitting member submitting the best check log in the opinion of the judges.

The General Rules for R.S.G.B. Contests apply to the contest.

Listeners' V.H.F. Contest 1962

THE following are the details of the Listeners' V.H.F. Contest to be held at the same time as the 144 Mc/s Open Contest.

1. **Eligible Entrants.** The contest is open to all fully paid-up members of the R.S.G.B. resident in Europe. Only the entrant may operate his receiving station for the duration of the contest. Holders of amateur transmitting licences are *not* eligible to take part if they own transmitting equipment for the 144 Mc/s band.

2. **Duration.** The contest will commence at 17.00 G.M.T. on Saturday, March 3, and end at 19.00 G.M.T. on Sunday, March 4, 1962.

3. **Scoring.** Entrants will be required to log stations operating in the 144-146 Mc/s band. Each complete log entry of a telephony transmission will score 10 points; for each complete entry of a telegraphy transmission 20 points may be claimed. In addition a bonus of 25 points may be claimed for the first station logged in each new county in accordance with the list given in the details for the 144 Mc/s Open Contest. The whole of the London Postal Districts will count as one county only. Stations outside the entrant's own country will score 25 points (50 points if on telegraphy) for each complete log entry.

4. **Entries.** (a) To count for points, logs must show, in columns, (i) Date/Time (G.M.T.); (ii) Call-sign of Station Heard; (iii) Report and Serial Number Sent by Station Heard; (iv) Your Report on the Signal Heard; (v) County of Station Heard; (vi) Call-sign of Station being worked; (vii) Bonus Points; (viii) Points claimed.

(b) Entries must be set out on R.S.G.B. Contest Log Sheets available from R.S.G.B. Headquarters or on one side only of foolscap paper.

(c) The cover sheet must be made out in accordance with R.S.G.B. Contests Rule 5 and must certify that the entrant does not possess transmitting equipment for the 144 Mc/s band.

(d) Entries must be postmarked not later than **March 19, 1962.**

5. **Awards.** At the discretion of the Council, certificates of merit will be awarded to the winner and to the runner-up.

144 Mc/s Open Contest 1962

R.S.G.B. members throughout Europe are invited to take part in this popular v.h.f. contest. Both phone and c.w. may be used. Attention is drawn to the revised scoring system.

The details are as follows:

When: 17.00 G.M.T. on Saturday, March 3, 1962, to 19.00 G.M.T. on Sunday, March 4, 1962.

Eligible Entrants: All fully paid-up members of the R.S.G.B. resident in Europe.

Contacts: May be made on either A1, A3, A3a or F3 in accordance with the terms of the Amateur (Sound) Licence.

Scoring: For each completed contact in the operator's own country, 10 points may be claimed; for each completed contact with a station in any other country, 25 points may be claimed. In addition a bonus of 25 points may be claimed for the first contact in each new county in accordance with the list below. The whole of the London Postal District will count as one county only.

Contest Exchanges: RST or RS reports followed by the contact number, the location and county (e.g. RST559001 Digswell, Herts).

Logs: (*a*) Must be tabulated in columns headed in this order " Date/Time G.M.T.", " Call-sign of station worked," " My report on his signals and serial number sent," " His report on my signals and serial number received," " Location and County of station worked," " Bonus Points," " Points Claimed."

(*b*) **The cover sheet must be made out in accordance with R.S.G.B. Contests Rule 5 and the declaration signed. The location of the station given on the cover sheet must include the county.**

(*c*) Entries must be postmarked not later than **March 19, 1962.**

Awards: At the discretion of the Council, the **Mitchell-Milling Trophy** will be awarded to the winning entrant and a certificate of merit to the entrant placed second.

The General Rules for R.S.G.B. Contests published in this issue of the R.S.G.B. BULLETIN apply.

List of U.K. Counties

England (G).

1. Bedford	15. Hereford	28. Nottingham
2. Berkshire	16. Hertford	29. Oxford
3. Bucks	17. Huntingdon	30. Rutland
4. Cambridge	18. Kent	31. Shropshire
5. Cheshire	19. Lancashire	32. Somerset
6. Cornwall	20. Leicester	33. Stafford
7. Cumberland	21. Lincoln	34. Suffolk
8. Derby	22. London (Postal Districts)	35. Surrey
9. Devon		36. Sussex
10. Dorset	23. Middlesex	37. Warwick
11. Durham	24. Monmouth	38. Westmorland
12. Essex	25. Norfolk	39. Wiltshire
13. Gloucester	26. Northampton	40. Worcester
14. Hampshire	27. Northumberland	41. Yorkshire

Scotland (GM).

