MARCH, 1963

RSGB BULLETIN

VOL. 38, No. 9

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

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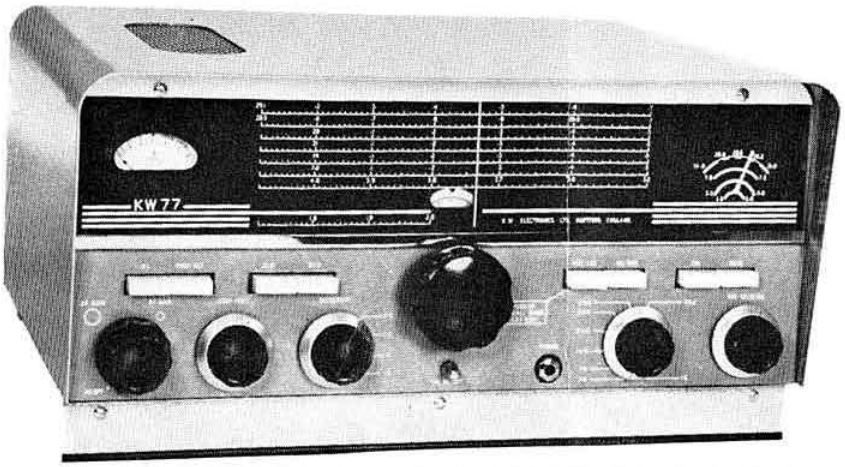

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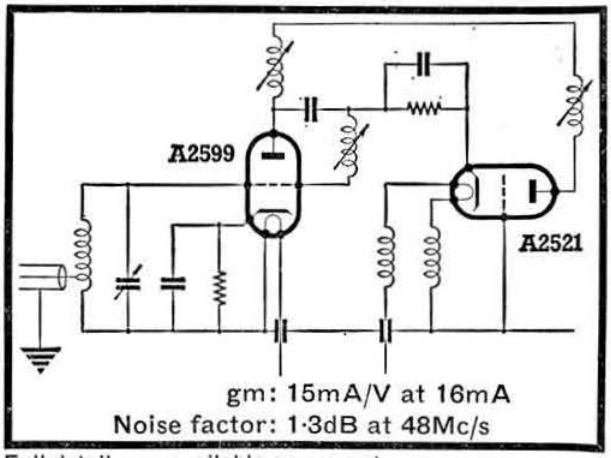

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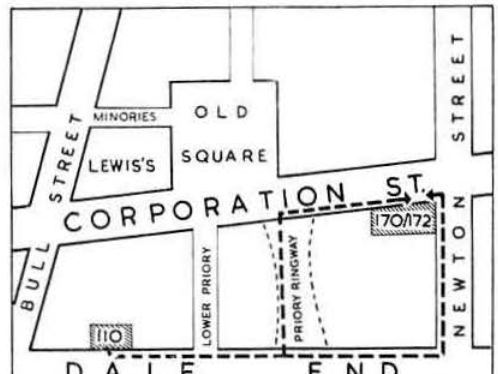

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Volume 38 No. 9

March 1963

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R.S.G.B. BULLETIN

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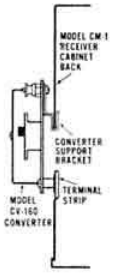

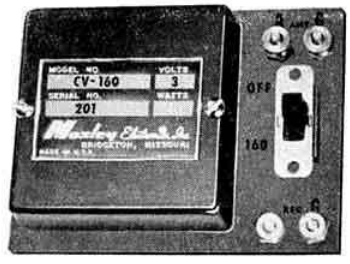

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Current Comment

discusses topics of the day

Radio Amateurs' Examination

MONTHS of work for would-be licensed amateurs will culminate on May 10 when the first Radio Amateurs' Examination of 1963 takes place. It is an unfortunate fact, however, that success or failure does not entirely depend on how conscientiously the student has studied.

Knowing the subject matter required by the syllabus is quite useless unless the answers are really pertinent to the questions. Information which has no bearing on the question asked should be omitted—the average time that can be spent on any question is 20 minutes, little enough to get down all the relevant facts in a coherent manner.

The problem is made more complicated for many candidates by the lack of recent practice in answering examination questions. The difficulty is naturally greater for those who left school many years ago than for those in their teens and twenties whose memories of examination paper style is still fairly fresh. In an effort to show what is required, a supplement to this issue of the BULLETIN provides specimen answers to the question paper set in May, 1962. It is worth serious study by this year's candidates not only as an example of the form of answer required but as a further source of revision in preparation for the real thing in a few weeks' time. Note, however, that answers are given to *all* the questions set in the paper: in the actual examination, there is some choice in Part 2.

To refresh still further the memories of those who will be taking an exam again after a lapse of perhaps many years a few words of further advice may not be out of place. First of all, read the entire question paper carefully and thoroughly, *including all the instructions*, before starting to write. Note particularly that Part 1 is compulsory; candidates must pass in this section however well they may do in Part 2. Endeavour to understand every question clearly before beginning and be sure to write answers to the correct number of questions. Candidates who run short of time should give the relevant points of the answers still to be done—this procedure gives the examiners a far better impression than omitting the answers altogether.

Finally allow time to read them through and check the diagrams. It is all too easy to omit an important word or make an elementary slip in a circuit diagram which can be quickly seen and rectified on a second reading.

It is perhaps worth repeating one other remark made on a previous occasion—provided a candidate has prepared for the R.A.E. with reasonable care and follows the advice given by his instructors and in such publications as the *Radio Amateurs' Examination Manual*, his chances of passing are good.

The News Service

WITH the extension of the R.S.G.B. News Bulletin Service to Northern Ireland, the number of transmissions from GB2RS each Sunday has now risen to 15—a far cry from the original single transmission on 80m when the Service was inaugurated on September 25, 1955. The first transmission from Belfast took place on February 24, 1963.

The current schedule of transmissions set out in this issue indicates how complete is the present coverage of the British Isles. In fact, practically every home member, wherever he may live, should be able to hear the News Bulletin every Sunday. We say "should" advisedly, for it is still unfortunately true that GB2RS on 80m is often buried under needless QRM. Not all of it emanates from British stations but nevertheless we appeal again to members to give the readers of the News Bulletin as clear a channel as possible for the few minutes of each transmission. Indeed, it is to be hoped that most members, whether licensed amateurs or shortwave listeners, will find something of interest each week and listen rather than transmit during the time GB2RS is serving their particular locality.

The practical organization behind the News Bulletin Service now entails a considerable amount of work both at Headquarters, and for the operators of GB2RS throughout the country.

On Thursday morning each week, reports from members, Society representatives, club secretaries and other sources of information are combined to form the script for submission to the Post Office for approval and for distribution by post to the various GB2RS operators and their stand-by stations. In all, about 30 copies are duplicated and despatched all over the country.

But the greatest task of all is the collection of sufficient information from which to prepare an interesting script of reasonable length. It is surprising how quickly a few hundred spoken words can be transmitted. Our grateful thanks, therefore, not only to those who devote part of their Sunday mornings to the transmission of the News Bulletin but also to those who supply the material to be transmitted.

J.A.R.

A Hydraulically-operated Telescopic Aerial Mast

By J. C. AYLING (G3PNA)*

THE mast to be described is used to support a 144 Mc/s 6-over-6 aerial at a height of 40 ft. and has also been used for N.F.D. with a 21 Mc/s cubical quad. It consists of three tubular sections, which are clamped together when extended to enable the whole aerial and mast assembly to be freely rotated. Turning power for steering the aerial is applied to the mast via the toothed portion of a bicycle freewheel attached to the bottom section, the cupped end of which stands on a peg mounted on a spiked bedplate which locates the aerial on the ground. When the mast is retracted, the aerial is brought down to a height of about 15 ft. and is thus reasonably accessible for adjustment.

The ground space occupied by the mast is such that it can easily be erected in a small backyard. It can be raised to its full height in about 12 minutes and can be safely lowered in only two minutes. Owing to the telescopic construction it is easily transported.

A hydraulic system is used to transmit the lifting force which extends the mast: water is pumped into the mast by means of a modified car tyre pump, and lifts first the top-mast section and then the centre section. After each extension, pumping is stopped while the extended tube is clamped in the end of the one supporting it. When the mast is fully extended and clamped, the water may be allowed to run away if there is a risk of frost. The capacity of the mast is about 2½ gallons.

In its fully extended position, the top of each section is held by four guy wires brought to four common points at the corners of a 14 ft. square. As the two top sections are retracted, the associated guys remain attached but fall slack, leaving the mast held only by the bottom section guys.

The mast is of simple construction and can be made by anyone having reasonable ability with hand tools: the only tool required which would not be found in the average workshop is a 1¼ in. B.S.P. tap used for cutting one thread. One constructional operation which may be beyond some home constructors is brazing, but it should be possible to find someone suitably equipped to do this. The design avoids the use of glands or seals, and most parts other than the tubes themselves should be obtainable from plumbers. The leather cup washers are available from motor factors.

Construction

The mechanical construction of the mast is shown in Figs. 1 and 2.

Mast no. 1 is made from 1⅞ in. aluminium scaffold tube and should be about 1 ft. longer than a third of the desired overall height: in the mast at G3PNA a 14 ft. tube is used.

At the top of the tube, two diametrically opposite slits 4 in. long and $\frac{3}{16}$ in. wide are made with a hacksaw, the unwanted metal being broken out. Four cuts will be necessary. All the burrs are removed with a file so that there are no sharp edges which might damage the leather cup washers forming the water-retaining joints.

A single ¼ in. hole for a limit port is drilled 15 in. from the top of the tube, and a 1¼ in. B.S.P.† thread cut in the inside of the lower end of the tube into which a 1¼ in. B.S.P. nipple is screwed. A 1¼ in. B.S.P. tee piece is screwed to the other end of the nipple and a wheel or gate valve to the side outlet. A ½ in. deep, ½ in. diameter hole is drilled into the squared end of a 1¼ in. B.S.P. plug, which is then screwed into the open end of the tee.

The position of the hole for the air cock is not critical, 3 in. above the nipple at the base of the tube being satisfactory. Clamp *J* is then made and secured in a suitable position at the top of the tube to support the guy plate *N*, which is fabricated from a 6 in. square, ⅛ in. thick mild steel plate, as indicated in Fig. 1. Clamp *G* is constructed next, and is also fitted to the top of the tube, being used to hold mast no. 2 in position when extended.

Mast no. 2 is made from 1½ in. galvanized welded electrical conduit, and should be about the same length as mast no. 1. A straight length having no bends or dents should be selected, and any threaded ends sawn off.

As with mast no. 1, cut two diametrically opposite slits 4 in. long and $\frac{3}{16}$ in. wide at the end of the tube which is to be used at the top, care being taken to remove sharp edges.

A single ¼ in. hole 15 in. from the top of the tube should then be drilled. A steel disc *D*, 1½ in. diameter and ⅛ in. thick, is made and brazed to the lower end of the tube. Port holes should be drilled in the disc as shown in Fig. 2, together with pilot holes for the 2B.A. screw threads which should finally be tapped.

A steel washer *F* is made to fit inside the 1½ in. leather cup washer *E*, and port holes and 2B.A. clearance holes are drilled in both to line up with the corresponding holes in the disc brazed to the end of the tube. The washers should then be screwed to the end of the tube. Clamp *K* is the next item to be constructed, which is fitted to the top of the tube in order to limit the entry of the tube into mast no. 1. Care should be taken to see that it is fitted below the limit port. The clamp position is determined by laying mast no. 2 beside mast no. 1, so that the leather washer is just above the air cock on mast no. 1. The clamp is then moved down mast no. 2 until it just touches the end of mast no. 1. Clamp *L* is next fitted to the top of the tube to support the guy plate *P*, which is slid over the top end of the tube to rest on clamp *L*. Similarly, clamp *H* is fitted to the top of the mast, the purpose being the same as for clamp *G*.

Mast no. 3 is made from 1¼ in. galvanized welded electrical conduit and should be about the same length as mast no. 1. A steel disc *A*, 1¾ in. in diameter and ⅛ in. thick, is brazed to the base of the tube. A suitable pilot hole is

* *7 Hospital Road, Bletchingly, Surrey.*

† British Standard Pipe Thread.

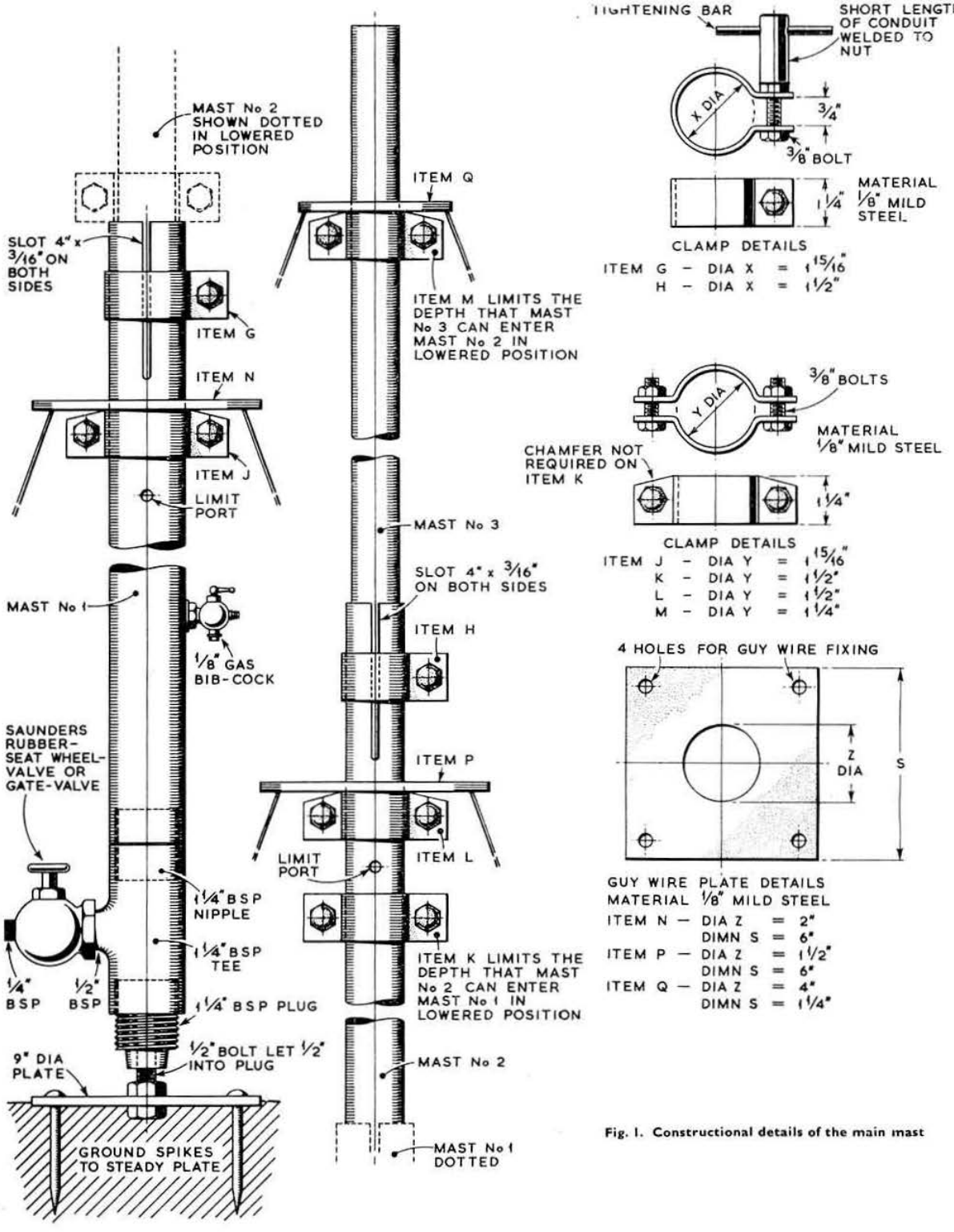

Fig. 1. Constructional details of the main mast

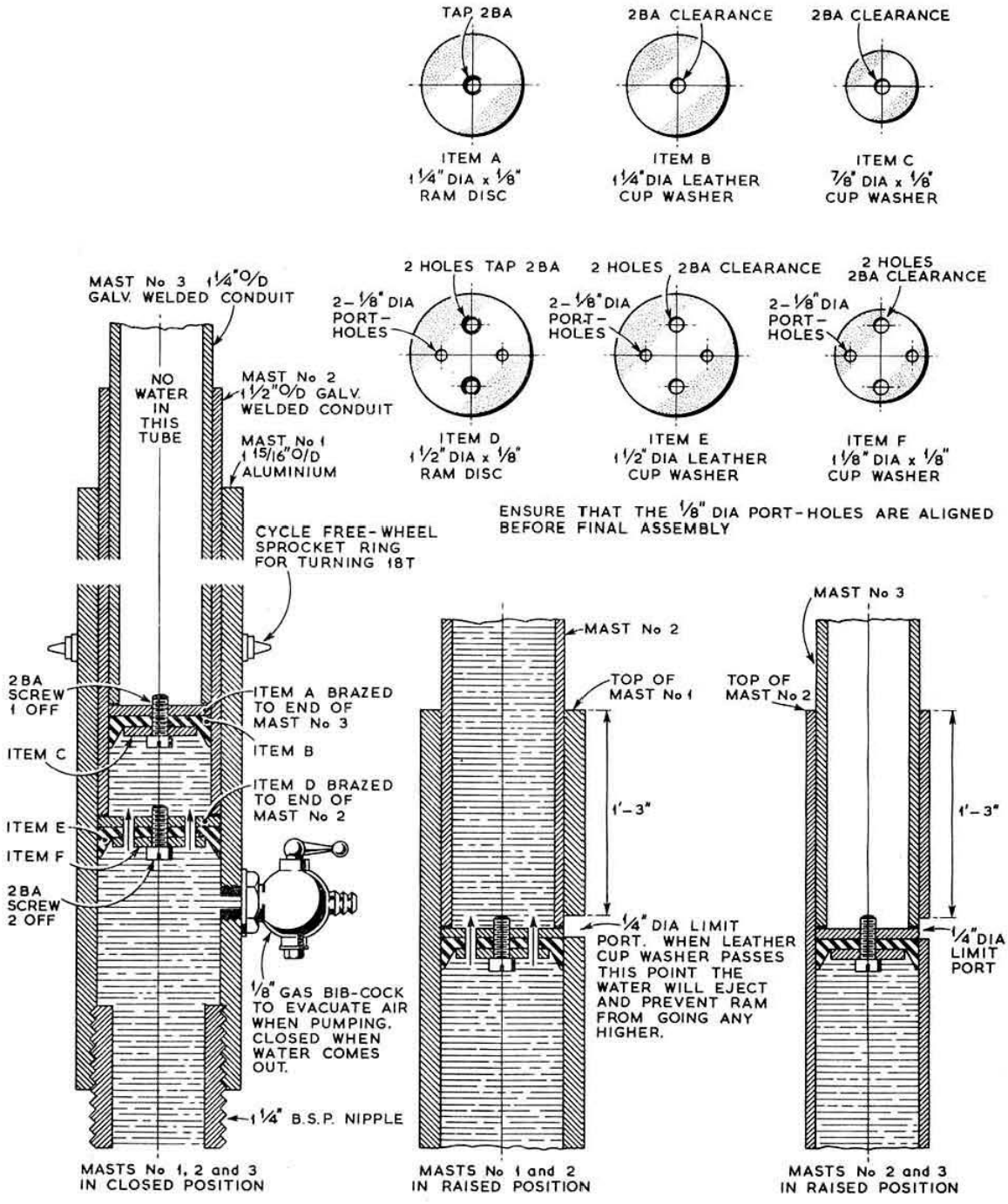

Fig. 2. Dimensions of the washers and method of assembly.

drilled in the centre of the disc and a 2B.A. thread tapped into it: no port holes are required as water does not enter this tube. A $1\frac{1}{4}$ in. leather washer *B* with supporting plate *C* is then screwed to disc *A*.

Clamp *H* is finally attached to the top of the entire mast to provide support for the uppermost guy plate *Q*. The procedure for determining the position of the clamp is to lay mast no. 3 adjacent to no. 2 so that the leather washer *B* just clears the bottom of mast no. 2. When actually assembling the mast, neatsfoot oil, obtainable from leather stores, should be liberally applied to the leather washers and the internal surfaces of masts nos. 1 and 2.

The Pump

The pump shown in Fig. 3 must first be modified by fitting a second leather cup washer upside down above the normal washer, in order to prevent air filtering into the circuit on the upward stroke. The washers and inside of the pump cylinder should be well lubricated with neatsfoot oil, as it is the only type suitable for the purpose.

The pumping system should be assembled as shown in the diagram, with the 5 gallon drum to act as a reservoir, and non-return valves to control the direction of water flow. The action of the system with the reservoir drum filled is as follows:

When the pump handle is raised, valve *B* closes while valve *A* opens and the pump fills with water. When the pump handle is lowered, valve *A* closes while valve *B* opens and water is therefore forced into the tube connected to the mast.

Raising and Lowering the Mast

The following procedure should be followed for raising or lowering the mast which can, of course, be left at any intermediate position so long as it is securely clamped and the guys tightened. In bad weather, it is probably wiser to clamp mast no. 3 inside mast no. 2 and raise masts 2 and 3 together.

(i) Stand the mast upright on the bedplate and fix the guys (keeping the guys to the two upper sections very slack when the mast is erected for the first time).
(ii) Fill the 5 gallon drum with water and connect the outlet from valve *B* to the wheel valve at the bottom of the mast.
(iii) Open the wheel valve and the air cock at the bottom of the mast.
(iv) Loosen clamp *H* at the top of mast no. 2 and tighten clamp *G* at the top of mast no. 1.
(v) Pump water into the mast, until it overflows out of the air cock.
(vi) Close the air cock.
(vii) Pump water into the mast until mast no. 3 has risen to the top of its travel, and water is emitted from the limit port at top of mast no. 2.
(viii) Open the air cock to let out enough water to lower mast no. 3 by 1 in., then close the cock. This seals the limit port.
(ix) Tighten clamp *H* at the top of mast no. 2, and loosen clamp *G* at the top of mast no. 1.
(x) Pump water into the mast until mast no. 2 has risen to the top of its travel and water is emitted from the limit port at top of mast no. 1.

