APRIL, 1963

RSGB BULLETIN

VOL. 38, No. 10

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

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Volume 38 No. 10
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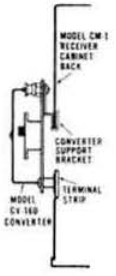

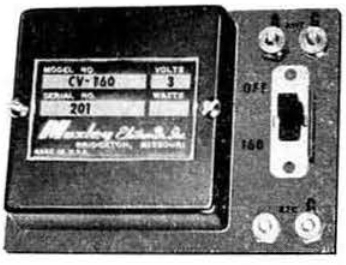

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Current Comment

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Once in a Lifetime

ONCE in a lifetime is a common catch phrase frequently used incorrectly but when applied to the Golden Jubilee Celebrations which have been arranged to take place in London during the first week in July 1963, it is surely true for the vast majority of us—it will indeed be a very young member who can anticipate taking part in the centenary celebrations of the Society in 2013. The celebrations this coming July mark the completion of the first 50 years of the Society's existence, 50 years of tremendous scientific development not least in the field of radio communication, 50 years of outstanding service to the cause of Amateur Radio.

From the coherer to the travelling wave tube, from the days of spark to space age communications, the Society has sought to bring together those interested in the science of electrical communication for their mutual benefit. Generally, this has meant providing meetings where the latest ideas could be presented and exchanged, exhibitions where equipment could be examined, and, by no means least, standing up for the amateur's rights against all comers, whether they be commercial interests or governments. That the Amateur Radio movement is held in the esteem it is today is largely due to the efforts of countless members who have acted together as the Radio Society of Great Britain during the past 50 years.

The Golden Jubilee of the Society is therefore an important landmark in its history, and because nothing similar is likely to occur for many years, the Council decided nearly three years ago that members should be given the opportunity to celebrate the occasion in a fitting manner. As a first step, a Golden Jubilee Celebrations Committee was set up. The outcome of the deliberations of that Committee are set out in a special supplement to this issue which shows that a carefully planned programme of technical visits and social events has been arranged. The programme is based on the results of a questionnaire sent to all members some two years ago asking them how they would like to see the Jubilee celebrated. More than 1,000 favourable replies were received indicating that members in all parts of the country would actively support a programme culminating in a Golden Jubilee Day Dinner. The Council hopes that those who signified their support for Golden Jubilee Celebrations will now honour their pledge by coming to London during the first week in July to take part in as many of the activities as possible. Members who have joined the Society since the questionnaire was issued will, of course, be most welcome at the celebrations.

There are already indications that considerable support will be forthcoming from a number of European amateurs. In addition news has reached Headquarters that many Commonwealth and United States amateurs are planning to visit London specially for the Celebrations or are arranging a trip to Europe so that it coincides with Golden Jubilee Week.

Ladies will be especially welcome at all the social events, in fact the celebrations would lose much of their appeal if they were confined to members. The Reception and visit to the London Planetarium, the river trip to Hampton Court on the Society's specially chartered launch, the gathering of the London Members' Luncheon Club, and, most important of all, the Golden Jubilee Day Dinner at the Connaught Rooms—which promises to be the greatest social function in the history of the Society—are among the functions at which the ladies will be well to the fore. And for those who want to do some window-shopping or just plain sightseeing there will be guides if required.

The G2DAF Linear Amplifier

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

OVER the years the increasing use of single sideband transmission by amateurs has developed new interest in linear r.f. power amplifiers. Most sideband operators have a continuing desire to put new ideas to the test and have constructed and used a wide variety of linears employing many different valves and classes of operation. This experience has contributed greatly to the data available for practical designs.

The circuits to be discussed in the present article are the result of experiments made by the writer some time ago. The interest at that time was in some method of simplifing

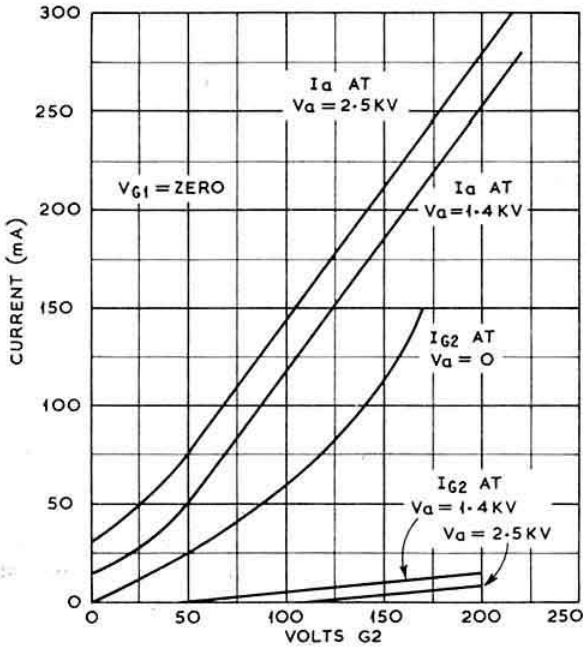


Fig. 1. Static anode and screen characteristics for two QY3-125 tetrode valves, with control grid held at zero potential.

existing circuits so that a tetrode or pentode valve could be used without any bias supply and in addition without the complication of screen dropper resistors, stabilizer valves, clamp valves or additional power packs. Initial experiments were undertaken using a pair of Mullard type QY3-125 (4-125A) valves in parallel with a passive grid input circuit.

Initial trials confirmed that the valves could be operated with zero bias and that very good control with a wide range of anode current was possible by variation of the screen voltage from zero to some positive value. A series of tests and measurements were made to determine the static anode-screen characteristics with differing anode voltages. Graphs were made from the readings obtained and these are shown in Fig. 1.

From the manufacturers' data for two QY3-125 valves operating in class AB1 with an h.t. supply of 2·5 kV, the maximum signal (single tone) anode current is 222 mA (111mA each valve). Inspection of the graph of Fig. 1 showed that the screen control was linear over a range of anode current from the resting value to a figure that was greater than the manufacturers' maximum-signal rating. Additionally the degree of control was little affected by wide variation in anode potential. It was further noted that the screen driving power was very small. At 2·5 kV anode potential with 625 watts input, the figure is 6 mA at 200 volts = 1·2 watts. At 1·4 kV anode potential, the figure is 10 mA at 190 volts = 1·9 watts.

Under *dynamic* operating conditions each positive r.f. cycle on the amplifier control grid causes the anode current to swing from its zero-signal resting point up to the maximum-signal value. At the same time the anode voltage swings down. This is the moment of time at which the screen current rises to its maximum value. If the instantaneous anode voltage drops *too* low, the screen current will rise to an excessive value. The graphs of Fig. 1 show this quite clearly. Under V_a = 1400 volt conditions $I_{g2\ max}$ =

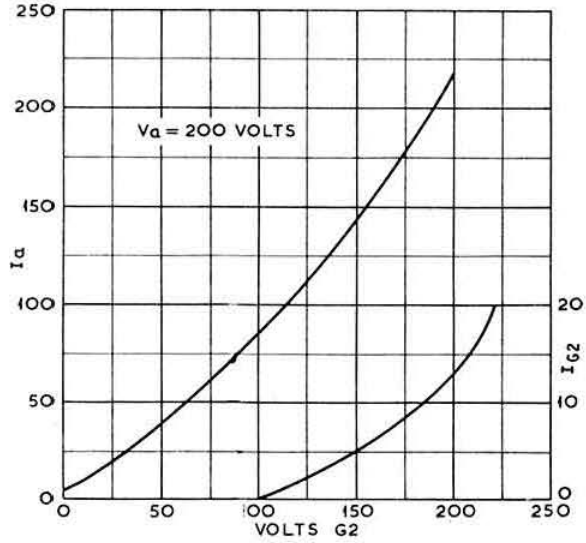


Fig. 2. Graph showing the anode and screen currents, under static conditions, for differing values of screen voltage with the anode held constant at 200 volts.

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

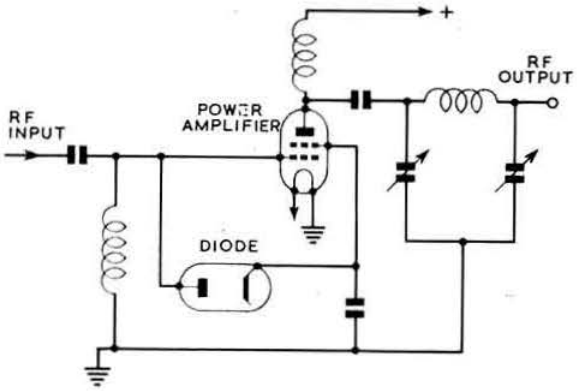


Fig. 3. Basic circuit diagram for the G2DAF Linear Amplifier.

10 mA. With $V_a = 0$ volts, $I_{g2\ max}$ has risen to 160 mA.

It was considered that in practice with the usual h.t. supply, the minimum value of V_a *min* would be about 200 volts, and would represent normal operating conditions. Tests were then made and measurements taken of the screen characteristics with the amplifier anode potential held at a constant 200 volts. The screen potential was increased from zero in 20 volt increments and readings taken of both the screen and anode currents. These were plotted as a graph and are shown in Fig. 2.

As had been expected the ratio of screen current to voltage was quite low. At 200 volts on the screen the current value was 13 mA. Even at the point where the screen had risen above the anode potential by 20 volts and a quick rise in current would be expected, the value was only 20 mA. It was noted with increasing interest that the screen driving power at an anode current of 230 mA and a screen potential of 200 volts was the low value of 2·6 watts.

At this stage sufficient data was available from the plotted static characteristics to build up a mental picture of the valve operation under dynamic conditions. This was itemised as follows:

(i) The ratio of anode current to screen voltage should show excellent linearity.
(ii) The "zero signal" anode current and therefore the static anode dissipation should be a low value.
(iii) The zero-signal anode current should be at a suitable value for class AB operation over a wide range of anode h.t. supply voltage.
(iv) The maximum screen driving power should be less than 5 watts.

The following conclusion was reached: a screen driving power of 5 watts is a small proportion of the r.f. available from the exciter to drive the amplifier. It should therefore be perfectly feasible to obtain the required screen potential directly from the amplifier input signal.

The next step was to draw out the basic circuit diagram shown in Fig. 3 and convert the existing class AB1 amplifier to the new arrangement for " on the air " tests. During the autumn of 1961 this amplifier was used at G2DAF on the 80m band and the opportunity taken to obtain a considerable number of signal reports. The reporting stations were informed that a new experimental amplifier was in use and asked to comment particularly on the quality of the speech and the level of the intermodulation products. All stations reported favourably in regard to clean and smooth speech quality and low distortion product level.

Having obtained this verification in regard to the practicability and soundness of the theoretical approach, a further series of graphs was plotted to show the amplifier characteristics under dynamic conditions with both single-tone and two-tone input signals. From an analysis of these curves it was apparent that the required maximum-signal screen voltage was only being developed by r.f. drive voltages that produced a rather large peak grid current. This difficulty was overcome by a further development of the existing principle that gave a more favourable ratio between V_{g1} and V_{g2}.

Amplifier Operation

As may be seen from Fig. 4 the finalized amplifier makes use of two diode rectifiers in a Cockcroft-Walton voltage doubler circuit. This gives approximately twice the screen potential for the same r.f. drive voltage and results in an improved maximum-signal handling capability with a useful economy in the required driving power. The associated

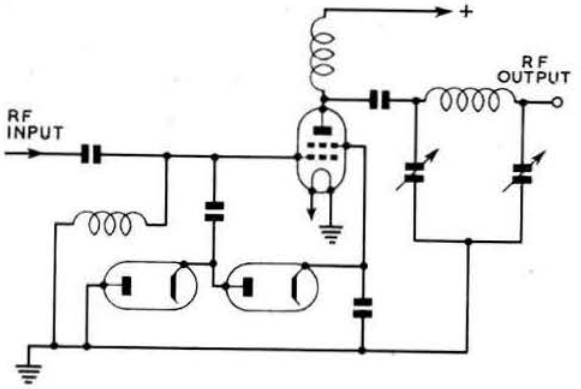


Fig. 4. Basic circuit diagram using Cockcroft-Walton voltage doubler circuit.

charging capacitor values are chosen to offer a low impedance to the signal input frequency, but a high impedance to all voice frequencies. The positive voltage on the screen is derived solely from the r.f. input signal and will at all times vary in sympathy with, and be directly proportional to, the amplitude of the modulation envelope. The screen voltage is therefore varying from zero in a positive direction at the frequency of the voice modulation.

It will be appreciated that as the amplifier valve is operating at zero bias, grid current is drawn throughout the 180° of each positive r.f. input cycle. Considering the input side of the amplifier only, the operation is class B. In regard to the output side of the amplifier the action of the valve is more complex than conventional operation because there is no reference point on the I_a/V_g characteristics against which to plot the anode current flow.

Consider first the dynamic characteristics for conventional class B operation shown in Fig. 5(a). This is a plot of the anode current in relation to the grid voltage for a particular valve at a rated fixed screen voltage. At zero bias the anode current would be very high as shown, and it would be necessary to bias the grid negative to reduce the standing

anode current to a value that would maintain the static anode dissipation within the manufacturers' maximum rating. The r.f. driving signal swings either side of a reference point determined by the amount of the necessary negative bias voltage. Each half cycle drives the grid positive and the anode current increases in a linear manner. This increase can be plotted against the I_a/V_g curve to show the anode current pulse and the duration of the anode current flow.

In the G2DAF amplifier there is no bias and the grid potential is zero; at the same time the anode current is also at a low value because there is no screen voltage. With a small r.f. input signal the screen voltage will rise slightly above zero and the anode current will increase by a small amount—the I_a/V_g curve will appear as shown in Fig. 5(b). The important point to note is that the anode current flow is now much greater than the 180° of class B working. In fact anode current is flowing for 360° of the grid swing and the amplifier is operating in class A.

Consider next what happens when the input signal increases. The screen potential rises and the standing anode current rises. However, the grid is still at zero bias with the r.f. driving signal swinging equally positive and negative about the zero bias reference point. In effect the I_a/V_g curve has moved over towards the left of the graph as shown in Fig. 5(c). It will be noted that the positive half of the grid swing is now having more effect on the anode current flow than the negative half. The anode current flow is more than 180° but less than 360° and the amplifier is operating in class AB. At greater signal strengths the I_a/V_g curve moves further over, the zero bias operating point moves farther up the slope, anode current flows during a smaller part of the grid swing and the amplifier is approaching class B operation, as shown in Fig. 5(d).

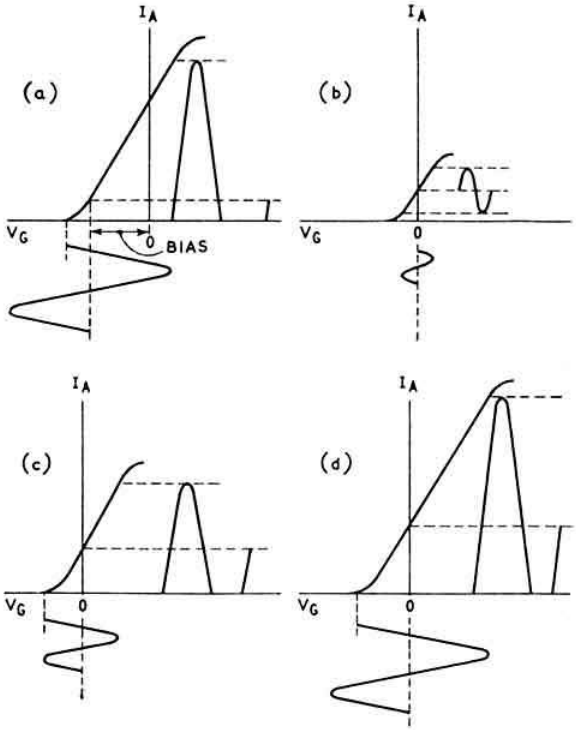


Fig. 5. Dynamic characteristics showing at (a) conventional ABI operation and (b), (c) and (d), the G2DAF amplifier with differing input signals.

The curve of Fig. 5(a) is representative of the usual tetrode or pentode operating in the conventional manner. Because of the curvature of the I_a/V_g line towards the cut-off point the valve is no longer linear with small grid swings. It is this curvature that produces non-linear operation and the increased generation of intermodulation distortion products. In the G2DAF amplifier, a small input signal produces a small screen voltage. The total length of the I_a/V_g curve becomes smaller and the sharpness of cut-off is much improved. In effect this is the curve of Fig. 5(d) reduced in size—the non-linear portion of this curve is reduced accordingly! All the graphs are drawn to the same scale and this point is shown clearly by comparison of Fig. 5(b) with Fig. 5(d). Because of this, and the class A operation at small signal levels, the linearity of the amplifier is improved with a corresponding reduction in intermodulation distortion product level.

In regard to the operation of the amplifier at maximum signal levels it will be noted that the grid swing of Fig. 5(a) and Fig. 5(d) are identical. However, the anode current pulse of the G2DAF amplifier is greater than the anode current pulse of the conventional amplifier. From this it follows that for the same maximum-signal input power, the G2DAF amplifier requires less driving voltage. Conversely, for the same driving voltage the amplifier will run to a greater power output.

Dynamic Characteristics

The most convenient method of expressing amplifier characteristics is in graphical form, and the mutual characteristics—where the anode current is plotted against the r.f. grid voltage—are particularly useful. From these it is possible to check (i) the amplifier linearity, (ii) the anode and screen current at different excitation levels, (iii) the maximum signal anode current, and (iv) the maximum signal power input. These characteristics are shown for both single-tone and two-tone input signals in Fig. 6. The r.f. grid input voltage was measured with a diode probe valve voltmeter, and the I_a and I_{g2} current values are the readings taken from the amplifier panel meters.

In regard to two-tone input power it is important to appreciate that the graph has been plotted using values of the anode current read on the panel milliameter. This is not the true maximum current value because the meter cannot follow at the two-tone (audio) rate. Fortunately the relationship between peak envelope input and indicated d.c. power input is accurately known. With a class B linear amplifier operating with low distortion and biased to cut-off, the peak envelope power input is 1·57 times the d.c. input as measured with a two-tone test signal. However this factor applies only in the case of a perfectly linear true class B amplifier.

In practice, amplifiers are never true class B and are run with less than cut-off bias. The relationship becomes: $I_{peak} = 1{\cdot}57\ (I_{dc} - 0{\cdot}363\ I_o)$ where I_{peak} = peak current; I_{dc} = anode meter reading; I_o = zero-signal (idling) current. At 2·5 kV anode potential the zero signal anode current is 30 mA as shown in Fig. 6 and the correct value of $I_{a\ peak}$ is $I_{a\ dc}$ multiplied by 1·5.

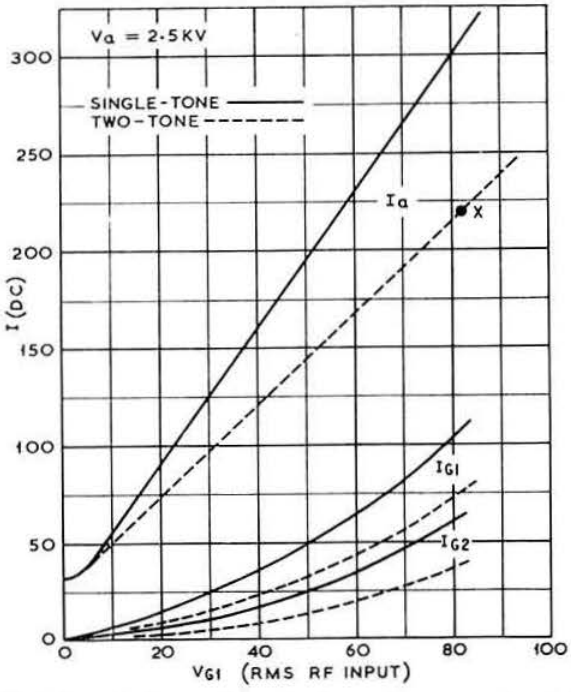


Fig. 6. Dynamic characteristics, showing anode, screen and control grid current for excitation voltages from zero to 80 volts for two QY3-125 valves.

Referring again to the graph of Fig. 6, the two-tone input current at point *X* is 220 × 1·5 = 330 mA and the input power is 825 watts. At this power level the amplifier was operating in a perfectly linear manner and the two-tone envelope monitored on the oscilloscope showed a clean cross-over, symmetrical lobe pattern and no evidence of flat-topping. The screen (I_{g2}) current is also plotted as a function of the excitation (V_{g1}) voltage on the same graph. It will be noted that the amplifier runs to a two-tone p.e.p. input of 660 watts for an r.f. grid swing of 63 volts, and at this level the screen current is 22 mA. By reference to the graph of Fig. 7 the screen voltage at this drive is seen to be 75 volts. The product of the two gives the screen driving power of approximately 1·65 watts.

Amplifier Efficiency

A considerable number of measurements have been made of the amplifier power output into a non-inductive load, at power input levels from zero up to the maximum possible. All figures for output have been based on r.m.s. voltage measurements across a 100 ohm dummy load. The amplifier tuning and loading was adjusted for maximum r.f. output, consistent with adequate loading to obtain a satisfactory two-tone envelope without flat-topping or other distortion. Measurements have been made under single-tone and two-tone input conditions.

At each power level the ratio (output watts)/(input watts) was calculated as a percentage. These percentage figures were then plotted against the corresponding value of input power. However, before considering the amplifier efficiency in detail the writer would like to make some general comments.

There is a considerable amount of confused thinking in regard to linear amplifier efficiency, and many amateurs do not realize that the often quoted figure of 66 per cent efficiency—for a "perfect" class B amplifier—only applies when the amplifier is operating at full output with maximum exciting voltage and under single-tone input conditions. At any other power level the efficiency is less than 66 per cent and is in fact proportional to the exciting voltage, i.e., if the drive voltage is halved the efficiency becomes 33 per cent; drive voltage one-third, efficiency 22 per cent—and so on. There is a simple reason for this:

Consider an amplifier with a grid drive of V_g, an anode current of I_a, an h.t. supply voltage of V_{ht}, an r.f. voltage across the tank coil of V_{tank}, and an r.m.s. voltage across the dummy load R of V_{load}.

Power input at full drive $= V_{ht} \times I_a = P_{in}$ watts.

Power output at full drive $= (V_{load})^2/R = P_{out}$ watts.

Consider now the conditions at half grid drive:

Excitation $= \frac{1}{2} V_g$. Anode current $= \frac{1}{2} I_a$. Tank voltage $= \frac{1}{2} V_{tank}$. Load voltage $= \frac{1}{2} V_{load}$.

Power input $= V_{ht} \times \frac{1}{2} I_a = \frac{1}{2} P_{in}$ watts.

Power output $= (\frac{1}{2} V_{load})^2/R = \frac{1}{4} P_{out}$ watts.

From this the statement follows: With a linear amplifier the d.c. anode current and the anode input power will be proportional to the exciting voltage, whereas the output power is necessarily proportional to the square of the exciting voltage.

A graph of amplifier efficiency plotted against power is shown in Fig. 8. In order to give a direct basis of comparison, the efficiency of a perfect class B amplifier operating with a single-tone input and zero no-signal anode current is also plotted to the same scale with the 66 per cent reference

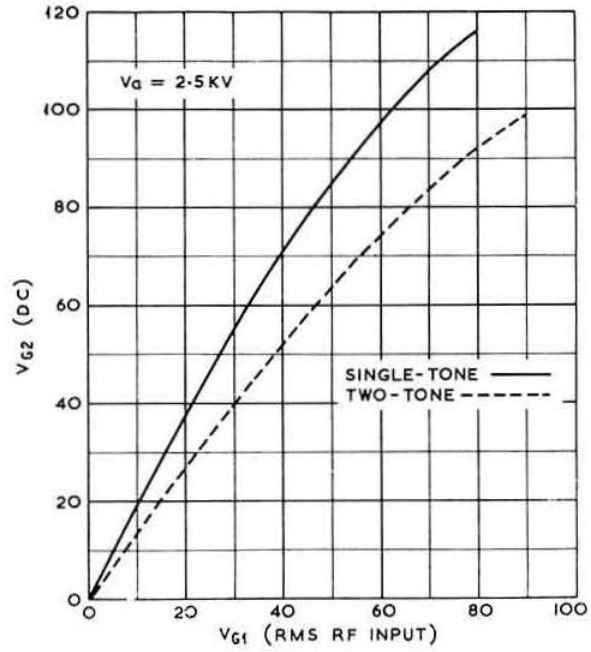


Fig. 7. Dynamic screen characteristics, showing the screen potential as a function of r.f. excitation voltage.

point taken as 750 watts. If the amplifier is operating in a linear manner, by definition—with a linear amplifier the d.c. anode current and the anode input power will be proportional to the exciting voltage, whereas the output power is necessarily proportional to the the square of the exciting voltage—the plot of either single-tone or two-tone efficiency should be a straight line. The graphs shown in Fig. 8 are curved because at each of the input measuring points, the amplifier tuning and loading was adjusted to give the maximum r.f. output consistent with satisfactory linearity. This has the effect of increasing the value of R_L and gives improved operating conditions at the lower power levels and therefore a greater output for the same input power. This procedure would be adopted in practical operation and is therefore perfectly legitimate.

It is normal procedure for valve manufacturers to quote power output and efficiency as measured at the anode. In practice the power output is calculated from voltage readings across a known value of non-inductive dummy load. Obviously the value obtained—and any efficiency figure based on this value—would be less than the *anode* efficiency because it includes transfer (tank circuit) loss. In order to be able to give a true basis of comparison for the G2DAF amplifier the power output has been corrected to allow for tank circuit loss, and the efficiency figures quoted in Table 1 and shown in Fig. 8 include this correction.

This gives an anode efficiency at maximum signal conditions of 65 per cent, almost equal to a conventional " perfect " class B amplifier. Finally, before concluding this section the writer would like to make it quite clear that he does not claim an efficiency for the G2DAF amplifier of 65 per cent at maximum drive level, based on an estimated transfer loss correction factor and power output measurement alone. It is generally possible to find an alternative measuring technique and this has been used as a check against the first.

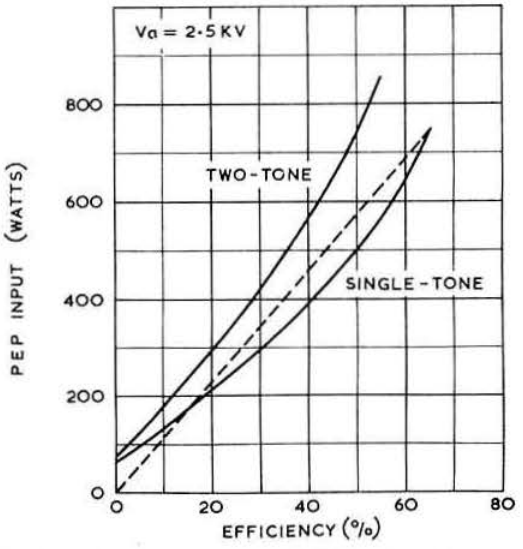


Fig. 8. Graph showing input power and efficiency for single-tone and two-tone signals. The dotted line shows for comparison the efficiency of an imaginary " perfect " class B amplifier operating with zero bias and 66 per cent efficiency at 750 watts input power.

TABLE I

Maximum signal operating conditions for an h.t. supply of 2·5 kV using two QY3-125 valves.

	Single-tone	*Two-tone*
Anode current (d.c.)	300 mA	220 mA
Power input (d.c.)	750 watts	550 watts
P.E.P. input	750 watts	825 watts
Anode dissipation	260 watts	250 watts
P.E.P. output	490 watts	600 watts
Power output (mean)	490 watts	300 watts
Anode efficiency	65 per cent	54 per cent

NOTE These ratings are in excess of permissible power output within the conditions of the G.P.O. Amateur (Sound) Licence.

Amateur Band operating conditions (400 watts p.e.p. output) for two QY3-125 valves.

V_a = 2·5 kV	*Single-tone*	*Two-tone*
Anode current	250 mA	175 mA
Power input (d.c.)	650 watts	440 watts
P.E.P. input	650 watts	660 watts
I_{g2}	38 mA	22 mA
I_{g1}	70 mA	45 mA
V_{g2}	105 volts	75 volts
V_{g1} (r.m.s.)	65 volts	64 volts
Driver Load (p.e.p. out)	30 watts	35 watts
Anode Dissipation	250 watts	240 watts
Power Output (mean)	400 watts	200 watts
P.E.P. Output	400 watts	400 watts
Anode Efficiency	61·5 per cent	46 per cent

Typical operation with 300 ohm grid swamping resistor.

With an anode supply of 3 kV the efficiency figures will show an improvement on those quoted. It is estimated that they will be as follows:

Single-tone efficiency = 72 per cent. Two-tone efficiency = 58 per cent.

Amplifier efficiency can be accurately checked by measuring the temperature of the valve envelope by a thermometer or thermocouple in close contact with the glass. With a single-tone input driving the amplifier to an indicated anode meter reading of 260 mA and an h.t. supply of 2·5 kV, the input power is 650 watts. At this input the envelope temperature indicated a dissipation of 250 watts (125 watts per valve) and this is an anode efficiency at 650 watts input of 61·5 per cent.* This experiment has been repeated with a two-tone input driving the amplifier to an indicated anode meter reading of 194 mA at 2·5 kV. This is a d.c. input of 480 watts for 250 watts anode dissipation giving a *mean* output of 230 watts and an anode efficiency at 480 watts d.c. input (720 watts p.e.p.) of 48 per cent.

It will be appreciated that the numerical difference between the input power and the dissipation power is the power output from the amplifier—at the anode. If simultaneous output measurements are made across the external dummy load, the discrepancy between the "load" figure and the

* The anode temperature for 250 watts dissipation is determined by running the amplifier up under static condition—no r.f. drive. Connect a 20 K or 25 K ohms 3 watt, wire wound, potentiometer across the exciter h.t. supply and the slider to one of the terminals of the amplifier screen current meter. Increase the potentiometer from zero until the required anode power is being drawn. At 2·5 kV supply voltage, this would be 100 mA. An alternative but less accurate method is to observe the colour of the anode at the rated dissipation for the valve in use. The amplifier is then run under single-tone input to the same anode colour and the p.e.p. input calculated from the product of the h.t. supply voltage and the steady anode current meter reading.

"anode" figure will indicate the transfer power loss in the tank circuit. This method was used to determine the correction value included in the output and efficiency figures that have been given. Really accurate r.f. power measurement is not easy and there must always be some possibility of error. However, the writer has attempted by repeated checking and by using two dissimilar methods to arrive at the right answer. The efficiency figures quoted and those plotted on the graph of Fig. 8 are given in good faith that they are reasonably correct.

Due to the method of operation, the screen voltage is always proportional to the exciting voltage, and is very much lower than the normal value for class AB operation. Because of this the anode can swing down to a much lower value without excessive screen current. The numerical value of $V_a - V_{a\ min}$ is the term in the formula:

$$\textit{Anode Efficiency}\ (\text{single-tone}) = \frac{3{\cdot}14}{4}\left(\frac{V_a - V_{a\ min}}{V_a}\right)$$

$$\textit{Anode Efficiency}\ (\text{two-tone}) = \left(\frac{3{\cdot}14}{4}\right)^2 \times \left(\frac{V_a - V_{a\ min}}{V_a}\right)$$

This governs the efficiency figure that is obtainable.

It is usual with power tetrodes to find that the two-tone efficiency figure is 15 to 20 per cent below the single-tone figure. In the G2DAF amplifier the maximum two-tone efficiency is particularly good and is in fact only 11 per cent below the peak efficiency obtainable with a single-tone input. This is attributed to the self-compensating action of the circuit under two-tone input conditions, where the mean screen potential is actually lower for the same p.e.p. input, thus allowing a further improvement in the ratio $V_a - V_{a\ min}$ $/V_a$, with increased efficiency and greater power handling capability without exceeding the rated anode dissipation.

Driving Power

The amplifier valves are operating with zero bias and are drawing grid current throughout the positive half cycle of the r.f. signal, and they require driving power. The grid drive requirements are similar to those of any other class B amplifier—from 2 to 5 watts or so—depending on the valve type. Additionally there is the screen driving requirement, and allowing for a small loss in the rectifiers, this is likely to be 2 to 4 watts—again depending on the operating conditions for the valve or valves in use.

The final requirement is the loss in the passive grid resistor and this will depend on the value used. This resistor not only stabilizes the linear amplifier and makes neutralizing unnecessary, but additionally provides a constant load for the driver valve—in this respect the lower the value, the better the performance. Taking as a specific example two QY3-125 valves, the maximum signal requirements are as follows (approximate values):

Driving Power, Grid	= 5 watts.
Driving Power, Screen	= 3 watts.
Dissipation, Grid Resistor of 300 ohms	= 17 watts
Total	= 25 watts.

(There is additional loss in the driver tank circuit and this transfer loss must be added to the total.)

A golden rule is to provide a driver stage with a p.e.p. output rating of double the calculated driving requirements. Therefore:

Driver p.e.p. output = 50 watts

This ensures that the driver is never overrun and never produces a distorted signal before it goes into the power amplifier. There is no point whatsoever in building a low distortion amplifier and then driving it with a signal that is already distorted by non-linear operation of the driver stage.

Two 6146 valves with 500 volts anode potential are rated at p.e.p. output of 57 watts, or with 600 volts anode potential 76 watts, and would in practice be very suitable for the requirement. If the exciter output was less than this—for instance a single valve with half the above ratings, the passive grid resistor would have to be increased in value to say 400 ohms. The figures would then be (approximate values):

Driving Power, Grid	= 5 watts.
Driving Power, Screen	= 3 watts.
Dissipation, Grid Resistor of 400 ohms.	= 10 watts.
Total	= 18 watts.

Allowing a 2 to 1 safety margin:
Driver p.e.p. output = 36 watts.

The correct value of passive grid resistor can be made up using standard 1 watt carbon resistors in a series parallel arrangement. Under two-tone input conditions the average output power is one half the p.e.p. rating. Therefore the wattage dissipation of the passive grid network need only be one half of the maximum signal figure shown, i.e., the 400 ohm resistor could be made up with five 1 watt resistors.

Because of the original method of operating the valve, manufacturers' figures for conventional AB1 or AB2 tetrode or pentode operation no longer apply. The grid driving voltage is smaller and the grid current larger than data sheet figures. An approximation for grid driving power that is near enough for all practical use is:

Maximum Signal Driving Power = $V_{g(r.m.s.)} \times I_{g(d.c.)}$

For initial calculation $V_{g(r.m.s.)}$ can be taken as approximately half the peak voltage normally quoted for class AB1 or AB2. $I_{g(d.c.)}$ is the grid current meter reading. When the amplifier is completed and driven to the required maximum signal (p.e.p.) output with a single-tone signal the actual grid voltage can be measured with a diode probe valve voltmeter. (These instruments are normally peak reading but are calibrated in r.m.s. values.)*

The d.c. screen voltage can also be checked under the same driving conditions using a standard AVO or similar test meter, and this voltage multiplied by the screen current meter reading is the approximate screen driving power.

The exciter at G2DAF uses two 6146 valves in the driver stage with an h.t. supply of 650 volts. As a check against the calculated driving requirements of 25 watts (300 ohm grid loading resistor) one of these valves was removed. Operating the exciter with the remaining 6146 valve, it was found just possible to fully drive the linear amplifier to the maximum allowable 400 watts p.e.p. output, either under two-tone or single-tone conditions. Allowing for the inevitable loss of

* An accurate figure for grid driving power is obtained from the formula:

$$\frac{V_{g\ peak} \times I_{g\ peak}}{4}$$

where $V_{g\ peak}$ is 1·4 times the r.m.s. value as measured with a diode probe valve voltmeter, and $I_{g\ peak} = I_{g\ d.c.} \times 3{\cdot}14$. This power is being dissipated at the grid in the form of heat—if the energy dissipated exceeds the manufacturers' rating, the grid wires may become white hot and melt. The most punishing form of input is single-tone (continuous carrier). Under voice input conditions it is permissible to allow the grid current meter to swing on peaks to a slightly higher value.

r.f. due to normal transfer losses, this is consistent with the estimated requirements.

Practical tests indicate that the same driving power—to either a G2DAF amplifier or a conventional class AB1 amplifier—can produce approximately the same maximum signal anode current. This occurs because zero-bias operation requires a smaller r.f. excitation voltage than normal AB1 operation and there is therefore a smaller power loss in the passive grid resistor. With low values of grid resistor, this can almost compensate the screen driving requirement.

Construction

The complete circuit diagram of the G2DAF linear is shown in Fig. 9. The diode rectifiers may be either semiconductors of the point contact type suitable for r.f. use, or alternatively thermionic valves. Suitable rectifier valves are already available at low initial cost and were used in the original amplifier. The main requirement is a good heater-cathode insulation and a heater rating suitable for the additional 6 volt winding generally provided on standard p.a. heater transformers. Suitable valves are the Brimar 6U4G or the Mullard EY81. The Brimar valve is preferred because the anode connection is brought out to a base pin and, as this is underneath the chassis, it is screened from the p.a. output circuits.

It will be noted that the circuit is inherently simple and straightforward. The only panel controls necessary are the anode tuning, band change, aerial loading and a small switch to bring in the second section of C1 as required. The simplicity of the r.f. side enables a compact layout to be used without any risk of instability. This is shown in detail in the chassis and panel diagrams in Fig. 10.

The pi tank coil is wound on an Eddystone 2½ in. diameter ceramic former grooved eight turns per inch, and this is attached to the switch (from a TU5B unit) before it is fitted to the panel. A gap of one groove is left between the 15 and 20, and 20 and 40m sections. The total winding length of 16 s.w.g. tinned copper wire is 3¼ in. For the 10m band the coil of six turns of 12 s.w.g. wire is spaced to approximately 2 in. long and is self-supporting—with the axis at right angles —between the tuning capacitor and the end of the main tank coil.

The pi tank values depend on the required value of anode load (R_L) and as with any amplifier it is important that the valves are operating into the correct load. If they are not, both the power handling capability and the efficiency will suffer. Assuming that V_a is the h.t. supply voltage; $V_{a(min)}$ the instantaneous anode voltage at its lowest point; $I_{a(dc)}$ the maximum signal anode current meter reading; then $I_{a(peak)} = I_{a(dc)} \times K$ (where K is a constant dependent on the angle of current flow—in this case approximately 3) and $R_L = 2(V_a - V_{a\ min})/I_{a\ peak})$. For the amplifier under consideration $R_L = 2(2500\ 0 - 250/300 \times 3 = 5000$ ohms.

The pi constants are then $R_L = 5000$ ohms; $R_{L(out)} = 75$ ohms. The ratio $R_L/R_{L(out)} = 5000/75 = 66$. The square root of 66 is approximately 8 and this is the reactance ratio (XC1 : XC2). For a Q of 12:

$XC1 = R1/Q = 5000/12 = 416$ ohms
$XC2 = XC1/8 = 416/8 = 52$ ohms
$XL = XC1 + XC2 = 416 + 52 = 468$ ohms

These values are a simple approximation but are quite near enough for amateur purposes. From the reactance chart the values for 80m are C1 = 116 pF; L = 20 μH; C2 = 900

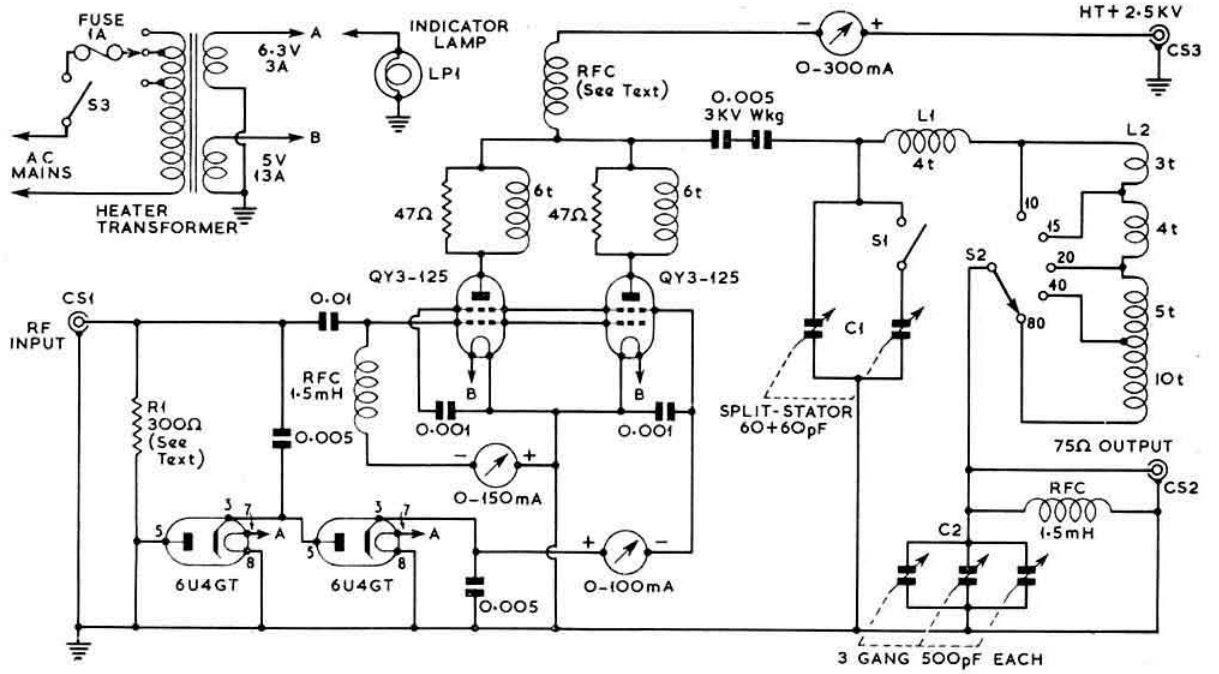


Fig. 9. Circuit diagram of the G2DAF Linear Amplifier. S1 open for 20, 15 and 10 metres, closed for 80 and 40 metres. All fixed capacitors mica except 0·005 μF 3K volt anode blocking which are disc ceramic. For CS3 Belling Lee chassis sockets and coaxial plugs are available coloured red. S1 and S2 ceramic switches. (All connections to panel meters via coaxial cable.) For winding details of L1 and L2 see text.

pF. Values for other bands scale down in the same ratio as the band wavelength as follows:

Band	C1	*L*	*C2*
80m	116	20	900
40m	58	10	450
20m	29	5	225
15m	20	3·5	160
10m	15	2·5	113

The type of transmitter tuning capacitor suitable for C1 generally has semi-circular rotor plates and therefore a large minimum capacity value—usually about 15 to 20 pF. This, together with circuit and valve anode capacity, will make up a total that is greater than required for the 10 and 15m bands. It is possible to overcome this in two ways. (i) redesigning the tank circuit for a higher Q value of, say, 15 or 20; (ii) reducing the minimum capacity of C1. A high value of Q in the tank coil will increase the circulating r.f. currents and therefore the losses. Accordingly the second expedient has been adopted and the tank capacitor was, in fact, made into a two-gang unit of 60 pF each section by sawing through the bars holding the stator plates. One section only is connected to the 10m coil and the anode r.f. blocking capacitor and this tunes the three higher frequency bands. The other section is switched in parallel for the 40 and 80m bands. In addition to reducing the minimum capacity value, this method also doubles the dial bandspread and makes tuning less critical on the 10, 15 and 20m bands.