42. Aberdeen	54. Fife	66. Renfrew
43. Angus	55. Inverness	67. Ross & Cromarty
44. Argyll	56. Kincardine	58. Roxburgh
45. Ayr	57. Kinross	69. Selkirk
46. Banff	58. Kirkcudbright	70. Shetland
47. Berwick	59. Lanark	71. Stirling
48. Bute	60. Mid-Lothian	72. Sutherland
49. Caithness	61. Moray	73. West Lothian
50. Clackmannan	62. Nairn	74. Wigtown
51. Dumbarton	63. Orkney	
52. Dumfries	64. Peebles	
53. East Lothian	65. Perth	

Wales (GW).

75. Anglesey	79. Caernarvon	83. Merioneth
76. Brecknock	80. Denbigh	84. Montgomery
77. Cardigan	81. Flint	85. Pembroke
78. Carmarthen	82. Glamorgan	86. Radnor

Northern Ireland (GI).

87. Antrim	89. Down	91. Londonderry
88. Armagh	90. Fermanagh	92. Tyrone

Channel Islands (GC).

93. Alderney	95. Jersey	96. Sark
94. Guernsey		

97. Isle of Man (GD). 98. All Stations outside the United Kingdom.

A.R.R.L. DX Contest 1962

THE following is a summary of the rules for this year's A.R.R.L. DX Contest:

1. The contest periods are: **Telephony, February 2-4, and March 2-4; C.w., February 16-18, and March 16-18.**
2. The commencing time in each instance is 24.00 G.M.T. Friday, and the finishing time 24.00 Sunday.
3. The object is to work as many W-K-VE-VO-KH6-KL7 stations as possible in as many different call areas as possible per band.
4. DX stations will send the RS or RST report followed by a three-digit number representing power input. U.S.A.-Canada stations will send a number consisting of the RS or RST report followed by an abbreviation of the name of their state or province.
5. Repeat QSOs on additional bands are permitted. The multiplier is the total call areas contacted on each band (maximum of 21 per band). Each completed QSO counts three points and an incompleted QSO two points. The final score is the number of QSO points times the multiplier.
6. Logs should contain calls, dates, times (G.M.T.), bands, exchanges and points. Logs and accompanying summary sheets should be sent to A.R.R.L. DX Contest, 38 La Salle Road, West Hartford, 7, Conn., U.S.A., and should be postmarked not later than **April 28, 1962.** Free log forms are available on request from A.R.R.L.

Second 1·8 Mc/s Contest 1961

THERE is no holding H. J. M. Box (G6BQ), who comes up with his third Top Band win in the last five events. With his highest total (163 points) for several years in an autumn competition, G6BQ had good reason to be confident in the remarks accompanying his log.

For all that, it must not be imagined the result was cut-and-dried before battle commenced. D. Alexander (G3KLH) with 157 points and W. R. Steverson (G3JEQ) totalling 152, fought it out the whole way with G6BQ. It is difficult to assess from the logs where G6BQ gained his few points advantage. All three stations managed to cross the water into Europe about half-a-dozen times for contacts with OK and HB9 operators and on comparing the entries for various times they were always very close in the number of contacts made.

The total number of participants submitting a log was up on last year's number, but the Committee noted with regret the meagre number of entries from GM and GW stations especially when just by checking the three leading logs it becomes apparent that at least 16 were giving points from these countries.

Several entrants put forward ideas for "pepping up" Top Band contests and these suggestions will be carefully considered when framing the next set of rules.

Check logs from G2MI, G3LLM, G4VF, HB9QA and A.2524 are gratefully acknowledged.

