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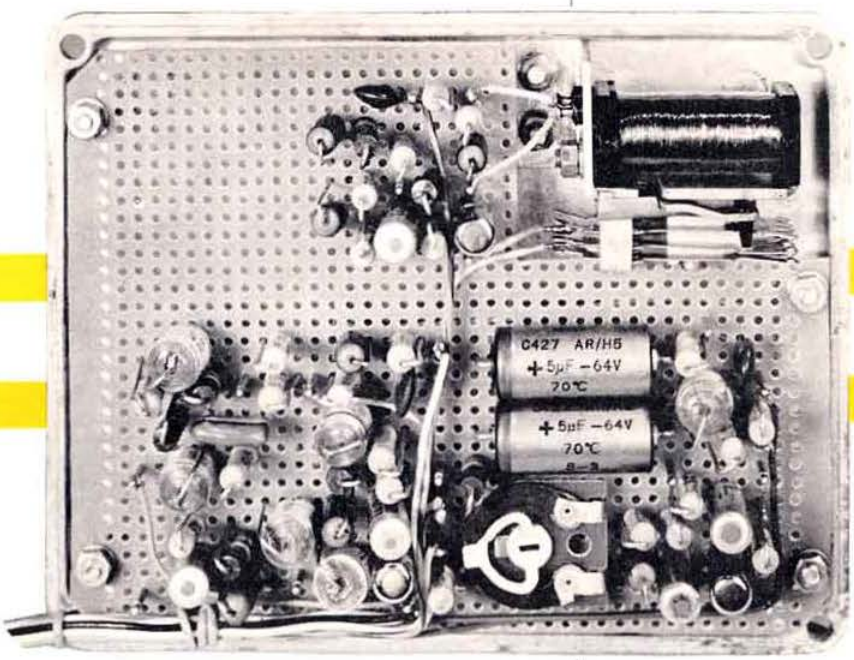

THE G3IAS KEYER

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

WEDNESDAY, OCTOBER 28 TO SATURDAY, OCTOBER 31

RSGB INTERNATIONAL

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3/- Monthly

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(Incorporated 1926)

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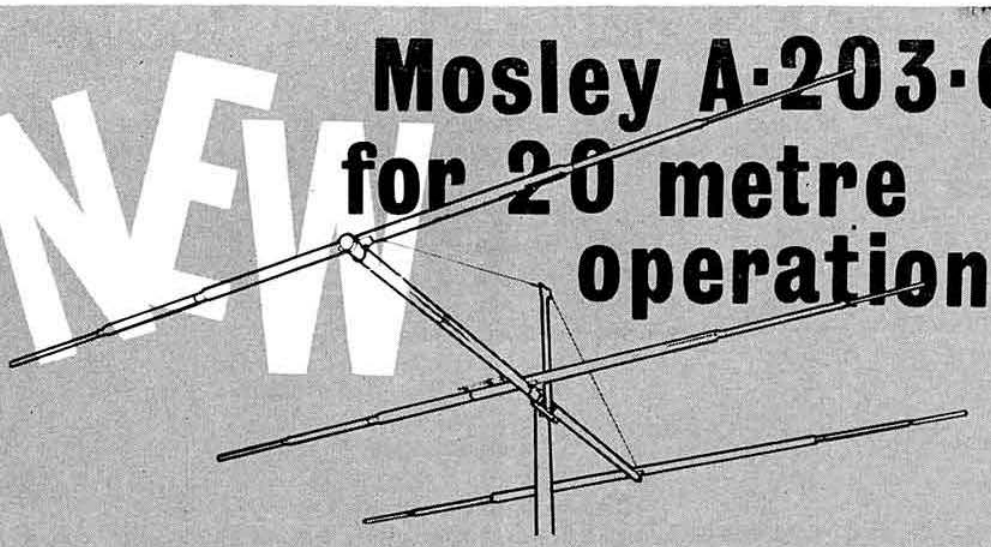
NEW Mosley A-203-C for 20 metre operation



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Current Comment

discusses topics of the day

All TV and No Construction

EVERY year at about this time we find ourselves suffering from what can only be described as an acute case of armchair construction. Articles describing gear of every size, shape and possible use are studied and mulled over. Elaborate stations-in-the-air, equipped with every conceivable aid to slick modern operating on every band and every mode quickly take shape in the mind's-eye and are as quickly replaced by even more complex and desirable set-ups.

This armchair construction, a very pleasurable if seldom productive employment, seems to be brought on by the annual visit to the Society's exhibition. The array of beautifully produced home-built equipment acts as a tremendous spur to go and do likewise and actually construct that new s.s.b. transmitter or v.h.f. converter we have been meaning to build ever since the previous exhibition. Occasionally we even get around to buying some of the components. And that, we suspect, is how far all too many of us get these days.

Some sages suggest that there may be a decline in home construction due to the availability of ready-made gear. There is no doubt that the finish and compact size of commercial equipment is a great selling point but we firmly believe that the number of completely commercially equipped stations is still a small fraction of the total. On the other hand, it is probably true to say there are very few completely home-brew stations (if there are, we should like to hear about them). Most contain something factory made.

Talking about the general subject in Headquarters a few days ago, it was suggested that in some ways the presence of these beautifully styled products tend to inhibit home construction because we so often fear our efforts will not match the professional items.

It is certainly an idea and on reflection we are inclined to think there may be something in the suggestion. Having become used to gear of commercial appearance it is all too easy not to try something new because of the time necessary to put the finishing touches. Appearance is, however, not necessary to get a circuit working satisfactorily and satisfyingly. Better to have a useful home-made item which improves one's station than go without it.

Not that we have anything against commercial gear. Far from it. With the complexity of modern equipment, many people just do not have time to do all the constructional work they would like to and still do some operating. Buying some items ready-built seems a sensible solution.

On the other hand, constructional work is an important and most enjoyable part of Amateur Radio and there is no better way of understanding equipment than to build it. Luckily, there are now a number of firms specializing in the manufacture of parts for the home constructor; for example, coils and metal-work, both of which can be extremely time-consuming. Far from being on the wane, we feel that interest in home construction is rising and the BULLETIN will continue to publish articles describing first rate equipment to be made at home.

Now, where's that armchair. . . .

Interference

IT seems that whenever any other service suffers interference of any kind the amateur is the first to be accused, particularly by national newspapers.

Just how unjustified is this reaction to interference is again revealed by the latest statistics issued by the Post Office Engineering Department. Out of a total of 15,134 cases investigated during the period under review, only 82 were due to amateur transmitters! Other radio transmitters were responsible for 107 cases.

Band 1 television continues to be the most troublesome, 54 cases of TVI being caused by amateurs. Radiation from the time-base circuits of other TV receivers, however, caused 343 complaints during the period. Other offenders on this band were "contact" devices (1585), sewing machines (824), portable electric tools (322), hairdryers (210), filament type lamps (149), neon signs (366) and overhead power lines (1237), to mention but a few. Unsatisfactory conditions at the receiving installations were again the biggest cause of difficulty—6160.

LONDON LECTURE MEETING

FRIDAY, NOVEMBER 27, 1964 — 6.30 P.M.

MOONBOUNCE

By P. K. Blair, G3LTF

Faraday Room, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.

Buffet Tea 6 p.m.

Instrument Transformers

By J. G. WILKES, B.Sc., A.R.I.C., G3OKJ *

THE purpose of this article is to draw attention to a transformer application seldom consciously employed by radio amateurs, yet one which could well be used to advantage in many stations, namely, the current transformer. A simple non-mathematical account of its underlying theory is given in order to point out the more critical design features to be followed in any practical uses. Those wishing to pursue the theoretical aspects in greater detail are recommended to obtain a standard text on a.c. measurements and a.c. instruments (1), since it is in this field that the current transformer is of most importance. Finally, a simple practical application of the current transformer in a metering circuit used to monitor the aerial current in a 160m transmitter is described. This has several advantages over the common thermocouple radio frequency ammeter in terms of operating convenience, space saving, reliability, and, not least in importance, low cost.

The Current Transformer

The essential components of a current transformer are a magnetic core linking a primary and a secondary winding. If the secondary winding is open-circuited, the primary current is used only to magnetize the core material, so setting up a magnetic flux linkage, which produces a back e.m.f. of self-induction in the primary winding, and a related e.m.f. in the secondary winding given by the expression

$$\frac{\textit{primary voltage}}{\textit{secondary voltage}} = \frac{\textit{number of primary turns}}{\textit{number of secondary turns}}$$

If the secondary winding is now closed through a low impedance, a current flows which interacts with the magnetic flux in the core, reducing its magnitude until the point is reached where the secondary e.m.f. balances the voltage drop in the secondary load circuit. In this condition the primary ampere-turns *approximately* balance the secondary ampere turns so that

$$\frac{\textit{primary current}}{\textit{secondary current}} \approx \frac{\textit{number of secondary turns}}{\textit{number of primary turns}}$$

If the secondary impedance is held constant it also follows that the secondary e.m.f. will be nearly proportional to the primary current. The balance is not exact because a small part of the primary current is used to produce the magnetic flux necessary to drive the secondary current against its load impedance. This primary current component is called the "exciting current," and is one of the most important factors affecting the performance of a current transformer.

When used for measurement purposes the device is referred to as an instrument transformer, and at once we become interested in accuracy. The effect of the exciting current now becomes significant. Exact proportionality of primary to secondary current cannot be obtained over the whole working range, nor can exact coincidence of phase be maintained. Further, the exciting current component cannot be regarded as giving rise to a constant error, since if the load impedance of the secondary circuit is held constant, then both the secondary voltage and current change, and these changes depend not only on primary current variations but also on the magnetic properties of the core material, i.e., on its *B-H* characteristics. The accuracy can be defined in more specific terms resolved about the two sources of error:

(*a*) The *ratio error* at any value of primary current is the difference between the actual and nominal ratios of primary to secondary current expressed as a percentage.

(*b*) The *phase error* at any value of primary current is the phase angle between the vectors of the primary and secondary currents.

These error definitions help in providing information about the transformer ratings and design. Firstly, the maximum normal primary current is limited to a value substantially less than that giving rise to core saturation, when very large errors would occur. Secondly, the output which can be obtained from the secondary without exceeding chosen limits of error may further curtail the maximum primary current rating.

From the foregoing discussion it can be seen that high accuracy in ratio and phase depend upon obtaining as large as possible a ratio of primary current to exciting current. For this the secondary load impedance must be reduced as far as is practicable, bearing in mind the lower limit set by the secondary winding resistance and leakage reactance, and that the choice of core material becomes critical. Thus mu-metal which possesses an exceedingly high permeability at low values of magnetizing force is far superior in performance to Stalloy. Current transformers using mu-metal are available for precision work in which the ratio and phase errors between one tenth of full load and full load do not exceed 0·1 per cent maximum. Such an instrument transformer, usually with various primary and secondary tapping points, is to be found in many of the higher grade multi-range meters as the basis of the a.c. current ranges. Finally, while not a design feature, it is worth noting at this point that, in addition to providing a reduced copy of the primary current, an instrument transformer also serves the very useful function of isolating the test gear from the main circuit.

Practical Applications

Enough has been said in the previous section to show that the design of a precision instrument transformer for very accurate work is not a task to be undertaken lightly, and it is not intended to attempt to do so here! Multimeters with broken movements, cases, etc., do appear occasionally on the surplus market at extremely low scrap prices, and these are worth considering purely for the current transformer, provided its windings are intact. If one of these is purchased it is

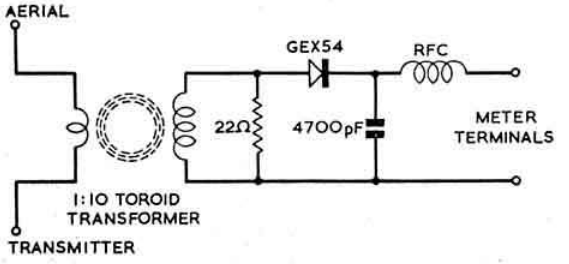


Fig. 1. Circuit diagram of the r.f. current monitor for a 160m transmitter.

* 25 Cedar Drive, Hatch End, Middlesex.

most important to note the value of the secondary load resistor, the layout of its associated rectifier network, and the ranges to which the tappings are connected, before removing the transformer. With this proviso the parts obtained can then form the basis of an accurate a.c. meter of very low cost.

The chief interest at the writer's station has been 160m band working, and in tuning up any Top Band transmitter some form of r.f. current indicator is essential, whether it be a pea-bulb in the aerial, or a thermocouple type meter. For quantitative comparison of changes made to the aerial/earth system an indicating meter is to be preferred, but thermocouple types are sluggish in use, cannot be shunted to extend their range, and are delicate in construction, as the writer has found out to his cost. It was therefore decided to examine the possibility of using a current transformer system.

The r.f. current to be measured was of the order of 0·5 amp, and light coupling between the aerial and meter was obviously desirable. Also, there was a further interest in probing the current distribution in the aerial system, so a toroidal core shape was chosen, with the aerial lead passing straight through the core centre acting as a single turn primary. The next question regarding core material for a working frequency of 2 Mc/s allowed only one answer, ferrite. The shape seemed to be a difficulty until a ferrite pot core, type LA3, was found in the junk box, and one half of it was used. This gave a toroid with a *U* shaped wall section of approximately $\frac{5}{8}$ in. o.d. and $\frac{5}{16}$ in. i.d.

To arrive at a first approximation of the required number of secondary turns, a little arithmetic was attempted. The maximum degree of coupling obtained between r.f. coils is normally found in practice to be around 0·25-0·30, and this was assumed to apply to the toroid shape. If the primary current is taken to be about 600 mA, and a 10 turn secondary is used, then the expected secondary current is

$$600 \times \frac{1}{10} \times 0{\cdot}3 = 18 \text{ mA.}$$

The secondary circuit must now be completed by a load resistor, and the theory clearly indicates that a very low value should be used. Again, since r.f. currents were involved it seemed that a carbon (non-inductive type) resistor was required. A couple of quick calculations led to the use of the preferred value of 22 ohms, which with a circulating current of 18 mA gives a secondary load voltage of 0·4V r.m.s. It was proposed to use a single diode detector to provide a rectified signal, and this would indicate peak voltage, that is:

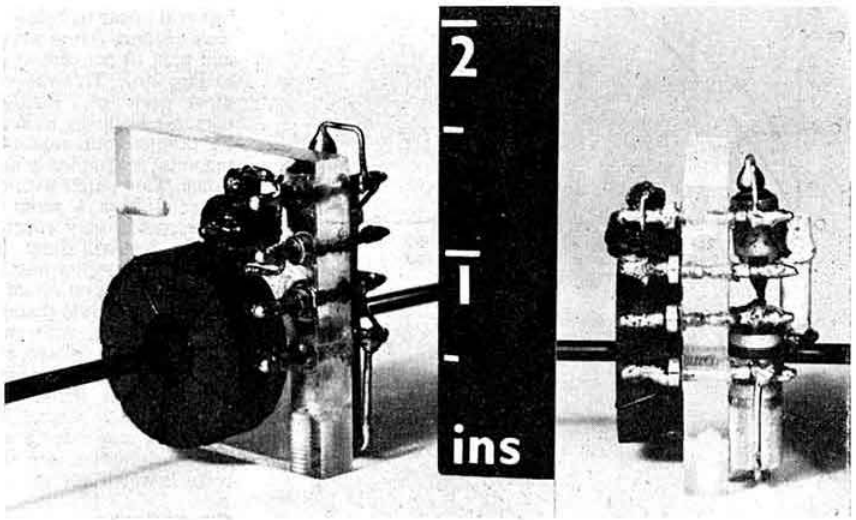
$$0{\cdot}4 \times 1{\cdot}414 = 0{\cdot}57\text{V}$$

for the specified input of 0·6 amp r.f. to the primary.

The first unit made to this design data was connected on its output side to a 0-100 μA meter in series with a 10K ohms resistor, and for the design input, 0·6 amp r.f., this gave an output of 0·52V. This was in closer agreement with the design value than had been anticipated. Subsequent results from other units having different turns ratios and load resistors have confirmed, however, that the approximate arithmetic used does give a good practical answer.

Construction

The construction of one of these units is shown in the photograph. The location of the secondary winding on the ferrite core is achieved by cutting staggered slots in it on both faces using an old hacksaw blade. The ferrite is soft and cuts relatively easily but does tend to chip if too much pressure is applied. The gauge of wire used for the secondary can be anything from about 24 to 40 s.w.g. enamel and is not at all critical. After winding the transformer an impact adhesive (Evostick) was used to bond the assembly to a Perspex mount through which soldering connection pins had been driven with a hot soldering iron. The 22 ohm secondary load resistor, a germanium diode, its reservoir capacitor, and a miniature r.f. choke (itself wound on a ferrite core), are all mounted on these pins, making a very compact unit.



Construction of a typical monitor unit. The Perspex mount is 1¼ in. wide by 1⅜ in. high. The r.f. choke is a high efficiency miniature type wound on a ferrite former, but any small choke should be satisfactory.

Results

Reference was made earlier to the use of a microammeter and a high series resistor in the measurement circuit. No meter is shown in the circuit diagram in Fig. 1, and this omission is quite deliberate. The single diode rectifier with a reservoir capacitor and its own load resistor, included in the meter, is much less simple than it looks, and unless this diode resistance is considerably greater than that of the diode itself, the measurement circuit as a whole acts as a shunt across the voltage source. In this case it is the 22 ohm resistor in the transformer secondary, the function of which has already been discussed. Even the forward resistance of the diode cannot be neglected since, although it may be low when an input of several volts is applied, it rises to some thousands of ohms as the applied voltage drops, again giving rise to errors between the input and output signals [2, 3]. Therefore in considering the results, we are concerned not only with errors arising from the current transformer but also errors introduced in the detector circuit. The procedure adopted to separate these effects was to make comparative measurements of the r.f. current through a thermocouple ammeter in series with the current transformer primary using three different meters to record the detector output in the secondary. These three meters were:

(*a*) A 0-10 μA meter in series with a 100K ohm resistor.

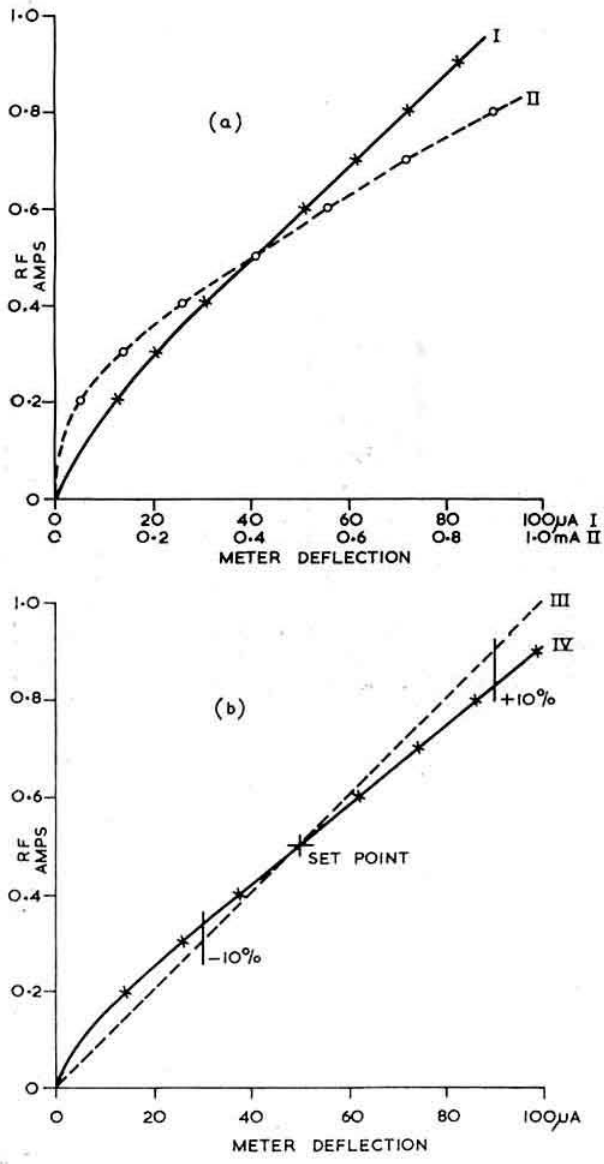


Fig. 2(a). The effect of meter impedance on the overall response linearity. Plot I: 0-100 μA meter with series resistor of 10K ohms. Plot II: 0-1 mA meter of internal resistance 75 ohms and no external series resistor. Note the greater curvature of Plot II. (b) Ideal (III) and actual (IV) response plots compared, for a monitor set to the numerically correct midscale value (50 μA at 0·5 amp r.f.). A 0-100 μA meter was used with a series resistor of 8·2K ohms.

(*b*) A 0-100 μA meter in series with a 10K ohm resistor.
(*c*) A 0-1 mA meter of 75 ohms internal resistance but with no series resistor.

Also, three thermocouple meters were used with overlapping ranges for cross checking purposes. It was found that the 0-1 mA meter (*c*) obviously shunted the rectifier circuit, but that within the limits of experimental error, meters (*a*) and (*b*) gave the same results. It was therefore concluded that in these two cases the loading on the rectifier circuit was having little effect and could safely be neglected, so that any variations observed could reasonably be ascribed to the performance of the current transformer. In the graph in Fig. 2(a) the two curves shown are those for meters (*b*) and (*c*), from which it can be seen that when a high resistance meter is used, and when curvature is due to transformer ratio errors, the response obtained is linear over about 85 per cent of the range, only departing from linearity at the low end of the scale.

As direct reading scales are always an advantage, an attempt was made to provide this by changing the series resistor from 10K ohms to about 8·2K ohms when an r.f. current of 0·5 amp gave a scale reading of 50 μA, i.e., mid-scale on the meter. It was then found that the response line was still linear to below 0·2 amp r.f. as before, and that the scale reading errors were minus 10 per cent at 0·3 amp r.f., and plus 10 per cent at 0·9 amp r.f., as shown in the graph in Fig. 2(b). This was considered to be quite adequate for most purposes. Finally, before leaving the subject of response linearity, to keep the picture in perspective it must be pointed out that the normal thermocouple ammeter response is completely non-linear (square law) over its whole range. Compared with this, the response using the 0-1 mA meter without a series resistor, although still not linear, represents a very considerable improvement, as reference to Fig. 2(a) will show. This is certainly quite adequate for general transmitter monitoring.

The incorporation of this device into a Top Band rig requires very little description. In the writer's transmitter a 0-1 mA meter, with suitable switching, is used to check grid drive, h.t. voltage, p.a. current, etc., with corresponding shunts and series resistors for the various ranges. The aerial current signal from a current transformer/rectifier unit, via the switching, is applied directly to the meter. For operating convenience and speed, the p.a. current and r.f. current functions are on adjacent switch positions. This point is worth noting.

Conclusions

The use of a current transformer makes it possible to build an r.f. current monitor into a transmitter and to link its output into the overall metering circuit as simply another position on the selector switch, thus saving the space and cost of a thermocouple ammeter. Compared with the thermocouple r.f. ammeter the current transformer/rectifier monitor has several advantages:

(*a*) Changes in r.f. current are followed immediately, thus making aerial tuning both faster and more precise, whereas the thermocouple meter has a relatively large thermal inertia and is sluggish in action.

(*b*) The monitor works into a relatively rugged d.c. milliammeter which will withstand large momentary overloads and mechanical shock far better than the thermocouple meter.

(*c*) The scale calibration of the monitor, even in its crudest form, is considerably more uniform than that of the thermocouple type, and, as discussed above, with care an almost linear calibration can be obtained.

(*d*) No mechanical connection is required other than threading the aerial wire through the centre of the toroid, and the secondary measurement circuit is electrically isolated from the primary. The position of the aerial lead within the toroid has no effect on the output signal, and thus it is possible to slide the monitor along the length of the aerial to determine current distribution. Such measurements during changes of length, direction, the position of loading coils, and earthing of bent wire Top Band aerials can be very illuminating.

(*Continued on page 715*)

TECHNICAL TOPICS By PAT HAWKER, G3VA

Is C.W. Obsolete? · Diode T-R Switch · Aerial Reed Relay Change-over Switch · Broadband Dipoles

The Inverse Balun · Transistor Transmitters · Improved Transistor P.A. Circuit

Overmodulation Indicator · S.S.B. Speech Clipping · Transformerless A.F. Amplifier

FOR the first time since before the first World War it is now possible to obtain a British amateur sound licence without taking a Morse examination—even if for operation only above 420 Mc/s. Some may regard this change as a further sign that c.w. is becoming an obsolete form of communication, soon to be completely superseded by s.s.b. or RTTY.

Since there could be some newcomers who may possibly be deterred by these developments from tackling the dull grind of learning the code, let us begin this month first by extending a warm welcome to any G8-three-letter readers and then by reviewing some of the solid technical reasons why c.w. is likely to remain important for many years to come—quite apart from such practical considerations as the ability of " radioese " to overcome the language problems in international communication.

First, of course, there is the tremendous power gain and the bandwidth economy. Much is often made of the theoretical 9db power gain of s.s.b. over a.m.—less is heard of the far greater power gain of c.w. In this respect the figure of 19db is sometimes quoted but this is a rough and ready estimate rather than the theoretical limit. As receiver and transmitter stability improves, and as sharp receiving filters become less prone to " ringing," good signal-to-noise ratios will be achieved with extremely weak signals.

As an example of how this point is being recognized even by commercial communicators, we would draw attention to a current project of the RCA Communications System Division. They are developing (see *Electronics Weekly*, New Thinking, August 19) a 10oz. pocket h.f. transmitter with a ½oz. aerial for long-distance emergency communication. Output power is only 100 milliwatts and yet they are confident of what are termed continent-spanning ranges. The secret lies in the stability of the equipment and the narrow bandwidth of the receiver. Stability is achieved in the transmitter by the ingenious idea of placing the crystals in a small unit attached under the upper part of the arm to provide a crystal oven at body temperature. Admittedly this equipment is meant for use by unskilled operators with a special type of coded keyer rather than for Morse, but the principle is still the same.

C.w. can be read at levels well below the signal-to-noise ratio necessary for conventional RTTY operation, although we must admit to having been impressed last year by a demonstration of the special " Piccolo " unit developed by the Diplomatic Wireless Service to permit teleprinter operation on low power h.f. circuits under poor conditions. This is capable of copying signals well below the noise level (although as the transmitter bandwidth is greater than for manual c.w., this does not really affect the argument).

Further support for the continuing value of c.w. comes from the US Army, as quoted in a *QST* editorial (August, 1964). The military, it is reported, after extensive evaluation of the various systems, has concluded that " a sound and undiminishing c.w. capability continues to be required by all tactical forces to assure effective communication—particularly where a high degree of reliability under all conditions is required."

Even on u.h.f. and v.h.f. where 'phone is generally regarded as " king," how many amateurs could seriously contemplate such interesting projects as meteor scatter and moonbounce without the invaluable services of the old pump handle?

So, no matter how much 'phone we may use for day-to-day working, the need for c.w. remains undiminished.

Diode T-R Switch

One way in which c.w. working can be made most pleasant and effective is with full break-in facilities. These days this is usually done by means of electronic T-R switches (such as those shown in *TT* for July, 1958, November, 1958 and November, 1959) to allow the same aerial to be used for transmission and reception.

Recently, Mike Hughes, VE2AUB/W5, sent us details of a new type of T-R switch (which may by now also have appeared in *73 Magazine*) offering a number of advantages. Fig. 1 shows the basic circuit diagram and Fig. 2 shows how this has been used by VE2AUB for some time.

He finds that this type of switch has the following advantages: it is broadband, silent in operation, has a low insertion loss of less than one db in the h.f. range, high isolation of up to 80db, and is simple to make and adjust. Its main disadvantage is that it requires a fairly high bias voltage to obtain maximum isolation.

Even with no bias the switch still protects the receiver, but under these conditions VE2AUB/W5 finds that it produces some TVI due to harmonic generation in the diodes. But with the correct bias applied he has been unable to detect any trace of TVI from the switch.

The 1N2071 is a silicon power diode with a peak inverse voltage rating of 600 volts, and this is more than adequate

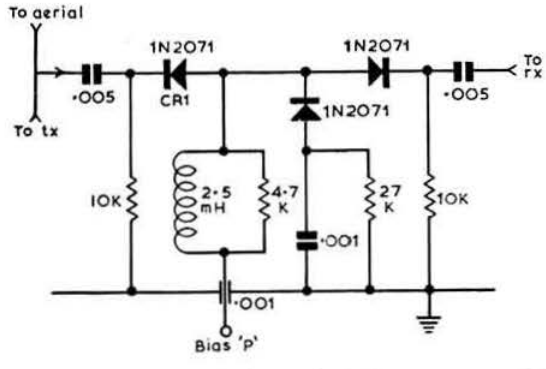


Fig. 1. Diode T-R switch.

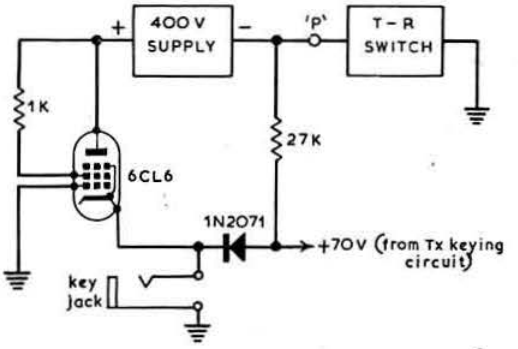


Fig. 2. Keying arrangement for the circuit of Fig. 1.

for transmitters having output powers of up to 200 watts and feeding 50 or 75 ohm co-axial line, provided that the s.w.r. on the line is fairly low. The receiving bias should be about 30 volts and the transmitting bias should be in the region of 350 volts.

VE2AUB points out that the arrangement shown is not the only possible one. Fewer diodes could be used, but one diode must always be included in the position CR1. As shown, the switch requires a positive bias for reception, and a negative one for transmitting. If the diodes are reversed, the bias polarities must of course be reversed. Fig. 2 shows how VE2AUB obtains the bias by making use of the 70 volts which appear across the key terminals of his transmitter in the key-up position; about 1 mA is bled from this source to bias the switch for reception. He adds that break-in is the best investment he has ever made as far as operating enjoyment is concerned.

Electromechanical T-R Switch

One of the snags with many electronic T-R switches occurs when attempting to use them with a transmitter in which the p.a. stage is not biased to cut-off in the key-up position; it is difficult to prevent the noise generated by the current flowing in the p.a. from reaching the receiver. Another problem is " suck-out " of incoming signals by the transmitter tank circuit.

To achieve complete isolation between transmitter and receiver one still needs an aerial change-over switch or relay. For break-in operation manual switches are out of the question and change-over relays have to be able to follow the keying without clipping on dots—a requirement well beyond the capabilities of the usual type of aerial relay.

However, in *QST* (July, 1964) details are given of two designs for keyed aerial relays developed by VE3AU and capable of operation up to 40 w.p.m. at power levels up to 700 watts, once again provided that they are used on a 50-ohm co-ax line that is well matched. This is possible with the use of single pole double throw reed relays of the general type described by G3LWM in the July BULLETIN.

One of the VE3AU circuits uses a 6AQ5 control valve; the other simplified design has no valves but this results in a little more difficulty in avoiding clipped dots at very high keying speeds. The simplified circuit can be adapted for either blocked-grid or cathode keying and requires only a 12 volt (or up to 22 volts for the highest keying speeds) supply at about 30 mA. The blocked-grid keying circuit is shown in Fig. 3, but it is recommended that the original article be consulted for a detailed description of this application of reed relays.

The Inverse Balun

In the July *TT* we made passing reference to a new type of inexpensive balun developed primarily for use with u.h.f. television receiving aerials. This brought an interesting letter from Mr V. R. Hartopp, development manager of J-Beam Aerials Ltd.

He wrote, " The 4 to 1 balun wound on an aluminium former was invented and provisionally patented by us and we feel that further information should be given lest constructors are disappointed by the results.

" The half wavelength of insulated wire should be an electrical half wavelength and must be measured electrically due to the variations in velocity factor when using different types of wire and insulation. Ideally, the insulation should be polythene, or better.

" The thickness of the insulation in conjunction with the wire diameter determines the characteristic impedance and, while this is not critical, it will control the rate of change of reactance with frequency, thus affecting the bandwidth of the complete radiator.

" It is essential that the wire is non-inductively wound on the former. The former need not be earthed to the aerial structure but must, of course, be connected to the braiding of the feeder.

" The wire must be capable of handling the power when used for transmitting. This is where the r.f. characteristics of the insulating material are important as losses will generate heat and cause eventual destruction."

Incidentally, an article on broad-band balun transformers using ferrite toroidal cores appeared in *QST* (August, 1964).

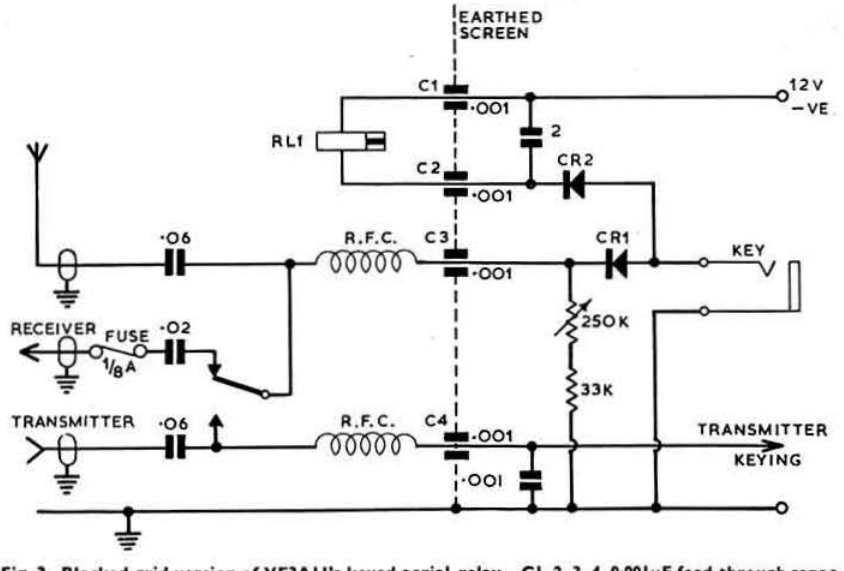


Fig. 3. Blocked-grid version of VE3AU's keyed aerial relay. C1, 2, 3, 4, 0·001μF feed-through capacitors; CR1, 2, 1N2071 or 400-600 p.i.v. silicon diodes; RL1, high speed reed relay.