The required air gap for C1 is approximately one-tenth of an inch. A standard three gang broadcast tuning capacitor of 500 pF each section is suitable for C2 and provided the amplifier is working into a load (as it should be) the plate spacing is ample to prevent flashover.

The r.f. choke comprises 300 turns of 32 s.w.g. enamelled wire wound in unequal sections—165, 65, 35, 20 and 15—on a ceramic former 1 in. in diameter and 5½ in. long with a ⅛ in. spacing between each section. Standard multi-section pie wound r.f. chokes are unsuitable for pi tank circuits and should not be used. A standard 1·5 mH r.f. choke rated for at least 300 mA is connected across the output co-axial socket as a safety precaution that should never be omitted when high voltages are in use. Should there be failure of the r.f. blocking capacitor the h.t. current through the choke will blow the main h.t. fuse and prevent h.t. voltage reaching the aerial circuits.

Operation

Tuning and loading is exactly the same as a conventional class AB amplifier. Initially the drive level is increased until the anode current meter reads 150 or 200 mA. With the loading capacitor fully meshed, the anode tuning is adjusted for a dip in anode current. With the tank circuit at resonance, the screen current will be a high value. As the loading is increased by reducing the capacity of C2, the anode current will rise and the screen current will fall in the usual manner. The drive can now be increased until the grid, screen and anode currents are the required values.

Should the amplifier have been built using some other type of valve, the manufacturers' figures for class AB1 or AB2 working can be used initially. If an oscilloscope is available the amplifier should be driven with a two-tone input and the modulation envelope monitored on the c.r.t. It is then a simple matter to adjust excitation, tuning and loading for maximum r.f. output consistent with adequate loading to prevent flat topping or other distortion of the modulation

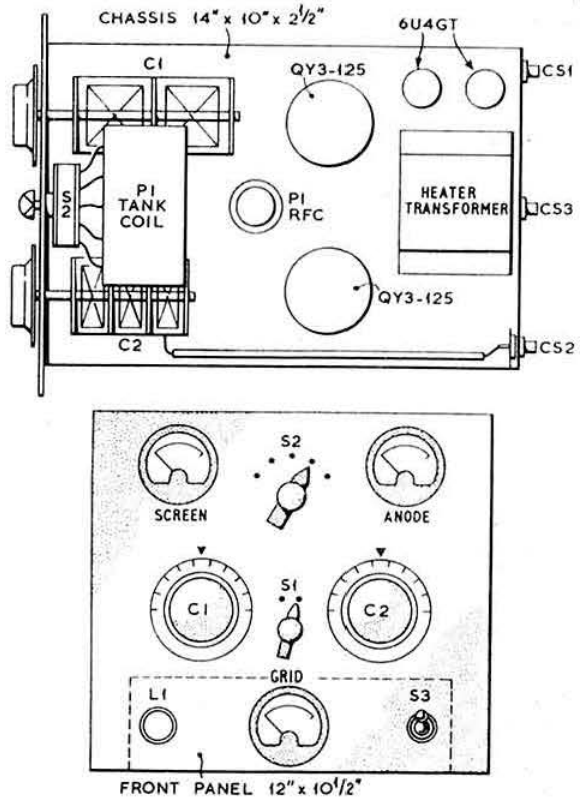


Fig. 10. Chassis and panel layout for the G2DAF Linear Amplifier.

envelope. The grid, screen and anode currents are then noted and in all subsequent operation the amplifier is adjusted to obtain these values. If an oscilloscope is not available, the loading should be adjusted so that the dip in anode current is not more than about 20 per cent of the off-resonance value, i.e. 250 mA off-resonance—load to 200 mA at resonance. A golden rule to observe is, " If in doubt, load heavily!" Under speech conditions adjust the exciter audio gain or r.f. drive so that the anode meter does not swing beyond half the steady signal value. Remember that the meter movement cannot follow at syllabic rate—if it swings up to 150 mA, the true maximum signal current is at least twice this value.

The question of harmonic generation and TVI as a result of the method of operation is of importance to all amateurs. This can only be answered by stating that careful measurement of harmonic output using the identical amplifier under (1) conventional class AB1 conditions, and (2) the G2DAF method of operation, indicates clearly that there is not in fact any appreciable difference between the two methods. Additionally, at the writer's home station during 18 months continuous operation—much of it during peak viewing hours—there have been no complaints.

Conclusion

There are many different methods of operating a linear power amplifier, and it is of course possible to dispense with bias and screen supplies by using zero bias triodes. It is also possible to dispense with neutralization by using grounded

grid operation. However, the grid driven tetrode or pentode linear power amplifier has become increasingly popular among amateurs and there are many good reasons for this. A method of operation that can provide tetrode advantages and at the same time give the simplicity of zero bias triode operation is sure to be of interest to a large number of single sideband workers.

The advantages of the writer's method of operation can be summarized as follows:

(i) Greater power handling capability.
(ii) Increased efficiency.
(iii) Low static anode dissipation and exceptionally cool running.
(iv) No screen power supply, dropper resistors, voltage regulators or clamp valves.
(v) No bias power supply.
(vi) No wasted power.
(vii) No adjustment or setting up procedure necessary.
(viii) An inherently high safety factor, i.e. the p.a. valves cannot be damaged by failure of either grid, screen or anode voltages.
(ix) Simple and stable operation.
(x) Heavy grid swamping resulting in a more constant load to the driver valve.
(xi) Very low intermodulation distortion product level.
(xii) High power gain. (Power gains of 10 are quite practicable.)

The method of operation is suitable for any of the commonly used tetrode or pentode amplifier valves including the 4-65, 4-125, 4-250, 4-400, 4X150A, 4X250B and 813. With regard to h.t. supply requirements, the amplifier will operate satisfactorily over a wide range. For instance the writer has used the QY3-125 valves with a supply of 1400 volts, and received favourable signal reports. As a matter of interest the zero signal anode current for the two valves at this voltage is 10 mA, representing a resting anode dissipation of 14 watts. The only proviso in regard to anode voltage is that there is sufficient to draw a small amount of static anode current, i.e., the valve must not be operated at cut-off or beyond.

It is seldom possible in this world to get something for nothing; the G2DAF amplifier is no exception to this rule and the many advantages have to be paid for. The price is a little more driving power than is usual for conventional class AB1 passive grid operation. However, in recent years it has become fashionable to build exciters with larger driver valves, and many amateurs today are operating small transmitters—both home constructed and commercially made—rated for 50 or 100 watts p.e.p. output and have driving power to spare.

The circuits and methods of linear power amplifier operation described in this article are protected by British Patent No. 926081. Amateurs who wish may nevertheless construct and operate the G2DAF linear amplifier for their own personal use.

LINEAR AMPLIFIER USING TWO 4X150A VALVES

Maximum Signal Conditions
V_a = 1·25 kV (nominal)

	Single-tone		*Two-tone*
V_a	1200 volts	1000 volts	1100 volts
I_a	350 mA	400 mA	350 mA
P in (dc)	420 watts	400 watts	385 watts
P.E.P. in	420 watts	400 watts	578 watts
I_{g2}	50 mA	60 mA	50 mA
I_{g1}	105 mA	125 mA	115 mA
V_{g2}	94 volts	110 volts	85 volts
V_{g1}	22 volts	26 volts	32 volts
V drive (r.m.s.)	56 volts	64 volts	80 volts
P diss	180 watts	144 watts	195 watts
P.E.P. out	240 watts	256 watts	380 watts
P out (mean)	240 watts	256 watts	190 watts
Efficiency	57 per cent	64 per cent	50 per cent

(The variation in anode voltage is due to poor regulation of the power supply).

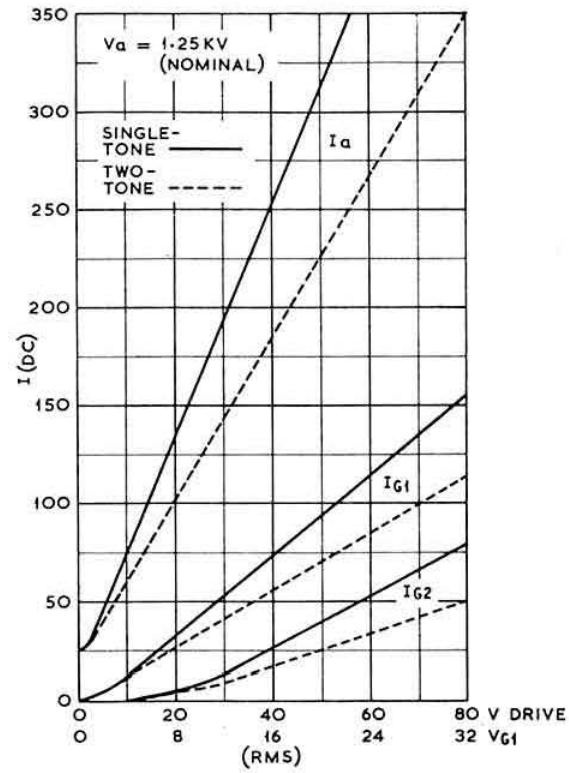


Fig. 11. Dynamic characteristics showing the anode, screen and grid currents. For excitation voltages from zero to 80 volts for two 4X150A valves.

Appendix

The small metal anode, high slope valves of the 4X150A and 4X250B class are becoming popular for linear amplifier use. These valves have a close electrode spacing and a low maximum grid dissipation rating. In the case of the 4X150A this is 2 watts maximum for a single valve.

Because of the high slope the required grid drive voltage is much smaller than usual, and under zero bias conditions, two 4X150A valves can be driven to 130 mA d.c. grid current with an excitation of only 36 volts peak. Using the formula: $V_{g\,peak} \times I_{g\,d.c.} \times 3.14/4$, this is equivalent to a grid dissipation of 3·6 watts—very close to the maximum allowable. However, this small value of excitation would only produce

a screen potential of approximately 50 volts and this is insufficient to allow the valves to draw the required maximum signal anode current. It follows therefore that, (i) a greater r.f. drive voltage is necessary to produce the required screen potential, (ii) because of the low dissipation rating, the whole of this voltage cannot be applied to the control grid. The practical solution is the very simple one of tapping the grid feed point down the passive grid resistor. This then becomes a potential divider and any desired ratio of $V_{drive} : V_{g1}$ can be selected to give the optimum operating conditions for the particular high slope amplifier valve in use.

The writer has had the opportunity of undertaking some measurements on an experimental G2DAF amplifier using a pair of 4X150A valves. At the time the measurements were made the only 1250 volt power supply available was one with a rather poor voltage regulation, and at full load current the anode potential dropped to 1100 volts. This is not the optimum operating conditions to get the best performance. With a full 1250 volts on the anode the figures for both power output and efficiency would have been improved.

The dynamic characteristics are given in Fig. 11 showing the anode, screen and grid currents, for different excitation levels from zero up to 80 volts r.m.s.

It will be seen from Fig. 12 that the grid is tapped down the passive grid resistor (total value 150 ohms) so that it receives 40 per cent of the total drive voltage. This is not necessarily the optimum ratio for the best possible performance, and there is in fact ample scope for the experimentally minded amateur to find the right ratio to suit his own particular valves and operating parameters.

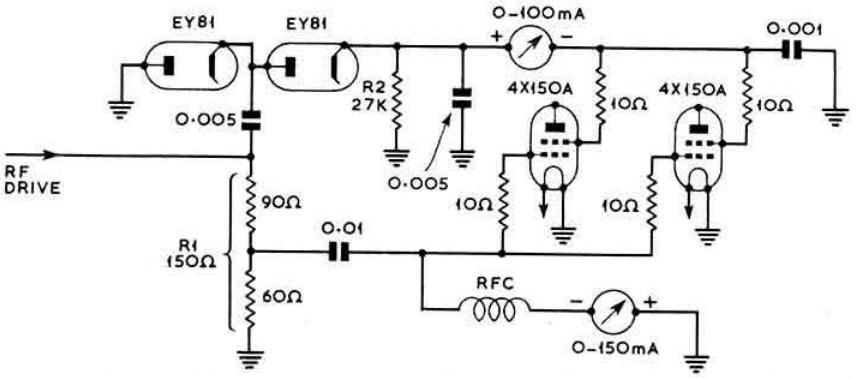


Fig. 12. G2DAF Linear Amplifier using two 4X150A valves, showing modified input circuit. R1 passive grid resistor.

Most transmitting tetrodes employing oxide-coated cathodes exhibit negative screen current under certain conditions of loading. This occurs because secondary electrons are emitted by the screen grid. Small values of negative screen current are not detrimental to valve operation and are quite normal for some tetrodes. Under conditions of negative screen current there would be no return path through the two diode valves for the reverse electron flow. Accordingly an additional resistor R2 of 27 K ohms is included in the screen circuit as shown. It is most important that under all operating conditions there is a return path from the screen-grid to earth, and this resistor is an essential part of the circuit and must not be omitted.

Special Events Stations

AN EXHIBITION STATION using the call-sign **GB3WOR** will be active on 160, 20 and 2m at a Hobbies Exhibition to be held at the Christopher Whitehead Boys' School, St. Johns, Worcester, during the evening of April 18 and 19 and the afternoon and evening of April 20. The station will be operated by members of the Worcester and District Amateur Radio Club.

AN ALL BANDS amateur station manned by members of local societies and other local amateurs will be in operation at the Festival of Leisure Exhibition which is being organised in Newcastle-under-Lyme by the local Rotary Club from April 25 to 27, 1963. The call-sign will be GB3RIW.

Wired Television

WITH THE INCREASING use of wired television, members may like to know that where interference is caused to such services using carrier frequencies embracing the bands assigned for amateur operation, the Post Office refers complainants to the relay company concerned. The Post Office normally looks to the relay companies to attend to their systems in order to prevent the interference.

NORTHERN IRELAND GOLDEN JUBILEE CELEBRATIONS

WOODBURN HOUSE HOTEL, BELFAST

Saturday, May 4, 1963

Programme

2.30 p.m. Assemble

3 p.m. Lecture: " Exploration of the Universe by 21 cm Waves " by Dr. B. L. Moiseiwitsch
Afternoon Tea
Demonstration of and discussion on radio equipment

Separate programme for the ladies

7.30 p.m. for 8 p.m. Golden Jubilee Celebration Dinner

The Council will be represented by the President, Mr. Norman Caws, G3BVG, the Zonal Representative, Mr. Barney Patterson, GI3KYP, and the General Secretary, Mr. John Clarricoats, O.B.E., G6CL. Visitors who are interested in private accommodation for the event should write as soon as possible to Mr. Patterson at 24 Cyprus Avenue, Belfast 5.

A 30 Watt Transistor Modulator

Simple Unit for Mobile or Portable Operation

By A. L. MYNETT, B.Sc. (G3HBW)*

THE modulator to be described gives 30 watts mean audio output, with low distortion, when operating from a 12 volt battery supply with earthed positive lead. Sufficient gain is provided to enable the unit to be used with any normal crystal microphone. The modulator is used in conjunction with a portable 2m transmitter, using a QQV03-20A in the p.a., for which it provides ample modulating power.

Six stages are used in all, arranged in negative feedback pairs. Four stages, using GET106's and GET104's, amplify the input from the microphone sufficiently to drive a single class A GET572, the 1·5 watts output from this stage being transformer coupled into the bases of the push-pull GET572 modulators. This driver transformer, and the modulation transformer which steps up the 3 ohm collector-to-collector optimum load impedance of the GET572's to a variety of impedances between 5,000 and 15,000 ohms, are both home-made.

The pairs of low-level stages have both d.c. and a.f. negative feedback applied to them for d.c. stabilization and improved linearity. To accomplish this, the first stage base of each pair is coupled to the second stage emitter through a parallel *RC* network and the first stage collector is directly coupled to the second stage base. This circuit is due to Mullard Ltd. [1]. The arrangement is repeated for the second pair of stages. The gain control potentiometer comes between the pairs of stages and so is not involved in the negative feedback loops.

The single ended class A driver and push-pull final stages also form a feedback pair. Emitter resistor and base-potentiometer biasing is used for both stages, the negative supply resistor R2 of the base potentiometer for TR5 being connected to one collector of the p.a. stage. It was found possible to choose the values of the three resistors involved, R1, R2 and R3, to obtain the correct d.c. operating conditions for TR5 together with a suitable value of inverse feedback for the pair. The right collector for attachment of R2 is found by trial and error. Forward biasing of TR6 and TR7 is such as to reduce crossover distortion to a low value. The common emitter resistor (R4) is of 0·1 ohm, 3 watts rating, obtained by suitably winding copper wire on a standard 3 watt carbon resistor of high value (see Table 1).

* *52 The Rutts, Bushey Heath, Watford, Herts.*

Mechanical Arrangement

The complete modulator, with the exception of the final stage, is built inside an Eddystone die-cast box measuring 7¼ in. × 4½ in. × 2 in. Cooling of TR5 is accomplished by clamping it to the side of the box, using 4.B.A. nylon screws and an insulating mica washer smeared with silicone grease,

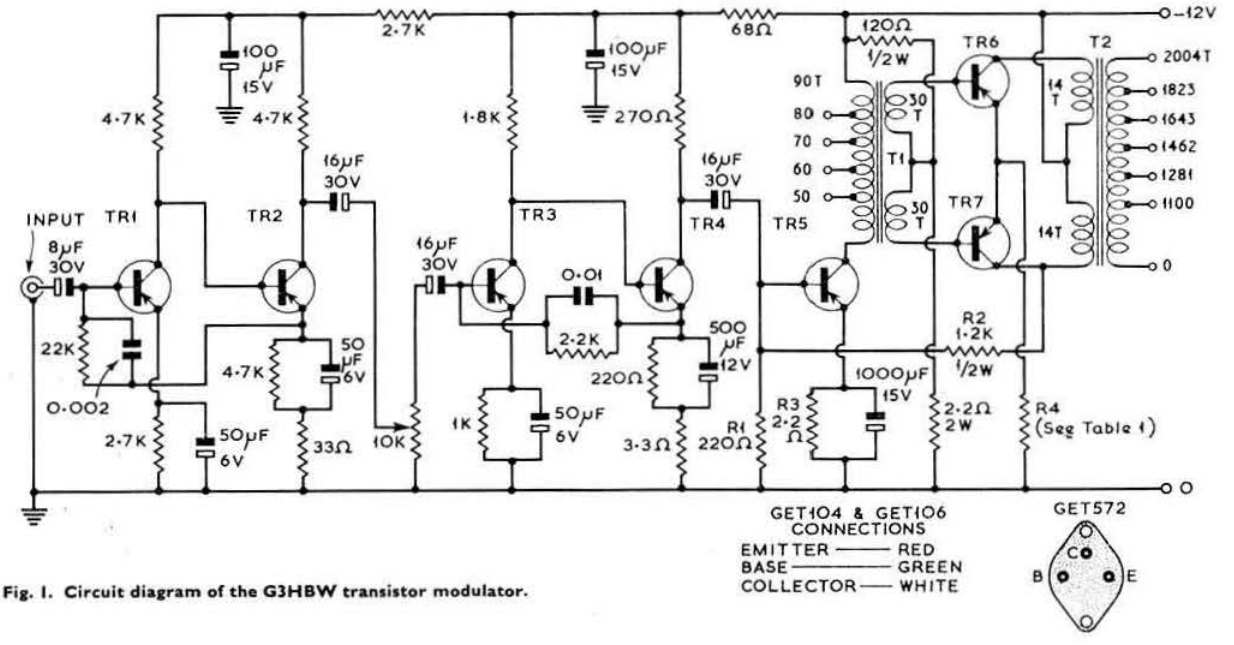
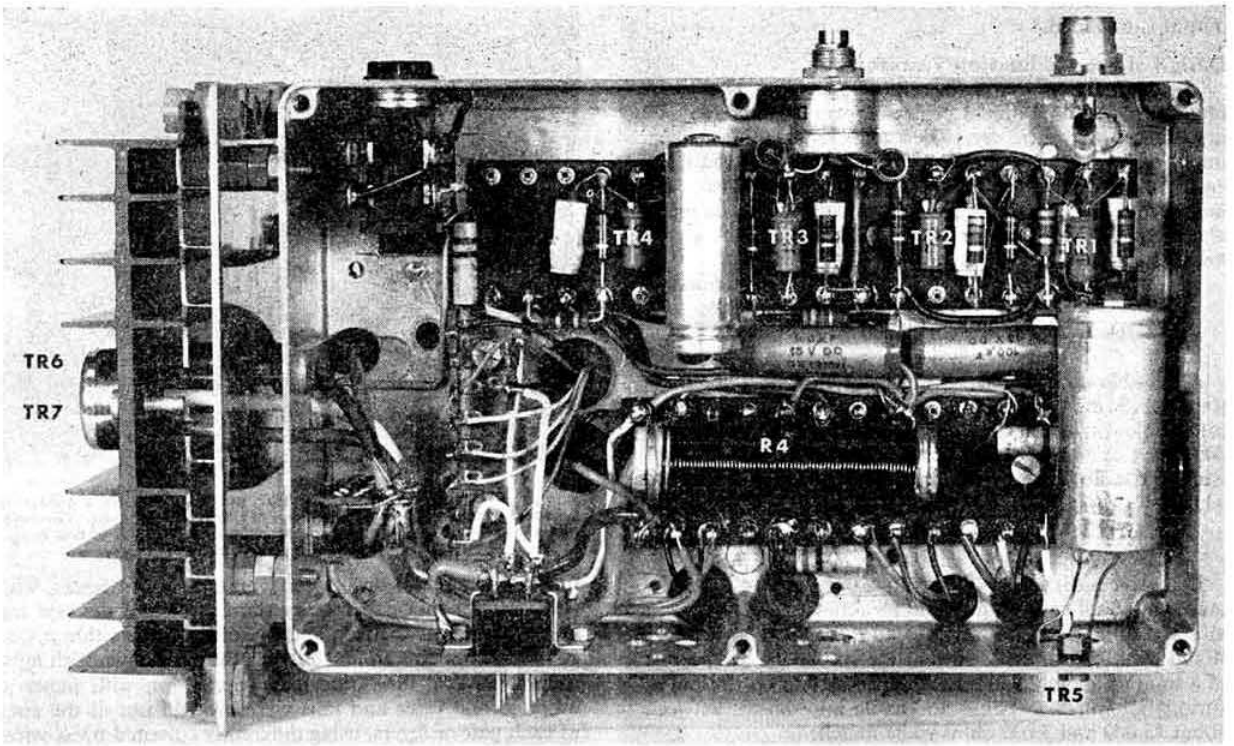


Fig. 1. Circuit diagram of the G3HBW transistor modulator.



A view under the chassis of the 30 watt transistor modulator.

following normal small-power transistor practice. A standard power-transistor cooler (see Table 1) is cut in half and TR6 and TR7 are each bolted directly to one half, as shown in the photograph. The coolers are themselves fixed to an aluminium plate, just large enough for the purpose and made of 14 s.w.g. material, using 0B.A. nylon screws and Tufnol spacing washers. The plate is finally attached to one end of the Eddystone box by means of four 4B.A. by $\frac{3}{4}$ in. cheese-head brass screws, each with three standard 2B.A. nuts as spacing bushes. The coolers should be mounted with the planes of their fins vertical for good airflow. The GET572's as supplied will probably not have sufficiently long leads to pass right through into the box, so the leads should be extended by soldering on lengths of similar tinned-copper wire and covering the whole lead with insulated sleeving.

As can be seen from the photograph, the two transformers are mounted on the top of the box, the modulation transformer being the closer to the output stage transistors. The gain control and a Belling-Lee co-axial socket for the microphone input are on the front, the output stage coolers on one end, as already mentioned, and the driver transistor TR5 and an 8-way Painton panel-mounting plug carrying 12 volts d.c. input and a.f. output are mounted on the rear.

A high-speed relay and jack socket, visible in the photograph, are, of course, associated with transmitter keying.

Design of the Output Stage

The output stage uses two GET572's in class B push-pull with transformer coupling in and out and a small forward base bias to reduce crossover distortion. With a 12 volt supply, it is reasonable to assume a peak collector-to-emitter voltage swing ($V_{ce\ pk}$) of 10·5 volts per transistor and a collector peak current swing ($I_{c\ pk}$) of 7·0 amps. Then the optimum load impedance, per transistor ($R_{ce\ opt}$) is given by the formula:

$$R_{ce\ opt} = \frac{V_{ce\ pk}}{I_{c\ pk}}$$

$$= \frac{10{\cdot}5}{7{\cdot}0} \text{ ohms}$$

$$= 1{\cdot}50 \text{ ohms.}$$

The maximum power output, $W_{o\ max}$ is given by:

$$W_{o\ max} = \frac{(V_{c\ pk})^2}{2R_{ce}}$$

$$= \frac{10{\cdot}5^2}{2 \times 1{\cdot}50} \text{ watts}$$

$$= 36{\cdot}7 \text{ watts}$$

The maximum transistor dissipation, $W_{c\ max}$ is given by:

$$W_{c\ max} = \frac{2}{\pi^2} \cdot \frac{(V_{c\ pk})^2}{2\ R_{ce}}$$

$$= \frac{2}{\pi^2} \cdot \frac{(10{\cdot}5)^2}{2 \times 1{\cdot}50} \text{ watts}$$

$$= \quad 7{\cdot}45 \quad \text{watts}$$

This is an acceptable value of peak dissipation for the transistors and coolers used, bearing in mind that the average dissipation will be considerably less. The available output power is reduced by the effect of the emitter resistor, which is necessary for stabilization, and is also reduced by losses

in the modulation transformer. In practice, about 30 watts output is obtained.

Design of the Modulation Transformer

The modulation transformer must provide a step-up in impedance from 3 ohms, centre-tapped, to a variety of impedances between, say, 5,000 and 15,000 ohms. This might seem rather a tall order but it can be achieved quite easily and efficiently with a home-made transformer. The inductive reactance of the whole secondary should be made about equal to the load resistance, i.e. 15,000 ohms at the lowest frequency to be handled, say 300 c/s. Since:

$X_L = 2\pi fL$, where X_L is the numerical value of the coil reactance.

Hence, $15{,}000 = 6{\cdot}28 \times 300 \times L$

and $L = 7{\cdot}96$ Henrys

A suitable core would be made up from a 1 in. thick stack of 3 in. wide, 0·015 in. thick Laminic stampings (see Table 1). On such a core, measurement showed that 200 turns of 34 s.w.g. wire gave an inductance of 122 mH with no d.c. flowing. To obtain 7·96 H, n turns are required where:

$$\frac{n}{200} = \sqrt{\frac{7{\cdot}96}{{\cdot}122}} \text{ and } n = 1{,}600$$

If the secondary is wound with 2,000 turns, the inductance with no d.c. flowing should be about 12·4 H. This is a more reasonable design figure to allow for core saturation. It can therefore be assumed that the secondary will consist of a total of about 2,000 turns, tapped at 1,100 turns and at various intermediate points to enable impedances between about 15,000 and 5,000 ohms to be matched.

If the total primary impedance is 3 ohms and the number of primary turns is n', then:

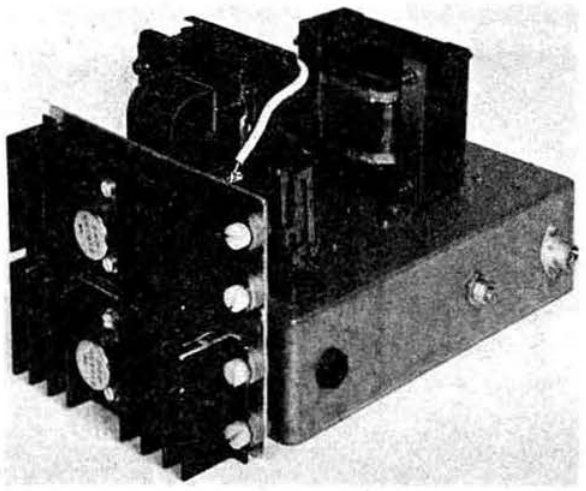
$$\frac{n'^2}{(2{,}000)^2} = \frac{3{\cdot}0}{15{,}000} \text{ and } n' = 28{\cdot}2$$

The primary will, therefore, consist of 28 turns of suitable wire, centre-tapped. The total "window" available for wire-winding, for the core in question, is about 0·52 sq. in. It was decided to use 0·20 sq. in. for the primary and 0·30 for the secondary, the rest being available for insulation and to allow for possible uneven wire-laying. Reference to the wire tables showed that 2,760 turns of 34 s.w.g. enamelled wire would occupy 0·30 in. and also that 28 turns of 16 s.w.g. enamelled would go quite easily into the 0·20 sq. in. remaining but, when an attempt was made to wind this over the secondary, it was found that there was not quite sufficient depth of "window" remaining to allow the winding to clear the laminations with a reasonable gap and so 17 s.w.g. enamelled was wound on instead and this was entirely satisfactory. The use of 18 s.w.g. wire for the primary would increase the resistance significantly.

As already mentioned, the secondary was put on first, winding directly upon the bobbin and requiring 22 layers,

TABLE 1

Emitter Resistor R4:	67 turns of 22 s.w.g. enamelled copper wire, close-wound on standard high-value 3 watt carbon resistor.
Transformers: T1	See text.
T2	Laminations by Magnetic & Electrical Alloys Ltd., stampings Type 101, material 0·015 in. thick Laminic, quantity 70 each of E's and I's.
Cooling Fins:	Marston Excelsior type 10D-400-A2 (only one required, cut in half). Manufactured by Marston Excelsior Ltd., 49-67 Armley Road, Leeds, 12.



The ouput transistors, TR6 and TR7, are mounted on a heat sink bolted with nylon screws to one end of the diecast chassis. The relay and the jack socket adjacent to the heat sink are part of the keying circuit in G3HBW's portable installation.

in all. First, 1,100 turns were wound on in 12 layers, with two turns of thin paper every third layer and the first tap was brought out at this point, by soldering on a thin p.v.c.-covered stranded lead and sticking the joint down with tape. Two layers at a time were then wound on, with paper at every second layer and taps were brought out at the ends of each pair of layers, using differently coloured p.v.c. wires for identification. In this way, taps were produced at 1,100, 1,281, 1,462, 1,643, 1,823 and the end of the winding itself at 2,004 turns. The impedances corresponding to these taps were calculated to be 4,600, 6,250, 8,150, 10,300, 12,700 and 15,400 ohms and these values were substantially confirmed by measurement later.

The next step was to wind the primary. After putting on three layers of black empire tape, 14 turns of 17 s.w.g. enamelled were wound on in a single layer and the centre tap was brought out by soldering on a length of p.v.c. insulated 14/0·0076 wire and bringing it across the whole winding. A layer of paper and another 14 turns of 17 s.w.g. wire completed the transformer which was covered with three further layers of empire tape. After inserting the laminations, interleaved, the whole was wax-impregnated.

Driver Transformer

Reference to the GET572 data sheet shows that the input drive conditions for a pair operating as intended would be 5·0 V r.m.s. at 0·3 A r.m.s., base-to-base, representing an input impedance of about 16 ohms. The driver stage, a single GET572 in class A, must give at least 1·5 watts output so that a suitable set of running conditions would be:

$V_c = -12$ volts
$I_c = 400$ mA
$I_b = 10$ mA
$P_{out} = 2$ watts
$R_{load} = 30$ to 40 ohms
Distortion = 2 per cent

The design of the driver transformer is not so critical as that of the modulation transformer and it was decided to wind it upon the core of an old choke, found in the junk box. The core is of unknown material, but probably Stalloy and

was made up of non-interleaved *E* and *I* stampings, with an air gap of about $\frac{1}{32}$ in., the whole being 3 in. long, $2\frac{1}{2}$ in. high and 1 in. thick. The core comprises 95 each of "*E*" and "*I*" stampings, 0·010 in. thick.

The output impedance of the class A stage will be in the region of 30 ohms. It is therefore desirable to make the reactance of the primary at least 30 ohms at 300 c/s. The value of inductance is calculated from $30 = 6{\cdot}28 \times 300 \times L$; hence $L = 15{\cdot}9$ mH.

It was found that 90 turns of 20 s.w.g. wire wound on the core mentioned gave an inductance of about this value, with a suitable d.c. flowing (400 mA). The secondary had to be wound to step the primary impedance of 30 ohms down to 16 ohms centre tapped. If n'' is the number of secondary turns, then:

$$\left(\frac{n''}{90}\right)^2 = \frac{16}{30} \text{ and } n'' = 66$$

The primary of the transformer was put on first, winding 90 turns of 20 s.w.g. enamelled in three layers and tapped at 50, 60, 70 and 80 turns, with paper between each layer. The secondary was then added in two layers, totalling 60 turns of 20 s.w.g. enamelled, centre-tapped, reducing the number of turns from the calculated 66 to make better use of the primary tappings. It was found that the best match to the collector of TR5 was obtained when the full 90 turns of the primary were in use but it is considered that the primary taps are still worth incorporating to improve the overall flexibility of the modulator and to make provision for possible experimental modifications.

Operation and Results

No setting-up was found to be required, other than connecting the negative feedback resistor for the last two stages to the correct collector. This should be done with care and with the modulator connected to a suitable load, as the last two stages will oscillate if the wrong collector is chosen! The pre-set gain control should be adjusted so that, at normal speech levels, the clipping condition is not quite reached. When it occurs, clipping is symmetrical and very square, at about 30 watts output, as expected. A simple low-pass filter between the modulation transformer secondary and the p.a. will reduce splatter if some clipping is required. No accurate measurements of frequency response have been made but this seems to be adequate to produce normal "good communications quality." Thermal stability is satisfactory up to at least 30° C. ambient, as the design of the final stages would indicate, and the battery consumption varies from 0·8 A under quiescent conditions to 5·5 A at full output, with a 12 volt supply.

As already mentioned, the modulator is used in conjunction with a portable 2m transmitter employing a QQV03-20A as the p.a., anode and screen modulated. Anyone who has heard G3EFX/P, the station of the Radio Society of Harrow, during any of the past year's field days will realize that the speech quality produced is reasonable and that there is no lack of modulation depth. The transmitter and modulator were operated during the 1962 Jamboree-on-the-Air under the call-sign GB3BPH and were also used to provide the first 2m signals to be heard from the Island of Sark, during the 1962 GC3PBR/A Expedition.

Reference

[1] *Reference Manual of Transistor Circuits*, page 176, Mullard Ltd.

A Modern Instrument Knob

Novel Use of Toothpaste Caps

By R. Mallinson (G3GOG)*

AS equipment is constantly being reduced in size with advancements in miniaturization, a common requirement is for compact, yet elegant and efficient control knobs. The writer was recently faced with this problem, when nine knobs were required to fit on the front panel of an oscilloscope, with only 48 sq. in. of available space. Enquiry into the available commercial designs did not reveal any satisfactory types, and the cost of instrument knobs was relatively high, especially when compared to the cost of the oscilloscope. The solution therefore had to be an original idea, and the result of further thought produced a knob consisting of a modified toothpaste cap.

Suitable types were found to be of the semi-soft polythene variety, used on Gleem and Colgate tubes, the various colours serving to identify each control, as well as making the instrument more attractive.

In order to be able to fit the caps securely to a $\frac{1}{4}$ in. diameter shaft, the writer filled each one with Araldite, drilled a $\frac{1}{4}$ in. diameter hole into the hardened filler, and drilled and tapped a 6BA hole for a grub screw into the side of the knob. The Araldite was found to be strong enough to take the strain of the screw.

For readers who possess lathes, drilling the $\frac{1}{4}$ in. hole should present no problems, but for the less fortunate, the jig which is to be described should offer a satisfactory alternative. A piece of sheet aluminium was cut to cover the top of a block of softwood, $1\frac{1}{2}$ in. × $1\frac{1}{2}$ in. × $\frac{3}{4}$ in., three sides of the sheet being turned over the edges of the block to ensure that it is always replaced in the same position. A $\frac{1}{8}$ in. hole was subsequently drilled through both sheet and block, the hole in the block then being enlarged as much as possible, to hold each cap, without any falling through. After placing a knob in the hole, the aluminium sheet was placed on the block, and a $\frac{1}{8}$ in. hole drilled into the Araldite, care being taken not to penetrate the polythene at the front of the knob. All were drilled in the same way, the template always ensuring that the hole is concentric with the exterior of each one. The $\frac{1}{8}$ in. holes were later opened out to $\frac{1}{4}$ in. with a hand drill, to avoid chipping the filler. The grub screws employed by the writer consisted of steel, cheese-head screws, cut down and slotted with a small hacksaw blade, but it should be possible to purchase suitable types from component dealers such as Home Radio of Mitcham (type Z79-6BA).

The result is a knob of modern style which is easy to operate, and enhances the appearance of any apparatus that has limited panel space.

* *53 Ashmore Grove, Welling, Kent.*

Getting Going on "Bottom Band"

Equipment Used and Results Obtained

By A. D. SMITH (G3MTI)*

Written specially for the April BULLETIN in response to numerous recent requests for non-technical articles of practical value.

DURING a routine visit from a Post Office engineer recently, the conversation turned to the allocation of the v.h.f./u.h.f. spectrum, and in the course of discussion, it was discovered that although the Post Office officials do not make any checks on such high frequencies, there is a shared band between 400,000 and 750,000 Gc/s which is available to amateurs. Without even considering s.s.b. operation, this would appear to give enough channels to accommodate simultaneously all the amateur stations in the world, including those wandering weirdies.

Some early experiments using these frequencies were very encouraging indeed. Contact was made two-way at the first attempt over a distance of one-and-a-half miles, and using a transmitter input of half a watt at each end. Having established that this band has possibilities, further investigations were made as to the characteristics of the band, which may be briefly summarized as follows:

QRM: The sun has been found to emit noise over the whole of the band, and tests made during the time that the sun is above the horizon have been unsuccessful on all occasions save one, when signals were received one-way only over a sea path of about half a mile. A test carried out in the Welsh mountains showed that, although the 144 Mc/s link was RS59 plus each way, no bottom-band signals were found above the solar noise, even on a line-of-sight six mile path. Similar tests in Worcestershire were equally unsuccessful through being undertaken before sunset.

Atmospheric Attenuation: This can be quite low, but changes very markedly at different altitudes and depends to a large extent on the barometer and hygrometer readings. In an atmosphere of high moisture content, a maximum range of 20 ft. was observed on one test, using 30 watts input!

DX Possibilities: As might be expected at these frequencies, line-of-sight paths only may be used, although reports have been made of a powerful Government transmitter being received far beyond the horizon, the single-hop path being accounted for by a reflecting layer at one or two miles above the Earth's surface. From the writer's QTH, signals (other than galactic noise!) have been received at RS57 from a distance of 23 miles, although no two-way QSO at this range has so far been made.

* "Hillstone," 42 Wyche Road, Great Malvern, Worcs.

Equipment

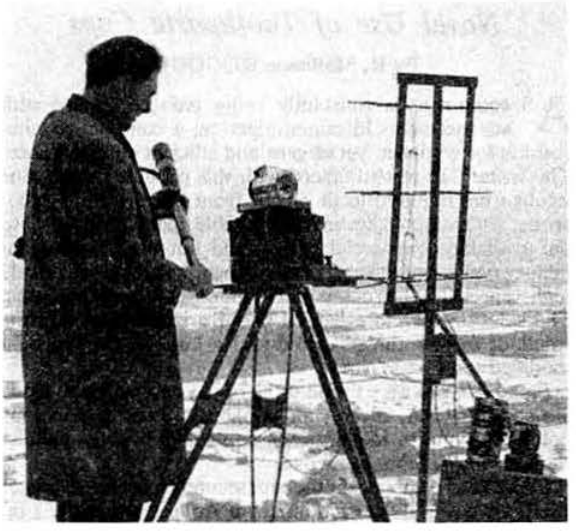
A very simple mobile transmitter can easily be constructed by modifying similar apparatus to that used by Fleming in his experiments of 1890. A non-resonant cavity, cylindrical in shape, is fixed securely round a 12 volt car bulb and the filament connections brought out at one end. The cavity is made 12 volts positive with respect to this filament. The open end of the cavity is covered by a flap of opaque material which can be slid sideways by an extension on a relay operating arm, the associated relay coil being connected between the cavity and the filament.