Posn.	Call-sign	Points	Posn.	Call-sign	Points
1	G6BQ	163	26	G8FC	92
2	G3KLH	157	27	G3JLE	91
3	G3JEQ	152	28	G2XP	89
4	G3FYE/A	147	29	G3JKY	87
5	G3LHJ	143	30	G3BTU	82
6	G2MJ	142	31	G3KHT	81
7	G3KOR	140	32	G3PEK	80
8	G3FM	137		G3ILO	76
9	G3ERN	133	33	G3OJG	76
10	G3NFV	125	†	G3OXD	76
11	G3NPI	122	35	G3KPU	73
12	G3IPG	120	36	GM2HIK	70
13	G3OCA	119	37	G3EUE	66
	G3OIT	119	38	G2HDR	64
15	G3KVG	117	39	G2CVV	63
16	G3IGW	116	40	G3KSH	61
17	GW3JI	113	41	G3KUG	59
18	G3PGN	112	42	G2HR	57
19	G3BIK	111	43	G3PJB	52
20	G2DC	108	44	G3CDK	47
*	G3NBL	108	45	G6OO	44
21	G3CCC	102	46	G3KWH	43
22	GM3AVA	99		G3GWX	40
23	G3GNS	98	47	G3LNR	40
24	G3DCZ	95		G3OXI	40
	G3NHE	95	50	G3MWZ	20
			51	G2DHV	16

* No declaration. † Multiple entry.

General Rules for R.S.G.B. Contests 1962

THE following rules apply to all R.S.G.B. Contests and are to be read in conjunction with the details for each individual contest published in the R.S.G.B. BULLETIN.

Rule 1. **Entrants** must operate in accordance with the terms of their licences.

Rule 2. **Unlicensed Stations.** Contacts with unlicensed stations will not count for points.

Rule 3. **Contest Exchanges.** An exchange of RST or RS reports followed by a three figure serial number starting with 001 for the first contact and increasing by one for each successive contact (i.e. 559001 or 58001) must be made before points can be claimed. All reports must be acknowledged. In the case of **v.h.f./u.h.f. contests,** the location must also be exchanged. The location must be either a town found on the 10 m. to 1 in. Ordnance Survey Maps or in distance and direction from such a town (i.e. 559001 Oxford or 56001 10W Cambridge). In large towns and cities, the location must be given in distance and direction from a small town on such a map.

Rule 4. **Contacts.** Only one contact on each band may be made with a specific station, whether fixed, portable, mobile or alternate address. Duplicate contacts must be logged and clearly marked as duplicates without claim for points. Cross-band contacts may not be claimed. Proof of contact may be required.

Rule 5. **Entries** must be clearly written or typed ON ONE SIDE ONLY of R.S.G.B. contest log forms or on foolscap or quarto paper and must be set out in the form prescribed in the published details for the contest concerned. The cover sheet of an entry must be made out in the following form and all the information filled in:

Contest.....Date.....Claimed Score.....

Section (if any).....Call-sign.....

Name .....

Home address .....

Address of Station or Portable Location as transmitted. National Grid Six Figure Reference (or Lat. and Long. or County Code number) ..... (where applicable—see contest details)

Transmitter.....Power input.....watts

Receiver..... Aerial(s).....

DECLARATION: *I declare that this station was operated strictly in accordance with the rules and spirit of the contest, and I agree that the decision of the Council of the R.S.G.B. shall be final in all cases of dispute. I certify that the maximum input to the final stage of the transmitter was .....watts.*

Date..... Signed .....

Failure to complete the cover sheet or sign the declaration may involve disqualification of the entry.

Rule 6. **Submission of Entries** Entries must be addressed to the Contests Committee, Radio Society of Great Britain, 28-30 Little Russell Street, London. W.C.1, England, and must be post-marked not later than the date stated in the published details governing the contest concerned. The name of the contest must be clearly shown at the top left-hand corner of the envelope. All entries become the property of the Radio Society of Great Britain.

Rule 7. **Multiple Operator Entries.** Unless otherwise stated, single operator entries only will be accepted. In those contests where multiple operator entries are allowed, such entries will only be accepted provided that:

(a) The call-sign of the operator concerned is recorded for each contact.
(b) The declaration is signed by only one operator who will be regarded as the entrant.
(c) The names and call-signs of all operators are listed on the cover sheet.

Rule 8. **Portable stations** must operate from the same site for the duration of a contest. Power must not be derived from public or private supply mains. No apparatus may be erected on the site prior to the day of the event. For the purposes of R.S.G.B. contests, **mobile stations** are stations installed in motor vehicles or vessels on inland waterways and so equipped that they are capable of operation in motion without any alteration.

Rule 9. The details relating to specific contests published in the *R.S.G.B. Bulletin* shall be regarded together with these general rules as the rules of the contest.