(Continued on page 471)

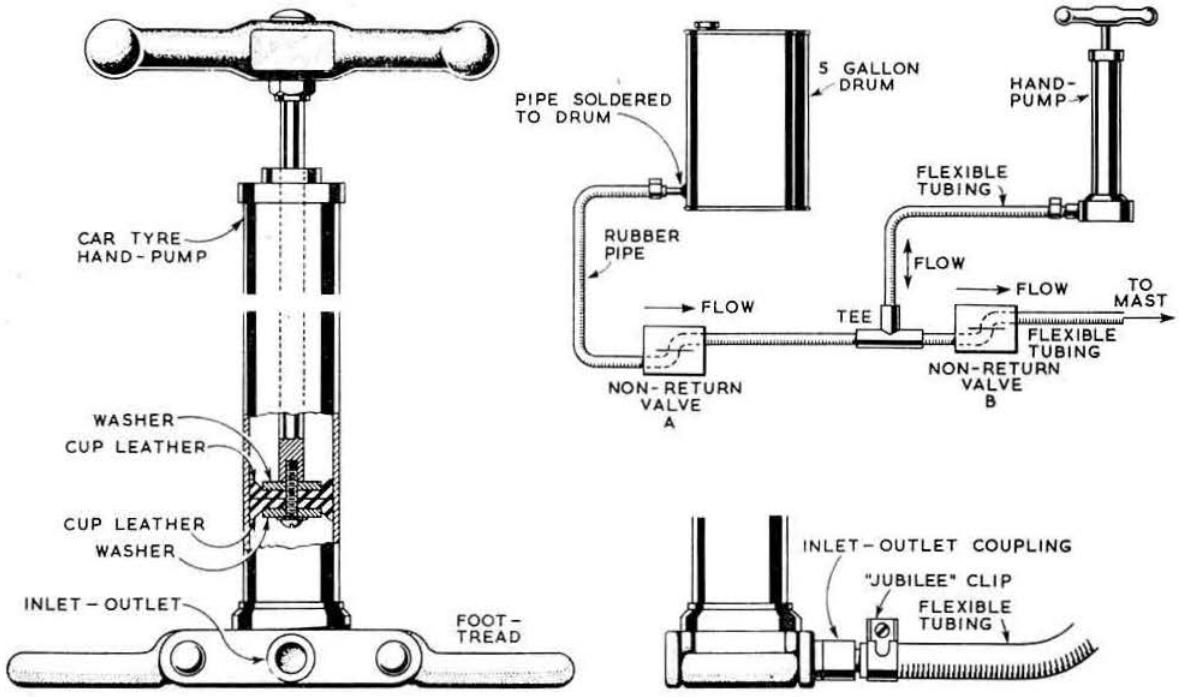

Fig. 3. Modifications to the pump and arrangement of the hydraulic circuit.

A Linear for 10 to 80 Metres

Bandswitching Unit using a pair of QV06-20 Valves

By G. F. GEARING (G3JJG)*

A CHANCE requirement for a linear amplifier to increase the effectiveness of a " barefoot " commercial s.s.b. exciter revealed the fact that few designs have been published recently in British amateur journals. The equipment to be described (Fig. 1) was designed to be simple in operation, self-contained, reliable and to have a high standard of electrical performance. It will handle a maximum power of 140 watts peak input on all bands from 3·5 Mc/s to 28 Mc/s. Two QV06-20 valves are used, with a tuned grid circuit and modified pi-section output tank. Input and output impedances are nominally 75 ohms.

Power supplies are contained on the same chassis, although the 250 volts 20 mA supply may be omitted if this is available from the exciter. The main h.t. voltage is 700 volts and the bias supply is −45 volts.

It is worth noting that, although this amplifier is intended to be driven by an s.s.b. exciter, there is no reason why it should not be driven by a small A3 transmitter, permitting a 5 watt 'phone station to use higher power without the cost of a large modulator and associated power supplies. This is offset by a small loss of efficiency.

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Grid Circuit

The input signal, between 2 and 4 watts peak, is fed through a co-axial socket on the front panel and thence to the link winding of the grid coil in use. The nominal input

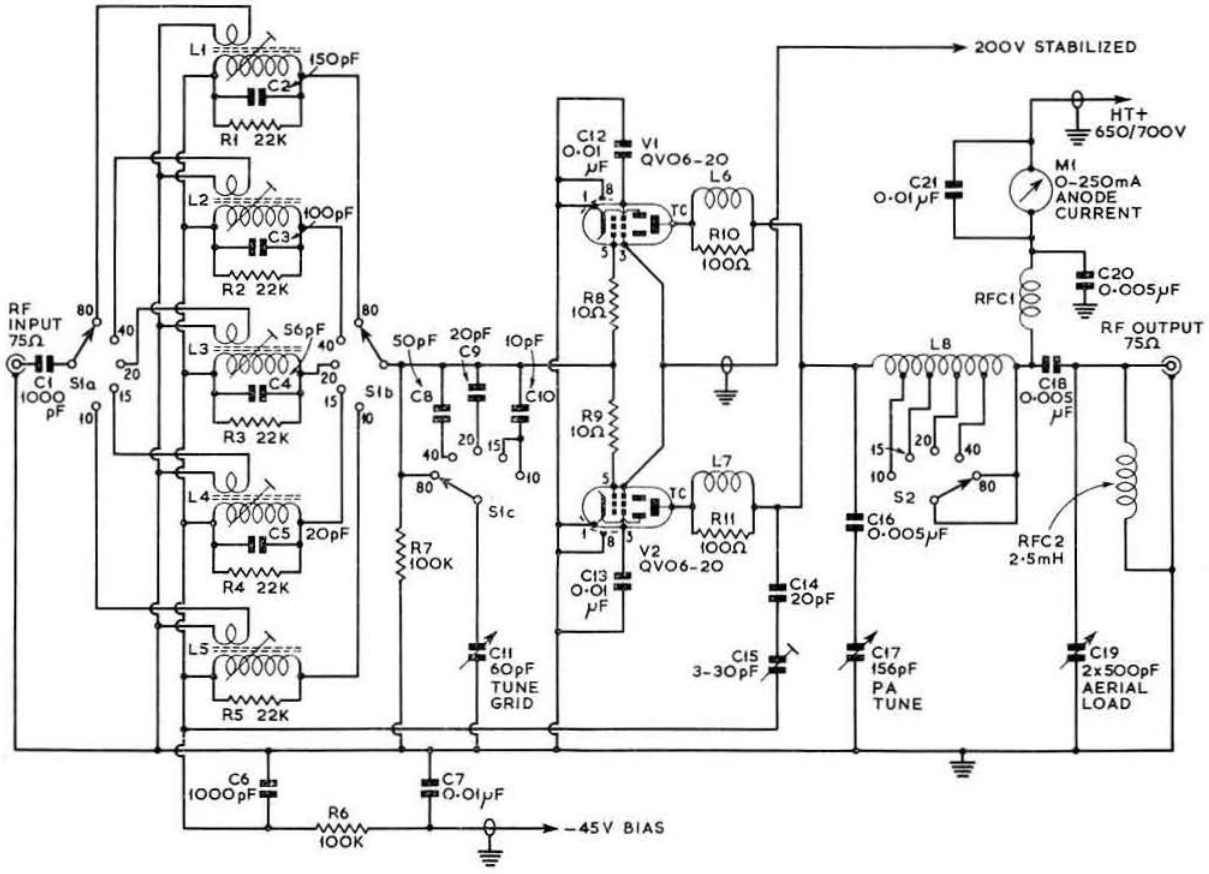


Fig. 1. Circuit diagram of a linear amplifier for 10 to 80m.

C1, 2, 3, 4, 5, 6, 8, 9, 10, silver mica type 5 per cent tolerance; C11, 60 pF variable (Eddystone type 582); C14, 20 pF 10 per cent tolerance high voltage ceramic (T.C.C. type HVD3); C15, 3-30 pF Philips trimmer; C17, 156 pF variable (ex-TU5B unit); C19, two gang 500 pF per section receiving type variable; R13, 14, 15, 16, 21, 22, 150 K ohms ½ watt high stability; S1, 2 bank 3 pole 5 way Yaxley type, break before make; S2, 1 bank 5 way ceramic (ex-TU5B unit).

impedance is 75 ohms. The coil for each band has a damping resistor across the tuned winding to reduce the loaded Q and increase the margin of stability.

In the interests of good linearity, it is of great importance to ensure the stability of the amplifier under all conditions. Instability will result in degrading the outgoing signal and causing distortion products which will cause interference to adjacent signals.

Separate padding capacitors are switched into circuit on each band, reducing the electrical coverage of the grid tuning capacitor. This avoids the danger of tuning to an unwanted signal and also the need to calibrate this control. The bottom of the tuned winding on each coil is taken to a common bus-bar, with a 1000 pF capacitor from this point to earth. Bias voltage is fed to the valves through the grid coils.

Liberal decoupling is used around the valves to avoid the presence of r.f. on the supply leads. The screen grids are fed from a stabilized nominal 215 volts source, using two miniature stabilizers in series. However, this may be within range 195 volts to 215 volts depending on the stabilizers available.

Alignment of the grid circuits is best accomplished with a grid dip oscillator. Set C11 to near maximum capacity, adjust each core in turn and then check that the swing of C11 encompasses each band.

Inductor Table

L1, 31 turns 28 s.w.g. enam., close wound on Aladdin type F.804 former 13/64 in. diameter with iron dust core. (Nominal inductance 9 μH.)
L2, 15 turns 28 s.w.g. enam., close wound on Aladdin type F.804 former 13/64 in. diameter with iron dust core. (Nominal inductance 3·6 μH.)
L3, 14 turns 28 s.w.g. enam., winding length 0·7 in., on Aladdin type F.804 former with half iron dust core. (Nominal inductance 1·35 μH.)
L1, L2, L3 have 2 turns 28 s.w.g. enam. link windings at the earthy ends.
L4, 10 turns 28 s.w.g. enam., winding length 0·5 in., on Aladdin type F.804 former with half iron dust core (Nominal inductance 1·03 μH.)
L5, 7 turns 28 s.w.g. enam., winding length 0·5 in., on Aladdin former type F.804 with no core. (Nominal inductance 0·8 μH.)
L4, L5 have 1 turn 28 s.w.g. enam. link winding at the earthy ends.
L6, L7, 7 turns 22 s.w.g. enam. wound on the ½ watt resistors R10 and R11 respectively.
L8, 28 turns 20 s.w.g. tinned copper, single spaced for 21 turns, double spaced for remaining 7 turns, on 1·75 in. ceramic former, total winding length 2·4 in., tapped at 16 turns (7 Mc/s), 7 turns (14 Mc/s), 4½ turns (21 Mc/s) and 2½ turns (28 Mc/s).
RFC1, 100 turns 36 s.w.g. enam., close wound on ½ in. diameter Tufnol former.
RFC2, 2·5 mH (Eddystone type 737).

P. A. Tank Circuit

A modified pi-section anode tank circuit is used, calculated for an output impedance of 75 ohms. The anode supply passes through the p.a. coil, h.t. being fed in at the aerial end through an r.f. choke. This d.c. potential does not appear

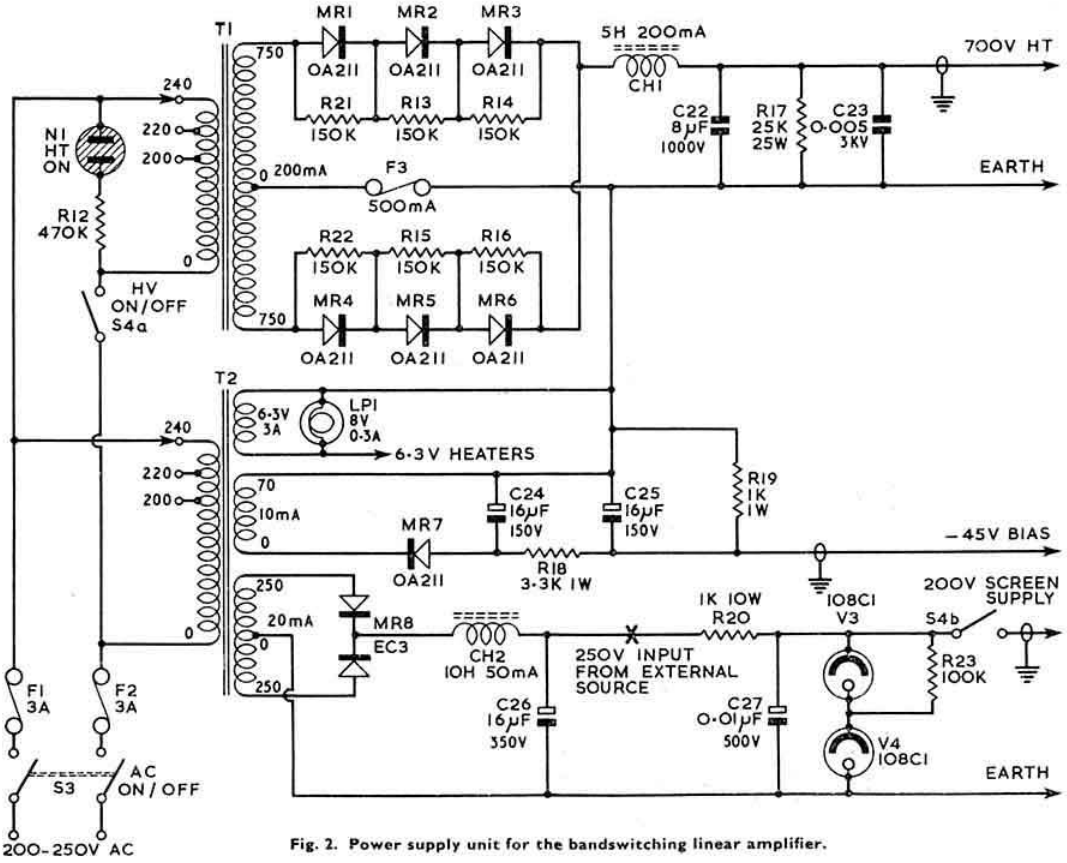


Fig. 2. Power supply unit for the bandswitching linear amplifier.

across either variable capacitor due to the series blocking capacitors. Note that S2 carries the full d.c. potential.

Using this method, the r.f. choke is no longer liable to damage, should it resonate within the bands in use. A further small r.f. choke is wired across the r.f. output socket to guard against a "hot" aerial, should the blocking capacitor fail.

Parasitic stoppers are incorporated right at the top cap connections of the valves, as well as on the grid pins below chassis. Neutralization is by means of the Philips trimmer and series blocking capacitor. The trimmer is wired straight through the chassis on to the grid coil bus-bar. This trimmer and the 1000 pF capacitor to earth together with the C_{a-g} and C_{a-k} of the valves form a bridge neutralizing circuit which is, in theory, suitable for use over a wide range of frequencies without re-adjustment. C15 is adjusted with no drive to the amplifier and no output load. When the amplifier is driven into a load, maximum r.f. output should coincide with the dip in anode current, indicating correct neutralizing.

The prototype proved to be a very stable with no tendency to v.h.f. parasitics or tuned anode/tuned grid oscillation when tuned to any frequency covered by the unit. During these tests, no output load was connected. With a resistive load of 75 ohms, the stability should be even better. However, if the aerial feeder has a standing wave, trouble may result.

Over-the-air reports indicate that the distortion products due to non-linearity are very small—in the region of −35db to −40db. Troubles due to TVI complaints lessened when the linear was used instead of the barefoot exciter.

Power Supplies

The general circuitry of the power supply (Fig. 2) is conventional, although silicon rectifiers are employed to conserve space and because of their increased efficiency over valves performing a similar function. Two transformers are used, one supplying all low tension circuits, and the second, the high voltage for the p.a. anodes. This permits primary switching of the high voltage, by far the safest way of dealing with 700 volts.

The silicon rectifiers suggested have a P.I.V. (peak inverse voltage) rating of 700 volts and a current rating of 500 mA. As the R.M.S. secondary voltage is a nominal 750-0-750, it is necessary to use six diodes, arranged in two series sections, to constitute a full-wave rectifier circuit. High stability resistors are wired in parallel with each rectifier to equalize the reverse current.

Choke-input filtering is employed and, together with the low source impedance of the rectifiers, provides a supply which is fairly well regulated under static and dynamic conditions.

The screen, bias and heater supplies are obtained from the second transformer. A small full-wave contact-cooled rectifier, rated at 250 volts 20 mA, feeds two 103C1 (VR105/30) stabilizers, giving a screen voltage of 215 volts. This is slightly higher than is desired. The −45 volts bias is derived by half wave rectification from a 70 volts R.M.S. winding.

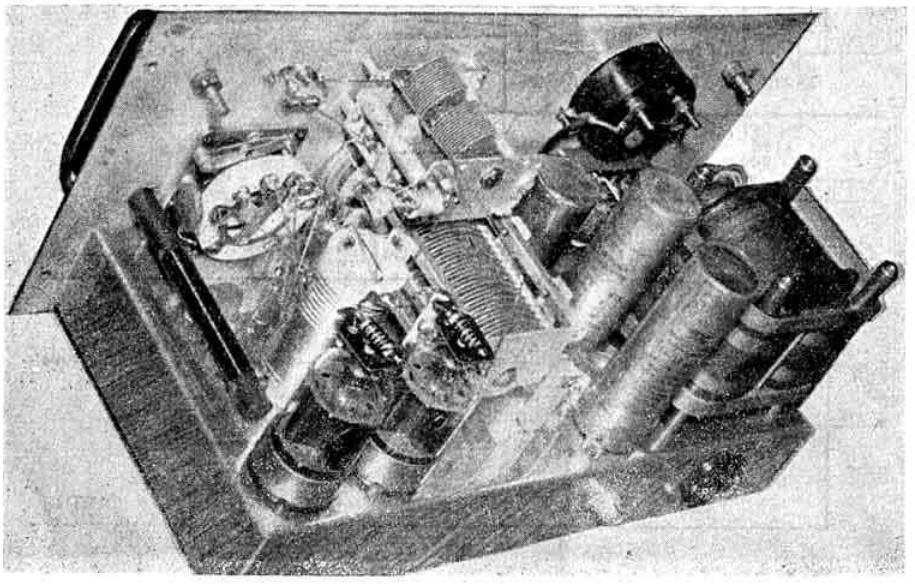
Switching is in the primaries of the two transformers. However, the d.c. screen voltage is switched with the anode supply to avoid the screens drawing a prohibitive current when the high voltage is switched off. Bias is applied at all times. Fuses are situated in the a.c. supply line and the centre tap of the high voltage secondary.

Mechanical Layout

For convenience, the unit was built to fit a surplus T.U. unit case but the general shape and size are not critical, depending largely on available components, As will be seen from the photograph, the anode current meter is on the left of the front panel, with p.a. tune and load capacitors on the right. R.f. input and output sockets are located on the panel to ensure a compact layout.

The layout of the r.f. section must be substantially similar

(Continued on page 473)



A rear view of the amplifier showing the layout of the principal components. The chassis measures 14 in. × 7 in. and the front panel 16¾ in. × 7¾ in. The power supply is at the right of this picture and the r.f. section in the foreground.

Using H.F. Crystal Oscillators

A Survey of Modern Practice

By PAT HAWKER (G3VA)

THIS year marks the fortieth anniversary of the original publication of the work of Dr. G. W. Pierce of Harvard University on the stabilization of oscillators by quartz crystals, the characteristics of which had earlier been investigated by Dr. W. G. Cady. An article on quartz oscillators appeared in *QST* in 1924 and from then until 1939 amateurs almost certainly formed the bulk of the users of quartz crystals.

But in the years following the 1939-45 war—which saw a vast increase in the manufacture of quartz crystals for Service and commercial equipment—there was a marked reversal of earlier trends. Apart from frequency calibrators and v.h.f. equipment, crystals almost disappeared from many amateur shacks, despite the large number of inexpensive surplus crystals available. Transmitters went over to v.f.o. control; receivers used double-conversion to obtain the necessary selectivity.

Now, however, there is a growing swing back, and the quartz crystal is again coming into its own; filter networks for receivers and s.s.b. exciters; mixer-type v.f.o.'s and "frequency synthesizers"; "pulled" crystals for variable crystal oscillators (VXO); transistor transmitters, and—perhaps most important of all—switched crystal-controlled h.f. oscillators for receivers and converters.

Accompanying this return to quartz have been new valve and transistor circuits galore—more than a dozen have been included in recent *Technical Topics* alone. Detailed articles on bandpass filter design and crystal etching have appeared. But surprisingly few articles have been published lately on the practical aspects of crystal characteristics and on the technical know-how required to obtain optimum performance from quartz h.f. oscillators. Yet, many of the new applications demand stabilities considerably higher than those of the past; unless careful regard is paid to the best use of quartz oscillators their substitution for *L-C* oscillators may not always prove as beneficial as was hoped. Today we can no longer regard quartz oscillators as always being high stability devices, and leave it at that.

It is the aim of this article to collate practical information in a form useful to the amateur. We have drawn freely on such sources as references [1], [2] and [3], and especially on a most useful booklet—*Guide to the Specification and Use of Quartz Oscillator Crystals*—prepared a few years ago by a committee of quartz experts. This booklet [4], which we shall refer to simply as the *Crystal Guide*, is well known to professional users of crystals but has received little mention in amateur radio journals.

No attempt will be made here to describe the basic principles of quartz resonators; interested readers will find ample information in references [1] and [2] and in the books listed in the Bibliography.

Early h.f. crystals were mainly of the *X* and *Y* cuts (the type is determined by the orientation of the cut with respect to the optical and electrical axes). Both these crystal cuts had appreciable frequency drift with variations in temperature. The temperature coefficient of the very popular *X*-cut was of the order of −25 parts per million per °C. Thus at 15 Mc/s a change of only 5°C would produce a drift of the order of −2 kc/s. *Y*-cut crystals suffered even more seriously from this cause. With a temperature coefficient of around 90 parts per million per °C, drift was about three times that of *X*-cut crystals. In many cases this frequency variation took the form of discrete jumps rather than a steady drift.

Modern Crystals

Later, new crystal cuts—*AT* and *BT*—were introduced resulting in a marked reduction of temperature drift. The *AT*-cut crystal is about two-thirds the thickness of a *BT*-cut one for the same frequency, and is thus more economical of quartz. Generally, modern h.f. crystals up to about 6 Mc/s are *AT*-cut; above 6 Mc/s or so, the *AT*-cut crystal becomes rather fragile and the *BT*-cut is often preferred. *AT*-cut crystals tend to be somewhat more active than *BT*-cut ones. These crystals are sometimes referred to as "zero temperature coefficient" crystals from which it might be supposed that they would be completely unaffected by temperature changes. Unfortunately this is by no means the case. How then can the makers justify the use of this term?

In the case of *BT*-cut crystals the frequency/temperature curves are in the form of a parabola: see Fig. 1(a). At low temperature the crystal has a negative coefficient; this gradually decreases, and then beyond a critical temperature begins to increase again. At the critical temperature the curve forms the apex of a parabola and the temperature coefficient is in fact zero over a limited range. The manufacturer can control the temperature at which this apex occurs. Usually this is made 40°C, but for crystals intended for use in crystal ovens it is generally 75°C.

Thus for limited departures from the apex temperature, the temperature coefficient is very low indeed; but as the temperature moves substantially above or below this figure, the coefficient becomes increasingly negative. A typical *BT*-cut crystal might have a negative coefficient of 40 parts per

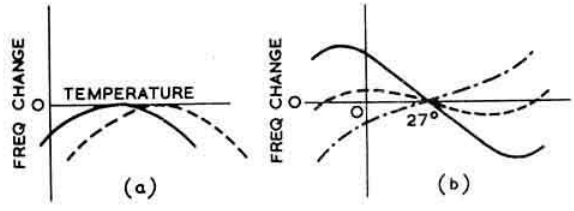


Fig. 1. Frequency/temperature curves of "zero temperature coefficient" crystals. (a) Typical BT-cut crystals. (b) Typical AT-cut crystals.

million 33°C from the apex but this may increase to around 100 parts per million 50°C from the apex. For this reason crystals should not be mounted close to "hot-running" components and valves. Since the temperature of a crystal will also be raised by overdriving, the drive level in high stability circuits should be kept as low as possible. A crystal intended for use in an oven would have an appreciable temperature coefficient at room temperatures.