The filament is first allowed to warm up, and upon application of the cavity potential, the radiation beam will emerge from the flap end of the cavity, and can be directed as required. The cavity voltage is keyed for c.w. operation, whilst for the f.s.k. mode, the flap is made of two gels fastened edge to edge.

Although there are some simple (even transistorized) receivers in use on the band, these are usually fairly insensitive and not suitable for communication purposes. The more usual receiving arrangement is complicated but extremely sensitive, and has a series of a.g.c. and filter circuits for use under special conditions.

Understandably, beamwidths can be extremely narrow, giving further protection against both natural and man-made interference. For really narrow beams, Yagis are impractical, and lens systems are almost always used. At the author's

(*Continued on page 544*)



The portable transmitter is mounted on a tripod and lining up is facilitated by the 420 Mc/s link on the right. Here the author is seen adjusting the three-stage pre-amplifier before connecting it in front of the receiver.

TECHNICAL TOPICS By PAT HAWKER (G3VA)

Is Simplicity Doomed? · Vertical Aerials—Hula Hoop Breakthrough?
Current Regulated Transistor Supply · Heater Regulation · Zener Diode Regulator
Temperature Compensation in Oscillators · Narrow-band A.F. Filters
Transistor Microphone · Parametric Multipliers · Electronic Keys
Micro-soldering · VLF

DURING the five years—completed this month—that *Technical Topics* has been appearing, some attempt has been made to steer a fairly balanced course between describing the strange and often rather complex techniques which have been flooding into electronics and reporting fresh variations on older and more familiar amateur radio circuits. It is little use devoting too much space to new and expensive components until they reach the stage where the average amateur can hope to use them; on the other hand it would be wrong to ignore completely new developments which must inevitably affect us all eventually. Most of us are interested in assimilating new ideas even if we continue to use surplus 807s and 6SK7s.

Many of us still yearn consciously or unconsciously after the simplicity of the time when a straight receiver could be put together in an evening, when nobody bothered to tell us that the carriers of a.m. stations remain constant in amplitude (after all our books invariably showed nice wavy diagrams) and mathematics were confined—or at least so it seems in retrospect—to working out the length of a half-wave Hertz aerial. But the sheer weight of numbers is against such an outlook. W2AOE, in *QST* (February, 1963), estimates that there are now 372,000 amateurs in the world and that by 1972 there may well be 740,000. New standards of frequency stability and bandwidth conservation—calling usually for more complex gear—must inevitably be accepted by us all or amateur communication will be bogged down. But fortunately many of the new components, such as tunnel diodes, could result in a simplification of the actual circuits.

A Breakthrough in Verticals?

Good DX aerials for the lower frequency bands are of increasing importance these days. If you doubt this then W3ASK's table of smoothed sunspot numbers (*CQ*, January, 1963) should remove all doubts. Taking the single month of April the recorded and predicted figures are: 1958 197; 1959 169; 1960 120; 1961 64; 1962 38; 1963 26; 1964 11; 1965 5. Each drop in value indicates a shortening of the time each day when the higher frequency bands are open to DX.

For those who can contemplate erecting a 50 ft. self-supporting vertical using 4 in. diameter aluminium pipe at the base, tapering to 1½ in. pipe at the top, with a co-axial stub sleeve section and different feedpoints for each band, an article by W3JHR in *CQ* (December, 1962) should be of interest since the result is a 3·5, 7, 14 and 21 Mc/s aerial with low angles of radiation on each band.

But a much more revolutionary approach which may allow us eventually to forget high masts or towers is foreshadowed in " Hula Hoop Antennas: A Coming Trend " by J. M. Boyer in *Electronics* (January 11, 1963), an article aimed primarily at commercial stations. It would take one of our aerial wizards to do real justice to this exciting new concept which suggests that an aerial only about *2 ft. high* can give a performance comparable to that of a full quarter-wave high 60 ft. aerial, a height saving of some 30 times. Imagine an effective DX aerial some 4 ft. high for 1·8 Mc/s, down to 3½ in. high for 28 Mc/s!

Most of us are likely to approach such claims a little sceptically, but the fact that the article appears in the highly respected *Electronics* suggests that here is something which should be investigated as soon as possible. In the past it has been shown that when vertical aerial height is reduced by electrically loading the element (as for example in mobile rigs) efficiency deteriorates pretty rapidly. But in this new system, which is termed a " leaky waveguide radiator," it is claimed that circumferential aperture is substituted for the lost height of the aerial.

This particular " hula hoop " has no connection with an earlier amateur aerial of the same name. In general appearance it resembles the popular halo but the loop extends right round (see Fig. 1) and the whole system is tuned against the ground plane earth by C1 rather like a quarter-wave Marconi. Basically it is explained as " a circular array with a conductor one-quarter wavelength long conductively joined to the top of a 2·5° high vertical element and bent round in the horizontal plane at this height to form a circle."

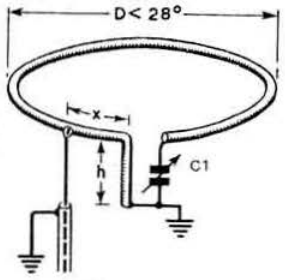


Fig. 1. The Hula Hoop Aerial: h = 2·5°, D is less than 28°, X is adjusted to match the feeder line. The capacitor is C1.

In the article all dimensions are given in terms of electrical degrees (90° equals an electrical quarter wave). As stated the vertical section is only about 2·5°, and the circular conductor has a diameter less than 28°. The feedpoint dimension *X* depends upon the feeder impedance and it is stated that it can be adjusted for lines of 36-500 ohms. By varying C1 a given aerial can be tuned over a frequency range of 2:1 (thus in theory making possible use on two adjacent bands) without exceeding a feeder standing wave ratio of 2:1, although its efficiency would appear to fall off fairly sharply.

A 2 ft. high model at KM2XOP (an American experimental station) supported on a circular ring of insulators was tested against 110 ft. and 68 ft. high radiators all using the same ground plane. At 4 Mc/s (h = 2·88°, D = 26·28°) the loss compared with a 68 ft. tower was less that 3db (½ S

point). At 2 Mc/s the same aerial was only 1·44" high, 12·9° diameter and compared with a 110 ft. tower represented a loss of about 2-2½ S points.

A mobile model for 26·5 to 31 Mc/s, 27 in. in diameter and only 3½ in. above the vehicle roof which formed the ground plane, is reported to have performed better than a quarter-wave whip.

The design is apparently patented in the United States but this does not prevent any amateur testing out the idea. Since it could represent a major breakthrough for low frequency and mobile operation, this is clearly a project of considerable potential value. We must stress however that our only source of information on this aerial is what is given in the *Electronics* article.

Current Regulated Supplies

In *Technical Topics* (December, 1962) we discussed the advantages of current-limited power supplies and also gave details of a voltage doubler circuit devised by W3FQB with what amounts to choke-input regulation. It was then stated that a practical difficulty in this arrangement was the need for a centre-tapped or dual-wound swinging choke. W5MCV/0 in *QST* (February, 1963) has found that old mains-transformers provide one solution if all windings other than the h.t. secondary are stripped off and the

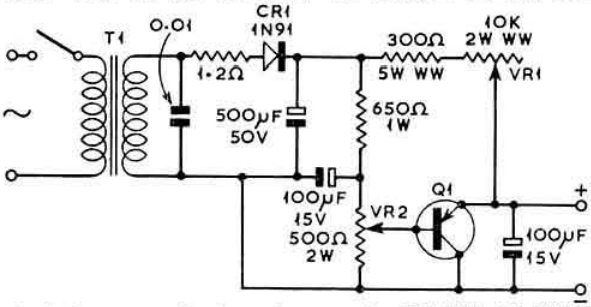


Fig. 2. Current regulated transistor supply. CR1 1N91, Q1 2N255, 2N307 or 2N554 etc. The 650 ohm resistor comprises 820 ohms and 3·9 K ohms in parallel. Resistors are all 10 per cent rating. The secondary of T1 should supply 25·2 volts at approximately 1 amp. A reader has since suggested that the 10K 2 watt resistor is under-rated in some settings and the wattage should be increased.

laminations restacked to provide a butt joint. With such a choke and a 330-0-330 volt transformer he was able to obtain 1180 volts (with a bleeder current of 40 mA) dropping by only 100 volts at the full 200 mA load.

A low-voltage current-regulated supply for transistor and similar applications is described by S. E. Bammel in *Radio-Electronics* (January, 1963): Fig. 2. This handy unit provides a variable voltage from 0·2-15 volts (regulated to within about 0·5 volt) with a continuously variable current limit of 3-100 mA. The output voltage falls away almost to zero for about 30 per cent overloads making it almost impossible to burn out a transistor if the current regulator has been set to a suitable value. The unit, it is stated, is not damaged by any load, including a short-circuit.

The two controls can be directly calibrated (the current calibration is by no means linear) with a volt/mA meter. To calibrate the voltage knob simply connect a voltmeter across the output sockets. To calibrate for current limitation, connect a milliammeter in series with VR1 with the voltage knob set to 10. The regulating transistor dissipation does not exceed about 1·5 watts so there should be no need to mount it on a heat sink.

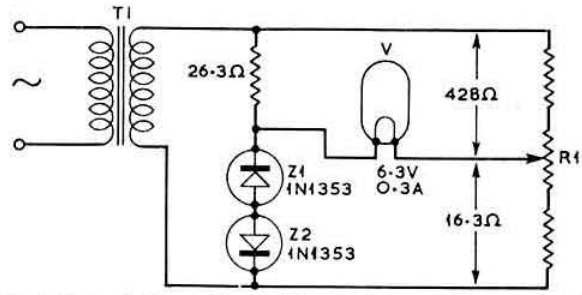


Fig. 3. Zener diodes used in a bridge circuit to provide a regulated heater supply for a 6·3 volt 0·3 amp valve. Trimmer R1 should be about 20 per cent of the total value of the lower arm of bridge. The Zener diodes are type 1N1353.

Heater Regulation

Few amateurs would contemplate operating a v.f.o. or receiver h.f. oscillator from an unstabilized h.t. supply. But it is often forgotten that changes in heater or filament supplies can cause even more substantial frequency changes (particularly during power cuts or if you are unfortunate enough to suffer from poorly regulated mains supplies). With the increasing need for higher stabilities, more attention could usefully be given to this question. Some factory-built receivers have used various types of barretters to stabilize heater supplies to oscillator valves (for example the Geloso G209R). A new technique for very close regulation of a 6·3 volt 0·3 amp valve was noted in *Radio-Electronics* (January, 1963) reprinted from *Hoffman Semiconductor Application Notes*. This uses two Zener diodes connected back-to-back in a bridge arrangement. When set up correctly, it is stated that this system (Fig. 3) will result in a heater voltage variation of less than 0·04 per cent for a transformer voltage change of 13 per cent.

This same back-to-back Zener technique, in rather simpler form, was given in *Electronics Design* (June 7, 1962) as a convenient means of stabilizing h.t. output from a mains transformer: see Fig. 4. It should be noted that Zener diodes used in this way result in a clipped output waveform rather than a pure sine wave but this is of little practical consequence in this type of application, though it could upset an accurate a.c. voltage measurement on some meters.

Oscillator Stability

An ingenious way of obtaining correct temperature compensation to overcome drift in oscillators is featured in

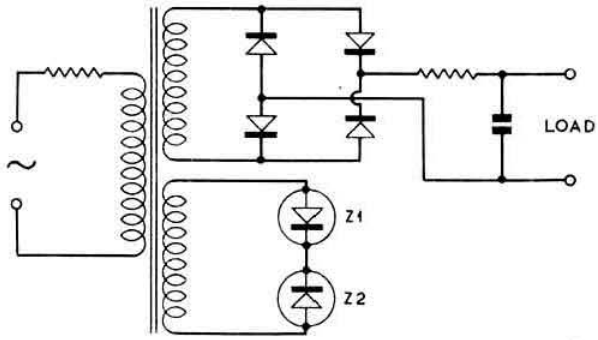


Fig. 4. Low voltage Zener diodes used to stabilize an h.t. supply. The diodes have a breakdown of 5-7 volts and are connected across a low voltage winding.

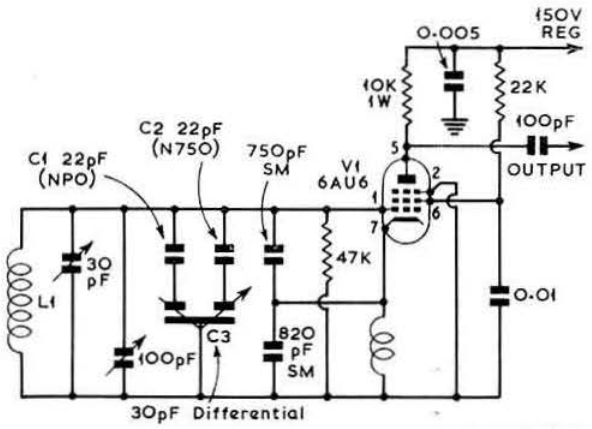


Fig. 5. V.F.O. from the W4JWV s.s.b. exciter covering 5-5·5 Mc/s. L1, 8½ turns, 18 B and S, 1 in. diameter, ¾ in. long. C1, 22pF (NPO); C2, 22 pF (N750); C3, 27 pF differential capacitor; V1, 6AU6.

an s.s.b. exciter by W4JWV (*QST*, January, 1963) and has also been used in Hallicrafters equipment. Fig. 5 shows the first conversion oscillator from the W4JWV design with a very high-*C* Colpitts. This has a differential capacitor to provide differing degrees of compensation from two similar value fixed capacitors, C1 and C2, one an NPO temperature coefficient type and the other an N750 type. There is a component called the " Tempa-trimmer "* which provides much the same facility but is a little costly for amateurs.

While accurate temperature compensation can be very effective, we still think that an even better technique is to avoid the need for such compensation by removing the tuned circuit out of reach of all sources of heat. At one of the early R.S.G.B. Amateur Radio Exhibitions, G2IG showed a Clapp v.f.o. with the tuning section separated by several feet from the unit containing the oscillator valve and this system has since been used by a number of designers. Although the entire unit is in one block, the same idea forms the basis of W8VVD's " Silver Sentry " super-stable v.f.o. (*CQ*, December 1962). The tuned circuit is in its own compartment, painted silver to reflect heat and lined with fibreglass thermal insulation. Drift figure is claimed to be only 18 c/s per hour. One warning by W8VVD should be noted: " A Clapp oscillator has one bad feature. The more immune you make it to external electrical changes, the more prone it becomes to mechanical instability."

Audio Filter

If only the stability of our c.w. transmitters were better, more effective use might be made of peaked audio filters without the risk of losing stations between " overs." Some time ago (*T.T.* June, 1962) we gave details of an audio bandpass filter suitable for 'phone operation. Fig. 6 shows a new idea for an extremely sharply peaked 400 c/s filter by P. Fung (*Electronic Design*, December 20, 1962) which is stated to have a bandwidth of only 10 c/s at —3db points and 150 c/s at —30db and which might well form the basis of a useful c.w. filter. The two transistors, Q1, Q2 are *n-p-n* a.f. types but we can see no reason why *p-n-p* types should not be substituted with reversed supply polarity. The transistors are connected in " compound " (we believe this configuration is more widely known as a " super alpha pair "). The output current is the sum of the collector currents of the two transistors and a bridged-*T* network gives heavy negative feedback except at the filter frequency.

* Manufactured by Oxley Developments Co. Ltd., Ulverston, Lancs.

Transistor Microphone

A possible successor to the carbon microphone which, despite its limitations, is still used in greater numbers than any other type, is reported to have been developed in the United States. According to the *Bell Laboratories Record* (December, 1962) this is a " transistor microphone " which can be made the size of a tiny button but which is at least four times as sensitive as the carbon microphone, yet uses 20-100 times less current. There have been earlier transistor microphones which have never made any real impact, but this particular design sounds very promising. A conventional diaphragm picks up the sound waves causing varying pressure to be applied via a 0·001 in. radius sapphire to the surface of the emitter of a junction transistor and this pressure passes

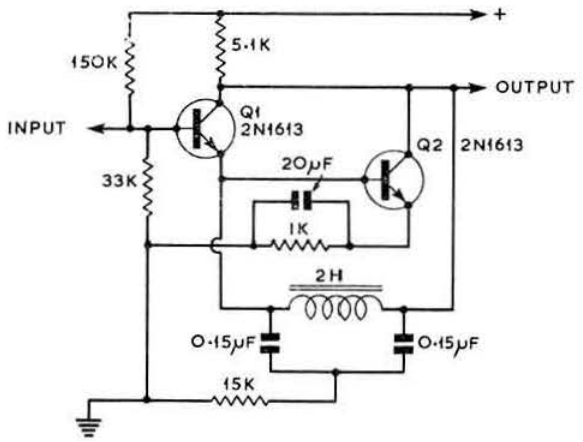


Fig. 6. Sharply peaked audio filter (values for 400 c/s) providing also some 30db amplification at the resonant frequency. Q1, Q2 2N1613 (n-p-n) in original design.

through the emitter region and across the two *p-n* junctions. These changes in stress change the current flowing in the transistor.

The frequency response depends upon the design of the diaphragm, stylus etc. but experimental models have given much higher signal-to-noise ratio than carbon types with a harmonic distortion of only 3 per cent at 1000 c/s. This device is still very much in the experimental stage but it clearly has many potential applications—not least in Amateur Radio.

Parametric Multipliers

Recently we made reference (*T.T.* December, 1962) to the interesting possibilities for amateur use offered by the new type of frequency multiplication using varactor diodes. Since then we noted at the Physical Society Exhibition some practical units produced by Marconi's. Within the range 100-2000 Mc/s the firm obtains a 75 per cent efficiency for doubling and 40 per cent for a multiplication factor of *six*. The compact unit shown required an input of 11·8 watts at 200 Mc/s to produce (without any further power supply) 4 watts at 1200 Mc/s.

We have also chanced upon a most useful publication for anyone contemplating using this technique; this is *Varactor*

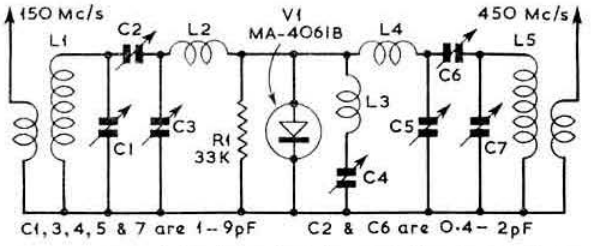


Fig. 7. Varactor tripler design by Microwave Associates. C1, C3, C4, C5, C7, 1-9 pF; C2, C6, 0·4-2 pF. L1, L2, 7 turns ¼ in. diameter, 20 B and S; L3, 5 turns, ¼ in. diameter, 20 B and S; L4, L5, 3½ turns, ¼ in. diameter, 20 B and S; R1, 33 K ohms; V1, MA-4061B.

Harmonic Generation (available from Microwave Associates Ltd., Craddock Road, Luton, Beds.) It surveys the present state of the art and practical design points including for example a description of a tuning procedure for a practical tripler circuit containing some 12 interacting variables. A tripler described in this booklet is shown in Fig. 7. This requires 20 watts drive at 150 Mc/s to provide around 10 watts into a matched load at 450 Mc/s.

Another problem which is discussed is that of modulating these units. Since the device is inherently non-linear considerable distortion may result when the parametric multiplier is driven by a modulated signal, although in other cases acceptable speech quality can be obtained. It is possible to modulate the output from the multiplier, although this system seems to be still in the experimental stage.

Electronic Keys and Keyers

In the February *T.T.* we included a two-transistor el-bug by ZL2AMW. This attracted quite a lot of attention but several readers were puzzled at the specified " low impedance junk box relay." This was the description by ZL2AMW in the original *Break-In* article but we must admit a feeling that the relay would need to be high-speed and require a " low current " rather than low impedance rating. Incidentally the circuit drawing puzzled some; this convention indicates that one pair of contacts is open, the other closed when the relay is unenergised. We would appreciate hearing from any member who has successfully built the key as to the exact type of relay used.

For those who would rather try their hand at a fully electronic key which has no relays whatsoever we give one by DJ3UC (from *DL-QTC*, February 1963). This is not only an el-bug but also a valve keyer with receiver muting arrangements for break-in operation. V1 functions as a blocking oscillator, producing a sawtooth waveform whose frequency can be varied by changing the anode voltage. The output is taken from the cathode and applied to the cathode-coupled double triode V2. T1 is a 1:1 transformer, the insert diagram showing how a standard push-pull output transformer can be used for this purpose. VR1 adjusts the keying speed; VR2 the dot/dash ratio; and VR3 the dot/space ratio. The unit is fed from a 200 volt supply with the positive line connected to its chassis so that this is at the same potential as the transmitter chassis.

Micro-soldering

A few weeks ago at the Mullard factory in Mitcham we were able to inspect one of the first fully-engineered equipments using thin-film microcircuits (see *Electronics Weekly*, February 20) on glass substrates only 0·039 in. thick and with a component density equivalent to 350,000 parts per cubic foot—the actual missile integrator concerned had 3438 components including some 1200 diodes and transistors in a unit only 17 cu. in. in volume. If such techniques

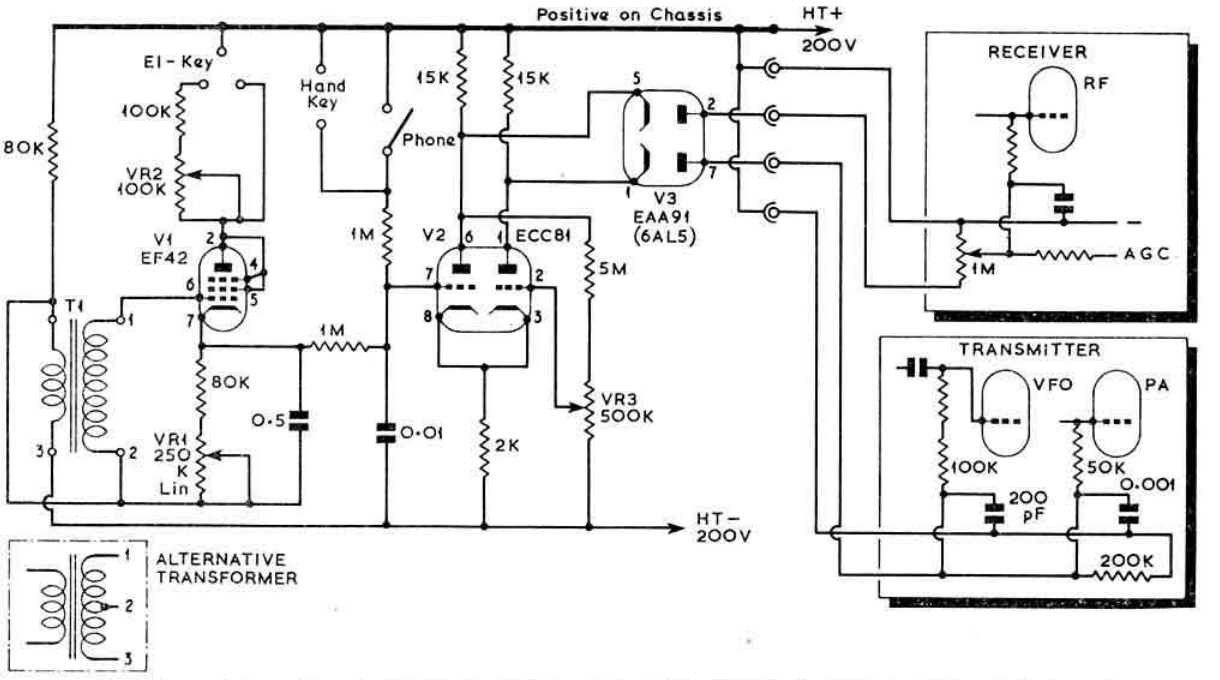


Fig. 8. Electronic key and keyer by DJ3UC. The British equivalent of the EAA91 is the 6AL5. An EB91 could also be used.

are ever applied to amateur equipment we can imagine someone complaining that he cannot find his s.s.b. exciter since it fell through a crack in the floorboards.

But from an amateur viewpoint the trip was interesting in quite another way. This was in seeing the girls in the production department hand soldering the tiny sub-miniature transistors and diodes into place. Apparently various forms of automatic soldering and welding have been tried but—at least up to now—conventional hand soldering has proved the best. Being one of those who find it difficult enough to make a good joint at normal component sizes, we were anxious to discover if there are any particular tricks of the trade. It has been found necessary, we were told, to have very carefully controlled bit temperatures for such work. Too hot or too cold bits are definitely out. We were still thinking this over when we came across an article by WA2NDM in *CQ* (January, 1963) which advocates the use of a small variable output transformer (" Powerstat ") to adjust the voltage input to one of the low-voltage British-made Oryx miniature irons so that the power dissipation can be readily varied from 0-25 watts. WA2NDM states that a power-adjustable iron is particularly useful for working with semiconductors and other miniature items. Which all seems to tie up with those Mullard micro-circuits.

Very Low Frequencies

After the close-down of amateur activity in 1939, we became interested for a time in reception on the very long waves, and recall that in conjunction with G3SB did a BULLETIN article on using GBR (16 kc/s) for Morse practice. Helped by some old broadcast plug-in coils of about 400 turns and quench-coils intended for super-regen. receivers, we found it possible to listen over almost the entire v.l.f. spectrum with a simple 0-v-1 receiver.

For a long time the ability of high-power v.l.f. stations such as GBR at Rugby to provide reliable world-wide signals was taken for granted and little experimental work was done on such frequencies. Recently the situation has changed. One reason clearly is the Service need, on account of Polaris, etc., to improve communications with submerged submarines, possible on such frequencies. Another is that it is now thought that v.l.f. signals are not—as previously believed—trapped in the ionosphere. A third is the interest in " whistlers " on these frequencies.

A number of articles have been appearing in American magazines such as *Electronics World* and *Radio-Electronics* on building equipment for listening to v.l.f. stations (Americans have few inhibitions about listening to commercial stations; over here, strictly speaking, such activity is outside the terms of the receiving licence). In *QST* (December, 1962), K1PLX/9 even suggests that there is a need for an amateur band below 20 kc/s (no half-wave dipoles!).

For those who wish to try their hand at v.l.f. DX a simple 0-v-1 regenerative receiver using a 12AU7 double triode and television line-output transformer windings for coils is described by W8PA in *QST* (February, 1963).

In Brief

It is generally accepted that cross-modulation effects in transistor r.f. amplifiers are between 1½ and 2 times worse than with good valves. According to Application Report 775 " Cross Modulation in Transistor Tuners " by Philco Lansdale Division, Lansdale, Pa., U.S.A., a great improvement can be obtained by fitting small value degenerative emitter resistors. By using a 56 ohm unbypassed emitter resistor and forward a.g.c., cross modulation of a T2028 microalloy diffused transistor is equal or better than the best conventional valve tuners over the entire a.g.c. range. Gain is unaffected by resistors of up to 100 ohms. No substantial differences between cross modulation effects of silicon and germanium transistors have been noted.

Finally, *CQ* suggests that the cutting section of a discarded office pencil sharpener fitted to an electric drill makes a good chassis hole enlarger.

" A Linear for 10-80 Metres "

MR. G. F. GEARING (G3JJG), author of " A Linear for 10-80 Metres " in the March issue of the BULLETIN, states that a number of errors occurred in the article. The 100K ohms resistor (R6 in Fig. 1) in the bias feed to V1 and V2 should be replaced by a 1mH r.f. choke. In the power supply (Fig. 2) R18 and R19 are transposed: R18 should be 1 K ohm and R19 3·3 K ohms. The value of the latter resistor may need to be altered within narrow limits to give a no-signal anode current of 50 mA for V1 and V2. The rating of the resistors R13, R14, R15, R16, R21 and R22 should be increased to 1 watt.

" Dicky " Donald now a ZL

FRIENDS OF R. J. " Dicky " Donald who until recently lived in Brighton and was for some years the Society's Region 8 Representative, will be interested to hear that he is now on the air as ZL1AYH. His address is 27 Tauranga Road, Waihi, New Zealand.

CONTESTS DIARY

April 6-7	Low Power Contest (see page 440, February, 1963).
April 6-7	Helvetia 22.
April 6-7	PZK (c.w.) Contest.
April 20-21	PZK (phone).
April 21	D/F Qualifying Event.
April 20-21	R.E.F. (phone).
April 27-28	PACC (c.w.).
May 4-5	PACC (phone).
May 4-5	U.S.S.R. DX (c.w.) Contest.
May 5	First 144 Mc/s Portable Contest.* (For details, see page 498, March 1963).
May 12	D/F Qualifying Event (Rugby). (For details, see page 558).
May 19	D/F Qualifying Event (Slade).
May 26	First 420 Mc/s Contest.* (For details, see page 498, March 1963).

June 1-3	—	CHC/HTH QSO Party.
June 8-9	—	National Field Day. (For rules, see page 308, December 1962).
June 15-16	—	70 Mc/s Contest.
June 22-23	—	1250 Mc/s Tests.
June 30	—	D/F Qualifying Event (Derby).
July 6-7	—	Second 144 Mc/s Portable Contest.*
July 21	—	D/F Qualifying Event.
September 7-8	—	V.H.F. National Field Day (For rules, see page 373, January 1963).
September 15	—	D/F National Final.
September 22	—	Low Power Field Day.
October 6	—	R.A.E.N. Rally.
October 19-20	—	7 Mc/s DX Contest (phone).
October 27	—	Second 420 Mc/s Contest.
November 2-3	—	7 Mc/s DX Contest (c.w.).
November 9-10	—	Second 1·8 Mc/s Contest.
November 16-17		R.S.G.B. 21/28 Mc/s Telephony Contests.

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

Transistor Morse Practice Oscillator

By F. G. RAYER (G3OGR)*

THE audio oscillator to be described is a simple unit running from a 1·5 volt dry cell and giving sufficient output for two pairs of headphones. If loudspeaker reproduction is required, the output may be fed into a transistor or valve amplifier.

The circuit is shown in Fig. 1, and uses only a few components and a single audio transistor. The driver-type transformer suggested is manufactured by Osmor Radio, 418 Brighton Road, South Croydon, Surrey, and can readily be obtained from most shops dealing in radio components. Colour coding of the leads naturally applies to this particular transformer. If other transformers of a similar type are used, it may be necessary to reverse the primary connections to obtain oscillation.

A number of transistors were tried in the circuit, and all

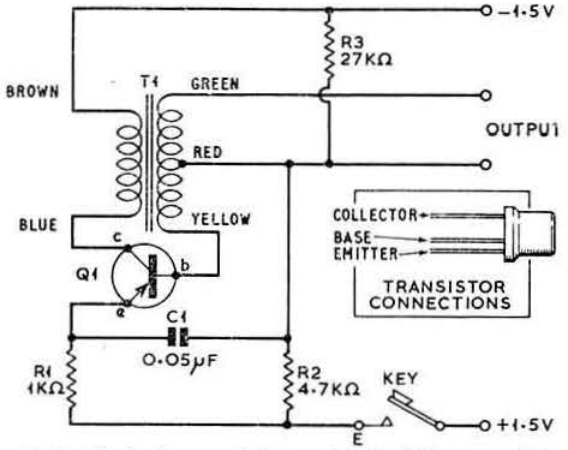


Fig. 1 Circuit diagram of the transistorized Morse practice oscillator.

gave similar results. Surplus audio transistors such as the yellow-green spot type work well. Red spot, yellow-red spot, and white spot transistors were also satisfactory. Transistors such as the OC81 and NKT251 were naturally found suitable. It was noted that some transistors which had been removed from audio equipment as defective were satisfactory. It thus appears that almost any transistor available can be tried, provided it is in some kind of working order.

Construction

The components are assembled on a piece of $\frac{1}{16}$ in. paxolin measuring about $2\frac{3}{4}$ in. × $2\frac{3}{4}$ in. The location of the parts and the method of construction should not significantly affect results. With the paxolin panel, components may be placed as in Fig. 2, leads passing through $\frac{1}{16}$ in. diameter holes. Underneath wiring can be checked against Fig. 3, if required.

No benefit was found to arise from using more than 1·5 volts with any of the transistors tested. As the current drain is under 0·5 mA a pen-torch cell has leads soldered to cap and case, and this is mounted directly on the panel. The zinc case is negative.

The output is suitable for the usual medium or high impedance phones. A simple transistor amplifier can also be fed from these points. A valve amplifier can be driven from the " green " output tag, via a 0·01 μF or similar capacitor. The amplifier chassis is then returned to the tag *E*. In the interests of safety the use of a.c./d.c. amplifiers, or amplifiers drawing h.t. directly from the mains is not recommended but if it is necessary to use such an amplifier it *must be completely isolated from the oscillator* by including isolating capacitors, or an isolating transformer. This precaution is

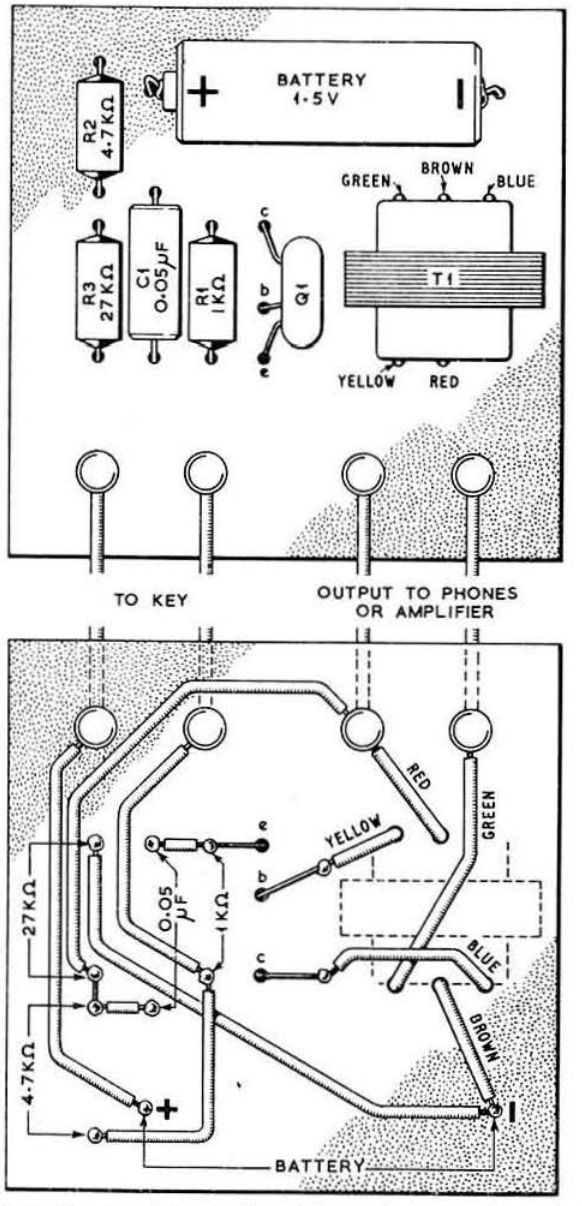
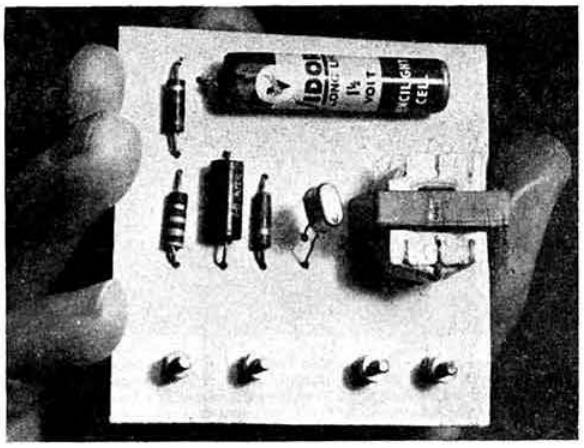


Fig. 2 Components layout. The wiring on the reverse side of the paxolin panel can be checked against the lower diagram.

* *Longdon Heath, Upton-on-Severn, Worcester.*



not necessary with an a.c. amplifier with a properly earthed chassis.

The tone was found to be satisfactory with the values shown but the frequency can readily be lowered by wiring capacitors of 0·01 μF to 0·1 μF in parallel with one of the transformer windings. No values are very critical.

C.W. Transmitter Monitor

The oscillator can be used to monitor c.w. transmissions, power being derived from r.f. obtained from the transmitter itself. To do this, the " key " tags or terminals on the oscillator are wired together, and the battery is removed.

A crystal diode and r.f. choke are required for the rectifier circuit. The type of diode and choke is not important. Typically, a GD9 diode and a 2·5 mH choke are suitable, but almost any diode and choke should prove satisfactory. One end of the choke is connected to the oscillator positive lead and the diode positive to the choke. The other diode lead is taken to the oscillator negative terminal.

The unit is placed so that the choke can pick up a small amount of r.f. energy from the transmitter. A suitable position, near a tank coil, tuner, or aerial lead, according to circumstances, can easily be found. The degree of coupling is arranged so that the level obtained in the monitor phones is similar to that with the 1·5 volt battery.

New Equipment

The Amplivox Jetlite Headset

JETLITE is the title given by Amplivox Ltd. to their recently introduced range of lightweight headsets which are available either as headphones only or with a boom microphone. The weight of the headset unit tested was about seven ounces, but, although lightweight, the construction is robust and with considerate treatment should provide many years of service. The headband consists of p.t.f.e.-covered chrome-plated spring steel wires, whilst the earpads can be either transparent diakon or flexible alkathene, with foam ear cushions as optional extras. Each earpad is secured to the headband by two flexible slides giving individual fitting. The microphone boom arm is supported from one earpad by a friction clamp which provides adjustment facilities and rotation for either left or right hand use.

The types of headphone which are available are standard magnetic (of 25, 300 or 600 ohms impedance); high impedance magnetic (8,000 ohms), tropicalized magnetic, and moving coil (50 and 400 ohms). The microphone can be either of the standard or noise cancelling magnetic type (300 ohms impedance), or miniature or noise cancelling carbon (100 ohms). The cables may be either composite or divided and can be obtained unterminated or fitted with one of a number of standard plugs. The price of the Jetlite units ranges from approximately £8 10s. for a headphone set only unit to £14 for a complete headphone/microphone assembly. Exact prices and full specifications of the units may be obtained from the manufacturers, Amplivox Ltd., Industrial Division Sales Office, Beresford Avenue, Wembley, Middx.

The assembly supplied for review was a type J.221 comprising high impedance earphones and a magnetic microphone. This was extremely comfortable in use and the quality of reproduction from the earphones was excellent giving first class readability on both speech and c.w. signals. The magnetic microphone is designed for close speaking and the output in this condition is in the region of 10 mV, the quality being adequate for communication purposes. The frequency response is " tailored " for communication purposes.

This headset is highly recommended although at first the price may appear high; however, if it is considered in relation to the cost of commercial communication receivers, then it is no more than one would expect to pay for a quality product.

The Jetlite headset and boom microphone manufactured by Amplivox Ltd.

RTTY

By ARTHUR C. GEE (G2UK)*

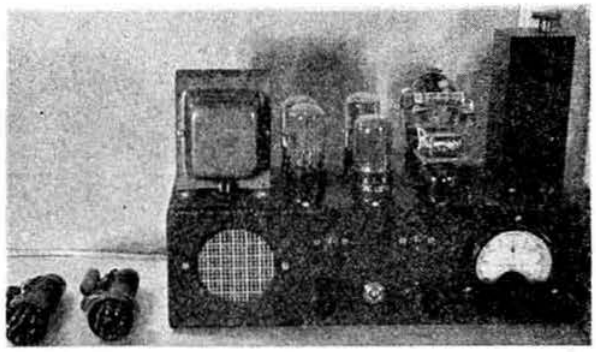
WHEN we were discussing earlier in this series of articles the theoretical aspects of transmitting and receiving RTTY signals, we gave what one might term a basic circuit for a RTTY terminal unit.†

It is now felt that it would be useful to publish a complete constructional description of such a unit, built around the basic design, which will enable the newcomer to acquire a satisfactory terminal unit with which to make his first experiments with RTTY reception.

The circuit is essentially the same as that given before, but has one or two additions which experience has shown are most useful features. First, a reversal switch on the relay output circuit to the printer is included. This is a great convenience, because not only amateur RTTY signals, but commercial ones too, follow no definite convention as to " which way up " their mark and space signals are and a switch which will easily reverse this function is almost essential. Secondly, a small loudspeaker is included as an aural indicator for tuning in f.s.k. signals. It is, of course, quite possible to use the speaker on the receiver, but one on the terminal unit is handy, particularly if it is provided with a volume control. It is also useful to arrange that the audio filters can be plugged in and are thus easily changed for a different set when required. As the whole performance of the terminal unit depends on its filters, most constructors will undoubtedly experiment in an effort to ensure that it is working at its peak performance.