Rule 10. In the event of any dispute, the ruling of the Council of the Radio Society of Great Britain shall be final.

Rule 11. **Check logs** submitted by non-transmitting members for consideration for the award of certificates of merit should give in this order the following details: Date, Time (G.M.T.); Band; Call-sign of station heard, His report and serial number sent; Call-sign of station being worked.

Forthcoming Events

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

DATES FOR YOUR DIARY

April 29.—North Midlands Mobile Rally.
May 6, 1962.—South Eastern Counties Mobile Rally.
June 17, 1962.—Longleat Mobile Rally.
June 24, 1962.—Bridlington Mobile Rally and Hamfest.
July 8, 1962.—South Shields Mobile Rally.
August 19, 1962.—Derby Mobile Rally.
October 20-21, 1962.—Jamboree-on-the-Air.

REGION 1

Ainsdale (A.R.C.).—Wednesdays, 8 p.m., 37 Hawthorne Grove, Southport.
Blackburn.—Fridays, 8 p.m., West View Hotel, Revidge Road.
Blackpool (B. & F. A.R.S.).—Tuesdays, 8 p.m., Squires Gate Holiday Camp.
Bury (B.R.S.).—February 13, 8 p.m., Knowsley Hotel, Kay Gardens.
Chester.—Tuesdays, 8 p.m., Y.M.C.A.
Liverpool (L. & D.A.R.S.).—Tuesdays, 8 p.m., Gladstone Mission Hall, Queens Drive, Stoneycroft.
Macclesfield.—January 23, February 6, 20, 42 Jordongate.
Manchester (M. & D.A.R.S.).—Wednesdays, 7.30 p.m., King George VI Club, North Road, Moston, Manchester 10.
Manchester (S.M.R.C.).—Fridays, 7.30 p.m., Fallowfield Bowling & Lawn Tennis Club, 81 Wellington Road, Fallowfield, 14.
Morecambe.—February 7, 125 Regent Road.
Preston (P.A.R.S.).—January 23 (A.G.M.), February 6, 20. (All meetings include morse practice, commencing 7.30 p.m.), St. Paul's School, Pole Street.
Southport (S.R.S.).—Thursdays, 8 p.m., The Esplanade.
Stockport (S.R.S.).—January 17, 31, February 14, 28, 8 p.m., The Blossoms Hotel, Buxton Road.
Wirral (W.A.R.S.).—January 17 (Junk Sale), February 7 ("Practical Constructional Methods," by G2AMV), 21 (Film Show), 7.45 p.m. 15 Balls Road, Claughton, Birkenhead.

REGION 3

Birmingham (M.A.R.S.).—February 20, 7.30 p.m. ("Eddystone Receivers" by Stratton & Co.), Birmingham Midland Institute, Paradise Street **(South).** January 18, 7.30 p.m., The Friends Institute, 220 Moseley Road, Birmingham.
Stourbridge.—February 6 ("Mixer Oscillators and Break-in" by G3BMY), 7.30 p.m., Foley College, Stourbridge.
Sutton Coldfield.—Second and fourth Thursdays in each month, 7.30 p.m., 92 The Parade, Sutton Coldfield.
Wolverhampton.—February 12, 26, 8 p.m., Neachells Cottage, Stockwell End, Tettenhall.

REGION 4

Peterborough (A.R.S.)—February 2 (Film Show), 7.15 p.m., Technical School, Eastfield Road.

REGION 5

Cambridge (C. & D.A.R.C.).—Fridays, 7.30 p.m., Club Headquarters, Corporation Yard, Victoria, Cambridge.
March (M. & D.R.A.S.).—February 6 (Mullard Film Show), 7.30 p.m., Police Headquarters.
Shefford (S. & D.A.R.S.).—Thursdays, 7.30 p.m., Digswell House. January 18—Technical Film, January 25—talk by N. Hockenhull.

REGION 6

Cheltenham.—First Thursday in each month, 8 p.m., Great Western Hotel, Clarence Street.
High Wycombe (Chiltern A.R.C.).—January 25 (Junk Sale), 8 p.m., British Legion Hall, St. Mary's Street, High Wycombe.
Wolverton (W.D.R.C.).—Fridays, 7.30 p.m., Science and Arts Institute, Church Street.