AT-cut crystals have a rather more complex frequency/temperature curve and considerable changes in the shape of this curve can be brought about by only slight variations in the angle of cut. Fig. 1(b) shows a family of such curves. It will be noted that all these curves pass through zero at more or less the same point (27°C). At this temperature some coefficient curves pass from positive to negative; others from negative to positive. Some curves remain very flat, others have substantial bumps. For the degree of temperature variations likely to be encountered in amateur practice, the *AT*-cut is usually more stable than the *BT*-cut, assuming that the correct drive levels are adhered to. Typically, a tolerance of 20 parts per million can be obtained for a temperature variation from 0°C to 70°C.

In practice, and with no special precautions, the average h.f. crystal oscillator using a valve will provide a stability of the order of ± 50 parts per million, or ± 50 c/s in 1 Mc/s; this amounts to just over ± 1 kc/s at 21 Mc/s and ± 7·5 kc/s at 150 Mc/s. Transistor oscillators have a further variable to contend with—the appreciable temperature sensitivity of the junctions. In commercial practice, the complete transistor oscillator may be contained within the crystal oven.

Mounting

The early holders used by amateurs consisted of two ground plates mounted horizontally, with the weight of the top plate providing the necessary slight pressure. These open holders suffered badly from electrode oxidization and both the electrodes and the crystals had to be cleaned frequently. Crystals could be cleaned with carbon tetrachloride or preferably with a little soapy water. Later the gapped holder was introduced, and still later the electrodes were plated directly on the crystal.

The best modern holders are sealed against moisture with metal cases and glass/metal seals or with evacuated glass envelopes. However, less expensive types such as phenolic resin or ceramic holders with a moisture-excluding gasket at the join are commonly used in amateur practice, though they should not be regarded as really suitable in the most rigorous climatic conditions.

TABLE 1

Crystal Holder Dimensions

Type	Defence Specification* Type	Pin Spacing (in.)	Pin Diameter (in.)	Pin Length (in.)
10XJ	B	0·505	0·127	0·62
FT243	C	0·494	0·095	0·437
HC-6/U	D	0·494	0·052	0·248
HC-18/U	J	0·200	0·019	1·5
—	K	0·192	0·040	0·238

*Defence specification No. 5271.

A number of different holders and pin dimensions are used: see Table 1. Metal cases where used are not connected to either electrode.

Since h.f. crystals tend to oscillate mainly at the centre of the quartz plate, modern units may have plated electrodes with wire supports to inactive parts of the crystal. The *Crystal Guide* notes that difficulties can arise when a plated crystal is substituted for the older gap-mounted type; the plated crystal is usually more active, while the absence of the gap increases the electrical coupling between crystal and circuit. Crystals in gapped holders can generally be driven harder than plated types.

Circuit Considerations

While the performance of a quartz oscillator is governed largely by the design of the crystal itself, its behaviour can be seriously affected by the way in which it is used. For example quite small variations in input capacitance may be magnified by Miller effect in the valve or transistor and cause appreciable variations in output frequency.

Most amateurs know that seriously overdriving a crystal (for example by excessive power dissipation or feedback in the oscillator stage) can result in permanent damage or even fracture of the crystal. In the thirties it was common practice to connect a 60 mA fuse bulb in series with the crystal and to adjust the stage so that the filament did not glow. It is less widely appreciated that overdriving at much lower levels than those likely to produce actual damage may nevertheless cause excessive rise in crystal temperature and hence produce appreciable frequency drift every time the crystal oscillator is turned on.

Moderate overdriving can also result in small permanent changes in crystal frequency. Such changes occur principally during the early life—mainly in the first year—of a crystal and are then referred to as "ageing." The degree of the frequency change during ageing is dependent upon a number of factors including drive and temperature. In commercial v.h.f. equipment, with the narrower channels now used, it is common practice to trim out such changes periodically by varying the crystal load capacitance by means of a trimmer.

For these reasons, in both transmitting and receiving applications, the oscillator stage should run at low power levels; a valve with high mutual conductance makes it possible to keep crystal drive low.

Quartz crystals can be broken rather easily by mechanical or electrical shock; contrary to popular belief, low frequency crystals—although thicker—are more prone to such damage than those of higher frequency of the same cut. In fact, some low frequency crystals are unsuitable for use in mobile equipment.

Keying of crystal oscillators should be avoided if possible due to the appreciable build-up and decay times; these may cause clipped dots and also affect a nearby receiver; the stability will also suffer.

The *Crystal Guide* stresses that with keyed oscillators the grid leak and anode and screen decoupling capacitors should be kept as low as possible. Care should also be taken that excessive voltages do not appear across the crystal during keying.

Basic Oscillator Circuits

Quartz oscillators operate in either the parallel or series mode, and the crystal may be resonated at either the funda-

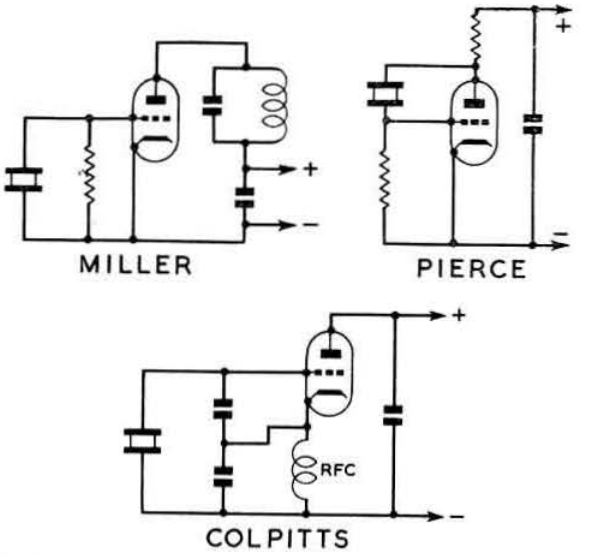


Fig. 2. The three basic parallel-mode crystal oscillators. In the Colpitts circuit a grid leak should be shown connected across the crystal.

mental frequency and then multiplied up as necessary, or alternatively it may be forced to resonate at an " overtone " frequency, again in either parallel or series mode. The selection of parallel or series mode has an appreciable effect upon the stability and output.

The most widely used h.f. circuits are all parallel mode oscillators; these include the well-known Pierce, Miller and Colpitts circuits (Fig. 2) and the popular harmonic generators using electron-coupled versions of the Pierce and Colpitts (the straight Miller circuit is generally considered unsuitable—except in the " tritet " configuration—for this purpose since, when the anode circuit is tuned to an odd harmonic " overtone," oscillation may result).

Stray capacitance across the crystal should be kept low, particularly with the Miller circuit where the effect of such capacitance is increased by the Miller effect. Stray capacitance becomes a problem where several switched crystals are fitted, and where the capacitance becomes large it may be advisable to use the Pierce circuit and switch each side of the crystal unit. Most modern crystals are designed to work into a load capacitance—including the dynamic capacitance represented by the Miller effect—of 30 pF. Changes in load capacitance change the output frequency slightly. The output frequency of a Miller oscillator is affected by the setting of the anode tuned circuit.

In the *Crystal Guide*, it is pointed out that with Colpitts and Miller, stray switch capacitance appears across each crystal in turn. The short-circuiting of crystals not in actual use is recommended.

Typical *AT*-cut (thickness shear) crystals intended for use with a 30 pF load capacitance have a frequency variation for each 1 pF change in load of from about 4·3-12·5 parts per million. The corresponding figures for *AT*-cut (third overtone) and *BT*-cut (thickness shear) crystals are 0·8-1·3 and 2·8-7·9 respectively.

Most crystals between 1 Mc/s and 15 Mc/s are intended primarily for use in parallel resonant oscillators, though many crystals can be used satisfactorily in the series mode. Strictly speaking, such crystals should have the correct loading capacitor wired in parallel.

Popular forms of series resonant oscillators include the Squier, the Butler and variations of what is often termed the Robert Dollar. In general the stability of a series mode oscillator is a good deal higher than that of parallel resonant types but the r.f. output is considerably lower. The output frequency is affected to some extent by the loop phase change in the oscillator circuit but stray parallel capacitance has little importance; it is sometimes possible to squeeze the crystal unit without any noticeable effect even at v.h.f. For this reason, series-mode oscillators are recommended for transistors since temperature changes in the transistor will have a much less important effect.

Series resonant circuits usually include a tuned circuit and this may be inconvenient for switching; a further complication in crystal switching is that the crystal is seldom earthed at either end.

TABLE 2

Characteristics of Basic Oscillator Circuits

Characteristic	Parallel-mode Oscillators		Series-mode Oscillators
	Pierce Colpitts	Miller	
Typical Stability*	10 p.p.m.	25 p.p.m.	5 p.p.m.
Power Output	Moderate	High	Low to moderate
Frequency range	To 20 Mc/s	To 20 Mc/s	To highest overtone
Adjustment	No tuning	Tuning	Tuning
Crystal switching	Easy	Switching of tuned circuits	Switching of tuned circuits

Notes: Adapted from Reference 4. *Stability figures assume constant crystal conditions. Pierce and Colpitts figure can be improved. Miller stability is for typical maximum permissible drive level. A stability better than 1 p.p.m. is obtainable with Meacham bridge oscillators (see references 1, 2).

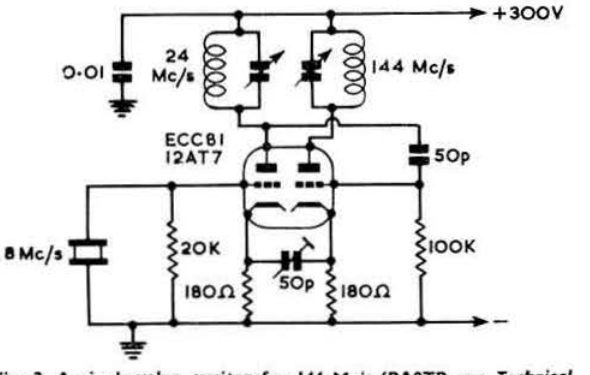


Fig. 3. A single-valve exciter for 144 Mc/s (PA0TP, see *Technical Topics*, August, 1961).

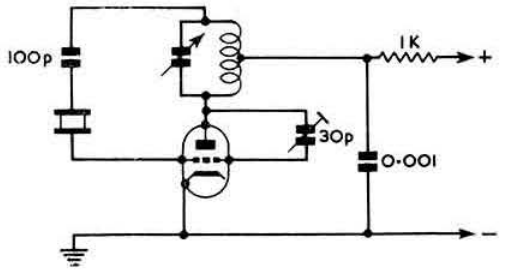


Fig. 4. Overtone crystal oscillator for fifth and higher overtones with active FT243 crystals. Suitable valves EC92, 6C4 or half ECC81/12AT7 (PA0EZ, see *Technical Topics*, August, 1961). A 15 K grid leak (not shown) is connected between grid and earth.

Both parallel and series mode oscillators can be resonated at an odd overtone. Overtone frequencies are nearly but not exactly odd multiples of the fundamental frequency, the overtone frequency being slightly higher than the exact multiple. In an overtone oscillator—unlike a harmonic generator—there is no output anywhere in the circuit on frequencies below that of the overtone concerned. Since regenerative feedback is used power must be kept low to avoid overdriving the crystal.

Most crystals will function satisfactorily at the third overtone, but fifth and seventh overtones can be obtained with particularly active crystals and in some circuits.

Overtone oscillators have been widely used for v.h.f. equipment, effectively cutting down the number of frequency multiplying stages required; details will be found in the *Amateur Radio Handbook*. Today, however, they are also proving very popular for h.f. receivers and converters, where the absence of lower frequency outputs is particularly attractive for reducing spurious responses.

It should be noted, however, that W4LNG [11] has recently concluded that the special third-overtone type crystals, while suitable for h.f./v.h.f. converters, are not to be recommended for transmitters, except low-powered battery types. Because of the need to operate these crystals at very low power levels the economy is less than might be expected. W4LNG provides curves showing the effect of temperature, supply voltage and load capacitance variations on a 32·5 Mc/s third-overtone crystal.

Table 2, reproduced from the *Crystal Guide*, provides a useful brief summary of the relative merits of some basic oscillator circuits.

Since transistor circuits are still relatively uncommon, a number culled from recent designs have been included: see Figs. 8 to 13.

Frequency Pulling and VXOs

From the early days of crystal control it was realized that it would be advantageous if the frequency could be shifted slightly in order to dodge interference, etc. The " Goyder lock " devised by Cecil Goyder of Mill Hill School (2SZ) fame comprised an *L-C* oscillator locked by a crystal; although successfully used by a number of amateurs in the 'twenties it fell into disuse because of the ease with which in less skilled hands the " lock " could become " unlatched."

The introduction of gapped holders made possible a much less critical means of frequency variation. Variable gap holders were marketed, permitting frequency variation up to

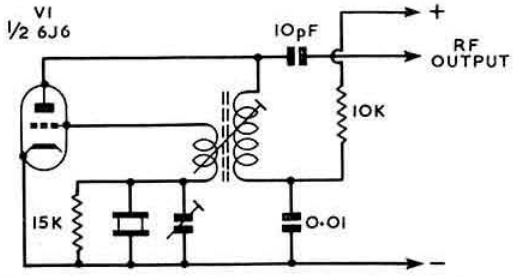


Fig. 5. Overtone crystal oscillator for third and fifth overtones with FT243 crystals (PA0DOK).

An " overtone-harmonic " triode oscillator for overtone crystals has recently been described by W6AJF (CQ, February, 1963) with a cathode (or emitter) circuit tuned to the overtone frequency and the anode (or collector) tuned to twice or three times this frequency, giving an output suitable for direct use in 144 Mc/s converters.

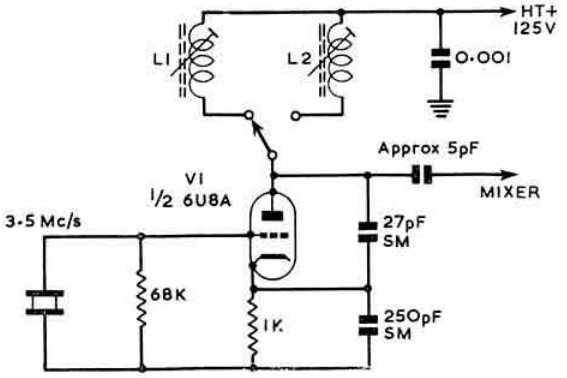


Fig. 6. Fundamental/overtone oscillator for h.f. converter (W4GEB/W1IOP). L1 tunes to 10·5 Mc/s (for 7 and 14 Mc/s with receiver tuning 3·5 Mc/s); L2 tunes to 17·5 Mc/s (for 21 Mc/s reception). Fundamental oscillation occurs when the anode circuit is not tuned to overtone frequency.

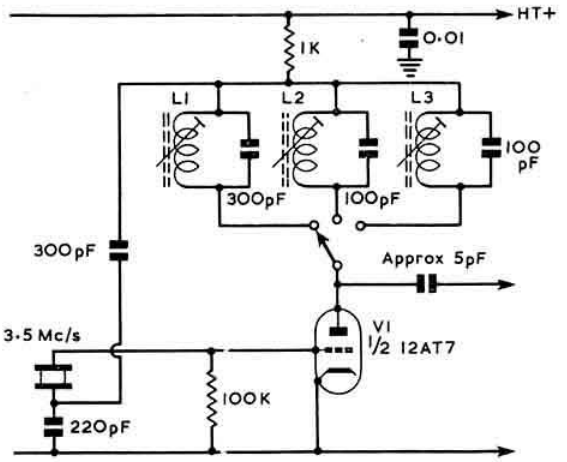


Fig. 7. Fundamental/overtone series-mode oscillator for a h.f. converter (ZL2AMJ), providing outputs on 3·5 Mc/s (L1, 35 turns); 10·5 Mc/s (L2, 13 turns); and 17·5 Mc/s (L3, 8 turns, spread over ⅜ in.). Coils are wound on ¼ in. diameter slug-tuned formers with 30 s.w.g. enamelled wire.

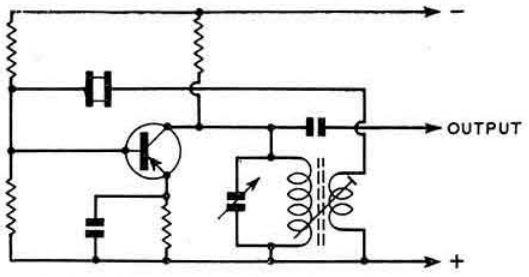


Fig. 8. Basic series-mode transistor oscillator (Ref. 2).

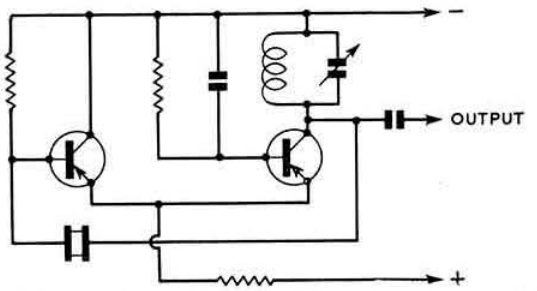


Fig. 9. Two-transistor series-mode oscillator will work with crystals whose series-resistance is too high for use with the circuit of Fig. 8. The second transistor provides a high impedance input (Ref. 2).

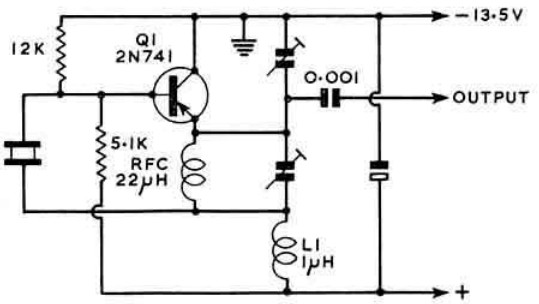


Fig. 10. There are many possible configurations for transistor oscillators. This is a 27 Mc/s "bootstrap" series-mode Colpitts overtone power oscillator permitting the heat-sink to be connected directly to the collector.

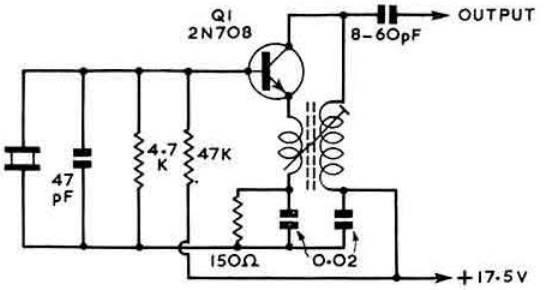


Fig. 11. A 25 Mc/s series-mode overtone power oscillator using an n-p-n transistor.

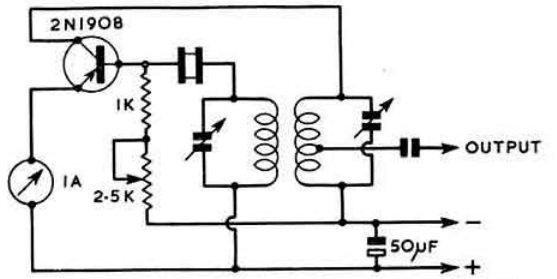


Fig. 12. High-power series-mode transistor oscillator (VE3ABU) providing up to 2 watts output from 3·5 Mc/s crystal. Miniature crystals should not be used with this type of circuit.

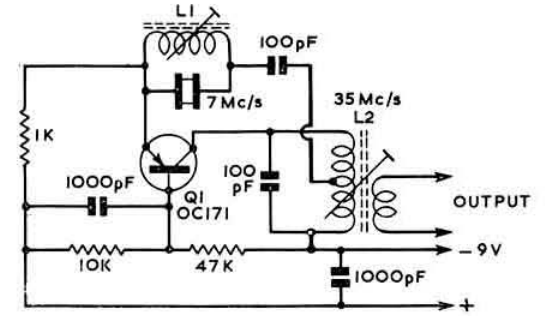


Fig. 13. An overtone circuit suitable for third and fifth overtones from FT243 7 Mc/s crystals. (PA0KSB). L1 with crystal holder capacitance tunes to 35 Mc/s. The tapping on L2 is about one-third from the "earthy" end.

a maximum of about 0·3 per cent of the fundamental frequency. Improvised methods such as the insertion of cigarette paper between crystal and holder were also used occasionally.

The frequency of a crystal can be "pulled" by putting a suitable variable reactance in series or parallel with the crystal (the various configurations are considered in Terman). For a long time the main use made of this by amateurs was for the trimming of frequency calibrators to zero beat with Droitwich or WWV. A table showing the effect on the crystal frequency of adding external reactance is given in the *R.S.G.B. Amateur Radio Handbook* (page 164).

Stanesby and Fryer [5] showed that a frequency shift of the order of 1 part in 1000 (0·1 per cent) could be obtained in h.f. oscillators by connecting a tuned circuit across the crystal: Fig. 14. Although this circuit was published in *Amateur Radio* and the BULLETIN relatively little use was made of it by amateurs.

Since 1958 amateur interest in variable crystal oscillators has been revived, prompted in part by a *QST* article by W3BWK [6]. The usual form (Fig. 15) has a series inductor shunted with a resistor, with frequency shift controlled by a split-stator variable capacitor. Continuously variable frequency shifts of the order of 1 part in 300 (0·33 per cent)

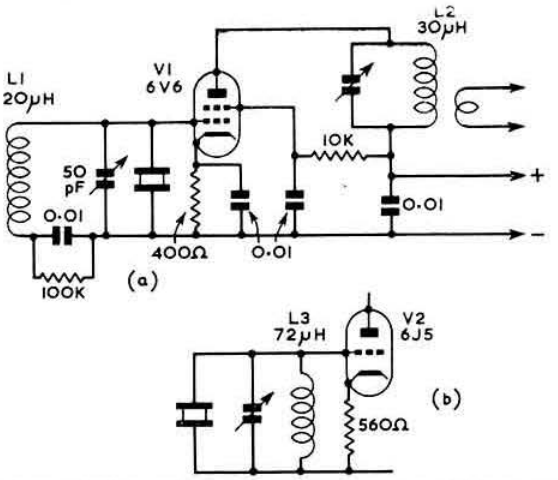


Fig. 14. Variable crystal oscillators using parallel reactance. (a) Design by VK2JR, 3·5 Mc/s X-cut crystal; L1 20 μH, L2 30 μH. (b) Input circuit from Ref. 5, L3 72 μH. Frequency shifts about 1 kc/s per Mc/s. Care should be taken with AT-cut crystals to avoid oscillation on spurious frequencies.

can be readily achieved; some published articles claim useful shifts as high as 1·5 per cent, though the stability drops sharply with greater pulling.

This particular technique would appear to date back to at least 1940 [7] although we are unaware of any substantial use being made of it for VXO's until the W3BWK article.

The stability of a VXO is below that of an unpulled crystal and depends upon the mechanical and thermal stability of the frequency pulling components. The further the crystal is pulled the lower the stability until finally the crystal loses control and we are left with an *L-C* oscillator.

A transistor version of this circuit was given in *Technical Topics* (February, 1963).