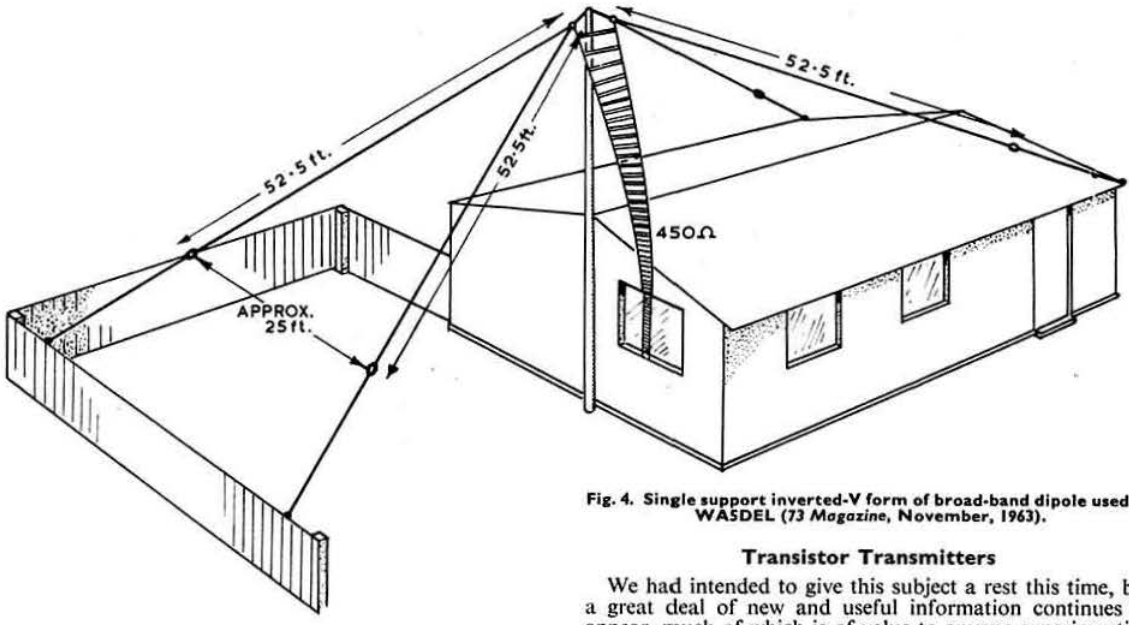


Fig. 4. Single support inverted-V form of broad-band dipole used by WA5DEL (*73 Magazine*, November, 1963).

Broad-band Dipoles

In the course of scanning commercial as well as amateur literature, we constantly observe that new and revived ideas diffuse through both fields at much the same time. For example, an article " An Antenna System for the Entire H.F. Band " in *Electronic Industries* (August, 1964) describes the advantages of fan-type, 48 ft. or 64 ft. two-wire dipoles, with a 20 ft. length of two-wire balanced transmission line into a pi-network/balun aerial coupling unit to match it to 50 ohm co-ax. The 48 ft. broad-band dipole is claimed as suitable for use throughout the range 4-30 Mc/s and the 64 ft. version for 3-22·5 Mc/s, for military or commercial use.

We then remembered an article by W5VOH and WA5DEL " All Band Conical Antenna " in *73 Magazine*, which presented two examples of what were called " two horizontal Vs back to back, centre-fed with 450 ohm feed line matched to a low impedance line with a Johnson Matchbox coupler " —substantially the same arrangement as above. In this case the conical broad-band dipoles had an overall length of about 105 ft. with a spacing of about 25 ft. at the outer ends (see Fig. 4), and were said to provide an effective aerial for use throughout 3·5–30 Mc/s with unity s.w.r. in the co-ax section. The actual element can be flat-top, inverted-V (centre-support) or any other configuration provided that the system remains balanced to earth.

Old-timers may, of course, smile reflectively at the current interest in such aerials, recalling the many years in which the so-called centre-fed Zepps were one of the main weapons in the armoury of the DX-man—and even the spider-web broad-band dipole receiving system developed by RCA in the 'thirties.

But for more recent recruits, this could be a relatively simple yet effective answer to the problem of multi-band operation. For those interested in more advanced forms of broad-band aerials, and in particular the log-periodic, a review of recent developments in this field appears in *IEEE Spectrum* (April, 1964).

Transistor Transmitters

We had intended to give this subject a rest this time, but a great deal of new and useful information continues to appear, much of which is of value to anyone experimenting with solid-state transmitters of appreciable power.

For instance, the British firm handling the Motorola range of r.f. power transistors (Celdis Ltd., 4 Trafford Road, Richfield Estate, Reading, supplied us with information on their fast growing range of r.f. power transistors, including two useful Applications Engineering Reports: No. 100 *2 watts output at 160 Mc/s using the 2N2950* and No. 101 *A citizen's band transmitter using the Motorola 2N2950*.

A cautionary observation from No. 100 would seem well worth bearing in mind when tackling v.h.f. solid-state transmitters.

" First attempts to build a transistorized 160 Mc/s (or, for that matter, a 144 Mc/s rig) power amplifier by the uninitiated will almost certainly result in partial or complete failure due perhaps to one or more of the following reasons:

" First, the available device power gain is drastically lower than present-day valves and therefore closer attention must be paid to losses. Transistor impedances are extremely low and often contain large reactive components, usually capacitive. Voltage is a major consideration in circuit design, since all present-day h.f. transistors are sensitive to abuse arising from voltage spikes as well as high currents and temperatures. Fortunately these and other obstacles can be overcome and highly reliable transistorized circuits and equipment are possible using presently available devices."

Since writing these notes, an interesting comment has been received from G2IG on power transistor trends which we hope to refer to in the next *Technical Topics*.

Improved Transistor Amplifier Circuit

Most transistor power amplifiers use the common-emitter arrangement, corresponding most closely to the standard valve (grounded cathode) circuit, on account of the high gain; others use the common-base configuration on account of its higher maximum frequency for a given transistor; or the common-collector circuit which allows direct metallic contact between the transistor case and the heat sink or chassis.

The distribution of the desirable characteristics among the three standard circuits has encouraged some designers

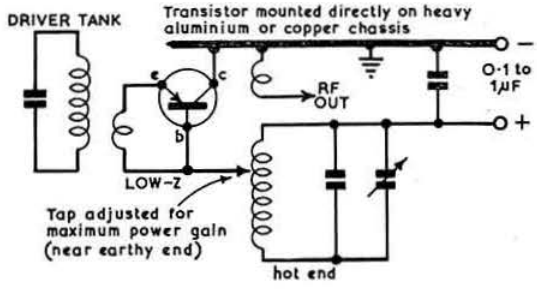


Fig. 5. Single-ended "improved power amplifier."

to try and produce hybrid arrangements combining as many possible good points into a single circuit.

One such approach is that described by Irving Gottleib in "Improved Transistor R.F. Amplifier Circuit" in *Electronic Industries* (August, 1964). This circuit, it is claimed, has been developed using a Texas Instruments 2N1908 and the author states that he obtained about 10 watts output on the 7 Mc/s amateur band using a transmitter consisting of a 2N697 c.o., 2N1907 b.a. and 2N1908 p.a. The efficiency, and thermal and electrical characteristics of this circuit are claimed to be outstanding. The author admits that some experimentation will usually be needed to achieve best results but states that once the input and output impedances have been optimized, stability is almost unaffected by driver or load variations, or by changes in supply voltages.

It is also claimed that an extra dividend is provided in that—unlike the normal common-emitter amplifier—it can be modulated to almost 100 per cent by means of a transformer winding inserted in the positive d.c. lead. During modulation, the supply for this particular transistor should be limited to about 12 volts, compared with 15 to 18 volts for c.w. operation. It is pointed out that best results and greatest safety for the transistor will be achieved when powered by a battery of adequate capacity, or by a closely-regulated d.c. power supply.

A reprint of this article, and also one by RCA engineers which outlines a "solid-state v.h.f. transmitter design" capable of 15 watts f.m. output up to 150 Mc/s using a varactor diode power doubler can be obtained from Reader Service Department, Chilton Company, Chestnut & 56th Streets, Philadelphia, Pa., USA.

A push-pull version of what appears to be rather the same basic arrangement of common-emitter with earthed collector has been used in a number of published Mullard designs, including one for a 100 watt 5 Mc/s unit with a pair of PT901 transistors and a 4 watt 8·3 Mc/s marine emergency transmitter using a pair of the less costly AUY10s. There

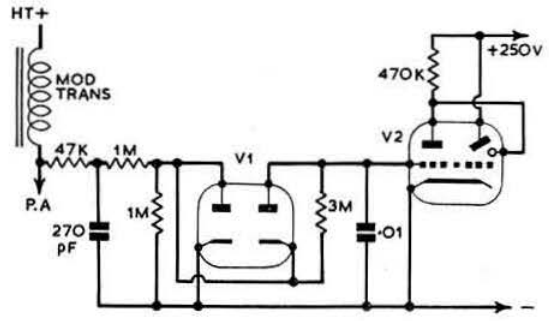


Fig. 6. Overmodulation indicator for use with a low power a.m. transmitter. V1, EB91; V2, EM84.

are, however, some differences between these circuits and that described in *Electronic Industries*.

While on the subject of transistor rigs, it is worth mentioning that at the recent TV and Radio Show, Ever Ready introduced a new 12 volt battery (type TV1) made up of heavy duty cells (see *TT*, April, 1964) and intended to supply some 3 watts of power continuously over periods of up to two hours a day, and providing altogether some 40 hours operation of the extremely low consumption television receivers which they have developed in prototype form. Such batteries would appear almost ideal for portable operation of transistor rigs of quite high power provided

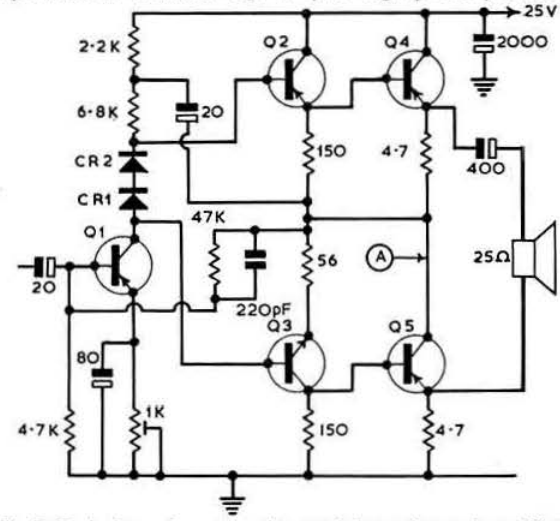


Fig. 7. Typical transformerless d.c.-coupled transistor a.f. amplifier. CR1, AA120; Q1, AC165; Q2, AC166; Q3, AC168 (*n-p-n*); Q4, 5, AC167.

that the duty cycle (ratio of reception time compared with transmission time) was reasonably high. The batteries will cost in the region of thirteen shillings each.

Overmodulation Indicator

Since so much space this time has been devoted to c.w. and semiconductors, we feel obliged to include at least one valve item for 'phone operators. Completely fresh valve circuits are, however, not exactly abounding these days and the best we can do is the overmodulation indicator of Fig. 6 which in various versions has been around for quite some time. This particular circuit comes from *Radioschau* Nr. 6, 1964, and provides immediate visual warning of any overmodulation which cuts the carrier and gives rise to splatter.

S.S.B. Speech Clipping

On several occasions we have pointed out that speech clipping is a much more difficult matter on s.s.b. than on a.m., and that this tends to invalidate some of the power claims put forward on behalf of s.s.b. (these are of course only part of the advantages of the system). Now, W2PUL and W2LOY, in *QST*, July, 1964, report on a new approach involving the clipping of the radio s.s.b. envelope at low level on 9 Mc/s rather than attempting to operate on the actual speech a.f. signals. According to the authors this system can add even more punch to s.s.b. transmissions provided that the final and the power supply can stand-up to the increase in average power.

Audio Output Stages

Another of the features of the Radio Show was the number of firms with domestic radiograms and record players using

the now popular d.c. coupled, transformerless transistor amplifiers. There are several slightly different arrangements in use but one of the most popular, due originally to H. C. Lin of the American General Electric Company, uses a complementary-symmetry pair of matched *n-p-n*/*p-n-p* transistors in the driver/phase-splitter with a pair of *p-n-p* transistors in the output stage. We feel that this type of circuit is likely to be much used eventually for such purposes as the output stages of transistor communications receivers, so it is worth getting acquainted with it. Alternatively, with *p-n-p*/*n-p-n* transistors of appreciable power rating and greater gain becoming available, the simpler complementary symmetry output stage (*TT* October, 1962) can be used for output powers of several watts, preferably with bias stabilizing diodes (see below).

The example in Fig. 7 comes from a record player providing about 2 watts output to a speaker with a 25 ohm impedance speech coil, although some amplifiers of this type have an output impedance of about 8 ohms.

The pre-set resistor in the emitter of the first driver stage (in the actual equipment this is preceded by a conventional transistor pre-amplifier) is set so that the potential between point A and chassis is approximately one volt higher than half of the d.c. supply.

The two junction diodes CR1, CR2 provide voltage and temperature compensation for the bias of the output stage and are mounted adjacent to the output transistors on the same small heat sink. In some designs, thermistors are used instead of these diodes.

Complementary symmetry using *n-p-n*/*p-n-p* pairs of transistors was discussed in *TT* (October, 1962) and is now being widely used in domestic and portable equipment to eliminate the need for driver transformers.

Here and There

The W3JHR "synthetic rock" transistor v.f.o. (*TT*, December, 1963) continues to attract favourable comment. The circuit has now turned up once more, this time in *Radio-REF* (July, 1964) with F8NB full of praise for the results achieved. He uses two OC171 transistors without any significant changes in component values. Because of the low level of output, he finds that the unit, when built in a screened box, can be kept running continuously without interfering with the receiver, though he prefers using a 9 volt rather than a 12 volt supply. The output is fed to a high-gain 1852 (6AC7) amplifier.

Although we have mentioned on several occasions our difficulty in finding time to deal adequately with all the queries which reach us, these continue to arrive in embarrassing numbers.

Can we therefore appeal to members to keep such queries to an absolute minimum and not to get too het-up if they fail to get a prompt reply? We can assure one irate member that we do *not* steam off the stamps from s.a.e.'s for our private use as he suggests!

An idea of the magnitude of this problem for those who write regularly for publications can be deduced from a recent note we had from VK2AZN who told us that following our mention of his Deltahet tuner he received some 60 enquiries. We are glad to see, however, that it has not deterred him from describing a complete receiver using this principle (*Radio, TV & Hobbies*, September/October, 1964). He is anxious to hear from anyone who has built the Deltahet.

For several years, the recognized guide for those requiring a sound technical knowledge of s.s.b. has been the Collins soft-cover book *Fundamentals of S.S.B.* We were interested to see recently a new hard-cover book also by present and former Collins engineers which updates the material and goes rather deeper into the subject. This is the 382-page *Single-sideband Principles and Circuits* by E. W. Pappenfus, W. B. Bruene, and E. O. Schoenike, published in 1964 by McGraw-Hill. For those in London, there is a copy in the Patents Office Library in Holborn.

Recently we saw exactly what happens when a large television picture tube is imploded in a small room (deliberately in this instance). It certainly brought home the need to take care when handling cathode-ray tubes. But we regret that we cannot confirm the old joke than an implosion goes "gnab."

OSCAR III

OSCAR III is now undergoing final ground tests in preparation for a late winter launch. If all goes according to plan, amateurs may soon be able to communicate, via the satellite, over distances of several hundreds, perhaps thousands, of miles on the 144 Mc/s band. Depending on the height of orbit the maximum distance that may be achieved will range between 2000 and 4000 miles.

OSCAR III will measure approximately 17½ in. × 12 in. × 6½ in., will weigh about 30 lb. and will have four aerials, one for receiving and three for transmitting, projecting from its sides. Any signal heard by the satellite within a 50 kc/s wide channel centred on 144·1 Mc/s will be accepted, amplified and translated to a 50 kc/s wide channel centred on 145·9 Mc/s. The signal will then be retransmitted back to earth. The satellite's orbit is expected to carry it over almost every corner of the globe and it will be available for radio amateurs everywhere.

In addition to the frequency translator, *OSCAR III* will carry two beacon transmitters. The first will transmit the identification code HI in Morse Code on 145·85 Mc/s, as well as certain telemetry information. The second will transmit a continuous carrier on 145·95 Mc/s for tracking purposes, signal strength observations, Doppler shift and propagation measurments.

The satellite programme is being arranged by the Project Oscar Association, PO Box 183, Sunnydale, California, USA.

Instrument Transformers (Continued from page 710)

The only disadvantage is that the ferrite cored current transformer will not perform so well at the higher frequencies. No effects due to this are discernible over the 1·8-2·0 Mc/s band, and using a reasonable grade of ferrite, it is probable that the performance at 3·5-3·8 Mc/s will not be seriously degraded. No facilities were available for the examination of its properties on the other bands, so there is still plenty of scope for experiment in that direction, especially bearing in mind that much higher powers are allowed on the higher frequency bands so that a poorer coupling will matter much less, and may even be an advantage in some circumstances.

In this article an attempt has been made to explain the basic principles of, and to draw attention to some of the more subtle complications of, the a.c. current transformer, especially as applied to r.f. current measurements. It is hoped that this will encourage others to experiment with, and make use of, this most interesting device.

References

(1) *Commercial A. C. Measurements*, by G. W. Stubbings, Chapman and Hall, 3rd Edition, 1952.
(2) M. G. Scroggie, *Wireless World*, March 1952, page 89.
(3) M. G. Scroggie, *Wireless World*, June 1954, page 284, and July 1954, page 339 (2nd part).

Obtaining Reliable 10 kc/s Frequency Markers in the Two Metre Band

By P. K. BLAIR, G3LTF*

FOR the 2m operator who wishes to work long distance schedules some equipment for accurate frequency measurement is essential. A crystal oscillator on 1 Mc/s and a chain of locked frequency dividers is an easy way of obtaining 10 kc/s markers up to about 20 Mc/s. When the markers are fed into a 2m converter, however, the strongest beats on the band usually turn out to be those coming straight through at the intermediate frequency while the 2m markers are very weak. This effect is particularly troublesome if an exact tuning range is used as the i.f., such as 4-6 Mc/s or 14-16 Mc/s to correspond to a signal frequency coverage of 144-146 Mc/s. To overcome this problem we must first generate the higher order harmonics of these 10 kc/s markers at a reasonable level and then amplify them selectively before applying them to the 2m converter.

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Design Considerations

The output and input leads to the multivibrators in the calibrator built by the writer (Fig. 1) are common and feed half of a 6J6 or a 6C4 as a resistance capacity coupled amplifier. This feeds the harmonic generator which uses two diodes, any point contact types being suitable. The output from the diodes is fed to an EF91 which is an amplifier with its anode circuit tuned to 145 Mc/s. The calibrator output is taken from a link on this coil via a co-axial cable to the converter. A triode-pentode such as an ECF82 could be used instead of the 6J6/EF91 combination if preferred.

The harmonic generator is a high impedance device and is thus rather prone to picking up other frequencies from receiver local oscillators, etc., which give rise to many spurious beats in the 2m band. It is essential, therefore, to screen the two diodes and the associated resistor and capacitor in a small can and to keep the leads short and close to the chassis. The output coil and tuning capacitor in the anode circuit of the EF91 are also in a screening can to eliminate stray pick-up. These precautions result in only a very few

(Continued on page 724)

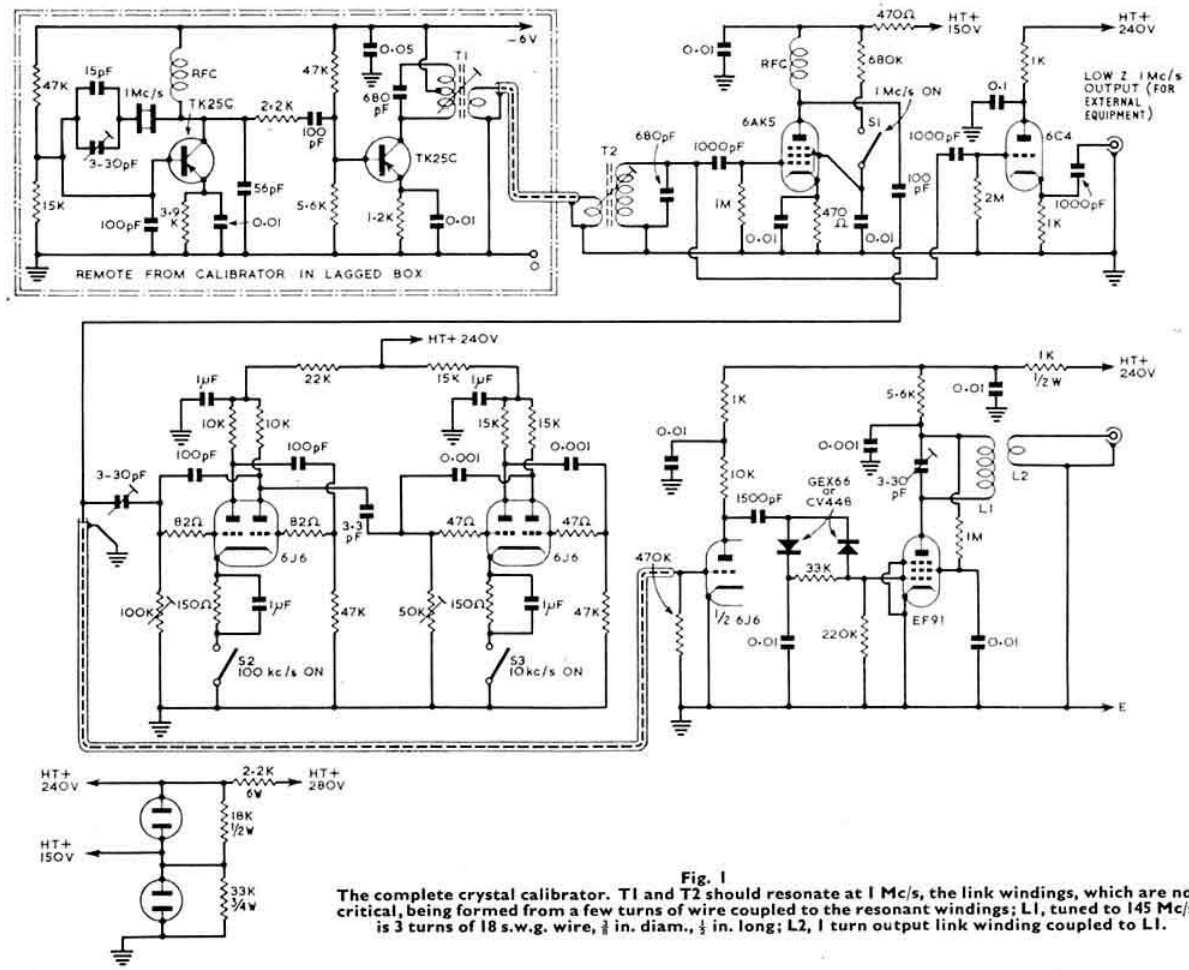


Fig. 1
The complete crystal calibrator. T1 and T2 should resonate at 1 Mc/s, the link windings, which are not critical, being formed from a few turns of wire coupled to the resonant windings; L1, tuned to 145 Mc/s, is 3 turns of 18 s.w.g. wire, $\frac{3}{8}$ in. diam., $\frac{1}{2}$ in. long; L2, 1 turn output link winding coupled to L1.

Part 2‡

Progressing Through Amateur Radio

By K. L. SMITH, G3JIX* and P. G. MARTIN, G3PDM†

BEFORE an appreciation of the effects of an electric current can be obtained, a working picture or *model* is required to help our minds grasp upon something solid in the abstract nature of the subject. Perhaps the main difficulty is that electricity cannot be detected by our senses, except rather painfully by touch, and this does not increase our knowledge much; except to keep off the h.t. points! We only notice the effects: the sparks, moving pointers, sounds, and so on. The *electron theory* is the model used to explain the effects observed, but it is important to remember that it is only a model. [1, 2]

The atomic theory has proved very helpful in explaining what is seen going on in the physical world. The atoms of many elements have outer electrons which are only weakly attached: others have electrons which are strongly bound (Fig. 1).

When an atom loses one or more of its negative electrons, it is left positively charged, and is called a *positive ion*. The free electrons may temporarily attach themselves to neutral atoms, thus making them *negative ions*. Electrons, being light, move freely and form the electric current. The heavy positive ions stay put, in solids anyway. In liquids, called electrolytes and in gases, positive ions often move. The

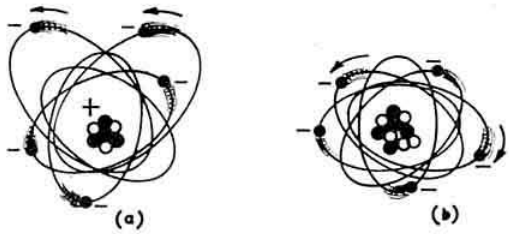


Fig. 1. Diagramatic representation of atoms. The atom at (a) would lose the outer two electrons easily. In (b) the electrons are tightly bound about the nucleus.

latter is a disadvantage in valves and cathode ray tubes, where the heavy positive ions bombard the cathode and damage it. A cluster of electrons forms a negative (−) charge: their absence leaves an area of positive (+) charge. Charge can move and forms the electric current.

It is found that negative charges repel each other; likewise positive charges. But a positive and a negative charge attract. The forces vary with the distance separating them, also with the amount of charge present. This remarkable effect of charge on charge is very important. If charges move under the action of these forces, work is done, this being proper scientific work, measurable in units. It explains the energy which is conveyed by electricity and this energy is what we buy when the electricity bill is settled. The forces tending to move electric charges are called *Electro-Motive Forces* (E.M.F.s). Another name is *potential*. A unit of work is done when a unit of charge moves between points which differ by a unit of potential. (See " Units," later).

The ideas of electric charge and current as the flow of charge are not too difficult. Because of its abstract nature, potential is rather harder to appreciate, being a force or pressure in some way. One way is to imagine a kind of tension like stretched rubber, driving electric charge against any resistance present. Another way is to use the mechanical analogy of a scenic railway. Mechanical potential energy is stored in the cars at the top of the run, or at the " high-potential " start. Various drops of potential occur as the train goes down the slopes, until it has completed the circuit and is ready to be raised for another run. Similarly, charge moves round a circuit with various potential climbs

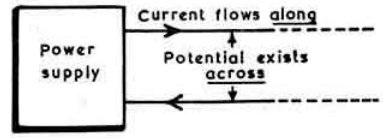


Fig. 2. Illustrating the difference between current and potential.

and drops. The vital fact to notice is that potential exists between two points. We speak of potential difference or of potential drop across two points. (Fig. 2).

The Electric Field

How is it that forces can operate at a distance through empty space? Now that is one of the deepest secrets of Nature, and we can only meditate quietly about it at the moment. Some aura or field of influence must surround electric charges, and Faraday has given us a good working picture or model showing this force field [2, 3]. Lines of force are drawn starting from the positive and ending on the negative charge. The direction of the electric field is given by the lines, and an idea of the strength by their closeness together. Electrons, free to move, would travel along the lines under the attraction of the positive charge. This is opposite to the line direction because it was once thought that positive charge did the moving, and the convention has stuck. Examples of field pictures are shown in Figs. 3 and 4.

Conductors and Insulators

The electron theory explains conductors and insulators

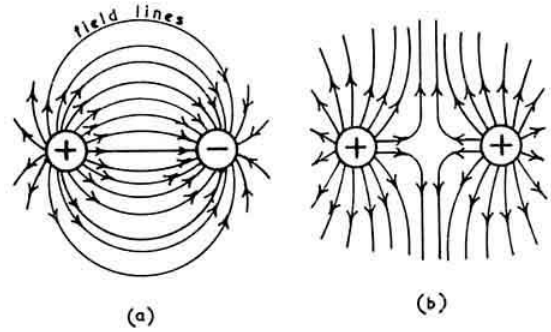


Fig. 3. (a) The positive and negative charges on the bodies set up *attractive* forces. (b) Two like charges, in this case positive, result in *repulsion*.

* RSGB Education and Training Committee.
† RSGB Technical Development Sub-Committee.
‡ Part 1 of this series was published in the September, 1964 issue of the RSGB BULLETIN.

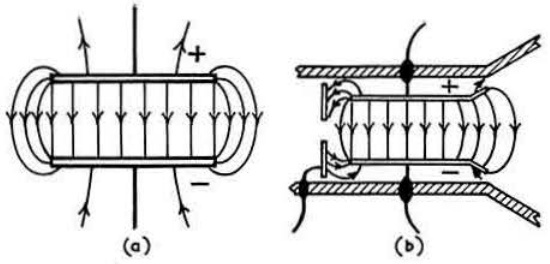


Fig. 4. (a) A charged capacitor. (b) Cathode ray tube deflector plates.

very convincingly. In conductors like copper and other metals, free electrons exist and move continuously in the body of the substance, rather like a gas. If a length of this material is joined between a positive and negative charge, the electron " gas " drifts along towards the positive end, under the action of the e.m.f. existing. This drift is the current flow. The current meets opposition by the atomic structure of the substance to a greater or lesser extent. This opposition is termed the electrical resistance, and the electrons have to do work overcoming it. In insulators, very few free electrons exist and no flow takes place.

The resistance of a conductor depends on the length, cross-sectional area and the material used, Actual components, called resistors, are made to offer known amounts of resistance to limit current, and so on. A circuit which should have a certain resistance but due to some fault has a much lower value, is said to be " short-circuited." This usually gives rise to dangerously large currents, and the energy which is released in the source as heat could destroy it.

Resistors

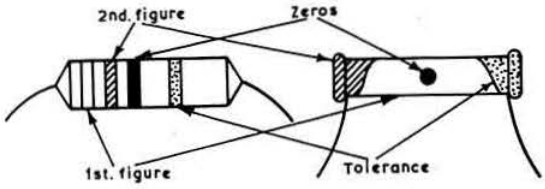
Resistors are made in a variety of forms [4]. The high quality ones are usually wirewound. The fine wire used is protected by firing a ceramic coating on to it. The wire can be cut off to give a very accurate value of resistance. Wirewound resistors are less noisy in the circuits than the majority of the carbon types. (Fig. 5).

Most resistors are made of a carbon/clay composition, which is squeezed out into lengths, cut up and has wires fixed into the ends. The older types were painted, and that was that, but modern types are usually enclosed in a ceramic tube for protection.

The value of the resistor is usually marked on it in colours, but high quality ones sometimes have it printed. An early knowledge of the resistor colour code (Table 1) is an advantage. Also marked on the resistor is the tolerance: one cannot make a component an exact multiple of the unit, so the percentage accuracy is stated between which the value lies. For instance, a resistor with a colour scheme yellow-violet-orange-silver is 47,000 ohms (Ω) plus or minus 10 per cent.

The study of a radio circuit shows that resistors figure very prominently. Variable resistors exist and their uses will be discussed later.

TABLE I
Resistor Colour Codes



COLOUR	First Figure	Second Figure	Number of Noughts Following	Tolerance
BLACK	0	0	—	
BROWN	1	1	0	±1%
RED	2	2	00	±2%
ORANGE	3	3	000	
YELLOW	4	4	0000	
GREEN	5	5	00000	
BLUE	6	6	000000	
VIOLET	7	7	not found, values very high and uncommon.	
GREY	8	8		
WHITE	9	9		
SILVER				±10%
GOLD				±5%

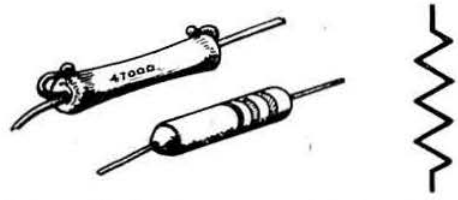


Fig. 5. Wirewound and carbon resistors with the theoretical symbol.

Other Conduction Methods: Semiconductors

Other ways of conveying the electric charge exist. If electrons can be detached into empty space, they can be accelerated towards positively charged plates. Very convenient ways of controlling the beam of electrons are carried out by using plates, grids and other electrodes introduced into the path. Electrons can be detached into the vacuum by emission from a hot surface, and valves (Fig. 6) operate by means of this effect. Notice that the current can pass in one direction only, from the hot electrode to a positive collector, hence the name valve.

A very important means of conduction and control of electric charge developed recently, is by the special action of a *semiconductor*. A little effort studying this topic is repayed by an understanding of the devices using semiconductors, and therefore easy adaption by the reader to amateur apparatus. Semiconductors are not just poor conductors, but are classes of material which are crystalline, examples of which are germanium and silicon. The special conduction in these materials is very interesting and is put to good use. [1, 5, 6]

The material is first formed into a near perfect crystal and is very pure indeed. The atoms line up into a pattern called the *lattice*. Heat is energy and appears as vibrations of the atoms, the higher the temperature the greater the amplitude of vibration.