REGION 7

Acton, Brentford and Chiswick.—January 16 (A.G.M.), 7.30 p.m., A.E.U. Rooms, 66 High Road, Chiswick.
Bexleyheath (N.K.R.S.).—January 25 (Junk Sale), 8 p.m., Congregational Hall, Bexleyheath, nr. Clock Tower.
Croydon (S.R.C.C.).—February 13, 7.30 p.m., "Blacksmith Arms," South End, Croydon.
Norwood and South London (C.P. & D.R.C.).—January 20 ("Construction and Finish of Amateur Equipment," by G3IIR), 8 p.m. Windermere House Annexe, Westow Street, Crystal Palace. February 5 (Morse Class, etc.), 8 p.m. at G3IIR.
February 5 (Morse Class, etc.) 8 p.m. at G3IIR.
Dorking (D. & D.R.S.).—January 23 (A.G.M.), 8 p.m., Star and Garter Hotel, Dorking.
Ealing.—Sundays, 11 a.m., A.B.C. Restaurant, Ealing Broadway, W.5.
East Ham.—Tuesday fortnightly, 8 p.m., Leigh Road, East Ham.
East London District.—February 11 ("Components," by H. T. Stott), 2.30 p.m., Lambourne Rooms, Ilford Town Hall.
East Molesey (T.V.A.R.T.S.).—February 7, 8 p.m., Carnarvon Castle Hotel, Hampton Court.
Enfield.—January 25, 7.30 p.m., George Spicer School, Southbury Road, Enfield.
Harlow and District.—Tuedays, 7.30 p.m., rear of G3ERN (G. E. Read), High Street, Harlow.
Holloway (G.R.S.).—Mondays, Tuesdays and Wednesdays (R.A.E. and Morse) 7 p.m. Friday (Club), 7.30 p.m., Montem School, Hornsey Road, Holloway, N.7.
Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (near Seven Kings station).
Kingston.—Lectures alternate Thursdays, Theory and Morse Classes weekly 7.45 p.m., Y.M.C.A., Eden Street, Kingston (Morse at 2 Sunray Avenue, Tolworth).

LONDON MEMBERS' LUNCHEON CLUB

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

at 12.30 p.m. on Friday, January 19, February 16 and March 16, 1962.

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

Mitcham (M. & D.R.S.).—Alternate Fridays, lectures, 8 p.m., Morse classes 7 p.m., "The Cannons," Madeira Road, Mitcham. January 26, "Aerials," by R. C. Hills (G3HRH).
New Cross (C.A.R.S.).—Fridays, 7.30 p.m., Sundays, 11.30 a.m., Wednesdays (Morse practice), 8 p.m., 225 New Cross Road, London, S.E.14.
Paddington (P. & D.A.R.S.).—Wednesdays, 7.30 p.m., Beauchamp Lodge, 2 Warwick Crescent, W.2.
Romford (R. & D.R.S.).—Tuesdays, 8.15 p.m., R.A.F.A. House, 18 Carlton Rd., Romford.
Science Museum (C.S.R.S.).—January 16 (Informal), February 6 ("Colour TV"), 6 p.m., Science Museum, South Kensington.
Southgate & District.—February 8, ("Selenium Rectifiers," by a representative of S.T. & C. Ltd.), 8 p.m., Arnos School, Wilmer Way, N.14.
Sutton and Cheam (S. & C.R.S.).—Every third Tuesday, The Harrow, High Street, Cheam.
Welwyn Garden City.—February 8 ("High Power Broadcasting on V.H.F.", by Gerald Gibbs, G3AAZ), 8 p.m., The Conference Room, Murphy Radio Ltd., Bessemer Road, Welwyn Garden City.

REGION 9

Bath.—January 22, February 12, 7.30 p.m., Committee Room, Bath Technical College, Lower Borough Walls, Bath.
Bideford.—First Thursday in each month, 7.30 p.m., alternately at T. G. Ward (G2FKO), 38 Clovelly Road (Phone Bideford 964), and D. H. Jones (G3BO), Rosebank, Westcombe (Phone Bideford 550).
Bristol.—January 19, 7.15 p.m., Carwardines Restaurant, Baldwin Street, Bristol, 1.
Exeter.—Second Thursday in each month, 8 p.m., Y.M.C.A., St. David's Hill, Exeter.
Falmouth (C.R. & T.C.).—First Wednesday in each month, Y.M.C.A., Falmouth.
Plymouth (P.R.C.).—Tuesdays, 7.30 p.m., Virginia House Settlement, St. Andrews Cross, Plymouth.
Torquay (T.A.R.S.).—February 10 (Mullard Film Show), 7.30 p.m., Y.M.C.A., The Castle, Torquay.
Weston-super-Mare.—First Tuesday in each month, 7.15 p.m., Technical College, Lower Church Road, Weston-super-Mare.
Yeovil (Y.A.R.C.).—Wednesdays, 7.30 p.m., Grove House, Preston Road, Yeovil.