Transitron V.H.F. VXO

A high stability series resonant VXO circuit which is relatively little known but which has been used in several recent designs for v.h.f. s.s.b. transmitters and transceivers is the transitron [5]. In this circuit, the valve, with grid and cathode earthed, appears as a negative resistance of the order

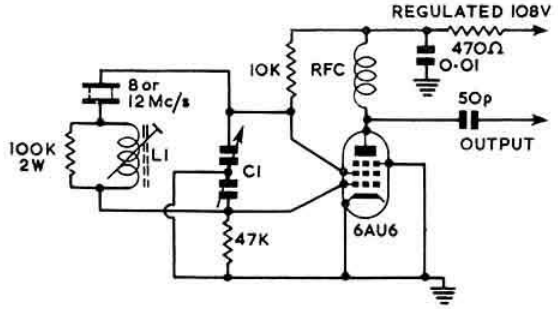


Fig. 15. Variable-frequency oscillator using circuit adapted by W3KXI from W3BWK's circuit. L1 governs the degree of frequency shift and typical value is winding length 1 in. of No. 26 (U.S.) enam. close wound on ¼ in. former with h.f. iron slug.

of −100 ohms. When a tuned circuit of less than 100 ohms is connected in the screen grid circuit oscillation is maintained. L1 and C1 are tuned to the crystal frequency by means of a grid dip oscillator with the stage inoperative and with the 3·9 K ohms resistor disconnected and the crystal sockets short-circuited. The values shown are for operation in the 24-37 Mc/s range but can be scaled for other frequencies. Frequency shifts of about 200-300 kc/s on 144 Mc/s can be achieved but for high stability the shift should be limited to about 100 kc/s. The output from the oscillator stage is very low and should be fed into a high gain 6AK5 buffer stage. The circuit can also be used without the VXO facility.

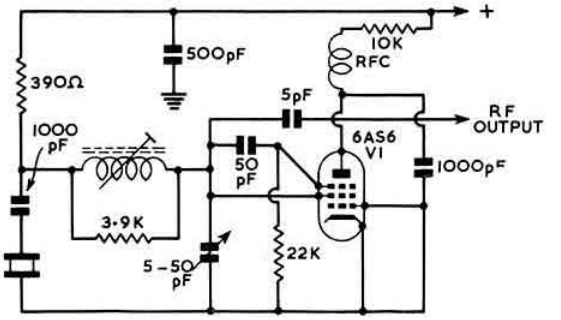


Fig. 16. High-stability v.h.f. series-mode transitron variable frequency oscillator with values suitable for 24-40 Mc/s range. Frequency shift at 144 Mc/s should be limited to about 100 kc/s for maximum stability by adjustment of L1 (about 12 turns, 28 B & S, close-wound on ¼ in. former). The type 6AS6 valve is available in this country (Mullard). The iron-dust cored coil should be marked L1 and 5-50 pF trimmer C1.

Harmonic Generators

Harmonic generators are particularly suitable for use in compact h.f. transmitters since usable output can be obtained on both odd and even harmonics up to about the sixth harmonic (or about fourth harmonic if the oscillator is required to drive a low power amplifier direct). The most commonly used circuits are the Colpitts (with electron coupling to the harmonically tuned anode circuit); the tritet (see below); and the modified Pierce (with crystal connected between grid and screen-grid and electron coupled to the anode circuit).

W2LCB suggests [9] that with high slope valves the tritet and Colpitts circuits provide appreciably more harmonic output than the modified Pierce. He found a direct

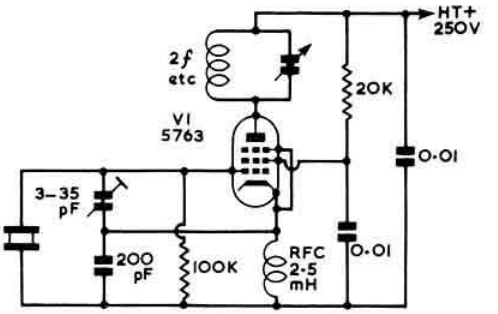


Fig. 17. Colpitts harmonic generator provides output on 7, 14, 21 and 28 Mc/s from 3·5 Mc/s crystal.

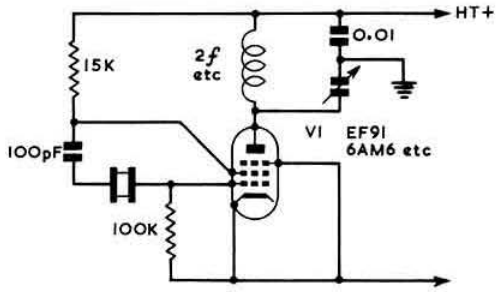


Fig. 18. Modified Pierce harmonic generator.

relationship between the mutual conductance of the valve and the goodness of the valve for this application.

The long popular tritet (so called because it combines a *tri*ode oscillator with a *tet*rode doubler in the same valve) is basically a Miller oscillator with the fundamental resonant circuit in the cathode circuit with electron coupling to the harmonically tuned anode circuit. The cathode circuit should be tuned well to the h.f. side of the crystal fundamental; the nearer to resonance the greater the crystal drive and this can rise to harmful levels unless stage input is kept low. Circuit details appear in the *Amateur Radio Handbook*.

Detailed results from a modified Pierce oscillator have been published [10]. Output voltages with an anode current of 8·5 mA and anode voltage of 250 volts with a 3750 kc/s crystal were: 2nd harmonic 117 volts; 3rd 58 volts; 4th 27 volts; 5th 21·5 volts; 6th 11·5 volts; reducing to 2·8 volts at the 10th harmonic.

Crystal Activity

There is considerable variation between different crystals, even of the same cut. This variation may well determine the suitability of a crystal for use in particular circuits.

The ease with which a crystal can be made to oscillate is termed its " activity " and can be measured quantitatively by instruments developed for this purpose (e.g., Test Set 193); see reference 2. A simple test to provide some indication of crystal activity is possible with many Colpitts-type grid-dip oscillators. With the tuning capacitance set to minimum the crystal is plugged in place of the coil and the meter reading noted. The higher the reading the more active the crystal; if only one crystal is being tested, check that the reading is about the same as that with the coil inserted. Varying the capacitance will also show the approximate pulling range of the crystal. These are of course only very rough checks but can provide useful information.

A compact transistorized activity check meter is described in Reference 12.

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[4] " *Guide to the specification and use of quartz crystal oscillators*," Electronic Engineering Association, 11 Green Street, London, W.1.

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[10] G. R. PEARCE (ZL1AKL/G3AYL) *et al.*, " Modified Pierce Crystal Oscillator," R.S.G.B. BULLETIN, November, 1953. (Out of print.)

[11] R. L. ELLIS, Jr. (W4LNG), " Frequency Stability of Third-Overtone Crystals," *QST*, January, 1963.

[12] J. R. GAZELEY (B.R.S.20533), " A Transistorized Crystal Activity Check Meter," R.S.G.B. BULLETIN, June, 1962.

Hydraulic Aerial Mast (Continued from page 461)

(xi) Open the air cock to let out enough water to lower mast no. 2 by 1 in., then close the cock. This closes the limit port.

(xii) Tighten clamp *G* at the top of mast no. 1.

(xiii) Adjust all guy wires very tightly.

(xiv) Close the wheel valve and disconnect the pump.

The water is ordinarily left in the mast when it is raised but, if there is risk of frost, the water may be drained by opening the wheel valve: if this is done, the bottom mast must be refilled with water before the mast is lowered. In lowering the mast, the following sequence should be adopted.

(i) Loosen clamp *G* at the top of mast no. 1 and allow mast no. 2 to lower itself as far as possible. This will only occur if the mast has been left extended for a considerable time and water has drained away: it should never lose so much that mast no. 2 will completely retract by itself.

(ii) Open the air cock and allow mast no. 2 to complete its retraction into mast no. 1.

(iii) Close the air cock.

(iv) Loosen clamp *H* at the top of tube no. 2.

(v) Open the air cock and allow tube no. 3 to retract into tube no. 2.

* * *

The writer's mast has been in use for over four years and in that time has given no trouble at all. When recently stripped down no deterioration of the water-retaining washers and associated parts was evident although the mast has frequently been raised and lowered.

Single Sideband

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

ONE of the major advantages of single sideband working is the ability to be able to carry on a natural conversation and get away from the long-winded over-to-you monologues of the past. It is customary to control the transmitter and receiver with muting bias that is switched with a change-over relay operated by a press-to-talk button or by a VOX (automatic voice control) system.

In the writer's opinion, the additional components and complication of a fully automatic VOX system are not worth while. Everything the voice control system can do, can be done equally well with a simple push button mounted on the microphone or placed on a block of wood on the floor. However, this is a matter of personal opinion and every operator is entitled to use the system that appeals to him best.

Ideally, the muting bias would be switched electronically and there would be no problem of clicking and thumping relays. There is, however, the further problem of aerial change-over, and if the system is electronic the aerial switching must also be electronic using some form of TR switch. Unfortunately the most satisfactory TR switch is the high impedance type linked back to the linear amplifier output circuits, and a sideband amplifier—drawing a considerable zero-signal anode current—is a most efficient noise generator. To stop the noise generation the p.a. must be made non-conducting during receiving periods; this is possible either by removing the screen potential or by applying additional negative voltage to the control grid. However, it is not practicable if the amplifier happens to be a zero bias triode, or a tetrode in a G2DAF amplifier circuit where there is neither bias or screen voltage. Additionally there is the further problem for those amateurs using mercury vapour rectifiers of getting rid of rectifier "hash."

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Single Sideband Control Systems

In general, most sideband workers appear to be using aerial change-over relays, and a further relay as the "master control" built into the exciter. This system is simple and works very well. The only complaint is that of relay noise—this applies particularly to the aerial relay and in fact the usual comment refers to "thumps" and "clangs." From this it would appear that many operators are still using the heavy duty, wide gap, Leach type aerial change-over relay found in the average a.m. station. That this is so would indicate a failure to appreciate that large contact surfaces are quite unnecessary in the aerial circuit of a single sideband transmitter, and that a Post Office type 3000 (or even smaller) relay with miniature contacts and a small gap—and therefore quiet operation—is perfectly suitable.

At G2DAF the exciter uses a pair of 6146 valves in class AB1 requiring about 50 volts negative bias. The small supply unit is built into the main power pack and a lead feeds through into the exciter chassis. This negative voltage not only provides bias for the driver valves but is used additionally as the source of negative muting voltage.

Fig. 1 shows the complete circuit arrangement with the controlling relay mounted on the exciter, and the connections from the second pole going to a terminal block on the rear chassis apron. Any small mains transformer rated for 50 mA is suitable for T1 and if there is a centre tapped secondary (120-0-120 volts or thereabouts) two rectifiers only can be used instead of four as shown.

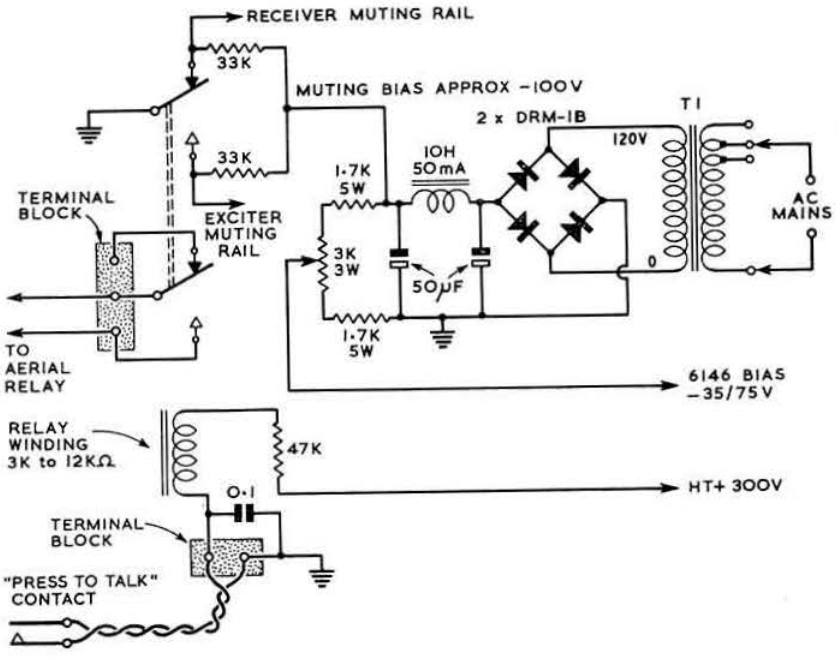


Fig. 1. Transmitter and receiver control system at G2DAF. The bias supply is in the main exciter power pack, with the 3 K ohm potentiometer and the relay on the exciter chassis. The relay is a high resistance two pole change-over type.

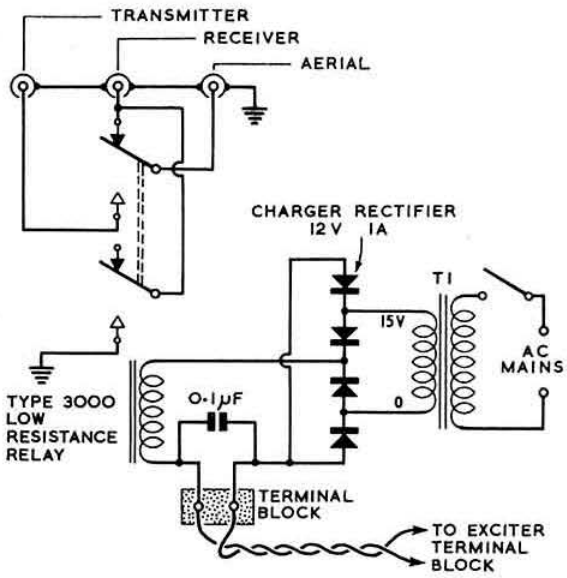


Fig. 2. Aerial control system at G2DAF. T1 may be any transformer that will give about 15 volts output. The relay is energized for transmit—this enables the receiver to be used when the transmitter is off or disconnected. The relay is a two pole change-over type.

It will be noted that the negative output of 100 to 125 volts is simultaneously feeding both the receiver and the exciter muting rails. However, the receiver is operative because the change-over relay contact is short-circuiting the negative voltage down to ground. When the press-to-talk button is depressed, h.t. current flows through the 47 K ohms resistor and energizes the relay winding (this may be any suitable value from 3 K up to 12 K ohms). The change-over contact moves over and short-circuits the exciter muting voltage to earth. At the same time the aerial contact closes and completes the circuit feeding the 12 volt energizing current to the aerial change-over relay.

Points of this system to note are:

(i) For a moment of time while the relay pole is in a mid position, *both* exciter and receiver are muted. Because of this, the receiver goes " dead " before the transmitter comes on and there is no thump from the loudspeaker.

(ii) After a period of transmission the exciter is muted *before* the receiver can recover and there cannot be any " howl back."

(iii) The exciter is muted and there cannot be any transmission of r.f. from the power amplifier while the aerial relay is changing over. Because of this the possibility of burning contacts by arcing r.f. cannot arise and the only voltage the relay ever has to handle is that on the aerial from the distant transmitting station—plus the usual band noises, static and the vacuum cleaner next door!

With regard to the aerial relay used at G2DAF, this is a Post Office type 600 with a low resistance coil—easily obtainable from most surplus dealers—and is energized with a simple 12 volt supply made up with a battery charger type metal rectifier and a surplus multi-ratio audio output transformer. This has been working very well for about five years with the transformer primary across the mains and the secondary feeding 12-15 volts a.c. to the rectifier.

The most suitable relay is a two pole change-over type. One pole changes over the aerial and the other pole is arranged to short-circuit the receiver input during transmission periods as a protection for the receiver input circuits. This is shown in detail in the circuit of Fig. 2.

A metal chassis is a wonderful sounding board, and any relay—even the most miniature type—will make a noise if it is bolted directly to a sheet of metal. The correct procedure is to isolate it from direct contact by means of a flexible rubber mounting or something similar. The 12 volt supply, the co-axial input sockets, an r.f. ammeter if required and the relay for the aerial system are best mounted in a small aluminium box about 8 in. by 6 in. by 2½ in. deep. The relay can be left hanging on its connecting wires—this is as good a method of isolation as any.

Finally, to those sceptical readers who just cannot believe it: the power amplifier at G2DAF runs close to the licensed maximum and the aerial relay was installed at least five years ago. To date it has never required either adjustment or cleaning.

A Linear for 10 to 80 Metres (Continued from page 464)

to that described otherwise instability may result. All earth connections are taken to a common point near the valve-holders. The neutralizing circuit should be wired as shown.

Power supply layout is quite logical, with the a.c. input socket on the rear chassis drop, and fuse and switches on the panel. The co-axial socket in the centre of the rear was for an incoming 250 volts supply, which was derived from the exciter.

Ventilation of the equipment should be adequate as silicon rectifiers do not like a severe rise in operating temperature, unless mounted on heat sinks. Holes in the underside of the cabinet, which should be on rubber feet, permit the ingress of cool air by convection, the warm air passing out of louvres in the cabinet top.

In conclusion, it is hoped that readers will gain some ideas from this article and that anyone building an amplifier to this design will obtain the same excellent performance as the writer.

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.

Tunable Breakthrough on Transistor Receivers

By F. G. RAYER, Assoc.Brit.I.R.E. (G3OGR)*

BREAKTHROUGH of amateur signals on transistor receivers is in some ways a very difficult problem—most popular transistor portables have features causing susceptibility to interference, and at the same time make it hard to apply a cure. Such receivers are often very sensitive. They use an internal ferrite rod aerial, and in miniature and pocket sets there is no free space to take a wavetrap or other components. They are generally superhets, with only one signal-frequency tuned circuit (the ferrite rod aerial).

Acting on the assumption that nothing can be done to the receiver, because of its small size and ownership, the transmitting amateur can still take some steps which may at least alleviate the results of interference; that is, avoid troublesome frequencies. The same precautions can, of course, be taken with valve receivers. However, with the latter other steps to help suppress interference are sometimes possible, such as the use of wavetraps, or mains suppressor units.

The causes of tunable interference briefly described here are generally well known, but are quite often overlooked. It is hoped the following notes will at least make it clear how some forms of tunable interference may arise, and thus help to point a way to avoiding this trouble.

Image frequency reception may be termed the " simplest " form of tunable interference. If the receiver is tuned to 900 kc/s and has an intermediate frequency of 470 kc/s, the receiver oscillator (usually a self-oscillating mixer) will be tuned to 900 plus 470 kc/s, or 1370 kc/s. The desired station will be 470 kc/s l.f. of the oscillator, or on 900 kc/s. A signal 470 kc/s h.f. of the oscillator frequency will also produce a 470 kc/s output, acceptable by the i.f. amplifier. In this case, such a signal would be on 1840 kc/s (1·84 Mc/s) in the 1·8-2 Mc/s band.

The image frequency is removed from the receiver signal frequency by twice the intermediate frequency. Signals in the 1800-2000 kc/s range may thus cause second channel interference through nearly 860-1060 kc/s (about 350-280 metres) if the transistor set i.f. is 470 kc/s.

Image rejection of the signal frequency tuned circuit (ferrite rod) in transistor portables seems to be reasonably good, bearing in mind circuit limitation. When the receiver i.f. is known, it may be possible to keep clear of frequencies which could cause second channel interference to desired stations, or heterodynes on such stations. Interference spoiling a required programme is clearly a more serious matter than the ability of the offended listener to hear an amateur's signals when the receiver is tuned between stations.

If necessary, a receiver i.f. can be checked with a signal generator. It may not be necessary to open the receiver.

Frequencies to avoid, when transmitting, may be calculated very easily; the required station frequency plus twice the i.f. = image frequency. At least 10 kc/s clear each side is desirable to reduce heterodynes.

In the 3·5-3·8 Mc/s band, mixing of the amateur signal with receiver oscillator harmonics can cause trouble. If so, the amateur signal can be tuned in at various points on the transistor set. Some of these spurious responses may spoil reception of required stations. Tuning, even with the receiver near the transmitter or aerial, may be sharp.

If the receiver is again tuned to 900 kc/s and has a 470 kc/s i.f., the oscillator is operating at 1370 kc/s. The third oscillator harmonic is 1370 × 3 = 4110 kc/s. An amateur signal on 3640 kc/s is 470kc/s l.f. of this harmonic, and will mix with it to produce a 470 kc/s signal accepted by the transistor receiver i.f. amplifier. Signals 470 kc/s h.f. of an oscillator harmonic will similarly produce interference. This, and the presence of second, third and other oscillator harmonics, will give interference over a wide range of broadcast frequencies.

Spot frequencies at which such interference is most likely can be found by noting the frequencies of required broadcast stations, adding the receiver i.f. to obtain the oscillator frequency, multiplying to obtain oscillator harmonics, then adding and subtracting the receiver i.f. to give h.f. and l.f. amateur frequencies liable to cause trouble.

This is easily worked on paper:

Wanted station:	900 kc/s
Receiver i.f.:	470 kc/s
Oscillator frequency:	1370 kc/s
Oscillator × 2:	2740 kc/s
Oscillator × 3:	4110 kc/s
Oscillator × 2 plus i.f.:	3210 kc/s (outside band)
Oscillator × 3 minus i.f.:	3640 kc/s (in band)

and so on.

Interference of this type is also possible on the long wave band. Naturally t.r.f. sets are not affected in this way, nor by image frequency reception.

As would be expected, precautions which reduce the strength of the amateur signal at the transistor mixer are helpful. Local field strength falls rapidly with increased distance, so chances of getting the transmitter, aerial, or any other source of radiation further from the receiver are worth investigating. The simplest test is probably to move the receiver. Attempts to orientate the receiver for minimum pick-up are likely to be useless.

Mains-borne Interference

If the interference remains severe with the transmitter operating into a dummy load (preferably screened) this is a good reason for suspecting mains filter arrangements. Mains leads running into other houses should not be acting as part of the radiating system.

When interference is much reduced by the dummy load, the aerial and its feeder are naturally suspected. An aerial near overhead power lines may induce strong r.f. in them, especially if the two are nearly parallel. An aerial at right angles to power lines is less likely to cause this trouble which may be intensified if the transistor set is placed near house wiring. The usual suspicion attaches to any unbalanced feeder system (downlead of end-fed aerials, Zepp feeders, co-axial feeder).

Attempts to cure interference trouble at the receiver seem particularly difficult. The lack of space in pocket sets has been mentioned. In addition, the mixer base input impedance is low. Again, maximum capacitances of only 115 pF to 208 pF or so are commonly used for aerial tuning, so that stray capacity has to be very low to secure adequate band coverage.

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

THE MONTH ON THE AIR

A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

By R. F. STEVENS (G2BVN)*

LATER in this feature readers will find the text of an announcement by the A.R.R.L. dividing the Channel Islands into two separate " countries " for the purposes of computing scores for the DXCC, a domestic affair sponsored by the League. In order to avoid confusion when claiming awards, particularly where non-English speaking operators are concerned, the R.S.G.B. and other organizations have accepted the arbitrary decisions of the A.R.R.L. in relation to " countries," and has applied them to awards such as BERTA and the Empire DX Certificate.

This latest enlargement of the ever growing DXCC carrot was effected without any prior information being given to I.A.R.U. societies who might be interested in the application in so far as their own awards were concerned. Certainly there could be no compulsion on the A.R.R.L. to contact other organizations in relation to a domestic award, but perhaps this could be classified under the heading of courtesy. The authoritative count of properly constituted countries is under 200, but the total for DXCC purposes is somewhere round the 325 mark, and the position has now reached the point where consideration must be given as to the desirability of following slavishly the trans-Atlantic edicts. Regarding the last decision affecting the Channel Islands, it is obvious that persons living only some 200 miles away from Jersey were unaware of the momentous events that must have taken place to give rise to the partition of the Islands, and one daily expects to hear of raids on the nosh bars by the enraged natives.

MOTA Poll

A brief note to remind DX minded readers that their list of 15 wanted " countries " should be sent to R.S.G.B. Headquarters to arrive by **March 15**, after when an analysis will be made.