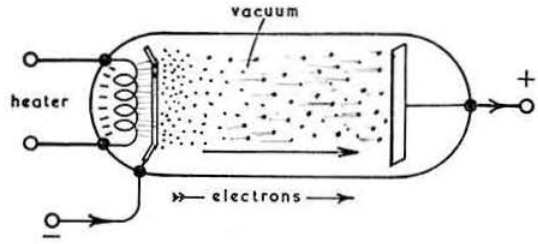


Fig. 6. A diagram depicting the operation of the thermionic diode.

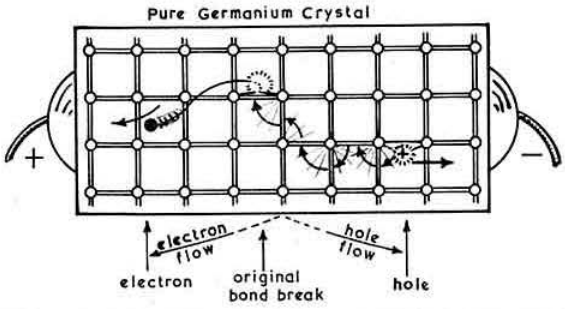


Fig. 7(a). A pure germanium crystal atomic structure, which produces hole/electron pairs.

Take germanium as an example: the atom has four outer electrons (for the chemists, a " valency " of four). These electrons form the links with the neighbouring lattice members. Because of the vibration, an electron bond may be broken now and then. The released electron moves off through the lattice; it has become free. Left behind is the

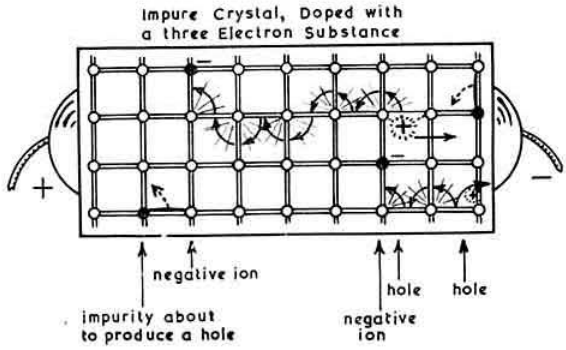


Fig. 7 (b). A germanium crystal doped with an impurity having three available outer electrons, and which produces holes.

vacancy, or in other words, the positive ion. It is very easy for one of the other bonds to switch round and fill the gap. The vacancy has, as it were, moved off. This " positive hole " also moves through the lattice (Fig. 7(a)). The difference is that the detached electron is free, but the hole appears to

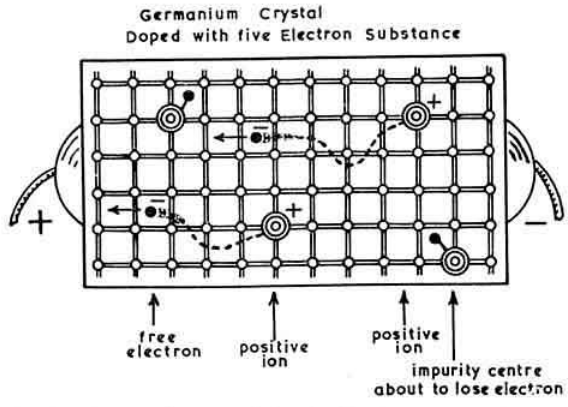


Fig. 7 (c). A germanium crystal doped with a five-electron substance and which produces electrons.

move because bound electrons (different each time) move into the space. Thus two methods of charge conveyance are noted: electron flow and positive hole flow. Temperature effects thus produce a hole-electron pair. The higher the temperature the greater the chance of bonds breaking and current flowing, even in a perfect crystal. This means that in semiconductors the resistance to current drops with increasing temperature. This is a test for semiconductors because in conductors of the metallic type an increase of temperature increases the resistance. Carbon has a resistance which decreases with temperature, and is strictly a semiconductor.

The above action is technically termed " intrinsic " semiconduction. If a hole and an electron meet, they disappear from the scene.

The real interest starts when the pure material is deliberately made impure by a controlled amount. This is called " doping " the material. If a substance like indium is added to the germanium, then with only three available outer electrons, only three bonds are formed in the lattice and the incomplete bond allows the easy production of a positive vacancy by accepting a nearby electron (Fig. 7(b)). The indium becomes a negative ion, and the positive hole moves off in the way described earlier. The negative ion stays put locked into the lattice.

Now try an impurity like arsenic with five available outer electrons (Fig. 7(c)). Four are taken up in the lattice bonds; the fifth is very easily detached and wanders off through the lattice. The arsenic is left as a fixed positive ion. At ordinary temperatures virtually all the impurity centres have lost the appropriate charge and are ionized. Therefore the resistance of doped semiconductors is a good deal lower than that of the pure material. Notice in particular that the current is conveyed by one type of charge only. This is called " extrinsic " semiconduction. The material producing holes is the " *p*-type ", and that producing the electrons is the " *n*-type." The other effect is going on as well (intrinsic), so a few carriers of charge of opposite sign exist.

This topic has been discussed at some length, because semiconductor rectifiers and transistors are becoming so common, and their actions are explained by the above picture.

Units

All ordinary quantities require a standard value of measure. Thus we buy a pound of sugar or a gallon of petrol. Electrical units are required for the same purpose.

The size of the units are chosen to be convenient for everyday use. It is perhaps most important to see the meaning of the quantity being measured, rather than just knowing the size of the units. This avoids such phrases as " the volts running through him!"

The units, and multiples of them, are quantities of something. They have symbols which are used to identify the quantity and also act as the algebra letters in the equations used to state the relationships between them. It is common practice to use these letter symbols both for the quality being discussed, and for the quantity of it being used. Thus Q means electric charge, and also the number of units of charge.

The unit of charge could be taken as one electron, but this would be far too small for convenience. In fact the chemical effect (electroplating a known weight of silver) was originally used to define a unit of charge. This is called a *Coulomb*, and the number of electrons in a Coulomb is $6{\cdot}28 \times 10^{18}$. A surplus of electrons gives a negative Coulomb, a deficiency a positive unit.

A Coulomb flowing per second is a unit of current, called an *Ampere*.

Work or energy is measured in *Joules*. The rate of working is the power output, and is measured in Joules per second,

commonly called *Watts* (*W*). 740 Watts is the rate of working of one horse power (h.p.). In the electrical case, when one coulomb moves between points differing by unit potential, one Joule of work is done.

The unit of potential is the Volt (*V*). If one Coulomb passes for one second, one Joule per second is the rate of working. The circuit is producing power at the rate of one watt. One coulomb per second is an ampere, therefore if one ampere flows under the action of one volt, one watt is the power consumed. If 10 coulombs move through four volts, then:—

Work done is $10 \times 4 = 40$ Joules.

If this is done in one second, then the rate of working is 40 watts.

Therefore it is seen that:—

$$Watts = volts \times amps.$$

Going the other way, for example, a transmitter with an output of 100 watts on for 9 minutes radiates 100 Joules every second, or

$100 \times 60 \times 9 = 54{,}000$ Joules altogether.

One " unit " of electricity is one kilowatt-hour, or the energy delivered by 1,000 watts running for an hour.

The unit of resistance is called the *ohm* (Ω). It is the resistance which allows one ampere to pass when one volt exists across it. Ohm's Law is the relation between current, potential and resistance. If the potential is increased, the current increases in proportion, but if the resistance goes up, the current goes down, this case being an inverse proportion. Ohm's Law is written using the symbols:—

$$I = \frac{V}{R}$$

where it is seen that I increases with V, but decreases as R gets bigger.

Now, $$Watts = I \times V$$

Take $W = I \times V$ and $I = \frac{V}{R}$ together, describing the same circuit, the V's and I's are equal. Substitute I from Ohm's Law into the power equation:—

$$W = V \times \left(\frac{V}{R}\right) = \frac{V^2}{R}$$

Or using $I \times R = V$:—

$$W = I \times (I \times R) = I^2R$$

These give directly the power in a resistance for a known voltage, V, across it, or a known current, I, flowing through it. Notice that the power follows a square law of either V or I. It is important to write down the values of the quantities in terms of the basic units: volts, amps., ohms, etc., but multiple and submultiple units are often met (see Table 1), and the safest way of using them in calculations is to reduce to the basic units. Thus if volts are divided by milliamps in an Ohm's Law equation, and the answer was written mistakenly as ohms, it would be a thousand times too small!

An important point to notice is that Ohm's Law only applies to ordinary resistors: these are said to be linear. The type of conduction found in valves, for instance, is mainly non-linear (remember that if the voltage is reversed, no current flows at all). Semiconductors have a resistance which is non-linear. Ohm's Law cannot be used on non-linear resistances, except when the voltage and current changes are so small that the resistance can be taken as staying constant over this small region of interest. Some resistors change their value very markedly with temperature, and these are known as thermistors [7].

We have begun to advance to the front line of our subject, covering the models used to picture what is going on. The laws of charge affecting charge have been mentioned, and the various methods of the conduction of the current. Units necessary to measure the quantities involved have been covered, but methods of measuring them are very important in all practical circuit testing. Next time we will discuss suitable instruments to do this job in the amateur shack.

TABLE 2

Prefix	Symbol	Multiplier	
pico-	p	$\frac{1}{10^{12}}$	Submultiple
nano-	n	$\frac{1}{10^{9}}$	
micro-	μ	$\frac{1}{10^{6}}$	
milli-	m	$\frac{1}{10^{3}}$	
kilo-	k	10^{3}	multiple
mega-	M	10^{6}	

Examples:

1 picofarad (1 pF) is $\frac{1}{1{,}000{,}000{,}000{,}000}$ of a Farad.

1 Megohm (1 MΩ) is 1,000,000 ohms.

1 nanosecond (1 ns) is $\frac{1}{1{,}000{,}000{,}000}$ of a second.

Things to Do and Notice

Attraction and Repulsion. You can easily study the forces of attraction and repulsion of electric charges by hanging up a small light ball of silver paper or plastic foam. The books traditionally quote " pith."* Hang it up by a silk thread (an insulator). Rub a stick of sealing wax, a fountain pen or a piece of polythene with a cloth. Touch the ball with this rod which will now be charged. Some of the charge will pass on to the ball, and any further advances with the rod towards the ball will result in it being repelled. The charge on the rod should be negative. If you can obtain a piece of silk and rub a glass rod with it, a positive charge should result. Use the charged ball to check this.

Resistance. Take a few lengths of fairly thin copper wire about 10 ft. long. The type of wire found on old loudspeaker transformers is suitable. Connect up a cycle lamp battery to one of the wires, take the other end to a torch bulb, and the other side of the bulb back to the battery. " Crock " clips are useful for this sort of thing. Now connect the other lengths of wire in series, so increasing the total length in the circuit. Note the brightness of the bulb. Try the other wires in parallel with the first, thus increasing the cross-section. This simple experiment should convince you about how resistance changes with length and cross-sections of conductors.

Switch on a set or amplifier which uses miniature valves with glass bases. Watch the heaters during switch-on. Sometimes you will see a sudden bright glow which dies away to a dull red. This shows that the resistance of the metal heater wire is low when cold, and gives rise to a current surge when switching on. The resistance rises as the temperature increases.

If you connect a crystal diode (obtainable from old TV sets) in series with the bulb and battery, then one way round the bulb will light, but not the other. Connect up the diode backwards, so that the bulb is out, and hold the diode in a match flame. Very soon the bulb will light. Let the crystal cool: the bulb goes out again if you are lucky enough to have the crystal still working! This is convincing evidence of the resistance decrease with rising temperature in semiconductors.

Break up a carbon resistor and note how the wires are joined to the composition. If you use a high and a low value,

* Obtainable from elder wood.

the difference in the composition material will probably be noticeable.

The last two experiments result in the destruction of the devices used, and it is interesting to note that whole books have been written, and much research carried out, on the subject of "Non-Destructive Testing." It has become a science in its own right, and can be seen most effectively used when testing things like ancient oil paintings, and the like.

SUPPORTING PROGRAMME

The following discussion supports the main theme, but is not essential for an understanding of it.

Mathematics has a reputation of striking fear in some people, or of causing strong feelings because of lack of understanding. But mathematical ideas are not so difficult. A few simple notions can help to make clear what is going on in a circuit or component. A little thought is amply rewarded by a greater understanding, and more pleasure is experienced.

If one looks round anywhere, the common factor is the change going on. The whole system appears to have causes giving rise to various effects at a greater or lesser rate. The ideas rate of change, and causes and effects, are the mathematical notions most appropriate right now. Maths? Where is all the adding, dividing . . . . fractions and things? These calculations require to be done, of course, but are the least interesting. It is best to get someone else to do them, if you can. Many people have not progressed past arithmetic into the maths in which figures hardly figure at all [8]. The advanced reader will have already recognized that the maths of change is the calculus, and of causes and effects, the theory of functions.

If you catch the h.t., one effect is that you shout. If the h.t. is made higher, we may assume the yell will increase (up to a certain limit, of course!) In this example, there is no easy connection between the h.t. value and the noise output. To state the case in mathematical terms, we say that the yell is a *function* of the h.t., writing it as:—

$$Y_{ell} = f(H.T.)$$

Function means that if one thing varies, then another does also, according to some rule. In natural occurrences, the connection is often remarkably well defined, and can be stated as known mathematical functions.

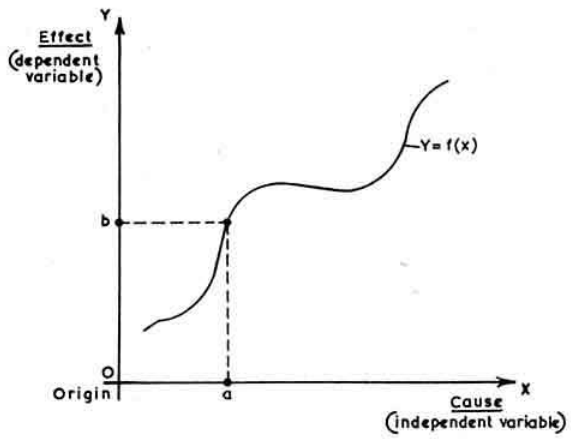


Fig. 8. A graph shows at a glance the relationship of one quantity to another. Often it is a picture of a mathematical law, but just as often the curve is produced by plotting pairs of values obtained by measurements using meters, etc. A value of X, say a, gives a corresponding value for Y, b, according to the law connecting them. The X and Y plates in oscilloscopes are so named because the cathode ray tube is a graphical drawing machine.

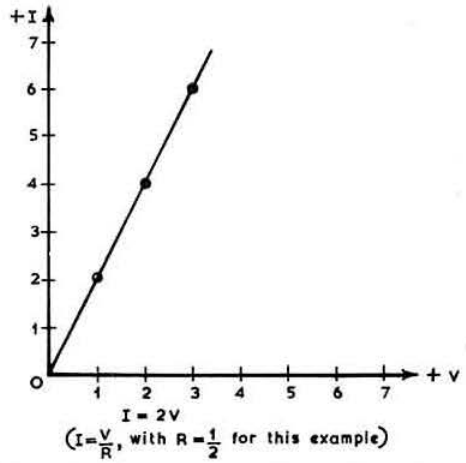


Fig. 9. The straight line law connects things that are in *direct proportion*, a decrease or increase in one gives a corresponding decrease or increase in the other. Thus an h.t. supply of 500V can be expected to pack twice the punch of a 250V one, if you touch the live terminal (Ohm's Law is a direct proportion).

Graphs are particularly useful in showing the connection between causes and effects; that is, the variation of one quantity as a function of another. The cause is plotted along the horizontal axis, and is usually denoted "x." "y" is plotted vertically, and is the effect, or function of "x."

Some graphs, or the mathematical relations from which they are drawn, are very general and important. The function is called the mathematical law of the graph. Some natural occurrences, especially in radio and electronics, follow these laws closely, and connections between different things are found which would not have been suspected otherwise.

The first one is called the straight line, or the linear law. The quantities which are connected are said to vary linearly, or to be in proportion, For instance, doubling the cause doubles the effect. Thus Ohm's Law is a linear one, because if the voltage, V, is say, trebled, the current flowing is trebled. If V is doubled, I is doubled, and so on. This is

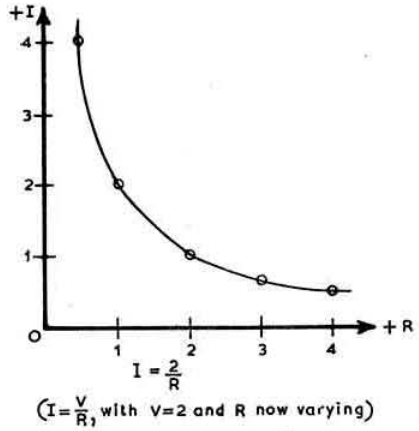


Fig. 10. This law shows how one quantity drops off as another increases. These two quantities are connected by an *inverse proportion*. The current from the mains can be expected to rise out of hand, if a negligible resistance is connected across it. Hence fuses are used to protect life and property from short-circuits.

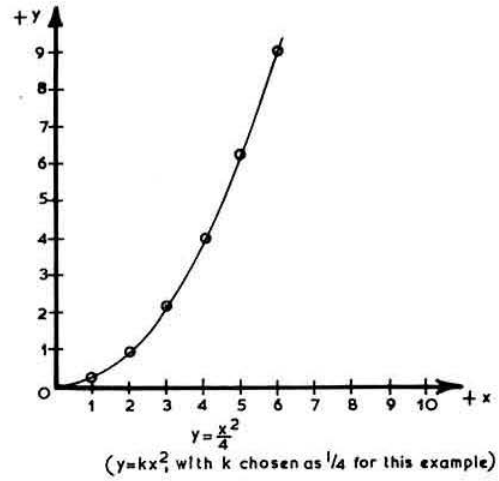


Fig. 11. The square law, the shape of the curve being known as a *parabola*, is found on non-linear meter scales such as the thermocouple and hot wire ammeters. Valve curves approximate to this law. Spin the curve about the Y axis and the shape of a headlamp or dish reflector is obtained.

written: $V = I \times R$. If the resistance R is fixed, doubling V means that I must double to keep the equals correct.

Secondly there is the inverse law, or inverse proportion. If, in Ohm's Law, the voltage is now held steady and R varied, I is found to drop as R is increased. In fact, I is halved if R is doubled. $I = \frac{V}{R}$, so obviously as R gets bigger, I gets smaller. Mathematicians call the curve obtained from this type of equation a hyperbola.

Now we come to the square law. If a number, call it C, is multiplied by itself, it is said to be squared, and is written C^2. If it multiplies three times, $C \times C \times C$, it is called C cubed, written C^3. If four times, it is written C^4, and so on.

Consider $Y = kX^2$; this is an example of the square law, and the curve obtained is called a parabola, which is the

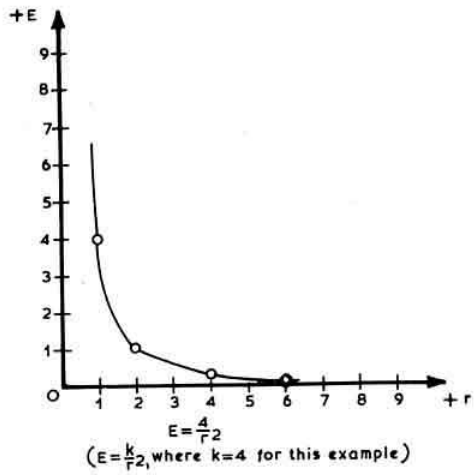


Fig. 12. The inverse square law results in a fast lessening in the effect as the cause quantity increases. Thus as one moves away from the earth the effect would be a fast drop off in gravitational force. Similarly the distant DX theoretically receives a very small signal compared to the chap next door.

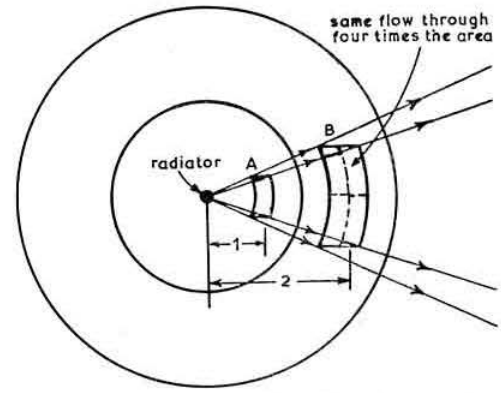


Fig. 13. The inverse square law. The radiator is assumed to emit equally in all directions.

shape of the dish at Jodrell Bank and car head-lamp reflectors. The value of anode current in a valve varies very roughly as the square of the grid voltage, and some circuits are known as " square-law detectors."

One more will suffice for now, and that is the very important " inverse square law." If some quantity E varies inversely as the square of another quantity r, then we write:

$$E = \frac{k}{r^2},$$

where k is some constant (constants 'usually' come into these laws to make the equals right). Notice that E drops off very rapidly as r is increased. Thus we have a way of showing the connection between two quantities.

The amazing thing is that so much in the world of nature follows these simple laws. Take the inverse square law, for instance. The energy radiating out from an aerial passes across any sphere enclosing it. The energy going through the area at B, say two miles away, is the same as that going through A at one mile. The energy crossing unit area at B is smaller than at A, because the surface area of a sphere radius 2 miles is four times as large as that of a sphere radius one mile. Thus the energy crossing unit area at B is one quarter of that crossing a unit at A. The strength drops off as the inverse square of the distance. Other examples now suggest themselves: light, for instance, and electric fields and gravity. In fact anything that radiates from the centre of a sphere.

Finally, the rate of change [9] of functions, or of effects, with their causes is seen to vary over the range of interest in most of the laws illustrated (except the straight line, which has a constant rate of change). The square law shows an ever increasing rate of climb as the quantities become larger. The inverse square law shows a rapid fall at first, then a smaller change from then on.

Of great importance is the idea that if a small enough part of any curve is taken, then that part can be considered as a small section of a straight line, without much error. In other words, the small region can be looked upon as linear. So, if small signals are fed to a valve or other non-linear circuit, then undistorted outputs can be obtained. However, for large signals, the curvature causes the overloading and the distortion. This idea is useful in many applications.

(Part 3 of this series will appear shortly).

References

[1] RSGB Amateur Radio Handbook.
[2] George Gamow. " Biography of Physics," Chapter 5. Hutchinson Science Library. A very entertaining book.

(Continued on page 728)

End-fed Aerial Matching Unit

By F. G. RAYER, Assoc. IERE, G3OGR *

THE use of a reactive network for matching dissimilar impedances is generally well known [1] and the aerial matching unit described here is simply an application of these principles. It is intended for use on the 3·5 Mc/s to 28 Mc/s bands, with pi-output transmitters, and end-fed aerials of indeterminate length. In tests, it allowed a 120 watt transmitter to be fully loaded on all bands (3·5-28 Mc/s) with any aerial from 6 ft. to 160 ft. in length. A length

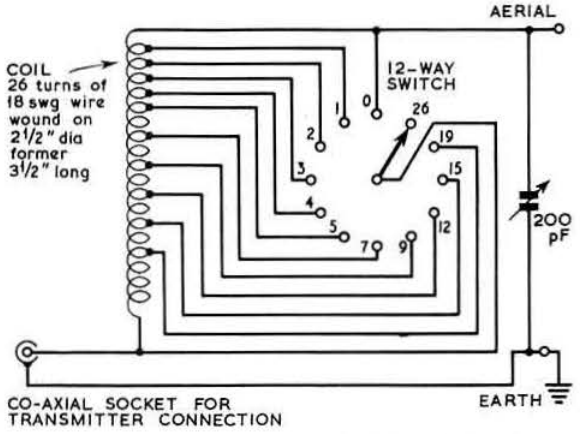


Fig. 1. Circuit diagram of end-fed aerial matching unit.

greater than 160 ft. was not available during tests, but could be used.

Construction

The circuit is shown in Fig. 1. The 12-way switch positions are marked to agree with the number of coil turns in circuit. With the switch in the "0" position, the coil is completely shorted, while the "26" position puts the whole coil in circuit. An ordinary single pole 12-way rotary switch was used, and appears to be adequate, though a transmitter type switch would have been fitted if to hand. A make-before-break switch is preferable to the break-before-make type. A wide spaced variable capacitor is necessary: the one fitted was from an old 1154 transmitter. The voltages across the capacitor depend on the aerial, as well as transmitter power, and spacing at least equal to that of the p.a. tuning capacitor is recommended.

Coils of other dimensions could be used, though the coil shown can be wound on a readily obtainable Eddystone 5 in. × 2½ in. diameter Frequentite former. The wire is strained, looped through one end hole, twisted and soldered. The 26 turns are wound on, and the end similarly fixed. To simplify construction, short pieces of ordinary single flex were soldered on, tappings being staggered as in Fig. 2. This allows short leads to the switch, with no crossing.

The layout in Fig. 3 was adopted, with plywood panel and ¾ in. thick baseboard. Dimensions can be changed to suit a different capacitor or coil, or to fit an existing cabinet. The coil should be at least half a diameter from a metal chassis, if used. The coil is mounted with brackets, and the flexible leads are cut and soldered to the switch tags. The switch was fitted with the dial shown in Fig. 3. The switch stop pin was removed to allow complete rotation.

A stand-off insulator provides an aerial terminal. The earth terminal is connected to the co-axial socket (Figs. 1 and 3). A short piece of 75 ohm or similar co-axial cable is used between the pi-output socket of the transmitter and the matching unit. The length of cable depends merely on a convenient layout of equipment.

Aerials

The length of the aerial need not be known. However, adjustments to the matching unit are in general less critical if the wire is fairly long. Better radiated signal strength is also to be expected from reasonably long aerials. If the aerial is very short, adjustment of the capacitor is likely to be critical. In tests with an aerial 4 ft. long, sparking over began in the 12-way switch when the transmitter was loaded to an input of only about 75 watts, and this set a limit to the shortness of aerials tested.

If an r.f. ammeter is included in the aerial lead, current will be fairly high on bands where the aerial length is near an odd multiple of quarter-waves, but fairly low where the aerial length is near a multiple of half-waves. This arises because $Watts = I^2 \times R$, where R is the resistive part of the aerial feed impedance, and is high at half-wave points. Therefore low aerial current on some bands does not indicate inefficiency.

When the aerial system is unchanged, maximum current, as shown by the ammeter, will agree with maximum radiation, as checked with a field strength meter. If the aerial system or operating frequency is changed, a change in aerial current is to be expected.

When a standing wave indicator is included in the co-axial lead from transmitter to matching unit, nearly zero reflected power is to be expected when almost perfect matching is obtained. When loading of the transmitter is obtained at some impedance other than that for which the s.w.r. indicator is intended, reflected power may be shown. This does not necessarily mean that there is any drop in

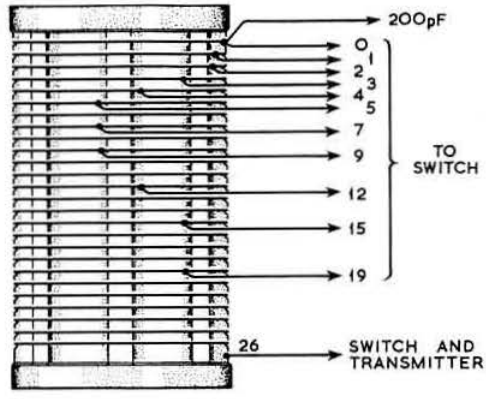


Fig. 2. Details of coil and tappings. The coil is wound on an Eddystone Frequentite former.

* Reddings, Longdon Heath, Upton-on-Severn, Worcs.

power radiated from the aerial, because the transmitter pi-output circuit can feed effectively into a line with a high standing wave ratio [2]. When the co-axial cable is only a few feet long, it is not necessary that transmitter or matching unit adjustments are selected to obtain any particular impedance in the circuit between transmitter and matching unit. In practice, this circuit is likely to be working at an impedance of some 50 ohms to 100 ohms or so.

If a harmonic filter of particular impedance is included in the co-axial lead from transmitter to matching unit, it then becomes necessary to adjust the transmitter and matching unit until this circuit is working with minimum reflected power at the filter impedance, as shown by a s.w.r. indicator.

Matching Adjustments

The 12-way switch is initially set at " 0 " and the capacitor at minimum. The p.a. anode and output capacitors of the transmitter are then adjusted in the usual way. If the transmitter cannot be loaded sufficiently, the matching unit switch is rotated to introduce 1, 2, 3 or more turns, and the 200 pF capacitor is rotated until correct loading is obtained.

On the h.f. bands, few turns will be required, but on 3·5 Mc/s in particular, 12, 15, or more even turns may be required. As various combinations of inductance and capacitance can provide a suitable impedance match, there is some overlap of switch and capacitor settings. One switch position can be noted for each band, for reference, or may be found in a few minutes by rotating the switch, beginning with no turns in circuit.

The transmitter can be loaded with its pi-tank output capacitor in many positions, corresponding to a wide range of output impedances. The output capacitor may be adjusted for about 75 ohms (as if working into a dipole) and loading adjusted with the matching unit. In all cases the p.a. tuner is dipped for minimum anode current in the normal way.

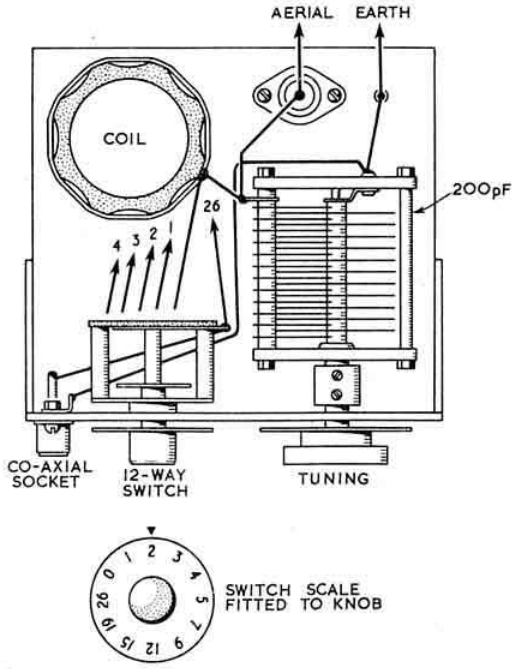
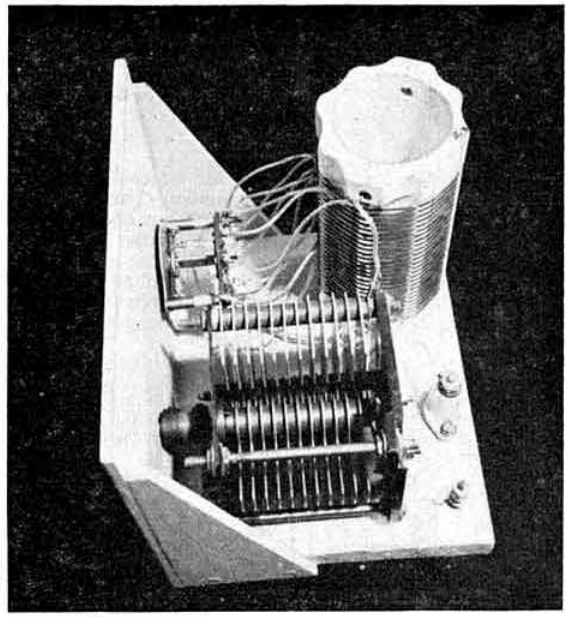


Fig. 3. Component and wiring layout. The switch scale shows the actual number of turns in use.



General view of the end-fed aerial matching unit.

Receiver Coupling

The unit can be employed to improve matching between the aerial and receiver. Where aerial and receiver impedances are reasonably similar, no improvement will result from including the unit, But on bands where a bad mis-match exists, including the unit will increase signal strength. Adjustment is simply for best results, as shown by the receiver signal strength meter.

A matching unit of this kind intended for reception only can be constructed with a small receiver type coil and capacitor.

References

[1] " R.F. Transformers using L-C Networks," R. C. Hills, G3HRH, RSGB BULLETIN, May 1962.

[2] " Some Reflections on Standing Waves," R. C. Hills, G3HRH, RSGB BULLETIN, January 1964.

Markers on 144 Mc/s (Continued from page 716)

spurious signals being found between 144 and 146 Mc/s, and these are weaker than the 10 kc/s markers.

The rest of the calibrator is quite conventional except that the 1 Mc/s oscillator is transistorized and encased in a well lagged tin remote from the rest of the equipment. A buffer amplifier transistor is also incorporated in the tin and the unit is coupled by co-axial cable to the rest of the calibrator. The 1 Mc/s crystal oscillator is adjusted to zero beat with MSF and enables frequencies to be measured on 2m to an accuracy of $\pm$ 500 c/s.

If an output is required for the lower frequency bands it could be taken from the anode of the 6J6 amplifier at high impedance or via a cathode follower if a low impedance feed is required.

In conclusion the writer would like to thank G3CCH for ideas which were used in the design of this calibrator.

Single Sideband

By G. R. B. THORNLEY, G2DAF *

WHILE it is undeniable that the use of commercial single sideband equipment is increasing, many amateurs are keen experimenters and prefer to build their own transmitters or receivers.

There have, over the years, been many articles describing complete items of sideband gear, and circuit details and component values are usually given. Notwithstanding this, the serious constructor would like to know more about the operating parameters of some of the basic units. This applies particularly to frequency conversion or mixing processes where a low level sideband signal is heterodyned by the r.f. output from the v.f.o. or the conversion crystal oscillator. Quite often there is no immediately clear answer to the question, " Is there sufficient injection voltage to ensure that the mixer output envelope is in linear relationship to the mixer input envelope?" or alternatively, " Is the distortion on my signal caused by having the injection too high?" The constructor is further baffled by finding that the amateur sideband handbooks are not very helpful either, and that all authors appear to assume that the reader will know all about this simple process and that it is unnecessary to waste space on it.