The circuit is quite straightforward, as can be seen from Fig. 1. It is based on the classical circuit originally described by W2PAT. The input is taken from the loudspeaker terminals of the station receiver to the 50 ohm wirewound potentiometer VR1 and thence to the secondary winding of a small low power audio output transformer from a " personal " type receiver. The secondary winding impedance in this type of transformer is usually of the order of 3 ohms and the primary impedance around 20-30 K ohms. The speaker used by the writer is a miniature W.B. 2½ in. unit.

The rest of the circuit needs little comment, apart from the filters L1/C1 and L2/C2. In the earlier terminal units built by the writer, Murphy V200 Series television line amplitude chokes were used, and considerable experimenting was carried out to find the right value of capacitors to tune them. Keen RTTY enthusiasts have since found numerous other components which prove satisfactory, and now that 88 mH toroids are somewhat more easily obtainable these are the obvious choice. The photograph shows two sets of filters. That on the left of the unit consists of Murphy chokes,



A view of the completed terminal unit. On the front drop of the chassis (left to right) are the loudspeaker, its volume control (VR1), the mains on/off switch S2, the reversal switch S1 and the milliammeter. Above VR1 and S1 are the two neon bulbs.

* *East Keal, Romany Road, Oulton Broad, Suffolk.*

† R.S.G.B. BULLETIN, April, 1962, Vol. 37, No. 10, p. 497.

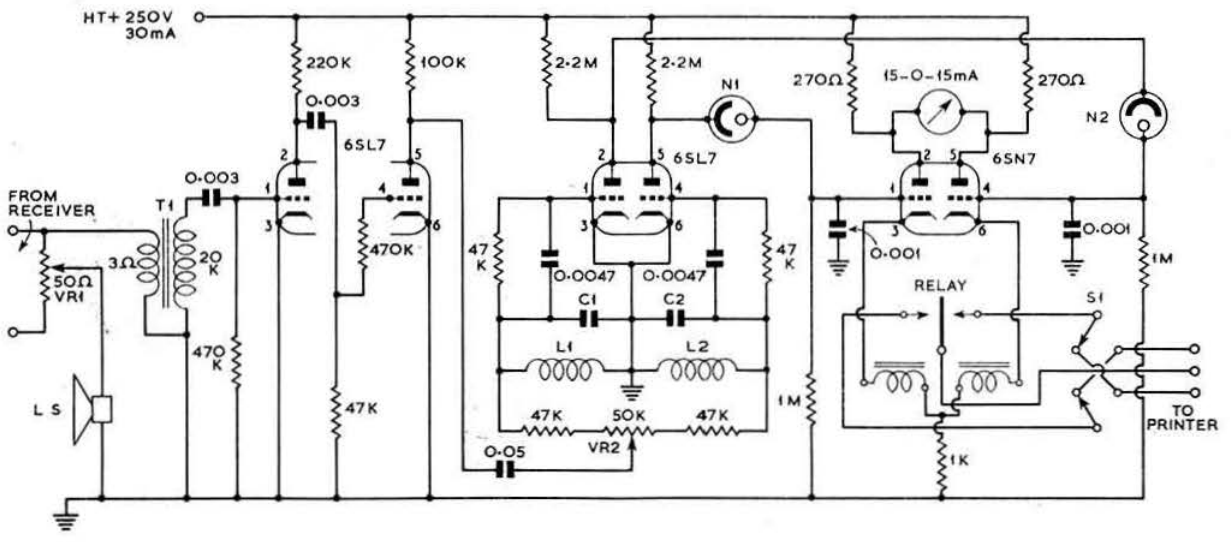


Fig. 1. The circuit of the improved terminal unit.

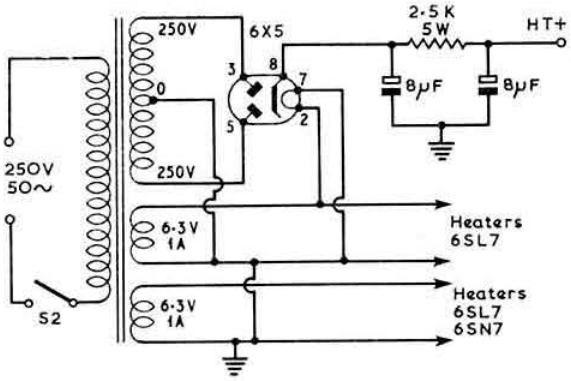


Fig. 2. The power supply circuit. The total heater consumption is 1·8 amp at 6·3 volts, and this could be provided by a suitably rated single 6·3 volt winding in an alternative transformer.

whilst the set in position on the unit is made up from 88 mH toroids. The filters are built up on Bulgin octal cable plugs, type P.112. The Murphy chokes can be cemented into the top of the plug with Araldite adhesive, whilst the toroids can be mounted between squares of Paxolin and held in place with suitable nuts and washers fitted to a length of threaded brass rod. Suitable capacitors for use with 88 mH toroids are 0·07 μF and 0·035 μF. With regard to the Murphy chokes, one of each type, No. 57010 and No. 56443, is required. The first is identified by a yellow spot and requires a 0·1 μF capacitor across it; the other has a green spot and needs 0·15 μF of capacitance.

If the constructor has access to an accurately calibrated audio oscillator, the filter can be rapidly aligned by feeding in an appropriate tone—2125 c/s or 2975 c/s—and adding or removing capacitors until a peak response is obtained. If no suitable valve voltmeter or other means of measuring the response is available, the meter in the unit can be used quite satisfactorily once the unit is completed.

The relay employed is a Type D.164816, this being a polarized, centre stable type which is readily available on the surplus market. Its pin connections are shown in Fig. 3.

N1 and N2 are Radiospares neon bulbs with M.E.S. bases. Suitable holders can be obtained from most radio stores and are mounted so that the ends of the bulbs project through the front panel of the chassis, as it is very useful to be able to see them functioning when tuning in the RTTY signal. A 2½ in. round, flush mounting, centre-zero milliammeter of 15-0-15 mA deflection, can usually be found at surplus stores.

The chassis, which should be fitted with a base plate, was obtained from Phillpots Metalworks of Loughborough, and the dimensions are given in Fig. 4. The power supply for the unit is built-in and the smoothing need not be elaborate. The mains transformer shown in the illustration is an Electro-Voice Products Type 104F, giving 250-0-250 volts at 65 mA; 6·3 volts at 1 amp; and 6·3 volts at 1 amp, but any other transformer of a similar rating can of course be substituted. Due allowance for fixing holes with an alternative transformer must be made when marking out and drilling the chassis.

A nine-way terminal block is fixed to one end of the chassis adjacent to the relay. Although not all the terminals

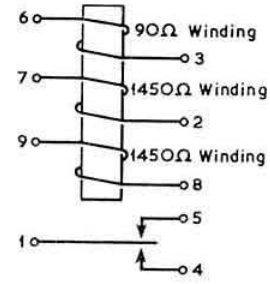


Fig. 3. The pin connections for the relay type D.164816.

are required, it is convenient to have some spare ones available for connecting such items as a tuning oscilloscope. In the photograph, the mains transformer is on the left, with the first 6SL7 next to it to the rear and the 6X5GT rectifier in front. Next are the second 6SL7 to the rear and the

(Continued on page 544)

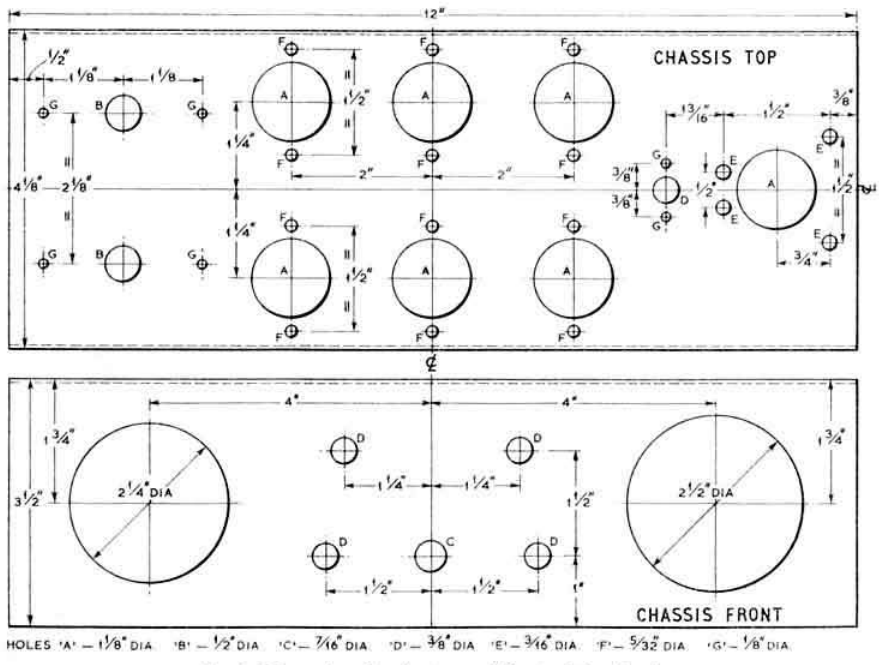
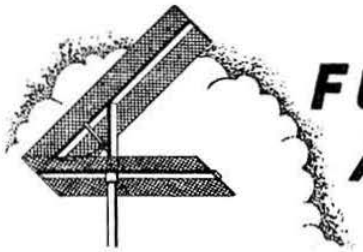
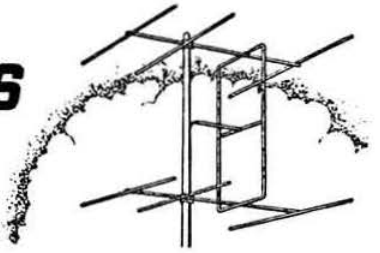


Fig. 4. Dimensions for the top and front of the chassis.



FOUR METRES AND DOWN



144 Mc/s Open Contest · New European Record · International V.H.F./U.H.F. Convention

By F. G. LAMBETH (G2AIW)*

THE advent of a warmer sunny weather period during the week preceding the 144 Mc/s Open Contest on March 2-3, 1963, may have persuaded many people to enter their cold shacks for the first time since Christmas. But whatever the reason, there is no doubt that activity was at a markedly high level throughout the contest compared with the doldrums of the previous two months, which was lightened only by the C.W. Contest in January. Unfortunately the sun's warmth did not induce the troposphere to perform to any marked extent, and conditions were generally average. Such DX signals as existed were characterized by a variable amount of fading, often deep and rapid. Stations in the West Country and Midlands were worked by many Home Counties operators, and occasional contacts were made to GW and to the North of England.

Principally, the activity seems to have been on a fairly " local " basis, and has shown up, possibly for the first time in a real way, the inherent disadvantages associated with a double or triple conversion v.h.f. receiver equipped with a reasonable amount of " straight " r.f. gain, when used in the presence of a number of very strong signals. As one competitor was heard to remark after the event " . . . was there anyone in the London area who did not suffer from cross-modulation and spurious responses?" There is no doubt that this is a real problem which has been accentuated by the greater band occupancy, popular use of high gain aerials and high transmitter powers, and the development of high sensitivity converter/receiver combinations. If anyone has any ideas on how to overcome this problem, they would be welcomed by many, and will be given publicity in the BULLETIN.

The picture in the London area, during the contest, developed into two distinct groups of stations. The former had commenced at 17.00 G.M.T. on the Saturday evening, and by 10.30 that evening were exchanging serial numbers in the fifties. By next morning, when the majority started, the leaders were in the nineties, and the second group of competitors followed at a healthy distance behind, tending to catch up as the Sunday wore on. When the contest closed, in what can only be described as bedlam in the London area between 144·5 and 145·1 Mc/s for the last half-hour, the winning numbers were up to the range 150-170, while the Sunday-only men were clocking anything from 20 to 50.

Results are not yet available, but it is likely that G2JF, G3EDD, G3OXD/A, G3GHI and G3EVV, all of whom were well on into their second century at closing time, will be well placed. Other London area stations believed to have turned the " ton " included G4DC, G3HRH, G3KKK and G3IAS while G3RND, remote up in Pontefract, must also have turned in a good score; G2HOP near Stamford was also heard to be running well. Of course it's the counties that count, but with conditions as they were, sheer endurance to work every local heard will probably prove to have been the key to the top ten. We look forward to the published results with interest to see how close are our predictions. It is also interesting to note that, with one or two exceptions, the top scorers did *not* find it necessary to move out of their Band Plan Zones; indeed the likely winners appeared only to use one channel throughout the contest. Perhaps some of those with a battery of crystals and the wanderlust will find something significant in this.

* *21 Bridge Way, Whitton, Twickenham, Middlesex.* *Please send all reports for the* **June** *issue by* **May 10.**

U.K. Space Communication Group

Quite a considerable interest has been shown since the initial announcement of the formation of this group in the December, 1962, issue of the R.S.G.B. BULLETIN, and an official meeting was held at the London U.H.F. Group on March 7, when Bill Sykes (G2HCG) was elected Chairman, and W. Browning (G2AOX) Hon. Secretary. P. Thorogood (G4KD) is taking care of the publicity side.

Various projects are under consideration, such as a " Moonbounce " experiment this coming summer. So far one V.H.F. Group has offered to design and produce the transmitter. The loan of a parametric amplifier is assured, together with a 6DS4 type Nuvistor converter, and responsibility for the construction and erection of the necessary aerial array has been accepted. Transmission will be on the 2m band.

The *Echo II* 135 ft. diameter reflective balloon project is temporarily held up until mid-summer, but full details will be available in due course, together with all the necessary predictions for tracking. As the frequency of the beacon signals will be in the 136-137 Mc/s band, all those interested should apply to the Radio Services Dept. of the G.P.O., for the special licence to listen on the band (no charge is made for the licence endorsement). Full details were given on page 80 of the August, 1962 issue of the BULLETIN.

The projected repeater satellite *Oscar III* has raised many problems concerning the very precise equipment necessary; namely, M.S. technique, with azimuth elevation tracking

—FLASH—

Just before this issue went to press, news was received that Ed Tilton, W1HDQ, for many years V.H.F. Editor of *QST*, and doyen of v.h.f.-u.h.f. activity in the U.S.A., will be present at the Ninth International V.H.F.-U.H.F. Convention (see this issue for details). It is hoped that he will be able to address the Convention on current U.S. activity above 30 Mc/s.

DON'T MISS THIS CHANCE TO HEAR
ED TILTON, W1HDQ

aerials, and this project has also initiated much interest as a result.

Active and passive membership of the Group is invited, and all interested should write to W. Browning, G2AOX, 47 Brampton Grove, Hendon, London, N.W.4.

Ninth International V.H.F./U.H.F. Convention

Arrangements are now well advanced for the Ninth International V.H.F./U.H.F. Convention to be held at the Kingsley Hotel, London, W.C.1, on Saturday, May 18, 1963. This well established event is organized jointly by the Society's V.H.F. Committee and the London U.H.F. Group.

The Convention will open at 11 a.m. with an exhibition of u.h.f. equipment made for the amateur. So far, it is known that J-Beam Aerials, the G.E.C. (M-O Valve Co.), Withers Electronics, and Green and Davis will all be showing examples of their products. There will be also an exhibition of home constructed v.h.f./u.h.f. gear, which will be judged by an independent panel, for the award of the 1962 V.H.F. Committee Cup. Details of the arrangements for this show are included in an information sheet which will be sent out with all tickets, but entries are also invited from members unable to attend the Convention. Such members should write the V.H.F. Committee at Headquarters, giving details of the equipment they propose to send along.

During the afternoon, there will be a Symposium of short lectures under the Chairmanship of the Society's V.H.F. Manager, Mr. R. C. Hills, G3HRH. Questions will be invited after each lecture, and the programme will include the following speakers:

H. L. Gibson, B.R.S.1224 (M-O Valve Co.)—" V.H.F. Receiver R.F. Stages."
C. A. Wright, G3CCA—" Parametric Amplifiers."
V. Hartopp, B.R.S.15304 (J-Beam Aerials)—" V.H.F. Aerials and Feeders."
J. Gazeley, B.R.S.20533—" Transistors at V.H.F."
G. M. C. Stone, G3FZL—" V.H.F. Transmitter Design."

There will be a break for tea at a convenient point, and the session will close at approximately 5.30 p.m. to permit further time for ragchewing before the evening programme commences.

The Chair at the Convention Dinner at 7 p.m. will be taken by the President of the R.S.G.B., Norman Caws, G3BVG, and the guests will include Dr. J. A. Saxton, Deputy Director of the D.S.I.R. Radio Research Station, and Dr. R. L. Smith Rose, President of the International Scientific and Radio Union and a Past President of the R.S.G.B.

In addition to the traditional draw on the dinner ticket numbers for a major prize, there will be a raffle for a wide variety of items.

This is the Golden Jubilee Year of the Society, and the V.H.F. Committee intend to make the Ninth Convention the best so far—to do this they need your support. Tickets may be obtained from the Hon. Secretary of the V.H.F. Committee, F. E. A. Green, G3GMY, 48 Borough Way, Potters Bar, Middlesex, and full details and prices are to be found in the announcement on page 554 of this issue. Every effort is being made to produce a wide and varied programme suitable for all interests, and the organizers feel sure that this year in particular, no one who has any interest in v.h.f. or u.h.f. activities can afford to miss this event. It is also hoped to have one or two amateur v.h.f. personalities of international repute in attendance.

New European 144 Mc/s Record

Somewhat belatedly, it is learnt that on May 13, 1962, I1ANY (Montalenghe Canavese, near Turin) worked UA3CD (Orechovo Zuevo), a distance of 2480 km (1550 miles). I1XD, the Italian V.H.F. Manager, states that the contact was by sporadic *E* propagation and that the delay in announcing the contact was due to the necessity of obtaining confirmation from the Russian society.

Two Metre News

G5ZT (Plymouth) is on every day at 14.00 G.M.T., but at present the only daily contacts are with G3IEA (Torquay), which have been going on for over a year. There are, however, odd QSOs with G3LMG, G3OCB and G3OJY.

In spite of other important activities **G3CCH** (Scunthorpe) has not lost interest in meteor scatter on 2m and expects to be running quite a number of tests during the coming season. To that end, the converter and transmitter oscillators have been transistorized for greater stability. The weekly sked with GI5AJ has been continued. For quite a few weeks during the winter, c.w. had to be used, but with conditions improving again s.s.b. can be operated. The signal is always audible even if it dips right down into the noise now and again! G3CCH thought there was a lack of activity in the London area, for not one station in a London *Postal area* was worked during the open contest, although there were quite a few on from Surrey and Kent.

I1XD, commenting on the reports of exotic calls heard during the opening in December (see December, 1962 BULLETIN), suggests that these were the result of pirate activity. I1SBR, for example, has no 144 Mc/s equipment.

G2DCG (Margate), who is recovering from illness, hopes to be on 2m soon.

G2JF (Wye, Ashford), had a good innings during the open Contest on March 2-3: 133-Gs, 1-GW, 6-ONs, 20-PAs, 26-Fs and 24 counties, a very good total indeed. Conditions on Saturday evening and Sunday morning were reasonably good, with " normal " conditions at other times. Judging by remarks from continental stations, activity over there was not very high, and no one appeared to have heard or worked a GM station.

G2BJY (Walsall) thought that the contest conditions were similar to those of the C.W. event in January. Distance coverage was erratic, reaching at the most a distance of about 160 miles. Stations in the Home Counties were very consistent, but surprisingly none was heard from the London postal area. Surrey was well represented; the strongest stations were G3BLP, G3GHI, G3IAS, G4CM, with G3MPS (Hants), G2JF and G3EVV (Kent). G6GN (Bristol) had a fine signal on the Sunday. Northern activity appeared to be much less, only G3RND (Pontefract) being consistent and strong. G5YV was heard a few times and G3AZU (Bradford) was good. Wales was well represented, the best signals being from GW4LU/A (Montgomery), GW3MDY (Flint), and GW3KXA (Radnor). Two new counties came via G3KEF/P (Rutland) and GW3MDY.

Closing at 22.00 G.M.T. on the Saturday, when conditions were excellent, and restarting at 03.30 was considered by G2BJY to be a serious error of judgment, especially as the band was totally dead (with the exception of GB3VHF) from 03.30 onwards. It appears that some fine QSOs could have been made between the above times.

G3LTF was able to work PA and F stations during the contest, but was appalled at the number of people who could not copy s.s.b. properly.

Commenting on the Contest, G5UM observes that something like a dozen members of the Mid-Herts net participated (but not necessarily on the Net frequency!)—" dipping in where and as circumstances allowed . . . most of them notching two or three dozen contacts, though others staggered almost the full course and scored considerably higher."

" Uncle Mike " adds that the range of inputs used by the Mid-Herts net could hardly have been wider. One or two used the " full gallon " while several operated with less than 10 watts input. Indeed, G3INU of Stevenage used an all-transistor transmitter with no more than 150 mW input. He had phone contacts of up to 40 miles range.

Activity was high: G2JF (Wye), for example, made 187 QSOs, including 52 continentals and G3GHI (Kenley, Surrey) 164, with G3IAS (Warlingham, Surrey) about the same number.

The limits from the Home Counties appear to have been Lancashire and Yorkshire and mid-Wales, with a few of the nearer continentals. G5ZT (Devon) was heard on c.w. during the contest.

OH1NL is actively engaged on E.M.E. tests with **W6DNG**, and although both have been hearing signals they are busy improving equipment and hoping for that elusive first QSO!

Two Metre Test Transmissions

Of late it seems to have become the practice of certain stations, particularly in the London area, to radiate long unidentified test transmissions comprising a relay of one of the B.B.C. sound programmes. This practice is of course a complete contravention of the terms of the Amateur (Sound) Licence, and also serves as a source of irritation to other band users. There is no justification for any test transmissions beyond the provisions already covered by our licences, and it is to be hoped that the practice will cease before further action becomes inevitable.

Four Metres

B.R.S.21027 (Bingley, Yorks) has a crystal controlled converter with a PCC89 cascode front-end, into an HRO. The aerial is a rotary dipole 600 ft. a.s.l. Locals heard include G2VO, G3AZU, G3BJP, G3KEP, G3LHQ, G3OGV, G5PW and G6MC. More distant stations heard include G3HRP (Scunthorpe, 50m), G3RND (Pontefract), G6XX (Howden) and G8KB (nr. Sheffield). B.R.S.21027 hopes to be on the band soon, the only obstacle now being the Morse test.

Seventy Centimetres

We are hoping to complete an up-to-date list of 70cm "firsts," and would therefore appreciate particulars from all those who claim such QSOs with other countries. Please send postcards, to G2AIW, setting out the details.

G5ZT (Plymouth) started up again "optimistically" near the end of February, and is willing to arrange 2m skeds with any 70cm stations in an endeavour to work two-way crossband.

G3LTF found conditions good at times during the period; on February 26, G3HAZ and G2CIW (Birmingham) were S9+ at Galleywood and G3ILD was also coming through.

Twenty-three Centimetres

G3LTF (Galleywood) has had phone QSOs with G3NOX/T using (a) n.b.f.m. and (b) a.m. on the 70cm transmitter only. The path is about 30 miles, with peak signals about S6. The power output has been improved slightly by better matching to the aerial feeder, and the receiver noise factor has been improved by about 2·5db as a result of work on the i.f. head amplifier.

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	Shooters Hill, London	144.50 Mc/s	A1	North West
GB3GEC	Hammersmith, London	431.5 Mc/s	A1	East

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

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

Date	Time	Error
February 19, 1963	12.12 G.M.T.	290 c/s low
February 26, 1963	14.49 G.M.T.	260 c/s low
March 5, 1963	13.00 G.M.T.	255 c/s low

Getting Going on "Bottom Band"

(Continued from page 532)

QTH, the beam can resolve an angle of a fraction of 1°, and scans over an arc of 25°.

Detailed descriptions of receivers, with reasons for certain common defects, are available in the literature (see references) and will not be considered further here.

There is at the moment very little amateur activity on this band, and the author would be amazed to hear of further progress by stations using simple equipment along the lines suggested.

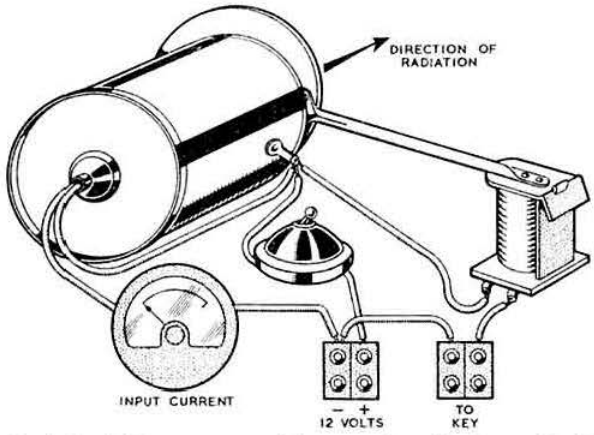


Fig. 1. Physical arrangement of the transmitter for Bottom Band.

References

Seeing, Luckiesh and Moss, Bailliere, Tindall and Cox, London, 1931.

Vision, S. Howard Bartley, D. van Nostrand Co. Inc., New York, 1941.

RTTY

(Continued from page 541)

6SN7 to the front. Between the two latter valves and the relay are the octal bases for the plug-in filters.

No difficulty should be experienced in getting the unit to work. First, connect to the speaker output of the receiver and tune in a RTTY signal with the b.f.o. on, and "centre" the signal in the channel. Turning the b.f.o. control one way or the other will now change the beat note up and down on either side of the centre setting. Switch on the terminal unit and set potentiometer VR2 midway. Slight adjustment of the receiver tuning control and b.f.o. should now bring the unit into action, indicated by the neons flashing in step with the f.s.k. signal and the meter and relay also following. Switch on the teleprinter and printing should commence. If it prints an unintelligible jumble of letters, switch S1 to its other position, when, if everything else in the system is functioning correctly, intelligible copy should be produced.

THE MONTH ON THE AIR

A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

By R. F. STEVENS (G2BVN)*

WITH the amateur population of the world now at the all time high figure of 370,000, it is absolutely necessary that operators on the h.f. bands should take all possible steps to ensure that their equipment and methods of operating effect every possible economy in spectrum space. It is therefore suggested that the following paragraph from the *Florida DX Report* be read and subsequently acted upon when applicable.

" My one DXing pet peeve is concerning the stations that work the rare ones every time they hear them just to boost their ego, and in doing so prevent people like me from working them. I have very little time to operate and when I do hear a ' new one ' 50 per cent of the stations in the pile-up that are calling and that are able to work him come back with comments as the following ' Just wanted to see if you got my QSL that I mailed yesterday,' or ' This is the first time I have heard you since we worked last week ' etc., etc. Some of our leading DXers (and ours—G2BVN) are guilty of this evil bit of inconsiderate operating. So please fellows—only work the rare ones once to give the rest of us a chance, W4PJG."

News from Overseas

HL9KH, operating from Osan in South Korea, has been worked by many U.K. stations, both from his " home " QTH and also during his trip to Rota and Saipan with three other operators, when they amassed in the region of 5000 contacts. HL9KH has also been of considerable assistance to operators wishing to contact KH6PD/KG6 on Marcus Island. Further trips to DXotic locations are planned for the near future, and it seems that a licence for AC3 is reasonably certain. The Niagara Frontier DX Club named HL9KH as the outstanding DX Signal of the Month for January, 1963. All QSLs for operations in which Don is involved should go to his QSL Manager **W9VZP,** who is preparing the cards just as soon as the logs arrive. All QSLs sent to HL9KH direct or via the K.A.R.L. Bureau will be diverted to W9VZP.

Following a request by the A.R.R.L., the F.C.C. has extended the facilities allowed to U.S. stations for operation on **Top Band**. Expanded frequency space is available in every state, and operation is now permitted in the Gulf states, Alaska and possessions. Some areas will have power restrictions and sideband transmissions are prohibited. The new regulations came into effect on February 21, and shortly after several U.K. stations contacted KP4AXU, whilst K1KSH/4, W4GCB, W4IYT and K4FMA were QSOd in areas hitherto denied activity on 1·8 Mc/s. In his *DX Bulletin* W1BB poses the question as to which station will be the first to make W.A.S. on this band. A number of " firsts " have been recently made on this band including VR3O and W2IU, W6KIP and KH6EGL/KM6, CT1CO and W3GQF, and nearer home the first GI to W0 contact between GI6TK and W0VXO. An outstanding total is that of W3GQF who has contacted 43 stations in 22 countries. Your scribe would be pleased to have a note of scores from U.K. stations.

OE1ME, now the editor of the DX feature in the journal of the Austrian national society, reflects the thoughts of many dx'ers when he comments that the country making and refusal of cards by A.R.R.L. is more confusing now than it was in the past. Toni would like to know more about the refusal to accept Chagos cards, in view of the QSLs from unlicensed stations that have been accepted in the past. The official position in Austria is that operators are forbidden only to work unlicensed stations in countries where official licences are given to amateurs. In view of the confusion surrounding DXCC, OE1ME suggests a new International Award based on specific areas of the Earth's surface, 10° × 10° is one possibility, excluding /MM operation, and points out that an award based on geographical location would rule out differences of opinion as to status and political changes.

In *M.O.T.A.* for December, 1962, a correspondent gave the information that **5N2LKA** was an unlicensed call. This is not so, and apologies are made to 5N2LKA, who is the Director of G.E.C. in Lagos, for any confusion caused.

ST2AR still has intentions of appearing on s.s.b. and in the meantime has commenced operation on c.w. on 3·5 Mc/s using a G5RV multiband aerial and a power of 100 watts. His first QSO was with OK1GT and the second with G5DQ.

DXpeditions

Marcus Island, now available with **KH6PD/KG6** active on s.s.b. around 08.30, will be further represented by **JA1EEB/KG6** on c.w. using frequencies of 7008, 7010 and 14,040 kc/s crystal controlled. JA1EEB is a member of a Japanese weather research team and will be on Marcus Is. until June 30. (W6YY).

The **Trinidade Is.** trip by PY4AS and party is now scheduled to take place on July 1, and it seems that s.s.b. will be most favoured mode.

The trip to **San Felix Is.** by the Florida DX Club has been cancelled owing to the prohibitively high cost of hiring a boat. It is hoped that an alternative target may be found.

The operation from **Nauru** by VK3AHO under the call **VK9BH** is still going forward and the tentative date is sometime in April/May. In addition to Nauru, there may be operation from Chatham Is. and Willis Is. Operation will reportedly be mainly confined to s.s.b.

Another trip in the making is one by VE7ZM who hopes to activate **ZK2** later this year. (G4MJ).

After making some 3000 contacts from **FW8DW**, Danny Weil arrived at Fiji on February 12. After a week or ten days' operation as **VR2EO** when repairs to the *Yasme* were complete, Danny plans to return to the U.S.A. thus terminating the *Yasme* saga. During his eight years of operation from many dxotic spots, and despite the controversies that occasionally arose over his activities, Danny has furnished

* *Please send all reports to R.S.G.B. Headquarters to arrive not later than* **April 5** *for the* **May** *issue and* **May 10** *for the* **June** *issue.*

many DX operators with additions to their scores, and it is regretted that the operation has had to come to an end prematurely. The Yasme Foundation has always suffered from lack of funds, and repairs in Fiji totalled some 1,250 dollars against the cash in the " kitty " of 600 dollars.

Permission to operate from **Christmas Island** (VK9) is being sought by Frank Johnstone, VS1FJ, and 14 days' operation from this spot may materialize at any time.

CR8AA, located in Dili, Portuguese Timor, operated practically continuously from March 6 to March 12, and enabled many operators to contact this hitherto rare spot. All QSLs should go to the home QTH of **W9JJF**.

The proposed trip by **VK5AB** is still very much in the melting pot; transport has been organized and the necessary paperwork completed, but at the time of writing Bram has not received the promised equipment. (VK4SS).

Activity from Juan de Nova ceased when Gus, W4BPD, went QRT on March 3. His movements are not entirely certain but he had a firm date to visit Tromelin Is. on March 29. QSLs from LH4C and ZD9AM have been distributed through the Bureau. The cost of maintaining even an economical character like Gus on this continuing DXpedition is necessarily high, and W4ECI would be pleased to receive any contributions to augment the amount that he has personally donated to the enterprise.

VS9ADV/P was active over the weekend March 16-17 from the **Yemen** with operation on 14 Mc/s s.s.b. Details have been given to the A.R.R.L. to clarify the DXCC situation. QSLs may be sent via VS9AAA.

DXCC News

The A.R.R.L. announce the addition to the Countries List of **Juan de Nova**. This listing will encompass the islands of Juan de Nova, Bassas da India and Europa. These three islands are French territory under the administration of the overseas department of Reunion. DXCC credit claims for contacts with Juan de Nova may be made starting **June 1, 1963**. Such confirmations must be for contacts made June 25, 1960, or later.

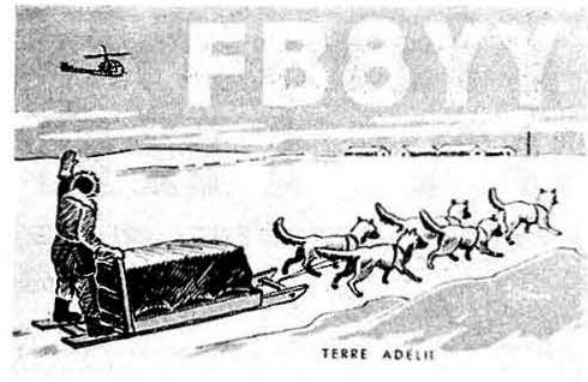
It is reported that the new prefix allocated by the I.T.U. for Algeria is **7X2**.

Despite the large number of conflicting rumours, the latest news on the eligibility of contacts from Chagos under the call **VQ9A/8C** is that QSLs are being accepted for DXCC credit. Nothing has come from A.R.R.L. which alters this situation.

Rota is a Trust Territory and not a U.S. possession, and therefore the normal U.S. sub bands do not apply. This possibly accounts for the crop of rumours regarding **W9WNV/KG6**, but HL9KH confirms that the activity was perfectly in order.

Contests

Conditions during the **B.E.R.U. Contest** were patchy although some good scores have been reported. In terms of actual QSO numbers the highest number is apparently the 482 of **VP8GQ**, closely followed by the two Malta entrants, **ZB1s CR** and **BX**, whilst **VS9AAA** clocked up 331 contacts. G3LPS (Blackburn) started off well on 7 Mc/s when VS1FJ came back to his first CQ, but lack of time prevented a really determined effort. G3JAG (Rochdale) comments that in so far as he was concerned, conditions seemed marginal, though farther south, they seemed to be distinctly better. The 7 Mc/s band yielded VP8GQ, VU2GG, VQ4IN, VQ2W in addition to 5B4, VK and ZL. The log of **VS9AAA** makes interesting reading and gives an insight into propagation conditions in that part of the world. John comments that for a 48 hour contest a maximum of 30 hours only should count, this does not preclude operating the full time, but will certainly enable one to get the best out of the period. Also, as far as B.E.R.U. itself is concerned he considers there is



The attractive QSL card used by FB8YY.

something radically wrong with the system of scoring unless it is designed to give concentration on U.K. contacts or new countries. From the point of view of an overseas competitor VS9AAA would prefer to see multipliers for countries rather than bonus points.

In so far as the **A.R.R.L. Contest** (c.w. section) is concerned G3JAG laments the hearing of ZL1ABZ who was S6 on 7025 kc/s and ZK1AR, S3 on 7010 kc/s, neither of them workable due to the pressure of North American r.f. G5GH notes that within an hour of the commencement of the A.R.R.L. Contest, North American stations were saying " No G, no DL." It seems obvious that the rule limiting the number of contacts with any one country discriminates against the areas of high activity, and is equivalent to putting such countries on a banned list, making the achievement of a high score from G or DL very difficult.

The 1963 **Helvetia 22 Contest** will take place from 15.00 April 6 to 17.00 April 7. For stations outside Switzerland the system of scoring is that three points are claimed for each QSO with a Swiss station and a multiplier of one for each canton on each band. The total score is produced by multiplying the total of the QSO points by the total of the multipliers. All bands from 1·8 to 28 Mc/s may be used, and logs should arrive at U.S.K.A. not later than May 6.

The identification letters used by Swiss stations to denote their cantons are:

AG: Argovie	LU: Lucerne	TG: Thurgovie
AR: Appenzell	NE: Neuchatel	TI: Tessin
BE: Berne	NW: Unterwald	UR: Uri
BS: Basle	SG: St. Gall	VD: Vaud
FR: Fribourg	SH: Schaffhouse	VS: Valais
GE: Geneva	SO: Soleure	ZG: Zoug
GR: Grisons	SZ: Schwyz	ZH: Zurich
GL: Glaris		

Due to an error in *CQ Magazine* the rules for the *CQ* **W.W. S.S.B. Contest** were not correctly reproduced and stations outside the U.S.A. should follow the point scoring rule originally headed " 2. For U.S.A. stations." The greater proportion of the rules distributed by G2BVN carried the correction, although the earlier applicants may have received unaltered sheets.

Awards

The **Cyprus Award** certificate has been announced by the Cyprus Amateur Radio Society. It will be awarded to any licensed amateur radio operator outside Cyprus who makes a specified number of two-way contacts with licensed amateurs on the Island of Cyprus. To reduce as far as possible any advantage accruing to stations by reason of their geographical location, and to encourage activity on the less

frequently used bands, the certificate will be awarded on a points basis determined by zone location and the frequency bands used.

For stations located in **Zones 14** and **15** the band/points allocation is:

1·8 Mc/s 8 points	21 Mc/s 2 points
3·5 Mc/s 4 points	28 Mc/s 4 points
7 Mc/s 2 points	144 Mc/s 16 points
14 Mc/s 1 point	432 Mc/s 32 points

The total number of points required to win the award is dependent on the number of bands used: all contacts on one band = 32 points; two bands = 24 points; three bands = 16 points; four bands = 12 points. Any mode may be used, but only contacts after July 1, 1962, will count. Full details of the log entries must be sent together with either the appropriate QSL cards or a certificate from the applicant's National Society certifying that the QSL cards have been produced to them. In countries without a national society a similar certificate signed by two other amateurs will be accepted. Claims, accompanied by three I.R.C., should be sent to The Awards Manager, Cyprus A.R.S., P.O. Box 216, Famagusta, Cyprus Republic.

The **Ontario DX Association** currently sponsors three awards for DX'ers: (i) The **Canadian** (trans-Canada) **Award**; (ii) The **St. Lawrence Seaway Award,** and (iii) The **Provincial Capitals of Canada Award.** The first two awards have been greatly improved in quality although the requirements for earning them remain the same. Present holders of the old certificates may, if they wish, reapply for the new certificates which will be issued free of charge. It is only necessary to state the number, name and call-sign appearing on the old certificate. The third award was formerly sponsored by VE3HB (now a Silent Key) but all three may now be claimed from Wm. A. Wragg, VE3BQP, Awards Manager, Ontario DX Association, 127 Castlewood Road, Toronto 12, Ontario, Canada.

In connection with the **1963 CHC/HTH QSO Party** between 23.00 May 31 and 06.00 June 3, the Surrey Chapter (No. 8) of C.H.C. will award the three following hand-drawn certificates:
(i) For the highest scoring CHCer in Europe, (ii) For the highest scoring HTHer in Europe, and (iii) for the U.K. listener station (not holding a transmitting licence) logging most C.H.C. members. In the event of one station qualifying for both awards (i) and (ii), the operator must opt to receive one only, the other then being awarded to the next station in order of merit. Logs for the s.w.l. award should be sent to G5GH to arrive by June 30, and entry forms with details are available from the same source by sending a s.a.e. Considerable thought has been given by the members of Chapter 8 to the form of the awards to be issued, and it is believed that the issue of hand-drawn certificates will obviate the difficulties associated with the despatch of trophies to European countries.

The **Code Proficiency Award** available from **V.E.R.O.N.** is issued free of charge and it is not necessary to send I.R.C. The proficiency runs take place on the last Friday of each month at 21.30 G.M.T., simultaneously on 3600 kc/s, 14,100 kc/s and 145·14 Mc/s, under the call PA0AA. Applications for the award should be sent to V.E.R.O.N. HQ, P.O. Box 9, Amsterdam; attention: Traffic Bureau.

Applications for the **5A Award** should now be sent to 5A1TK, Box 372, Tripoli, Libya, North Africa.

In a note **G8PL** mentions that the information given in the *Directory of Awards* regarding the new **Indiana Awards** is not entirely correct; he has forwarded a copy of the conditions governing the Worked Evansville Indiana Award, the Ohio River Award and the Worked Indiana Award. Amongst the recent certificates received by G8PL have been the NDS-CA from North Dakota (the first in Europe) and the ABCDX (Alphabet) Award from K5FKD which will enable him to apply to CHC-100.

The **Worked All Wisconsin Counties Award** sponsored by the Waupaca Amateur Radio Club, P.O. Box 161, Waupaca, is available to stations outside continental U.S.A. who can produce a check list showing contacts with ten counties in the state of Wisconsin. All contacts must have been after January 1, 1958, and seven I.R.C., or the equivalent, are required with each application. Additional stickers are available for contacts exceeding the first ten.

G2FFO has recently submitted his claim for the U.S.A. Counties Award: it is believed that he will be the second U.K. station to obtain this attractive certificate.