News from Overseas

A note from **EL4A** (W7VCB) mentions that Liberian stations have been shut down and all their gear removed without any explanation being given. The situation in relation to QSL cards is unsatisfactory and it is believed that most of the ingoing cards are being seized at the post offices. Any cards for EL4A and EL4YL may be sent to G2MI from whom they will be collected in person later this year, probably in May.

A letter from W9VZP to GM3PAE provides the information that **HL9KH** (for whom W9VZP is QSL manager) will be active for the next two years using all bands as propagation allows. European stations should look for him on 7 Mc/s around the band edge at 21.00, and when conditions permit 3·5 Mc/s c.w. will be tried. From reports received, HL9KH has been worked from the U.K. on 14 and 7 Mc/s, and QSL replies have been extremely prompt.

Conditions on **1·8 Mc/s** have improved tremendously since the autumn and the high level of activity is bringing unprecedented results. From the **160 Metre Bulletin of W1BB** it is learnt that W1BU recently worked 15 countries in two days. Both the W6 and W7 call areas have been heard in the U.K., and many European stations have been heard in the W9 and W0 call areas. New Zealand stations are authorized to use frequencies between 1875 and 2000 kc/s. and usually operate round the lower edge of this band when looking for DX. Following recent comments on his practice of asking U.K. stations to call on frequencies below 1825 kc/s, which is contrary to established procedures, W2FYT explains that this is done to move stations away from the Loran noise which is very troublesome in his area, and ensures that only a few of the stronger DX stations will be heard. From his letter it appears that W2FYT will not be altering his operating tactics.

In an effort to ascertain the best frequency for mine rescue work a station was set up 630 ft. below ground level in a salt mine at Nova Scotia to work in conjunction with another station at ground level. W1BB reports that signals were 5 and 9 both ways using dipole aerials, and that signals from l.f. stations were well received at the underground location. The stations involved in this experiment were VE1ZZ/1 (down the mine) and VE1PV/1 (at ground level).

Although the recent series of trans-Atlantic tests have

UA6ND (ex-UA6LWW) operating his 40 watt transmitter on 28 Mc/s. The station is located at Taganrog near Rostov and Alex is active on both the h.f. and v.h.f. bands.
(Photo via G3NBC)

* *Please send all reports to R.S.G.B. Headquarters to arrive not later than* **March 8** *for the* **April** *issue and* **April 3** *for the* **May** *issue.*

ended, the prevailing good conditions, which should continue during the period of low sunspot activity, will undoubtedly lead to a high level of activity on 1·8 Mc/s and reports of unusual contacts will be welcomed.

The Ghana Amateur Radio Society lists **ZD4ANS** and **FD8FD** as pirates, particularly as the former prefix became obsolete after March, 1957. Cards for **9G1AQ** worked during the last three years will not be forthcoming as the owner of this call has not been on the air during this time although his call has been extensively pirated.

5A3TY is QRT and Brian Bush is now active as **MP4BDX** on 14, 21 and 28 Mc/s, all modes. Any operator lacking a card from 5A3TY may obtain one from P.O. Box 144, Bahrain, either through the Bureau or direct with one I.R.C.

VS6EY, ex-G3GKI, is now settled in Hong Kong and advises any amateurs travelling to that part of the world to take as much equipment with them as possible, as receivers are the only good buy. VS6EY is looking for QSOs on 14 Mc/s c.w. after 18.00, and is unhampered by TVI problems as the service is run on a wired relay basis.

K6CQM, Bob Murphy, who has been the editor of *The DX'er*, the monthly publication of the North California DX Club, is moving to Texas to take up a business appointment and the new editor is **WA6TGY,** Joe Reisert, of 2614 Media Way, San Jose 25. Our thanks to K6CQM for past co-operation and best wishes to R.S.G.B. member WA6TGY in his new task.

The weekly nets of the **Ex-G Radio Club** will now take place as follows: (i) Canadian Section Net, with VE6TF and VO1DZ in control, at 14.00 on 14,125 kc/s, (ii) 15.00 on 14,345 kc/s, and (iii) 19.00 on 14,345 kc/s. It is hoped that the second net will be suitable for overseas members now that that the 21 Mc/s net has been discontinued.

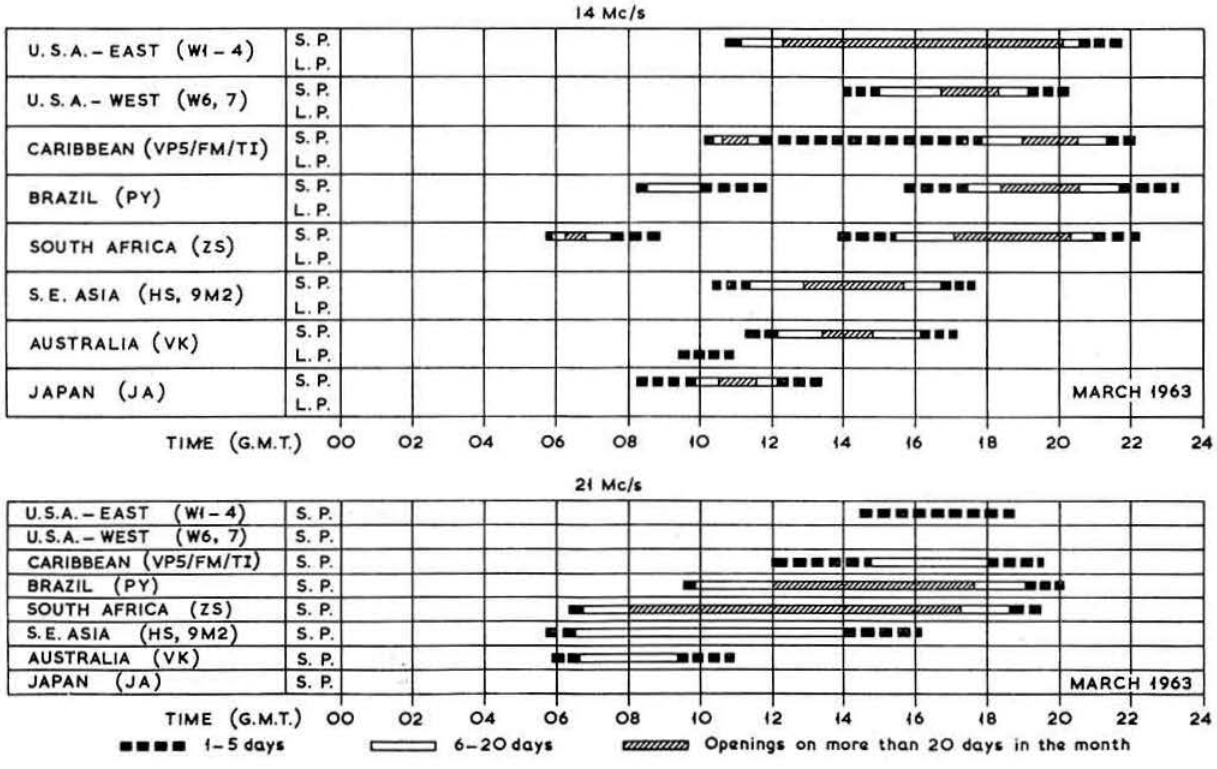
The German National Society, the D.A.R.C., has established a beacon transmitter on 29,000 kc/s in connection with auroral propagation research. This station operates continuously with a three element beam oriented to the North and using a power of 170 watts. The location is at Bielstein/Teuteburger Wald, the co-ordinates of which are: Lat.: 51° 54′ 49″ N. and Long.: 08° 49′ 18″ E. The call-sign of

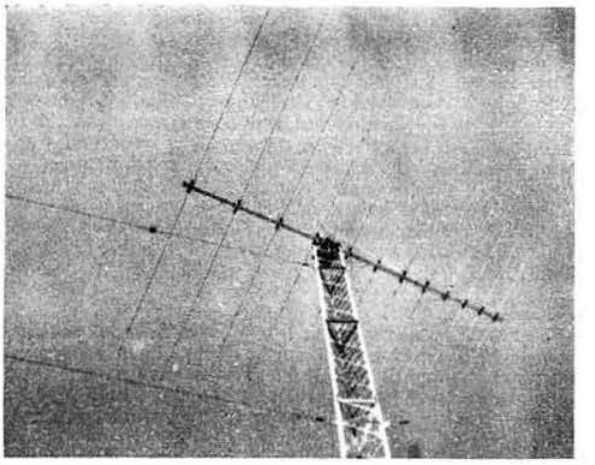
PROPAGATION PREDICTIONS

During March the symmetrical disposition of the m.u.f. about the Equator will give similar propagation conditions in both hemispheres, and the paths to South Africa, South America and Australia will experience better conditions than during the winter months. Following the fall in sunspot activity 28 Mc/s will produce very little DX, but possibly on days with exceptionally high m.u.f. contacts may be possible to South America at times between 12.00 and 17.00 and Africa between 08.00 and 17.00. With the approach of summer conditions the incidence of sporadic E openings over distances of between 500 to 1000 miles will increase, and contacts by auroral reflection and meteor scatter may be possible at suitable times. 21 Mc/s will be less favourable for DX working and the path to North America will be particularly affected, but openings to South America and South Africa should continue without interruption.

The 14 Mc/s band will remain open longer in the evenings and contacts with all continents should be possible. On days with higher than average *F2* m.u.f., contacts with Alaska should be possible between 08.30 and 12.00 and occasionally also between 15.30 and 18.30, whilst QSOs with Hawaii may be possible during the period 16.30 to 18.30. There will be DX openings on 7 Mc/s and the paths to South America, South Africa and Australia may show some improvement, although the path to North America may be adversely affected by the low m.u.f. Conditions on 3·5 Mc/s will generally be less favourable than previous months, and the level of atmospheric disturbances will increase with the approach of summer. Following the unusual happenings on 1·8 Mc/s during the past year there may be DX openings throughout the spring, particularly with expected decrease in sunspot activity.

The mean sunspot number for January, 1963 (provided by the Zurich Observatory) was 19; with the greatest activity occurring during the period January 14 to 17, when on the latter three days the number was 40 or above. The predicted numbers for June and July are 21 and 20 respectively.





The operating position and aerial array at KL7FBI on Shemya Island, the most westerly island of the Aleutian chain, and practically in Zone 19. There is both M.A.R.S. and amateur activity from the station which uses a Collins S Line with a Delcon T210 linear running at 1 kW. p.e.p. The aerial is a log periodic 68 ft. above the ground. This array has a 28 ft. boom, the longest element being 38 ft., and has so far withstood 75 knot gales. Many phone patches are made from this station, but after 06.00 G.M.T. the beam is swung over the North Pole for rag chewing and DX work, often on a frequency of 14,290 kc/s. The two operators are A/1C Jack L. Anderson (Andy), K7AIP, and A/1C Ray Corbet (Ray) who will be pleased to respond to QSLs sent to KL7FBI via A.P.O. 736, Box 411, Seattle, Washington, U.S.A. *(Photos via G3NBC)*

this station is **DL0AR** and reports on the reception thereof should be sent to DJ1SB, Hasenspitz 56, Wiesbaden-Dotzheim, W. Germany.

Information on geophysical occurrences and the passage of satellites is broadcast every Saturday on the 3·5 Mc/s band at 15.30 by **DJ1SB,** and every Sunday at 08.00 by **DL0HH.**

Two members of the U.S. Forces in Europe stationed at Naples are now operating Aeronautical Mobile. They are W. E. Simpson, **WA6NPW/AM** and R. E. Le Page, **K1SDS/AM,** who can be reached c/o I1DFG, Navy No. 566, Div. 80, c/o F.P.O., New York or c/o U.S. Naval Air Facility, Aeroporto, Capodichino, Naples, Italy. When operating /AM these stations work on 21,270 kc/s (a.m. and s.s.b.) and 21,070 kc/s (c.w.), and then only when over international waters. The following U.S. Forces stations are currently licensed in Italy:

I1DFA. Headquarters A.F.S.E., Naples.
I1DFB. U.S.A. Supply Command, Leghorn.
I1DFC. U.S.A. Set A.F., Verona.
I1DFD. U.S.A. Signal Post, Vicenza.
I1DFE. 7227 TH Supp. Gp., Aviano.
I1DFG. U.S. Naval Air Facility, Naples.
I1DFH. U.S. Naval Air Facility, Sigonella.
I1DFI. U.S. Air Force, Vicenza.

DXpeditions

The Cambridge University Wireless Society will be running their annual DXpedition to the Isle of Man during the period March 21 to April 2 when **GD6UW** will be in operation on all bands from 1·8 to 28 Mc/s as propagation conditions allow. A s.a.e. (or I.R.C.) is required for a direct reply otherwise QSLs will go via the Bureau.

Jersey will be the scene of a trip by G8KS and G3IFB who will operate during the period April 13 to 15 as **GC8KS.** There will be s.s.b. and c.w. operation on 14 and 15 Mc/s using the following frequencies: *c.w.* 21,020 kc/s, listening higher in frequency; 14,010 kc/s, listening 20 kc/s up: *s.s.b.* 14,110 and 14,260 kc/s; 21,435 kc/s, listening 21,430 kc/s and down. The equipment will probably be a 32S1 and 75S3 with a beam for 14 Mc/s and also a ground plane. QSLs should go direct to **G8KS** with self-addressed envelope and stamps or I.R.C. One I.R.C. will cover despatch by second-class airmail while three I.R.C. will be required for first-class air mail.

FW8DW operated from Wallis Island between January 25 and February 8, on which date the *Yasme* sailed for Suva, Fiji Islands, for repairs. At the time of writing it is not known whether the trip will terminate here or if further rare spots may be visited. A feature of the last few days of the operation from FW8DW was the good signals heard in the U.K. around 18.00 to 19.00 over the long path, which attracted surprisingly little attention from European stations.

W4BPD commenced operation from **Juan Da Nova Is.** on February 9 signing **FR7ZC/J** and plans a trip to Europa Is. after a week or 10 days, when he will use the suffix /E. The status of these spots has not yet been determined, but it is believed that they will count as new countries.

Latest news on the W4BPD trip is that Europa Is. will not count as a new country. Gus plans a short stay on the Comoro Is. before proceeding to Tromelin on March 21.

VS9ADV operated /**4W1** for a brief period at the beginning of February, and it is hoped that there may be a repeat of this in the near future and when some advance warning can be given. Operation was on a.m., and next time a KWM-1 may be available.

Owing to the non arrival of a KWM-1, the **Kamaran Is.** trip by VS9AAA and others was cancelled, but it is hoped that this may now take place in the autumn. Efforts are also being made to activate Muscat, Oman and other spots on s.s.b. in the meantime.

The projected operation by **W6CBE** from Saipan did not take place owing to the intervention of Typhoon Karen which wrecked practically all communication systems in the Marianas. W6CBE took part in emergency service work and passed some 1,000 messages.

There are rumours of a DXpedition to **Barthelmy Is.,** a French possession in the West Indies between St. Kitts and St. Martin, and this will probably depend upon the granting of separate " country " status.

A DXpedition to **Zone 23** will be made during March by **UA1CK,** who will probably operate s.s.b. over a period of three to four days.

DXCC News

The A.R.R.L. announce that **Eritrea** is deleted from the

Countries List and contacts made with this area on or after November 14, 1962 will count as **Ethiopia.**

The following change is made to the A.R.R.L. Countries List w.e.f. May 1, 1963. The listing of Channel Islands will be dropped and replaced by two listings of **Guernsey Islands** and **Jersey Island.** Credits that have been given towards the Channel Islands listing will be automatically credited to the appropriate listing upon presentation of a confirmation for whichever of the two new listings not previously credited. Confirmation for contacts with either Guernsey or Jersey must be for contacts made on November 15, 1945 or later. Confirmation for this change should not be submitted before **May 1, 1963.**

Contests

The **1963 Contest** organized by the **R.E.F.** will take place between 14.00 on March 30 and 21.00 on March 31 (*c.w.*), and 14.00 on April 20 and 21.00 on April 21 (*phone*). The numbers to be exchanged will consist of the RS/RST report and the number of the QSO, and, in addition, French stations will also give the code number of the DPF province. Three points will be scored for each QSO and a multiplier of one for each DPF province or each DUF country, other than F or FC, for each band. All logs should be sent to: R.E.F., B.P. 42-01, Paris, R.P.

The **International SP DX Contest** will take place between 20.00 on April 6 and 20.00 on April 7 (*c.w.*), and 20.00 on April 20 and 20.00 on April 21 (*phone*). The numbers to be exchanged will consist of the RS/RST report and the number of the QSO. One point will be scored for each contact with a Polish station, and a multiplier of one for each of the nine Polish call areas on each band. The total sum of contact points on all bands multiplied by the sum of call area multipliers on all bands gives the total score. Separate log sheets are necessary for the c.w. and phone sections and these should reach the Contest Committee not later than June 30, 1963. The address for logs is: Polski Zwiazek Krotkofalowcow, P.O. Box 320, Warsaw, Poland.

The **International C.W. Contest** organized by the Radio Sport Federation of the **U.S.S.R.** will take place between 21.00 on May 4, 1963, and 21.00 on May 5. (i) Only 12 hours of operation will count for scoring purposes although the log for the whole operating period must be presented; (ii) Contacts must be made on c.w. in the bands 3·5 to 28 Mc/s; (iii) The numbers to be exchanged will consist of the RST report plus a consective QSO number beginning with 001; (iv) The contest call will be CQM; (v) Only one contact with a station on each band will count for scoring purposes; (vi) The total score of each station will be the number of contacts, each of which will count one point, multiplied by the number of countries worked. Any mistake in the call-sign or number will prevent a contact from scoring points; (vii) Awards will be made to the first five stations in each country in (*a*) single operator and (*b*) multi-operator categories; (viii) Participants who contact 100 different U.S.S.R. stations will be awarded the W-100-U diploma.

LIST OF COUNTRIES FOR D.U.F.

EUROPE

1	France	F
2	Corsica	F/FC
3	Monaco	3A2
4	Andorra	PX
5	French Zone of Germany	DL5
6	French Zone of Austria (bef. December 21, 1950)	FKS8
7	Saar (bef. January 1, 1957)	9S4

ASIA

8	French India (bef. November 1, 1954)	FN8
9	Indochina (bef. July 20, 1954)	FI8
10	Cambodia (bef. November 1, 1955)	XV
11	Laos	XW8
12	Spratley Is.	

AFRICA

13	Algeria	FA
14	Sahara	FA FF8/SH
15	Tunisia (bef. January 1, 1959)	3V8
16	Morocco (bef. April 22, 1961, but French stations still valid)	CN8
17	Tangier (bef. November 1, 1956)	CN2
18	Fezzan	
19	Central Africa Rep. (FQ8 Oubangui-Chari bef. August 13, 1960)	TL8
20	Congo Rep. (FQ8 beg. June 15, 1960)	TN8
21	Ivory Coast Rep. (FF8 bef. August 7, 1960)	FF4 TU2
22	Dahomey Rep. (FF8 bef. August 1, 1960)	TY2
23	Gabon Rep. (FQ8 bef. August 17, 1960)	TR8
24	French Guinea (bef. October 1, 1958)	FF8
25	Mali Rep. (FF8 French Sudan bef. June 6, 1960)	TZ
26	Mauritania (FF8 bef. June 20, 1960)	FF7 5T5
27	Niger Rep. (FF8 bef. August 3, 1960)	5U7
28	Senegal (FF8 bef. June 20, 1960)	6W8
29	Tchad Rep. (FQ8 bef. August 11, 1960)	TT8
30	Voltaic Rep. (FF8 Upper Volta bef. August 5, 1960)	XT2
31	Cameroons	FE TJ8
32	Togo	FD 5V4
33	French Somaliland	FL8
34	Malagasy Rep. (FF8 Madagascar bef. October 14, 1958)	5R8
35	Nossi-Be and Nossi Lava (FB8)	5R8
36	Sainte-Marie (FB8)	5R8
37	Glorieuses Is.	FB8
38	Comoro Is. (FB8)	FH8
39	Tromelin	FB8
40	Mozambique Channel islets	FB8
41	Reunion	FR7

NORTH AMERICA

42	Saint-Pierre and Miquelon	FP8
43	Martinique	FM7
44	Guadeloupe	FG7
45	Saint-Martin (French part)	FS7
46	Clipperton	FO8

SOUTH AMERICA

47	French Guinea and Inini	FY

OCEANIA

48	New Caledonia and Isle of Pines	FK8
49	Loyalty and Chesterfield Is.	FK8
50	Society Is: Tahiti	FO8
51	Toubouai (Austral Is.)	FO8
52	Tuamotou: Gambier	FO8
53	Marquesas Is.	FO8
54	Austral Is. Rapa	FO8
55	New Hebrides	FU8
56	Wallis and Futuna Is.	FW8

AUSTRAL CONTINENT

57	St-Paul and New-Amsterdam Is.	FB8ZZ
58	Kerguelen	FB8XX
59	Crozet Is.	FB8WW
60	Adelie Land (Antarctica)	FB8YY

Those who make contact with six continents or 150 countries will be awarded the R6C and R150C diplomas respectively. For these awards it will not be necessary to present QSL cards; (ix) All logs must be sent to the Contest Committee, P.O. Box 101, Moscow, not later than **May 15, 1963;** (x) Logs must be submitted for each band used and the column headings should be: Date; Band; Time (G.M.T.); Call of station worked; Number received; Number sent; Points. The last column should be left blank. At the end of each band log there should appear three totals, viz.; number of points for contacts; number of countries worked; total points. In addition each log should contain the full name and address of the operator and details of the equipment used.

The results of the **U.S.S.R. C.W. Contest 1962** show the following U.K. stations: G2DC 5,300 points; G3EYN 3,410 points; G3JUL 2,448 points; GI6TK 1,501 points and GI3OTV 187 points. The highest scoring Russian station was UC2AA with 38,427 points and outside the U.S.S.R. W9WNV was world high with 26,574 points.

The **P.A.C.C. Contest 1963** will take place as follows: *c.w.:* April 27, 12.00, until April 28, 18.00. *Phone:* May 4, 12.00, until May 5, 18.00. All bands between 1·8 and 30 Mc/s may be used but cross band contacts are not valid. (PA0 stations are now permitted to use 1825 to 1835 kc/s.) Stations participating in the Contest will exchange 6 (5 on phone) digit numbers, and PA stations will, in addition, send a two letter group indicating their province. Each completed QSO counts three points, two points are scored on receiving the control number correctly, and one point upon receiving an acknowledgement of a transmitted number. Each station may be worked only once per band. For stations outside the Netherlands the provinces give one point per band for the multiplier, giving a maximum multiplier of 66. The final score is the sum of all QSO points from all bands multiplied by the sum of provinces worked on all bands. The information required in the logs is: (i) Date and Time; (ii) Station worked; (iii) Province worked; (iv) Multiplier column for each band (filled in only when working a new province); (v) Transmitted number; (vi) Received number; (vii) Points. Logs must be postmarked not later than **June 15, 1963,** and be sent to PA0VB, Contest Manager, V.E.R.O.N., Keizerstraat 54, Gouda, Netherlands. Each log must be accompanied by a declaration that the participant has observed the Contest rules and the Amateur Radio regulations in his/her country.

The **CHC/HTH 1963 Annual QSO Party** will take place between 23.00 on May 31 and 06.00 on June 3. This event is open to all operators as those who are not members of the Certificate Hunters' Club are automatically HTHers. A photostat copy of the rules may be obtained by sending your request and a foolscap size s.a.e. to R.S.G.B. Headquarters.

In connection with the **CQ World Wide S.S.B. Contest,** the rules of which were presented last month, it should be noted that reference to *prefix lists* should be deleted.