Detailed checking of the desired type requires (i) the construction of a suitable test rig, (ii) laborious plotting of many characteristic curves, and (iii) detailed analysis of results. The writer's present commitments are such it is not possible to personally undertake this kind of work. However, during a conversation on the 80m band in which this subject was discussed in detail, G5UG was kind enough to volunteer to undertake the necessary work and forward the details for the benefit of BULLETIN readers.

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Triode Mixer Operation

A balanced double triode modulator/mixer was selected as representing the classical and most widely used method of frequency conversion. The primary purpose of the experiments was to determine the limits of amplitude for the oscillator input for most favourable mixing in terms of (i) input volts/output volts linearity and (ii) levels of unwanted

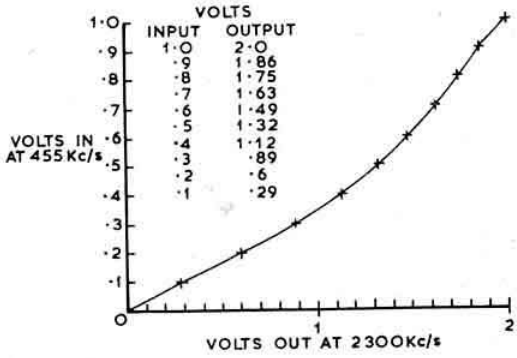

Fig. 1. 12AT7 mixer with oscillator input of 5 volts and no grid current.

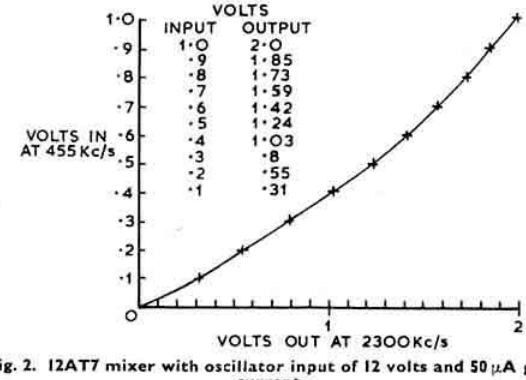

Fig. 2. 12AT7 mixer with oscillator input of 12 volts and 50 μA grid current.

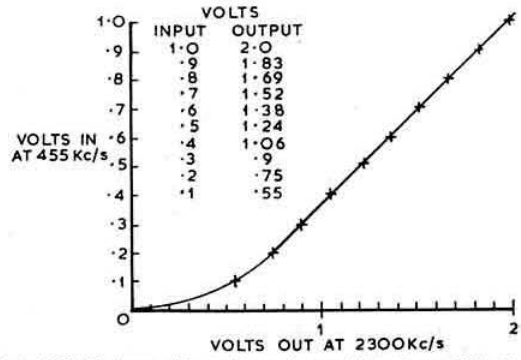

Fig. 3. 12AT7 mixer with oscillator input of 15 volts and 100 μA grid current.

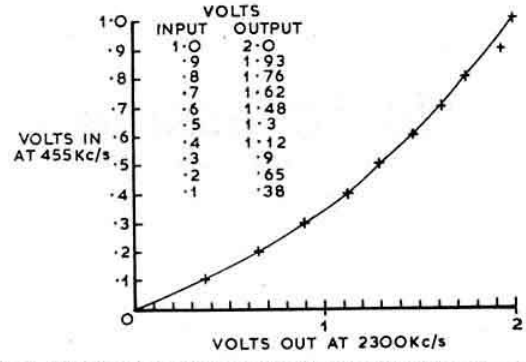

Fig. 4. 12AU7 mixer with oscillator input of 8 volts and no grid current.

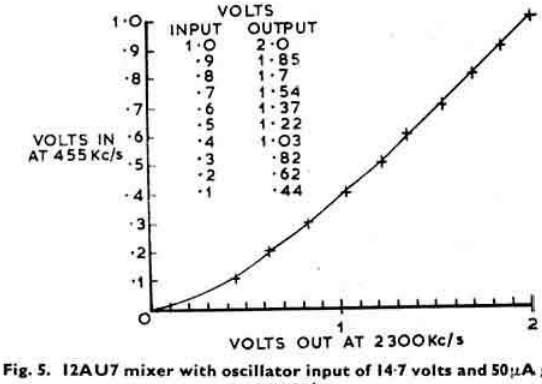

Fig. 5. 12AU7 mixer with oscillator input of 14·7 volts and 50 μA grid current.

products in a standard double triode push-pull mixer circuit. The circuit used is shown in Fig. 6.

Five characteristic curves were plotted—three for the 12AT7 valve and two for the 12AU7. These are shown in Figs. 1 to 5.

From these it is clear that best mixer linearity is obtained when the stage is driven into grid current by the oscillator output. The improvement in linearity by maintaining grid current is significant in both the 12AT7 and the 12AU7, and a noticeably greater conversion conductance is also obtained.

In the grid-current condition, however, measurements showed that third order products were in the output, and were in some cases as much as 20db greater than in the no grid current condition. On the other hand, harmonics of the two input frequencies tended to decrease slightly in the grid current condition by 5 to 10db.

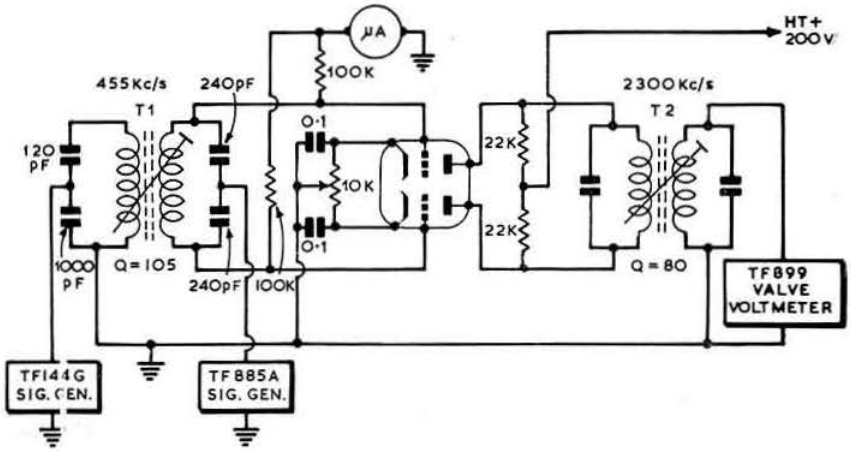

Fig. 6. Circuit of the test unit used to obtain the characteristic curves shown in Figs. 1-5, together with the signal and heterodyning sources and the output measuring instrument. T1 and T2 are individually screened transformers resonant at the required frequencies.

G5UG also comments that, prior to making the measurements, and verified later, it was noted that the intensity of harmonic outputs was critically dependent on the balance of the mixer valve. No precise measurements were taken, nor did time permit any more further balancing adjustments than the circuit as shown would allow. It is thought that capacitance balancing of both input and output circuits might pay dividends in reducing harmonics still further.

The writer feels that it would be most interesting to take these curves a stage further and investigate the 12AT7 and 12AU7 characteristics under different cathode bias conditions—also to determine the overload or saturation point—and to investigate further why the conversion conductance is so remarkably constant between two valves with such dissimilar static characteristics.

Mobile Column

By E. ARNOLD MATTHEWS, G3FZW *

There have been surprisingly few reports of mobile activity this month, and the only mobile rally of which we have any details was a venture by the Harlow and District Radio Society.

Magdalen Laver's isolated village hall, out in the country adjoining Harlow, was, on September 27, the scene of the Harlow and District's annual Mobile Rally, where over 600 people gathered. Of 180 cars which arrived, 60 were equipped for two-way radio communication, and at times mobiles were " queuing " to make contact with the rally station, G3PRN/M, operated by Leslie Cox, Basil Chambers and Robert Frost, G3SZF, the youngest member of the society.

Over 50 prizes were donated by the trade, and these were presented to the winners of the various competitions by the society's President, T. A. Johnston, G6UT.

Cossor Electronics Ltd., of Harlow, made a substantial contribution to the success of the event by demonstrating for the first time in this country a transistorized Raytheon transmitter-receiver.

From the rally's proceeds, the RAIBC will benefit financially by a substantial donation.

Operating Notes

G2ANX/M (East Molesey) has built a very neat variometer into the base loading coil of his aerial, which overcomes the difficulty of making tuning adjustments if the unit is mounted inside the car boot, for closing the boot cover upsets the capacitance. The variometer coil consists of 25 turns on a ¾ in. diam. former. A strip of presspahn is cemented round the coil and pivot rods are passed through the 2 in. diam. loading coil former and cemented to the presspahn. A knob, ½ in. diam., was fixed to one pivot for adjustment, thus making an extremely neat and efficient unit. He uses a home-built four band (long and medium broadcast bands, plus 1·8 and 3·5 Mc/s) receiver and a 6 watt a.m. transmitter. Sixty-mile QSOs on 1·8 Mc/s are regularly made, and GM has been worked.

G3KVH/M (Stourbridge) runs an NCX-3 transceiver, and is hoping to achieve the " ne plus ultra " of a /M to /M with a ZL. **G3FZW/M** continues to work 3·5 Mc/s travelling to and from work. His best /M to /M so far was with DL3BJ/M who was using a Heathkit HW12 and a Master Mobile aerial.

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Sounds from Outer Space

During August and early September, the United States successfully launched an Orbiting Geophysical Observatory (OGA-A), an Ionospheric Research Satellite (TOPSI), a SYNCOM Communication Satellite and a NIMBUS Weather Satellite. Each of these satellites contained advanced communication or telemetry equipment, and provided additional sounds from outer space for listeners to tune in on the 136 Mc/s Space Band.

Name	*Frequency*	*Purpose*
OGO-A	136·20 Mc/s	Beacon
	400·25 Mc/s	Command Telemetry
TOPSI	136·35 Mc/s	Command
	136·68 Mc/s	Tracking
NIMBUS	136·95 Mc/s	Auto Picture Transmissions
	136·498 Mc/s	Command Telemetry
SYNCOM 3	136·98 Mc/s	Beacon
	136·47 Mc/s	Command

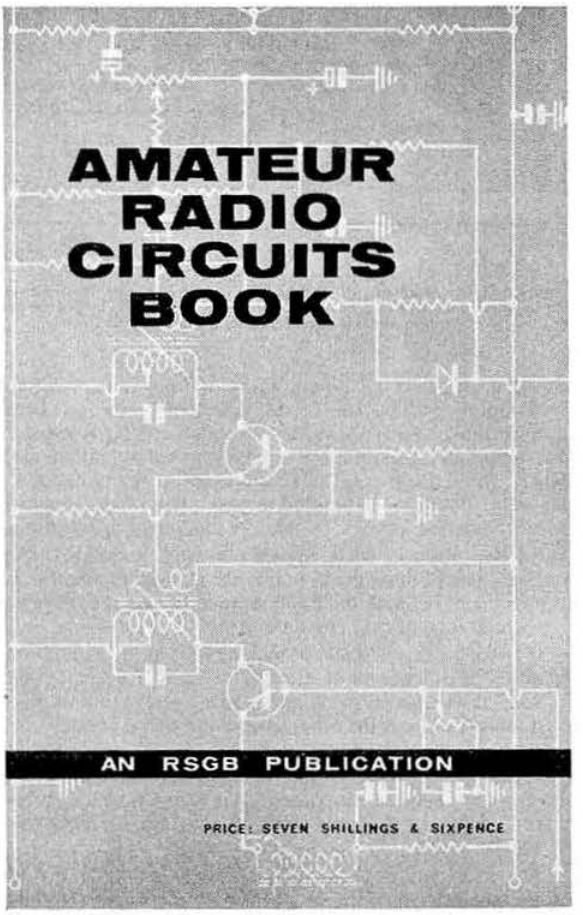
Radio Terminology Simplified

By ALEC D. VANCE

AT this time of year, an easily understood glossary of the more uncommonly used terms seems appropriate. The list which follows should not be regarded as exhaustive but merely exhausting.

TRANSMITTER	That which lets forth—XYL.
RECEIVER	That which takes in—OM.
SELECTIVITY	Ability to reject unwanted transmissions.
IF	A partial promise.
SWITCH	A change of tack.
LOUDSPEAKER	Horsey Mother-in-Law.
PICK-UP	Someone to play records with.
WOW	A good pick-up.
RUMBLE	Uncontrolled interruption.
FLUTTER	Caused by a loose pick-up.
YL	A better person to play records with.
XYL	Heard them all. Now plays her own.
RESISTOR	Never!
CONDENSER	Corsetiere's objective.
CHASSIS	Something to contemplate. Model 392635
COMPUTER	A calculating chassis.
PROGRAMME	Predetermined progression of a computer.
METER	Depends on the chassis.
VERT. HOLD	Preliminary skirmish.
HORIZ. HOLD	Censored.
TRANSFORMER	Misnomer. Should be Transformyou.
OHM	Where transmitters and receivers live.
CURRENT	Found in an ohm.
QTH	Source of harmonics.
HARMONICS	Things which are difficult to control.
CUT	The bit the censor wanted.
C.W.	A dashed load of dots.
KEY	A pump which produces c.w.
KEYER	A key which errs.
CQ	Come Quickly—I'm lonely.
TEST	A shy alternative to CQ.
" S " UNITS	" S " denotes suspicious.
QSL	A sort of paper chase.
HANDLE	Pots have names—people handles.
NUT	The other fellow.
HAM	Invariably worthy of the name.
LID	Hamier than ham.
SURPLUS	Cheap in theory—expensive in practice.
EARPHONE	Opposite to Therephone.
MICROPHONE	A 10^{-6} phone.
WOOFER	A very large dog.
TWEETER	A dickey bird.
BASS	A fresh water fish.
TUNER	A salt water fish.
VOLT	A gymnastic exercise.
KILOVOLT	A fatal gymnastic exercise.
DB	Dog biscuit. Usually variable in size.
A.F.	Initials of Albert Freek, discoverer of sound.
R.F.	Rossalinda, Albert's three legged sister.
GAIN	A dirty capitalistic word.
TOP CUT	See Yul Brynner.
S.S.B.	A primeval monkey-like noise.
A.M.	To honour Alfred Muchtoo who swallowed his mike.
DX	That which can turn a hobby into an obsession.
RECTIFIER	Upon which a recti is burnt.
FUSE	Prevents a rectifier.
INSULATOR	An electrical chaperon.
CONDUCTOR	An ohmless lead.
HUM	A bug that lives in grids.
VOLUME	Measured in jars or jugs.
INSTABILITY	Sometimes noted at excessive volume levels.
SOCKET	Nothing surrounded.
PLUG	A stop gap.
BOLT	A hasty retreat.
V.F.O.	Very Funny Oscillator.
OSCILLATOR	Stationary movement.
CIRCUIT	Explosive when short. See Bolt.
OM	Nominally Old Man, but rarely is.
OB	Flattery will get you nowhere.
OT	A rare source of wisdom.
L.W.	A protracted farewell.
M.W.	The usual farewell.
S.W.	A quick farewell.
MICROWAVE	Two bugs saying bye-bye.

To be published October 28



Available from the Society's stand at the RSGB International Radio Communications Exhibition, or by post, price 8/6, from

RSGB PUBLICATIONS

28 Little Russell Street, London W.C.1.

An Effective Noise Limiter

By J. G. SEAL, VQ2JG*

OF all the improvements that can be made to receivers, the inclusion of a noise limiter is one of the most attractive from the point of view of comfortable listening. For this reason, I decided to include a limiter in my CR100/7 for a.m. reception.

The circuit adopted (Fig. 1) is basically a series connected positive and negative peak clipper, controlled by the rectified d.c. voltage across the signal diode load. The modulation level at which clipping occurs depends on the setting of the 160 K ohms variable resistor VR1. With this in its maximum

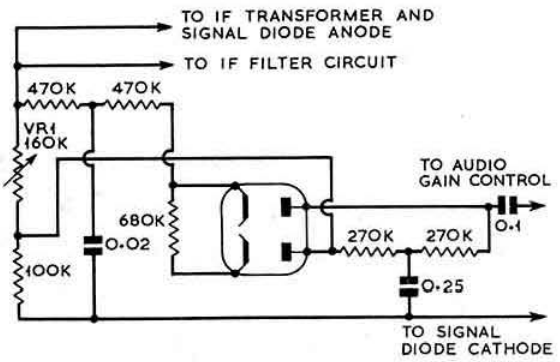


Fig. 1. Circuit diagram of an effective noise limiter. The connections should be dressed to avoid hum pick-up and the lead to the a.f. gain control should be in screened cable.

position all peaks corresponding to 100 per cent or greater modulation will be sliced. In this respect the limiter is conventional. When, however, the value of VR1 is reduced, the clipper becomes effective at lower modulation levels, and when the variable resistor is effectively a short-circuit, no signal whatsoever is permitted to pass. This ability to clip at low modulation levels is of value in the following situations:

(a) Reception of weak signals not fully modulated. The amplitude of noise peaks which are allowed to pass can be effectively reduced to the amplitude of the speech peaks without introducing any distortion.

(b) Reception of weak signals blanketed by continuous noise. The noise automatically increases the rectified d.c. voltage and hence the clipping level. Reduction of VR1, however, reduces the noise level to the signal peaks.

(c) Estimation of modulation depth. An undermodulated signal allows VR1 to be reduced considerably before distortion becomes noticeable. Turning VR1 by a further rotation of 20°, however, noticeably distorts the modulated signal.

The double-diode originally employed was a 6H6, but any other type with separate cathodes and a good heater-cathode insulation should prove to be equally satisfactory. The component values were chosen to give balanced clipping of positive and negative peaks, and the circuit constants also provide a slight bass boost to counter the tendency to shrillness often encountered when clipping speech peaks. The filter capacitors are considered to be optimum, greater values being undesirable as the larger time-constants cannot follow rapid fading.

The limiter seems to be superior to conventional types in practice, this having been particularly evident when comparison tests were made. Copy that was undecipherable with normal types exhibited reasonably good readability when the signals were fed through the prototype.

* *P.B.E.I., Lusaka, Northern Rhodesia.*

Delivery of the RSGB Bulletin

From time to time complaints are received from members that their copy of the RSGB BULLETIN has arrived late.

The BULLETIN is now published on the first Wednesday in each month, posting of copies to all members taking place on the previous day and copies should be delivered to addresses in the United Kingdom within 48 hours. Members whose copies regularly arrive late are asked to mark the wrapper with the date and time of delivery and return it to Headquarters so that the matter may be taken up with the Post Office.

Correction

On page 581 of the September issue of the BULLETIN the call-sign in the caption to the photograph at the foot of the right hand column should have read G8SC.

Progressing Through Amateur Radio

(Continued from page 722)

[3] Grimsehl. " A Textbook of Physics, Vol. III. Electricity and Magnetism." Chapter I. Blackie.
[4] G. W. A. Drummer. " Fixed Resistors." Pitman.
[5] S. W. Amos. " Principles of Transistor Circuits." Chapter I. Iliffe.
[6] R. L. Riddle, and M. P. Ristenbatt. " Transistor Physics & Circuits " Early Chapters. Prentice Hall.
[7] See for example: " Wireless World " November, 1963, page 530 for a use of a thermistor, to stabilise the circuit of an a.f. oscillator.
[8] Abbot. " Teach Yourself Algebra." E.U.P. Ltd.
[9] Abbot. " Teach Yourself Calculus." E.U.P. Ltd.

GB2RS SCHEDULE

RSGB 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
	10.15 a.m.	Belfast
	10.30 a.m.	North Midlands
	11 a.m.	North West England
	11.30 a.m.	South West Scotland
	12 noon	North East Scotland
145·10 Mc/s	9.30 a.m.	Beaming north from London
	10.00 a.m.	Beaming west from London
145·8 Mc/s	10.15 a.m.	Beaming south from Belfast
145·30 Mc/s	10.30 a.m.	Beaming north west from Sutton Coldfield
	11.00 a.m.	Beaming south west from Sutton Coldfield
145·50 Mc/s	11.30 a.m.	Beaming north from Leeds
	12 noon	Beaming east from Leeds

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.

THE MONTH ON THE AIR

A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

By R. F. STEVENS, G2BVN *

THE letter from G3SJQ in the October issue of the BULLETIN in connection with band occupancy during contests finds ready agreement by the writer. Whilst being the first to admit that there is room for a number of diverse interests all coming under the heading of amateur radio, one has been appalled by the constant QRM on the h.f. communication bands during recent weekends, and it is not unusual to find contests in progress in both the c.w. and phone sections. To reach the peak of unpopularity one has only to make a QSO with a station that is wanted by the contest participants, but who is in fact not taking part in the affair. Then the Jaguar type complex really rears its voice! Surely the answer is fewer contests, restricted, as G3SJQ recommends, to subsections of the bands, and also something less in period than a 48 hour endurance test.

A plea from **9M4LX** (alias VS9MG and ZC5AJ, etc.) asks for short wave listener reports that really convey some useful information to the recipient. Many SWLs send very good and comprehensive reports but others often despatch missives of the "I heard you at 3 p.m." variety. 9M4LX will be pleased to QSL worthwhile reports and indeed feels that it is his duty to do so. Bob also asks for the observance of GMT in reports, and this, of course, applies equally to QSLs. When a station is very active and making many QSOs the use of GMT will avoid much log searching and annoyance.

News from Overseas

Further to the comments on the **Cyprus** situation appearing last month, the Sovereign Base Stations have been heard in full cry on the bands, and are operating with the permission of the authorities concerned, but communication with Cyprus stations outside the SBA (in the event that they have not had their equipment impounded) is expressly forbidden. The following stations are still active: ZC4s **CZ, GT** and **SS** (Famagusta); **GY** (Dhekelia); **KW** and **PC** (Pergamos); **HK** and **RA** (Heraklis); **CL, TJ** and **TX** (Episkopi); **AK** (Akrotiri) and **MO** (Troodos). The only two stations operating on s.s.b. are ZC4s CZ and GT. ZC4GT queries the possibility of separate country status for the SBA, but this is felt to be unlikely in the present uncertain situation. (Tks ZC4CZ).

MP4TBJ is the Trucial Oman call of MP4QBF, Don Aveling, who also may be heard as MP4DAL (Das Island), MP4MAU (Muscat and Oman) and MP4BFD (Bahrain). Main activity during the coming months will be from Trucial Oman with at least one trip to Muscat and Oman. There has been a very poor return on QSLs despatched and the future policy will be to QSL only upon receipt. The address for direct QSLs is to be found in *QTH Corner*, but despatch via the Bureau is preferred. (Tks G3PSY).

VE3WSB, the HQ station of the Boy Scouts World Bureau in Ottawa, will maintain a regular operating schedule of 17.30 to 19.00 daily on 14,130 or 14,310 kc/s, except on Saturdays when the activity will be on 7,150 kc/s for about one hour from 01.00, and on 14 or 21 Mc/s between 14.00 and 17.00.

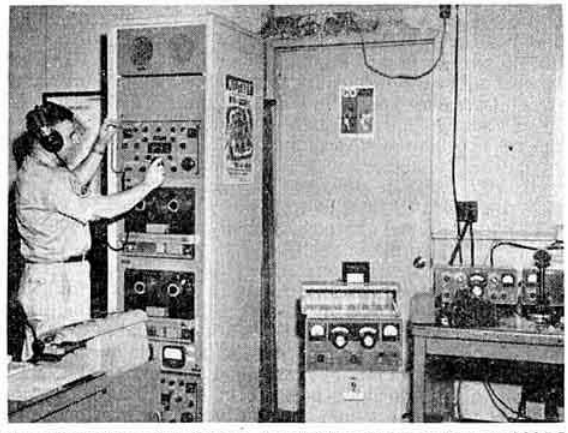
Costa Rica and the **USA** have exchanged notes, effective September 19, allowing reciprocal operating by amateurs of the two countries, the first such agreement under the provisions of the new law. At the present time negotiations are in progress between the USA and several other countries.

5H3HZ will be closing down in November and returning to the UK in January upon completion of two tours of service with the Tanganyika Government, and, as an active DX'er, he will be missed. His home call will be G3APX. (Tks G3PSY).

VK4SS passes along these snippets on activity in the Pacific area:

KS6AN, Pago Pago, active each day on c.w. from 04.00 onwards, will be there for some time yet. **VR4CM** is to be heard regularly using s.s.b. and **VR4ED** tries 14 Mc/s c.w. from 06.00 with a further try for Europe around 19.00. **VK9CJ** (Port Moresby) also favours c.w. and contacts Europe around 11.00. **FK8BC,** Henri, is on 7 and 14 Mc/s c.w. from 06.00 onwards and sometimes works FB8WW around this time. **FU8AA** prefers frequencies around 14,045 kc/s and may usually be heard at weekends.

5N2JKO, editor of the Nigerian Amateur Radio Society newsletter, and probably the most active of the 5N2 DX'ers, left for Thailand on a business trip on October 11 which will last for six weeks. Having recently been loaned a KW2000,



Sgt. George Ruppert, KZ5AA, the chief operator at the new MARS station, United States Army Forces Southern Command at Fort Clayton, Canal Zone, adjusting an incoming signal at the station recording console. The console is fitted with two recorders, which are capable of being operated from any studio. To the right can be seen the Collins-equipped operating position.

* Please send all items to RSGB Headquarters to arrive not later than November 18 for the December issue and December 11 for the January issue.

QTH Corner

EA9EO	via EA4GZ, Alcalde Sainz de Baranda 25, Madrid 9, Spain.
FK8BB	P. Waneque, BP 104, Noumea, New Caledonia.
FP8CA	via K2OJD, 43 Oak Avenue, Irvington, New Jersey, USA.
HL9KE	via K4EKI, 703 Irvin Street, Athens, Alabama, USA.
HM1AX	via WB6GVV, D. Nichols, 1460 S. Crest Drive, Los Angeles 35, USA.
K1QHP/FL	S/Sgt. A. Kemmesies, Opns. Co. 4th USASAFS, Box 302, APO 843, New York, USA.
KG6IF	H. A. Train, Jr., RM1 USCG, Lorstat, APO 315, San Francisco, Calif., USA.
MP4QBF	D. Aveling, Box 300, Abu Dhabi, Trucial Oman, Persian Gulf.
MP4MAH	C. A. Thomas, P.D.(O) Ltd., Azaiba, PO Box 81, Muscat, Persian Gulf.
OR4VN	via ON4VN, H. Vandevelde, 11 Rue des Moutons, Uccle, Belgium.
VK9RB	R. Hattersley, Box 24, Norfolk Island.
VP2KD	via VE3ACD, M. J. Wolfson, 305 Rosemary Rd., Toronto 10, Canada.
VQ2DB	N. Jackson, Box 38, Mongu, N. Rhodesia.
ZB2AI	via GW3SWK (home call).
ZD8BB	via W7ZMD, 1931 W. Whitton Avenue, Phoenix 15, Arizona, USA.
ZD9RB	via ZS6SI, Box 215, Kempton Park, Transvaal, S. Africa.
4W1D	via W2CTN.
4W1E	via HB9ZN, Leimbachstr. 36, Zurich 41, Switzerland.
6W8BF	C. Tenot, BP 971, Dakar, Senegal.
5N2BRH	B. R. Holifield, PO Box 17, Ikeja, Nigeria.
7Q7GN	Box 700, Blantyre, Malawi.
7Z3AB	Box 2486, Dhahran, Saudi Arabia.
9Q5OO	Box 949, Jadotville, Congo.

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RSGB QSL Bureau: G2MI, Bromley, Kent.

Mike feels that this is a badly timed journey, for the owner, **5N2RJO**, is on leave until mid January 1965.

The **S.E.Asia Net** (SEAnet) meets daily at 12.00 on 14,320 kc/s and participation from UK stations is welcomed. The countries to be heard on the SEAnet include: HS1, KG6, VS6, VS5, XW8, 4S7, 9M4 and 9N1.

The district in which **Austrian** stations are located may be identified by the number following the prefix, e.g., **1,** Vienna; **2,** Salzburg; **3,** Lower Austria; **4,** Burgenland; **5,** Upper Austria; **6,** Styria; **7,** Tyrol; **8,** Carinthia and **9,** Voralberg.

Top Band News

The **Annual 160m Transatlantic and Worldwide DX Tests** will continue a yearly operating activity established in 1932 and held every year since that date, excepting, of course, during the war years. For the 1964/65 season the Tests will be held on the following Sunday mornings between 05.00 and 07.30: **December** 6 and 20; **January** 3 and 17; **February** 7 and 21. USA and Canadian stations should CQ DX Test during the first five minutes of the hour, and then the third, fifth, etc., periods. DX stations will call during the second, fourth, sixth, etc., 5 minute periods. The operating frequencies are: east coast W/VE, 1800 to 1825 kc/s; west coast W 1975 to 2000 kc/s; Europe 1825 to 1830 mostly; ZL 1875 to 1900; VK 1800 to 1860, with JAs on 1880 kc/s.

During the International Quiet Sun Year, propagation conditions on 160m are expected to be at their best for many years. Operators are alerted to the possibility of unusual openings at sunset or sunrise times at either end of the transmission path. Signals peak when the path is in darkness and the end of the path is at or near twilight or sunrise. These are Tests. not contests, for pleasure in an unusual operating activity with competition, and to develop some propagation information as a worthwhile contribution to the art of radio.

UK stations should send their reports to G6QB at 49 Winchelsea Lane, Hastings, Sussex, and your scribe will be pleased to have log extracts for the activity mornings. (Tks W1BB).

DXpeditions

The trip to **Rodriguez** by **VQ8AM** and **VQ8BS** is all set to go and operation on c.w., a.m. and s.s.b. is assured. The ship leaves Mauritius on or about November 14 and the operators hope to be on the air on the day of arrival, November 16. Through the co-operation of W2GHK a generator has been obtained, and it is intended to use vertical aerials. The Hammarlund DXpedition of The Month will provide the QSLs and Box 7388 will act as the QSL Bureau. It is intended to stay on Rodriguez for eight to ten days, and both VQ8BS and VQ8AM have given up their annual leave to make the trip. It is hoped that good propagation conditions will bring their just reward.

San Marino will be the target of DL9LJ and DJ6RN for a stay between November 1 and 11 when concentrated activity may be expected. QSLs should be directed to DL1CF.

Continuing his travels, **DJ4EK** expects to operate from **YK** and **YI** with a return to TA during the middle part of November. DL3RK is the source of QSLs.

Much wanted **Easter Island** will be the destination of **W4QVJ** and **W6UF** commencing on December 1. Operation on 3·5, 7, 14 and 21 Mc/s is planned, and QSLs should go to the home QTH of W4QVJ (Tks W5IGJ).

W9WNV/XU ceased operation on October 7 and planned to reappear from Vietnam within a few days. Don was active consistently on 14,020 and 14,110 kc/s and his operating was a pleasure to hear. QSLs should go to K6EVR, but note that the QTH in all but the latest *Call Book* no longer holds. The correct address will be found in *QTH Corner* for October.

GC3JAG/P favoured 7 Mc/s c.w. during a ten day stay on **Guernsey** at the beginning of October. The portable equipment comprised a low powered (eight watts) crystal controlled transmitter with a four valve receiver, and this was located inside a small tent. The ground plane was supported by a 33 ft. " mast " built from greenhouse spars and using borrowed marquee ropes as guys. 161 QSOs were made, the contact with ZL4JF on Campbell Island being the best DX, although at least six VK stations made the grade, together with YV5, KL7, W6 and 5A1. GC3MLR and GC3HFE provided great hospitality and the holiday was undoubtedly a success, although a note has been made that next time 50 or so watts will materially improve results.

Band Activities

Initial reaction to the new form of presentation has, without exception, been favourable. However, with only a three week period between this and the last closing date for copy not many readers have yet expressed their views. The following survey also reflects the shorter period covered and, in fact, no noteworthy reports have been received on either 1·8 or 3·5 Mc/s operation.

It is hoped that with five weeks between now and the next closing date for copy contributors will report in force and enable a comprehensive picture of band conditions to be drawn up for the December BULLETIN.

For reporting the following thanks are due to: G3AAE, G3HCT, G3HDA, G3OAD, G3RKH, G8JM, GM3ITN, BRS20317, BRS26070, A1798, A2498, A3699, A4068, A4110 and A4177.

7 Mc/s C.W.: CR6AI (19.15), FP8CK (19.30), HK2GO (22.40), HK3RQ (06.15), KC4USK (22.40), KH6AFS (06.10), KL7PI (06.30), MP4BEQ (22.00), MP4QBF/MP4T (19.15), OR4VN (06.10), OX3RP (22.20), TI2CMF (06.15), UA1KED Franz Joseph Land (07.20), VK5NO (19.30), VK5ZP (18.00), VK9RB Norfolk Is. (06.50), VP7BG (06.15), VQ2DT (19.30), ZL2AFZ, ZL2GS, ZL3AAP (06.20), ZL4JF Campbell Is. (06.30), 6W8AJ (06.25) and 9M2LO (18.00).