Around the Bands*

DX has continued to appear on **1·8 Mc/s** but judging by our reporters' comments conditions have already declined from the January peak. **G5ZT** (Plymouth) records contacts with W1ME, VE1ZZ, W2FTY, W2EQS, W3GQF and W3MSK all between 05.00 to 07.40 G.M.T. **VP5CZ** (Jamaica) reports European stations coming in clear and steady including G3PQA (06.30), G3PU (07.03), many others including W's, the regular HC1DC (05.16) and VE2UQ calling LU3EX have also been heard. He has now heard 78 W's in four sittings, including W2QHH as late as 10.20 G.M.T. indicating the high level of activity on this band over the water. **G3OIT** (Billericay) complains that much interference on this band is due to failure on the part of many stations to honour the band sharing arrangements. He also finds that when calling the rare stations, e.g., OY7ML, on a schedule many G's immediately come on frequency and call too even although they could not possibly have heard the station in question. So, all concerned, please play the game! Contacts are reported with 5A3CJ (c.w. and a.m.), HB9T (17.20), W2FYT (07.20) and W8JIN (07.44). **B.R.S.20317** (Bromley) reports changeable conditions during the month but, nevertheless, has logged HC1DC (06.08) on 1801 kc/s., CT1CO (06.40) on 1827 kc/s, YV5ANT (05.00), KP4AQY (07.00), VP5XG (06.58), OH3NH (00.40), VE1ZZ and many W1, W2, W3, W4, K8 and K9 stations at good signals levels. The first breakthrough this season to New Zealand came on March 8 when **G3OQT** (Romford) and G3ERN (Harlow) worked **ZL3RB** around 06.50 at RST449. This followed the reception by ZL3RB of signals from G3IGW (Halifax) on February 23. **G3IGW** keeps regular schedules with W6 and W7 but at the time of writing no G/W6 QSO had materialized, and W6KIP had not heard any European signals.

On **3·5 Mc/s** only **B.R.S.20317** (Bromley) reports this month. He has found variable conditions with good openings to the U.S.A. between 00.00 and 08.20 G.M.T. and peaking 58 towards the end of the period. Other loggings include HP1IE (06.05), UA9PP (19.30) in Zone 18, UA0EQ (00.00) VE4RO (07.44), VQ4IN (01.00), VP5XG (04.10), VP8GQ (01.45), VS1LP (ex-EP2BK, 22.40), XE1BB (06.50) and ZL2FT (06.50). Undoubtedly, it is the early bird who gets the worm on this band!

Conditions on **7 Mc/s** seem to have picked up again during February and helped by the B.E.R.U. contest considerable DX has been worked. **G3LPS** (Blackburn) reports contacts with OX3XU, PY7TY, VK3GU, VK3ZR, VK7SM and ZL2GS, all between 08.00 and 09.00. Also VK5NO (08.20), VK7SM (08.40), VP5XG (02.35), VP8GQ (00.53), VP9BO (03.20), VS1FJ (00.05), VU2GG (01.14) and ZB1BX (01.00). Considerable activity by CN2GA between 16.00 and 20.00 G.M.T. is reported by **G3PVS** (Woking) who also lists YV5ANT (21.50), VS9AAA, EA4GY (20.00) and UN1AN (20.50). G3PVS says that his call is being pirated on 40m by someone quoting his old address given in the current

* Compiled by J. G. Cottrell (G3PSY).

Call Book. **B.R.S.20317** (Bromley) confirms the good conditions with the following summary. *Africa*—CR7IZ (22.15), FB8XX (16.08), FB8ZZ (17.05), FR7ZC/J (23.45), ST2AR (19.20), ZE6JE and 5N2RSB. *Asia*—HL9KH (14.26), JA's between 15.20 and 17.15 G.M.T. with JA6YG best at S6, VS1LP (15.20), VS9APB (15.55) 9K2AD (16.30). *Oceania*—The path to Australia and New Zealand opened at various times with VK3IT (15.40), VK4SS (16.00), VK2QL (07.45), ZL2AWJ (09.35), ZL3GU (19.00), ZK1AR (08.45) and W9WNV/KG6R (15.00-17.00). *South America*—VP8GQ still giving consistently strong signals after dark, LU8DLK, BAJ (04.40-05.20), HK7BE (06.30), HC1DC (03.00). *North America*—Good conditions late in the evening with K3GKF (23.33) giving S8 signals. Also W2JAE and W4QP at 23.00 G.M.T. The short path to W6 opens in the mornings; W6LHN and W6RW appear 07.50-08.35 G.M.T. Also logged were OX3AY and VE8DX (22.15), HI8XAG (22.15) and XE1RM (05.30).

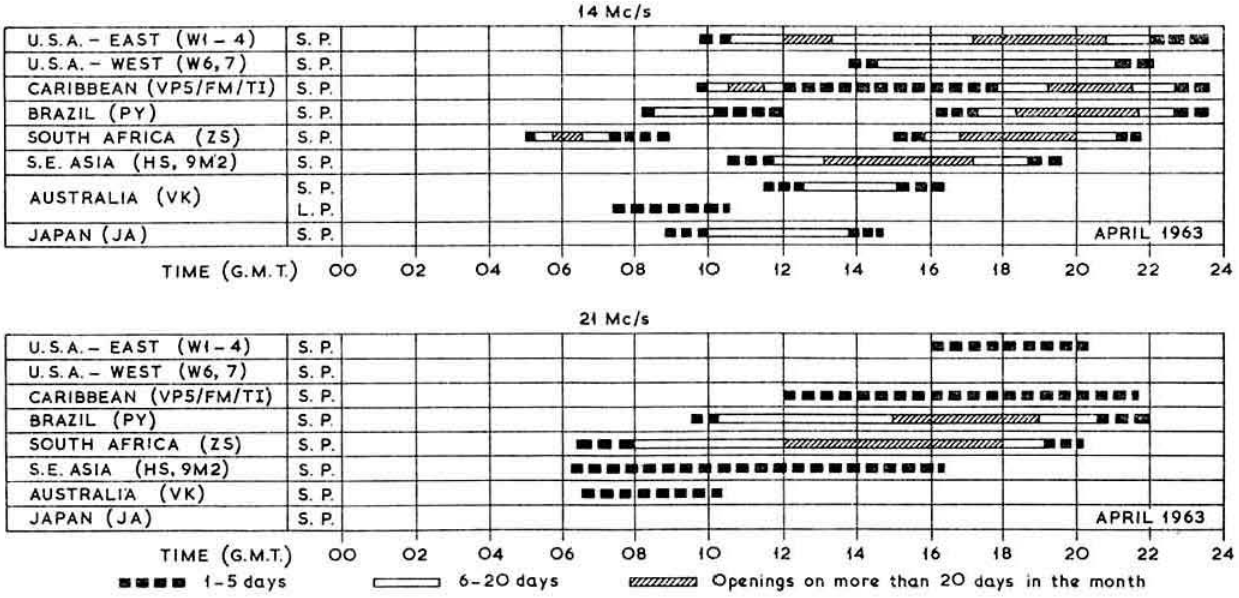
Helped by the B.E.R.U. contest **14 Mc/s** has produced a great deal of DX. Spring conditions (not weather) are appearing and the band is open until 21.00 to 22.00 most evenings. The day starts with openings to the East, the Antipodes and the Pacific areas. **G3YF** (Chingford) reports YI1WS (08.20), K4OXP/KG6 (08.30), UR2EK (09.45) all on c.w. and KG6IJ (09.10), BV1US (09.15), KA7AA (08.45), KC6BK, KR6BP (09.30), VK9LA (15.00) on Cocos Keeling, KH6PD/KG6 (08.40) on Marcus Island, JA2AEY (08.45), VU2AK (08.45), all on s.s.b. **G3AAE** (Loughton) confirms with W9WNV/KG6R (09.24) on Rota Island, DU0DM (11.06), CR9AH (09.20) and, in addition, your compiler managed VK7SM (12.41), 9M2UF (13.50), VS9AAA (11.25) and VS1GZ (14.20). Also reported are openings to KL and KH in the early morning.

Generally by noon the path to the South improves and by early evening openings to VQ2, ZS6, VE7, OX3 and W land appear fairly regularly. Later on the Caribbean, South American (YV, PY) come in with the U.S.A. in force. **G3YF** (Chingford) lists ST2AR (14.45), 5R8AB (15.35), FB8ZZ (16.00), FB8XX (16.00), 6W8DD (18.30), VQ1GDW (18.53), VP8GQ (19.03), VQ8AM (16.40), FR7ZC/J (18.15)

PROPAGATION PREDICTIONS

The change from winter to summer conditions will lead to a further deterioration in the conditions on 28 and 21 Mc/s. The former will be open only on days of exceptionally high *F2* m.u.f. when the paths to Africa (12.00 to 18.00) and S. America (15.00 to 19.00) may be open. On 21 Mc/s the only reliable paths will be those to Africa and South America, although short skip contacts of distances between 500 and 1,200 miles will become more frequent during the month. On days of strong geomagnetic disturbances there may be the possibility of inter-European contacts by auroral reflection. Conditions on 14 Mc/s will continue to improve and with the longer days the band will remain open longer, and on undisturbed days may be workable until midnight during the later part of the month. On days with above average *F2* m.u.f., contacts with Hawaii may be possible between 16.00 and 21.30. The lengthening days will lead to poorer conditions on 7 Mc/s and DX will only normally be workable when the greater portion of the transmission path lies in darkness, although it may be found that contacts with South America and South Africa are of better quality than during previous months. Sporadic short skip conditions may also be noticed on this band. DX contacts on 3·5 Mc/s will be possible when the whole of the path lies in darkness and the shorter nights together with an increase in atmospheric disturbances will lead to fewer DX openings on this band. The 1·8 Mc/s band will also be open for DX working and it is predicted that the optimum time for contacts between 1,200 and 2,400 miles will be between 22.00 and 03.00.

The steady decline of the sunspot cycle continues and the level of activity approximates to that prevailing in the spring of 1955. The mean sunspot number supplied by the Zurich Observatory for February, 1963 was 22, and the predicted figures for July and August are 19 and 17 respectively. The yearly mean number for 1962 was 37 and the month of highest activity was September with a figure of 51.



on c.w. whilst s.s.b. accounted for FG7XT (10.30), TI2LA (18.40). **G3AAE** (Loughton) records c.w. with LA9RG/P (13.00), OD5AX (14.50), VQ8BI (16.25), VQ8AI (17.15), ZS7M (17.20) 9L1GM (17.35), KV4CI (20.05), ET3JK (19.10), ZD8DW (21.00). **A.3062** (Camberley, Surrey) logged CX2CA (10.43), KR6CF (11.25), KR6RN (11.09), KZ5LC (19.01), OA4CV (20.56) and many PY's, ZL's, VK's and, seldom heard, XE1GJ from Mexico at 19.39. **A.2498** (Peterlee, Co. Durham) heard s.s.b. from ET3USN (18.00), HH2CL and PW (19.30), KG1AG, FR and AKR during the day, MP4BCC (13.00), PJ2AA (19.30), VE8MC and MD (18.00), 5R8CM (19.00). **OE1ME** in Vienna has found similar conditions in Southern Europe and lists many of the above and also KC4USV and BK (07.15-10.15) and KX6AE (12.13) on s.s.b.

GW3AHN (Cardiff), now up to 305, reports c.w. QSOs with FR7ZC/J, VP5XG, VP8GQ, VQ2JG and VQ2W, whilst s.s.b. yielded CR8AA, FR7ZC/J, HH2PW, HI8XAG, HL9KH, KC6BK, KH6PD/KG6 (Marcus Is.), W9WNV/KG6R, KG6IJ (Iwojima), KR6CF, PJ2AA, TI2LA, UA0EK, VK8NE, VP4TI, VP7CW, VS1JH, YA1AW, ZD6RM, ZD8DW, ZL1ABZ (Kermadec Is.) and 9M2CR.

Only lack of activity makes **21 Mc/s** appear a dead band. The B.E.R.U. and A.R.R.L. contests proved this contention and on these occasions 21 Mc/s sounded more like the 20m band. **G3AAE** (Loughton) reports contacts with CR5SP (10.10) on a.m. and VP8GQ (09.00) ZD6OL (11.15) and ZS7M (16.00). **A.3062** (Camberley, Surrey) has logged on phone CR6ES, FN, FY, between 14.00 and 18.00 G.M.T., EL6IA (17.07), HK3AFB (19.58), KP4PM (15.05), MP4BCP (14.07), VK5BQ (11.39), VP7WP (19.25), YV6AV/P (15.09), ZS1VQ (15.33), 5U6AC (16.48), 9G1EC, EE and GW (14.00 to 17.00 G.M.T.), 9K2AD (12.14) and 9Q5EP (14.46). **A3532** (Cumberland) adds MP4TAM and BCT, VS9AKH (15.39), TR7GT (15.20) and HI8MMN (20.20). **G3PSY** can add CR6CA (13.30), PY5ASN (18.03), LU3DMD (17.45), CR6DX (17.28), ZS6JK (17.11), VQ2EW (16.57), UD6DU (12.23), 5R8AB (15.53), FR7ZC/J (15.45), ZE6KL (10.00), VS1FJ (09.45). Finally, EL3AF (16.26) contradicts the report from EL4A that equipment and licences in Liberia have been withdrawn. He says all is normal.

GW3AHN exchanged RST with FR7ZC/J, HC1DC, MP4BBE, VQ2W, VQ4IN, VP8GQ, VS9AAA, ZD6OL, 5N2RSB, 5R8BK and 9G1EE.

Again no reports for **28 Mc/s**—local or DX. Surely someone must have heard something to pass on?

DX Briefs

With the separation of the Channel Islands into two separate DXCC "countries" G3AAE reminds us that he has the logs and cards for the **GC3AAE** operation from Jersey (1957) and Alderney (1958), if any operator still lacks confirmation of a contact.

Cards for **VS9APH** should continue to go to **W3HQO** but QSLs for GW3IEQ should go to the QTH in the *Call Book*.

HP1ME is looking daily for European contacts at 12.00 around 14,320 kc/s on s.s.b., often with KP4CL assisting. (G4MJ).

Following initial work by the Ontario DX Association it is hoped that there will soon be a national radio society in Canada. (VE3BQP).

G3JAG relates the appearance of a "KG4AM" whilst the authentic **KG4AM** was working on his usual frequency of 7025 kc/s. A suggestion that the two stations should get together led to the disappearance of the phoney KG4, but doubtless a number of stations will be disappointed when they do not receive the anticipated QSL. The writer has never been able to understand just what pleasure these piratical characters derive from their activities.

Heard on 7 Mc/s, also by G3JAG, KP4BCL calling "CQ Europe only," goes back to a K9 saying "since when has K9 been in Europe, there are guys over there staying up all night to work DX, I can work K9 anytime." Some of the Central European stations working on 7 Mc/s could also do well to heed directional calls.

VP2KP is apparently unwilling to part with cards for the Anguilla operation in October and there are many operators who would be pleased to receive the promised QSLs.

W2MUM has the logs for **TF5TP** dating from 1957 and will be pleased to issue QSLs on receipt of QSO details and s.a.s.e. with I.R.C.

VK7SM, VK7LZ, VK7ZZ (a blind operator) and **VK7AG** are all active and keen to work Europe. Best times are around 13.00 on 14 Mc/s and 19.30 on 7005 kc/s. VK7AG also works 3·5 Mc/s c.w. around 08.00. (VK4SS).

YA1AW will be moving to Pakistan around the time that this is being read, and will deal with QSLs forwarded from his home QTH at K5YYP.

* * *

Information and reports from numerous correspondents are gratefully acknowledged, and also assistance from the *DX'press* (PA0FX), the West Gulf DX Club *Bulletin* (K5ADQ), *The DX'er* (WA6TGY), *DX* (W4KVX) and *Florida DX Report* (W4CKB). Please send all items to R.S.G.B. Headquarters to arrive not later than **April 5** for the May issue and **May 10** for the June issue.

QTH Corner

BV1US	Box 8, APO 63, San Francisco, California, U.S.A.
CR8AA	W. F. Cuga, 125 Eastview Terrace, Lombard, Illinois, U.S.A.
CR9AH	via W7ZAS.
DL2DM	Capt. K. L. Miller, 6B Frieden Strasse, Unna, Westfalia, W. Germany.
ET3JK	via K3HQJ.
FA9VJ	J. Vignolles, 4 rue de la Remontee, Oran, Algeria.
FG7XJ	Box 387, Pointe-a-Pitre, Guadeloupe.
FR7ZC/J	via W4ECI.
FY7YE	via W5JLU.
GB3RAF	S.S.B. Contest *only* via G2BVN.
HK0AI	via W9WHM.
KC4USV	Box 11, Navy 20, FPO, San Francisco, California, U.S.A.
KG6SX	via KH6FBJ, 1132, McMorris Dr., Honolulu 18, Hawaii.
SM5CGK/9Q5	via SM6URO.
SP5AFL and SP5XM	W/VE only via K4EF.
TG9SC	Box 53, Guatemala City, Guatemala.
TI2J	via K5PSO.
VP5BP	via VE3CJ.
VP8HE	via GM3JDX (home call).
VP8HK	via British Antarctic Survey, Port Stanley, Falkland Is.
VP7CW	USN 141, c/o FPO, New York, N.Y., U.S.A.
VR2EO	via W8EWS.
W9WNV/KG6R	via W9VZP.
YA1AW	via K5YYP (home call).
ZD3P	via G2BVN.
ZD6OL	Box 41, Zomba, Nyasaland.
ZD8DW	C. Shoemaker, W5SWX, 3217 Moon St., Mesquita, Texas, U.S.A.
ZS4PB/ZS9	via W8SMQ.
3A2CL	via IIRIF.
5R8CE	H. Malgorn, B.P. 730, Tananarive, Madagascar.

Can You Help?

- D. B. Hill (B.R.S. 24890), 10 Vale Road, A.E.R.E., Harwell, near Didcot, Berks., who wishes to borrow the circuit diagram of the Hallicrafters Super Skyrider receiver?
- N. T. Hodgson (G2ABK), Hundleby, Spilsby, Lincs., who requires the manuals for the AR88LF and CR150 receivers?
- B. J. Payne (B.R.S.25124), "St. Kitts," 66 Exeter Road, Newmarket, Suffolk, who requires the Service Manual T1864/4 for the Marconi 300/2.

R.S.G.B. 21/28 Mc/s Telephony Contest 1962

G3FXB overall leader—ZB1BX leading overseas entrant

IN general, the number of entries for the contest was very satisfactory although, owing to adverse band conditions, it was restricted to being virtually a 21 Mc/s event. Another surprising revelation from the entries was the lack of British stations participating, especially as the contest was arranged with U.K. operators in mind. W1QCO reported hearing no "G" signals on 21 Mc/s during 36 hours' of listening. On the second day, however, upwards of 100 W stations were worked from Britain. Operators in Malta did hear some very weak signals on 28 Mc/s, but none originated from the British Isles. The fact that some 28 Mc/s signals were heard in Malta indicated that conditions were good in that area, which was substantiated by the high standard of ZB1 entries.

A number of South American stations complained that, although many Gs were heard and called, results were poor, apparently because British beams were directed more towards North America and Africa.

In the usual hurry of contest operating, it became evident that "R5" was more automatic than actually the case with the letters such as C, T, D, B, V and Z (when pronounced Zee) often received incorrectly, despite the existence of several universally recognized phonetic alphabets. "Break-break" also caused considerable difficulties for the receiving contestants.

Receiving Section

The Receiving Section was supported reasonably well compared with other such events, but quality was certainly lacking in a considerable proportion of the entries. A great many Associate members who participated in this section lacked contest experience although one entrant who declared his age as 12 submitted a good log. It would be advisable, however, for all entrants in this and similar contests to read the "Notes on Listeners' Logs" published on page 440 of the February 1963 issue of the BULLETIN.

The tendency of receiving contestants to tag on to a star "G" transmitter and log his contacts is unfortunately growing, although it is the intention that listeners should report on the *overseas* stations, recording the Gs they work and the reports given to the U.K. stations. Long lists of overseas contacts with one U.K. station are too coincidental to be the result of searching the band.

Awards

In the British Section of the Transmitting event A. J. Slater (G3FXB) won the Whitworth Trophy with a score of 2080 points, with A. E. White (G3HCU) as runner-up with 1508 points. ZB1BX submitted the best overseas station entry.

In the somewhat poorly supported multi-operator section, UB5KCA submitted a very useful log, while G3LHZ was the British leader.

D. G. Rumsby (B.R.S.22844) won the Metcalfe Trophy, with a score of 1359, followed by E. F. J. Hoare (B.R.S.23425) who claimed only 28 points less. J. Farrer (B.C.R.S.1119), the only entrant from overseas, scored 600 points.

Check logs from G2CVV, G3DYY and G3KHU are gratefully acknowledged, as are comments on the scoring system and other details, which will receive full consideration when the Contests Committee formulate the rules for the 1963 event.

Results—R.S.G.B 21/28 Mc/s Telephony Contest 1962

Call-sign	Points	PLACINGS: Home Position	PLACINGS: Overseas Position
G3FXB	2080 *	1	
ZB1BX	2069 *		1
ZB1CR	1895		2
5A5TW	1662 *		3
9GIEE	1610 *		4
G3HCU	1508 *	2	
9GIAB	1480		5
G5HZ	1383	3	
5N2RSB	1208 *		6
G3KFT	1129	4	
5N2JKO	1115		7
ZD6HK	1095 *		8
5N2BRG	1040		9
G2JB	975	5	
G3NGZ	970	6	
G2QT	940	7	
G3JAF	909	8	
G2HDU	905	9	
5M3IW	870 *		10
5A5CJ	849		11
G3OPJ	840	10	
MP4BDC	834		12
G3VW	825	11	
G3OIB	815	12	
G3OGT	790	13	
4X4LO	783 *		13
G3NEO	765	14	
G2DC	731	15	
G3PTM	685	16	
G3PZO	680	17	
YV1EL	672 *		14
5B4WS	525 *		15
GM3PZR, G3BXS	485 *	18	
G2AJB	476	20	
GW2HFR	455 *	21	
G3FUU	450	22	
G3NLY	435	23	
W2JKH	425 *		16
SM5CEU	395 *		17
G3DNR	370	24	
W3HQO	359 *		18
PY1CAD	335 *		19
GM3PZR, G2BLA	310	25	
VK6QL	300 *		20
VK2AKV	280 *		21
VQ2JG	270 *		22
SM5CHA	265		23
GW3IOI	220	27	
YV1II	160		24
VK6RE	145		25
G3MWZ	130	28	
K2UTC	120		26
LU3BAC	85 *		27
VE3EVK	65 *		28
SP5AHO/LZ	60 *		29
4X4MJ, VE2AFC	55		30
VE2AFC	55 *		
Multi-Operator Section			
UB5KCA	1317 *		1
G3LHZ	440 *		2
G8TA	290		3

RECEIVING SECTION

Posn.		Points	Posn.		Points	Posn.		Points	Posn.		Points
1	B.R.S.22844 *	1359	11	A.2340	985	20	A.2886	760	29	B.R.S.21389	523
2	B.R.S.23425 *	1331		A.2385	985	21	A.2917	740	30	A.3421	475
3	B.R.S.24643	1329	13	A.2432	955	22	A.2327	690	31	B.R.S.22445	455
4	B.R.S.24733	1296	14	A.2111	945	23	A.3295	660		A.3297	455
5	A.1902	1235	15	A.3247	900	24	A.3213	625	33	B.R.S.18461	410
6	A.3419	1160	16	A.2019	895		B.R.S.21624	625	34	A.3004	395
7	B.R.S.21008	1120		B.R.S.15822	895	26	B.R.S.24962	614	35	B.R.S.24987	310
8	Mr. Hunter	1030	18	A.1798	875	27	B.C.R.S.1119 *	600		A.2748	310
9	A.2946	1005	19	Mr. Farrell	769	28	A.3275	532	37	A.2703	238
10	A.2122	990									

* Certificate winners

Mobile Column

BY C. R. PLANT (G5CP)*

THE sad news of the death of Mr. C. H. L. Edwards, G8TL, Chairman of the R.S.G.B. Mobile Committee, came as a great shock to us all. He was devoted to the cause of Amateur Radio and had a particular interest in mobile operation; in the early days he developed a centre loaded whip aerial with a multi-tapped coil which was copied by many mobile amateurs. Although a very busy man, he always found time to give assistance to anyone who needed it, and he would fight for any cause where a principle was at stake—he will be greatly missed.

The Zener Diode P.A.

Last month details were given, albeit in good faith, of a revolutionary p.a. employing a Zener diode. Such a device would clearly be a real breakthrough if it really existed. Unfortunately the writer's enthusiasm for such an excellent idea overcame his native caution, with the result that he did not realize the technical impossibility of the scheme as presented. It is to be hoped that not too many members were taken in by this unintentional " legpull."

Receiver Squelch Circuit

A brief comment was made in *Mobile Column* in February, 1963 of a report received from GM3NRB (Helensburgh, Dunbartonshire) covering mobile activities on 28 Mc/s. Interest has been shown in the " squelch " method used—Fig. 1 shows the circuit of this section of the receiver.

The equipment was installed primarily to carry out tests with a local amateur, GM3HSF, who owns an almost identical set-up. It was felt that it would be a great advantage to have a silent background when signals were not being received—and the inclusion of the squelch section has succeeded in cutting out unwanted noises, particularly from passing vehicles. With careful adjustment it is possible to set the receiver so that weak signals trip the squelch. GM3NRB describes the operation of the circuit as follows: When the a.v.c. line voltage is low, i.e., under no signal conditions, V1 (6AM6, EF91) draws anode current through R3. This results in the anode end of R3 becoming negative in respect to the h.t. end. The anode end is connected through R2 (a.f. blocking resistor) to the grid of the controlled a.f. stage V2a. The h.t. end of R3 is connected to the cathode of V2a, thus with the passage of current through R3, the grid of V2a is driven to cut-off. Upon receiving a signal the a.v.c. line goes negative and the current through R3 drops, the grid of V2a goes more positive and the valve conducts thus allowing the passage of the a.f. signals from the detector to the following stages. The actual level of signal at which V2a conducts is governed by the setting of the " squelch " control VR1. V2b and V3 form the following a.f. stages, which are quite conventional and give plenty of volume to overcome normal car noises. Most of the resistance values were determined experimentally and seem to be quite satisfactory but slight modifications may be required to suit individual requirements; this applies particularly to R5 and C4. A reasonable amount of a.v.c. is required to operate the circuit but with careful adjustment it can be made to work very satisfactorily. It is an advantage to make R5 a 50 K ohms potentiometer, connected as a variable resistance—this modification has been incorporated in Fig. 1. It will certainly reduce the experimentation which might be necessary to select a suitable resistor for this part of the circuit.

Forthcoming Rallies

The **North Midlands Amateur Mobile Rally** and O.R.M. organized by the Midland Amateur Radio Society in conjunction with the Stoke-on-Trent Radio Society will take place on Sunday, April 21, at Trentham Gardens, near Stoke-on-Trent, Staffs.

The venue is situated four miles south of Stoke-on-Trent on the A34 Manchester/Birmingham road and plenty of parking space has been reserved. Luncheons and light refreshments may be obtained without prior booking; in this connection we have been asked to announce that this year there will be additional staff on duty to cope with the expected heavy demand.

The Rally will start at 11 a.m.—the official opening ceremony will be performed by The Lord and Lady Mayoress of Stoke-on-Trent at 12 noon. The Regional Meeting will take place after lunch. A special request is made to all

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

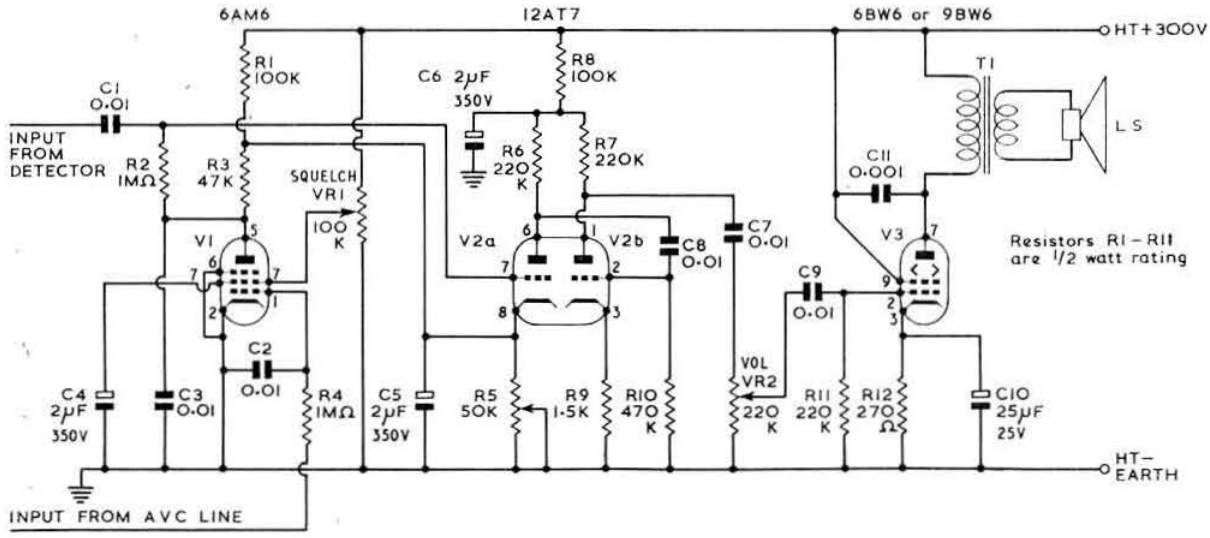


Fig. 1. Circuit diagram of the audio section of GM3NRB's mobile receiver.

The new transmitter for G3NBR/M covers all bands from 20-160m., the valve line-up being 6AM6, 6AM6, 6AM5 and a pair of 6BW6. The power supply is transistorized and a new modulator with two OC35 in the ouput stage is under construction.

R.S.G.B. members to attend the O.R.M. This is an opportunity for people living remote from London to meet Council Members and to put questions to them. The usual exhibition stalls by manufacturers and demonstrations by Civil Defence units together with a station operated by A.T.C. members of the Stoke-on-Trent section will form the main inside attractions. Outside there will be demonstrations by model boat societies, model aircraft display and water skiing on the lake, so all visitors should find something to interest them. Prizes for the " Grand Raffle " are coming in well.

The talk-in stations will be G3MAR/A on 144 Mc/s and G3GBU/A on Top Band with outstations as follows: G3OGB (North), G3HVI (East) and G3JZB (South).

The Trentham Rally, always the first in the Season, has never failed to provide a pleasant and informative day for all: let us see to it that this year is no exception.

Operating Notes

During a contact with VE3BWY (Toronto) the writer was told that there is a great deal of mobile activity, largely on 3·5 Mc/s, in Canada. A few of the stations active are: VE2AUU, VE2DVA, VE6TF and many VE3s—the latter are heard mainly at weekends when travelling to and from weekend cottages in Northern Ontario. VE station operators are asked to send information about the equipment used and results obtained.

G3NNF (nr. Wantage, Berks.) operates during the summer months on Top Band using equipment which is nearly all transistorized. The receiver is completely transistorized and takes only 40 mA from the car battery. The transmitter uses three valves, the p.a. being a 6BW6 running 8 watts input. The modulator is entirely transistorized terminating in a pair of OC16s in class B—when on stand-by with the heaters running the load on the battery is only 0·5 amp. G3NNF makes a plea that base stations at Mobile Rallies erect vertical aerials so that a strong ground wave is radiated —he complains that the wire often slung over tree branches with the major part of the aerial in a horizontal plane often gives poor local reception.

G3JHM (Portsmouth, Hants.) reports that he is now mobile on 4m using a Mark 2 B44 transceiver. The stations active on this band locally are G8RO, G3GVM, G3PUR, with G3IDX, G3RDT and G3ORR awaiting crystals for their B44s. More news of 4m activity comes from **G3GVM** (Worthing, Sussex) who reports satisfactory results using a quarter wave vertical whip mounted on the front wing of his car. He also uses a modified B44 with an input of 5 watts. The best contact to date was with G3JQI (Norwich), a distance of 130 miles. G3JHM and G3KEU/P have been worked at distances up to 70 miles—the South Downs prevent regular contacts with Northern stations hence the large amount of local activity along the South Coast.

G3PUR (Worthing, Sussex) also reports 4m mobile activity using a converted B44 running 3 watts. He has regular mobile-to-mobile contacts with G3GVM, with a normal range of about 10 miles, and has been heard by G3KEU/P when mobile on the A23 near Haywards Heath, a distance of 15 miles. G3PUR reports that a number of keen SWL stations in the Worthing area are on this band.

A welcome letter from **G3ABU** (Torquay, Devon) refers to the question of spot frequencies for Rally Stations—he thinks that it would be a " jolly good idea " and suggests a frequency between 1880 and 1920 kc/s. G3ABU is Chairman of the Torbay Amateur Radio Society who are running a Mobile Rally in August, with a location in such delightful surroundings its success is surely a foregone conclusion.

Enquiries Regarding Bulletin Articles

MEMBERS WHO WRITE to the authors of BULLETIN articles are asked to enclose stamped addressed envelopes if they require replies.

QRA Locator Maps

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

MOBILE RALLIES 1963

April 21	North Midlands Mobile Rally at Trentham Gardens.
April 28	U.B.A. Rally, Verviers, Liege, Belgium.
May 5	Thanet Mobile Rally, Cliffsend, Ramsgate.
May 12	Grimsby Amateur Radio Society, Hamfest, Birds' Nest Cafe, Boating Lake, Cleethorpes.
May 26	Bucket and Spade Party, Hunstanton.
May 26	Cheltenham Mobile Rally.
May 26	Northern A.R.M.S., Harewood House.
June 2	Reading A.R.C. Mobile Rally, Pangbourne, Berks.
June 2	R.S.G.B. National Mobile Rally, U.S.A.F Station, Wethersfield.
June 16	A.R.M.S. Rally, Barford St. John, Oxon.
June 16	Cornish Radio and Television Club Hamfest and Mobile Rally.
June 23	East Yorkshire Coast Mobile Rally, Bridlington.
June 30	Longleat Mobile Rally, Longleat, near Warminster, Wilts.
July 7	South Shields and District Mobile Rally, South Shields, Co. Durham.
July 14	Chiltern Amateur Radio Society Mobile Rally, West Wycombe Park, Bucks.
August 11	Torbay A.R.S. Mobile Rally, Naval College, Dartmouth.
August 18	Derby Radio Societies Mobile Rally, Rykneld School, Derby.
August 25	Reading A.R.C. Mobile Rally, Pangbourne, Berks.
September 8	Thames Valley Amateur Radio Transmitters' Society Mobile Rally.
September 15	Lincoln Hamfest and Mobile Rally, Kesteven Grammar School, North Hykeham, Lincoln.
September 22	R.S.G.B. Woburn Abbey Mobile Rally.
September 29	Region 9 Mobile Rally, Weston-super-Mare, Somerset.

Society News

I.A.R.U. Region I Conference

THE PRESIDENT (Mr. Norman Caws, G3BVG), Mr. L. E. Newnham, G6NZ, Mr. R. C. Hills, G3HRH, and Mr. R. F. Stevens, G2BVN, have been appointed to represent the Society at the I.A.R.U. Region I Conference due to open at the Hotel Arkaden, Malmo, Sweden, on Monday, June 10, 1963. Delegates from at least 16 European Societies will be in attendance when a comprehensive survey will be made of many matters of International Amateur Radio importance.

In addition to the official delegates, observers and their ladies are cordially invited to attend the Conference. A special ladies' programme is being arranged.

The overall organization of the Conference is in the hands of the Secretary, I.A.R.U. Region I Division (Mr. John Clarricoats, O.B.E., G6CL) who will be pleased to furnish R.S.G.B. members with further information. Correspondence concerning the Conference should be sent to Mr. Clarricoats at 16 Ashridge Gardens, London, N.13.

Lt.-Col. Per-Anders Kinnman, SM5ZD, Lievegen 2, Roslags Nasby, Sweden (Vice-Chairman of the Executive Committee) is arranging hotel accommodation and visits. Mrs. Kinnman is arranging the ladies' programme.

Silent Keys

RENE KLEIN, F.R.S.A., M.I.R.E. — FOUNDER

To the deep regret of all who knew him, the unique occasion has been lost of offering congratulations at the Golden Jubilee Dinner on July 5, 1963, to the Founder of the Society, for death came on February 19, 1963 to Rene Klein, until recently, G8NK.

From the time he convened that first meeting on July 5, 1913, Rene Klein resided in the same house in the north-west London suburb of West Hampstead, and it was from the room in which the first meeting was held that he, in due time, set up a very modern post-war station. If ever an amateur deserved to hold the earliest G2 call it was Rene Klein but in his modest way the idea probably never crossed his mind of asking for preferential treatment.

From the day the London Wireless Club was founded, until its name was changed to Wireless Society of London, Mr. Klein carried out the duties of Honorary Secretary and he was confirmed in that appointment at the first General Meeting of members held at Westminster City School on September 23, 1913.

On the outbreak of war in August, 1914 the Society went into "suspended animation." When peace returned the duties of Honorary Secretary were taken over by Rene Klein's close friend and business colleague, Leslie McMichael. Mr. Klein continued to take an active interest in the work of the Society but he was then, and for many years afterwards, deeply engrossed with Mr. McMichael in establishing the famous firm of McMichael Radio.

Rene Klein was elected an Honorary Member of the Society on February 16, 1954, and to mark the occasion he shortly afterwards donated the Founder's Trophy.

For some years after the Second World War Mr. Klein and Mr. C. G. (Bert) Allen, G8IG, worked closely together both in business and in Amateur Radio matters, in fact it was largely due to Mr. Allen's enthusiasm that Mr. Klein was persuaded to set up an amateur station once again after a lapse of some 25 years. At the time of his death his son, Mr. J. A. Klein (B.R.S.11108), and his grandson, Mr. R. A. Klein (B.R.S.22047), were members of the R.S.G.B.

To the great sorrow of the writer of this tribute, and to the sorrow of many other old timers, the news of Mr. Klein's death was not received in time for the Society to be represented at the funeral. To his widow and family, sympathies are extended in their great loss. We in the Society much regret that Mr. Klein did not live to take part in the Golden Julibee celebrations of the Society he founded nearly 50 years ago. VALE, RENE—YOUR NAME WILL LIVE ON.

J. C.

W. H. BURNET (G3GQZ)

We regret to report the death, after a long and painful illness, of William (Bill) Henry Burnet (G3GQZ) of Chalton, near Luton.

Although never very active on the air, he took considerable interest in the meetings of his local group, the Luton and District Radio Society, of which he had been chairman for almost 15 years. He was always ready to help and encourage others, particularly at Portable and Field Day events, which he thoroughly enjoyed.

To his widow and children we extend our deep and heartfelt sympathy.

F. W. T.

M. ESKDALE (G2SU)

It is our sad duty to record the death of Matthew Eskdale (G2SU) of Bradford at the age of 73.

He was first licensed in 1911 and except for the war years was continuously active, particularly on the DX bands. He spent many thousands of hours in his living-room station, packed with radio equipment. He will be sorely missed by all who worked and knew him on the DX bands, 160 and 2 metres.

P. D.

LESLIE H. LOMAS (GM2HB)

We record with much regret the death on November 28, 1962, of Leslie H. Lomas (GM2HB).

Well-known for many years in the Macclesfield area Leslie retired some while ago and was living at the time of his death at Kyles Lodge, near Leverburgh on the Sound of Harris.

An R.S.G.B. member since 1936, Leslie had not been on the air for about a year before his death but previously his call was frequently heard on the 7 and 3·5 Mc/s bands. GM2HB took an interest in everyone he worked and he was always ready with a cheerful and kindly word. He will be very much missed by his many friends. Leslie was pre-deceased by his cousin Fergus Southworth (GW2CCU) by about two years.

To Mrs. Lomas, her two sons and their families we extend our deepest sympathy.

W. B. S.

H. SWIFT (G3ADG)

We record with sorrow the sudden death, as a result of a coronary thrombosis, of Harry Swift (G3ADG), on February 14, 1963.

Harry was a very keen DX'er, holding DXCC and needing only Zone 39 for WAZ. He was well known on Top Band, particularly as an enthusiastic member of the Tops C.W. Club with a record of having worked over 200 other members. His long and varied experience of radio matters enabled him willingly to help anyone with a problem.

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

F. S.

ARTHUR TIBBITS (VP6MC)

It is with the deepest regret that we record the death of Arthur Tibbits, VP6MC, in Barbados on January 20, 1963, at the age of 48. Mr. Tibbits had always taken a very keen interest in all types of radio activity.

He first started Amateur Radio in 1934, when he became the first amateur in the island of Antigua. He operated from there as VP2AT, only stopping during the war years. He took part in many DX contests: in more recent years he operated as VP6AT, VP3MC and VP6MC. He was the brother of VP4TR. In Barbados he worked for Cable & Wireless Ltd., in Canada he served with the Air Material Command at Rockcliffe, Ottawa, and in Bermuda with Pye Ltd. His last post was Assistant Engineer Post Office Telecommunications, British Guiana.

He leaves to mourn his loss his widow and two very young sons.

GEORGE W. WIGGLESWORTH (G2BH)

It is with deep regret that we announce the death, at the age of 78, of Old Timer George W. Wigglesworth, G2BH, of Barnsley, Yorks. A pioneer of Amateur Radio in the district, his transmitting days dated back to 1910.