During the **CQ 160m Contest GI6TK** found conditions excellent with as many as eight North American stations coming back to a CQ call! PA0s were worked in daylight and K4HJJ was contacted at 08.23. Amongst the stations heard were VP8GQ (04.31), HR3HH (08.36), HC1DC (05.05), VQ2IS being called by G3FGT, HB9T working G8PG at 13.30 and K7CIW (08.05). **G3IGW** worked 16 countries on 1·8 Mc/s including the first European QSO with VP5XG. Unfortunately a QSO with W6KIP could not be included in the reckoning, but in present conditions this will surely follow very soon.

Awards

The Ghana Amateur Radio Society announce the **9GI Award** which is issued for contacts with a total of five different Ghana stations on at least two bands since January 1, 1958. Contacts may be phone, c.w. or mixed, and QSL cards must be submitted. Applications together with seven I.R.C., should be sent to: H. Suess, 9G1CW, P.O. Box 1945, Kumasi, Ghana.

The **H.F.-Aurora-10 Award** for 21 and 28 Mc/s is offered by the D.A.R.C., in conjunction with the Institute for Ionospheric Physics, to those operators who produce proof of successful contacts by auroral propagation on 21 and 28 Mc/s with 10 stations in three different countries (including the applicant's home country) located not more than 2000 km away. The QSL cards must be accompanied by an extract from the applicant's log book made on a special form AB 021. Detailed conditions of this award and form AB 021 may be obtained by sending a s.a.e. and I.R.C. to E. Brockmann, DJ1SB, Hasenspitz 56, 6200 Wiesbaden-Dotzheim, W. Germany.

The **WABR Award** is commended by G8PL who received it after contacting five stations in Bremen and sending log details and 10 I.R.C. to DJ4TT. G8PL also comments on the non receipt of correspondence regarding awards from Burma, and it might be added that QSL cards from this area are not easy to obtain.

In connection with the **CQ S.S.B. Awards** it should be noted that countries that cannot now be contacted are deleted from the list available. This at present comprises: Ghana (ZD4); Italian Somaliland (I5); British Somaliland (VQ6); French West Africa (FF8); French Equatorial Africa (FQ8); Goa (CR8); Tangier (CN2/KT1) and Ruanda-Urundi (9U5). Presumably Eritrea will now be added to this list.

The premier award of the Radio Society of East Africa, the **Worked All VQ Areas Award,** has been claimed by only 11 stations, of which **G4CP** was the second.

The "**Worked All London Town**" Certificate has been awarded, for only the second time, to **G3MNR** for 48

QTH CORNER

AP2AR	36 Purana Paltan, Dacca 2, E. Pakistan.
AP5DC	J. J. Geil, Technical Training Centre, Mirpur Road, Dacca 7, E. Pakistan.
DJ0IK	W. Nielsen, Fatimastrasse 47, Munich 49, German Fed. Rep.
DM QSL Bureau	Post Box 30, Berlin No-55, German Democratic Rep.
ET3GZ	via W1URM.
ET3LM	via W7KMF (home call).
ET3PP	K4QDO.
FW8DW	via W8EWS.
G3OHM, G3RSR, GB3SB	J. K. Harvey, 2A The Avenue, Rubery, Birmingham.
HL9KN	A.P.O. 358, Postmaster, San Francisco, Calif., U.S.A.
HL9KO	via K7MGZ, 1840 N. 16th Ave., Phoenix, Arizona, U.S.A.
KISDS/AM	U.S.N.A.F., Div. 80, Capodichino Airport, Naples, Italy.
KB6CA	J. Burris, Box 87, U.S.P.O., 06-50000, Canton Is., via Honolulu, Hawaii.
LA5FI/P	via LA5AD.
MP4BDX (ex-5A3TY)	B. Bush, P.O. Box 144, Bahrain, Persian Gulf.
MP4DAF	via W2CTN.
TL8AC	P. Sevestre, B.P. 54, Bangui, C. African Rep.
TT8AJ	via K2UYG.
TT8AL	via R.E.F.
TU2AP	G. Cravet, B.P. 7002, Abidjan, Ivory Coast Rep.
VK QSL Bureau	P.O. Box 41, Box Hill E.11, Victoria, Australia.
VP4 Bureau	Box 756, Port of Spain, Trinidad.
VQ1IZ	Box 1283, Zanzibar.
VQ2JM	via W2CTN.
VS1LQ	J/Tech. M. F. Addison, C.C.S. (Radio Relay), R.A.F. Changi, Singapore 17.
VS6EY	V. F. Kershaw, 16-18 Conduit Road, Apt. 12, Hong Kong.
WA6NPW/AM	as KISDS/AM.
ZD8DW	via W5SWX.
5H3HV	via W2CTN.
6W8AA	B.P. 3006, Dakar, Senegal Rep.
9GIGN	via VE4IM.
9LIGM	G. McCavish, HQ Royal Sierra Leone Military Forces, Freetown, Sierra Leone, W. Africa.

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

contacts on 144 Mc/s and 17 contacts on 1·8 Mc/s. Comments have been received from overseas stations that they are experiencing considerable difficulty in obtaining QSLs from some London stations, in spite of direct requests in many cases.

The **Certificate Hunters' Club** is open to those operators who can provide evidence of holding at least 25 Amateur Radio awards. The membership certificate is obtainable from K6BX, Clif Evans, the founder of the club, who acts as secretary, and life membership in the Club costs one dollar or equivalent. Flyers giving details of the Club may be obtained by sending a s.a.e. to G2BVN, or members in South London may contact G5GH, secretary of C.H.C. Chapter No. 8.

The code proficiency transmissions from **PA0AA,** and referred to in January *M.O.T.A.*, are transmitted on 3600 kc/s, 14,100 kc/s and 145·14 Mc/s on the last Friday in each month at 21.30 G.M.T.

Around the Bands*

Undoubtedly **1·8 Mc/s** came up trumps during January which may well prove the best month for this season. Activity has been high with quite a few complaints of QRM hiding the rare ones!

G8PG reports good openings to the west with HC and all American call areas except W7 to be heard (a.m.—January 26, 1963). The same evening nine European countries were worked including PA0, DL, HB, OK and GD. A few days later HB9T (13.14) was heard working the North of England and DL1FF in QSO with HC1DC (07.04). These findings were all confirmed by **B.R.S.20317** (Bromley, Kent) with U.S. stations peaking up to S7 including W1BB, BU, HDX, 2CHQ, GNC, K4HJJ, K6EIV (07.20), K7ICW (08.08), K8HBR, K9AOB, MBR, YWO, W0AIH, VXO (07.30). Also VE1ZZ, 2UQ, 3AGX, HC1DC, CT1CO in QSO with G3OZF (07.18) and many others. An interesting report from **Jamaica (E. Devereux)** records VP5XG, VP7NY (07.36 on 1822) working W's, HK7ZT (09.56 on 1804), HC1DC (05.00 on 1803). U.K. stations start to appear 06.45 G.M.T. and GW3IGW (06.47), G6BQ (06.57) were heard. A local m.f. beacon produces strong harmonics at 1800 up to 1804 so stay above 1805 for contacts with VP5. East and West Coast Ws are heard consistently and often simultaneously. VP5 would seem to be a good location for all round 160m DX. **G3IGW** reports a QSO with VP5XG in the *CQ* 160m W.W. Contest when conditions were good.

Many transatlantic contacts were made and in support of other reporters, 1976 kc/s is suggested as a good frequency for W6 contacts. **G5ZT** (Plymouth) wno is active again with a 600 ft. long wire, worked 73 stations and 10 countries in the *CQ* 160m contest. His bag included W1ME (05.37), VE3KE (06.15), W9EWC (07.39), W2FYT (05.35) and W1BU (07.38). **G3OQT** (Romford) worked many stations including CT1CO, W0NWX, W6KIP (08.00) and heard VP8GQ. **G3PQA** complains bitterly about fishfone QRM but worked, amongst others, W0NWX (03.00) and UA1FSE (23.15). Finally a report from **5B4PB** on the *CQ* contest. Starting at 22.00 G.M.T. G stations were not heard until 02.00 when G3CNM (229), G3PQA (439), G3IGN (339) came through. Later G3IGW, G3OQT, G5ZT and G3PUK were all heard calling W/VE.

Conditions on **3·5 Mc/s** are reported good with a high level of activity. **A.3053** turns in an impressive log of phone stations heard including VS9ASS, VK3AHO, HR1CM, HI8XAG, YV1EE, FG7XT, PZ1AX, VP5BL, KZ5LC (07.00), EA9AZ, XE1CV, 4X4DK, VE3FFW/SU and ZL1ATQ (08.00). The path to the U.S.A. and Canada is open regularly and **B.R.S.20317** lists W6QYH (08.27), W2PEO (22.15), VE3EK, W8FQQ (00.00) and VE1CD, the latter two at S7, W5MCO (07.00) and, on s.s.b., KZ5LC (07.00) and PJ2AA (23.00). **G6LX,** back from the U.S.A., says that after working a few Gs from the East Coast he now realizes just why some of the boys have trouble getting through. Apparently the top end of the band is jammed with W/VE c.w. and phone and only the Europeans with 57 signals or better have a chance. Outstanding signals logged in the States were from ON4UN, GI3CDF, G3FPQ, GW3AX and G3FXB. The path to the Antipodes has been opening and **A.2340** reports ZL1ACG, AIX, AGO (08.20), VK3AHO and 2AVA (19.30). Also heard were 3A2CL (23.10), VP2AB (00.37), VP9DC (01.11), W8UPV/VO2, KZ5LP, OX3AI, all on s.s.b. **A.3449,** using a Joystick, records ZS6CB (20.00) and ZS6CL trying to work Gs but failing due to the pile-up their appearance caused.

Variable conditions on **7 Mc/s** existed during January with a decline setting in towards the end of the month. **A.2340** reports VK2AVA, NN and AHT (all around 08.45 G.M.T.) but otherwise Pacific stations have faded out although **G3JAG** (Rochdale) says that Southern European stations are regularly working into VK/ZL, and that his sked with ZL2CS has been resumed. His log includes HK7AJP (00.05), W6EOZ (07.40), 9K2AD (17.35), OY2H (19.15), KV4CI (21.15), ST2AR (22.05), CM2BB (23.45), KG4AM (23.50) and VS1LP (23.55) all on c.w. Openings to Central and North America have occurred irregularly and listener **A.2340** logs PY1NFC, PY7KI, AJB, OS and BP all around 02.00 while **G3PVS** worked PY7TY at 19.40 G.M.T. **B.R.S.20317** reports PY7TJ (01.15) and HK7AJP (00.45), HI8XAG (23.44), KZ5MQ (01.00), PJ2ME (00.00) XE1FFG (00.35) and HI3PC (10.00). Conditions to both East and West Coasts of U.S.A. have been generally good after 10.00 G.M.T. with 14.00 to 17.00 best for California. W6LUS, GRX and EPZ have all been logged regularly.

Although many reporters say conditions on **14 Mc/s** are poor the DX is there if you listen hard enough as the c.w. log of **G3AAE** (Loughton) shows: 5R8BX (17.00), AB (16.15), 9U5JH (18.55), 9L1GM (16.50), KG6AAY (08.40), KV4CI (16.40), FR7ZC (17.45), FB8ZZ (16.30), VQ8AI (17.45), VQ8BI (16.00), VS9MB (15.45), VP5XG (12.40), TT8AJ (16.20), VQ8BT (16.10), ZD6GA (17.05), ZS4PB/9 (19.45), ZS5RS/8 (19.40), ZS6ZF/8 (18.00) and ZS7M (19.40). **G8PL** reports little doing on the band before 07.00 but was surprised to find W3AFM at this time. YI2WS is said to be active again and asking for QSLs via the bureau. Other loggings include TT8AJ, 4X4HK, CR6EI, VS9AAA, CN8FE, UM8FZ and ZL1AV all between 06.00/10.00 G.M.T. whilst the got-aways were ET3AF, TN8AF, VU2HS, MP4QAI, EP2BN and VK4EL all in the same period. **OE1ME** reports good openings to the Pacific particularly via the long path which he thinks the U.K. stations often ignore. He logs KC6BK (07.30), ZL1ABZ (07.12), VR2BZ (07.50), VS6EO (12.25), KX6AA (09.17), VK0JM (15.55), KB6CA (06.45) and FW8DW (08.00), all on s.s.b. **G3PVS** offers PY7VDU (19.15), EL7A (16.40), 9Q5EI (18.40), UN1KAA (15.20), whilst **G3RFS** gives EA8DO (17.40) and F2CC/FC (13.00 G.M.T.) while **B.R.S.25274** records, amongst others, 9G1TD at midday. **A.3449** had a good log with OA4CV (12.57), 4U1ITU (16.29), YV2LA (19.43), VU2NR (12.59), VS1LQ and VQ2JC (18.40), all on A3. S.s.b. has been active and a comprehensive log from **A.2340** includes OY7ML (13.25), HH2CL (11.35), EP2AD (13.05), VP4QD (13.24), JA2AEY (08.20), KA2EB (08.22), KG6AJB (09.00), KL7DZH (09.10), PK5LB (11.01) and many others. **G3LPS** is finding DX around midday and reports VK7SM, VS9AAA and 4S7EC.

The **21 Mc/s** band is still very quiet but some openings are occurring to the south and **G3AAE** reports a.m. with 9U7AC (10.50) and 5R8BX (13.40) whilst c.w. produced ET3PP (10.20), 3V8CA (13.30), 9U5DS (12.35) and 5R8AB (12.30). **A.2340** reports a similar story and adds CR7CO

(*Continued on page 482*)

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

Mobile Column

By C. R. PLANT (G5CP)*

THE aim of all mobile operators is to get " the most out of the least "—in this context the relationship is that between the power taken from the car battery and the useful radiated signal. The advent of the transistor has been of great assistance, particularly in converters and receivers, the early stages of modulators and transmitters, and last, but not least, in modern high efficiency h.t. power packs. Whilst some transistors handling relatively large power inputs at high frequencies have been developed, these have not yet become readily available for amateur use and therefore the major power demand is made by the p.a. and modulator.

It was therefore of considerable interest to see an article in the April 1962 issue of *CQ Magazine* by Dr. Shorza Gitchagoome of Bell Laboratories, Los Angeles, which introduced an entirely new technique using a Zener diode as a p.a. in a 3·5 Mc/s transmitter. The diode is driven by a single stage transistorized crystal oscillator and gives an output of approximately 36 watts. There appears to be some doubt as to the use of this device at higher frequencies owing to the inherently limited characteristics of the diode, but for Top Band and 3·5 Mc/s it seems to provide a useful output at high efficiency.

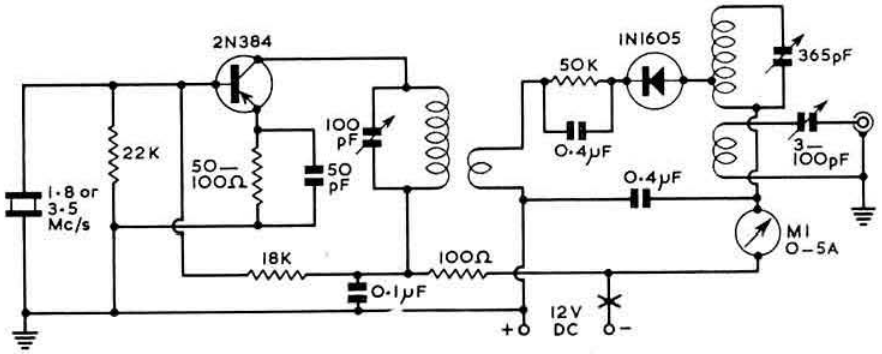


Fig. 1. Circuit diagram of a 3·5 Mc/s transmitter using a Zener diode in the p.a.

The crystal oscillator may be made to double and drive the diode; under such conditions the circuit is said to behave in a similar manner to a valve operating in class C. A practical circuit is shown in Fig. 1: a link coupling between the crystal oscillator and the Zener diode circuit being used because of the extremely low impedance of the diode. For the same reason the anode coupling to the p.a. coil is connected to a few turns at the " earthy " end in order to obtain a good match. The 1N1605 has a maximum continuous dissipation of 10 watts (12 volts at 1 amp.); however, in the mode of operation described, it is possible to increase this rating four times without overloading, because of the intermittent current flow during oscillation. On actual test the diode was run at 12 volts 4 amp., and with a 100 sq. in. heat sink the temperature rose to 85° C with an output of 36 watts into a 51 ohm load—an efficiency of 75 per cent.

When the saving of heater current is taken into account, the overall efficiency, compared with an equivalent valve circuit, rises to over 80 per cent, a very satisfactory figure. This is undoubtedly a circuit which offers an interesting field for investigation, being easy to build and operate. After reading the *CQ* article, K0AYU (Minn.) built a Zener amplifier using four 2N1662s, drawing 10 amp. at 29·4 volts in an s.s.b. rig operating on 3·9 Mc/s. He reports excellent results.

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

Belgian Mobile Rally

Further information has been forwarded by G3BID (London), covering the CQ Verviers Rally, U.B.A., to be held at Verviers, on April 28, 1963. The Rally is under the auspices of the Union Belge des Amateurs, Section de Verviers, 33 rue Belle-Vue, Lambermont-Ensival, Pce de Liege, Belgium. The final date for applications has now been changed to April 1 and these should be forwarded to Monsieur Rene Vanmuysen, President de L'U.B.A., 81 rue Joseph Baus, Wezembeek-Oppem (Brabant), Belgium. Provisional licences will be sent to applicants by the Telephones and Telegraphs Administration. British stations must send requests for the special temporary licences (valid from April 26 to May 3) accompanied by a photostatic copy of their mobile licence.

A fee of 100 Belgian francs will be charged, remittances for which shall be made out to Compte Cheque Postal 652667 de Monsieur Julien Counhaye, at the address given first. Half of the enrolment fee will be used to cover the operator for the insurance of the car (" 50 fr. pour l'assurance responsabilité civile de la voiture inclus.")—just what this means appears to be obscure, hence the direct quotation from the French. The remittance should be accompanied by a note specifying the name of the operator, his call-sign, the make of the car and its registration number, the type of transmitter installed in the car and the frequency to be used during the rally, i.e. either 144 or 3·5 Mc/s. The Verviers Committee of U.B.A. reserve the right to decide on classification and all other matters, their decision being final. Each participant will receive a numbered card, which will be the number of the car during the Rally. The following rules apply during the Rally:

(i) All mobile stations on the way to Verviers will call from 08.00 to 11.00 on 3·5 and 144 Mc/s in order to make as many contacts as possible with stations in Verviers. Only contacts with stations in Verviers will count for points. The active stations will be ON4HJ, 4JS, 4LU, 4NB, 4PL, 4RV, 4SN, 4UU, 4XJ and 5BC.

(ii) The stations in Verviers will not send out CQ calls, but will only listen for the mobile stations and reply to them. The mobile stations should give RS reports, the kilometre reading on the speedometer of the car (mileage in the case of British cars), and the Province they are in. Any station may be contacted several times but only once in every 25 km. Five points will be awarded for every contact.

(iii) Contacts will be made, as far as possible, in French, Flemish, German or English.

(iv) The meeting point in Verviers will be on the edge of La Tourelle Park, behind the Civil Hospital.
(v) Informal meetings and a picnic will be held between 11.00 to 13.30.

After lunch the Rally proper will take place, cars leaving at two minute intervals. The itinerary is intended to show visitors some of the most beautiful parts of the country around Verviers and will end at the Barrage d'Eupen where YLs and juniors will find something of interest. The prize distribution will take place at 17.00. Refreshments will be available for all who need them at the Hotel du Barrage.

The organizers have quite obviously gone to a great deal of trouble and expense in an endeavour to make this, the first truly International Mobile Rally, a success and it will be of interest to see how many British stations will be able to participate.

South Devon Mobile Rally

The Torbay Amateur Radio Society and the Britannia Royal Naval Radio Club are jointly organizing a mobile rally at the Royal Naval College, Dartmouth, on August 11, 1963. Full details will be given in *Mobile Column* nearer the date.

Operating Notes

GM3LRG (Greenock) reports that although he has built a 3·5 Mc/s transmitter and has a suitable receiver, he has not yet fitted it into his Wolseley 14. He operates mobile on v.h.f. when on duty as a power supply engineer with the South Scotland Electricity Board.

A letter from G3COY (Stoke-on-Trent) suggests that the calling frequency of rally stations should be announced in advance and agrees that 1900 kc/s should be a good choice. He also thinks that it might be a good idea to have local stations situated about 10 miles away from the venue operating on other frequencies, to give information concerning routes to mobile stations approaching the area. In this way the rally station proper would be relieved of considerable detail which could easily be handled by the out stations. This method has been tried out in connection with the Trentham Rally with great success. He also makes the point that inter-car contacts should keep well clear of the official station frequencies. G3COY has formed an A.R.S. at the University of Keele, Stoke-on-Trent, where he now works.

GM3NZN (Shortlees, Kilmarnock) has been active for the past two years on 3·5 Mc/s using a converted Type 19 Set with a home-built modulator. The aerial is an 8 ft. centre loaded whip fixed to the rear of the car, and contacts are often made whilst running between Kilmarnock and Edinburgh. During the holiday periods Tom uses the equipment as /A with a long wire slung into any convenient tree or rock.

GI3PLL (Co. Derry) is one of the few amateurs who concentrates most of his interest into mobile operating. He has recently installed a KW. Valiant alongside his Mohican receiver, and the use of a transistorized power pack has enabled him to run 40 watts to his centre loaded 8 ft. whip on 3·5, 7 and 14 Mc/s. In GI Dick finds that 7 Mc/s is the most useful band for working "G" stations, a regular daily schedule being maintained on 3·5 Mc/s with GM3PGX in Kinloss, Morayshire at lunchtime. Top Band is practically useless in Northern Ireland, but is used when he travels through England on his way home to Clacton-on-Sea.

MOBILE RALLIES 1963

April 21	North Midlands' Mobile Rally at Trentham Gardens.
April 28	U.B.A. Rally, Verviers, Liege, Belgium.
May 26	Bucket and Spade Party, Hunstanton.
May 26	Northern A.R.M.S., Harewood House.
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 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.

The Month on the Air (Continued from page 480)

(08.30), EL2K (15.20), ZE2JA (09.50) and, surprisingly, VK6QC at 13.57, all on a.m.

Ten metres seems to be dead without a single report on local or DX working—what have you for next month?

DX Briefs

Stations awaiting QSLs from **G3PAG,** the manager for **VP8GQ** on Signy Island in the South Orkneys, will like to know that no logs have been received since October 26, 1962, but as soon as these come to hand cards will be distributed.

KC6BO, the station of the Page Engineers' Radio Club at Koro, has a 14 Mc/s beam located at the top of a scatter array of the Pacific Scatter Communication System. It is hoped that in the near future the P.S.C.S. net will be established which will bring together a number of the exotic Pacific spots on one frequency.

Those operators wishing to arrange a sked with **VR6TC** on Pitcairn Is. may do so through W5OLG.

5T5AD is now on leave in France but will be returning to Mauretania in the middle of March. It is hoped that he will be active on s.s.b. a short time after his return.

KH6PD/KG6 has been active from Marcus Island and has been heard with weak signals by G3YF at 09.05 on 14,280 kc/s.