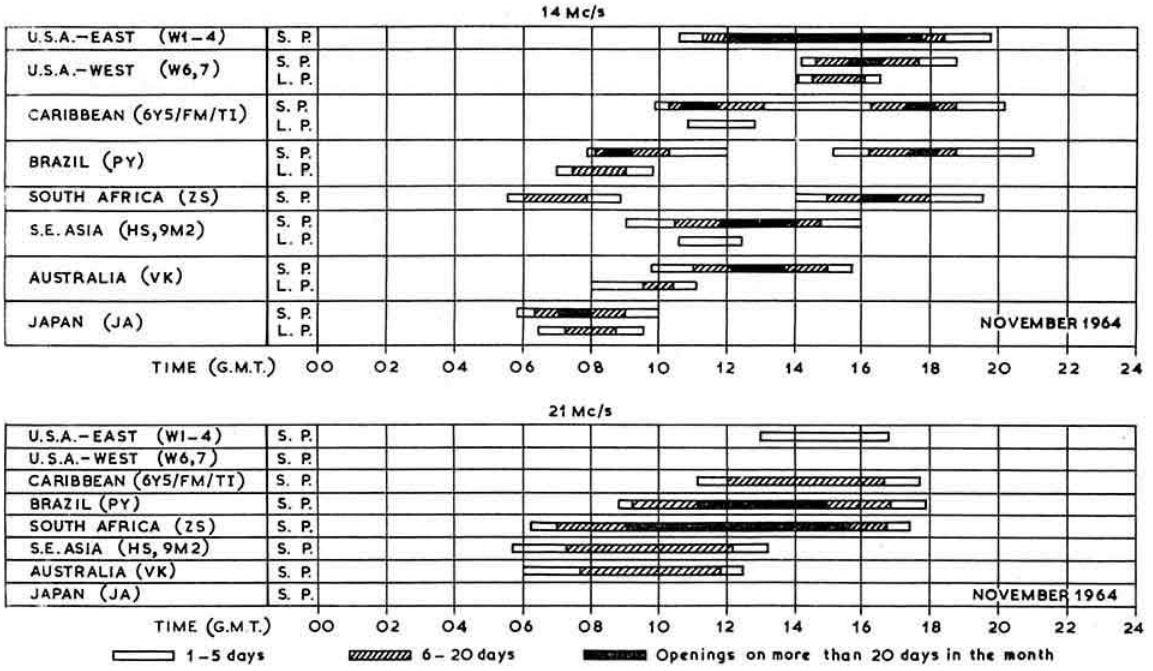
14 Mc/s C.W.: AP5HQ (17.05), AP5SS (13.40), BV1USA (12.45), BY1PA (14.25), BY1PK (12.05), DU6TY (12.25), ET3USA (17.30), FG7XQ, FP8CA (15.25), FP8CK (14.15),

FU8AG (10.40), FY7YJ (20.35), HM1AX (13.20), HS1K (13.10), JT1KAA (08.55), KC4USK (19.10), KC6BK (12.15), KG4AM (21.30), KR6FG (12.40), LU1ZC Deception Is. (19.40), MP4QBF/MP4T (19.15), OR4VN (16.15-19.00), SU1IM (17.50), TA2BK (17.30), TN8AF (19.15), UA1KED Franz Josef Land (12.20), VK9GC New Guinea (13.25) VK9RB Norfolk Is. (08.35-10.45), VP1TA (22.10), VP4TR, VP6BW (21.30), VP7NY, VP8HJ Falkland Is. (21.00), VP8HK Grahamland (20.35), VP8HU Grahamland (19.40), VQ8AM (16.15), VR2DK (08.45), VR2DT, VS6FC (13.15), VS9OC (13.20), W9WNV/XU (13.00-15.30), XW8AL (12.15), ZD3A (20.00), ZD8BB (18.45), ZS3EW (18.50), 5H3HZ (19.05), 5H3KB (17.35), 5R8AB (17.30), 5R8AN, 6O6BW (19.00), 6Y5XG (19.35), 7Q7GB (18.15), 7Q7RM (19.00) and 9M4JY (14.50).

14 Mc/s S.S.B.: AP2AD, CE1DD, CE1FX, (18.30), CP1BJ (18.50), CR9AH, CX4AW (19.55), FH8CD, FP8CA, HC8FN (21.00), HI8AK (19.45), HL9KE, HL9KH (09.15), HP1SH, HS1I, HV1CN (21.05), KB6CS, KB6EPN (07.50), KC4USN, KG4AM (22.50), KG6SB Saipan Is. (08.15), KM6BI (08.45), KR6DI (11.50), KB6CP/KS6 (06.55), KW6CV (08.30), KW6DS (08.30), KX6DC (08.20), KX6DO (08.45), M1FT (15.15), OA5AO (20.20), OD5AX (20.40), PJ2CR (21.15), PZ1BW (19.30), VE1AGR/SU (14.10), TU2AU (17.05), VK9RB (08.30), VP2KD, KJ, KM (19.10-21.30), VQ8BS (16.10), VR2ES, VS6AJ (14.35), VS9MG (16.10), W9WNV/XU (13.00-15.30), XW8AL, YN1LH (12.35), YV8AS (20.15), ZB2B (09.10), ZL1ABZ Kermadec Is. (08.10), ZS2MI Marion Is. (17.00), 5H3JJ (19.55), 5T5AD, 5X5IU (19.05), 6O6BW (20.10), 6Y5MJ, 7Q7PBD (17.50), 9K2AM (19.30), 9L1HX (07.35), 9L1JR (18.15), 9N1MM (14.50), 9M4ME (16.30) and 9X5GG (18.05).

21 Mc/s A.M.: CR6GB (19.00), CR7CK (17.15), KV4CX (13.00 and 19.30), TN8AA, TN8AD (18.15), TN8AG (18.15),

PROPAGATION PREDICTIONS



The autumn peak in the seasonal variation of the quality of DX on the h.f. bands will be maintained during November, although 28 Mc/s will remain of little use for DX traffic. At the present time exceptional conditions should produce contacts with Africa between about 13.00 and 15.30 GMT. Short skip conditions will occur only occasionally on 28 Mc/s as well as on 21 Mc/s, though the possibilities for European contacts on these bands by auroral reflection will not be prejudiced. South America and Africa should continue to come through on 21 Mc/s, but Western N. America and Japan are unlikely to be heard. 14 Mc/s will be the main band for DX during daylight, and in contrast to 21 Mc/s, all continents should be workable. Because of the shorter winter days, the band will close at about 19.00 GMT for DX, although in some cases the band may remain open a little longer to Africa and South America. In contrast to the months of March and September, with day and night of equal duration, the midwinter months should, under favourable conditions, produce contacts via the long path with many countries. This type of contact is possible especially on 14 Mc/s at the present phase of the sunspot cycle and takes place when the great circle through both stations lies approximately in the twilight zone, the boundary between day and night. Especially favourable are South America and East Asia in the morning and Western North America in the afternoon. Between about 16.40 and 17.20 GMT on 14 Mc/s KH6 should be workable via the short path when conditions are favourable, and between 05.50 and 07.15 via the long path. 7 Mc/s will become the main DX band after 19.00 GMT, and at about 19.30 GMT the East Coast of the USA should come through, but a too low m.u.f. will frequently interrupt North American traffic in the latter half of the night. South America should be workable throughout the night, though with difficulty owing to the QRM. On 3·5 Mc/s the winter DX conditions (as described in October) should remain substantially the same. In the latter half of the night, and sometimes earlier, local traffic outside the ground wave area will frequently be interrupted by the dead zone.

The provisional sunspot number for September 1964 was 4·4 with the period of greatest activity lying between September 7 and 14. Between September 15 and 29 the sunspot number was zero. The predicted figure for December, January and February is 7.

TU2AJ (17.50), VQ2BC (17.55), ZD3A (18.40), 5H3JI (16.55), 5X5AU (19.00), 5X5JK (18.35), 7X2SQ (18.10), 9G1FF (17.35) and 9L1WN (19.00).

21 Mc/s C.W.: CR7IZ (10.30), CR9AH (09.00), FB8XX (10.30), HI8WSI (15.10), JAs (08.00-09.00), OR4VN (10.30), UI8AI (09.10), W9WNV/XU (10.55) and YA4A (08.10).

21 Mc/s S.S.B.: CR9AH, (09.50), OA7Z (20.40), ZS6AD (17.35), 6O1KH (11.35), 6O6BW (18.25), and 7Q7PBD (18.30).

28 Mc/s A.M.: CR4AD (18.15), CX1AAM (21.00), LU1CS (17.40), PY1AKD (18.15), 6W8AE (18.50), 9G1DM (18.10) and 9L1HX (18.30).

There is obviously more on 14 Mc/s than all the other bands put together, but next month should show a considerable increase in the amount of DX reported on 21 Mc/s, while 7 Mc/s should continue at about the same level as now.

Please try to arrange your reports in alphabetical and numerical order, with times in GMT.

Contests and Awards

Owing to the early appearance of this issue, there is little to report and the two headings have been combined.

In so far as contests are concerned the writer has already had his say but hastens to add that this column will continue to fully report all contest activities. The only item to hand is the result of the **1964 French Contest** which lists **G3EYN** as UK leader in the c.w. section with 13,851 points, followed by **G8TS** with 4168 points. In the phone section **G3MCA** registered 264 points.

In connection with the **Century Club Award** of the **RAFARS**, lists of members are available by sending a s.a.e. to the Secretary, RAFARS, Royal Air Force, Locking, Weston-super-Mare, Somerset.

In response to enquiries the terms of the **5N2 Award** are as follows:

It may be claimed by stations who have contacted five Nigerian amateurs since January 1, 1961, using at least Two bands. There is no restriction on mode and QSL cards need not be sent but a check list giving full details of the contacts is required. The Award is also issued to short wave listeners who must enclose the five QSL cards with their application. Applications, accompanied by five IRC or a British Postal Order for 2/6d., should be sent to Dr M. Dransfield, 5N2JKO, Regional Research Station, PMB 1044, Zaria, Nigeria.

With the co-operation of W1WY the information in *Contests Diary** this month shows the dates of the major events in the first part of 1965. Looking at the rival attractions one is struck by the lack of international co-operation in the arranging of dates.

DX Briefs

OR4VN is active around 14,080/090 kc/s from Antarctica and asks for QSLs via ON4VN (see *QTH Corner*). He promises replies during 1965. (Tks G3PSY).

YV5BTK who is readily workable around 06.00/07.00 on 7 Mc/s requests QSLs via Box 2285, Caracas. (Tks G3PSY).

ZS6JFS is the Zoo Lake Festival station in Johannesburg and has been very active on 14 and 21 Mc/s in giving QSOs to count for the Festival Award.

OH3NY promises to be active on Top Band during the coming season, saying that few Finnish stations will be heard on 1·8 Mc/s.

The FCC **Banned List** reads: XU, PK, 3W8 and HS. The net effect on UK stations is that cards from these areas submitted for DXCC will not be allowed. The recent operation by W9WNV/XU was, however, permitted.

The **Swiss Short Wave Service** will be broadcasting details of relative sunspot numbers on 7, 110 and 9664 kc/s at 12.55 on the following dates: November 7, December 5, January 9, February 6 and March 6.

ZD3A runs 25 watts to a dipole running East-West, but will be going on UK leave in the near future. A comment on the ZD3 weather is that 60 inches of rain have fallen during four months' continual downpour. Hardly the best treatment for radio equipment. (Tks GW3FEJ).

ZD8BB has been heard on the low end of 14 Mc/s dispensing c.w. contacts around 21.00, whilst **ZD9RB** (Gough Is.) is usually active on Sundays between 13.00 and 17.00.

A note in the *DX'press* from OE1ME states that ARRL will allow *phone* contacts with FB8WW below 21,000 kc/s to count for DXCC. Readers will remember the outcry when W0MLY operated s.s.b. below 14,100 kc/s during his African DXpedition.

VK9NT (New Guinea) has been active on 14 Mc/s s.s.b. recently, mainly on Sunday mornings (GMT) and with good signals peaking around 11.00. QSL requests should be directed to W2CTN.

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Correspondents are thanked for their co-operation and acknowledgement is made to the West Gulf DX Club *Bulletin* (W5IGJ), the LIDXA *Bulletin* (W2FGD/W2MES), *DX'press* (PA0FX), The Florida DX Club *Report* (W4HKJ) and *The DX'er*. Please send all items to RSGB Headquarters to arrive not later than November 18 for the December issue and December 11 for the January issue.

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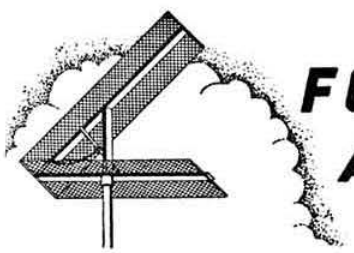
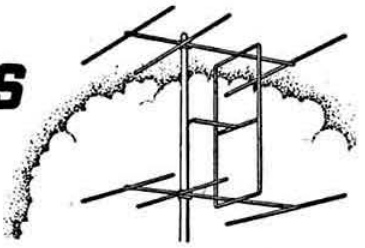


FOUR METRES AND DOWN



By F. G. LAMBETH, G2AIW*

SOME observations on the performance of parametric amplifiers as opposed to conventional circuit arrangements have been made by **G3LLJ**, *Newcastle, Staffs.* Using a parametric amplifier, G3LLJ has been able to receive the BBC 2 signals on 570 Mc/s over a 140-mile path under conditions where the signal was, to all intents and purposes, " missing " using conventional circuitry. There seems very little doubt that this configuration has much to offer in the u.h.f. region, and it would be interesting to have more comparisons of this kind.

With this issue, Fred Lambeth completes 10 years' responsibility for the BULLETIN'S v.h.f. feature. We feel sure members everywhere will join with us in congratulating him on his marathon effort. EDITOR.

GM3EGW, *Dunfermline*, has obtained the use of a cottage in Kinross which faces South and is some 950 ft. a.s.l. To date he has been active on 70 Mc/s and Top Band from this location, and shortly expects to have equipment for the 144 Mc/s band operational. Power is a real problem. A 24 V d.c. supply has been arranged, and this operates in conjunction with a transistor power converter.

V.H.F. National Field Day, 1964

The following lists the six leading claims, the score representing the total points claimed for all bands worked.

Wolverhampton and Severn Valley Radio Club	69,862
Albright and Wilson Amateur Radio Club	62,511
Cumberland and Westmorland V.H.F. Group	60,842
AERE (Harwell) Amateur Radio Club	56,134
Bournemouth and Poole Group	49,467
Reigate Amateur Transmitting Society	49,010

Four Metre Band Plan

G3GFN, *Bognor Regis*, is in hot water with **G3ION**, *Southampton*, who points out that the suggested calling frequency of 70·39 Mc/s is very close to the RAEN frequency of 70·375 Mc/s ±25 kc/s, and in view of the published appeals to keep this segment clear, we are asked to do all that we can to dissuade this move. Our impression was that it was only a frequency suggested by G3GFN to prevent interference to well established nets, the main point being that 70·26 Mc/s and 70·32 Mc/s are already well used. If a unified calling frequency is agreed, it will have to lie between 70·2 Mc/s and 70·4 Mc/s to allow its use by EI stations. As 70·39 Mc/s has been shown the door, alternative suggestions would be welcome.

Two Metre News and Views

Recent comments in this feature concerning transistorized v.h.f. working in Germany have prompted **G3AZT** *nr Abingdon* to give us some interesting details of his own fully transistorized equipment. These notes are particularly useful in that they show that quite diminutive power levels can give a good account of themselves, and with this in mind, the information may well encourage other operators to venture into the field of transistorized v.h.f. equipment.

The transmitter employs silicon *n-p-n* transistors throughout. The initial stage is an overtone crystal oscillator with its output on 36 Mc/s which is followed by a doubler, buffer amplifier and p.a. In the p.a., two transistors are connected in parallel and they give an r.f. *output* of 100 mW.

Standard transistors are used in the modulator, the output of which is applied to the buffer amplifier collector as well as the collectors of the p.a. transistors. The problem of a suitable modulation transformer was solved very neatly by using two Ardente receiver transformers connected " back-to-back."

The receiver is also transistorized employing AF139's in the r.f. stages on 144 Mc/s. The balance of the receiver, which is a double conversion superhet, uses the more usual transistor types.

The aerial consists of two stacked ten element long Yagis showing a forward gain of the order of 15db. The top Yagi is some 48 ft. above ground level.

Comparison between portable and fixed station operation has shown little difference in performance. When portable, sites of up to 1000 ft. a.s.l. have been used, the aerial on these occasions being either a five or eight element wide spaced Yagi at 15 ft.

Distances of up to 132 miles have been covered. Nevertheless, G3AZT comments that while 100 mW seems adequate for distances of up to 30 miles, for distances of around 100 miles and full readability, a power output of some 500 mW would seem to be necessary. Unfortunately, transistors capable of providing this power on 144 Mc/s are not yet freely available at other than solid gold prices. To date, 12 counties have been worked, and we think that this is quite an achievement.

We would be particularly interested to hear from other stations using transistorized equipment with details of the line-up which they employ and the results which they have secured.

On July 28, **GM3EGW** found some pretty odd conditions. The only two stations audible from the south were GW3MDK, *Colwyn Bay*, and F8VN. F8VN worked GM3EGW, *Dunfermline*, and in addition, GM3FYB, *Dunfermline*, and GM3NG, *Carluke*. On September 1, conditions seemed particularly good with southern stations coming through great guns. After working a few G calls, GM3EGW set his sights a little higher and went on to have contacts with PA0MSH, OZ2RD, OZ6AF and OZ3M.

From *VERON V.H.F. News Bulletin* we see that F1BP/M, while at *Pic de Nore, Aude*, on September 10, heard G2MV, but was unable to raise him. F1BP/M's location was about

* 21 Bridge Way, Whitton, Twickenham, Middlesex. Please send all reports for the December issue by November 6, and for the January issue by December 11.

The 2m station GB2GC at Alderney. This particular site, which was also chosen by the Germans for a block-house, has one of the best views of France from the island.

60 miles from the Spanish border, 50 miles from the Mediterranean, and 1200 ft. a.s.l.

From the same source we learn that F9NL, who is located in the Pyrenees, worked GC2TR, *St. Saviour, Jersey*, G5NF *Farnham*, G5LK, *Portsmouth*, G3KEQ, *Sanderstead*, G3SAR *Sevenoaks*, and G3LTF, *Chelmsford*. All these contacts took place on September 10. The following day GB3VHF was heard at S9 plus 10db.

V.h.f. activity in the Grand Duchy of Luxembourg is increasing, and is now of more than a purely local interest.

Meteor Scatter on 144 Mc/s

From **G6CL** comes the news that **YU1EXY** was well pleased with the achievements during the Perseids. Contacts were made with G5YV, *Leeds*, UR2BU, *Tartu*, SM5BSZ, *Stockholm*, F8DO, *Lyons*, and HB9RG, *Zurich*. All these contacts occurred between August 10 and August 15; those with G5YV and UR2BU lasted for four hours each: that with SM5BSZ for five hours: that with HB9RG for 12 hours and that with F8DO for a period of 20 hours.

The Perseid shower was found to be the most favourable in view of the large number of bursts, and the prolonged nature of the shower—about two days. Many bursts lasted more than 30 seconds, while one extended for 1 minute, 10 seconds.

The equipment used at the Yugoslav station ran 120 watts input to a long Yagi with a gain of 16db. Reception was taken care of by a double superhet, the front-end of which comprised two 6CW4 Nuvistors in a cascode amplifier.

Alderney Expedition, GB2GC

The party arrived on the morning of September 3 and by 14.00 most of the equipment had been set up. Preliminary checks with the 2m equipment produced GB3VHF and GB3CTC at 5 and 9 plus, and 5 and 8 respectively.

The 2m station commenced operations at 21.50 GMT and continued into the early hours of the following morning. Strong signals were received from G2AUD, G3BA, G3DBO, G3KEQ, G3LHA, G3MDH, G3MPS, G3OWA, G3PTM, G3SAR, G5LK, G6GN, G6ZP, GW8NP, and F1FK. Many other QSO's were made, of which that with G3FRV who had a fixed beam pointing northwards, and another with G2CAJ, *Earls Court*, using an *indoor* aerial, were particularly notable.

Despite a nearly flat accumulator for the 4m station, contact was made with G3JHM/A G3MET, G3OWA and GC3OBM. Many other stations were heard calling GB2GC on the 4m band, but the 4m unit had to close down due to lack of drive to the p.a.

During V.H.F. National Field Day, 4m was operated under the call GC3OUF/P and 2m under the call GC3PSH/P. At 18.32 GMT, GW4CG/P was contacted on 4m to make the first GC/GW contact on this band. The report was 5 and 8 both ways. Other contacts made were with G3GVM, G3IMV, G3LLW, G3PIA/P, G3REI/P, GC3OBM and G6XM/P.

The 2m band produced a larger number of contacts by virtue of the higher level of activity. Particularly strong signals were received from G2DSP/P, G3GOP, G3IIR/P, G3GIQ/P, G3PNA, G3OBD/P, G3SDS/P, G3SOU/P, G3SRC/P, G3REQ/P, F1GJ, F1FK, F1GC, F2IN/P, F3YY, F8IE, F8VN, F9JY and GC2TR. There was some talk of sending a bill to G2JF who pretty near turned the loudspeaker cone inside-out! At about 21.30 GMT, conditions declined, and to add to the merriment, a rainstorm set in. Shortly afterwards both stations closed down.

During the Sunday, 4m produced contacts with G2AXI, G3CLW, G2AIH, G3OWA, G3MAR/P, G2RD/P, G3KUJ/P, G8RW/P, G3LTF/P, G5UM/P and GW3PXZ/P. On this day the best 4m contact of the expedition was made in a QSO with G3SVR/P, *Shropshire*.

Conditions were only fair on 2m, but despite this, contacts were established with G2PL, G3FEX/P, G3FUR/P, G3BLP, G3CXM, G3HGE, G3HRH, G3HXJ/M, G5LK, G8LM, GW3KMT/P, GW4LU/P, GW8UH, GW2HIN/P, GC2FZC, F3YE and F9ZA. After the contest, both stations closed down for the rest of the day.

On the Monday, a telegram was sent to G5ZT to see if he was available for 70cm tests. Eventually he was received at 5 and 7, but due to a fault in the p.a. of the GB2GC 70cm transmitter which limited the output to about an estimated 25 mW, two-way contact was not established. The 2m band produced G3SAR, G3PYC, G3LAS, G3GWL and G3SHZ, together with G3EHY, GW3MFY, G3CO, G6XM, G8VR, G3EVV, G3TR, G3FUR, G5MA, G3EGV, G2MV, G2BLA and G3AHB to name but a few.

On 4m, contacts were secured with G3PHG, G3SKR, G3EHY, G3MOT and G3HWR, along with repeat contacts with other stations.

Stumps were pulled, and the party left the island by air on the Tuesday. The operators making up the expedition were G3OUF, G3PSH, G3RRU and G3SHK. QSL's for contacts with GB2GC should be sent to G3OUF.

Seventy Centimetre Notebook

The first G-GC contact took place on September 23 between 18.50 and 19.20 GMT. The stations involved were **G5ZT**, *Plymouth*, and **GC2FZC**, *Guernsey*, and to them both we extend our congratulations. Signal reports were G5ZT to GC2FZT 5-5/6-9 and GC2FZT to G5ZT 5-7-9.

GC2FZC particularly wishes to acknowledge the help and encouragement given by G5ZT, G3OBD and G3MPS which made the contact possible. Incidentally, GC2FZT also heard G3JGJ.

The transmitter at GC2FZC uses a QQV03/20 in the p.a. operating as a tripler, giving about three-quarters of a watt of r.f. output which is fed to a 6-over-6 slot-fed aerial. At G5ZT the p.a. is a 4CX250 co-axial p.a. running 100 watts input feeding an 8-over-8 slot stacked with a second 8-over-8

V.H.F./U.H.F. BEACON STATIONS

Call-sign	Location	Nominal Frequency	Emission	Aerial Direction
GB3CTC	Redruth, Cornwall	144.10 Mc/s	A1	North-East
GB3VHF	Wrotham, Kent	144.50 Mc/s	A1	North-West
GB3GEC	Hammersmith, London	431.5 Mc/s	A1	East

RSGB V.H.F. BEACON STATION GB3VHF

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

Date	Time	Error
September 29	11.05 GMT	1070 c/s high
October 6	19.05 GMT	1350 c/s high
October 13	18.00 GMT	1842 c/s high

slot. The receiver employs an A2521 into a crystal controlled converter in front of a BC454.

What is especially interesting about this contact is the very poor v.h.f. location of G5ZT. True he uses rather more power than most on 70cm, and a potent aerial system, both of which would seem, on this showing anyway, to compensate for the location difficulties.

Both G5ZT and GC2FZC will be active during the 432 Mc/s Contest.

On September 1, **SM6ANR** asked **GM3EGW** for a 70cm transmission in view of the excellent conditions which were prevailing. Although the equipment had not been in use for months it came up trumps, and two-way contact was secured on c.w. in addition to which, SM6ANR received a phone transmission from GM3EGW.

G3OBD, *Poole*, found conditions well above average on September 29 and worked G2XV, *Cambridge*, G8ACL, *Fareham*, G3LQR, *nr Colchester*, G3LTF, *Galleywood* and F8MX/A *nr Dieppe*. Heard, but not worked, were G3MCS and G3KEQ.

G3LLJ, *Newcastle, Staffs.*, has now completed a 70cm converter and hopes that it will not be too long before he is active on this band.

Moonbounce World Record on 70cm

A new world record was created on July 31 by the use of moonbounce techniques between W1BU, *Medfield, Mass.* and W2UK/KH6 in *Hawaii*. The haul was some 5000 miles. Signals were not particularly strong, being only about 10db above the noise in a 100 c/s wide i.f. filter. Rapid fading was noted by both stations.

Each station employed 28-ft. paraboloids with horizontally polarized radiators. The power *output*—note *power output* and *not* d.c. input—at W1BU was 700 watts, and that at the KH6 end of the link somewhat less.

Moonbounce on 1296 Mc/s

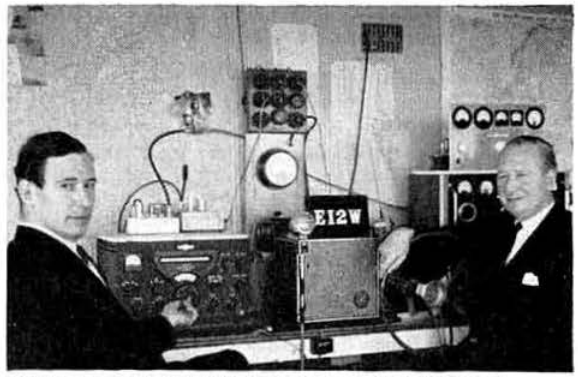
We understand from **G3LTF** that the ARRL Moonbounce Crew, W1BU, schedules with HB9RG came to fruition on September 28 when they were able to report two-way contact after receiving three 15-minute transmissions from HB9RG. They had also received two transmissions from the Swiss station on the previous day, but, unfortunately, the transmitter at W1BU was not operational. The frequency of HB9RG was precisely 1296 Mc/s and that of W1BU, 1 kc/s lower. The next tests are scheduled for Spring 1965.

Twenty-three Centimetre Jottings

G3OBD worked F8MX/A at 5 and 9 both ways on September 29. A really first-class performance.

During tests with **G3LTF,** G3OBD was received at about S2/3, but it was a one-way only affair. Another test with **G3MPS** produced the same peculiar result—but inverted. G3MPS was heard at S5, but to him G3OBD was " missing."

From *Radio REF* we learn that the first 23cm contact between France and Western Germany took place on August 30 over a distance of 76 km (48 miles). The stations taking part were F2TU/M situated at *Le Honneck* 1300m a.s.l. and DJ3ENA at his home QTH. Both stations employed horn aerials. Preliminary contact had been made on 2m after which the test was made.



G3FZL, left, with EI2W during his recent visit to Ireland.
(Photo by G3HRH)

Deadline

Due to the closeness of the Exhibition, this feature goes to press quite a bit in advance of the normal date. If any reports have been left out, we extend our apologies to the operators concerned.

Deadline for the **December** issue is **November 6** and for **January, December 11.**

Masonic Lodge

A few London and provincial radio amateurs, who are Freemasons, are proposing to seek authority to establish a Masonic Lodge in London. Society members interested are invited to communicate with the Organizing Secretary, 16 Ashridge Gardens, Palmers Green, London, N.13.

LONDON MEMBERS' LUNCHEON CLUB

Arrangements for the Christmas meeting are being made with the Horse Shoe Hotel, Tottenham Court Road, W.1, London, for Friday, December 11 at 6.30 for 7 p.m.

This year due to popular demand, the meeting will be held in the evening and will take the form of a Dinner-Dance.

Tickets, price 25/- each may be obtained from the Honorary Secretary G. A. Leicester, G3IKC, 153 Park Road, Chiswick, London, W.4.

Early application is advised.

Annual Dinner of the IRTS

THE Annual Dinner Dance of the Irish Radio Transmitters' Society was held at the Central Hotel, Dublin on Saturday, October 3, 1964 from 7.30 to 11.30 p.m.

The President of IRTS, Mr Ambrose McNamara, EI8A, took the chair at the dinner, and welcomed as the principal guests, Colonel T. O'Brien, Director of Signals of the Irish Army, together with Mrs O'Brien, and Mr Gwilym Jones, Staff Engineer of the Department of Posts and Telegraphs.

After an excellent meal enjoyed by over 50 members of the IRTS and their ladies, the President of RSGB, Mr G. M. C. Stone, G3FZL, proposed a toast to the IRTS in which he referred to the happy relationship which has existed between the two societies for many years, and the wish of the RSGB that the ties might become even stronger. He also referred to the 1966 IARU Region I Conference, which will be held in Yugoslavia, and spoke of the importance of all IARU member societies being represented at that Conference. Mr McNamara replied on behalf of IRTS and reciprocated the wish for a close association with the RSGB.

The toasts to the Guests and Ladies was proposed by Mr Merry, EI3B, Vice-President of IRTS, and replied to by Mr Jones on the guests' behalf. The trophies of the IRTS for the year 1964/5 were then presented, after which the gathering adjourned to the ballroom for dancing and a general get-together.

At the Annual Dinner-Dance of the Irish Radio Transmitters Society, Geoff. Stone, G3FZL, President of RSGB, and Ambrose Mac Namara, EI8A, President of IRTS, laugh at the quips of Mr G. Jones, a senior official of the local Dept. of Posts and Telegraphs, during his address to the ensemble.
(Photo by ex-ZS3FF, Graphic Studios, Dublin)

In addition to the President, the RSGB was represented by the V.H.F. Manager, Council Member, R. C. Hills, G3HRH, Mr A. Patterson, GI3KYP, Zone F Representative and by Mr J. W. Douglas, GI3IWD, Region 15 Representative. Mr Patterson was also there in his own right as the holder of the call EI4BC, together with Mr N. Miller, G3MVV, who holds the call EI9AE.

During their weekend visit to Ireland, the President and Mr Hills had several useful discussions with the President and Secretary of IRTS on problems common to the two societies.

Mr Ambrose McNamara, EI8A, President of IRTS, replying to the toast proposed by Mr Stone. In the foreground, Mr A. D. Patterson, GI3KYP/EI4BC.
(Photo by G3HRH)

G3HRH was also able to visit EI2A, the IRTS V.H.F. Manager, at his home in Navan, Co. Meath, in company with Harry Wilson, EI2W, when discussions on G/EI v.h.f. liaison took place.

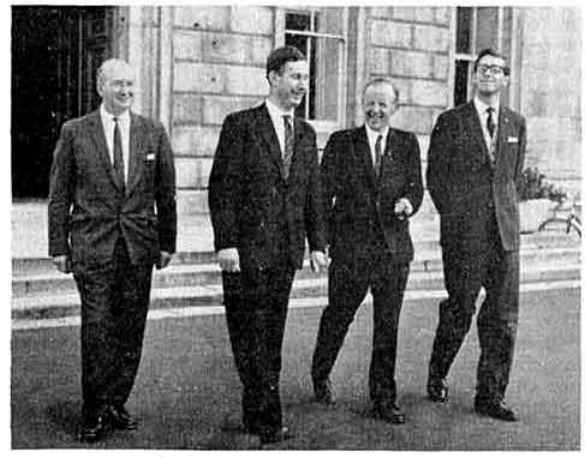
Nimble Fingers

At the Annual Convention of the Yugoslav Amateur Radio Society (SRJ) held in Novi Sad, youngsters under 14 were invited to take part in a fast-building transistor receiver competition.

The competition was staged in public and attracted a large audience. And so it should, because the winner spent only two minutes and 15 seconds constructing a receiver with two transistors and all the accompanying parts. More than 40 youngsters competed.

Claims for RSGB Certificates

Members are reminded that claims for RSGB Certificates should be sent direct to Headquarters. Claims are acknowledged on arrival and passed to the Honorary Certificates Manager for attention.



During their recent visit to Dublin to attend the annual dinner of IRTS, the President and the V.H.F. Manager were privileged to be shown the Dail and Seanad Chambers in the Irish Parliament Building by Mr Lionel O. Booth, T.D., Member for Dublin South. Seen here leaving the main entrance are, left to right, Harry Wilson, EI2W, G3FZL, Mr Booth, and G3HRH. *(Photo by "Irish Times")*

Society News

Council Election 1965

Mr L. N. Goldsbrough, G3ERB, and Mr J. Fraser Shepherd, GM3EGW, have been nominated to fill the vacancies in the offices of Zone A and Zone G representative respectively which will become vacant on December 31, 1964.

No nominations for Ordinary Members of the Council in opposition to the Council's nominations announced in the September issue of the BULLETIN have been made and a ballot will not therefore be necessary this year.

Annual Report of Council

The Council's annual report for the year ended June 30, 1964, will be published in the December issue of the RSGB BULLETIN.

Annual General Meeting

A notice calling the Annual General Meeting for December 18, 1964, is enclosed with each copy of this issue of the BULLETIN sent to Corporate members.

RSGB QSL Bureau

The QSL Bureau Sub-Manager for the G3IAA-KZZ call-sign series, BRS and A numbers, is Mr G. L. V. Butler, G2BUL, 995 London Road, Thornton Heath, Surrey, and not as stated in the October issue of the RSGB BULLETIN.