He was a founder member of the Barnsley and District Amateur Radio Club, which has seen unbroken existence since 1913, and for many years up to the time of his death he was President. He took a lively interest in all club matters and was a regular attender at meetings until recently, when ill-health restricted his activities.

The funeral service, followed by cremation, was held at Barnsley on March 9. In addition to family mourners, club members G2AFV, G3GNK, G4JJ, G5IV, G6UF and Mr. W. W. Williams also attended.

George Wigglesworth's cheery voice and ready wit will be sadly missed by all who knew him and his passing will prove a great loss to the club.

He leaves a widow, three sons and a daughter, 11 grandchildren and four great grand-children, to whom we offer our deepest sympathy.

G2AFV

V.H.F. Manager

THE COUNCIL has appointed Mr. R. C. Hills, B.Sc. (Eng.), A.M.I.E.E., A.M.Brit.I.R.E., G3HRH, to be the Society's V.H.F. Manager for the current year. Mr. Hills, who has been Chairman of the Society's V.H.F. Committee since January, 1960, succeeds Mr. F. G. Lambeth, G2AIW, who continues to contribute the monthly feature *Four Metres and Down*.

"Crack of Doom"

MEMBERS WHO TOOK EXCEPTION to certain passages in the play *Crack of Doom* broadcast by the B.B.C. on February 9, 1963, will be interested to learn that the Society's President, Mr. Norman Caws, G3BVG, protested vigorously to the Corporation. Although no apology was forthcoming for suggesting radio amateurs were responsible for false distress messages, a letter written by Mr. Caws setting the record straight was published in *Radio Times*.

Posting Certificate

ALL COPIES OF THE March issue of the R.S.G.B. BULLETIN were posted on Tuesday, March 5, 1963, and the Society holds a certificate to that effect from the Letchworth, Herts., Post Office. The BULLETIN is now published on the first Wednesday in each month.

HERE IT IS . . .

NINTH INTERNATIONAL V.H.F.-U.H.F. CONVENTION

Saturday, May 18, 1963

Kingsley Hotel, Bloomsbury Way, London, W.C.1

Programme:

Convention opens	11 a.m.
Exhibition of commercial and home constructed equipment	
Lecture Symposium	2 p.m.
Convention Dinner	7 p.m.
Presentation of 1962 V.H.F. Committee Cup, and Raffle draw	9 p.m.
Convention closes	10.30 p.m.

Tickets may be obtained from F. E. A. Green, G3GMY, 48 Borough Way, Potters Bar, Middlesex at the following prices:

Convention only 3/6

Convention and Dinner 27/6

Bookings for the Dinner cannot be guaranteed if received later than Wednesday, May 15, 1963.

Tube Stations: Holborn and Tottenham Court Road.

Buses: 78, 23, 25, 32.

Organized jointly by the R.S.G.B. V.H.F. Committee and the London U.H.F. Group.

. . . BOOK NOW

NORTH WALES OFFICIAL REGIONAL MEETING

COLWYN BAY HOTEL, COLWYN BAY

Sunday, May 12, 1963

Programme:

10 a.m.	Exhibition Opens
12 noon	Assembly
1 p.m.	Luncheon
2.30 p.m.	Business Meeting
4.30 p.m.	Buffet Tea

Full details will be published next month. Advance information from the Region 11 Representative, R. Jones, GW3JI, Beirut, Albert Drive Gardens, Deganwy, Caernarvonshire.

Radio Sports Federation of the Soviet Union is now an I.A.R.U. Member Society

THE CURRENT ISSUE of the *Calendar* of the I.A.R.U. announces that the Radio Sports Federation of the Soviet Union is now a member of the I.A.R.U. There were 28 votes in favour of the proposal and only one against. Sixteen of the 18 Societies in I.A.R.U. Region I Division (including R.S.G.B.) supported the proposal. The Association Radio-Amateurs Libanais has also been elected to membership.

There are now 59 Member Societies in the I.A.R.U.

Headquarters Fund List—No. 18

THE FOLLOWING IS THE 18th list of those who had contributed to the Headquarters Fund up to March 15, 1963: T. Edgar (G3BZZ), D. S. Cooke (B.R.S.23273), N. Burton (ex-VS9ANB), A. E. J. Cooper (G5VT), Atomic Energy Research Establishment Amateur Radio Club (G3PIA), E. A. Matthews (G3FZW), C. C. Dumbrille (VE2BK), J. G. Wilkes (G3OKJ), M. E. Mattinson (B.R.S.20966), R. C. Holt (G3NWV).

Total amount contributed to date: £1,644 19s. 0d.

French QRA Locator Maps

R.S.G.B. HEADQUARTERS has 12 copies of the QRA Locator map of France available at the same price as those for the British Isles: 2s. 6d. post paid. Orders will be executed on a basis of first come, first served. If the demand warrants it, a further quantity may be obtained.

Silent Keys

IT IS REGRETTED THAT in the Silent Key for the late R. C. Harrison, G2RH, 9G1CG, published in the March issue of the Bulletin, his call-sign in Ghana was given incorrectly as 9G1CC.

The holder of the call-sign 9G1CC is Mr. P. Lorden, to whom we tender our apologies for any embarrassment that may have been caused by our error.

German Radio Amateur Meeting

THE BI-ANNUAL GERMAN RADIO Amateur Meeting will be held this year at Wolfsburg from May 31 to June 3. The programme will include discussions on v.h.f. and DX, a mobile competition, and a grand dance and variety show. Members of the R.S.G.B. are cordially invited to attend and may obtain further information from Gerd Schnabel (DJ7GS), Deutscher Amateur Radio Club, Röntgenstrasse 44, 318 Wolfsburg, Germany.

"Ham" Clark, G6OT

A Personal Tribute

HARRY CLARK once wrote in the BULLETIN " A ham is a well-balanced individual." It would be hard to find a better example of his words than in the man himself. Active as an amateur for nearly 40 years, yet never a slave to his prime hobby; a brilliantly successful engineer; a tower of support to the technical standing of the R.S.G.B., to whom the veriest tyro could go for advice, and receive it in clear and kindly explanation; who could, when necessary, show dignified anger, yet who was never seen to lose his temper.

Now he has left us. Radio amateurs have lost a great friend; so have I. I am honoured to have been asked to write this tribute, but where can I find words worthy of him? This is a sad occasion but the memory is glorious and the record must be inspiring.

I well remember the day we first met, in 1926; here was a real ham, and I was hoping to be one. We walked and

H. A. M. Clark, G6OT

talked for hours. The excitement was intense, as we swopped ideas and got to know each other, forging a bond that turned into a lifelong friendship.

That happened at Bedford in the works of Igranic Electric Co. He came as a vacation student, and finding himself in the Inspection Dept. with nothing much to do, his ideas soon turned to Amateur Radio. Through the wall was a row of component test bays, each powered by a 60 volt h.t. accumulator. Very soon the test bays were wired in series, with leads through the wall and G6OT was on the air!

But he soon began to make his presence felt in a more serious manner. He became imbued with the need to establish scientific justification for Amateur Radio, for in those days, and for many years, its very existence was in jeopardy. As early as 1926 he began to contribute technical correspondence to the BULL, and soon to write technical articles of great merit. The total solar eclipse of 1927 provided him the opportunity to experiment with the ionosphere—which was still in dispute amongst scientists. He took part in the first 28 Mc/s tests and in the radio monitoring of the pioneer Transatlantic flight of Kingsford Smith in the *Southern Cross*, an effort which secured for Harry Clark a " scoop " story in the *Wireless World*, partly because the bulk of the article was written before the event—you always found him looking well ahead!

A letter from him in the BULLETIN, describing the principles and advantages of the crystal-mixer v.f.o., passed unnoticed, because it was years ahead of the techniques for making it work.

It was inevitable, with his writings, lectures, and valuable advice to the management, that he would soon appear on the Council of the Society, to which he gave many years of service. He also contributed largely to the first *Handbook* and in 1938 became chairman of the Society's Technical Committee, an office he held until his death. He could have stood for President but declined the opportunity, and accepted a Vice-Presidency in 1951.

His early ambition to build up the technical and scientific standing of the R.S.G.B. was well fulfilled and his work in this direction over more than half a lifetime, can only be compared with that of his friend, the late C. H. L. Edwards, G8TL, in the organization fields.

But he was not just a " back room boy "—he took a full part in social and business activities, and was known all over Great Britain and in many other countries as a real personality.

In his second hobby, he was a member of the Little Ship Club and a proficient yachtsman. Under his own sail, or that of the late Gerald Marcuse, G2NM, he knew his way into every creek and harbour of the South Coast, and much of the Continent too. With full radio and navigating equipment, and with a disciplined boat, the hazards of the sea were faced with confidence. One always felt secure in a boat with Harry—he was always one move ahead of Father Neptune.

His business life as an engineer was no less notable; whilst at college he made fundamental contributions to the understanding of the (new fangled) moving coil speaker. From 1928 he worked as assistant to the great A. D. Blumlein, developing electrical recording, first with the Columbia Graphophone Co. and later in the E.M.I. Group. He worked in recording till the end, only stepping aside, for a little variety as it were, to engineer the first B.B.C. Television sound equipment, the first lock-follow radar and a couple of the B.B.C. Band I vision transmitters. At the time of his death, as Technical Director of his company responsible for the quality of the world's largest production of gramophone records, he was at the top of his career, and his company, as well as the R.S.G.B., have suffered a great loss.

Yet his closest friends were aware that all this activity was carried on against a background of adversity at home; an invalid mother needing constant attention and a physical disability of his own, which imposed a strict discipline on his personal routine.

Nature shows no favours. We come; we go. The gap is closed, somehow, and only the memory remains. If we have done well we leave our mark of progress for others to follow. " Little Harry " has gone too soon; he will be remembered in many places for what he was and what he did, but the gap he leaves is difficult to close. " DUD "

Funeral of H. A. M. Clark, G6OT

The cremation of the late H. A. M. Clark, G6OT, took place at Marylebone Crematorium, East Finchley, London, N., on February 21, 1963, when the Council was represented by the President (Mr. Norman Caws, G3BVG) and Mr. R. C. Hills, G3HRH. Others present included Mr. Arthur Watts, G6UN, and Mr. F. J. H. Charman, G6CJ (Past Presidents), Mr. D. N. Corfield, G5CD, and Mr. J. W. Mathews, G6LL (Vice-Presidents), Mr. John Clarricoats G6CL (General Secretary), Miss May Gadsen (Assistant Secretary), and Mrs. Irene Marcuse (widow of Past President Gerald Marcuse). The Radio Amateur Old Timers' Association was represented by Messrs R. L. Royle, G2WJ, W. E. F. Corsham, G2UV and V. A. Sims, G5VS. In addition to the family mourners many other Society members were present as well as representatives of E.M.I. Ltd. and the Little Ship Club.

Annual Report of the Scientific Studies Committee

By G. M. C. STONE, A.M.I.E.E. (G3FZL)*

THIS article is an amplified version of a report made to Council covering the work of the Scientific Studies Committee during 1962. It is thought that some of the activities may not be known to the membership in general.

The Scientific Studies Committee was formed in 1960 to continue the work started during the International Geophysical Year 1957-58, when C. E. Newton (G2FKZ) and the writer were appointed joint co-ordinators of the R.S.G.B. programme in support of the I.G.Y.

A vast amount of data was collected by the R.S.G.B. during the I.G.Y. and during the later year of International Geophysical Co-operation, I.G.C., especially in the fields of v.h.f. tropospheric propagation, v.h.f. auroral reflection propagation and satellite signal recording and observation. The work of analysis has continued over the past few years and the ultimate aim to publish papers on the various subjects has been achieved in the case of satellites [1, 2] in collaboration with the British Astronomical Association, and will be achieved during the next 12 months in the case of the remaining fields of study. Interim reports have been presented from time to time [3] and one paper was read before the Society at the I.E.E. in January, 1960 [4].

Other programmes of scientific study have been initiated since the I.G.Y., experience gained at that time providing extremely valuable in ensuring a sound foundation for the new work.

V.H.F. Tropospheric Propagation

The original aim of the I.G.Y. programme was to attempt to improve our knowledge of long range v.h.f. propagation and related meteorological phenomena and to see whether simple readings of atmospheric pressure and water vapour pressure taken by an individual at home could give any reliable indication of possible v.h.f. band openings. The results were used of many observers who recorded the signal strengths of television, the Gee navigational system, v.h.f. f.m. stations, and normal amateur transmitting stations operating in the 144 and 432 Mc/s bands. A number of long distance schedules were kept by 144 Mc/s operators to provide consistent and reliable data.

The work of analysing these results is complete and at present three BULLETIN articles are in the course of preparation. Considerable assistance to this project has been given by R. G. Flavell (G3LTP) who is professionally a radio meteorologist and who was originally co-opted to the Committee in November, 1961. He has been able to apply new methods of analysing the important properties of the atmosphere to amateur v.h.f. applications. In particular he has introduced the concept of Potential Refractive Index which in effect eliminates the relatively large and constant parameters of the atmosphere leaving those responsible for the mechanism of long range propagation. It has thus proved possible to explain in detail why openings have occurred and by experience thus gained it is now proving possible to give at least short term predictions of future openings. The articles previously mentioned are covered by the general title " V.H.F. Weather." The first article† is by R. G. Flavell, and describes some of the basic principles. The second, to be published during the summer, develops these principles further and the third, written by C. E. Newton (G2FKZ) analysis R.S.G.B. I.G.Y. v.h.f. propagation data in the light of this work and his past experience in the study of meteorological phenomena affecting v.h.f. propagation.

An extremely interesting study has been carried out by Ray Flavell, with permission of the R.S.G.B. Council, in analysing the results of V.H.F. N.F.D. on July 7-8, 1962, a period of good long range 144 Mc/s propagation, in relation to the Potential Refractive Index theories mentioned above. A large number of contacts were made in excess of 200 miles, and the period also covered a 24 hour contest when the activity was exceptionally high. An important feature was that since many groups put in entries for the contest, much data was available in convenient form in the logs of the participating stations. This analysis, when related to meteorological data for the period, has proved so successful that an article entitled " 200 Plus " has been written for the BULLETIN and will appear in the May issue.

A further outcome was the approval by Council of a similar exercise in connection with the National 144 Mc/s Open Contest, September 1-2, 1962, also a period of good long range propagation, when a similar large amount of data were available from contest logs. This work indicates the value that v.h.f. contests can have in providing a mass of information over a short period of time, collected together very conveniently in the form of contest logs. It is doubtful whether any other form of amateur v.h.f. operating activity can provide even a fraction of the data obtained in this way.

It is our intention to apply this method of analysis to future contests when the meteorological conditions are interesting.

V.H.F. Beacon GB3VHF

The signals received from the R.S.G.B. station GB3VHF [5] at the J-Beam Aerial Works, Northampton, have been recorded on paper over a period in excess of 12 months. The recording has been arranged in close collaboration with B. Sykes (G2HGC) and was under the direct supervision of V. Hartopp (B.R.S.15304). The recordings were taken continuously, 24 hours per day. These records have been studied and various interesting characteristics noted, and it is hoped to describe these results in a future BULLETIN article. Whilst the periods of abnormally high signal strength are of course interesting from the amateur point of view, it has been decided initially to study " holes " in the recordings, i.e. when the signal falls to zero, to see whether it is possible to find related meteorological conditions to explain this. In many cases these holes occur quite rapidly and without any indication in advance of the event. This may be caused by phase cancellation of multi-path signals or some property of the refracting medium. It is hoped to find some explanation of this phenomenon.

U.H.F. Beacon GB3GEC

The U.H.F. Beacon station, GB3GEC, radiating on 431·5 Mc/s, has been in operation now for over 12 months. The transmitter, located at the M-O Valve Works, Hammersmith, was set up under the supervision of H. L. Gibson (B.R.S.1224) and has proved to be extremely reliable; it has been fully described elsewhere [7]. The aerial, a J-Beam comprising four 8-over-8 Yagis, is beamed on The Hague where the signals are received at the Dutch Government experimental station, PE1PL. The latter station, under the direction of Dr. Gratama, has sent back data regularly showing the variation of signal strength with time. These data have been processed into the standard form required by the U.K. C.C.I.R. Study Group V Committee (Chairman Dr. J. A. Saxton, well-known to R.S.G.B. members who attend the V.H.F. Conventions). These data have been included with data obtained from a number of other bodies including the B.B.C., G.P.O. and Cable and Wireless Ltd.,

* *Executive Vice-President and Chairman, Scientific Studies Committee.*
† R.S.G.B. BULLETIN, March, 1963.

as part of the U.K. contribution to the work of the International C.C.I.R. Study Group V. An interesting fact so far found is that the average signal level at The Hague is lower than expected compared with other paths but one unique feature of this particular path is that both terminal stations are poorly sited, especially the transmitter at Hammersmith, and this may account for the findings. Data analysed so far covers until October, 1962. An exceptionally good opening occurred in December last and the data obtained at that time will be studied with great interest as signal reports received from PA0FB at that time indicates that signals were extremely strong.

Project Oscar

The U.K. Co-ordinator for Project Oscar, W. H. Allen (G2UJ), has collected a considerable amount of data from U.K. amateurs and sent it to the Project Oscar co-ordinators in the U.S.A. British amateurs are recorded as being amongst the first and last, if not the first and last, to receive signals from *Oscar II*, and due credit to this fact has been given in reports issued by the Project Oscar co-ordinators. A mock-up *Oscar* satellite was shown at the R.S.G.B. International Radio Communications Exhibition in October, 1962.

Ray Flavell (G3LTP) has studied the problem of predicting the orbit of the Oscar satellite and articles on this subject have appeared in the BULLETIN [8]. An independent investigation of considerable merit was carried out by W. Browning (G2AOX) whom the R.S.G.B. Council awarded the Wortley Talbot Trophy in recognition of his work. Another keen worker in this field is B. J. P. Howlett (G3JAM) and it is hoped that these members will be encouraged to work together in the event of possible future *Oscar* launchings about which no information is available at present.‡

Project Echo A-12

Dr. W. E. D. Parker (G6BY) is the official U.K. Representative for Research Group B of the Office for Satellite Scatter Co-ordination of the Massachussets Institute of Technology, Cambridge, Mass., U.S.A. This international programme is directed by Rafael Soifer (K2QBW) and is to study the apparent enhancements in reflecting area of an orbiting satellite balloon, caused by ionization of the rare atmosphere in the satellite's trail. This satellite when launched will be known as *Echo II*.

These effects were first noted on signals recorded from WWV on 20 Mc/s and K2QBW was the first amateur to achieve communication by using the ionized trail. It is not known how high in frequency the effects are apparent. They certainly occur in the region 20-30 Mc/s and if they occur at v.h.f. could, by meteor scatter techniques, be used for long range communication in the 144 Mc/s band. Dr. Parker is co-ordinating the U.K. efforts concerning the h.f. study (Research Group B) and is the U.K. correspondent maintaining contact with M.I.T. The V.H.F. Study (Research Group A) will be co-ordinated by W. H. Allen (G2UJ).

Certain U.K. amateurs have been granted, upon recommendation from the R.S.G.B. to the G.P.O., permission to use powers up to 1 kilowatt on specified frequencies in the 144 Mc/s band for the purpose of studying forward scatter propagation. These amateurs have been invited to participate in the Research Group A programme working together in pairs or with other receiving stations to see whether long range communication can be achieved using *Echo II*.

The problem of orbit prediction has again been studied by Ray Flavell (G3LTP) and an article on the subject was published in the January, 1963 issue of R.S.G.B. BULLETIN. Arrangements have been made with the Director, Radio Research Station, to obtain orbit predictions for broadcast over the R.S.G.B. News Bulletin each week. The *actual* launch of *Echo II* has been delayed by technical difficulties and is not now expected until mid-1963.

‡ *Oscar III* is scheduled for launching during mid-1963.

Year of the International Quiet Sun (I.Q.S.Y.)

The Council has approved R.S.G.B. participation in the programme of the I.Q.S.Y. which lasts from April, 1964 to December, 1965, i.e. at sunspot minimum.

An initial programme is being drawn up at present which will cover auroral reflection propagation in the 28 and 144 Mc/s bands, meteor scatter and other forms of ionospheric propagation and also v.h.f. tropospheric propagation in these bands. It is known that auroral propagation will occur only rarely during the I.Q.S.Y. and hence 28 Mc/s has been chosen for the main effort. In any case auroral events are more common on h.f. than v.h.f. although usually masked by more common forms of ionospheric propagation. At sunspot minimum the m.u.f. will be so low that 28 Mc/s will become an ideal band for this work.

The Deutscher Amateur Radio Club (D.A.R.C.) already has an ionospheric study programme on 28 Mc/s under the direction of Edgar Brockmann (DJ1SB). They are operating a beacon station DL0AR on 29 Mc/s, and it is hoped to co-operate with this group during the I.Q.S.Y. The U.K. effort in this field will be co-ordinated by Roy Stevens (G2BVN).

Other studies will cover v.h.f. propagation and further investigation into the theories developed by Ray Flavell to extend our knowledge of the mechanism of long range v.h.f. propagation. Satellite work will continue as satellites suited to amateur purposes are launched.

Conclusion

The work of the Committee is now well established. Considerable progress has been made during the year both towards the publication of articles in the BULLETIN and in support of the U.K. activities in the field of v.h.f./u.h.f. propagation research. This level of activity will be continued during 1963 and, in particular, the R.S.G.B. programme for the I.Q.S.Y. will be finalized.

Members of the Committee

The members of the Scientific Studies Committee are Messrs. W. H. Allen (G2UJ), R. C. Hills (G3HRH), J. W. Mathews (G6LL), C. E. Newton (G2FKZ), H. L. Gibson (B.R.S.1224), R. G. Flavell (G3LTP), Dr. W. E. D. Parker (G6BY) and G. M. C. Stone (G3FZL).

References

[1] *Proceedings of the Royal Society*, Series A, Vol. 248, No. 1252: "The British Astronomical Association's and Radio Society of Great Britain's earth satellite observations."
[2] B.A.A. Memoir, "Artificial Earth Satellites."
[3] R.S.G.B. BULLETIN, July, 1958.
[4] R.S.G.B. BULLETIN, March, 1960, "Amateur Radio Participation in the I.G.Y."
[5] R.S.G.B. BULLETIN, August, 1961, "CQ de GB3VHF."
[6] R.S.G.B. BULLETIN, November, 1961, August, 1962, "GB3GEC—A New U.H.F. Beacon Project."
[7] *Wireless World*, December, 1962, "Band IV Beacon Transmitter (GB3GEC)."
[8] R.S.G.B. BULLETIN, April, 1962, "Using Oscar Predictions."

Polish Amateur Radio Call Book

THE WARSAW SHORT WAVE Amateur Radio Club has recently published the first edition of a *Polish Amateur Radio Call Book*. The directory proper lists several hundred call-signs. The call-signs information is also presented in a separate index arranged on a prefix zone, town and area basis.

Copies can be obtained by sending eight I.R.C. to the Warsaw Short Wave Club, P.O. Box 298, Warsaw 1, Poland.

R.A.E.N. Notes and News

BY E. ARNOLD MATTHEWS (G3FZW)*

AT the first meeting of the R.A.E.N. Committee for 1963, Mr. G. A. Allcock, G3ION, was elected Chairman and Mr. E. R. L. Bassett, B.R.S.16075, was re-elected Hon. Secretary.

After the Committee had paid tribute to the late C. H. L. Edwards, G8TL, Mr. Matthews presented the Raynet Cup to Mr. Allcock, who received it on behalf of the Hampshire County Group, the first winners.

The draft rules for the conduct of R.A.E.N. have been approved by the Committee and now await final approval by Council. They are a collation of existing rules, and modifications generally deal with qualifications and appointment of officers. New rules deal with group finances.

The draft of the procedure is being circulated in the Committee and when finally approved will have passed the scrutiny of several members who have professional experience in the production of radio procedures, but who are also very active amateurs. It has been proposed that Midlands members produce a tape lecture of this procedure for the Society's Library.

Exercises

In his last circular to C.C.s and A.C.s G8TL dealt briefly, and to the point, with the need for maintaining the happy mean of exercises. He suggested that in well organized counties one large exercise, arranged by the C.C., and two smaller schemes (organized by the A.C.s in spring and autumn), were sufficient to keep a satisfactory level of interest without overdoing matters. Scheduled weekly nets should be kept short and not run on the calling frequency. He also made the point that a mobile team should consist of four persons, two licensed operators, an adult listener and a youngster. This is not the waste of manpower it might seem. There will always be times when the operator must leave the set. Operators tire, and in actual emergency will probably tire more quickly than in exercises in any case. If traffic is heavy messages will flow faster than one person can handle them.

No Snow Emergency Operation

Whilst the lengthy period of snow certainly upset travelling, it does not appear to have upset communications generally. The writer has not received any reports of emergency action, although it is known that many members maintained watch more carefully than usual.

Group Activity

Interest in the West Country remains high, but communication between counties is a continuing difficulty, and C.C.s G2AYQ and G2HCD would like to hear from amateurs well placed for regular communication with Dorset, Devon and Cornwall.

Activity continues high in Surrey, where 2 and 4m appear to have largely superseded 160. It is rather surprising that more groups have not taken the opportunity to acquire surplus business radio equipment for conversion to amateur use.

Resignations and Relinquishments

The following have relinquished the office of County Controller: W. Higgins, G3PNR (Norfolk); J. R. Watson, G3AET (Cornwall); J. R. Brindley, G3DML (Staffordshire); A. F. Dennis, G3CNV (Birmingham).

The following Area Controllers have resigned: E. G. Augood, G3MML, G. F. Hayward, G3MDF, C. K. Richardson, G3NAE and B. S. Freeman, G3ITF. F. Wingfield, G2AO, has resigned as Route Manager, Western Trunk Route.

Appointments

The following have been appointed County Controllers: D. F. Willies, G3HRK, 3 Broadwater Way, Horning, Norwich, Norfolk 39Z; J. L. Bowden, G2AYQ, Albany House, Goontown, St. Agnes, Cornwall. A. Mears, G8SM, is now Deputy C.C., Surrey.

The following have been appointed Area Controllers: R. Morgan, G3FVP, Church Farm, Bredfield, Woodbridge, Suffolk (Ipswich); E. C. W. Beale, G4HZ, 3 Orchard Road, Altringham, Cheshire (East Cheshire); J. W. Hill, G3JIP, 68 Kings Road, Walton-on-Thames (North West Surrey).

* * *

Correspondence and routine enquiries concerning R.A.E.N. matters should be sent to the Hon. Secretary to the Committee, E. R. L. Bassett, B.R.S.16075, Flat 2, Pound Court, Pound Street, Bitterne, Southampton. Reports for this feature should be sent to G3FZW. Enrolment forms for new members may be sent either to B.R.S.16075 or to the Hon. Registrations Secretary, F. C. P. Flanner, G3AVE, 91 Blackrock Road, Birmingham 23.

** 1 Shortbutts Lane, Lichfield, Staffs.*

Osram " Music Magnet " Receiver

MR. D. S. COOKE (B.R.S.23272) of 22 Barnhill Lane, Yeading, Hayes, Middlesex, has an Osram " Music Magnet " receiver which he is willing to donate to any member who collects antique radio equipment. Mr. Cooke does not wish the receiver to be broken up for its parts.

The " Music Magnet " is believed to have been supplied in kit form for home construction around 1930.

CONTEST NEWS

RESULTS — REPORTS — RULES

D/F Qualifying Events

DETAILS OF THE RUGBY qualifying event are as follows:

RUGBY

Sunday, May 12, 1963.
Organizer: G. Taylor (G3MDC), 80 Grosvenor Road, Rugby.
Frequencies and Call-signs: To be announced at the start.
Map: Ordnance Survey, New Popular Edition, Sheet No. 132.
Assembly Point: Sowe Common, 3½ miles north east Coventry (N.G.R.374832).
Assembly Time: 13.00 B.S.T.
Entries and Tea: Intending competitors should notify the organizer by May 6, stating the number in their party requiring tea, which will be at the A.E.I. Rugby Recreation Club, Hillmorton Road, Rugby (N.G.R.517744) (High Tea, 5s. per head).

NATIONAL FIELD DAY 1963
FINAL DATE FOR ENTRY—MAY 1

Members responsible for stations participating in this year's N.F.D., to be held on June 8-9, are reminded that details of call-signs and frequencies to be used, together with the name of the group, club or affiliated society concerned, must reach the Contests Committee at R.S.G.B. Headquarters not later than Wednesday, May 1, 1963. The information should be set out as shown in Rule 6 on page 308 of the December 1962 issue of the R.S.G.B. BULLETIN.

Casual Use of R.A.F. Airfields and Sites in the United Kingdom for Amateur Radio Purposes

By Wg. Cdr. H. E. BENNETT, M.B.E., M.Brit.I.R.E., R.A.F. (G8PF)*

THE regulations controlling the use of R.A.F. airfields and sites for non-R.A.F. purposes were revised during 1962 and published as Air Ministry Order A.164/62. When first published, provision was made for such things as private flying, model aeroplane flying, motor car/cycle and go-kart racing, sheep dog trials, archery practice, driving training and tests, gymkanas, etc., but no provision was made for Amateur Radio experimenters. The R.A.F. Amateur Radio Society therefore took action on behalf of its members and those of the R.S.G.B. to request that Amateur Radio activities be included in the regulations. This has now been done by an amendment published as A.M.O. A.263/62. As Air Ministry Orders are not generally available outside H.M. Services the following outline is given, in so far as Amateur Radio usage is concerned. It is thought that with the increase in mobile activity and the use of u.h.f. and s.h.f., some amateurs may like to take advantage of the wide open spaces of inactive R.A.F. airfields.

Air Ministry Policy

It is A.M. policy to be reasonably accommodating with the casual use of inactive airfields and sites for non-political activities so long as it can be allowed without detriment to any Service or Air Ministry tenants and does not unreasonably affect local amenities. Application must be made at least six weeks in advance to permit completion of the various formalities, including informing the local authorities and the police. This also includes the time needed to obtain the agreement of the local representatives of the Ministry of Agriculture or the Agricultural Land Commission (A.L.C.) for inactive airfields which are managed by these authorities.

Procedure

An application is made to either the Commanding Officer or the Superintending Engineer of the Works Area in which the inactive airfield is located. The application is then either rejected, or, is accepted by the issue of a " licence " detailing the conditions under which the use of the airfield is permitted. One copy of the licence is signed by the applicant as acceptance of the conditions.

Conditions on which approval is given:

1. The Amateur Radio activity must:—
   (*a*) not involve any interference whatsoever with public highways that may have been reopened across the airfield and must not endanger the users of such highways;
   (*b*) be acceptable to any Air Ministry, Ministry of Agriculture or A.L.C. tenants there may be; and
   (*c*) be organized by a member of the Radio Society of Great Britain who holds the necessary G.P.O. licence for the experimental work to be undertaken.
2. The organizer must have undertaken to:—
   (*a*) return one completed copy of a licence;
   (*b*) insure the liabilities incurred under the terms of the licence;
   (*c*) ensure that the local authority and the police are informed;
   (*d*) pay whatsoever charge is assessed for the use of the airfield, etc.;
   (*e*) obtain the Commanding Officer's or the Superintending Engineer's agreement to detailed arrangements for the usage, and keep to the area he defines for it;
   (*f*) comply with any other conditions that may be imposed by the C.O. or Superintending Engineer to suit the peculiar circumstances of individual stations (these conditions are to be specified in the licence);
   (*g*) leave the airfield or site in a clean and tidy condition;
   (*h*) ensure that there is no contravention of the Lord's Day Observance Acts; and
   (*j*) meet any out-of-pocket expenses that may be incurred.

Action by the applicant:—

1. He must apply normally not less than six weeks in advance of the proposed date of the initial usage of the airfield or site.
2. He must state:—
   (*a*) the dates of usage;
   (*b*) the type of experimental work;
   (*c*) the estimated number of participants;
   (*d*) the dates and times between which the facilities will be required; and
   (*e*) the area of the airfield and details of other facilities required.
3. He must undertake to meet the conditions laid down in the licence, forwarding one copy of the licence and evidence of insurance to the C.O. or Superintending Engineer for scrutiny not later than ten days before the date of the event.
4. He must produce, if so requested, the appropriate licence issued by the G.P.O. for the Amateur Radio activity in question.

Action by the Commanding Officer or Superintending Engineer:—

1. He is to:—
   (*a*) acknowledge receipt of applications; and
   (*b*) send copies of acknowledgment to the local authority and to the police.
   NOTE: If an application is incorrectly submitted and contains insufficient detail the letter of acknowledgment is to explain what is required.
2. At an inactive station the Superintending Engineer is to consult and obtain the agreement of:—
   (*a*) the Air Ministry tenants;
   (*b*) the local Ministry of Agriculture representative as appropriate, in respect of their tenants; and
   (*c*) the C.O. of the parent station.
3. He is to issue two copies of a licence or a refusal and send copies to interested authorities.
4. He is to examine the completed copy of the licence and evidence of insurance.

Financial and Insurance Arrangements

1. The charges for use of part of an airfield:—
   (*a*) by an individual user for occasional experiments—£1 per occasion;
   (*b*) by individual users for a series of experiments—£1 per notified period not exceeding one year;
   (*c*) by members of a club affiliated to the Radio Society of Great Britain—£1 per annum.
   The above charges will not be levied on individual R.A.F./Air Ministry personnel, or R.A.F./Air Ministry clubs, who are members of, or that are affiliated to the R.A.F. Amateur Radio Society.
2. The use of airfields or sites is to be covered by a contract of indemnity (which is included in the " licence ") and backed by insurance for a sum not less than £10,000.
3. It is important to realize that insurance for the minimum amount stated (£10,000) does not cover the full extent of the liability which is, in theory, limitless. Furthermore, although charges will not be levied on, or insurance cover required from amateurs connected with the R.A.F.

(*Continued on page 562*)

* *Vice-President R.A.F. Amateur Radio Society, Air Ministry, London.*

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.

Zener Diode Transmitter

DEAR SIR,—It is to be hoped that very few readers of the BULLETIN went to the expense and trouble of making up and experimenting with the Zener diode p.a. described by Mr. Plant in his *Mobile Column* (March 1963).

The original *CQ Magazine* article by a so-called Dr. Gitchagoome of the Ball (not Bell) Laboratories, Los Angeles, was an obvious and amusing April Fool joke to be compared with the well known Larsen E. Rapp comedies which appear from time to time in *QST*.

At first sight the Zener diode circuit may appear legitimate, but how for instance does one pass a current of 4 amps through the 50 K ohms resistor? A d.c. supply of 200 kV would be required! In the original article the resistor in question was marked as being 0·05 ohm; a difficult and ridiculous component to acquire. Also it must be realized that both the input and output circuits are in series and in phase. If such a device could be induced to work we would have had neon tube audio amplifiers years ago! Semi-conductor diodes can of course be used as high efficiency frequency multipliers but will only amplify in the well known parametric amplifier circuits.

I may be doing Mr. Plant an injustice. Perhaps the article was intended to be a "leg-pull," in which case it ought to have been held over to the April issue of the BULLETIN.

Writing as a technical author myself may I appeal to BULLETIN contributors never to offer for publication any circuit which has not been proved and tested personally unless it is known to come from an authoritative and unquestionable source.

Yours faithfully,
JOHN D. HEYS (G3BDQ)

St. Leonards-on-Sea, Sussex.

(The reference in *Mobile Column* was no intentional leg-pull—the details were given in good faith. In the circumstances we can only ask for offers of a bell for installation in the editorial department at Headquarters. Perhaps some member has an old ship's bell that emits a "clang" of suitable magnitude on occasions such as this.—EDITOR).

3000-type Relay Adjustments

DEAR SIR,—I should like to comment on the article on this subject in the January issue. The rule given by Mr. Essery that all "make" contacts should make before "break" contacts break is wrong. With contact units that are "make," "break" or "change-over" the opposite applies; "breaks" should break before any "makes" make, otherwise there will be bunching of contacts during their travel which will upset circuit operation. Exceptions are the special make-before-break units such as contact B2 in Fig. 6 of the article, and special units known as "X" and "Y" contacts found on relays used in two-step circuit operations.

Contact springs are certainly not made of silver steel—I have yet to see any that show signs of rust! The material used for contact springs is nickel silver. The remark in italics on filing of buffer blocks suggests to me that Mr. Essery has yet to try filing one. He will find that these blocks are made of a very hard ceramic material which will quickly glaze the teeth of a file. A point he missed about block clearance is that the clearance is to ensure proper spring tension, and to impart the required wiping action to contact domes to help keep them clean and so reduce contact failures. Contact springs held away from the block steps by travelling springs should have a clearance of about five-thou (with two-thou minimum) between contact tongue and block step.

As spring tensions are usually measured with special tension gauges which an amateur is not likely to possess, one wonders how a tension of 18 grammes would be determined. It is also hardly likely that an amateur would have the special tools necessary to bow and set a spring properly, to bend contact tongues and to "twin" the contacts, or to bend armatures correctly to secure the 31-thou travel. Ordinary pliers and unorthodox bending tools with which the amateur is more likely to attack a relay will "adjust" a relay to the damaged condition with the greatest of ease!

The article may enlighten some readers on the standard adjustments used on 3000-type relays, but it evades the important requirement of how he can achieve them without having access to the proper tools, or experience.

Yours sincerely,
W. E. THOMPSON (G3MQT)

St. Leonards-on-Sea, Sussex.

DEAR SIR,—Mr. Thompson makes a point: as he says "breaks" break before "makes" make, except for "make-before-break" contacts. "X" and "Y" contacts are early or late contacts but are rarely seen on surplus relays. I cannot but comment that in this respect Mr. Thompson is correct and my checking was at fault.

The same comment applies to the "silver steel" error—here again my checking was at fault. However, in the same paragraph he is wrong—I have filed buffer blocks, but they can be cut down. Hence my comment is still valid. I may point out that the G.P.O. Engineering Instruction makes a specific reference to filing of buffer-blocks.

I have straightened relay springs with several unorthodox tools in my time, and since I left the G.P.O. I have never had a G.P.O. tension gauge. As for an armature bender, the only time I have ever had the proper tool was when I demonstrated it as part of the training at the G.P.O. Training School. Even there we used to show the brute force method to students—however, things have probably changed in the last ten years!

While disagreeing with Mr. Thompson as indicated above, I fully agree that any unorthodox tools (or even the orthodox ones!) can wreck a relay in no time at all.

As to Mr. Thompson's final comment, there is no substitute for experience, other than extreme care; all I can possibly do is indicate a line of attack, and try to provoke a few thoughts on how to use relays.

Yours faithfully,
E. P. ESSERY (G3KFE)

Stevenage, Herts.

Help Wanted

DEAR SIR,—A good deal of my spare time is given up to helping the National Association of Boy's Clubs. Having been a licensed amateur for some 16 years, it is natural that I suggested to the Association that they should make an attempt to encourage Amateur Radio in some of the many hundreds of Boy's Clubs throughout the country. They have, in fact, made a few tentative enquiries, and it appears that there is considerable interest in the subject, but a great lack of knowledge and guidance.

I wonder if you would spare a little space in the BULLETIN to appeal to members throughout the country, to try and find a few who would be prepared to offer a little of their time to help in their local Boy's Club.

I would be greatly obliged if you could see some opportunity of helping in this matter, which, I am sure you will agree, is a very worth-while project.

Yours sincerely,
BASIL TAIT (G3DDN)

40 Westmoreland Road, London, S.W.13.

MIDLANDS OFFICIAL REGIONAL MEETING

TRENTHAM GARDENS, NEAR STOKE-ON-TRENT, STAFFS.

Sunday, April 21, 1963

The Council will be represented by the President, Mr. Norman Caws, G3BVG, the Zone B Representative, Mr. F. K. Parker, G3FUR, Council Member Mr. R. C. Hills, G3HRH, and the General Secretary, Mr. John Clarricoats, O.B.E., G6CL.

Council Proceedings

Résumé of the Minutes of the Proceedings at a Meeting of the Council of the Radio Society of Great Britain, held at New Ruskin House, Little Russell Street, London, W.C.1, on Thursday, January 24, 1963, at 6 p.m.

Present: The President (Mr. Norman Caws in the Chair), Messrs. D. A. Findlay, R. C. Hills, E. G. Ingram, J. D. Kay, L. E. Newnham, F. K. Parker, R. F. Stevens, G. M. C. Stone, J. W. Swinnerton, E. W. Yeomanson (Members of the Council), John Clarricoats (General Secretary) and John A. Rouse (Editor).

Apologies
Apologies for absence were submitted on behalf of Major General E. S. Cole, H. A. Bartlett, C. H. L. Edwards, A. O. Milne and A. D. Patterson.

Absent
Mr. A. C. Williams (illness).

Death of Philip Wade
The President referred to the death of Philip Wade, G2BPJ, on December 24, 1962, and to the services he had rendered to the Society in the office of Zonal Representative. The Council stood in silent tribute to his memory.

Honorary Treasurer
It was reported that Mr. D. A. Findlay had accepted the Council's invitation to serve in the office of Honorary Treasurer.

Membership
Resolved (i) to elect 83 Corporate Members and 45 Associates; (ii) to grant Life Membership to Mr. W. James, G6XM (member since 1942); (iii) to grant Corporate Membership to 13 Associates who had applied for transfer.

Applications for Affiliation
Resolved to grant affiliation to The Students' Union Amateur Radio Society, Royal College of Advanced Technology, Salford; Midland Radio Contest Club and Demerara (British Guiana) Amateur Radio Club.