REGION 10

Cardiff.—February 12 ("Aerials" by R. A. Stevens, GW3GQM), 7.30 p.m., T.A. Centre, Park Street, Cardiff.
Penarth.—Last Monday in each month, 7.30 p.m., R.A.F.A. Club, Windsor Road, Penarth.
Port Talbot.—February 13, 7.30 p.m., Trefelin Workman's Club and Institute, 8 and 10 Jersey Street, Velindre.

REGION 12

Aberdeen (A.A.R.S.).—January 19 ("Building Techniques"), January 26 (N.F.D. Discussion), February 2 (Work Night), February 9 (Top Band Night), February 16 (Junk Sale), 7.30 p.m., 6 Blenheim Lane, Aberdeen.

REGION 14

Ayrshire.—Third Sunday in each month, 7.30 p.m., Royal Hotel, Prestwick.
Falkirk.—First and last Thursday in each month, 7.30 p.m., Comely Park School, Falkirk.
Motherwell.—Third Friday in each month, 7.30 p.m., Carfin Hall, Motherwell.

REGION 16

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

REGION 17

Portsmouth.—Wednesdays, 7.30 p.m., Room 3, The Community Centre, Twyford Avenue.
Southampton.—Second Saturday in each month, 7 p.m., Engineering Lecture Theatre, Lanchester Building, University of Southampton, University Road, Southampton.

COPY DEADLINE

TO enable the R.S.G.B. BULLETIN to be printed in time for bulk postings to take place by not later than the 14th day of the month, the closing date for editorial copy, the 22nd day of the preceding month, must be strictly adhered to. Society Representatives and Club Secretaries will greatly assist the Editorial staff by posting copy to reach Headquarters by not later than the 20th of the month whenever possible.

Copy received after the 22nd day of the month will be held over for future use if still topical.

Regional and Club News

Bristol.—There was an attendance of 60 at the December meeting to hear John Tanner (G3NDT/T) lecture on " Amateur Television." The following were elected to the 1962 Committee: *County Representative*—C. N. Chapman (G2HDR); *Town Representative*—R. V. Hinchcliffe (G3KHA); *Hon. Secretary*—E. C. Halliday (G3JMY), 4 Parkside Avenue, Winterbourne, Bristol; *Hon. Treasurer*—D. F. Davies (G3RQ); *Hon. Auditor*—R. E. Griffin (G5UH); *Committee Members*—M. S. Batt (A.1437); R. Shaddick (B.R.S. 19727) and J. S. Harper-Bill (G3IZM). On January 19, P. K. Wall of S.T. & C. Ltd. will give a talk entitled " A Thumbnail Sketch of Present Filter Art." A film show has been arranged for February 2. Visitors are cordially invited to attend.

Clifton Amateur Radio Society.—The Annual Constructional Contest was won by G3OYU with his transistor el-bug. G3OGE was the leading station in the society's contest held in December while P. Madagan was the winner of the receiving section.

Cornish Radio and Television Club.—The December meeting was devoted to a discussion of the arrangements for GB3MSA at Poldhu and to screening G3OUZ's unedited colour film of the erection of the GB3MSA masts. *Hon. Secretary:* W. J. Gilbert, 7 Poltair Road, Penryn.

East Kent Radio Society.—The Hon. Secretary of this society is D. N. T. Williams (G3MDO), " Seletar," New House Lane, Canterbury, and not as stated in *Regional and Club News* in the November issue.

Harrow, Radio Society of.—The A.G.M. to be held on January 19 will mark the end of the society's most successful year since it was founded in 1946. The society has three contests running currently: the Enthusiasts' Contest in which points are awarded by the Committee to members whose various activities show enthusiasm for the hobby, the Annual Constructors' Contest, and a monthly 160m. c.w. contest which is held on the first Wednesday in each month from 20.00 to 21.00. *Hon. Secretary:* A. C. W. Biddell (G3GNM), 114 Kingshill Avenue, Kenton, Harrow, Middlesex.