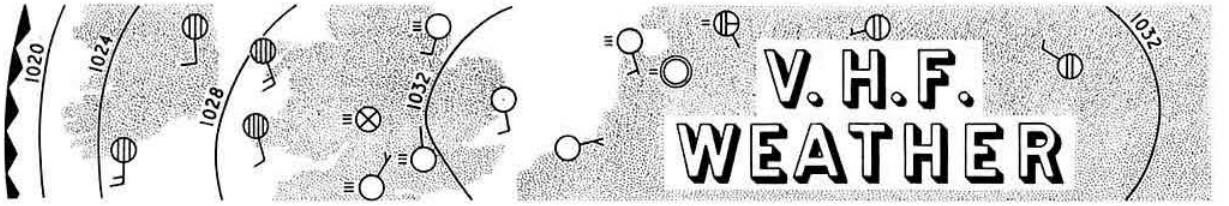
The QSL Manager for **LA9RG/P** (Spitzbergen) is now **LA8LF.** The **VQ4s** have received permission to use **Top Band** and VQ4IN is already active.

An addition to the list of stations active in the Antarctic area comes from G3RIA who worked **VP8FX** in Grahamland on 21 Mc/s.

It has been reported that some **Algerian** stations are using the prefix AL9, i.e., AL9BG, worked by G3PWT on 14 Mc/s recently. At the same time the former FA prefix has also been heard.

* * *

The co-operation of numerous correspondents is gratefully acknowledged, and also information from the *DX'press* (PA0FX), the West Gulf DX Club *Bulletin* (K5ADQ) and *The DX'er* (K6CQM). Please send items to R.S.G.B. Headquarters to arrive not later than **March 8** for the **April** and **April 3** for the **May** issue.



Part One

In which the K-unit is introduced · The anticyclone is unmasked
Some propagation mysteries are explained · and high-signal paths are located while you wait

By R. G. FLAVELL, F.R.Met.S. (G3LTP) *

AS anyone who has taken a day off from work to contact the babel of Continentals heard the night before will confirm, propagation conditions at v.h.f. vary considerably from day to day, and sometimes even from hour to hour.

It is well known that there is a close connection between " the weather " and one's ability to exchange signal reports with distant friends well beyond the horizon, and it is common knowledge, too, that you stand a better chance of working some rare DX when the pressure is high and the weather is settled, than when it is blowing half a gale and you need the light on to eat your lunch. But it soon becomes equally obvious that not every anticyclone, however fine the weather, brings about a period of anomalous propagation, and that even when such conditions exist, not everyone enjoys an equal benefit. Occasionally, too, a long-range contact is made when the pressure is comparatively low and it would seem likely that we cannot hope to explain what is happening in terms of atmospheric pressure alone.

What we must do, in fact, is to find out what is happening in the atmosphere between the transmitter and the receiver at a time when conditions favour long-range transmission, and for this we need a function which not only shows the meteorological processes involved but also what is happening to the radio wave as it travels along the path.

A very convenient parameter for this purpose is Potential Refractive Index. To understand why this particular unit should be so suitable will require a slight excursion into physics and elementary meteorology, but the concept is not a difficult one and, as we shall see later, the results of using it give a very clear answer to some otherwise puzzling aspects of v.h.f. and u.h.f. propagation.

Radio-refractive Index

We are all familiar with the effects of light waves passing from one transparent medium to another of different refractive index, even if our experience is limited to the sight of a stick apparently bent as it passes into a bucket of water. A mirage is another manifestation of changes in refractive index, and this example is the counterpart in terms of light waves of one form of long-range propagation by radio-waves.

* *141 Clyfford Road, Ruislip, Middlesex.*

At frequencies above those returned by the ionosphere, the path taken by a radio wave is determined by the variations in the radio-refractive index of the air it encounters. The actual changes in magnitude which are sufficient to make all the difference between normal and abnormal conditions are extremely small, and it is customary to express radio-refractive index in " N-units," which represent the excess over unity in parts per million.

The radio-refractive index of a given sample of air may be calculated from measurements of pressure, temperature, and some function of the water-vapour content, such as vapour pressure or dew point, by the use of the expression

$$N = \frac{77{\cdot}6\ P}{T^2} + \frac{3{\cdot}733 \times 10^5 e}{T}$$

where T is the absolute temperature, P the atmospheric pressure in millibars, and e is the partial pressure of water-vapour, also in millibars.

Although this is the form of refractive index necessary for mathematical calculations of ray-bending, it is not the most suitable for graphical or pictorial analysis. One reason for this is that the normal changes of N with height tend to obscure the abnormalities which give rise to anomalous conditions.

From time to time a number of modified units have been proposed in an effort to emphasize these deviations from the average values, and some readers may recall one of them, the M-unit, which was frequently discussed in amateur circles some years ago. [1]

Potential Refractive Index, K (which must not be confused with k, the effective earth radius factor), achieves this end by reducing the meteorological data to a standard pressure of 1000 mb. This results in a change of temperature in accordance with a well-known law of thermodynamics (the same one which causes the end of a bicycle pump to get warm when you compress the air inside) and, although the amount of water-vapour remains unchanged, most of its attributes, such as vapour pressure, dew-point and relative humidity will alter.

If these new values, together with 1000 mb as the value for P, are inserted in the original expression for N, the result will be the potential refractive index, K. However complicated this may appear, there is a very simple method of

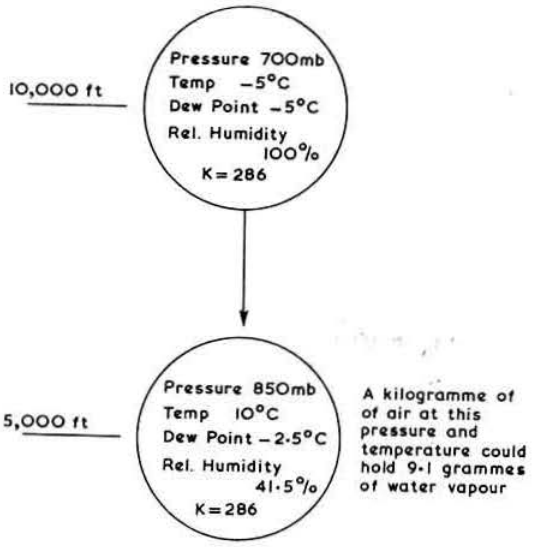


Fig. 1 An example of changes resulting from the adiabatic descent of a sample kilogramme of air containing 3·78 grammes of water-vapour.

arriving at the answer which avoids any calculation whatsoever and provides the result directly in *K*-units from the values of pressure, temperature and dew-point as reported in upper-air meteorological soundings. This is dealt with more fully in an appendix to this article.

A value of potential refractive index is the value of normal refractive index which a sample of air would have if it was taken adiabatically (i.e., without gain or loss of heat) to a pressure of 1000 mb. [2] As we shall see later it has a number of very important properties. We shall continue on the assumption that the figures have been converted into *K*-units, and then plotted against height.

Anticyclones

It is well known that the most prolonged and pronounced periods of anomalous propagation coincide with the presence of regions of high atmospheric pressure in the vicinity of the transmission path. At such a time the air circulation consists of light surface winds spiralling outwards from the centre of an anticyclone, and for these to be maintained air must be brought slowly down from aloft.

As the subsiding air descends its pressure increases, producing dynamical warming (the bicycle pump effect again). Now air at, say, 20,000 ft. holds very little moisture even when saturated and as the capability of the air to retain water-vapour increases very rapidly with temperature, by the time the air has descended to about 5,000 ft. the amount which it contains is only a small fraction of the amount which it could hold at its new temperature. Therefore, although no water-vapour has been taken away, the descending air has become very dry, compared to air normally found at that level.

The interesting point, which may now be obvious, is that the mechanism controlling the temperature, and hence, indirectly, the relative humidity or dew-point of the subsiding air, is the same one which was used to reduce the refractive index value to a standard pressure of 1000 mb, and this means that the air, as it descends, tends to retain its original value of *K*. (Fig. 1).

This is where potential refractive index scores over other derived units, because, as we shall see, large-scale downward movements of air are almost invariably involved when v.h.f. signal enhancements occur and the *K* value provides us with a means of identifying and following a particular part of an air-mass as it undergoes adiabatic change.

Now to return to the anticyclone. The portion of the atmosphere near the ground is generally a region of turbulence due to convective currents and mechanical stirring brought about by the presence of obstructions, either natural or man-made. This causes the removal of water-vapour from the surface by evaporation, to be distributed in the first few thousand feet of air where it may ultimately show itself in the form of cloud. Rising air cools and increases in humidity by an inversion of the same reasoning already applied to descending air. Eventually then, it would reach saturation and further cooling would cause water droplets to form if condensation nuclei are present. At this stage the process is no longer reversible, but that need not concern us here.

It is quite likely therefore that the warm, dry, subsiding air will find itself in close vertical proximity to the relatively cool, moist, turbulent air stirred up from the surface, and there is then a sharp transition at the subsidence boundary.

In terms of *K* (or *N* for that matter) an ascent through the boundary layer is characterized by a sudden, steep fall in

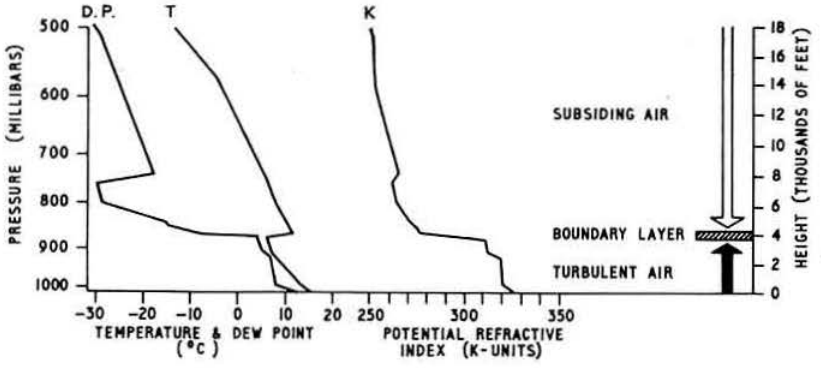


Fig. 2 Distribution with height of temperature, dew-point and Potential Refractive Index through the subsidence boundary layer.

refractive index with height (Fig. 2) and this is a change in such a direction as to cause abnormal bending of the radio waves back down towards the earth. Under these circumstances, a low-angle ray from the transmitter could be returned to the ground many miles beyond the normal horizon.

The Subsidence Boundary Layer

The effectiveness of the transition layer will depend upon its height, its horizontal extent and its intensity. When warm, dry, subsiding air is present aloft, the more the water-vapour which is available below, the sharper will be the transition across the boundary. Many operators will be able to testify from their own experience to the excellent results obtained during an opening when thick fog sets in during the evening, and, as another instance, the almost unlimited supply of cool, moist air available in the lower layers over the sea accounts for the higher median signals received on over-sea paths, as compared to land paths of a similar length.

Under the meteorological conditions normally encountered near the surface, the amount of water-vapour held in suspension is the most important factor in determining the refractive index. The quantity required to saturate a given volume of air increases rapidly with increasing temperature, approximately doubling in value for each rise of 10°C. The low values of temperature usually found in the lower levels in a winter anticyclone result in relatively low values of refractive index, even when the air is saturated. This reduces the magnitude of the transition layer between the convective air below and the subsiding air above, which, in turn, reduces its effectiveness as an aid to long-range v.h.f. propagation.

In summer, when the temperature is high and the air is capable of holding a large amount of water-vapour, air passing over land is normally dry (because of the large amount of water-vapour required to saturate it), again resulting in low values of refractive index. This often produces a very marked diurnal variation in propagation effects, high signals being most common in the late evenings and early mornings.

The best compromise between temperature and availability of water-vapour commonly occurs in autumn, and some of the most spectacular openings occur around September and October. Autumn anticyclones may persist for two or three weeks, and conditions will be observed to vary considerably over this period although pressure remains high.

Most Favourable Part of an Anticyclone

There is a well-known rule-of-thumb among amateurs both here and in the United States, which suggests that the most favourable conditions for v.h.f. signal propagation occur when the path lies on the western side of an anticyclone. W. F. Hoisington, W2BAV, analysed a large number of surface weather charts and gave an account of his findings in *QST* some years ago [3] which confirm this without attempting to explain it. Can we offer any explanation for this on a theoretical basis?

We have seen that subsiding air is an essential requirement, bringing air from aloft which becomes dry and warm as compared to the normal low-level air. But the mere presence of this air is not enough. To provide the steep lapse of refractive index necessary for abnormal ray-bending there must be air of high refractive index below it, and it is the transition region between them which is all-important. Now this region is the resultant of a slow, steady flow from above, and a turbulent or convective motion from below, the latter largely determining the height and sharpness of the boundary.

Consider the circulation around an anticyclone, which is clockwise in the Northern Hemisphere. On the eastern side air is travelling towards the south, usually towards regions of increasing surface temperature, a situation generally leading to an increase in convection and turbulence. This raises the boundary and, by spreading it, makes it a more gradual transition. The reverse argument applies to the western side, where the boundary tends to become lower and more pronounced, due to the more stable conditions below. On these grounds, then, one would expect the western side to be more likely to give rise to long-range propagation, and this is borne out by observation. It needs to be emphasized though, that it is not the subsiding air which gives abnormal conditions; it is the sharpness of the contrast between its refractive index and the higher values encountered near the ground which is important. For a given path length there will be an optimum height for the boundary layer, although as a general rule, the lower it descends, the more effective it will be, until a height is reached which cannot be " seen " by the lowest angle radiation from the transmitter, and the lowest angle reception at the receiver. The possibility of multi-hop propagation, particularly over paths crossing the sea, complicates any attempt to derive a hard-and-fast connection between layer-height and distance over which reception is possible for a given power, and there is frequently evidence of " skip " effects over long-distance paths.

A descending layer may ultimately reach the surface, initially over high ground, and subsequently over a wide area. When this occurs during a spectacular opening a mysterious " drop-out " results, since the refractive index gradient in the subsiding air is markedly below normal. High-altitude stations may then experience the disappointment of hearing their neighbours still in contact with distant stations which to them have disappeared.

For a station located at an appreciable height above sea-level, periods of what is to everybody else abnormally good propagation may turn out to be just the reverse. Strange though it may at first seem, the cure for this is to reduce the height of the aerial system—a difficult decision to accept for anyone who has transported equipment up the side of a mountain the hard way, but nevertheless a fact. Under such circumstances, wet-and-dry bulb thermometers should reveal low relative humidity which will confirm any such suspicion regarding the cause of the apparent lack of activity on the band.

Locating the Subsidence

We are now in a position to appreciate how potential refractive index assists in an analysis of the state of the atmosphere during periods of anomalous propagation.

Along a particular transmission path during normal conditions refractive index tends to be distributed horizontally as shown in Fig. 3(*a*). The changes of refractive index with height are inversely proportional to the spacing of the lines, which are here uniformly distributed.

Subsiding air will cause potential refractive index lines to be brought down to abnormally low levels, as discussed

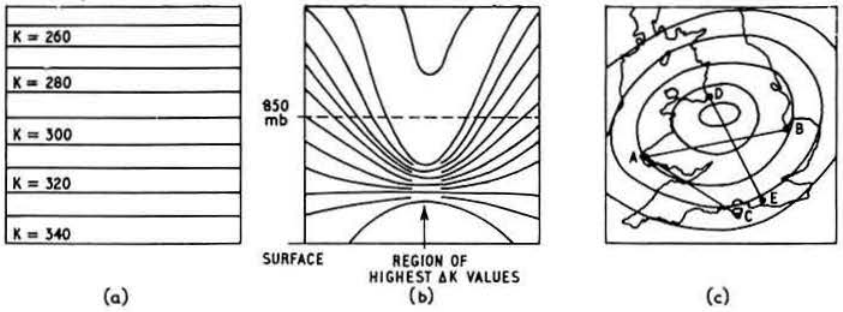


Fig. 3 Development of the Delta-K chart. (a) Uniform distribution along path. (b) Subsiding air revealed by displacement of K lines. (c) Contours of constant difference in K values between surface and 850 mb. Path AB, symmetrical to the pattern, is more favoured for anomalous propagation than paths AC or DE.

earlier (Fig. 3(*b*)). The lines nearer the ground tend to rise slightly and the overall effect is of a region of steep lapse at some distance above the ground. Whenever this is present signals become higher in strength over a given path, and receivable over greater distances, provided the paths are favourably placed with regard to the location of the subsiding air.

A very simple technique enables this to be placed. Consider once again Fig. 3(*b*). If the change in *K* between top and bottom of the diagram is calculated for various points horizontally, the greatest differences will occur in the region of the subsiding air. If such differences are derived for a horizontal " slice " of the air above the British Isles, we can, in fact, locate the subsidence by drawing the difference contours, or Delta-*K* lines. (Fig. 3(*c*)). It is convenient to take for this purpose the difference between the *K* value at the surface and that at a height where the air pressure is 850 mb (approximately 5,000 ft.), since this information is always available without interpolation from data reported by radiosonde stations.

It has been found that paths experiencing high signals are symmetrically placed to the pattern of the corresponding Delta-*K* chart, and that when signals have fallen the pattern has become asymmetrical. In other words, although conditions are generally good in the example pictured, the path AB is more likely to experience signal enhancement than either of the paths AC or DE, since the former has a symmetrical distribution of Delta-*K* values along it.

In practice, the subsidence boundary layer does not always occur between the surface and a pressure of 850 mb. It is fortunate that when it is above, the region of steepest lapse (i.e., where the lines are closest together) generally has below it a compensating slack gradient. In this case the Delta-*K* contour lines enclose a centre of low value instead of high, as originally considered, but the same symmetry observation is found to apply.

Further Analysis

In the second part of this account, the Delta-*K* chart technique will be applied to particular cases of high-signal periods of interest to radio amateurs, and the cross-sectional distribution will be examined in greater detail to explain some of the earlier observations relating to anticyclones. A third presentation of potential refractive index will be introduced, enabling high-signal periods to be picked out immediately, on sight, from several months of collected data.

The work described here is based on part of the programme of the Radio Research Station, D.S.I.R., and has been adapted to amateur interests by kind permission of the Director.

APPENDIX

Calculating K

Referring to Fig. 4, which is a skeleton outline of part of a meteorological temperature-entropy chart known as a " tephigram " on which *K* isopleths have been drawn, three scales are of interest in the present matter, namely, the pressure lines sloping diagonally from bottom left to top right, the temperature lines running vertically, and the *K* lines which curve around the top left-hand corner. In the interests of clarity the values above $K = 310$ have been omitted although the lines themselves have been inserted.

To find the *K* value corresponding to a given combination of pressure (*P*), temperature (*T*), and Dew-point (*Td*)

(*a*) Locate the point corresponding to (*P*, *Td*), using the appropriate skew axes.

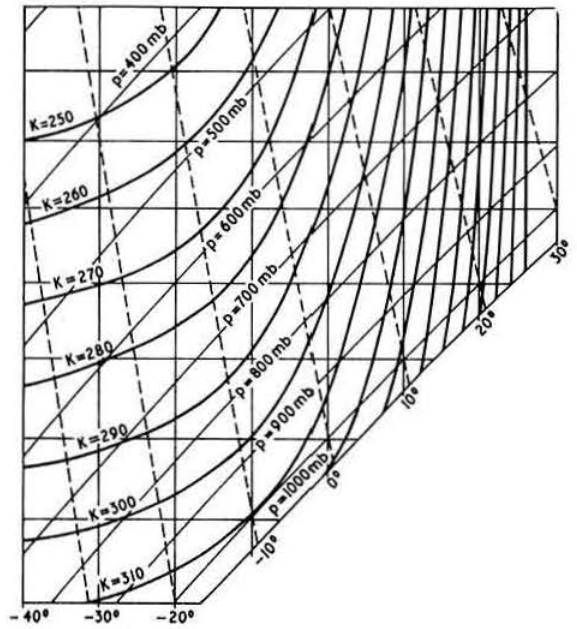


Fig. 4 Section of tephigram for calculation of K.
(Reproduced by permission of the Journal of Atmospheric and Terrestrial Physics)

(*b*) Through this point lay, and hold steady, a transparent straight-edge parallel to the sloping dashed lines.
(*c*) With a pencil in the right hand follow the pressure line to the point (*P*, *T*).
(*d*) Return horizontally to the straight-edge and make a dot beside it.
(*e*) Interpolate from the *K* curves the potential refractive index value at the dot.

As an example, where $P = 1000$mb, $Td = 0$°C and $T = 10$°C, then $K = 302$.

Once proficiency has been attained in working with unfamiliar skew axes, this is a very simple operation which provides a *K* value in a matter of only two or three seconds.

If required for ray-tracing purposes, the normal refractive index value, *N*, may be calculated from the *K* value by the use of a factor dependent on the pressure, derived from the expression

$$K / N = (1000/P)^{0.714}$$

where *P* is the air pressure in millibars at the level of the observation.

References

[1] Hooper, A., "Predicting V.H.F. Conditions," *Short Wave Magazine*, *10*, 741 (February 1953)
[2] Flavell, R. G. and Lane, J. A., "The Application of Potential Refractive Index in Tropospheric Wave Propagation." *J. Atmos. Terr. Phys. 24*, No. 1, (January 1962).
[3] Hoisington, W. F., "Painless Prediction of 2 meter Band Openings," *QST*, *33*, No. 10, 23 (October 1949).

R.N.A.R.S. Morse Code Proficiency Test

READERS MAY BE interested to know the Proficiency Run on February 5 was taken from page 24 of the August 1942 BULLETIN. There were no errors in the transmission and the speeds were 20·5, 25·5, 30 and 35 w.p.m. respectively. Transmissions take place on the first Tuesday of every month at 20.00 G.M.T. on approximately 3550 kc/s. Details of these transmissions can be found on page 250 of the November, 1962 BULLETIN.

Amateur Radio in Turkey

IN A LETTER TO R.S.G.B. Headquarters Mr. Güney Gönenc, P.K.29—Yenisehir, Ankara, Turkey, reports that a law permitting Amateur Radio in Turkey is about to be passed by the National Assembly. With the passing of legislation to permit the establishment of Amateur Radio stations in Turkey an effort is to be made to establish an Amateur Radio Society in the Republic.

New Morecambe Bay Television Relay Station

THE B.B.C.'S NEW television relay station at Stewnor Park, near Barrow-in-Furness (known as the Morecambe Bay station) was brought into operation on December 3, 1962. Because a new type of equipment is being used, the transmissions were initially experimental, but the new equipment has proved satisfactory and the station is now fully operational on Channel 3.

The Morecambe Bay station provides improved reception over an area which includes Barrow-in-Furness, Dalton-in-Furness, Millom, Ulverston, Carnforth, Morecambe and Lancaster.

Stratton & Co. Ltd.

INFORMATION HAS REACHED Stratton & Co. Ltd., Birmingham, that the call-sign allocated to their company (G6SL) has been used by an unauthorized person using the name of "Bill."

Members who hear a station using that call should notify both the G.P.O. and Stratton & Co. Ltd.

Equipment Finishes

THE EDITOR WILL BE pleased to consider an article describing the various forms of finish available for Amateur Radio equipment.

C.C.I.R. Delegates Entertained by International Amateur Radio Club

ON FEBRUARY 9, 1963, the Chairman and members of the International Amateur Radio Club, which is located in Geneva, invited delegates attending the C.C.I.R. Xth Plenary Assembly to inspect their station 4U1ITU. The invitation was accepted by many of the delegates who also took part in a special Technical Programme organized by the I.A.R.C. Committee.