RAEN Members Wanted in South Wales

The Regional Police Commander for the Wales Region is interested in the use of RAEN in South Wales, and the Glamorgan Controller, H. G. Hughes, GW4CG, of 20 Austin Avenue, Porthcawl, Glamorgan, will therefore be pleased to hear from any RSGB members over the age of 16 in the district who would be willing to assist him by joining the RAEN.

Should a satisfactory scheme be submitted to the Chairman of the RAEN Committee, equipment would be loaned to members in accordance with standing arrangements.

Radio Amateurs' Examination

The next City and Guilds of London Institute Radio Amateurs' Examination will be held on December 10, 1964. Applications to sit the RAE must be received by the Technical Colleges holding the examination not later than November 1, 1964.

Ingang 1964

Among those who visited London with the UBA party last August was London-born Lou. Vervoort, ON5LV, Editor of *CQ UBA* for the past 10 years. Unfortunately his call-sign was omitted from the account of the visit published on page 593 of the September issue of the RSGB BULLETIN.

New Call-sign at Headquarters

Trevor Preece, who joined the Editorial staff at Headquarters in January, 1963, is now licensed as G3TRP.

RAEN Registration

All RAEN members are reminded that membership registration for 1965 is now due, and membership cards must be sent to the Honorary Registrations Secretary, F. C. P. Flanner, G3AVE, 40 Parkhouse Drive, Birmingham 23, before *December 31, 1964*. A stamped, addressed envelope for the return of the card must also be included.

County Controllers and Independent Area Controllers may if they wish collect their members' cards and forward them in bulk.

Headquarters Fund—List No. 23

The following is a list of those who have contributed to the fund up to October 7, 1964:

H. G. Price, BRS23444, H. F. Nell, G2ABB, E. Somerville, BRS25693, N. C. Haigh, G3NUC, B. Speakman, BRS23256, H. E. Bull, G3ABM, A. G. Mabbutt, G3ILL, G. V. Haylock, G2DHV, R. Heath, G3OAN, W. H. Brownson, G3NYI, J. B. Foster, G3IIT, J. H. Young, G3RWY, J. Barton, A2737, E. H. Trowell, G2HKU, E. Rayner, G6IO, S. J. Stansfield, WA8GDR, Stockport Radio Society, T. Edgar, G3BZZ, N. C. Hews, Cpl D. F. Higgins, DL2DP/6O2AB, K. R. Davis, G3GPL, J. O. Dykes, BRS2036, E. Early, F8ZF, J. R. Gazeley, BRS20533, P. J. McGoldrick, A2379, L. Boor, BRS22653, N. P. Sjostedt, FRS345, A. R. Wakeman, BRS25492, R. W. Peters, G3JXV, P. J. Atkins, G3RJU.

D. J. Goacher, G3LLZ, B. P. Queenan, C. F. Beech, G3PVL, H. J. M. Box, G6BQ, D. R. Moore, G3LSA, A. J. Machin, G3POU, M. A. Pyle, G2BLA, International V.H.F./U.H.F. Convention 1964, E. A. Lomax, BRS1579/5N2, F. Halfacre, G3MNW, H. G. Hughes, GW4CG, B. E. Greville, G3JCW, R. A. E. German, G3OZT, A. E. Brown, G3GZF, R. C. Hewitt, G3NIX, K. A. Lewis, A3879.

Total amount contributed to date: £1,959 3s. 2d.

Overseas RSGB Groups

In response to a number of enquiries, the Council has decided that there is no objection to the setting up of overseas RSGB groups where there is no national society for radio amateurs.

Mr E. D. Whitehead

Mr E. D. Whitehead, M.B.E., B.Sc., M.I.E.E., who has been the Director of Electrical Inspection, Ministry of Aviation since 1959, and who was due to open the RSGB International Communications Exhibition on October 28, has been appointed Director of Electronics Production (Radar). The Society wishes him good fortune in his new appointment.

Civil Defence

The President, who is a Signals Instructor in Civil Defence and a member of the Corps (as is next year's President), would like to know how many RSGB members are also connected with Civil Defence. He already knows several personally and believes that there may be quite a number in our ranks. This is useful as background information when showing how radio amateurs are serving the needs of the country—their contribution in the fighting services is, of course, already well known.

Vacancy on RSGB Bulletin

There is a vacancy on the editorial staff of the RSGB BULLETIN and associated publications.

A good command of English, the ability to write quickly and lucidly on a wide variety of subjects, and enthusiasm are essential. A knowledge of Amateur Radio, preferably as a licensed amateur, would be an advantage.

Applications for this interesting post on the Society's Headquarters staff should be addressed to the General Manager, Radio Society of Great Britain, 28 Little Russell Street, London, W.C.1.

CONTESTS DIARY

October 31–November 1	– RSGB 7 Mc/s DX Contest (phone). (see page 328, May, 1964).
November 4–5	– YL RL Anniversary Party (phone).
November 21–22	– RSGB 7 Mc/s DX Contest (c.w.) (see page 328, May, 1964).
November 28–29	– Second 1·8 Mc/s Contest (see page 539, August, 1964).
November 28–29	– CQ WW DX Contest (c.w.). (see page 684, October, 1964).
December 5–6	– RSGB 21/28 Mc/s Telephony/ Receiving Contests (see page 472, July, 1964).
December 5–6	– OK C.W. DX Contest.
December 13	– 70 Mc/s C.W. Contest (see page 539, August, 1964).

1965

January 23-24	— Affiliated Societies' Contest
January 30-31	— 144 Mc/s C.W. Contest.
January 30-31	— CQ WW 160m Contest.
January 30-31	— REF (C.W.).
February 6-7	— QCWA Party.
February 13-14	— ARRL DX Contest (Phone).
February 20-21	— BERU Contest (see page 678, October, 1964).
February 27-28	— ARRL DX Contest (C.W.).
February 27-28	— REF (Phone).
March 6-7	— 144 Mc/s Open Contest and Listeners' V.H.F. Contest.
March 13-14	— ARRL International DX Competition (Phone).
March 20-21	— First 1·8 Mc/s Contest.
March 20-21	— International S.S.B.'ers.
March 27-28	— ARRL International DX Competition (C.W.).
April 10-11	— CQ WW S.S.B. Contest.
April 25	— D/F Qualifying Event.
May 1-2	— 144 Mc/s Portable Contest.
May 9	— D/F Qualifying Event.
May 23	— D/F Qualifying Event.
May 29-30	— First 420 Mc/s Contest.
June 12-13	— National Field Day.
June 27	— D/F Qualifying Event.
July 3-4	— Second 144 Mc/s Portable Contest.
July 17-18	— 1250 Mc/s Tests.
July 17-18	— D/F Qualifying Event.
September 4-5	— Region 1 IARU Contest.
September 4-5	— V.H.F. National Field Day.
September 12	— D/F National Final.
September 18-19	— Low Power Field Day.
September 25-26	— 21/28 Mc/s Telephony/Receiving Contest.
October 9-10	— Raynet Rally.
October 16-17	— 7 Mc/s DX Contest (Phone).
October 24-25	— CQ World Wide Contest (Phone).
October 30-31	— Second 420 Mc/s Contest.
November 6-7	— 7 Mc/s DX Contest (C.W.).
November 20-21	— Second 1·8 Mc/s Contest.
November 28-29	— CQ World Wide Contest (C.W.).
December 4-5	— 70 Mc/s C.W. Contest.

Can You Help?

● A. H. Willame, ON4WN, Ankerslaan 26, Gentbrugge, Belgium, who wishes to obtain the January, February, March and May 1964 issues of the RSGB BULLETIN?

Obituary

George Percy, GM3OL

One of the pioneers of amateur v.h.f. was lost to the movement when George Percy, GM3OL passed on at his home at Kipford in Kirkcudbrightshire on Wednesday, August 5. George, who was head of a flourishing retail television and radio business in South-West Scotland, had operated under the call-sign GM3OL since the mid 1930's, and was one of the early group of Scottish amateurs who opened up the old 5m band.

G5UM

Obituaries

Bob Bishop, GM8FB

Bob Bishop, who died on September 21 at the age of 66, was for many years prominent in east Scottish amateur circles.

During the inter-war years he was both a keen key and phone operator, and is remembered for his low power activities. In particular, one can recall his home-brew t.p.t.g. rig with an output of 2 watts, with which he achieved QSOs up to 750 miles, mainly on 7 Mc/s. His receiver was an ambitious 0-V-1 with high resistance headphones.

In recent years, he tended to concentrate more on television and receiver construction, as his amateur radio activities had been reduced through TVI problems. Of original and independent disposition, Bob was very helpful, being at all times dedicated to amateur radio.

We offer our deepest sympathy to his son, Willie.

J. M.

W. Moore, G8OO

It is with deep regret that we record the death on August 9, 1964 of W. Moore, G8OO.

"Pony" Moore became licensed in 1936, and was active on most bands in the Grimsby area. He later moved to Dorset, where he continued his amateur and professional activities. He had been connected with the radio industry for most of his life, having been employed by the Post Office and Cable and Wireless Ltd.

We extend our condolences to his widow, son and daughter.

G2YT

Thomas Russell Stevens, FRCS, G3DUQ

It is with the deepest regret that we have to place on record the passing of "Doc," G3DUQ, after a short illness. He had been President of the South Dorset Radio Society for the past three years, and had made many friends on the air.

We extend our deepest sympathy to his widow and two daughters.

C. E. B.

J. Timbrell, ex-G6OI

The Midlands, and in particular the Stourbridge district, have suffered a great loss with the death, after a long illness, of J. Timbrell on October 4.

Mr Timbrell was formerly the Senior Science Master at King Edward VI School, Stourbridge, from where he ran a station, G6OJ, for many years, giving training facilities which often culminated in the issue of licences to the school pupils. He was also a very keen member of the Cadet Corps, and was Major in charge of the Signals Section.

When the Stourbridge Radio Society was formed in 1938, he became Founder President, and after the war he extended his active support to the RSGB and was appointed County Representative for Worcester, later to become Regional Representative for Region 3—an office which he held until he was forced to resign several years ago through ill-health. When it became impossible for him to carry on with his amateur radio activities, he strongly supported arrangements made with the GPO to have his call-sign, G6OI, transferred to the Stourbridge and District Amateur Radio Society, who are very proud to perpetuate his memory in this way.

He will be well remembered for his very wide knowledge and experience of amateur radio, including his early pioneering work on 5m.

Our deepest sympathy is extended to his widow, who has so patiently nursed him through these recent years of ill-health.

G8GF

Society Affairs

A digest of the business discussed at the August, 1964, meeting of the Council

THE meeting held on August 17, 1964, was attended by Messrs G. M. C. Stone (President), N. Caws, J. C. Foster, J. C. Graham, R. C. Hills, E. G. Ingram, R. H. James, A. O. Milne, L. E. Newnham, F. K. Parker, R. F. Stevens, J. W. Swinnerton, L. Varney, E. W. Yeomanson (Members of Council), John A. Rouse (General Manager and Secretary), and P. C. M. Smee (Minuting Secretary).

Apologies for absence were submitted on behalf of Mr. L. N. Goldsbrough and Mr. A. D. Patterson.

Contests Committee

The President reported on a meeting of the Contests Committee held on July 23 at which two separate committees to deal with H.F. and V.H.F. Contests were set up.

It was noted with regret that Mr. W. H. Matthews, G2CD, had resigned from the Committee and it was agreed to place on record the Council's deep appreciation of his work for the Society over many years.

Meeting with the Post Office

It was reported that the General Manager had met officials of the Post Office on July 23, and discussed a number of current licensing matters. The opportunity had also been taken to discuss a particularly difficult case of TVI on behalf of a disabled member in the North of England.

The Search for a New Headquarters

The President stated that what appeared to be a possible building for a new Headquarters had been found in Westminster which was to be auctioned on September 10. The property was in excellent condition.

It was unanimously agreed that the Society should bid up to £30,000 for the property, provided various questions relating to title and continued use as office premises were satisfactorily resolved. (This matter was reported in the October issue of the BULLETIN.)

Service Agreement—Mr. J. A. Rouse

The Council unanimously approved a recommendation of the Finance and Staff Committee that the service agreement between the Society and Mr. J. A. Rouse should be signed.

Committee Recommendations

The Council considered a number of recommendations put forward by Committees relating to such subjects as affiliation fees, the co-option of members to two committees, expenditure in connection with exhibits at the RSGB International Radio Communications Exhibition and the award of a miniature cup to the Northampton Short Wave Club, winners of the First 144 Mc/s Portable Contest, 1964.

Membership

The Council approved 146 applications for membership (126 Corporate and 20 Associates). In addition 15 applications for transfer from Associate to Corporate grade were approved.

The Council unamimously waived the subscriptions of three members on the grounds that they suffer from blindness.

Affiliation

An application for affiliation from the Ipswich Radio Club was approved.

New Zone G

The Council accepted a recommendation of the Membership and Representation Committee that Northern Ireland and Scotland should in future form two separate zones (a notice calling for nominations for the representative for the new Zone G (Scotland) was published in the September BULLETIN).

Nominations for Ordinary Members of Council

The Council resolved, in accordance with Article 52 of the Society's Articles of Association, to nominate Messrs. J. C. Foster, E. G. Ingram, R. F. Stevens and J. W. Swinnerton for election to fill the vacancies which will occur on the Council on December 31, 1964.

Election of President for 1965

In accordance with Article 10 of the Society's Articles of Association, Mr. E. W. Yeomanson was appointed President with effect from January 1, 1965.

Permanent Headquarters Station

The Council agreed in principle to the setting up of a permanent Headquarters Station and referred the matter to the Technical Committee for advice on equipment for use on the h.f. and v.h.f. bands.

RSGB Bulletin

Arising from a discussion on the editorial content of the RSGB BULLETIN, it was decided to continue to publish the names of the members of Council and the Regional Representatives. It was also decided to publish brief biographical details of Council members, illustrated with photographs, in the BULLETIN each month, commencing in January 1965.

H.F. Convention

A sub-committee (Messrs R. C. Hills, A. O. Milne, R. F. Stevens, L. Varney and the President) was set up to explore the idea of arranging an H.F. Convention on somewhat similar lines to the popular v.h.f. conventions.

ARRL Golden Jubilee National Convention

The Council agreed to request Mr. Roy Poeton, G3CTN, personally to convey the Society's message of congratulations to the ARRL. (The text of the message was published on page 595 of the September issue of the BULLETIN.)

Reports of Committees

The TVI/BCI Committee met on June 26 to discuss a number of individual members' TVI cases and problems connected with relay television. Arising from consideration of an appeal against refusal of planning permission for a member's mast, it was agreed that it would be best if members could consult the Committee before applying for planning permission.

The Education and Training Committee considered BULLETIN articles, the results of a questionnaire sent to affiliated societies, a suggestion that equipment might be sent to amateurs in Africa, the Wireless Institute of Australia's Youth Training Scheme, plans for an Overseas

(Continued on page 741)

CONTEST NEWS

RESULTS — REPORTS — RULES

Second 144 Mc/s Contest 1964

The Second 144 Mc/s Contest, held on July 6, attracted 48 entrants, a similar number to that of previous years. There were comparatively few Welsh entrants, despite the fact that these stations did so well in the May contest. The Scottish stations were active for the whole of the event, but the longest distance contact was with G3LRP at Wakefield, Yorks., who was worked by three out of the four GMs. At least 30 other portable stations are known to have been operating, and it seems a pity that they did not send in their logs.

The scores of the leading stations are 24 per cent higher than in the May contest, and 52 per cent higher than last July. Among the longer distance contacts, G3KMT/P worked ON4TQ/P at 330 miles, and G8SB/P contacted the same station at 315 miles and ON4LQ at 284 miles. In all, six French, three Belgium and a Dutch station were worked by a number of contestants. A miniature cup and certificates of merit will be awarded to G8SB/P (operators G8SB and G3EGK) to G5ZT, and also to Gordon Rolland, A3766, for the most useful check log.

The general standard of log-keeping was good, although a number of stations made the work of other entrants more difficult by not using the ten mile to one inch Ordnance Survey map for specifying their locations. An example is Croydon, Surrey, which has been used by a number of stations in recent contests, but which appears on this map as a name some seven miles long with no obvious centre. One group gave a QTH as 25 miles E.N.E. of a town. Surely somewhere nearer could have been found, even if in a different county. The attention of contestants is drawn to the comments on the 70 Mc/s Contest (RSGB BULLETIN, March, 1964). The results table shows that the number of contacts obtained is no indication of score. A number of club stations appear to have been single-operator.

Equipment

The line-up of most converters began with a Nuvistor r.f. stage, although transistors are now as popular as E88CCs. About half the entrants used a large general coverage communications receiver as a tunable i.f., although the number of specially built units is increasing. A large number of Command receivers are still giving good service and one group managed to transport an R107. Transmitting equipment was conventional, with the exception of one club using a small class B linear amplifier driven by a 21 Mc/s s.s.b. transmitter with carrier insertion.

Comments

Conditions seemed to deteriorate after a good start and GC2FZC heard nothing after 13.50. Many northern stations mentioned the terrible weather after a good week, though further south the day was fine.

Many contestants apparently used the contest as a trial run for V.H.F. NFD. G5ZT was sad to note the reduced portable activity from two-letter call-signs; G3HAZ reports on cross-modulation which appears only when operating from a good site; GW3MFY suggested that the scoring might be simplified; and G8SB gave a graphic description of the difficulty of crawling across maps laid on the front-room floor with a ruler (or do some people use elastic?).

Check logs are gratefully acknowledged from G6XA, GC2FZC, GW3MFY, BRS15744 and A3766.

RESULTS

Position	Call-sign		Score	Contacts	County
1	G8SB/P	M	20,018	149	Staffs.
†	G3IGV/P	M	18,518	76	Cornwall
2	G5ZT/P	S	15,710	88	Devon
3	G3KMT/P	M	15,645	131	Shropshire
4	G2HIF/P	M	14,281	130	Berks.
5	G3OBD/P	S	13,593	100	Dorset
§	G6AG/P	M	13,135	116	Bucks.
6	GW4LU/P	M	12,765	84	Montgomery
7	G3NJF/P	S	12,200	65	Lincs.
8	GW3OXD/P	M	11,946	101	Radnor
9	GW3RUF/P	M	11,488	87	Brecon
10	G3BNL/P	S	10,973	82	Derby
11	GD3KCB/P	S	10,880	58	I. of Man
12	G3FRV/P	M	9,831	87	Sussex
13	G3FD/P	S	9,687	104	Beds.
14	G3MDH/P	M	9,096	70	Wilts.
15	G3GWB/P	M	7,848	76	Northants.
†*	G3MAR/P	M	7,544	82	Birmingham
16	G3BDS/P	S	7,317	83	Worcs.
17	G3MWB/P	S	7,315	90	Berks.
18	G3KEU/P	S	7,267	74	Hants.
19	G3CGQ/P	S	6,788	72	Beds.
§	G2YU/P	M	5,690	47	Norfolk
20	G3FIJ/P	S	5,656	50	Essex
21	G3BXF/P	M	5,591	55	Northants.
22	G3RAL/P	S	5,086	57	Leicester
†	G3NKS/P	M	5,050	70	Surrey
23	G3EMU/P	S	4,948	43	Kent
†	G2DSP/P	M	4,912	53	Sussex
24	GW2HIN/P	S	4,709	46	Glamorgan
25	G3RXK/P	S	4,556	53	Worcs.
26	G3ERD/P	M	4,455	57	Derby
27	G3RCV/P	M	3,856	46	Surrey
28	G3OZH/P	M	3,669	43	Northants.
29	G3OSC/P	M	3,463	38	Bucks.
30	G3RZG/P	S	3,285	38	Dorset
31	G3FCY/P	M	2,785	28	Yorks.
32	G3MFX/P	S	2,445	27	Yorks.
33	G2WS/P	S	2,350	26	Warwick
*‡	G3GKF/P	M	2,229	47	Surrey
*	G3DIT/P	S	2,228	29	Hants.
†	GM3IQL/P	M	1,945	28	Fife
34	G3JDM/P	S	1,676	19	Staffs.
35	GM6XW/P	S	1,634	29	Stirling
36	G5CP/P	S	1,228	13	Derbyshire
37	GM3NZI/P	M	998	19	W. Lothian
38	G2DHV/P	S	916	15	Surrey
39	GM3TFY/P	S	682	23	Midlothian

† General Rule 6. * Rule 7. § late entry. ‡ incomplete declaration. M multiple operator. S single operator.

144 Mc/s C.W. Contest 1965

The scoring of this event has been slightly changed to encourage more long distance working: remote counties now score 20 points per contact, compared with 10 points for local contacts. This contest is now the only v.h.f. one in the RSGB Calendar scored on a " points per contact " basis and it is probable that it will be changed to " points per mile " in 1966.

1. **When:** 10.00 GMT to 22.00 GMT on Sunday, January 31, 1965.
2. **Sections:** (a) High Power (up to 150 watts input to the p.a. stage); (b) Low Power (up to 30 watts input to the p.a. stage).
3. The General Rules relating to RSGB Contests, published in the January, 1965 issue of the RSGB BULLETIN, will apply except as superseded by the rules of this Contest.
4. **Eligible Entrants:** All fully paid-up members of the RSGB resident in Region 1.
5. **Contacts:** May be made on A1 only.
6. **Scoring:** For each completed contact with a station in the operator's own **county** or in an adjacent **county** 10 points may be claimed. For each completed contact with a station in any other **county** in the operator's own **country** 20 points may be claimed. For each completed contact with a station outside the operator's own **country** 30 points may be claimed. In addition 20 bonus points may be claimed for each British Isles county worked.
7. **Contest Exchanges:** RST reports followed by the contact number, and county (e.g., RST559001, Cornwall, or RST579002, London). The full name or the abbreviation given on page 52 of the January, 1964 RSGB BULLETIN must be used to designate the county.
8. **Logs:** (a) Must be tabulated in columns headed (in this order) " Date/

Time (GMT)," " Call-sign of Station Contacted," " My report on His Signals and Serial Number Sent," " His report on My Signals and Serial Number Received," " County," " Bonus Points," " Points Claimed."

(b) The cover sheet must be made out in accordance with RSGB Contests Rule 4 and the declaration signed. The address of the station must include the county.

(c) Entries must be postmarked not later than Monday, February 15, 1965.

9. **Awards:** At the discretion of the Council of the RSGB, certificates of merit will be awarded to the leading station and runner-up in each section.

First 1·8 Mc/s Contest 1965

The rules for next year's First Top Band Contest are as follows:

1. **When:** 21.00 GMT on Saturday, March 20, to 03.00 GMT on Sunday, March 21, 1965.
2. **Eligible Entrants:** All fully paid-up members of the RSGB resident in G, GC, GD, GI, GM and GW.
3. The General Rules published in the January, 1965 issue of the RSGB BULLETIN relating to RSGB Contests will apply.
4. **Contacts:** C.w. (A1) only in the 1·8-2 Mc/s band.
5. **Scoring:** Three points for contacts with stations in the entrant's own county and those counties having a common boundary with that of the entrant and five points for all other contacts.
6. **Contest Exchanges:** RST reports followed by the contact number starting with 001 and the county code letters given in the January, 1964, issue of the BULLETIN, e.g. for a contact from Surrey 579005SY. All reports must be acknowledged with " R ".
7. **Logs:** (a) Must be tabulated in columns headed (in this order): " Date/Time GMT," " Call-sign of station worked," " My report on his signals and serial number sent," " His report on my signals and serial number received," " County code letters received," " Points claimed." The county code letters as sent must be entered at the top of each log sheet.

(b) The cover sheet must be made out in accordance with RSGB Contest Rule 4. The declaration must be signed.

(c) Entries must be postmarked not later than April 5, 1965.

8. **Power Input:** The d.c. input to any stage of the transmitter shall not exceed **10 watts.**
9. **Awards:** At the discretion of the Council, the **Somerset Trophy** will be awarded to the winning station and certificates of merit to the stations placed second and third. In addition, the **Maitland Trophy** will be awarded to the Scottish member with the highest aggregate number of points in this contest combined with the Second 1·8 Mc/s Contest 1964.

A **certificate of merit** will also be awarded to the **non-transmitting member** submitting the best check log. Check logs submitted by non-transmitting members for consideration for the award of a certificate of merit should give in this order the following details: Date/Time (GMT); Band; Call-sign of station heard; Report and serial number sent by station heard; Call-sign of station being worked; any other information required by the above rules.

144 Mc/s Open Contest 1965

RSGB members throughout Europe are invited to take part in this popular v.h.f. contest. Both phone and c.w. may be used. Comments on equipment, conditions and any other points of interest will be welcomed. Contestants should note that the scoring has been changed to a points per distance system.

1. **When:** 17.00 GMT on Saturday, March 6, to 19.00 GMT on Sunday, March 7, 1965.
2. **Eligible Entrants:** All fully paid-up members of the RSGB resident in Europe.
3. The General Rules relating to RSGB Contests as published in the January 1965 issue of the RSGB BULLETIN will apply except as superseded by the rules of this Contest.
4. **Contacts:** May be made on any mode except A2, in accordance with the terms of the Amateur (Sound) Licence A.
5. **Scoring:** Points will be scored on the basis of one point per mile for all contacts.
6. **Contest Exchanges:** RST or RS reports followed by the contact number and the location (e.g. RST599001 Hull). This location must be identifiable on the 10 mile to 1 in. Ordnance Survey map. Five figure QRA locator details may be exchanged with continental stations. It is the responsibility of the receiving operator to obtain the information he requires to calculate distances correctly.
7. **Logs:** (a) Must be tabulated in columns headed in this order, (i) Date/Time (GMT); (ii) Call-sign of station worked; (iii) My report on his signals and serial number sent; (iv) His report on my signals and serial number received; (v) Location; (vi) Points claimed.

(b) The cover sheet must be made out in accordance with RSGB Contests General Rule 4 and the declaration signed. The NGR of the station (in the form of two letters and six figures) and the QTH as transmitted must be shown on the cover sheet. Stations outside the area covered by the National Grid should specify their latitude and longitude.

(c) Entries must be postmarked not later than March 22, 1965.

8. **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 runner-up.

Listeners' V.H.F. Contest

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. Entries for this event will be automatically credited to the V.H.F. Championship.

1. **When:** The contest will commence at 17.00 GMTon Saturday, March 6, and end at 19.00 GMT on Sunday, March 7, 1965.
2. **Eligible Entrants:** The contest is open to all fully paid-up members of the RSGB resident in Europe. Only the entrant may operate his receiving station for the duration of the contest. Holders of amateur transmitting licences are eligible to take part if they do not own transmitting equipment for the 144 Mc/s band.
3. **Scoring:** Entrants will be required to log stations operating in the 144-146 Mc/s band. Each station heard may be logged once only in column ii. Points are to be scored for each complete log entry, with bonus points for each new county received and for c.w. reception. For each station logged in the entrant's own **county** or an adjacent **county**: 10 points; for each station logged in other **counties** in the entrant's own **country**: 20 points; for each station logged in any other **country**: 30 points; for a log entry of any station not taking part in the contest: 5 points. Bonus points: for an entry of a telegraphy transmission double points are to be claimed. For each British Isles County received an additional 20 points may be claimed. The whole of the London Postal Districts will count as one county only.
4. **Entries:** (a) to count for points, logs must show, in columns, (i) Date/Time (GMT); (ii) Call-sign of station heard; (iii) Report and serial number sent by station heard; (iv) My report on the signal heard; (v) County of station heard; (vi) Call-sign of station being worked; (vii) Points claimed.

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

(c) The cover sheet must be made out in accordance with RSGB Contest Rule 4 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 22, 1965.

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

RSGB Experimental Transmissions from GB3LER

Many verbal reports of the reception of GB3LER on 145·995 Mc/s and 29·005 Mc/s have been received, but there have been few written reports giving brief details of the times of reception and signal strengths. Such reports are urgently required, particularly from stations in the Midlands and Southern England, and should be sent direct to R. G. Flavell, GM3LTP, The Observatory, Lerwick, Shetland. IQSY log sheets are available from RSGB Headquarters on request.

Society Affairs **(Continued from page 739)**

Education Scheme and the Committee's participation in the RSGB Radio Communications Exhibition.

At its meeting on July 13, 1964, the Membership and Representation Committee discussed advertising and general publicity, the membership drive, recorded lectures and badges for Area Representatives.

The Finance and Staff Committee at its meeting on July 14 discussed insurance matters, the Contracts of Employment Act 1963, the General Manager's service agreement, the Offices Shops and Railway Premises Act, and the provision of Committee secretaries.

The meeting of the Mobile Committee held on July 15 was devoted principally to a discussion of the arrangements for the Woburn Abbey National Mobile Rally in September.

Among the matters discussed at the meeting of the Scientific Studies Committee held on July 27 were BULLETIN articles, the current tropospheric propagation programme, the operation of GB3LER on 2m and 10m, new offers from members to act as IQSY observers, and the *IQSY Newsletter*.

* * *

The Council was in session for nearly five hours.

1250 Mc/s Tests 1964

THE 1250 Mc/s Tests held on June 27 and 28, 1964, were a convenient focusing point for the summer activity on this u.h.f. band. As can be seen from a perusal of *Four Metres and Down* in the spring issues of the BULLETIN, plans and preliminary tests were being made in several centres while the enforced isolation of these centres was being steadily reduced. A fresh influx of enthusiasm for the band in the south-west is noted: a group comprising G3NAE, G3NIL, G3OBD, G3PFM and C. G. Slingsby, A3527, combined to put on a portable station in South Dorset. G3OBD provided the transmitter which took the form of two triplers: a DET24 driven by a QQV03-20A which was driven in turn by a 2m transmitter. No input or output power was given in their report, however. G3NAE provided the converter which used a germanium diode as the final multiplier in the local oscillator chain and a trough line mixer. The i.f. was 24 to 26 Mc/s to an HRO. The team used a corner reflector, also provided by G3OBD, and a 4 ft. paraboloid dish mounted at about 9 ft. a.g.l.

G3EGV (who apparently operated during the 1963 Tests without success) only operated a portable station as his home location is impractical for u.h.f. at the present state of the art. He obtained an output of about ¼ watt from a TD03-10F tripler and his receiver used a GEX66 as final multiplier. His aerial is a dipole fed trough reflector and the station was operated from Hardy's Monument near Dorchester.

Also on in Somerset, at Ashcott, is G3MPS, and the three stations all worked each other at good strength. The distances were: G3OBD/P to G3EGV/P, 25 miles; G3OBD/P to G3MPS, 30 miles; and G3EGV/P to G3MPS, 33 miles.

G6GN (Bristol) was expected on the band for the Tests using equipment loaned by G3KPT, but no reports of any contacts have been received.

Representing the Midlands is a report from G3NBQ (Coventry) who uses a 2C39A tripler and trough reflector. He made a routine contact with G2CIW (Birmingham) at 19 miles, followed by a series of tests with G2RD on Dunstable Downs. These resulted in the reception of G2RD's signals at RST539, but there was no communication on 1296 Mc/s in the other direction.

Later in the day G3KFD (Kingswinford) was contacted for the first time after nearly a year of trying; reports were RST 549 and 339, and several QSOs have since resulted. Usually, once a path has been established other contacts follow easily, and as equipment and techniques improve the signals can be built up to a level which makes the early efforts seem rather painful. This particular path is 28 miles long, between stations each at about 400 ft. a.s.l. As the intervening land rises to 700 ft. it will be interesting to see how communication develops.

The region loosely termed the South-East of England is now well populated, covered with stations conveniently spaced for tests under all conditions. In the extreme north-east of Essex, G3LQR and G3FIJ, Colchester, are able to work G3LTF in Chelmsford at any time. Contacts with G3NOX/T (G8ACN, Saffron Walden) are possible with some tropospheric assistance, but during the period of the Tests this path was closed as was that to the London area. G3LTF was also worked by G2RD, G2RD/P and G3FP.

G3LQR uses the only p.a. reported on the band, and this is a 3CX100A5 driven by a similar valve as a tripler. The actual input is not given in his report, but this valve, which is a later development of the 2C39, can run up to 100 watts on 1296 Mc/s. His main aerial was a set of four 10-turn helices at 60 ft., supplemented by a 32 element stack at 20 ft.

G3PFM, G3NAE and G3OBD are seen here, left to right, with the aerials used by G3OBD/P for the 1250 Mc/s Tests.
(Photo by A3527)

From Surrey, reports were received from G3FP and G2RD. G3FP operated fixed, and G2RD operated fixed on the Saturday and went portable on the Sunday. The equipment used by both stations was substantially the same as in 1963.

G3FP (Thornton Heath, Surrey) reports contacts with nine stations, three of which were in one direction only, using 70cm as the return band. An attempt to contact G3NNG/P near Wantage failed, though a short burst of c.w. was heard.

G2RD, as last year, operated from two sites: at his home at Wallington, Surrey, and on Dunstable Downs. From home he had six routine contacts, all with stations previously recorded in these notes, and while portable he had four complete and two cross-band contacts. An unsuccessful attempt to contact G3NBQ has been noted. Another attempt to reach G2CIW in the Midlands also failed, although signals were RST579 both ways on 70cm.

G3NNG/P was heard on 70cm arranging a sked with G3LTF. This is a difficult path of about 95 miles with intervening high ground, and presumably no contact resulted or at least one of the participants would have reported it. We suspect that in the past other stations have come on the band during the Tests, have had no contacts, and have quietly dropped out without reporting. At least one station which was not recorded during the 1964 Tests subsequently appeared on 23cm during V.H.F. NFD.