Annual General Meeting
Following considerable discussion it was *Resolved* to hold the next Annual General Meeting on Friday, December 20, 1963, at the Royal Society of Arts commencing at 6.30 p.m.

Committees of the Council
The Committees of the Council were constituted as set out in the list published on page 492 of the March, 1963, issue of the R.S.G.B. BULLETIN.

QSL Manager
Resolved to appoint Mr. A. O. Milne QSL Manager for the year 1963.

V.H.F. Manager
Resolved to appoint Mr. R. C. Hills V.H.F. Manager for the year 1963.

Safety in Mobile Working
Consideration was given to a letter from Mr. Frank Fletcher, G2FUX, on the question of co-operation between the Society and the Amateur Radio Mobile Society in matters concerning safety in mobile working.
Resolved to invite Mr. Fletcher to meet the President and members of the Society's Mobile Committee.

Golden Jubilee Issue of R.S.G.B. Bulletin
Resolved to authorize the Editor to produce a special Golden Jubilee issue of the R.S.G.B. BULLETIN.

O.R.M.s
(a) *Resolved* to authorize the Region 11 Representative (Mr. R. Jones) to hold an O.R.M. and Mobile Rally in North Wales during the weekend, May 11/12, 1963;
(b) *Resolved* to authorize the President, the General Secretary, Mr. R. C. Hills and Mr. F. K. Parker to represent the Council at the Region 3 O.R.M.

Region 12 Representative
It was reported that for business reasons Mr. A. G. Anderson, GM3BCL, has resigned from the office of Region 12 Representative and as a News Bulletin Reader.
Resolved to accept Mr. Anderson's resignation with regret and to place on record the appreciation of the Council for his services to the Society.

Region 14 Affairs
Mr. Ingram reported upon meetings he had had with members in Ayrshire and with the Region 14 Representative (Mr. D. R. Macadie).
It was agreed to enquire from Mr. Macadie whether he would be able to organize an O.R.M. in his Region during the early part of 1963.

The Meeting was adjourned at 10.30 p.m.

The Council re-assembled at 6 p.m. on Monday, January 28, 1963, when the following were in attendance:

The President (Mr. Norman Caws in the Chair), Messrs. D. A. Findlay, C. H. L. Edwards, R. C. Hills, E. G. Ingram, J. D. Kay, A. O. Milne, L. E. Newnham, F. K. Parker, R. F. Stevens, G. M. C. Stone, E. W. Yeomanson, John Clarricoats, (General Secretary) and John A. Rouse (Editor).

Apologies for absence were received from Messrs. Bartlett, Cole, Patterson and Swinnerton.

I.A.R.U. Region 1 Conference—Malmo
Resolved to appoint the President (Mr. Norman Caws), Mr. R. C. Hills, Mr. L. E. Newnham and Mr. R. F. Stevens to represent the Society at the forthcoming I.A.R.U. Region 1 Conference to be held in Malmo, Sweden.

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

Committee	*1962*
Headquarters Building	November 8
R.A.E.N.	December 1
V.H.F.	December 3
Scientific Studies	December 10
TVI/BCI	December 12
Contests	December 20
	1963
Contests	January 3,
Technical	January 7

Resolved to receive the Reports and to accept certain of the recommendations contained therein.
The Recommendations dealt with the award of the Raynet Trophy to the Hampshire R.A.E.N. Group; the publication of lists of " Four Metres and Down " certificate holders; the award of honoraria to members who had helped to maintain the Society's beacon station, GB3VHF, during 1962; the presentation of a *Handbook* to the Cornwall Technical College in recognition of their services in running and providing the Society's beacon station, GB3CTC; the award of the 1950 Committee Cup to Mr. E. L. Mollart, B.R.S.10977, winner of the 1962 D/F National Final; the award of a miniature cup to Mr. P. K. Blair, G3LTF, winner of the Second 1962 420 Mc/s Contest; and the award of a certificate of merit to the runner-up Mr. J. M. Appleyard, G3JMA.

Contests
It was agreed to ask the A.R.R.L. for a programme of the Contests they organize, giving notice as far in advance as possible to enable the Contests Committee to avoid contest clashes.

V.H.F. and Scientific Studies Committees
It was agreed to publish the Annual Reports of both Committees.

Headquarters

It was reported that the Society, on the advice of the *ad hoc* Headquarters Building Committee, had made a bid subject to survey and contract, for premises in the Holborn area but the offer had not proved acceptable.

International Emergency Service

It was agreed to invite Dr. A. C. Gee, G2UK, to contribute a short paper on International Emergency Services for discussion at the Malmo I.A.R.U. Region I Conference.

Handouts

It was agreed to publish from time to time a list of handouts available from Headquarters.

Contest Calendar

It was agreed to send a copy of the Society's Contest Calendar to *Short Wave Magazine*, *Radio Constructor*, *Wireless World* and *Practical Wireless* with a request that the information be published.

The meeting terminated at 9 p.m.

Deputy Regional Representatives

THE FOLLOWING HAVE BEEN appointed as Deputy Regional Representatives:

REGION 4

T. DARN (G3FGY), 44 Laurel Avenue, Ripley, Derbyshire.

REGION 8

R. G. B. VAUGHAN (G3FRV), 9 Hawkins Road, Tilgate, Crawley, Sussex.

Area Representatives

THE FOLLOWING ARE ADDITIONS to the list published in the December 1961 issue:

REGION 7—LONDON SOUTH-EAST

KENT—BEXLEYHEATH AREA

C. J. LEAL (G3ISX), 1 Deepdene Road, Welling.

REGION 9—DEVON

EXETER

J. D. FORWARD (G3HTA), 12 Clevedon Close, Pennsylvania, Exeter.

REGION 14

AYRSHIRE GROUP

JOHN F. MCCREIGHT (GM3DJS), 40 Auchenharvie Road, Saltcoats, Ayrshire.

GLASGOW GROUP

CAMERON LINDSAY (GM3KTZ), 17 Dukes Road, Cambuslang, via Glasgow.

REGION 17—BERKSHIRE

READING

LT. COL. N. I. BOWER, O.B.E. (G5HZ), Little Priory, Peppard, Henley-on-Thames, Oxon.

Affiliated Society Representatives

THE FOLLOWING ARE ADDITIONS to the list published in the December 1962 issue:

ARIEL RADIO CLUB (LANGHAM) (G3AYC)

A. H. B. Bower, Designs Department, B.B.C., London, W.1.

CIVIL SERVICE RADIO SOCIETY

D. E. Tomkinson (G3IIE), 24 Mead Way, Coulsdon, Surrey.

CLIFTON AMATEUR RADIO SOCIETY

A. J. Gould (G3JKY), 60 Merlin Grove, Beckenham, Kent.

DORKING AND DISTRICT RADIO SOCIETY

W. J. Walsh (G3HZJ), 4 Meadowbrook Road, Dorking, Surrey.

LIVERPOOL AND DISTRICT AMATEUR RADIO SOCIETY

R. Halhead (G3KOR), 102 Waldgrave Road, Liverpool 15.

NEWARK AND DISTRICT AMATEUR RADIO SOCIETY

C. Crisp (G3ELJ), 6 Welfern Lane, Claypole, Newark, Notts.

NORTH KENT RADIO SOCIETY

B. J. Reynolds (G3ONR), 49 Station Road, Crayford, Kent.

PADDINGTON AND DISTRICT AMATEUR RADIO SOCIETY

B. R. Timms (G3MLE), 7 Nottingham Street, London, W.1.

PURLEY AND DISTRICT RADIO CLUB

P. G. Munt (G3KTA), 130 Chipstead Way, Woodmansterne, Banstead, Surrey.

RADIO SOCIETY OF HARROW

A. L. Mynett (G3HBW), 52 The Rutts, Bushey Heath, Watford, Herts.

SOUTH DORSET RADIO SOCIETY

C. E. Biggs (G2TZ), 54 Prince of Wales Road, Dorchester, Dorset.

SURREY RADIO CONTACT CLUB (CROYDON)

S. A. Morley (G3FWR), 22 Old Farleigh Road, Selsdon, South Croydon, Surrey.

TORBAY AMATEUR RADIO SOCIETY

B. E. Symons (G3LKJ), 23 Westhill Avenue, Plainmoor, Torquay, Devon.

WOLVERTON DISTRICT RADIO CLUB

D. A. Shepherd (G3LCS), 35 The Crescent, Haversham, Wolverton, Bucks.

Casual Use of R.A.F. Airfields and Sites in the U.K.

(Continued from page 559)

(generally as members of the R.A.F. A.R.S.), the contract of indemnity is still necessary.

Conclusion

It is regretted that neither the R.S.G.B. nor the R.A.F. A.R.S. can undertake negotiations for the use of inactive R.A.F. airfields or sites and applications must be submitted direct to the nominated authority. This will generally be the Superintending Engineer, Air Ministry Works Directorate, of the nearest Works Area, the addresses of which are as follows:

No. 1 Works Area, St. Vincents, Grantham, Lincs.
No. 2 Works Area, Angusfield House, Queens Road, Aberdeen.
No. 3 Works Area, Shelley, Acomb Road, York.
No. 4 Works Area, Underclyffe House, London Road, Appleton, Warrington, Lancs.
No. 5 Works Area, Abingdon, Berks.
No. 6 Works Area, "Rose Duryard," Argyle Road, Cowley Bridge, Exeter, Devon.
No. 7 Works Area, Falmouth Avenue, Newmarket, Suffolk.
No. 8 Works Area, Block "D," Government Bldgs., Brooklands Avenue, Cambridge.
No. 9 Works Area, Garrick House, Lypiatt Road, Cheltenham, Gloucestershire.
No. 10 Works Area, R.A.F. Ruislip, Middlesex.

It is understood that the annual premium for insurance cover of £10,000 should be about £8. A copy of an extract from the draft licence covering the indemnity conditions may be obtained on request from: The Secretary, R.A.F.A.R.S., R.A.F. Locking, Weston-super-Mare, Somerset. A s.a.e should be enclosed.

GB2RS SCHEDULE

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

Frequency	Time	Location of Station
3600 kc/s	9.30 a.m.	South East England
	10 a.m.	Severn Area
	10.15 a.m.	Belfast
	10.30 a.m.	North Midlands
	11 a.m.	North East England
	11.30 a.m.	South West Scotland
	12 noon	North East Scotland
145·30 Mc/s	10.30 a.m.	Beaming north west from Sutton Coldfield
	10.45 a.m.	Beaming south west from Sutton Coldfield
145·50 Mc/s	11.00 a.m.	Beaming north from Leeds
	11.15 a.m.	Beaming east from Leeds
145·8 Mc/s	11.30 a.m.	Beaming west from Belfast
	11.45 a.m.	Beaming north east from Belfast
145·10 Mc/s	12 noon	Beaming north from London area
	12.15 p.m.	Beaming west from London area

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.

Regional and Club News

Barnet Radio Club.—At the meeting on February 26 F. Barnes (G3AGP) discussed and demonstrated " Electronics in Medicine." R. W. Howe (G3PLB) acted as patient. On March 26, Ray Hills (G3HRH) made " A Survey of U.H.F. during the Past Decade." *Hon. Secretary*: F. E. A. Green (G3GMY), 48 Borough Way, Potters Bar, Middlesex.

Bristol.—There was an attendance of 41 at the Royal Fort on February 22, when a talk on " Mobile Radio Equipment " was given by D. V. Newport (G3CHW), and various items of gear were displayed and described. *Hon. Secretary*: E. C. Halliday (G3JMY), 4 Parkside Avenue, Winterbourne, Bristol.

Caithness Amateur Radio Club.—On February 12, A. Auld and G. Woffinden (GM3COV) lectured on transistor receivers, and exhibited examples that they had constructed. H. Cowie (ex-GM3HHL) also displayed a receiver of his own design. *Hon. Secretary/Treasurer:* W. N. Hardie (GM3NQB), 24 Brownhill Road, Thurso, Caithness.

Cambridge and District Amateur Radio Club.—G3PEI has provided a 4-over-4 beam array for 2m and the Technical Committee has been busy constructing suitable rotating gear for its use at the Club Headquarters. On March 1, members were invited to bring along their 70cm converters, and join in a discussion of the various types on show. *Hon. Secretary:* H. L. Lowe (G3PEI), 34a Verulam Way, Cambridge.

Coventry Amateur Radio Society (G2ASF).—Meetings are held regularly on Monday evenings at 8 p.m. at the Willenhall Scout Headquarters, Little Farm Buildings, Littlethorpe, St. James's Lane, Willenhall, Coventry. On April 8, there will be a lecture entitled " G5GR through the ages," a film show is scheduled for April 22. A discussion on 2m contests will tale place on April 29. There will be no meeting April 5. *Hon. Secretary:* A. J. Wilkes (G3PQQ), 141 Overslade Crescent, Coundon, Coventry.

Cray Valley Radio Society.—A good attendance was recorded at the February meeting, at which A. O. Milne (G2MI) gave a talk on the " Geneva Conference 1959." The society holds a net on Top Band every Friday evening. *Hon. Secretary:* S. J. Coursey (G3JJC), 49 Dulverton Road, London, S.E.9.

Crystal Palace and District Radio Club.—The A.G.M. took place during February, and the following officers were duly elected: *Chairman:* B. Arundel; *Hon. Treasurer:* F. Lawrence (G2LW); *Hon. Secretary:* G. M. C. Stone (G3FZL), 10 Liphook Crescent, London, S.E.23; *Committee Members:* M. Bass (G3OJE), M. Pavely (G3GWD) and E. Yeomanson (G3IIR). An inter-club quiz was scheduled for March 16 and April 5. On April 20, R. Shears (G8KW) will give a talk on " K. W. Products."

Derby and District Amateur Radio Society.—The Annual Dinner and Dance was held on February 16, at which 159 members and friends attended. The toast to the society was proposed by the Regional Representative, F. K. Parker (G3FUR). *Hon. Secretary:* F. C. Ward (G2CVV), 5 Uplands Avenue, Littleover, Derby.

Dorking and District Radio Society.—On February 26, the informal meeting comprised a visit to the QTH of G3PIQ, where several photographs were taken for local publicity. The club net takes place on 1910 kc/s at 9 p.m. on Fridays. The society meets on the second and fourth Tuesdays of each month, at the Wheatsheaf, Dorking, at 8 p.m. Visitors are welcome. *Hon. Secretary:* J. Greenwell (G3AEZ), Eastfield, Beare Green, Dorking, Surrey.

East London Group.—The explanation of the system of representation of the R.S.G.B., given by P. Thorogood (G4KD), Regional Representative for Region 7, was lucid and very well received at a recent meeting. *District Representative:* M. McBrayne (G3KGU), 25 Purlieu Way, Theydon Bois, Essex.

Flintshire Radio Society.—The new Philips 626 line u.h.f. TV conversion kit was demonstrated by L. W. Barnes (GW3PCZ/T) at the meeting on February 25. The remainder of the evening consisted of a " Night on the Air " under the call GW3JGA/A, using an experimental 160m 8 ft. whip aerial. Meetings continue to be held on the last Monday of each month at the Railway Hotel, Prestatyn. *Hon. Secretary:* A. Antley, " Fairholme," Fairfield Avenue, Rhyl, Flintshire.

Halifax and District Amateur Radio Society.—A queries night was held on March 5, and the annual dinner was due to be held on April 2. A talk on " Working Mobile " will be given by B. Crisp (G3LHQ) on May 7. Negotiations are proceeding in connection with the new clubrooms that have been offered to the society, but meanwhile meetings continue to be held at the Beehive and Crosskeys Inn, commencing at 7.30 p.m.

Harrow, Radio Society of (G3EFX).—Meetings are held on Friday evenings from 7.30 p.m. to 10 p.m. in the Science Laboratory, Roxeth Manor County School, Eastcote Lane, South Harrow. Talks, lectures, junk sales and film shows are held on alternate Fridays, whilst the remaining Fridays are devoted to practical work, including constructional work, operation of the society's station, and Morse practice classes. Visitors are always welcome. *Hon. Secretary:* A. C. W. Biddell (G3GNM), 114 Kingshill Avenue, Kenton, Harrow, Middlesex.

North Kent Radio Society (G3ENT).—Recent activities included a visit to a London theatre, and the club's annual dinner with P. Thorogood (G4KD), Region 7 Representative, as the guest of honour. Mr. Hackney of the Wireless Engineers Branch of the Metropolitan Police will give a lecture on April 11, whilst the subject of the April 25 meeting has yet to be arranged. Visitors are welcome to attend the meetings which commence at 8 p.m. at the Congregational Church Hall, Chapel Road (near Clock Tower), Bexleyheath, Kent. *Hon. Secretary:* B. J. Reynolds (G3ONR), 49 Station Road, Crayford, Kent.

Lincoln Short Wave Club.—At the A.G.M., the following officers were elected: *Chairman:* J. Charlesworth; *Hon. Treasurer:* J. Deller; *Hon. Secretary:* A. D. Taylor (G3OSB), 34 St. Peters Avenue, Lincoln.

Magnus (Newark) Grammar School Radio Society (G3PAW).—The fourth A.G.M. took place on February 19 and on February 26 a party visited the B.B.C. Television Centre at White City, whilst on March 5 there was a film show. Meetings are regularly held on Tuesdays at 3.50 p.m. at the Magnus Grammar School, Newark, Nottinghamshire.

Mansfield Radio Club.—Recently inaugurated under the Chairmanship of F. Bewley (G8HX), the club holds meetings every Friday at 7.30 p.m., at the Hope and Anchor, Union Street, Mansfield. The *Hon. Treasurer* is B. Pearson (G3DBZ). *Hon. Secretary:* M. Dawson, 35 Elkersley Road, Welbeck Colliery Village, Mansfield.

Medway Amateur Transmitting and Receiving Society.—The following were elected at the A.G.M. in February, *President:* W. E. Nutton (G6NU); *Chairman:* P. Kirby; *Vice-Chairman:* V. Davis (G3MSK); *Hon. Secretary:* P. J. Pickering (G3ORP), 101 Chatham Road, Maidstone; *Assistant Secretary and Publicity Manager:* G. R. Griggs (G3PRX); *Hon. Treasurer:* L. Mayne: *Assistant Treasurer:* C. E. Harris (G3ORH); *Committee Members:* B. White (G3LID), R. Nesbitt. Meetings are held at the " Bungalow," Riverside Gardens, Gun Wharf, Chatham.

Norfolk Amateur Radio Club.—The subject of the talk on February 4 was " Going Mobile," by R. Lang (G3KAY/M). Two films, " The Principles of X-Rays " and " Conquest of the Atom," were shown by T. Gomeshe on February 18. Details of future activities may be obtained from J. D. Simpson (G3NJQ), 50 Vicarage Road, Norwich, Norfolk.

Norfolk Amateur Radio Club (East Dereham Group.)—The inaugural meeting was successfully held on February 28, at which there was a recorded lecture, " Radio over the Years," by Capt. P. P. Eckersley. The next meeting, which will also be attended by members from the parent group in Norwich, is scheduled for April 30 at 7.30 p.m. Details are available from H. A. S. Gray (B.R.S.23279), " Eleven," Swanton Drive, East Dereham, Norfolk. It is regretted that the name of the group was given incorrectly in the March issue.

Northern Heights Amateur Radio Society.—Meetings continue to be held at the Sportsman Inn, Ogden, Halifax, at 7.30 p.m. on Wednesdays. The A.G.M. will be held on April 10, a discussion on the Amateur (Sound) Licence on April 17, an open meeting on April 24 while on May 8 members will visit the Manchester Radio Society. May 22 is booked for a ragchew. *Hon. Secretary:* A. Robinson (G3MDW), Candy Cabin, Ogden, Halifax.

Paddington and District Amateur Radio Society (G3PAD).—Among the visitors who attended the " Any Questions " night on March 6, were a member of the Budapest Radio Club (HA5KFR) and GW3LAD. Meetings are arranged for April 3

(" Stereo " by S. W. J. Legg, G3KNL), April 10 (Activity Night), April 17 (Lecture), and April 24 (Constructional Night). On May 1, John Clarricoats, O.B.E. (G6CL), General Secretary of the R.S.G.B., will give a talk entitled " Golden Jubilee Recollections." Visitors are welcome at meetings on Wednesdays at 7.30 p.m. *Hon. Secretary:* B. R. Timms, 7 Nottingham Street, London, W.1.

Peterborough Radio Society.—On March 1, B. Armstrong spoke on the design of 2m equipment, and demonstrated a v.h.f. converter using ceramic valves. Members have recently visited an electricity generating station. *Hon. Secretary:* D. Byrne (G3KPO), Jersey House, Eye, Peterborough.

Port Talbot.—On February 12, the club held their annual invitation social, an event which has become a notable one in the Regional calendar. Guests from most of the local areas were present, and had the weather not been so unfavourable, the number present of about 50 would have swollen into an all-time record. It was a matter for regret that the Chairman of the Club, Arthur Williams (GW5VX), was prevented by illness from attending. The death of a great friend of South Wales, the late C. H. L. Edwards, G8TL, was commented upon by the Regional Representative who also thanked the club for their hospitality on behalf of the visitors. Formality was, as usual, kept to a minimum, and an extremely enjoyable evening resulted, the comfortable surroundings contributing in no small measure. Excellent refreshments were provided, and the club officers, GW4CG, GW3BQY and the Deputy Chairman, together with other enthusiastic members, are to be congratulated on the excellence of their arrangements.

The Annual Dinner-Dance of the Derby and District Amateur Radio Society was held at the Derbyshire Yeoman, Kingsway, Derby, on February 16, 1963. In this picture, Fred Ward, G2CVV, R.S.G.B. Region 4 Representative and Hon. Secretary of the Derby society, is on the extreme left.
(Photo by M. Shardlow, A.1706)

Reading Amateur Radio Club.—A " Junk Sale " will be held on April 27, whilst the May 25 meeting is to be devoted to receivers and gear for short wave listeners. The first of the " Mobile Picnics " is scheduled for June 2, at the Childe Beale Trust Pavilion, Lower Basildon, near Pangbourne. *Hon. Secretary:* R. G. Nash (G3EJA), 9 Holybrook Road, Reading.

Reigate Amateur Transmitting Society (G3REI).—Visitors from Northwich, Bournemouth and Dorking were among those who attended the film show at the February meeting. Under the guidance of D. Thom (G3NKS) and D. M. Norman (G3RCY), the junior (under 18 years) members assembled a station for the recent A.R.R.L. Contest, and gained some useful contest operating experience. The next meeting will be held on April 20, at The Tower, Redhill. *Hon. Secretary:* F. D. Thom (G3NKT), 12 Willow Road, Redhill, Surrey.

Royal Naval Amateur Radio Society.—Membership is open to serving or past members of, or those who have been connected with, the Royal Navy, Royal Marines, Women's Royal Naval Service, Reserves or Commonwealth Navies. Further details may be obtained from G3BZU, or from the *Hon. Secretary:* R.N.A.R.S., H.M.S. *Mercury*, Leydene, Petersfield, Hampshire.

Royal Signals Amateur Radio Society.—J. E. P. Philp (G3NJM) has been posted abroad and his responsibilities have been temporarily assumed by Major L. Beaumont (G3RUS), 240 Signal Squadron, Imphal Barracks, York.

Shefford and District Amateur Radio Society.—Meetings during March were devoted to an Aerial Discussion, the Radio Amateur's Examination, Amateur Procedure, and a Quiz. Members are reminded that there will be no meeting on April 11. *Hon. Secretary:* G. R. Cobb (G3IXJ), 75 Ampthill Road, Shefford, Bedfordshire.

South London Mobile Club.—At the meeting at Clapham Manor Baths, Clapham, S.W.4, on April 13 at 8 p.m., there will be an " Any Problems? " session. A ragchew is arranged for April 27. Membership is now 47. *Hon. Secretary:* B. Negri, 17 Voltaire Road, Clapham, London, S.W.4.

Thames Valley Amateur Radio Transmitters' Society.—The February meeting, which was well attended, included a talk by E. H. Dedman (G2NH) on " S.S.B. Developments." A considerable amount of time was devoted to the subject of linear amplifiers and faulty transmissions. The society net on 160m is to be resumed on the third Wednesday of each month at 9.30 p.m. *Hon. Secretary:* K. Rogers (G3AIU), 21 Links Road, Epsom, Surrey.

Torbay Amateur Radio Society.—At the February meeting, judging of the annual entries for the various club cups and trophies took place. The winners were as follows: 28 Mc/s Cup —D. Webber (G3LHJ); Construction Cups—first: D. Tarr (G3OUA), followed by D. Symonds, consolation—P. Hunt; G3LFL Rose Bowl—R. Western; G3LHJ S.W.L. Cup—R. Western. Some interesting films on the Decca Navigator System were shown by A. Brooker-Carey (G3OGH). The Annual Dinner and Social was held on March 2 at the Abbey Lawn Hotel, Torquay, attended by 96 members and friends. The guest of honour was H. Jones (G5ZT) who deputised at short notice for Herb. Bartlett (G5QA), the Zonal Representative, who was unable to attend owing to illness. *Hon. Secretary:* Mrs. G. Western (G3NQD), 118 Salisbury Avenue, Barton, Torquay.

Welwyn Garden City Group.—The second part of the lecture, " Simple Things about Simple Aerials " will be given on April 11 at 8 p.m. by Ray Hills (G3HRH). Members from other groups are invited to attend the meeting at the Conference Room, Murphy Radio, Bessemer Road, Welwyn Garden City.

Wirral Amateur Radio Society (G3NWR).—On April 6, the club will be active at the Birkenhead Institute School Fair, on all bands from 160m to 2m. There will be a constructional contest on April 17, a junk sale on May 1, and a pre-N.F.D. meeting on June 5. *Hon. Secretary:* A. Seed (G3FOO), 31 Withert Avenue, Wirral, Cheshire.

Yeovil Amateur Radio Club.—Two R.S.G.B. Recorded Lectures entitled " The Use of Transistors " and " Music Concrète." were played at a recent meeting. Using the call-sign G3CMH, the club is on the air every Wednesday from 8 p.m. on phone or c.w. on Top Band. Future activity includes a visit to a " forward scatter " radio station. Constructional work is now being performed on the main club transmitter, and also on transistor equipment. *Hon. Secretary:* D. L. McLean (G3NOF), 9 Cedar Grove, Yeovil.

Forthcoming Events

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

REGION 1

Ainsdale (A.R.S.).—April 3, 17, May 1, 15, 37 Hawthorne Grove, Southport.
Blackburn.—Fridays, 8 p.m., West View Hotel, Revidge Road.
Blackpool (B. & F.A.R.S.).—Mondays, 8 p.m., Pontins Holiday Camp, Squires Gate.
Bury (B.R.S.).—April 9 (N.F.D. Discussion), May 14 (Tape Recorded Lecture), 8 p.m., Knowsley Hotel, Kay Gardens.
Chester.—Tuesdays, 8 p.m., Y.M.C.A.
Eccles (E. & D.R.C.).—Tuesdays, 8 p.m., The Congregational Mission Church, King Street.
Liverpool (L. & D.A.R.S.).—Thursdays, 8 p.m., Gladstone Mission Hall, Queens Drive, Stoneycroft.
Macclesfield.—April 16, 30, May 14, 42 Jordongate.
Manchester (M. & D.A.R.S.).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10.
Manchester (S.M.R.C.).—Fridays, 7.45 p.m., Rackhouse Community Centre, " Rackhouse," Daine Avenue, Northenden.
Morecambe.—April 3, May 1, 125 Regent Road, Morecambe.
Preston.—April 9, 23, May 14 (Meetings start with a Morse practice at 7.30 p.m.), St. Paul's School, Pole Street.
Southport (S.R.S.).—Wednesdays, 8.30 p.m., Sea Cadets Camp, The Esplanade.
Stockport.—April 10, 24, May 8, 22, 8 p.m., The Blossoms Hotel, Buxton Road.
Wirral.—April 3, 17, May 1, 15, 7.45 p.m., Harding House, Park Road West, Claughton.

REGION 2

Catterick (C.A.R.C.).—Tuesdays and Thursdays, 7.30 p.m., Club Rooms, Vimy Road, Catterick Camp.
Halifax (Northern Heights A.R.S.).—April 10 (A.G.M.), April 24 (Discussion on Amateur Sound Licence), Sportsman Inn, Ogden.
Heckmondwike (Spen Valley A.R.S.).—April 4 (" Aerial Problems " by A. R. Bailey, G3IBN), 7.15 p.m., Grammar School, Heckmondwike.

LOOKING AHEAD

April 18-21.—Audio Festival, London.
April 21.—Midlands Mobile Rally and Region 3 O.R.M. at Trentham Gardens.
April 28.—U.B.A. Mobile Rally, Verviers, Liège, Belgium.
May 3.—R.A.O.T.A. Reunion, Horse Shoe Hotel, London, W.1.
May 4.—Northern Ireland Golden Jubilee Year Celebrations.
May 12.—North Wales Official Regional Meeting, Colwyn Bay.
May 26.—Hunstanton " Bucket and Spade " Party and D/F Contest.
June 2.—R.S.G.B. Golden Jubilee Mobile Rally, Wethersfield, Essex.
June 10-15.—Region 1 I.A.R.U. Conference, Malmö, Sweden.
June 16.—A.R.M.S. Rally, U.S. Air Force Base, Barford, St. John, Oxon.
June 23.—Bridlington Mobile Rally.
July 5.—R.S.G.B. Golden Jubilee Dinner.
July 7.—South Shields Mobile Rally.
August 18.—Derby Mobile Rally.
September 8.—G6UT's Ham Party.
September 15.—Lincoln Mobile Rally.
September 22.—Woburn Abbey National Mobile Rally.
September 22.—Surrey Radio Contact Club 144 Mc/s D/F Hunt.
September 29.—South West Mobile Rally, Weston-super-Mare.
October 30-November 2.—R.S.G.B. Radio Communications Exhibition.

Scarborough (S.A.R.S.).—Thursdays, Chapman's Yard, North Street, 7.30 p.m.

REGION 3

Birmingham (M.A.R.S.).—April 16, 7.30 p.m., Birmingham and Midland Institute. **(Slade).**—April 12, 26, 7.45 p.m., The Church House, High Street, Erdington.
Cannock (C.C.A.R.S.).—April 4, 7.30 p.m., " Tavern," Bridgtown.
Coventry (C.A.R.S.).—Mondays, 8 p.m., Willenhall Scout H.Q., Little Farm Buildings, Littlethorpe, St. James's Lane, Willenhall, Coventry.
Lichfield (L.A.R.S.).—April 16, May 6, 7.30 p.m., Swann Inn, Lichfield.
Stourbridge (A.R.S.).—May 7, 7.45 p.m., Foley College, Stourbridge.
Sutton Coldfield.—April 11 (" D/F Receivers "), April 25, 7.30 p.m., 92 The Parade, Sutton Coldfield.
Wolverhampton (W.A.R.S.).—April 8, April 22, 8 p.m., Neachells Cottage, Stockwell End, Tettenhall.

REGION 4

Burton-on-Trent (A.R.S.).—First Wednesday in each month (R.A.E. Lecture), April 10 (" Receiver Design " by W. Hazeldon), 7.30 p.m., Club Rooms, Stapenhill Institute, Burton-on-Trent.
Chesterfield (C. & D.A.R.S.).—April 10, May 8, 7.30 p.m., Newbold Observatory, Newbold Road, Chesterfield
Derby (D. & D.A.R.S.).—April 10, April 17 (D/F Practice Run), April 24 (Informal Meeting), May 1 (Sale of Surplus), May 8 (" Safety in the Shack "), 7.30 p.m., Room No. 4, 119 Green Lane, Derby.
Derby (D.S.W.Exp. Soc.).—Fridays, 7.30 p.m. Sundays, 10.30 a.m., Club Rooms, Nunsfield House, Boulton Lane, Alvaston.
Grantham (G. & D.A.R.S.).—Mondays, 7.30 p.m., Club Rooms, rear of Manners Arms, London Road, Grantham.
Grimsby (G. & D.A.R.S.).—April 9, 23, May 7, 8 p.m., R.A.F.A. Headquarters, Abbey Drive West, Grimsby.
Leicester (L.R.S.).—Mondays, 7.30 p.m., April 8 (Tape Recorded Lecture), April 15 (Informal Evening), April 22 (Film Show), April 29 (Open Evening), May 6 (Tape Recorded Lecture), Club Rooms, Old Hall Farm, Braunstone Lane, Leicester.
Loughborough (A.R.S.).—Fridays, 7.30 p.m., Corporation Hotel, Wharncliffe Road, Loughborough.
Lincoln (L.S.W.C.).—First Wednesday in each month, 7.30 p.m., Lincoln Technical College, Cathedral Street, Lincoln.
Melton Mowbray (A.R.C.).—April 18 (" Transmitter Construction for N.F.D." by A. Brown, G3OWR), 7.30 p.m., St. John Ambulance Hall, Asfordby Hill, Melton Mowbray.
Mansfield (M.R.C.).—Fridays, 7.30 p.m., Hope and Anchor, Union Street, Mansfield.
Nottingham (A.R.C.N.).—Tuesdays (R.A.E. Lecture), Thursdays (Lecture), Room No. 3, Sherwood Community Centre, Woodthorpe House, Mansfield Road, Sherwood, Nottingham.
Northampton (N.S.W.C.).—Thursdays, 7 p.m., Allen's Pram Works, 8 Duke Street, Northampton.
Peterborough (P. & D.A.R.S.).—April 5 (Transmitters), May 3 (Receivers), 7.30 p.m., Room No. 14, Peterborough Technical College, Eastfield Road, Peterborough.
Retford & Worksop (N.N.A.R.C.).—Tuesdays (Beginners), Thursdays (Informal), 7.30 p.m., Club Rooms, Victoria Institute, Eastgate, Worksop, Notts.

REGION 5

Cambridge (C. & D.A.R.C.).—Fridays, 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge. April 5 (" H.F. Propagation " by J. Douglas Kay, G3AAE). April 19 (Sale of Surplus Equipment), May 3 (Talk by Fred Parker, G3FUR).
March (M.A.D.R.A.S.).—Tuesdays, 7.30 p.m., Police Headquarters, High Street.
Shefford (S. & D.A.R.S.).—Thursdays, 7.45 p.m., Digswell House, Hitchin Road, April 4 (N.F.D. Meeting), April 11 (No Meeting), April 18 (Two way Morse for N.F.D.), April 25 (Talk by I. B. Howard, G2DUS), May 2 ("Definitions," by G. R. Cobb, G3IXG.)

REGION 6

Cheltenham.—First Thursday in each month, 8 p.m., Great Western Hotel, Clarence Street.
Dursley.—April 5, 19. Venue from G3ILO.
High Wycombe (C.A.R.C.).—Last Thursday in each month, 8 p.m., British Legion, St. Mary Street, High Wycombe. April 25, demonstration of Collins KWM-2 s.s.b. equipment by Collins Radio Co. of England Ltd.
Stroud.—Wednesdays, 8 p.m., Arundel Mills, London Road, Stroud.

LONDON MEMBERS' LUNCHEON CLUB

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

at 12.30 p.m. on Fridays, April 19, May 17 and June 21, 1963

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

REGION 7

Acton, Brentford & Chiswick (A.B.C.R.C.).—April 16 (Transmitting and Receiving Techniques for New Members), 7.30 p.m., A.E.U. Club, 66 High Road, Chiswick.
Bexleyheath (N.K.R.S.).—April 11 (Lecture by Mr. Hackney, Wireless Engineering Branch, Metropolitan Police), April 25 (Open Meeting), Congregational Hall, Chapel Road, Bexleyheath.
Barnet (B.R.C.).—April 23, 8 p.m., Red Lion Hotel, Barnet.
Croydon (S.R.C.C.).—April 12, 7.30 p.m., Blacksmiths' Arms, South End, Croydon.
Dorking (D. & D.R.S.).—April 9, 22, 8 p.m., Wheatsheaf, Dorking.
East Ham.—Tuesday fortnightly, 8 p.m., Leigh Road, East Ham.
East London.—April 21 (" V.H.F. Aerials " by V. Hartopp of J-Beam Aerials Ltd.), 2.30 p.m., Lambourne Room, Ilford Town Hall.
East Molesey (T.V.A.R.T.S.).—April 3, 8 p.m., Carnarvon Castle Hotel, Hampton Court.
Edgware & Hendon (E. & D.R.S.).—April 8 (G4KD Lecture on R.S.G.B. Regional Organization), 8 p.m., John Keble Hall, Church Close, Deans Lane, Edgware.
Enfield.—April 23 (" Project Oscar " by W. H. Allen, M.B.E., G2UJ), George Spicer School, Southbury Road.
Gravesend (G.R.S.).—Thursdays, 7.30 p.m., R.A.F.A. Club, 17 Overcliffe, Gravesend.
Harlow.—Tuesdays, 7.30 p.m., rear of G3ERN (G. E. Read), High Street, Harlow.
Harrow (R.S.H.).—Fridays, 7.30 p.m., Roxeth Manor County School, Eastcote Lane, Harrow.
Holloway (G.R.S.).—Mondays and Wednesdays (R.A.E. and Morse), 7 p.m., Fridays (Club), 7.30 p.m., Montem School, Hornsey Road, N.7.
Hounslow (H.A.D.R.C.).—Mondays, 7.30 p.m., Isleworth Town Hall, Twickenham Road, Hounslow.
Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (near Seven Kings Station).
Kingston.—Alternate Thursdays (Lectures), 8 p.m., Y.M.C.A., Eden Street, Kingston. (Morse Classes weekly at 2 Sunray Avenue, Tolworth).
Mitcham (M. & D.R.S.).—First Friday in month, 7 p.m., " The Canons," Madeira Road, Mitcham.

New Cross (C.A.R.S.).—Fridays, 7.30 p.m., 225 New Cross Road, S.E.14. April 5 (" Quiz " by G3OGE).

Norwood & South London (C.P. & D.R.C.).—April 5 (" Quiz Round 2 " with Clifton Club), April 20 (" K.W. Products for the Amateur " by R. G. Shears G8KW). C.D. Training Centre, Bromley Road, Catford.

Paddington (P. & D.A.R.S.).—Wednesdays, 7.30 p.m., Beauchamp Lodge, 2 Warwick Crescent, W.2.

Purley (P. & D.R.C.).—April 5, 19, 8 p.m., Railwaymen's Hall (Side Entrance), Whytecliffe Road, Purley.

Reigate (R.A.T.S.).—April 20 (Clubnight), 7.30 p.m., The Tower, High Street, Reigate.

Romford (R. & D.R.S.).—Tuesdays, 8.15 p.m., R.A.F.A. House, 18 Carlton Road, Romford.

Science Museum (C.S.R.S.).—April 2 (A.G.M. and Exhibition of Handicrafts), April 16 (" R.S.G.B. Tape Lecture " by GB2SM).

Sidcup (C.V.R.S.).—April 4 (" Audio Evening " by W. E. Sutton, G3FWI), 8 p.m., Congregational Church Hall, Court Road, Eltham.

Southgate and District.—April 11, 8 p.m., Arnos School, Wilmer Way, N.14.

Slough (S.A.R.S.).—First Wednesday in each month, 8 p.m., United Services Club, Wellington Street, Slough.

Sutton and Cheam (S.C.R.S.).—April 16, 8 p.m., " The Harrow," High Street, Cheam.

Welwyn Garden City.—April 11 (" Simple Things about Simple Aerials," Part 2, by R. C. Hills, G3HRH), 8 p.m., Conference Room, Murphy Radio, Bessemer Road, Welwyn Garden City.

REGION 8

Canterbury (E.K.R.S.).—Tuesdays, 7.30 p.m., Technical College, Canterbury. April 9 (Film).

Folkestone.—First Tuesday in each month, 7.30 p.m., Sea Cadets' H.Q., Castle Road, Sandgate, Folkestone.

Tunbridge Wells (W.K.A.R.S.).—April 5 (A.G.M.), 7.30 p.m., K.C.C. Adult Centre, Culverden House, Culverden Park Road, St. John's.

REGION 9

Bath.—April 22, 7.30 p.m., Committee Room, Bath Technical College, Lower Borough Walls, Bath.

Bristol.—April 26 (" High Fidelity " by A. Rawlings, G3PFC), 7.30 p.m., Royal Fort, Bristol University, Woodland Road, Bristol 8.

Burnham-on-Sea.—Second Tuesday in each month, 8 p.m., Crown Hotel, Oxford Street.

Camborne (C.R. & T.C.).—First Thursday in each month, S.W.E.B. H.Q., Pool.

Exeter.—First Tuesday in each month, 7.30 p.m., Y.M.C.A., St. Davids Hill, Exeter.

Plymouth (P.R.C.).—First Tuesday in each month, 7.30 p.m., Guild of Social Service Building, Plymouth. Other Tuesdays, Virginia House Settlement, St. Andrews Cross, Plymouth.

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

Torquay (T.A.R.S.).—April 6 (A.G.M.) 7.30 p.m., Club H.Q., Belgrave Road, Torquay.

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

Yeovil (Y.A.R.C.).—Wednesdays, 7.30 p.m., Park Lodge, The Park, Yeovil.

REGION 10

Cardiff.—May 13 (Junk Sale and Final N.F.D. Arrangements), 7.30 p.m., TA Centre, Park Street, Cardiff.