London Members' Luncheon Club.—There was a record attendance of 84 at the Christmas luncheon on December 15 including Major-General Eric Cole (G2EC), President of R.S.G.B., Ted Ingram (GM6IZ), Vice-President, Norman Caws (G3BVG), Hon. Treasurer, and Council Members R. C. Hills (G3HRH), J. Douglas Kay (G3AAE) and P. H. Wade (G2BPJ). Visitors from overseas were Mrs. Northrop (W0RNO) and Harry Brice (EARS64), son of VQ5AU. The next meeting will be held at the Bedford Corner Hotel on January 19. Bookings may be made by telephoning either G2FUX at Ruislip 2763 or R.S.G.B. Headquarters at Holborn 7373.

Northern Heights Amateur Radio Society.—Recent activities have included an " Any Questions? " session and the Christmas Dinner. On January 24, T. Fawthrop will give a talk on tape recorders. Meetings are held at the Sportsman Inn, Ogden, and commence at 7.45 p.m. *Hon. Secretary:* A. Robinson (G3MDW), Candy Cabin, Ogden, Halifax.

Peterborough and District Amateur Radio Society.—Members recently visited the B.B.C. TV and v.h.f./f.m. transmitting station at Morborne. *Hon. Secretary:* D. Byrne (G3KPO), Jersey House, Eye, Peterborough.

Plymouth Radio Club.—At the December meeting in the competition for the Ernie Hillyard Trophy, John Fallon was placed first with his seven valve communication receiver, followed by Roger Smith who entered his oscilloscope and Michael Smith who exhibited a voice-operated relay. There was also an exhibition of home-constructed apparatus by transmitting members. John Share (G3OKA) gave a talk on the erection of beam aerials. Preliminary arrangements for N.F.D. will be discussed on February 7 commencing at 7.30 p.m. at Virginia House Settlement, St. Andrews Cross. *Hon. Secretary:* R. Hooper, 2 Chestnut Road, Peverell, Plymouth.

GB2RS SCHEDULE

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

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

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

Reading Amateur Radio Club.—There was an excellent attendance of short wave listeners at the November meeting which was devoted to their interests. The design of the club transmitter and plans for N.F.D. were due to be discussed at the December meeting. The A.G.M. will be held in January and on February 24 G. Preston (G3OLA) is to give a talk on simple but effective test gear. *Hon. Secretary:* R. G. Nash (G3EJA), 9 Holybrook Road, Reading.

Reigate Amateur Transmitting Society.—The A.G.M. is to be held at The Tower, Redhill, on January 20 at 7.30 p.m. and the Annual Dinner at Laker's Hotel, Redhill, on February 10 when the programme will include the film *Surrey N.F.D. 1961* and the constructional competition for the G8KW Cup and the XYL Trophy. On January 11, a panel from the society was due to visit Crawley to judge the Constructional Competition. *Hon. Secretary:* F. D. Thom (G3NKT), 12 Willow Road, Redhill.

During Commonwealth Technical Training Week the North Kent Radio Society operated Amateur Radio stations at two local exhibitions. During the year they took part in N.F.D. and later ran a station at the Erith Show. In the strictly social field a bucket and spade party was held in June, followed in the autumn by a visit to see the Brian Rix show, " One for the Pot " at the Whitehall Theatre. This picture depicts part of the Society's stand at the Commonwealth Training Week Exhibition held in Crayford Town Hall. *(Photo by G3ISX)*

THIS MONTH'S BARGAINS

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SENIOR ELECTRONIC TECHNICIAN, age 21-30, required for new medical engineering laboratories to develop, construct and maintain electronic and other types of equipment for use in medical research. Applicants with previous experience in this field and holding an H.N.C. or O.N.C. will be given preference. Salary scale £625-£1,000 per annum, but applicants with higher qualifications may be appointed technical officer in the range £700-£1,250 per annum. Application forms from: Secretary, Postgraduate Medical School, Ducane Road, W.12.

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

OFFICIAL APPOINTMENTS (continued)

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PERSONAL

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CLASSIFIED ADVERTISEMENTS

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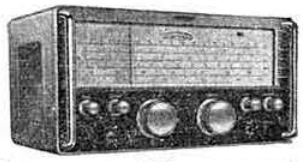

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