Many operators experience difficulty in arranging contacts on 23cm with other stations, for some stations use 144 Mc/s, while others use 432 Mc/s for preliminary contacts. The great majority, however, use the latter band for arranging skeds and this seems to be a satisfactory arrangement. Stations intending to operate during the Tests in 1965 who have not previously made contacts on the band are strongly advised to approach some of the operators listed in this report and the 1963 Tests. Alternatively, if requested, plans for operation during the 1965 Tests can be published in *Four Metres and Down.*

Transmitters and Receivers

Transmitting and receiving equipment is becoming more standardized. The most popular transmitters use a 2C39 or TD1-100 as a tripler, driven by an existing 70cm rig. A suitable rectangular cavity for this valve was described briefly in the report on the 1962 Tests, and an article about the unit is in preparation. This arrangement has the advantage of being able to be run at any power level from

5 watts (G2RD/P) to 90 watts or more (G3LTF), depending on the available drive. The most popular receiving arrangement is the converter described by K6AXN in the March, 1961 issue of *QST*. Several home-brew designs also obviously found inspiration in that article.

Aerials

Aerials are still varied. Corner and trough reflectors are justifiably popular, and several paraboloid dishes up to 6 ft. in diameter were set up temporarily for test purposes (for not many people are able to leave such a large structure in position continuously). Various multi-element arrays were used for local contacts, but no details of these have been passed on for inclusion in this report. Further information would, nevertheless, still be appreciated.

Test Equipment

There is still very little information available on test gear. G3LTF points out that a length of cheap v.h.f. TV coaxial cable makes an excellent dummy load; a 30 ft. length of UR70 gives a loss of 6db and an input v.s.w.r. of 1·7:1. A longer length, or alternatively a cheaper cable, would improve this figure. The v.s.w.r. can also be improved by terminating the cable with a suitable ordinary carbon resistor, although this may be impractical for r.f. outputs in excess of 5 watts since a quarter of the power may reach the termination. G3LTF uses an s.w.r. indicator devised by G6CJ and G6LL—further information on this unit would be much appreciated.

Stations on 23cm

This list is supplementary to that published on page 49 of the January, 1964 issue of the RSGB BULLETIN.

Call-sign	Power Input	P.A.	Aerial	Receiver
G2CIW	50W (10W*)	2C39†		K6AXN
G3FIJ	8W	2C39†	32 ele stack	K6AXN
G3EGV/P	1W*	TD03-10F†	Trough	
G3KEF		2C39A†		K6AXN
G3LQR		3CX100A5	4 10-turn helices and 32 ele. stack	K6AXN
G3MPS	25W*	2C39A	4 ft. paraboloid	
G3NBQ		2C39A†	trough	K6AXN
G3NAE, G3OBD		DET24†	4 ft. paraboloid corner reflector	GEX66
G3RSB/T		2C39A†		
GM3FYB		DET24†	3 ft. corner reflector	

Amendments

G2RD	35W	TD1-100†	8-over-8
G2RD/P	4W	TD1-100†	3 ft. paraboloid

* power output. † tripler final.

G3FIJ/P, G3ENY/P, G3LHA, G3MAR/P, G3NNG/P, G3OVQ, G6GN, GM3GPK, GM3GUO and GM5VG are also believed to be equipped for operation on 23cm.

Frequencies of 23cm Stations

G3KPT, 1298·1 Mc/s; G3KFD, 1298·22 Mc/s; G2CIW, 1298·25 Mc/s; G3MAR/P, 1297·08 Mc/s; G3NBQ, 1297·3 Mc/s; G3EFX/P, 1297·08 and 1297·47 Mc/s.

D/F National Final

It was a bright and sunny afternoon when 15 finalists assembled in a narrow lane north of Temple Guiting in the Cotswolds for the D/F National Final on September 13.

Maurice Fowler and Don Wilson, the organizers, had hoped for a difficult start, and to help in this respect they had previously experimented with a radiating frame aerial complete with sense, but the latter part, although it worked satisfactorily, was not used, however. The first transmitter, with its frame aerial, was sited in Guiting Wood, just 1¼ miles from the start. The second transmitter was 9 miles away in Chedworth Woods, and almost on the same bearing. V.h.f. and Top Band intercommunication between the stations and the start had been arranged.

It was hoped that competitors would tend to make for the most southerly transmitter, and thus go out of range of the low powered signal from Guiting Wood. However, the tables were turned, for only the signals from the beam could be heard, and after discussion with D. A. Findlay, G3BZG, it was decided to restart the test at 14.00 about halfway to Chedworth, but as signals were still not to be heard, Don Wilson drove south in much haste to find out what had gone wrong. It transpired that the aerial current bulb had burned out, and the operator, G3AYJ, was blissfully ignorant that he was not radiating, for his own receiver, being close to the transmitter, was successfully picking up the weak signals.

At 14.30, a start was made and competitors got away to good signals. The majority made their way direct to Guiting Wood, and then on to Chedworth. The winner, M. P. Hawkins, arrived at Chedworth at exactly 16.00.

Tea was taken at Bourton-on-the-Water, and after all the food had been consumed by the hungry competitors, Mrs Grace Wilson presented a prize of a signal injector to the winner, M. P. Hawkins, and a box of chocolates to the ladies in his team. An Eddystone die-cast box was presented to the runner-up, R. J. Parsons, G3RBP.

Maurice Fowler and Don Wilson thank everyone who worked so hard to put on this final: the owners of the two sites, the operators and their assistants, the RSGB, and, of course, the competitors.

The finalists and their positions in order of time of arrival are shown in the table. As D. R. H. Coller, D. Roome, and S. W. Smith did not hand in their log sheets, they cannot be placed. G. Nicholson was unfortunately not able to be present that afternoon.

RESULTS

Name	Society	Times of Arrival Station A	Station B
M. P. Hawkins	Oxford	15.15	16.00
R. J. Parsons	Oxford	15.18	16.09
G. H. Taylor	Rugby	15.29	16.16
E. W. Bristow	Oxford	15.12	16.16
E. L. Mollart	Oxford	15.29	16.18
A. D. Bristow	Oxford	15.13	16.37
J. J. Grant	Rugby	15.34½	16.41
A. Hitchcock	Derby	16.44	15.48½
R. Pearce-Boby	Oxford	17.36	15.27
P. M. Williams	Slade	17.22	—
I. A. Jackson	Rugby	—	15.49½

Letters to the Editor

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

Exploration of the Four Metre Band

DEAR SIR,—The recent article by Mr. D. N. Biltcliffe, G6NB, under the above title has provoked a number of letters to you, and to the V.H.F. Committee, on the subject of the suggested 4m band plan.

This article was written by G6NB at the request of the Society's V.H.F. Committee, of which he is a member, and was intended to provoke a response, this being the most effective way of obtaining the general viewpoint. We have "flown the kite," and it has been shot at. We must now re-consider the question of planning in this band armed with a wide selection of views—our thanks to all who have written on this subject.

Yours faithfully,
R. C. HILLS, G3HRH
Chairman, V.H.F. Committee

Band Plan for Four Metres

DEAR SIR,—There is at present much discussion on the future use of the four metre band. This mainly seems to be centralized on the use of the band for mobile stations, and I would therefore like to suggest that we take a few tips from the largest v.h.f. mobile service of all, i.e. the Aeronautical Mobile Service.

The first thing that springs to mind is the standardization of polarization—vertical polarization is obvious for mobile stations. Secondly, all transmission and reception on pre-determined channels with crystal controlled transmitters and receivers.

As a basis for discussion may I suggest that the mobile channels be 70·15 Mc/s and every 100 kc/s up to 70·65 Mc/s. Stations active in RAEN could also have a channel on 70·375 Mc/s making a total of seven mobile channels. This should be sufficient in any one area under normal conditions. To further simplify mobile operation one of the channels should be designated, by general agreement, as a calling frequency only, on which one would call CQ only and QSY after making contact on to one of the other mobile frequencies.

To take maximum advantage of this system mobiles would have to be equipped to operate several, if not all of the mobile channels and fixed stations wishing to work mobiles should carry the calling frequency and at least one other mobile frequency.

If the crystals are switched into circuit by relays, the only equipment that need be in sight in the car is a channel change switch, a loudspeaker and a volume control for the receiver, which could save a lot of negotiation with the XYL.

Technically there should be few problems in this system, apart from the number of crystals required. The channels would be sufficiently close together so that if all circuits were initially resonated in the centre of the band no further retuning should be necessary and if i.f. bandwidths are made to be in the region of 25 kc/s this should take care of troubles due to inaccuracies of marked crystal frequencies.

Naturally, fixed station QSOs should try and avoid the mobile channels and the fixed stations when not working mobiles could use any form of band planning in general agreement.

Incidentally, whilst mentioning band planning I notice that many GM stations are not allowed to use the sector of the band that is earmarked as the GM part in the band plan.

Whilst I do not suggest the answer to all our problems on 4m mobile operation is contained in the foregoing, I do suggest that this system is one that would go a long way towards solving the problems on the band.

Yours faithfully,
W. B. KENDAL, GM3GDU

By Campbeltown, Argyll.

V.H.F. Band Plan

DEAR SIR,—Regarding the current discussion on the need for a 4m band plan, and the earlier suggestion that a portion of the 2m band should be reserved for c.w. only, I believe that some thought should be given to the existing 2m band plan. Earlier this year I took note of the frequencies used by stations received at Danbury under normal conditions, and the following summary was prepared.

Kent stations in their own zone	16
Kent stations out of their own zone	21 (mostly in Zone 5)
Other stations in their own zones	37
Other stations out of their own zones	42

Therefore 53 were working in their own zones, while 63 were not. So much for band planning. Of the stations out of their Zones, 26 had two-letter calls.

One point is clear from these figures; if all the Kent stations moved into their zone it would be uncomfortably congested, and I would suggest that part of Zone 3 should be added to Zone 4. Speaking for myself, Zone 3 is usually devoid of its rightful occupants in this area, and I assume the same applies to most of the south-east. With the addition of part of Zone 3 to Zone 4, however, the Zone 5 stations would then be able to get into their own zone, which has to cater for six home counties. I think that a band plan is necessary, but it needs the RSGB to set up a crystal exchange bureau, and perhaps appoint someone to etch crystals for the chaps who cannot do it themselves. Crystals are still inexpensive on the surplus market, and there is no real excuse for being out of zone. A simple variable crystal oscillator will shift an 8 Mc/s crystal 200 kc/s on 2m, and 100 kc/s on 4m.

It is not necessary or advisable to wander all over the zone. A variable crystal oscillator can be used to select a clear channel, although I see nothing against netting in one's own zone, which certainly helps when one wishes to contact a particular station. The 2m band is now in the same state as the l.f. bands in the early 1930's, when we all had our *own* crystal controlled frequencies.

I see that the s.s.b. chaps are tending to net around 145 Mc/s, which means out of zone operation for some. I would not say that it is a bad thing in this case, but would suggest the dividing frequency between Zones 5 and 6 of 145·1 Mc/s as being more suitable.

Regarding c.w. operation in a zone of its own, I am not sure that it is a good thing, for the locals would jam each other out, as at present. If, however, one wanted to contact Cornwall or the west country for instance, one would know just where to look for them and they would be free from severe local QRM.

As far as I can judge it does seem to be the stations in the south-east who fail to observe the band plan, which is surprising as I imagine the main source of supply of surplus crystals is in the south-east.

As regards a 4m band plan, if the chaps will not conform to it, I say leave it alone. I expect to be shot down in flames over this, but never mind, the point is that if we want a band plan, we should observe it.

As regards making a v.x.o., circuits have been published in past issues of the BULLETIN. The method of etching crystals has also been described.

Yours faithfully,
Danbury, Essex. H. G. COLLIN, G2DQ

RAE Examination Centres

DEAR SIR,—In recent years members of the Clifton Amateur Radio Society have always featured in each new block of call-signs issued.

It is with some concern that I learn from some of our members of the difficulty they have experienced in having their applications to take the RAE accepted by certain educational establishments. Apparently one has to take a course at the establishment concerned to qualify to sit the examination. Also with regard to these courses there are certain age limits imposed and pupils under 18 years of age are not accepted at our local technical college. Some five years ago I endeavoured to help one of our members to get enrolled for the RAE course at this same establishment; he was 17 years of age. I was unsuccessful and this lad left the amateur ranks through losing interest owing to the attitude of the educational authority. It is also observed that fewer than ever institutes now cater for the RAE course and examination.

I would like to hear from members as to whether they feel this is a satisfactory state of affairs. Are amateurs who cannot attend a course but who wish to study at home to be penalized by this red tape, and are our youthful members to be discouraged from staying in the amatuer radio movement ?

Yours faithfully,
W. A. MARTIN, G3FVG
Chairman, Clifton Amateur Radio Society

London, S.E.14.

Modifying the B44

DEAR SIR,—On reading G3PHG's excellent series on converting the B44 Mk. 2 transmitter-receiver (September issue), it struck me that some readers might be slightly confused, as the B44 Mk. 3, which is now generally available, bears not the slightest resemblance to the Mk. 2.

Briefly, the Mk. 3 is a more modern unit having three crystal channels, independent in the transmitter and receiver, with a single 5763 in the final running 10 watts without modification.

The receiver is a single conversion superhet with an i.f. of 54 kc/s having a bandwidth of 50 kc/s. You have not read wrongly; the reason for the low i.f. was to overcome unwanted second-channel reception. At this i.f. the image response is adjacent to that of the signal channel and both responses are embraced in an r.f. bandwidth of 150 kc/s.

In service operation a 200 kc/s channel separation was used, thus eliminating spurious second channel interference. The wide bandwidth was necessary to allow for tolerances of the l.o. crystal and transmitter frequency and was achieved by making the second i.f. (V5) a parallel voltage feedback amplifier, thus loading the tuned circuits to a suitable level (and much reducing the gain).

All in all this is a rather novel method of achieving the required end, necessitating a much more radical approach to conversion, in the receiver at any rate, than the Mk. 2.

Yours sincerely,

Bewdley, Worcs. GRAEME WORMALD, G3GGL

Interference from Power Lines

DEAR SIR,—The local Electricity Board is planning an 11 kV overhead line near my QTH.

I would be grateful if any member with an 11 kV line within a half mile of his house would kindly write to tell me what QRN he has experienced from it and how far away the 11 kV line is.

Yours faithfully,

Parsonage House, BOB TEMPLER, G3RDX
Woodbury, near Exeter.

RSGB Slow Morse Practice Transmissions

The following Slow Morse Practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sent to the Honorary Organiser, M. McBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.

Time	Call-sign	kc/s	Town
Sundays			
08.00	G3KLT	1827	Birmingham
09.30	G3KZZ	1920	South Shields, Co. Durham
10.15	G3CGD	1875	Cheltenham
10.30	GI3JEX	1860	Belfast
11.00	G2FXA	1900	Stockton-on-Tees
12.00	GM3HBY	1903	Glasgow
12.00 †	G3HVI / G3OGD	1890	Stoke-on-Trent
12.00	G3SQU	1840	Margate, Kent
18.30	G3NCZ	1920	Blackburn, Lancs.
19.00	G3SEP	1980	Gt. Yarmouth
19.00	G3NPB	1875	Hexham, Northumberland
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.30	G3NQR	1875	Harrow Weald, Middx.
Mondays			
18.30	G3NC	1968	Swindon
18.30	G3NCZ	1920	Blackburn, Lancs.
19.00	G3MXS	1875	Birkenhead
19.00	G3NPB	1875	Hexham, Northumberland
19.30	G3LZV	1910	Canterbury, Kent
19.30	G3SRY	1920	Cheam, Surrey
19.30	G3SWR	1980	Middlesbro, Yorks.
20.00	G3HJG	1825	Manchester
20.00	G3IBJ	1910	Southampton, Hants.
20.00	G3PKZ	1930	London N.22
21.00 †	G3IRM / G3MWO / G3PHW	1981	Bury St. Edmunds
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.15	G3ADQ	1990	Bradford, Yorks.
21.30	G2BSW	1865	Studley, Warks.
Tuesdays			
19.00	G3NPB	1875	Hexham, Northumberland
19.00	G3NUE	144·26 Mc/s	Worcester
19.30	G3RFL	1910	Great Harwood, Lancs.
20.00	G3RZO	1865	Redditch, Worcs.
20.00	G3PJI	1910	Southampton
20.00	G3AYJ	1925	Birmingham
20.30	G3NKX	1915	Loughton
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.30	G3HZG	1865	Redditch, Worcs.
22.00	G3AWL	1980	Wingate, Co. Durham
22.00	G3HZM	1925	Manchester
Wednesdays			
18.30	G2FXA	1900	Stockton-on-Tees
19.00	G3GBS	1865	Moseley
19.00	G3GBJ	1870	Redditch, Worcs.
19.00	GW3CJR	1930	Newbridge, Mon.
19.00	G3RBP	1860	Oxford
Wednesdays			
20.00	G3RQX	1840	Wolverhampton, Staffs.
20.00	G3SAD/A	1980	Stevenage, Herts.
20.30	G3KGU	1920	Theydon Bois, Essex
20.30	G3AGN	1875	Felixstowe
21.00 †	G3HVI / G3OGD	1890	Stoke-on-Trent
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.00	G3POU / G3KAD / G3SFO	1850	Doncaster, Yorks.
Thursdays			
18.30	G3NC	1968	Swindon
19.00	G3NUT	1875	Wallasey
19.00	G3NPB	1875	Hexham, Northumberland
19.30	G3LZV	1910	Canterbury, Kent
19.30	G3RFL	1910	Great Harwood, Lancs.
20.00	G3NHR	1900	Hounslow
20.00	G3LLM	1820	Bath, Somerset
20.00	G5XB	1878	Reading, Berks.
20.30	G3RSF	1925	Harlow, Essex
21.00 †	G3IRM / G3MWO / G3PHW	1981	Bury St. Edmunds
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.00	G3ADQ	1990	Bradford, Yorks.
21.30	G3EVT	1865	Redditch, Worcs.
22.00	G3AWL	1980	Wingate, Co. Durham
22.00	G3LLM	1820	Bath, Somerset
Fridays			
18.30	G3NCZ	1920	Blackburn, Lancs.
19.00	G3RBP	1860	Oxford
19.00	G3NPB	1875	Hexham, Northumberland
19.30	G3PWU	1850	Reading, Berks.
20.30	G3SDQ	1920	Leyton
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.00	G3PKE	1920	Dorking, Surrey
21.30	G3RZI	1865	Redditch, Worcs.
21.30 †	G3RPW / G3KSS	1900	Pudsey, Yorks. Bradford
22.00	G3LLM	1820	Bath
23.00	GM3HBY	1903	Glasgow
Saturdays			
10.00	G3SQU	1840	Margate, Kent
13.00	G2FXA	1900	Stockton-on-Tees
14.00	GI3JEX	1860	Belfast
15.30	G3RFL	1910	Great Harwood, Lancs.
19.00	G3NPB	1875	Hexham, Northumberland
20.00	G3KPO	1980	Peterborough
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.

†*Alternately*

CLUBROOM

A Monthly Survey of Group and Club Activities

As the schedule, and hence the closing date for this issue of the BULLETIN was moved forward a few days to enable copies to be made available on the RSGB stand at the Radio Communications Exhibition, few newsletters were available on which to comment. One which just made the deadline was *QAV*, the newsletter of the AERE (Harwell) ARC. Amid a lengthy report on the happenings during NFD was an interesting piece headed, " Gems from the Uncorrected Log Slips "—G3--- was logged /P in the Edgware Road; GC3---/P was recorded as being in Alderney (top left hand corner); G3---/P was copied as being 3 SW of Dodgyone; G3--- gave his QTH as 5 km south of Portsmouth. /MM?" A very interesting article entitled " V.H.F. Transistorization " was published in the *MARS Newsletter*. It described the 2m transistor transmitter described in *Four Metres and Down* in the May 1964 BULLETIN, with the addition of a number of modifications and a field test carried out by G3KPT. The Cray Valley Radio Society's *QUA* contained a summary of a talk given by G2MI on his early days in Amateur Radio; one paragraph which shows how times have changed described how quartz crystal units were assembled from the lenses of reading glasses sold by Woolworths! The September *EARS Newsletter* is unfortunately considerably shorter than usual, and the introduction foretells the possible discontinuation of the newsletter, through lack of support by members of the Echelford ARS in providing material. We would view this as a great pity, for it is normally a very well produced, informative document. The North Kent Radio Society's newsletter carries an original piece on " How to be a Successful XYL," in which, under the heading " Budgeting," the equivalents (in price) of various items of amateur equipment were given; e.g., one 807 = two pairs stockings; one pair headphones = one evening's pictures plus visit to Ferraro's; one complete kit for working mobile = one mink stole—watch it, chaps!

News from the Clubs

Basildon and District ARS. P. K. Blair, G3LTF, will be giving a lecture on v.h.f. and u.h.f. to the society on December 9, and all members of the RSGB are invited. The meeting will begin at 8 p.m. at the " Bullseye " Public House, Southernhay, Town Centre, Basildon, and there are adequate car parking facilities available. *Honorary Secretary*: C. Robertson, Milestone Cottage, London Road, Wickford, Essex.

Barnsley and District ARC. Since the summer recess, the club has held its AGM, and a visit was paid to the Saml. Fox steel works to inspect the electronic methods of controlling steel manufacture. At the AGM, the following officers were appointed: *Chairman*, D. Geldart; *Honorary Secretary*, J. A. Ward, G4JJ, 44 Northgate, Barnsley; *Honorary Treasurer*, W. W. Williams. The programme for the coming year has been compiled, and meetings will be held on the second and fourth Fridays in each month at 7.30 p.m. at the Lecture Rooms, King George Hotel, Peel Street, Barnsley.

Basingstoke ARC. The following officers were elected at the recent AGM: *Chairman*, D. R. Revell, G3MGZ; *Honorary Secretary*, P. Jackson, G3ADV, 11 Oaklands Way, Winklebury, Basingstoke; *Honorary Treasurer*, E. T. Clarke; *Publicity Manager*, L. M. C. Berry, BRS26215.

The **Bristol Amateur Radio Club** held its first AGM on September 24, at which 42 members attended, which included eight licensed amateurs. The officers elected are: *Chairman*, M. Blake, G3OUK; *Vice-Chairman*, M. N. Egan, G3SJN; *Honorary Secretary*, C. Davis, G3SXY; *Honorary Treasurer*, H. W. Leonard, G4UZ; *Finance Adviser*, M. Batt, G3SJI; *Honorary Auditor*, P. Elton; *PRO*, R. Adamson, BRS26212. The present address for meetings is the University Settlement, 43 Ducie Road, Barton Hill, Bristol 5, although the club expects to move to new premises shortly.

City and County of Bristol Group. Members of the Bristol Group became temporary members of the Civil Defence organization on September 25 when they visited the CD training centre at Charnwood. An interesting programme had been arranged for them, and included a tour of the premises and a film entitled " A Hole in the Ground." *Honorary Secretary*, E. C. Halliday, G3JMY, 4 Parkside Avenue, Winterbourne, Bristol.

Cambridge and District ARC. The Autumn season opened on September 4 with a sale of surplus equipment, which enjoyed an extremely good turn-out. One of the items, an Eddystone 750 receiver, was purchased on behalf of the club for use at the club headquarters. On September 25, a large number of Luton Club members arrived at the meeting to return a visit made to Luton in June by the Cambridge Club. During the evening there was an " Any Questions ?" session, when G3NBP, G3BBY, G3GGK and G2CDX dealt with a wide variety of questions, with G5BQ as Question Master. Refreshments and a junk sale completed a very pleasant evening.

Cannock Chase ARS. The AGM was held recently, and the officers elected are: *President*, W. Schaefer, G3PNN; *Vice-President*, D. Rhodes, G3LUP; *Chairman*, G. Hayward, G3MDF; *Honorary Treasurer*, K. Ballance, G3KNB; *Honorary Secretary*, C. J. Morris, G3ABG, School House, 24 Walhouse Street, Cannock, Staffs.; *Assistant Secretary*, B. A. Morris; *Auditor*, G. Taylor, G3HRR; *Newsletter Editor*, J. Reynolds, G3PTO. Meetings will in future be held at the George Inn, Walsall Road, Cannock, Staffs, at 7.30 p.m.

Chelmsford. Over 60 people were present at the September meeting to hear Peter Blair, G3LTF, relate his experiences of 70cm moonbounce communication, and describe the equipment he uses on this band. Interest in the club apparently still runs high, and the standard of lectures each month is being well maintained. The social life is not being neglected, for YLs and XYLs are always welcome to attend the informal monthly meetings held at the " Wheatsheaf," in New Street, provided, of course, that they can withstand the inevitable rag-chewing on amateur matters. Details of these gatherings may be obtained at the regular lecture meetings at the Marconi College on the first Tuesday in each month.

Derby and District ARS. Activity during September included a visit to the local telephone exchange for a demonstration of the operation of STD. On September 17 members were guests at the social evening organized by the Heanor and District Amateur Radio Society in the Refectory at Heanor Technical College. Meetings, which are held each week, are preceded by a Morse practice session conducted by G. Treece, G3JIY, commencing at 7 p.m. in the society's sub-basement club rooms in the College of Art. *Honorary Secretary*, F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.

Dorking and District RS. The Dorking Society reports average success with the V.H.F. NFD this year, although the site used, which was a new one, seemed to be an improvement on the previous locations. At the September meeting, the Chairman, Bruce Bonehill, G3LHC, gave an interesting talk, illustrated with colour slides, on his recent visit to China and Japan. The next two meetings will be held on November 10 and 24 at the " Wheatsheaf " and " Star and Garter " respectively. Visitors are always welcome.

Glasgow Group. At the meeting on September 2, members had a chance to welcome the President of the RSGB, G. M. C. Stone, G3FZL, who provided them with a first-hand report of the Region 12 ORM.

Harlow and District RS. An amateur radio workshop and construction practice course has been arranged at the Latton Bush School, Southern Way, Harlow, with P. Essery as instructor. An RAE evening course has also been organized, and will be held at the Harlow College of Further Education. The instructor will be Colin Hebden, G3GRQ. *Honorary Secretary:* G. O'Donald, G3TLG, " Great East," Roydon Road, Roydon, Harlow, Essex.

Lothians RS. A very competent lecture by J. R. Spankie of the BBC began the Winter session for the Lothians RS. The next venture will be in connection with a Hobbies Exhibition to be held in the Waverley Market, Edinburgh, from November 7 to 14, at which the society will have a stand with h.f. and v.h.f. transmitters in operation. *Honorary Secretary:* T. Spears, GM3OWI, 24 Priestfield Road, Edinburgh 9.

Peterborough and District RS. A. Swain, G3KWY, spoke on " Exotic DX " at a meeting held in the Lecture Hall at Peterborough Technical College on October 2. The new club room in the Old Millhouse behind the " Peacock " Inn, London Road, Peterborough, is now open every Friday from 7 p.m., and visitors are invited to attend and see the club station in operation. *Honorary Secretary:* D. Byrne, G3KPO, Jersey House, Eye, Peterborough, Northants.

Reading ARC. A mobile picnic was held during fine weather on September 20, and 80 people turned up. There were 20 cars equipped for mobile operation, with five containing apparatus for 2m, and 15 for 160m. The meeting to be held on November 28 will be devoted to the conversion and use of Government surplus apparatus. All entries for the Trophy competitions organized by the club will have to be handed in at the meeting, for the judging will take place at the meeting on December 19. *Honorary Secretary:* R. G. Nash, G3EJA, " Peacehaven," 9 Holybrook Road, Reading.

Salop ARS. This report marks the first anniversary of the Salop Amateur Radio Society. The previous radio club in Shropshire had failed through lack of support, and therefore this venture was started with some misgivings. We are glad to learn, however, that the response has exceeded all optimistic expectations, and members continue to be very enthusiastic. The club station G3STR/A at the Church Stretton Traction Engine Rally was a great success, and 40 QSOs were made on 80 and 160m. Immediately afterwards, the Shrewsbury Carnival Committee requested that a station be put on at the Carnival on September 12. *Honorary Secretary:* Dr. K. E. Jones, G3RRN, " Greystones," Shrewsbury Road, Church Stretton, Salop.

South Birmingham RS. There has been little activity during the month prior to the AGM on October 15, with the exception of an SBRS/SCARS Mobile Rally, the winners of which were: 1st G3TDL, 2nd G3GLQ, 3rd Mr. Collins, and, for the fastest time, G3JFL. The meeting on November 19 at the Friends Institute will include three films by Mullard Ltd. on transistors. *Acting Honorary Secretary:* A. E. Bishop Jnr., 40 Cecil Road, Birmingham 29.

South Dorset RS. Members at the October meeting stood in silence for one minute in respect of their late President, Thomas Russell Stevens, FRCS, G3DUQ. The meeting then proceeded with a talk and demonstrations on Meteorology given by Mr. Box, father of the treasurer, G3RZG. The V.H.F. NFD station at Batcombe Downs in Dorset proved quite a success. A talk on " Outer Space " is programmed for the November meeting. *Honorary Secretary*: C. E. Biggs, 54 Prince of Wales Road, Dorchester, Dorset.

South Shields and District ARC. The club held its AGM in September, and the following officials were elected: *President*, Capt. E. Clarke, G8AO; *Vice-President*, E. Glenwright; *Chairman*, F. E. Loxham, G3TNF; *Vice-Chairman*, K. Sketheway, BRS20185; *Honorary Secretary*, D. Forster, G3KZZ, 41 Marlborough Street, South Shields; *Honorary Treasurer*, W. Armstrong, G3PRE. Meetings are held weekly on Friday evenings at the Trinity House Social Centre, Laygate, South Shields, at 7.30 p.m. There will be a junk sale on November 6.

Southampton Group. The group has been very active during the summer, when visits to the Esso Petroleum Refinery at Fawley, Hants., and the National Physical Laboratories in London were arranged. The group also maintained an exhibition station at the Great Southampton Show, one of the City's main annual events, and National Field Day was not neglected. A club room in the centre of Southampton has recently been acquired, and it is anticipated that it will prove useful for various inter-group committee meetings, as well as providing a suitable place for members to carry out constructional work, test gear being readily available. A recent " beer-skittles " evening was enjoyed by a number of members, and it is hoped that it will be the first of a series of such evenings. G. J. Meikle, G3NIM, 34 Victoria Road, Netley Abbey, Southampton, Hants., will be glad to answer any queries concerning the group and its activities.

Southgate, Finchley and District Group. The main monthly meeting will be on November 12, when there will be a home-constructed equipment competition for the G6QM Trophy. The second meeting on November 26, which is intended mainly for SWLs, will include slow Morse practise. Meetings are held at Atlasta Lodge, Tottenhall Road, Palmers Green, London, N.13, at 8 p.m. *Honorary Secretary:* R. Wilkinson, 33 Amberly Road, Palmers Green, London, N.13.

Surrey Radio Contact Club. At the monthly meeting on Tuesday, November 10, Clem Jardine, G5DJ, will give his talk on " Cables," which was postponed last month. *Honorary Secretary:* S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon, Surrey.

Torbay ARS. At the September meeting, a special welcome was extended to L. G. Williamson, an engineer with the Decca Navigator Co., from the Shetland Isles. The club SWL Cup was awarded to G. Cumming. The next meeting will be held on November 7.

Wimbledon and District RS. The talk on " Radar Techniques " given on September 11 by John Whitney, G3MFB, proved so interesting that the meeting over-ran the permitted time and members were thrown out by the caretaker! However, it is intended to continue with the subject in November, and the AGM will be held over until December 11. *Honorary Secretary:* E. N. Hurle, G3RZN, 156 Monkleigh Road, Morden, Surrey.

Worcester and District ARC. An RAE course has been started, and takes place on Friday evenings at the club headquarters, Hut 35, Perdiswell Park, Droitwich Road, Worcester. Meetings are held on Saturdays at 7.30 p.m., and the AGM is scheduled for November 17. The club station, G3GJL, is active on most Tuesday and Saturday evenings, on all bands between 160m and 10m, and also 2m. Details of club activities may be obtained from the *Honorary Secretary:* G. W. Tibbetts, at his new address, 25 Greenford Gardens, Martley Road, Worcester.

Worthing and District ARC. The AGM was held on September 15, at the conclusion of a very successful year. Membership rose to over 30, but the club organizers would still like to see an improvement. Meetings are held on the second Monday in each month at 8 p.m. at the Adult Education Centre, opposite the Police Station, Worthing. New members and visitors will be especially welcome. The next meeting on November 9 will be concerned with the construction and use of test equipment.

Can You Help?

● C. C. Chirnside, VK3WQ, 8 Blake Street, Canefield, S.E.8., Victoria, Australia, who wishes to obtain the circuit of the Admiralty Wavemeter type G73, and would like advice on adjusting an AR88D receiver to make the centre-scale dial calibrations correspond with the received frequency?

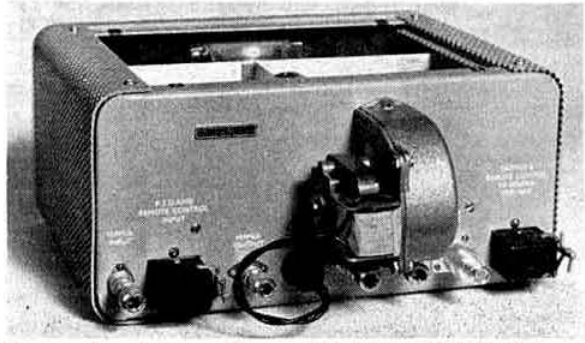
● P. G. Browning, BRS22261, Grasmere, Coggeshall Road, Earl's Colne, nr. Colchester, who wishes to obtain or borrow the circuit of the R89/ARN-5A, 24V d.c. aircraft receiver?