REGION 11

Prestatyn (F.R.S.).—April 29, 7.30 p.m., (Slow Morse), 8 p.m., (" Simple Hints and Kinks " by L. W. Barnes, GW3PCZ/T), 8.30 p.m. (" Contests," by R. Jones, GW3JI). May 27, 7.30 p.m. (Slow Morse), 8 p.m. (Simple Hints and Kinks), 8.30 p.m. (" Using Relays," by W. Davies, GW3PKH/T), Clubroom, Railway Hotel, Prestatyn, Flintshire.

REGION 13

Edinburgh (L.R.S.).—April 11 (" Ancient Radio at Sea " by T. Spiers, GM3OWI), April 25 (" Monkey Glands for the HRO " and Demonstration of TVI Proofing by S. Lawrie, GM3PQU), May 9 (" Railway Communications " by R. McInnes, GM3LNE), 7.30 p.m., Y.M.C.A., 14 South St. Andrew Street, Edinburgh 2.

REGION 14

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

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

REGION 16

Basildon (B. & D.A.R.S.).—May 1 at Billericay. Fuller details from G3RQT, 472 Long Riding, Basildon.

Chelmsford (C.A.R.C.).—First Tuesday in each month at Marconi College, Arbour Lane, Chelmsford, at 7.30 p.m. May 7 talk by B. N. McLarty, O.B.E., on " Diesel and Electric Trains."

Southend (S. & D.A.R.S.).—Alternate Fridays at 7.30 p.m. in Canteen of E. K. Cole Ltd., Priory Road, Prittlewell, Southend. Details from G3NPF, 2 Edith Road, Prittlewell.

REGION 17

Newbury (N. & D.A.R.S.).—Last Friday in each month, 7.30 p.m., The Canteen, Elliots of Newbury Ltd., West Street, Newbury.

North Berks. (A.E.R.E.—Harwell A.R.C.).—April 16 (" TVI and the Radio Amateur " by Mr. Hobbs of G.P.O.), 7.30 p.m., Social Club, A.E.R.E. Harwell.

Southampton.—April 13 (Live demonstration of Amateur Television), 7 p.m., Engineering Lecture Theatre, Lanchester Building, University of Southampton, University Road, Southampton.

CLOSING DATE FOR JUNE ISSUE

MAY 9

A NEW 48-PAGE CATALOGUE has been issued by Alfred Imhof Ltd., Ashley Works, Cowley Mill Road, Uxbridge, Middlesex, and gives details of the types and sizes of **instrument cases** available. Many attractively styled cases, rack-type cabinets, small boxes and meter cases are described, including a range of special portable cases with internal panels, and a portable oscilloscope cabinet. A number of sectional, or modular chassis systems, and a wide range of accessories are also listed.

A. N. Clarke (Engineers) Ltd., Binstead, Ryde, Isle of Wight, have issued a 44 page illustrated catalogue, describing their air-operated **telescopic masts** and ancillary equipment. It is available on request from the above address.

The problems associated with the reliability of **" layer " type dry batteries** have been considerably reduced, according to a claim by Vidor Ltd., Erith, Kent. In a new range of replacement batteries, instead of the cells being strapped together and encased in cardboard, the assembly is contained in a metal case, the ends being turned over to increase the strength, thus eliminating distortion of the battery on discharge. The new types are catalogued as follows, the original numbers being bracketed: VT1 (T6001), VT3-5 (T6003-5), VT6 (T6006).

A catalogue describing the range and specifications of **precision resistors** is obtainable from Electrothermal Engineering Ltd., 270 Neville Road, London, E.7. *Presistors* are available with power ratings from 0·1 to 2 watts and tolerances from 0·01 per cent to 0·1 per cent. Although wire-wound, they are manufactured to a maximum value of 10 Megohms.

Controlled Electronics, 62 High Street, Croydon, Surrey, have announced a new combined **signal tracer and detector,** the 670. It is contained in a pen-sized case with two plug-in probes: one for a.f. and the other for modulated r.f. Complete with a miniature earpiece, it is priced at £6 19s. 6d.

Catalogue No. 15, price 2s. 6d, obtainable from A. T. Sallis Ltd., 93 North Road, Brighton, Sussex, gives details of a comprehensive range of Government **surplus equipment** available from stock. A wide range of relays, motors and associated mechanisms, receivers, transformers and new components are included, special attention being paid to equipment for radio control.

A new **metal rectifier** brochure, which describes the entire range of Brimar/SenTerSel silicon and selenium rectifiers, is available on request from Thorn-A.E.I. Radio Valves and Tubes Ltd., 155 Charing Cross Road, London, W.C.2. As it was produced primarily for the replacement market, full-size illustrations are included, together with electrical performance data.

LONDON S.S.B. DINNER

Waldorf Hotel, Aldwych, London

Saturday, May 11, 1963

Programme

3.30 p.m. Informal Get-together
Display of S.S.B. Equipment

6.45 p.m. Dinner, followed by Dancing and Cabaret

Tickets, inclusive of entertainment and late night refreshments, are available, price £2 10s. from N. A. S. Fitch, G3FPK, 79 Murchison Road, London, E.10.

Organized by J. A. Steele, G3KZI, and N. A. S. Fitch G3FPK.

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PERSONAL

5th BN. THE MIDDLESEX REGT.—Territorial Army—interesting wireless work with pay with the Territorial Army. One evening a week and nine days annual training.—Write R.S.O., T.A. Centre, Deansbrook Road, Edgware or phone EDG. 5236 any Tuesday evening.

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

WANTED

WANTED.—Good class Communication Receiver such as Collins 75A1/2/3/4, R390A/388/389, S line, AR88D mint, Racal RA17. Also transmitter such as Panda Cub, KW Viceroy, Collins 32V2/3. Cash transaction, will personally collect. —Clappison, 291 Beverley Road, Hull, Yorks.

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

TO BUY OR BORROW, copies of S.W. Magazine, especially March 1957. Tindal, 38 Russell Street, Reading.

WANTED—Portable QRP Phone/CW Transmitter-Receiver, for 80-40-20 meters suitable Dxpedition employing 12 volt accumulators. Box No. L.7086, c/o R.S.G.B. BULLETIN, 4 Ludgate Circus, London, E.C.4.

Stamp Collections, postal history material, old letters, etc., wanted. Stamps **FOR SALE** by "Approvals," all countries, periods, particularly G.B.—G3DGN, 88 Ram Gorse, Harlow. Tel. Harlow 26370.

EXCHANGE

EXCHANGE 888A in perfect condition for similar general coverage receiver, BRT400, SX 101A, 680 X etc.—G3EFD, Hillcrest, Leazes Lane, Hexham, Northumberland.

SERVICES OFFERED

GO ONE BETTER. Have your cabinets, panels, etc., stove-enamelled and lettered to your own or original specification.—For by-return quotations, contact: The Universal Productions (Enamellers) Ltd., 22 Aston Road North, Birmingham 6. Tel.: Aston Cross 2987.

FOR SALE—PRIVATE

LARGE NUMBER of Vibrator packs for sale, P.C.R.3 type. Brand new, in original cartons, in perfect condition. 12 volt input, output approximately 300 volts at 130 ma, 12/6 each plus carriage 7/6. Special plug and leads with croc clips 2/6 extra.—West (G3JPN), 188 Warwick Road, Birmingham 11.

R1155B in good condition with Power Pack and Output Stage giving 250 volts d.c. at 250 m/a and 4 × 6·3 volts at 3A and has provision for use with Rotary Converter, all with circuit diagrams. Partly constructed oscilloscope containing Power Pack giving 350 volts and 900 volts d.c. and 4 volts and 6·3 volts a.c., supplied with spare CRT. Focus, Brightness and X and Y shifts working. Copies of Practical Wireless from January 1958 to January 1963 complete. Copies of R.S.G.B. BULLETIN from June 1959 to February 1963 complete. 5-10 amplifier. Base Reflex Cabinet with speaker. RF24 and Power Pack with plugs, sockets, switches and all cables. 6-9 Mc/s Command Receiver with Power Pack. Needs a little attention. Highest offers secure. Write to: G. Ritchie, 7 Silverknowes Eastway, Edinburgh 4.

FOR SALE.—Eddystone 358X Rx, all coils 40 kc/s to 31 Mc/s, xtal filter, internal PSU and ANL, excellent condition, £14 o.n.o. G3PTB, 6 Winders Lane, Histon, Cambs.

FOR SALE—PRIVATE (continued)

FOR SALE.—Hallicrafters S20R, 550 kc/s-44 Mc/s, internal PSU, LS, electrical Bandspread, £15. Also HRO-M including PSU, coils three LF bands and Handbook. Offers? G3OIU, 2 Westbourne Grove, Chelmsford.

EDDYSTONE 840A Receiver in perfect order and new condition. £30 o.n.o. G6IF, 1 Squirrel Lane, High Wycombe, Bucks.

TYPE 3A Teleprinter spares,—type heads, motor brushes, gears, shafts, castings, etc. 239 Cambridge Road, Ellesmere Port, Cheshire.

TRANSFORMERS Pri 230V 300-0-300V 200mA, 5V 3A, 2 × 6·3 3A, 30s.; Pri 200-250V 2 × 2 2-0-2V 5A 10s.; Thordarson Pri 200-250V 2·5V CT 10A £1; Chokes 20H 250 mA 22s. 6d.; 20H 150mA 15s.; Dynamotors 12V-275V 75mA 17s. 6d. Valves TT15 new 17s. 6d.; 2 × 1616 7s. each; EF55 5s.; QVO47, 7s. 6d.; 2 × 866A 12s. 6d. each, 2 × QVO47 used 4s. each. Postage free, reduction if collected.—G3ADK, 264 Stockingstone Road, Luton 4036.

SSB OUTFIT. Minimitter Tx (807's) with SB10U, all in mint condition. Excellent SB suppression and speech quality. May be air tested. £65 o.n.o.—G3RDW. (Tel. Brownhills 3550).

G2HQ has for sale a very fine beam, full size on 20 metres. Steel lattice tower 40 ft., motorized, and with indicators. Offers. H.R.O. type RJB/I with power pack, 12 coils. Coil box cabinet spares and manual £25 o.n.o. Wilcox Gay V.F.O. £4 with manual. Crystal Calibrator 100 and 1000 Kc/s. P. & P. extra. Send S.A.E. to A. W. Fawcett, 4 Woofindin Avenue, Sheffield 11.

MOVING QTH. Rotary Transformer 12v/365v 10-0d; UM2 Modulation Transformer £2; SCR 522 Transformer 7/6d; Lots of other gear must clear. Send S.A.E. for list.—Richardson, 170 Orchard Way, Croydon.

OFFERS?—Bulletins vols. 21 to 33. CQ Nov. 1952 to Oct. 1955. S.W.M. Mar. 1947 to Aug. 1953. QST 1946 to 1957 3 copies missing. 90 other radio mags. Exchange for 1475Rx, ARC5 equipment or anything useful.—G3BHQ, 9 Victoria Street, Old Whittington, Chesterfield.

R.T.T.Y. FOR SALE COMPLETE R.T.T.Y. STATION. 7.B. Page Printer complete with Silent Cover and a.c. motor in mint condition, 2 speed governors and operating table. Converter unit (W2.JAV) 6.S. Auto transmitter a.c. motor (2 speed governors). MK.11 Perforator modified a.c. 80 + 80 rectifier. K.W. Viceroy MK.111A. As new with mod. v.f.o. for F.S.K., £230. Terms available.—J. A. Steele, 12 Broadwalk, London, E.18. (G3KZI).

EDDYSTONE 888 RECEIVER, immaculate condition, with S meter. Checked by makers. Price £55, buyer collects.—Jones, 18 Charles Road, Quarry Bank, Brierley Hill, Staffs.

AIRMEC C864 Rx in top condition. Accurate continuous bandspread. 7 bands 100 Kc/s to 30 Mc/s. Manual. £75. Carriage by arrangement.—Berry, 12 Warwick Crescent, Harrogate. Tel. 3807.

FOR SALE.—MINIMITTER RECEIVER MR44/2 as new £40. Box No. L.7088, c/o R.S.G.B. BULLETIN, 4 Ludgate Circus, London, E.C.4.

HEATHKIT Q Multiplier £3. Top Band Command TX/RX cw/am £6. Transistorized DC converter silicon rectifiers 30watt, £5. Minimitter mobile whip 160m, £3. Portable 10m am TX £5. Selsyns 2 in. 2 for 15/-. 5 in. 12/6. New boxed 6J4 10/-. 717A 3 for 7/6. 4X150D, 2 for 30/-. Bound CQ 1957, 25/-. All plus carriage or collect London.—Box No. L.7089, c/o R.S.G.B. BULLETIN, 4 Ludgate Circus, London. E.C.4.

HALLICRAFTER RADIO, model SX-62A 50-60 cycles, AC, with loudspeaker, transformer, extra valves and table. £100 or near offer. Phone: RA 2 5265.

GONSET G66B, Eddystone 740, Master Mobile Master Matcher and Aerial; Audio Amplifiers, Power Supplies, many components. Large S.A.E. for Lists.—Box No. L.7090, c/o R.S.G.B. BULLETIN, 4 Ludgate Circus, London, E.C.4.

FOR SALE—PRIVATE (continued)

SALE.—Mosley V3-Jr. £5. Minimitter FB-5 70/-. Johnson LPF £4. Sundry valves, chokes, components etc.—SAE list. **WANTED**—Collins 312B-4, 516E-1. G5RP, Old Gaol House, Abingdon, Berks.

LG 300 TX, special high quality version, £30 o.n.o. Also T1131 power supplies/relays/modulator for same in bespoke cabinet. Offers? Can deliver S. London—Brighton areas.—204 Brighton Road, Lancing. Lancing 3630.

FOR SALE—TRADE

CATALOGUE No. 15.—Government Surplus Electrical and Radio equipment. Hundreds of items at bargain prices for the experimenter and research engineer, 2/6 post free; catalogue cost refunded on purchase of 50/-.—Arthur Sallis Radio Control Ltd., 93B North Road, Brighton.

BAMBOO POLES FOR CUBICAL QUAD ANTENNAS, ETC. ALL SIZES. S.A.E. BRINGS LIST.—WHINES & EDGELER, BAMBOO PEOPLE, GODMANSTON, DORCHESTER, DORSET.

"SPECIAL OFFER FOR LIMITED PERIOD." Communicator mobile 2 or 4 metre Tx/Rx, £75, brand new, normally £90. H.P. terms.—R.E.E. Telecommunications Ltd., Telecomm Works, Crewkerne, Somerset.

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

PHOTOGRAPHIC "HAMS," IF YOU HAVE DIFFICULTY IN OBTAINING BRAUN FLASH SPARES, AND NEW EQUIPMENT, WE CAN HELP. APPOINTED BRAUN MAIN SERVICE AGENTS. CAMERAS AND PHOTOGRAPHIC EQUIPMENT ALSO STOCKED.—PARKER PHOTOGRAPHICS (G3DUV), 308 LICHFIELD ROAD, BIRMINGHAM, 6. EAST 2466.

73 MAGAZINE.—This American magazine can now be paid for in sterling. Special club rate 25/- per year subscription, five or more. One subscription, 28/6 per year. Order now as subscription will be going up, from J. Coote, 56 Dinsdale Avenue, Kings Estate, Wallsend, Northumberland. Payable J. Coote Crossed.

GOING MOBILE?—12 volt D.C./230 volt A.C. 15 watt Inverter Transformer 27/6d. Circuit instructions 9d.—Repanco Limited, 203 Foleshill Road, Coventry.

COLLAPSIBLE STEEL MASTS in telescopic sections measuring 20 ft. 3 in. extended, 6 ft. collapsed, 4 in. base, 2 in. top, suitable for field day, or garden masts—£2.10. each, carriage 10/-. —L. V. Easter (G3JHF), Talbot Drive, Market Street, Loughborough.

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Our new DECALET transfer sheet includes all necessary lettering and numerals to give your newly constructed RX that professional touch. These waterslide transfers are especially suitable for the G3BDQ and similar receivers; available in Black or White, by return of post. (Special colours also printed.) Price 6d per sheet (postage and packing 7d.). Send now to:

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PLEASE MENTION THE
R.S.G.B. BULLETIN
WHEN WRITING TO ADVERTISERS

INDEX TO ADVERTISERS

RADIO SOCIETY OF GREAT BRITAIN
GOLDEN JUBILEE CELEBRATIONS

1913 1963

Programme of Events

The full programme for Golden Jubilee Celebrations Week is set out below. A form of application for tickets is given on page (ii).

Monday, July 1, 1963

1 p.m. Coaches leave Allsop Place, adjoining the London Planetarium, for visit to Radio Research Station.
2 p.m. Tour of Radio Research Station begins.
5 p.m. Coaches leave R.R.S. for return journey.
2.30 p.m. Technical visit to the B.B.C. Television Centre.
6 p.m. Open House at Mullard Ltd., Torrington Place, Tottenham Court Road, London, W.C.1.

Tuesday, July 2, 1963

1 p.m. Coaches leave Allsop Place, adjoining the London Planetarium, for visit to Radio Research Station.
2 p.m. Tour of Radio Research Station begins.
5 p.m. Coaches leave R.R.S. for return journey.
2.30 p.m. Technical visit to the B.B.C. Television Centre.
3 p.m. Open House at Mullard Ltd., Torrington Place, Tottenham Court Road, London, W.C.1.

Wednesday, July 3, 1963

12 noon London Members' Luncheon Club at Bedford Corner Hotel, Bayley Street, Tottenham Court Road, London, W.C.1.
6.30 p.m. Official Reception at the London Planetarium, Marylebone Road, London N.W.1 (adjoining Madame Tussaud's). During the course of the evening there will be a Special Programme in the Planetarium conducted by Dr. H. King.

Thursday, July 4, 1963

10 a.m. Private launch leaves Westminster Bridge Pier for Hampton Court.
8 p.m. London U.H.F. Group Social Evening at White Hall Court Hotel, Bloomsbury Square, London, W.C.1.

Friday, July 5, 1963

6.30 p.m. Golden Jubilee Dinner at the Connaught Rooms, Great Queen's Street, Kingsway, London, W.C.1.

Admission to all these events will be by ticket only obtainable by completing the order form on page (ii) and sending it, with a remittance to cover the total cost, to Frank Fletcher, G2FUX, Hon. Business Manager, Golden Jubilee Celebrations, 11a Ickenham Road, Ruislip, Middlesex. Mr. Fletcher can deal only with correspondence relating to the Golden Jubilee Celebrations.

FOR OFFICE USE

REF.

TO: Frank Fletcher, G2FUX,
Hon. Business Manager, Golden Jubilee Celebrations,
11a Ickenham Road, Ruislip, Middlesex, England.

Please send tickets as follows:

Date 1963	Function	Number of Tickets	Names (Please state Mr., Mrs. or Miss)	Cost per ticket	Total Cost £ s. d.	For office use
July 1	Visit to D.S.I.R.			free	———	
July 1	Coach trip for above			6/-		
July 1	Visit to B.B.C. Television Centre			free	———	
July 1	Open House at Mullard Ltd.			free	———	
July 2	Visit to D.S.I.R.			free	———	
July 2	Coach trip for above			6/-		
July 2	Visit to B.B.C. Television Centre			free	———	
July 2	Open House at Mullard Ltd.			free	———	
July 3	London Members' Luncheon Club			9/-		
July 3	Official Reception at London Planetarium			12/6		
July 4	River Trip to Hampton Court			17/6		
July 4	Lunch and Tea on Launch			11/6		
July 4	London U.H.F. Group Social			free	———	
July 5	Grand Banquet			32/6		
				Total £		

If possible we should like to be seated at the Banquet with .....as one party.

The following ladies would like to tour London on *Monday/Tuesday afternoon.....

.....if this can be arranged.

I enclose remittance by *Cheque/M.O./P.O. Cheques/M.O./P.O. should be made payable to R.S.G.B. Golden Jubilee Account.

Please send tickets to

NAME.....CALL-SIGN/B.R.S./A.....

ADDRESS .....

.....

* Delete as required.

PLEASE USE A BALL POINT PEN AND BLOCK LETTERS THROUGHOUT

RADIO SOCIETY OF GREAT BRITAIN

GOLDEN JUBILEE CELEBRATIONS

Programme Details

Monday, July 1, 1963

Radio Research Station, D.S.I.R., Ditton Park, Slough, Bucks.

A visit to this interesting establishment has been arranged through the kind co-operation of Mr. J. A. Ratcliffe, Director of Radio Research. The visit will take place during the afternoon, and private coaches have been arranged to leave Allsop Place (adjoining the London Planetarium) at 1 p.m., arriving at Slough at 2 p.m. The visit will last about three hours, and the coaches will leave Ditton Park at approximately 5 p.m., arriving back in London at about 6 p.m. Separate tickets will be issued for the visit and for the coach journey. Members who wish to do so may travel direct to Slough, meeting at the entrance at 2 p.m.

The cost of the coach trip will be 6s.

Admission by ticket only.

British Broadcasting Corporation Television Centre

A visit to the B.B.C. Television Centre at White City has been arranged through the kind co-operation of Mr. F. C. McLean, Director of Engineering. This visit is of a purely technical nature and numbers are strictly limited. Visitors will meet at 2.20 p.m. at the entrance to the Television Centre which is 50 yards from White City Station (Central line). Car Parking opposite White City Stadium (100 yards).

Admission by ticket only.

Mullard House, Torrington Place, Tottenham Court Road, London, W.C.1.

Mullard Ltd. have arranged an " Open House " featuring working exhibits, film shows and product displays from 6 p.m. to 8 p.m. at their London Headquarters. Refreshments will be served to visitors.

Admission by ticket only.

Tuesday, July 2, 1963

Radio Research Station, D.S.I.R., Ditton Park, Slough, Bucks.

A second visit has been arranged for this day, all details being the same as for Monday.

The cost of the coach trip will be 6s.

Admission by ticket only.

British Broadcasting Corporation Television Centre, White City

A second visit has been arranged for this day, all details being the same as Monday. This is a purely technical visit and numbers are strictly limited.

Admission by ticket only.

Mullard House, Torrington Place, Tottenham Court Road, London, W.C.1.

Mullard Ltd. are holding another " Open House " from 3 p.m. to 5 p.m.

Admission by ticket only.

Monday and Tuesday, July 1-2, 1963

For the benefit of the ladies whose escorts are visiting the Television Centre, the Society will arrange sight-seeing tours of London for those who are interested—see appropriate space on the order form.

Wednesday, July 3, 1963

London Members' Luncheon Club

The Club is holding a Special Golden Jubilee Luncheon at the Bedford Corner Hotel, Bayley Street, Tottenham Court Road, London, W.C.1, under the Chairmanship of Mr. S. E. Vanstone, G2AYC. Bar opens at 12 noon for lunch at 1 p.m.

The cost will be 9s. each, including gratuity.

Admission by ticket only.

Official Reception

An Official Reception will be held at the London Planetarium, Marylebone Road (adjoining Madame Tussaud's), commencing at 6.30 p.m. There will be a running buffet and a cash bar. During the evening there will be a Special Presentation in the Planetarium, conducted by Dr. H. King, the Scientific Director.

The cost will be 12s. 6d. including buffet and display.

Admission by ticket only.

Thursday, July 4, 1963

All-day River Trip

By private launch from Westminster Bridge to Hampton Court and return. Lunch and tea will be served on board and there will be a cash bar. Members of the Thames Valley Amateur Radio Transmitters' Society will meet the launch at Hampton Court and act as hosts for those who would like to visit the Palace. The launch will leave Westminster Pier at 10 a.m. and arrive back at about 7 p.m. Lunch and tea must be booked in advance, but members may bring their own refreshments if they wish.

The cost of the trip (excluding refreshments) will be 17s. 6d. The cost for lunch and tea will be 11s. 6d. each.

Admission by ticket only.

Social Evening

The London U.H.F. Group is holding a social evening at White Hall Court Hotel, Bloomsbury Square, W.C.1, for those who would like to meet members of the Group. The meeting will commence at 8 p.m.

Friday, July 5, 1963

Grand Jubilee Dinner

To mark the 50th Anniversary of the formation of the Society, first known as the London Wireless Club and later as the Wireless Society of London, on July 5, 1913, a Golden Jubilee Dinner will be held during the evening of July 5, 1963, under the chairmanship of the President. The Dinner will be held at the Connaught Rooms, Great Queen's Street, Kingsway, London, W.C.1. It is anticipated that many personalities in the field of radio communication will be present.

Reception from 6.30 p.m. for dinner at 7 p.m.

Dress: lounge suits.

The cost of the dinner will be 32s. 6d.

Admission by ticket only.

HOTEL ACCOMMODATION

For the benefit of visitors to London the Society has reserved a number of rooms for members at the Royal Hotel, Woburn Place, Russell Square, London, W.C.1. Visitors requiring accommodation should write direct to the Royal Hotel, stating their requirements and mentioning that they are coming to the R.S.G.B. Golden Jubilee Celebrations. Early booking is important.

RESERVATIONS FOR THE VARIOUS FUNCTIONS

Enclosed with this issue of the BULLETIN is an order form for tickets for the various functions. This form should be sent, together with remittance, to the Hon. Business Manager, Golden Jubilee Celebrations, Frank Fletcher, G2FUX, at 11a Ickenham Road, Ruislip, Middlesex, England, as soon as possible. Cheques and postal orders should be made payable to the " R.S.G.B. Golden Jubilee Account." Mr. Fletcher can only deal with correspondence relating to the Golden Jubilee Celebrations.

Members are asked to note that in a number of cases, the number of tickets is strictly limited and applications will therefore be dealt with in the order received.

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

THIS MONTH'S BARGAINS

AERIAL EQUIPMENT

TWIN FEEDER: 300 ohm twin ribbon feeder, similar K25, **6d.** per yard. K35B Telcon (round), **1/6** per yard. Postage **1/6** any length. 75 ohm Twin Feeder, **6d.** per yard.

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

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

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

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

2 METRE BEAM 5 ELEMENT W.S. YAGI. Complete in box with 1" to 2½" mast head bracket. **PRICE 49/-.** P. & P. 3/6

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

TOUGH POLYTHENE LINE, type ML1 (100 lbs.), **2d.** per yd. or **12/6** per 100 yds. Type ML2 (220 lbs.), **4d.** per yd. or **25/-** per 100 yds., post free. Ideal for Guys, L.W. Supports, Halyards, etc.

NEW MOSLEY POWER BEAMS *Write for details.*

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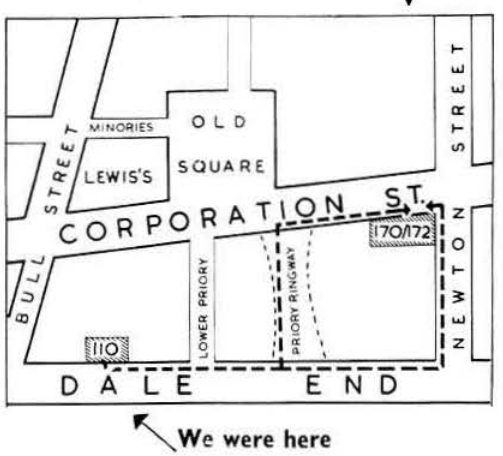

ABSORPTION WAVEMETERS: 3·00 to 35·00 Mc/s in 3 Switched Bands, 3·5, 7, 14, 21 and 28 Mc/s Ham Bands, marked on scale. Complete with indicator bulb. **A MUST** for any Ham shack. **Only 22/6,** POST FREE.

ROTARY TRANSFORMERS, 12 v Input, 490 v, 65 mA, Out. **17/6** each. P. & P. 3/-.

150 OHM VERY LOW LOSS BEADED COAX. 20 yd. lengths only **10/-** each. Post Free.

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

SHADED POLE MOTORS, 230 v or 110 v operation, ideal for fans, blowers or models. Single Unit **12/6** plus 2/- P. & P. or Pair **£1** plus 2/6 P. & P.

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

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

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OA2 ..	6/-	6A6 ..	5/-	6K8G ..	8/-	12SA7 ..	7/-				
OA3 ..	11/-	6A8MG	7/-	6L5 ..	6/-	12SC7 ..	4/-				
OB2 ..	6/-	6AB4 ..	6/6	6L6 ..	9/-	12SG7 ..	3/-	30C15 ..	10/-	85A2 ..	8/6
OB3 ..	6/-	6AB7 ..	4/-	6L6G ..	6/-	12SJ7 ..	5/-	30F5 ..	8/6	117N7 ..	20/-
OC3 ..	5/6	6AG7 ..	6/-	6L18 ..	8/-	12SK7 ..	5/-	30FL1 ..	9/6	117Z6GT	10/-
OD3 ..	5/-	6AH6 ..	11/-	6P28 ..	12/6	12SL7GT	7/6	30L15 ..	12/-	715B ..	60/-
OZ4 ..	5/-	6AK5 ..	5/-	6Q7G ..	6/-	12SN7GT	7/6	30P19 ..	14/-	807 ..	6/6
1A3 ..	3/-	6AK6 ..	7/-	6R7 ..	6/-	12SR7 ..	5/-	30PL1 ..	10/6	813 ..	55/-
1A5GT/G	5/-	6AL5 ..	4/-	6SD7GT	5/-	12SX7GT	8/-	30PL13 ..	0/6	814 ..	20/-
1A7GT	10/-	6AM5 ..	3/-	6SG7 ..	5/-	12SY7 ..	6/-	35L6GT	8/-	815 ..	40/-
1G6GT/G	7/-	6AM6 ..	4/6	6SJ7 ..	5/-	12V4 ..	2/6	35W4 ..	6/-	829B ..	50/-
1H5GT	9/-	6AN5 ..	15/-	6SK7 ..	4/6	20P2 ..	15/-	35Z4GT	6/-	832 ..	15/-
1N5GT	9/-	6AQ5 ..	6/-	6SL7GT	6/6	20PL1 ..	14/-	35Z5GT	7/-	838 ..	12/-
1R5 ..	6/-	6AS6 ..	5/-	6SN7GT	4/6	20P1 ..	14/-	42 ..	5/-	954 ..	5/-
1S4 ..	5/-	6AS7G ..	20/-	6SQ7 ..	6/-	20P3 ..	15/-	50B5 ..	8/-	955 ..	3/-
1S5 ..	5/6	6AT6 ..	5/-	6V6G ..	4/-	25L6GT/G	8/-	50C5 ..	7/-	956 ..	2/-
1T4 ..	4/-	6AU6 ..	7/-	6V6GT	7/-	25Z4G ..	8/-	50L6GT	7/-	957 ..	5/-
1T5GT ..	6/-	6AV6 ..	6/-	6X4 ..	5/-	25Z5 ..	8/-	75 ..	5/6	958A ..	4/-
1U4 ..	7/-	6B7 ..	5/-	6X5G ..	4/6	25Z6GT	8/6	76 ..	5/-	959 ..	8/-
1U5 ..	7/-	6B8 ..	5/-	6X5GT ..	6/6	26A7GT	15/-	80 ..	6/-	2050 ..	10/-
1Z2 ..	22/6	6BA6 ..	5/-	6Y6G ..	6/-	28D7 ..	7/-	83 ..	8/-	2051 ..	6/-
1X2B ..	7/-	6BE6 ..	6/-	6Z4 ..	5/-						
2A3 ..	5/-	6BH6 ..	5/-	7B7 ..	8/-						
2D21 ..	6/-	6BJ6 ..	5/-	7C5 ..	12/-						
2E26 ..	20/-	6BR7 ..	11/6	7Z4 ..	4/-						
2X2 ..	3/-	6BR8 ..	9/-	9BW6 ..	11/-						
2X2A ..	7/-	6BW6 ..	9/-	10C2 ..	13/-						
3A5 ..	7/-	6BW7 ..	9/-	10D1 ..	7/-						
3A8GT ..	8/-	6C4 ..	2/6	10F1 ..	7/-						
3B28 ..	15/-	6C5G ..	5/-	12A8GT	5/-						
3D6 ..	4/-	6C8G ..	7/-	12AH7GT	5/-						
3E29 ..	50/-	6CB6 ..	5/-	12AH8 ..	11/-						
3Q4 ..	7/-	6CL6 ..	10/-	12AT6 ..	5/-						
3Q5GT ..	7/6	6D4 ..	17/6	12AT7 ..	5/-						
3S4 ..	5/-	6F5 ..	6/-	12AU7 ..	5/-						
3V4 ..	6/6	6F6G ..	5/-	12AX7 ..	6/-						
4X150A	50/-	6F7 ..	6/-	12AY7 ..	10/-						
5R4GY ..	9/-	6F8G ..	6/6	12B4A ..	9/-						
5R4WGA	15/-	6F17 ..	5/-	12BA6 ..	8/-						
5T4 ..	8/-	6F32 ..	5/-	12BE6 ..	5/-						
5U4G ..	5/-	6F33 ..	4/-	12BH7 ..	8/-						
5U4GB ..	6/-	6G6G ..	2/6	12BV7 ..	10/-						
5V4G ..	8/-	6H6 ..	1/6	12C8 ..	3/-						
5Y3G ..	4/-	6J5G ..	3/-	12H6 ..	3/-						
5Y3GT ..	6/-	6J6 ..	3/6	12J5GT	3/-						
6Z3 ..	6/-	6J7 ..	9/-	12J7GT	7/6						
6Z4 ..	9/-	6J7G ..	5/-	12K7GT	7/-						
6Z4G ..	7/-	6K6GT	6/-	12K8 ..	10/-						
6A3 ..	8/-	6K7 ..	5/-	12Q7GT	5/-						

FULLY GUARANTEED VALVES

85A2 ..	8/6	5651 ..	8/-	C1C ..	8/-	EBF83 ..	10/-	ECL86 ..	11/-	HL23DD	6/-	TZ40 ..	30/-
117N7 ..	20/-	5654 ..	10/-	CL33 ..	9/-	EBF89 ..	8/-	EF9 ..	12/-	HL41 ..	4/-	U12/14	8/-
117Z6GT	10/-	5670 ..	10/-	CY31 ..	6/-	EBL1 ..	11/-	EF37A ..	8/-	KT33C	6/-	U20 ..	8/6
715B ..	60/-	5718 ..	7/6	DAF96	7/6	EBL21 ..	12/6	EF39 ..	4/-	KT41 ..	12/6	U24 ..	12/6
807 ..	6/6	5749 ..	9/-	DF96 ..	7/6	EC34 ..	10/-	EF42 ..	7/6	KTZ41	6/-	U191 ..	12/6
813 ..	55/-	5751 ..	11/-	DH63 ..	6/-	ECC40 ..	9/-	EF50 ..	1/6	ML6 ..	6/-	U282 ..	15/-
814 ..	20/-	5763 ..	10/-	DK92 ..	9/-	ECC70 ..	15/-	EF55 ..	8/-	MU12/14	7/-	U301 ..	12/9
815 ..	40/-	5787 ..	10/-	DK96 ..	7/6	ECC84 ..	8/-	EF80 ..	6/-	N78 ..	15/-	U801 ..	20/-
829B ..	50/-	5814 ..	9/-	DL96 ..	7/6	ECC85 ..	8/-	EF83 ..	10/-	PABC80	8/6	UABC80	8/6
832 ..	15/-	5879 ..	12/-	E1T ..	55/-	ECC88 ..	15/-	EF85 ..	6/6	PC97 ..	10/-	UAF42	8/-
838 ..	12/-	5902 ..	17/-	E88CC ..	10/-	ECF80 ..	10/6	EF86 ..	6/-	PCC84 ..	6/6	UBC81	8/-
955 ..	3/-	6146 ..	27/6	E182CC	15/-	ECF82 ..	8/-	EF89 ..	6/-	PCC85 ..	8/-	UBF80	8/6
7193 ..	2/-	EABC80	7/-	ECH42	9/6	EF98 ..	10/-	PCC89 ..	11/-	UBL21	13/-		
9002 ..	5/6	EAF42 ..	8/6	ECH81	7/6	EF183 ..	10/-	PCF80 ..	7/-	UCC85 ..	8/-		
9003 ..	7/-	EBC21 ..	7/6	ECH83	8/-	EF184 ..	10/-	PCF82 ..	7/-	UCH21 ..	9/6		
ARP3 ..	3/-	EBC41 ..	7/9	ECL80 ..	7/6	EF200 ..	10/-	PCF84 ..	13/-	UCH42 ..	8/-		
ARP12	3/6	EBC81 ..	7/-	ECL82 ..	8/6	EL11 ..	10/-	PCF86 ..	11/-	UCH81 ..	9/-		
ARTP2	6/-	EBF80 ..	7/6	ECL83 ..	14/-	EL32 ..	3/6	PCL81 ..	9/-	UCL82 ..	9/-		
						EL33 ..	9/-	PCL82 ..	8/-	UCL83 ..	12/6		
						EL34 ..	10/-	PCL83 ..	10/-	UF41 ..	9/-		
						EL37 ..	17/6	PCL84 ..	7/-	UF42 ..	9/-		
						EL41 ..	8/-	PCL85 ..	11/-	UF80 ..	7/-		
						EL42 ..	8/-	PCL86 ..	11/-	UF85 ..	7/-		
						EL81 ..	9/-	PL36 ..	11/-	UF86 ..	12/-		
						EL83 ..	7/6	PL38 ..	16/-	UF89 ..	7/6		
						EL84 ..	7/-	PL81 ..	8/6	UL41 ..	9/6		
						EL85 ..	10/-	PL82 ..	8/-	UL84 ..	8/-		
						EL95 ..	6/6	PL83 ..	8/-	UU6 ..	12/-		
						EL821 ..	6/-	PL84 ..	8/-	UY21 ..	6/6		
						EL822 ..	8/-	PL500 ..	16/-	UY41 ..	6/-		
						EM34 ..	9/6	PM84 ..	10/-	UY85 ..	6/-		
						EM80 ..	7/6	PX25 ..	10/-	VR40 ..	10/-		
						EM81 ..	8/-	PY33 ..	12/-	VR53 ..	4/-		
						EM84 ..	8/6	PY80 ..	6/6	VR55 ..	6/-		
						EM85 ..	10/-	PY81 ..	6/6	VR56 ..	4/6		
						EN31 ..	10/-	PY82 ..	6/-	VR57 ..	6/-		
						EN32 ..	10/-	PY83 ..	7/-	VR65 ..	4/-		
						EY51 ..	8/-	PY88 ..	9/-	VR100 ..	6/-		
						EY81 ..	9/-	PY800 ..	10/-	VR135 ..	2/6		
						EY84 ..	7/6	PY801 ..	10/-	VR136 ..	4/6		
						EY86 ..	7/-	QQV03-10		VR137 ..	4/6		
						EZ40 ..	7/-		32/-	VU120 ..	8/6		
						EZ41 ..	6/6	QV04-7	7/-	W81M ..	6/-		
						EZ80 ..	6/-	RL18 ..	12/6	X65 ..	5/6		
						EZ81 ..	6/-	SP2 ..	3/6	X66 ..	8/-		
						G810A ..	25/-	TT15 ..	35/-	X81M ..	7/-		

R.C.A. NUVISTORS

2CW4 (2V) or 6CW4 (6.3V) high "mu" triodes for TV tuner applications .. 14/-
7586 General purpose medium "mu" triode 22/-
7859 General purpose high "mu" triode 22/-
Bases for above, 2/9 each.

9-FT. SECTIONAL OUTDOOR AERIALS

3 strong light alloy screw-in sections mounted on an insulated base, supplied with bracket for wall or window sill mounting. Complete with down lead. 15/-, p.p. 5/-.

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MULLARD OC44, 7/6; OC45, 6/6; OC71, 6/-; OC75, 6/-; OC76, 8/-; OC78, 7/-; OC78D, 7/-; OC81, 7/-; OC81D, 7/-; OC170, 6/6. Set of two matched OC78 or OC81, 13/-; or set of two matched OC81 with one OC81D, 18/-.
EDISWAN X101A equivalent to OC72, 8/-.
R.C.A. 2N410 equivalent to OC45, 5/-; 2N412, equivalent to OC44, 5/-.
SPOT MARKED TRANSISTORS: Red, 2/8; White, 2/8; Yellow, 1/10; Green, 1/6. Germanium miniature Diodes OG12E, 1/6 each.

CRYSTAL DIODES

BY100 Silicon Rectifiers 700 p.i.v. 450mA 8/-
8X641 .. 60 p.i.v. 290mA 3/-
8X642 .. 120 p.i.v. 270mA 3/6
8X643 .. 180 p.i.v. 260mA 3/6
8X647 .. 400 p.i.v. 190mA 15/-
8X781 .. 60 p.i.v. 50mA 4/6
(High speed switching)
Packing and postage: 1 to 6—6d.; 7 or more 1/-.

EX-ARMY TRANSMITTER RECEIVERS

WIRELESS SETS, No. 19 Mk.11, 2 to 8 Mc/s and 230-240 Mc/s; Intercom. Amplifier, 12 or 14 v. operation.
POLICE. Transmitter-receiver unit only, without power supply unit and without accessories **£2. 15. 0**
Packing and carriage, 20/-.
TYPE 88 WALKIE-TALKIE SETS. Four crystal channels 38 to 42 Mc/s. Dry battery operation, 84 v. HT and 1.3 v. Dimensions: 34 x 6½ x 9½. Weight 6 lb.
PRICE. Transmitter-receiver unit only, without accessories .. **£2. 10. 0** each
Packing and carriage, 7/6. **£4. 10. 0** per pair.
The above are offered in good condition and complete but not tested nor guaranteed.

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