● A. C. Mee, BRS25629, 1 Wynstanley Road, Saffron Walden, Essex, who wishes to borrow or purchase the circuits or manuals for the BCC/Marconi v.h.f. transmitter-receiver type L67C, and the 1·5-18·5 Mc/s US Naval Receiver type R105A/ARR15?

● K. Forbes-Sinclair, 14 Monmouth Road, Watford, Herts., who requires the circuit and any other information on the Erskine oscilloscope type 13?

● P. G. Bigam, GM3SBS, 7 Hillview Terrace, Corstorphine, Edinburgh 12, who requires the manual, or any information on the transmitter type 53 (10D/1310), covering 2·4-6·5 Mc/s, and 4·8-13 Mc/s?

● P. K. Hamblett, G8AAL, 234 Shenstone Avenue, Norton, Stourbridge, Worcs. who wishes to buy or borrow the manuals for the Lavoie type 105SM (TS-127U) u.h.f. frequency meter, and the Advance type E.1 r.f. signal generator?



The rear view of the new Green and Davis Ltd. 70CM1000 40-90 watt 432 Mc/s tripler-amplifier. The blower provides forced air cooling for the QQV03-20A tripler and the QQV03-20A or QQV06-40A p.a. The 70CM1000 can be driven by a 2m transmitter, the Green and Davis 2M15-20A Falcon, which is built in a matching cabinet, or the 2M1000 being suitable. A heavy-duty aerial change-over relay is incorporated, but this can be bypassed for duplexing systems.

Forthcoming Events

Details for inclusion in this feature should be sent to the appropriate Regional Representatives by the first of the month preceding publication. A.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.

LOOKING AHEAD

October 28-31.—RSGB Radio Communications Exhibition.

December 18.—RSGB Annual General Meeting.

May 30, 1965.—RNARS Mobile Rally at RN Signal School, HMS Mercury.

REGION 1

Ainsdale (ARS).—October 28, November 11, 25, 8 p.m., 77 Clifton Road, Southport.

Blackburn.—Fridays, 8 p.m., West View Hotel, Revidge Road.

Blackpool (B & FARS).—November 2 (Tape Lecture, "International Conference and Amateur Radio," by A. O. Milne, G2MI), November 9 ("Home-Built Crystal Controlled Converter," by M. Denny, G6DN), November 16 (Tape Lecture, "Elements of Radio Valve Theory and Manufacture"), November 23 ("Aeronautical Electronics," by M. B. Morgan, G8JU), November 30 (Junk Sale), 8 p.m., Pontins Holiday Camp, Squires Gate.

Bury (BRS).—November 10 ("Single Sideband," by A. Newall, G3QV), 8 p.m., Knowsley Hotel, Kay Gardens.

Chester.—Tuesdays, except November 3 and December 1, 8 p.m., YMCA.

Eccles (E & DAC).—Tuesdays, 8 p.m., The Congregational Mission Church, King Street.

Liverpool (L & DARS).—Tuesdays, 8 p.m., Conservative Association Rooms, Church Road, Wavertree.

Macclesfield.—November 10, 24, 42 Jordongate.

Manchester (M & DARS).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10.

(SMRC).—Fridays, 7.45 p.m., Rackhouse Community Centre, Daine Avenue, Northenden.

Morecambe.—November 4, December 2, 125 Regent Road.

Preston.—November 10, 24 (All meetings start with a Morse practice at 7.30 p.m.), St. Paul's School, Pole Street.

Southport (SRS).—Wednesdays, 8.30 p.m., Sea Cadets Camp, The Esplanade.

Stockport.—November 4, 17, December 2, The Blossoms Hotel, Buxton Road, Stockport.

Wirral.—November 4, 18, December 2, 7.45 p.m., Harding House, Park Road West, Claughton, Birkenhead.

REGION 2

Barnsley.—November 13 ("Transistorized S.S.B. Exciter," by G. Billington, G3EAE), November 27 (Debate), King George Hotel, Peel Street.

Bradford.—November 10 (Mullard Film Show), Queen's Hall, Bradford, November 17 (Junk Sale), 7.30 p.m., 66 Little Horton Lane.

Catterick.—Tuesdays and Thursdays, 7.30 p.m., Clubroom, Vimy Road.

Northern Heights.—November 10 (Mullard Film Show), Queen's Hall, Bradford, November 11 (SWLing by Alan Robinson, Richard Constantine and Philip Ealham), November 25 ("Transmitter Alignment," by Mr. L. M. Dougherty, B.Sc., F.R.A.S.), 7.30 p.m., Sportsman Inn, Ogden.

Scarborough.—Thursdays, 7.30 p.m., rear of No. 3 Trinity Road.

Spen Valley.—November 12 (Visit to Home Office Wireless Depot), November 26 ("S.S.B."), 7.30 p.m., Heckmondwike Grammar School.

REGION 3

Birmingham (MARS).—November 17 (Film Show), 7.30 p.m., Midland Institute, Paradise Street, Birmingham.

(South).—November 19 (Film Show), 7.30 p.m., Friends Meeting House, Balsall Heath.

Coventry.—Mondays, 8 p.m., Westfield House, Radford Road, Coventry.

Stourbridge (STARS).—November 3 ("Oscilloscopes," by G. Woolfenden and E. Brickstock), 7.45 p.m., Foley College, Stourbridge. November 6 (Annual Dinner), 8 p.m., Bell Hotel, Stourbridge.

Stratford-upon-Avon (S-u-AARS).—November 6 (Club Room Renovation), November 20 ("TV," by J. Lambert), November 27 (Club Night), 8 p.m., Mason's Arms, Sanctus Road, Stratford-upon-Avon. November 13 (Visit to Beecham's Buildings, Shipston), meeting at 7 p.m. at Mason's Arms, November 25 (Talk to International Friendship League), "The Firs," Stratford-upon-Avon.

Wolverhampton (WARS).—November 9 (Combined meeting with Wolverhampton Astronomical Society), 8 p.m., Neachells Cottage, Stockwell Road, Tettenhall.

University of Keele RS.—October 10 (Students' Mart), 10 a.m., in the Students' Union, October 12, 7.30 p.m., Club Room in Sneyd Annexe.

REGION 4

Burton-on-Trent (B-o-TARS).—November 11 (Auction Sale), November 25 (Annual Dinner), December 9 (Film Show), 7.30 p.m., Club Rooms, Stapenhill Institute, Burton-on-Trent.

Chesterfield (C & DARS).—November 4, 7.30 p.m., Newbold Observatory, Newbold Road, Chesterfield.

Derby (D & DARS).—November 4 (Surplus Sale), November 11 (Communication Receivers—Demonstration), November 18 (Film Show), November 25 (Open Evening), December 2 (Surplus Sale), 7.30 p.m., Room No. 4, 119 Green Lane, Derby.

(DSW Exp Soc).—Fridays, 7.30 p.m., Sundays, 10.30 a.m., Club Room, Nunsfield House, Boulton Lane, Alvaston, Derby.

Grimsby (GARS).—November 12, 26, 8 p.m., Model Engineers Club Rooms, Fletchers Yard, Wellowgate, Grimsby.

Heanor (H & DARS).—November 3 ("Receiver Alignment," by E. West, G3KTP), November 10 ("RTTY," by J. Roberts, G3OKX, and A. Woodroffe, G3OVZ), November 17 (Surplus Sale), November 24 ("The Finishing Touches to Home Made Equipment," by A. Hitchcock, G3ESB), December 1 (Film Show), 7.30 p.m., Room No. 5, Heanor Technical College, Ilkeston Road, Heanor, Derbyshire.

Leicester (LRS).—Mondays, 7.30 p.m., Sundays, 10.30 a.m., Club Room, Old Hall Farm, Braunstone Lane, Leicester.

Lincoln (LSWC).—First Wednesday in each month, 7.30 p.m., Lincoln Technical College, Cathedral Street, Lincoln.

Loughborough (ARC).—November 6 (Tape Lecture "Transmitter Design and TVI," by N. N. Shires, G3BTM), November 13 (Club Night on the Air), November 20 (Equipment Sale), November 27 (Film Show), November 29 (Trip to Rugby Radio Station), 7.30 p.m. Club Room, Corporation Hotel, Wharncliffe Road, Loughborough.

Mansfield (MRS).—Fridays, 7.30 p.m., ATC Headquarters, Sutton Road, Mansfield.

Melton Mowbray (ARS).—November 26 (Constructional Evening), 7.30 p.m., St. John Ambulance Hall, Ashfordby Hill, Melton Mowbray.

Nottingham (ARCN).—Tuesdays, Thursdays, Room No. 3, Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham.

Northampton (NSWC).—Thursdays, 7 p.m., Allen's Pram Works, 8 Duke Street, Northampton.

Worksop (NNARS).—Tuesdays (RAE Classes) Thursdays (Lectures) 7.30 p.m., Club Rooms, 13 Gateford Road, Worksop Notts.

REGION 5

Bedford (B & DARC).—Inaugural Meeting on October 29, at Harpur Secondary School. Details from G3OWQ, 12 Robin Hill, Brickhill, Bedford.

Cambridge (C & DARC).—November 6 (Introduction to Amateur Radio—mainly for juniors), November 13 (Activity Evening), November 20 (Amateur TV), November 27 (Activity Evening), 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge.

Cambridge University (CUWS).—Tuesdays, 8.15 p.m., Psychology Department Lecture Room, Downing Site, during University Term. Freshmen welcome.

Haverhill (H & DARC).—Mondays, 7.30 p.m., Secondary Modern School, Haverhill, Suffolk.

Luton (L & DARS).—November 3 (Demonstration by J-Beam Aerials Ltd.), November 10 (Five Minutes per Member—prize for best idea), November 17 (RSGB Tape, "TVI"), November 24 (Activity Evening—prize for best gear on display), December 1 (Demonstration by Green & Davis), 8 p.m., ATC Headquarters, Crescent Road, Luton, Beds.

March (M & DRAS).—Tuesdays, 7.30 p.m., rear of Police Headquarters, High Street, March, Cambs.

Royston (R & DARC).—Wednesdays, 8 p.m., Manor House Social Club, Melbourne Street, Royston, Herts.

Shefford (S & DARS).—November 5 (Annual Dinner Preparations and Junk Sale), November 12 ("Modern Crystal Manufacture," by J. Johnson), Thursdays, 7.45 p.m., Town Recreation Centre, Hitchin Road, Shefford, Beds.

REGION 6

Cheltenham.—First Thursday in each month, 8 p.m., Great Western Hotel, Clarence Street, Cheltenham.

Gloucester.—November 5, 19, and all subsequent Thursdays, 7.30 p.m., "The Cedars," 85 Hucclecote Road, Gloucester.

Oxford (O & DARS).—October 28 (AGM), second and fourth Wednesdays in each month, 7.30 p.m., Cherwell Hotel, Water Eaton Road, N. Oxford.

REGION 7

Acton, Brentford & Chiswick (ABCRC).—November 10 ("Test Gear," by G3IGM), December 8 (Film Show), 7.30 p.m., AEU Club, 66 High Road, Chiswick.

Ashford (Middlesex) (Echelford ARS).—November 25, 7.30 p.m., Ashford Grammar School.

Bexley Heath (NKRS).—November 12, 26, 7.30 p.m., Congregational Hall, Chapel Road, Bexley Heath.

Barnet (BRC).—November 24, 8 p.m., Red Lion Hotel, Barnet.

Chingford (Group).—November 13, Details from the Honorary Secretary, Loughton 2397.

Chingford (SRC).—Fridays (except first), 8 p.m., Friday Hill House, Simmons Lane.

Croydon (SRCC).—November 10, 7.30 p.m., Blacksmiths Arms, South End, Croydon.

Dorking (D & DRS).—November 10 (Informal Meeting), 8 p.m., "Wheatsheaf," Dorking. November 24 ("Soldering," talk and demonstration), 8 p.m., "Star & Garter," Dorking. December 8 (Informal Meeting), 8 p.m., "Wheatsheaf," Dorking. December 15 (Christmas Dinner).

East Ham.—Tuesdays fortnightly, 7.30 p.m., 12 Leigh High Road, East Ham.

East London Group.—November 15 ("Why S.S.B.?" by R. F. Stevens, G2BVN), 2.30 p.m., Lambourne Room, Ilford Town Hall.

East Molesey (TVARTS).—November 4, Carnarvon Castle Hotel, Hampton Court.

Edgware and Hendon (EARDS).—November 9, 23 ("Transistorized V.H.F. Equipment," by A. Mynett, G3HBW), 8 p.m., John Keble Hall, Church Close, Deans Lane, Edgware.

Enfield.—November 19, 7.30 p.m., George Spicer School, Southbury Road, Enfield.

LONDON MEMBERS' LUNCHEON CLUB

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

at 12.30 p.m. on Fridays, November 20 and December 18, 1964

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

Gravesend (GRS).—November 18, 7.30 p.m., RAFA Club, 17 Overcliffe, Gravesend.
Guildford (G & DRS).—November 9, 23, 8 p.m., Guildford Model Engineering Society in Stoke Park.
Harlow (DRC).—Tuesdays, 7 p.m., rear of 11 High Street, G3ERN (G. E. Read).
Harrow (RSH).—Fridays, 8 p.m., Roxeth Manor County School, Eastcote Lane, Harrow.
Holloway (GRS).—Mondays and Wednesdays, (RAE and Morse), 7 p.m., Fridays (Club), 7.30 p.m., Montem School, London, N.7.
Hounslow (HADRS).—November 2, 16, 30, Canteen, Mogden Main Drainage Dept., Mogden Works, Isleworth.
Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (Nr. Seven Kings Station).
Kingston.—November 12, 26, 8 p.m., YMCA, Eden Street, Kingston. Fridays, Morse classes at 2 Surrey Avenue, Tolworth.
Leyton & Walthamstow.—November 24, 7.30 p.m., Leyton Senior Institute, Essex Road, London, E.10.
Loughton.—November 13, 27, 7.30 p.m., Loughton Hall (Nr. Debden Station).
Mitcham (M & DRS).—November 13, 7 p.m. "The Cannons," Madeira Road, Mitcham.
New Cross (CARS).—Wednesdays and Fridays, 8 p.m., 225 New Cross Road, London, S.E.14.
Norwood & South London (CP & DRS).—November 21, CD Training Centre, Catford, London, S.E.6.
Paddington (P & DARS).—Wednesdays, 7.30 p.m., Beauchamp Lodge, 2 Warwick Crescent, London, W.2.
Purley (P & DRC).—November 20, 8 p.m., Railwaymen's Hall (Side Entrance), Whytecliffe Road, Purley.
Reigate (RATS).—November 21 (Lecture on U.H.F.), 7.30 p.m., George & Dragon, Cromwell Road, Redhill.
Romford (R & DRS).—Tuesdays, 8.15 p.m., RAFTA House, 18 Carlton Road, Romford.
Scout ARS.—November 19 (Discussion on Jamboree), 7.15 p.m., Baden Powell House, Queens Gate, S. Kensington.
Science Museum (CSRS).—November 3 (Film Show), November 17 ("Transistor Transmitters," by F. C. Judd, G2BCX), December 1 ("DX Working in Nyasaland," by Alan Remsbury, ZD6OL), 6.30 p.m., Science Museum, South Kensington.
Sidcup (CVRS).—November 5, 7.30 p.m., Congregational Church Hall, Court Road, Eltham.
Slough (SARS).—First Wednesday in each month, 8 p.m., United Services Club, Wellington Street, Slough.
Southgate & District.—November 12 (Home Construction Competition), November 26 SWL Slow Morse and Talk), 7.30 p.m., Atlasta Lodge, Tottenhall Road, Palmers Green, London, N.13.
St. Albans (Verulam ARC).—November 18, 8 p.m., Hedley Road.
Sutton & Cheam (SCRS).—November 18, 8 p.m., The Harrow, High Street, Cheam.
Uxbridge.—November 2, 16, 8 p.m., Railway Arms, Vine Street.
Welwyn Garden City.—November 12 (Guest Night and NFD Film by Keith Clarke, G3KRC), 8 p.m., Conference Hall, Murphy Radio, Bessemer Road.
Wimbledon (W & DRS).—November 13, 8 p.m., Community Centre, St. Georges Road, Wimbledon, London, S.W.19.

REGION 8

Tunbridge Wells (WKARS).—November 13 ("Components," by a representative of Erie Resistors Ltd.), November 27 ("Dual Standard TV Receiver Circuitry," by H. Turner), December 11 (Exchange and Mart Junk Sale), December 18 (Christmas Party), 7.30 p.m., Culverden House, Culverden Park Road, Tunbridge Wells.

REGION 9

Bath.—November 20, 7.30 p.m., Room 248, Fourth Floor, Main Building, Bath Technical College.
Bristol.—November 27 ("V.H.F. and U.H.F."), 7.15 p.m., Small Physics Theatre, Royal Fort, Bristol University, Woodland Road, Bristol 8.
Burnham-on-Sea (B-o-SARS).—Second Tuesday in each month, 8 p.m., Crown Hotel, Oxford Street, Burnham-on-Sea.
Camborne (CR & TC).—First Thursday in each month, Staff Recreation Hall, SWEB Headquarters, Pool, nr. Camborne.
Exeter.—First Tuesday in each month, 7.30 p.m., George and Dragon Inn, Blackboy Road, Exeter.
Plymouth (PRC).—Tuesdays, 7.30 p.m., Virginia House, Bretonside, Plymouth.
South Dorset (SDRS).—First Friday in each month, 7.30 p.m., Labour Rooms, West Walks, Dorchester.
Torquay (TARS).—Last Saturday in each month, Club HQ, Belgrave Road, Torquay.
Weston-super-Mare.—First Tuesday in each month, 7.15 p.m., Technical College, Lower Church Road.
Yeovil (YARC).—Wednesdays, 7.30 p.m., Park Lodge, The Park, Yeovil.

REGION 10

Cardiff.—November 9, 7.30 p.m., TA Centre, Park Street, Cardiff.

REGION 11

Bangor (UCNARS).—Details from the Honorary Secretary, c/o Dept. of Electrical Engineering, University College of North Wales, Bangor.
Llandudno (CVARC).—November 20 (RAE, "Aerials and Propagation," and "Mathematics for Radio," by B. Clarke, GW3HGL) 7.30 p.m., Cross Keys, Madoc Street, Llandudno.
Prestatyn (FRS).—November 24 (Film Show), 8 p.m., Railway Hotel, Prestatyn.

REGION 13

Edinburgh (LRS).—November 7-14 (Hobbies Exhibition in Waverley Market, Edinburgh), November 26 (Visitors Night), 7.30 p.m., YMCA, South St. Andrew Street, Edinburgh.

REGION 16

Basildon (BDARS).—November 3 (Social Evening at the "Van Gogh"), November 18 "Aerial Tuning Units," by G3EDM). Further details from G3IJB.
Chelmsford (CARS).—November 3 ("A History of Radio Communication," by B. N. McLarty), 7.30 p.m., Marconi College, Arbour Lane, Chelmsford.
Great Yarmouth (GYRC).—Fridays, 7.30 p.m., the Manager's Office, The Old Power Station, South Quay, Swanstons Road, Great Yarmouth. Details from G3HPR.

REGION 17

Newbury (NADARS).—November 27 ("A Little Flutter on V.H.F., by Rev. Paul Sollom, G3BGL), 7 p.m., Club HQ, Elliot's Canteen, West Street, Newbury.
Southampton.—November 14 (Lecture on business relating to the group's activities), 7 p.m., Engineering Lecture Theatre, Lanchester Building, Southampton University.

SBE equipment, manufactured by SBE Sideband Engineers, 317 Roebling Road, South San Francisco, California, is now available from Green and Davis Ltd., 104 Hornsey Road, London, N.7, who have been appointed sole British agents. The present range includes the following units: the SBE-33 four band s.s.b. transceiver; the SB1-LA 1 kW linear amplifier; the SB1-DCP and SB2-DCP 150 watt 12 V d.c. to 117 volt a.c. transistor inverters; the SB3-DCP 1·2 kW transistor inverter; the SB1-MB car mounting for the SBE-33 transceiver; the SB1-VOX plug-in VOX unit; and the SB1-MIC microphone.

A new 48-page brochure MQ/108 has been issued by STC Ltd., and is available from the STC Quartz Crystal Division, Edinburgh Way, Harlow, Essex. It describes 22 types of **10·7 Mc/s crystal filters** intended principally for use in mobile radio equipment. The characteristics of each device are given in tabular and graphic form.

The **YL1150** is a new power tetrode manufactured by Mullard Ltd., Mullard House, Torrington Place, London, W.C.1, and is intended specifically for s.s.b. linear amplifiers up to a frequency of 30 Mc/s. With radiation and convection cooling, it is capable of 120 watts p.e.p. output with the low anode voltage of 600. The third order intermodulation distortion figure without r.f. feedback is better than 30db. It will also operate in push-pull as a modulator, with a maximum output power of 200 watts. The glass envelope measures approximately 2 in. in diam. by 4⅝ in. high, and the base is a 7 pin Septar type with a centre spigot.

Publications for the Radio Amateur and Shortwave Listener

RSGB PUBLICATIONS

AMATEUR RADIO HANDBOOK. Covers the whole field of Amateur Radio transmission and reception from fundamentals to station operation. Practical designs for home-constructed h.f. and v.h.f. equipment are important features. Profusely illustrated with nearly 700 line diagrams and more than 100 half-tones. 544 pages bound in maroon buckram linson. **Price 36s. 6d. post paid in carton.**

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AMATEUR RADIO CIRCUITS BOOK. A wide selection of circuits for use in transmitters, receivers and ancillary equipment. 96 pages specially bound to lie flat. **Price 8s. 6d. post paid.**

RADIO AMATEURS' EXAMINATION MANUAL. Covers the syllabus of the City and Guilds of London Institute examination. Chapters on licence requirements and conditions, interference, receivers, circuits, calculations, semiconductors, aerials and propagation. Essential reading for those wishing to obtain the Amateur (Sound) Licence. More than 50 line diagrams. 60 pages. **Price 5s. 6d. post paid.**

A GUIDE TO AMATEUR RADIO. Provides the newcomer to Amateur Radio with basic information on receivers, transmitters, and aerials. Explains how to obtain an amateur transmitting licence. Well illustrated, 80 pages. Tenth Edition. **Price 4s. post paid.**

THE MORSE CODE FOR RADIO AMATEURS. A carefully graded selection of exercises designed to make learning the Morse code as simple as possible. 24 pages. **Price 1s. 9d. post paid.**

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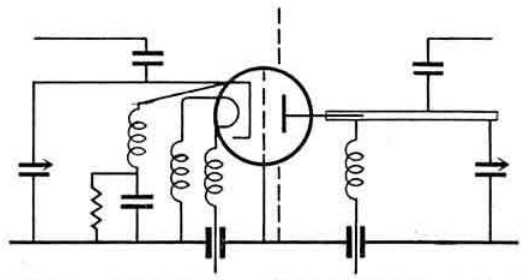

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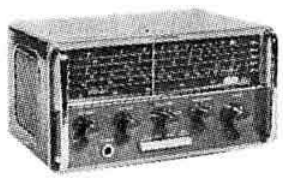

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REPORT OF THE HONORARY TREASURER

I HAVE pleasure in submitting the Balance Sheet of the Society at June 30, 1964, and the Income and Expenditure Account for the year to the same date.

I am glad to report that the Income and Expenditure Account shows a suplus of £1,394, which compares with a surplus last year of £3,952.

During the year under review expenses have risen; at the Annual General Meeting I shall deal with these in full detail and I trust that members will consider the increases have been justified. I want, however, in this Report to deal with one or two specific items.

The Golden Jubilee celebrations took place during the period of these Accounts and the policy of Council during the Jubilee year was to increase our support at Regional and other meetings both at home and abroad.

The cost of the larger BULLETIN has, I am glad to say, been to a great extent covered by enhanced advertising revenue. As I have repeated each year, and Council has stressed in the Annual Report, it is imperative that members buying through the medium of advertisements should mention the RSGB BULLETIN when writing to advertisers. As will be seen, the net cost is only just over £700 more on a total expenditure of nearly £15,000.

We have had staff changes during the year with a certain amount of duplication so that the necessary training could take place. The structure of the administration has been altered, and we trust that the services given to members will be enhanced as a result.

It will be seen that the method of dealing with equipment and furniture has been changed. It was felt that the writing-off of the whole value of any purchases during the year was not in line with normal practice and could result in an unfair charge in any one year. In future, capital purchases will be added to the asset value on the Balance Sheet and appropriate depreciation written off each year.

Only one exhibition was held during the year, the RSGB International Radio Communications Exhibition, and it is felt that the cost of the increased size of the Society's stand was well justified.

The policy of Council has been at all times to enhance the status of the Society both at home and abroad and whilst watching the expenditure very carefully it has been felt that expenditure for publicity of this kind was proper and justified.

I would like to extend my thanks to the staff at Headquarters for the continued assistance that has been given both in connection with the Accounts and in normal Society matters, and once again to thank those who help so magnificently by contributing articles, without which there would not be a BULLETIN.

NORMAN CAWS
Honorary Treasurer

RADIO SOCIETY OF GREAT BRITAIN

(COMPANY LIMITED BY GUARANTEE)

New Ruskin House, 28 Little Russell Street, London, W.C.1

INCOME AND EXPENDITURE ACCOUNT
for the year ended 30th June, 1964

1963 £	1963 £			1964 £	1964 £	
			INCOME			
	17,586		Subscriptions (including proportion of Life Members' Subscriptions)			19,863
	7,133		Profit on Sales of Publications, etc.			5,876
	—		Profit on Sale of Furniture			5
	647		Interest on Investments (Gross Amount before deduction of Income Tax)			802
	96		Deposit Interest			55
	25,462		**Total Income**			26,601
			EXPENDITURE			
962			Rent, General and Water Rates, Cleaning, Lighting and Heating		1,067	
5,333			Salaries, National Insurance and Staff Pension Premiums		6,511	
—			Payments to Past Employees		120	
106			Telephone		156	
688			General Postages		800	
731			Printing and Stationery (including Articles of Association)		1,094	
156			Staff Luncheon Vouchers		202	
85			Insurances		94	
100			Bank Charges		100	
43			Repairs and Maintenance		74	
11			Legal Expenses		142	
105			Audit Fee		105	
203			Sundry Expenses		242	
85			*Purchase of Equipment written off*		—	
—			Depreciation of Furniture and Equipment		74	
25			Membership Certificates and Badges		62	
106			Awards, Trophies and Contests		155	
9			Tape recorded Lectures		10	
529			Cost of QSL Bureau		563	
215			Contribution to I.A.R.U. Region I Division		229	
—			Provision for Bad Debts		17	
—			Bad Debts written off		17	
107			General Meetings (Cost of Printing and Hire of Hall)		193	
310			Net cost of Exhibition (Note 1)		366	
—			Golden Jubilee		305	
334			*I.A.R.U. Region I Conference at Malmö*		—	
40			Equipment for Technical Development		15	
21			*Wrotham Beacon Maintenance*		—	
—			Lerwick Beacon		75	
			Bulletin distributed free to Members—			
13,135			Printing, Postages, etc.	14,974		
3,657			*Less* Receipts from Advertising	4,781		
	9,478				10,193	
			Travelling, Entertaining and Meetings—			
354			Council and Committee Meetings	345		
917			Council and Committee Members	899		
211			Regional, Club, Overseas and Foreign Meetings including net cost of various rallies and conventions	299		
46			R.A.E.N. Committee Meetings and Expenses	79		
27			Representatives' Expenses	69		
55			London Lectures	93		
118			Sundries	130		
—			Regional Representatives' Conference	312		
	1,728				2,226	
		21,510	**Total Expenditure**			25,207
		£3,952	**SURPLUS OF INCOME OVER EXPENDITURE FOR YEAR ENDED 30th JUNE, 1964**			£1,394

BALANCE SHEET 30th June, 1964

1963 £	1963 £	1963 £		1964 £	1964 £	1964 £
			CURRENT ASSETS			
			Cash at Bank and in Hand			
2,413			On Current Account and in Hand	2,923		
6,041			On Deposit Account	500		
	8,454				3,423	
	1,758		Debtors, *less* Provision for Doubtful Debts		2,140	
	196		Payments in advance		228	
			Stock of Publications, etc. (as certified by the General Manager)		3,108	
	5,082					
		15,490				8,899
			FIXED ASSETS			
			Investments at Cost			
14,795			Quoted at Stock Exchange (Note 2)	14,795		
			Middle Value £12,998 (*1963* = £*13,429*)			
3,000			5 per cent. Defence Bonds	3,000		
3,000			Luton Corporation—Loan on Mortgage @ 5½ per cent.	8,000		
	20,795				25,795	
			Furniture and Equipment			
1			Net Book Value at 1st October, 1947	1		
899			Additions at Cost less items sold or scrapped	1,293		
900				1,294		
899			*Less* Depreciation and Amounts written off	877		
	1				417	
		20,796				26,212
		£36,286	**Total Assets**			£35,111
			BEVAN SWIFT MEMORIAL LECTURE FUND			
	85		Balance at 1st July, 1963	80		
	5		*Less* Prize Awarded	5		
		80				75
		152	**LIFE MEMBERS' SUBSCRIPTIONS RESERVE ACCOUNT**			256
			CURRENT LIABILITIES			
	6,757		Sundry Creditors and Accrued Expenses		3,484	
	10,314		Subscriptions in advance		11,393	
	752		Taxation		583	
		17,823				15,460
		18,055	**Total Liabilities**			15,791
			ACCUMULATED FUND			
	15,023		Balance at 1st July, 1963		18,231	
3,952			Surplus of Income over Expenditure for the year ended 30th June, 1964	1,394		
744			*Less* Income Tax in respect thereof	305		
	3,208				1,089	
		18,231				19,320
		£36,286				£35,111

G. M. C. STONE, *President*

NORMAN CAWS, *Honorary Treasurer*

JOHN A. ROUSE, *General Manager and Secretary*

REPORT OF THE AUDITORS TO THE MEMBERS OF RADIO SOCIETY OF GREAT BRITAIN

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. In our opinion proper Books of Account have been kept by the Society so far as appears from our examination of those Books. We have examined the above Balance Sheet and Income and Expenditure Account, which are in agreement with the Books of Account. In our opinion and to the best of our information and according to the explanations given us, the said Accounts in conjunction with the notes annexed hereto give the information required by the Companies Act, 1948, in the manner so required, and the Balance Sheet gives a true and fair view of the state of the Society's affairs as at 30th June, 1964, and the Income and Expenditure Account gives a true and fair view of the surplus of Income over Expenditure for the year ended on that date.

Thames House, Queen Street Place, London, E.C.4.
16th October 1964

EDWARD MOORE & SONS
Chartered Accountants

NOTES

(1) **Net Cost of Exhibitions, etc.**

Held in 1962 £		*Held in 1963* £
279	National Radio Show	—
31	International Radio Communications Exhibition	366
£310		£366

National Radio Show	International Radio Communications Exhibition		International Radio Communications Exhibition
337	561	Profit on Sales of Publications, etc.	483
111	160	Subscriptions of New Members enrolled	180
£448	£721		£663

(2) **Investments**

Middle Value at 1st July, 1963 £		Middle Value at 30th June, 1964 £	Cost Price £
3,910	*£4,000* 3 per cent. Savings Bonds 1955/65	3,930	4,021
4,175	*£5,000* 3 per cent. Savings Bonds 1965/75	3,975	5,219
3,689	*£4,145 1s. 6d.* British Transport 4 per cent. Guaranteed Stock 1972/77	3,482	4,055
1,655	*£1,751 9s. 6d.* 3½ per cent. Conversion Loan 1969	1,611	1,500
£13,429		£12,998	£14,795

(3) **Capital Commitments**

There is an outstanding commitment for capital expenditure amounting to approximately £1,350 which has not been provided for in these accounts.

THE PILOT OFFICER NORMAN KEITH ADAMS PRIZE TRUST FUND

BALANCE SHEET 30th JUNE, 1964

	£ s. d.		£ s. d.
TRUST FUND	150 0 0	**INVESTMENT**	
Creditor:		*£150* 3½ per cent. Defence Bonds	150 0 0
Prize to be awarded under the terms of the Trust Deed for year ended 30th June, 1964	5 5 0	**CASH AT BANK**	15 15 0
ACCUMULATED FUND			
Balance at 1st July, 1964	10 10 0		
	£165 15 0		£165 15 0

INCOME AND EXPENDITURE ACCOUNT for the year ended 30th June, 1964

	£ s. d.		£ s. d.
Provision for prize for the year ended 30th June, 1964	5 5 0	Interest on Investment for the year	5 5 0
	£5 5 0		£5 5 0

NORMAN CAWS, *Honorary Treasurer*

JOHN A. ROUSE, *General Manager and Secretary*

REPORT OF THE AUDITORS

We have audited the Balance Sheet and Income and Expenditure Account as set forth above and have obtained all the information and explanations we have required. In our opinion such Balance Sheet and Income and Expenditure Account are properly drawn up so as to exhibit a true and correct view of the state of affairs of the Prize Trust Fund as at 30th June, 1964, according to the best of the information and explanations given to us.

Thames House, Queen Street Place, London, E.C.4.
16th October 1964

EDWARD MOORE & SONS
Chartered Accountants

HEADQUARTERS' FUND ACCOUNT AT 30th JUNE, 1964

	£ s. d.
BALANCE AT BANK:	
On Deposit Account	1,954 3 2
	£1,954 3 2

NORMAN CAWS, *Honorary Treasurer*

REPORT OF THE AUDITORS

We have examined the above Statement of Contributions to the Headquarters' Fund and report that it is in accordance with the records of receipts.

Thames House, Queen Street Place, London, E.C.4.
16th October 1964

EDWARD MOORE & SONS
Chartered Accountants

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