Among the speakers were R.S.G.B. Past-President Dr. R. L. Smith-Rose, C.B.E., who discussed "Propagation and Amateurs," Mr. George Jacobs, who described the various OSCAR programmes and Mr. Dolozal who expounded on a simple approach to orbit predictions for *Oscar III*.

Mr. Alfred Schadlich (DL1XJ), who is a member of the Executive Committee of I.A.R.U. Region I Division and a member of the Federal German Republic delegation to C.C.I.R., conveyed greetings from the I.A.R.U. to all delegates and gave an outline of I.A.R.U. activities in general.

The chair at the technical meeting was taken by Dr. Mireslow Joachim (OK1WI) of Czechoslovakia who is now a member of the I.T.U. permanent staff.

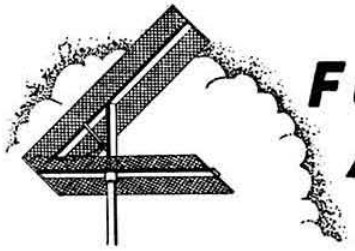
The Special Activities Day programme was held in the new I.T.U. building, at the invitation of the Secretary-General of I.T.U. (Mr. Gerald Gross, HB9IA, ex-W3GG).

Storing Electricity in Magnetic Coils

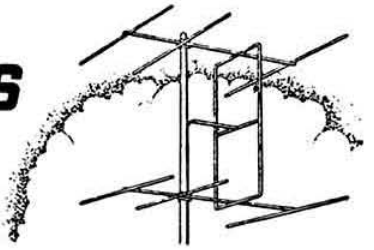
METHODS HAVE BEEN developed to store electric power indefinitely by placing it in special magnetic coils at temperatures low enough to liquefy air. A device is used which is composed of wire coils which have virtually no resistance to electricity, according to a U.S. Navy physicist, William F. Hassel, who described the methods in a paper read at a recent conference on Space Power Systems.

The coil is bathed in liquid helium at minus 269°C. in order to improve its superconducting qualities. The storage unit is enclosed in an insulated stainless steel case. Its superiority over the battery lies in its ability to deliver power to a load at a level several orders of magnitude higher than is possible for the battery. The power output of a small superconducting coil can range from Megawatts for a period of seconds to kilowatts for many minutes.

In space a small storage unit could be charged by solar energy by a low power nuclear generator at a slow rate. When needed, it could supply short bursts of high power for a transmitter, laser beam communications or even thrust impulses for an arc jet or other electric propulsion engine.—*Science Horizons.*



FOUR METRES AND DOWN



By F. G. LAMBETH (G2AIW)*

SOME welcome reports on activity on 4m have been received from new correspondents showing that the general activity is considerably more than might appear as a result of the earlier lack of information. Readers are asked to remember that operators are interested in your 4m work, and if you submit details, we will report to the general membership through this feature. Without your letters we can do little.

G3PLX (Liverpool) came on the band in June, 1962, and has since worked 31 stations in 11 counties. The equipment runs a QV04/7 in the p.a., driven by a pair of EF91s as oscillator/tripler and additional tripler, the input being 15 watts on 70·3 Mc/s. The receiver is an EC91 pre-amp into a crystal controlled converter using five EF91s, the i.f. being an HRO on 8 Mc/s. The aerial is a four element beam at 35 ft. (135 ft. a.s.l.). G3PLX is active on the band on Sunday mornings at 10.00 G.M.T. and usually on Tuesdays at 22.30 G.M.T. A most interesting QSO occurred on December 2 when G3JHM/A was worked cross-band to 2m on phone. Also heard recently was G3OSB at 569. GW3MDY (nr. Chester) and GW3RBM (Wrexham) have been worked cross-band, but since then GW3RBM has been heard on 4m.

G3NRW (Banstead) recently took the plunge with G3PDK, who runs very similar equipment. The original intention was to set up a reliable link between home QTHs, and it is certainly a great improvement over Top Band! The transmitter runs 10 watts to a QQV03/10 p.a., the aerial being a dipole. The converter is an RF27 with a CR100 as the i.f. strip. This simple gear has proved most useful for cross-town QSOs with the locals. The QTH is around 375 ft. a.s.l. but lies in a valley. Fortunately, this does not appear to affect signals except to the West (G3EHY has not yet been heard). A 4m s.s.b. transmitter is under way.

G3NDF (Bookham) has been on 4m since April, 1961, using a 440B transmitter at 18 watts input to a three element beam 300 ft. a.s.l. The receiver is now a G3FZL type converter which gives good results, Midlands stations often being heard. The score to January, 1963, was 86 stations, 24 counties and two countries. During 1962 the following 4m mobile/fixed nets were heard to commence: Worthing, Essex, Surrey and Surrey (R.A.E.N.). The main activity periods seem to be Sunday mornings and afternoons, Wednesday evenings and Monday evenings, in that order. G3NDF would like to hear some of the contest stations operative during the rest of the year.

G3GVM (nr. Worthing) says there are four active local stations on 70·26 Mc/s (the Sussex net frequency): G8RO (Tangmere), G3PUR (Worthing) fixed and mobile, G3JHM/A and mobile, and G3GVM fixed and mobile. There are known to be four other stations preparing for the same frequency. G3GVM shares the G3JHM hut on the South Downs 500 ft. a.s.l., and during the good conditions of December 2, stations as far north as Newcastle were contacted. We have also heard from **G3PUR** (Worthing) who works mainly mobile, and mentions G3ORR, G3RDT and G3IDX. He refers to 10 keen S.W.L.s as local 4m addicts, in addition to the others mentioned by G3GVM. G3PUR works fixed from the Home QTH and in addition from near Washington, Sussex, and finds 4m just as pleasing as 2m.

G3JHM is active on Wednesday evenings around 19.30 G.M.T. from Portsdown Hill, and will be pleased to arrange skeds. On Saturday and Sunday mornings and afternoons operation is from the /A QTH at Washington (6 miles north of Worthing), the results being excellent up to 160 miles. Activity in the South-East is rapidly increasing, and up to 20 stations are known to be building equipment specifically for the band. In addition to the Sussex R.A.E.N. net on 70·32 Mc/s there is a Surrey net with G3LBA/M, G3JEQ/M, G3BU, G8SM/M, G3HZJ, G3NDF, G3NRW, G3OWA and G3PRQ on 70·32 Mc/s. Other stations joining in the nets on the same frequency are G3HWR, G3BHT, G3CCM, G3HZJ, G2AIH, G3NPI, G6NB, G3NDF and G3BJR.

G3JHM has recently worked G3BHT (Surbiton), G3BJR (Harrow Weald), G3HZJ (Dorking), G3RPE (Hemel Hempstead) and G2DQ (Danbury). During the good December conditions G3JHM worked three new counties, the stations being G3IUD (Cheshire), G2OI, G3PJK, G3PLX (Lancs), G3LHQ and G3AZU (Yorks) with G5PW (Leeds) heard. G3OSB (Lincoln) has been heard and called several times. In addition, on Sunday mornings G3JHM scans 2m and 160m for people wishing to work cross-band. G2AIH has been worked on the band at 599 using 250 mW to a transistor transmitter at a distance of 30 miles. G3JHM has been active on 4m since June, 1961, and 77 stations in 26 counties have been worked to January, 1963.

G3OSB (Lincoln) states that a sked with G3PJK (Manchester) was successful on the second attempt on c.w. with reports averaging 459 both ways. They have a sked on Sundays at 10.00 G.M.T. but have only heard snatches of phone from each other. Another station worked on sked is G3IUD (Cheshire) with reports of 459. Local activity is increasing with G3LYF (R.A.F. Scampton) who is running 15 watts to a dipole. The equipment comprises an RF27-CR150 receiver, and a modified 18 watts S440B transmitter. The aerial is a three element Yagi at 35 ft. **G3HRP** (Scunthorpe) is operating again, from a new and better v.h.f. QTH.

G2DQ (Danbury) is running 50 watts to an 829B, feeding a four element Yagi, and during two months on the band has worked G5JU, G3EHY, G4AC, G2AOK, G3AZU and G3JHM/A, with many other stations within 40-50 miles. More activity during the week would be appreciated.

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* *21 Bridge Way, Whitton, Twickenham, Middlesex. Please send reports for the* **April** *issue to arrive by* **March 8** *and for the* **May** *issue to arrive by* **April 3.**

G3BSU and G3KMP have just got started on the band, and G8BJ is also on.

G3PJK (nr. Manchester) has been on 4m since March, 1962. The equipment is to *R.S.G.B. Amateur Radio Handbook* design, running 48 watts phone and 50 watts c.w., modulated by a pair of 807s in AB1. This excellent design is found to be simple, effective and reliable. The converter is crystal controlled, and uses the front-end of the 70 Mc/s *Handbook* design (EC91-6AK5) cascode into a 6AK5 mixer, with an i.f. output of 14 Mc/s. The aerial is a 4-over-4 slot at 45 ft. height and 320 ft. a.s.l. The total counties worked to date is 18 plus EI2W, and four other countries. Activity is mainly on Sunday mornings and between 22.00/23.00 G.M.T. most evenings. Up to now, 45 stations have been worked, the best DX being G3GVM/A (Worthing). After carefully checking over the results of the past few months, G3PJK has found the band better up to 10.00/11.00 G.M.T., unless conditions are exceptionally good. Other stations regularly active include G3OHH, G3IUD, G3PLX, G3PMJ and G3AYT.

G4OU (Sheerness) has recently become active on 4m and has had excellent QSOs with G2DQ, G3BSU and G3KLI, also being heard by a number of other stations at various times. Activity usually appears low, however, and some stations heard do not appear to be beaming towards Sheerness. The equipment in use is a transmitter operating a pair of QV04-7s with an input of 12 watts, a 12AX7 with two 6V6s comprising the modulator. The receiver is a modified RF27 unit, delivering a 7 Mc/s i.f. into a CR100. An R.S.G.B. 4m converter is under construction. The aerial is a three element Yagi at 15 ft., the frequency being 70·263 Mc/s. G4OU will be pleased to co-operate in any tests, any evening of the week.

G3MAA (Clitheroe) informs us there are four stations operational in N.W. Lancs.: G4GM, G3RNR (Accrington), G6AU (Blackburn) and himself. The transmitters are 440s and the receivers RF26 or 27 units. Three of these are operational on 2m, the tendency being to use 4m for cross-band working. G3BUR (Blackburn) has a 440 and hopes to be on soon. The Clitheroe QTH is shadowed by hills to the South and East, and consequently little success is possible in the Manchester direction, but G4GM and G6AU are able to work G3OHH (Macclesfield), G3JIJ (Castleton, nr. Oldham), G3PJK (Middleton), and other Manchester stations. Several local stations including G3TU (Accrington) and G5ZN (Burnley) have RF27s.

G3PTO (Wolverhampton) runs 10 watts c.w. only on a frequency of 70·28 Mc/s. The aerial is a three element beam at 32 ft., the converter being an E88CC cascode, 6AK5 mixer and 12AT7 crystal oscillator. The QTH is in rather a poor situation except possibly to the South-West and due North. Operation is on Sunday mornings from 09.30 onwards, and on Monday, Thursday and Friday evenings, and all day Saturday. Recent QSOs have been with GW3RBM (Wrexham), G3PDT (Birmingham), G3EHY, G3NUE, G3PJK, G3PLX, G5JU and G3JHM/A. Skeds would be appreciated with any station.

GI3HXV (Belfast 10), one of the 4m pioneers in Northern Ireland, is still very interested in the band and is always trying for more QSOs across the water. Several skeds are running with G stations, but only a few have been successful so far. The aerial is a four element fully rotary beam at 35 ft. There are now two more GIs on the band, GI3HJA and GI3NFM, both in Co. Tyrone, with whom several QSOs have been made. EI7A (Co. Donegal) is also active, and at least one other GI and an EI are expected to be shortly. GI3HXV does not think it was advisable to alter the rules for the " Four Metres and Down " awards to three countries; his opinion is that if it had been left as it was (five) more stations in GM, GI and GD would have come on. Secondly, as activity tends to be confined to areas (e.g., London, Birmingham, Yorks, Lancs, etc.) this sometimes leads to the use of indoor dipoles with a consequent loss of efficiency for DX work. If DX is sought, equipment must naturally be good. QSOs with G stations confirm this. Lastly, as many 4m operators are also 2m operators, it is obvious which band will be favoured in an opening; so could there be a plea that during such openings the 4m band could at least be looked over?

The " London " Convention

Preliminary arrangements are in hand for the Ninth International V.H.F./U.H.F. Convention to be held at the Kingsley Hotel, London, on Saturday, May 18, 1963. The V.H.F. Committee hopes to present the customary programme of lectures, and a small exhibition. There will be the traditional dinner in the evening and, of course, plenty of time for rag chewing.

Members with a flair for construction are reminded that the 1962 V.H.F. Committee Cup will be awarded for the best piece of home constructed v.h.f. or u.h.f. equipment exhibited. It is hoped that this year an even larger amount of equipment will be brought (or sent) along for display, so how about you—what have *you* built this year?

Further details will be published in *Four Metres and Down* and on GB2RS as they become available.

Two Metre News and Views

A letter from U.B.A. (West Flanders District, Bruges) invites all 2m operators to participate in a " Fox Hunt " at 13.00 local time on April 7, at the Zeebrugge Mole of famous memory. The " fox " will transmit under the call ON4PU/P. The first four hunters will receive vouchers

DJ3EN adjusting his 15 ft. dish aerial for moon-bounce experiments

valued at 1,000, 500, 250 and 100 Belgian francs. Entries from overseas amateurs and S.W.L.s should be sent to Rene Vanmuysen (ON4VY), President, U.B.A., 81 Jos. Bausstraat, Wezembeek—Oppem (Brabant) not later than March 25. Mobile operators can obtain a mobile licence for April 6/7 by submitting a photostat of their licence, the registration number of their vehicle, and also the address to which the licence is to be sent. The " fox hunt " will be followed by a party and dance.

G3CCA (Oadby) has been designing and building a new converter to precede his parametric amplifier. The final version of the paramp incorporates many modifications which have been found necessary during operational tests on the prototype. The pump frequency has been increased once again and is now 1100 Mc/s. In doing so the noise factor has been reduced from 0·65db to 0·55db. In order to improve a good converter, the " Mark 16 " was constructed and put into service recently. It is a vast improvement on the " Mark 15 " and is *all* Nuvistor. The final converter line-up is as follows: 6DS4 (isolation amplifier), 6CW4-8058 cascode, 6CW4 mixer, 6CW4 cathode follower i.f., and a tunnel diode oscillator on 15 Mc/s. A 6CW4 doubles to 30 Mc/s, and a varactor diode quadruples to 120 Mc/s. Comparing this with the " Mark 15 " with the aid of full instrumentation available at the laboratory where G3CCA works, the noise factor of the converter was found to be 2·3db. The total noise level of the whole receiving system including second stage noise is only 0·89db as against 1·1db with the previous system. Using the new system GB3VHF at Shooters Hill was S9 on February 6 (barometer 1000 mb). Owing to much time being used in construction, contacts have been few, apart from a long one with G3BA to discuss parametric devices. Those worthy of note (all 59+) were with G3KPB (Wandsworth) on January 24, G3JXN (St. John's Wood) January 20, G3PNA (Bletchingly, Surrey) January 20, G6NB (Aylesbury) February 3, and of course the local station which has stood by during all these tests, G3CKQ (Braunstone, Leicester).

G3OJY (nr. Penzance) reports that activity since the beginning of December appears to have dropped right off. However, activity night in Cornwall is still Monday after 20.00 G.M.T., and he asks again that beams should be turned towards that direction. G3XC is back on the band from his new QTH at Indian Queens, Cornwall, which is 500 ft. a.s.l. and should be pretty good for 2m. G2BHW, G3EKM, G3CZZ and G3OCB have been missing lately. Stations worked since the beginning of January include G5ZT, G3XC, G3MWM and GW3MFY. A rather startling suggestion made by G3OJY is that there should be cross-band working 2m and 80m as there are several stations on the latter band who can listen on 2m. Anyone wanting a sked is asked to contact G3OJY by post.

As briefly mentioned last month, it appears that the Northern stations participated much more in the December opening than was at first apparent.

G3FCY (Hull) reported that SM, OZ, SP, DL, ON, PA and F stations were worked by himself and others in that region, and probably the only reason he did not work LA as well was because he was unable to turn the beam in that direction. SP3GZ was worked by several stations and was 59 whilst in contact with G3FCY, who received a report of 59+ 20db! He was unfortunately at the lower end of the band and for the most part was blotted out by a PA teleprinter station.

G2BJY (Walsall) says that the highlight of the past few weeks was the 144 Mc/s C.W. Contest. This had been looked forward to with some foreboding since conditions had been so poor after the splendid December opening. During the whole of the interim, with operating times between 18.30 and 22.00 G.M.T., the only station heard at a distance greater than 50 miles was G3RND (Pontefract). However, on January 27 68 were heard between 10.45 and 21.40 G.M.T. The best, from the point of view of signal strength, were G3HRH and G6NB, with G2JF and G3EVV not far behind. Other outstanding signals were G3LTF, G2RD, G3GWL, G6OX, G3BNL, G2XV, G5UM, G3JXN, G3INU, G5LK, G3CCH, G3NNK, G3CGQ, G4CM, G5YC, G2AXI, G3KMT, G6XX, G3RND and G3NOH/P. Conditions to the North were poor and no stations farther east than Cambridge were heard. The only Welsh station heard was GW3PDI.

G3GVV (Haywards Heath) reports that during the period under review few stations were heard over distances of 100 miles and even fewer were worked. F2XO was the only Continental heard, during one of his regular QSOs with G3KMP. The 144 Mc/s C.W. Contest results were disappointing—only 19 contacts during the full 12 hours. G3NOH/P (Dorset), however, provided a new county; and those Cambridge stalwarts, G2XV and G3EDD, were the best DX! Two Welsh stations, GW3ATM and GW3MFY, were heard but not raised; G6GN (Bristol) was also heard several times.

G3LTF (Galleywood) took part in the 144 Mc/s C.W. Contest and found conditions fair in the morning, but the activity was not thought to be so high as last year.

C.U.W.S. in the Isle of Man

G3PIT, who is Transmitting Secretary of C.U.W.S., asks us to note that a group of the Cambridge University Wireless Society will be spending part of their Easter vacation on the Isle of Man, from March 21 to April 2. Operation on 2m is planned (frequency approximately 145·820 Mc/s) to conform to the Band Plan. They will endeavour to establish an a.m./c.w. link on 80m, which will be used as a calling frequency for anyone who hears them on 2m and cannot raise them. Operation will only be possible on Snaefell (2034 ft. a.s.l.) from March 26 to April 1 inclusive and mostly from 3 p.m. onwards. Prior to March 26, operation will be attempted from Douglas. A station for operation on 4m will also be arranged. If all goes well, skeds will be attempted. QSLs will be sent via the R.S.G.B. Bureau unless an s.a.e. is provided. The call-signs will be **GB3CUW** on 144 Mc/s and GD6UW on the h.f. bands.

V.H.F. Operating Awards

While checking claims for the various listener certificates available under the " Four Metres and Down " Award rules, it has become evident to the V.H.F. Committee that non-licensed members are not getting a fair deal when exchanging QSL cards with licensed stations. Possibly the latter do not realize that the listener is collecting cards for his certificate, with the result that their QSL acknowledging the listener report frequently omits to refer to the date, the time, the year, or even the band! In some cases a blank card has been sent bearing only the listener's identification number and the brief statement " thanks for report."

We hope that licensed stations who read this will realize that the listener does require a certain amount of confirmatory information on the acknowledging card, in just the

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

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

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
January 22, 1963	12.35 G.M.T.	1340 c/s low
February 12, 1963	12.00 G.M.T.	300 c/s low

same way as the transmitting member, and will do their best not to let the listeners down for the sake of the time taken to add the date and time of the contact on their QSL.

I.A.R.U. Region I V.H.F. Contest 1961

The results of European V.H.F. Contest 1961 have been received from S.S.A., the Swedish society, who judged the event. Some of their remarks are quoted here as they throw some light on the delay in producing the results:

(i) Some logs did not appear to have been checked by the V.H.F. Managers.
(ii) A few logs had no points or distances filled in.
(iii) The system with one point per kilometre makes it very difficult to check the distances in a just way.

The number of logs received from each country were as follows:

Austria	13	Italy	94
Belgium	9	Liechtenstein	1
Czechoslovakia	124	Poland	24
Denmark	20	San Marino	1
Eire	1	Sweden	9
Finland	1	Switzerland	14
France	45	The Netherlands	50
Germany	125	U.S.S.R.	1
Great Britain	26	Yugoslavia	22

The section leaders were as follows:

Section 1.—144 Mc/s fixed stations: PA0EZ, 34,378 points; 2nd—G3BBR/A, 31,075 points.
Section 2.—144 Mc/s portable stations: PA0YZ, 49,889 points; 2nd—G3LTF, 47,353 points.
Section 3.—430 Mc/s fixed stations: OK1KKD, 1,415 points.
Section 4.—430 Mc/s portable stations: I1RO/P, 1,777 points.
Section 5.—1260 Mc/s fixed stations: OK1KKD, 164 points.
Section 6.—1260 Mc/s portable stations: OK1KRE/P, 225 points.
Section 7.—2400 Mc/s fixed stations: no entry.
Section 8.—2400 Mc/s portable stations: DL6MH/P, 14 points.

The British results were as follows:

Section 1

	Points		Points
1. G3BBR/A	31,075	7. G5MR	6,443
2. G3FIJ	10,256	8. G3LTN	5,639
3. G5TN	9,993	9. GM3GUI	3,333
4. G5DW	8,962	10. G3OSA	3,035
5. G6GN	8,639	11. G3AS	2,976
6. G2AXI	6,908	12. G2DHV	2,281

Section 2

1. G3LTF/P	47,353	8. G3FRV/P	14,421
2. G2DTO/P	24,197	9. GW3FJI/P	11,908
3. G2HIF/P	21,369	10. G3MDH/P	11,820
4. G3EFX/P	20,027	11. G3OBD/P	10,905
5. G3FD/P	17,308	12. G3LCH/P	10,258
6. GW3KMT/P	16,467	13. G3OXD/P	7,524
7. G3EMU/P	14,485	14. G3LJB/P	5,170

R.S.G.B. News Bulletin Service

Members in Northern Ireland will be interested to know that the Society's News Bulletin Service on 2m on Sundays has been extended and is now transmitted from Belfast in accordance with the schedule on page 496. The first transmission is intended to serve Northern Ireland while the second is intended to provide an improved service to Southern Scotland.

Seventy Centimetres

G3LTF had a QSO on February 2 with G3NOX/T. G3LTF was using as a transmitter a varactor diode multiplier from 2m to 70cm giving an output of about ½ watt. Modulation was applied to the 2m drive and quality was reasonable. This may be the first British QSO using one of these devices. G3LTF has been improving the mechanical stability of his 70cm paramp, and the noise factor is now below 2db.

Twenty-three Centimetres

On February 10 G3NOX/T and G3LTF had their first two-way QSO on 1296 Mc/s, over a 27 mile path. G3LTF used a DET22 in the p.a. with about 1 watt output and a 4 ft. dish at 13 ft. The dishes were aligned by using 70cm signals, and needed to be pointed away from the direct heading due to home obstructions. Signal levels were about S3/4.

1296 Mc/s

G2RD (Wallington) reports that activity has been reduced generally owing to the bad weather. Snow on aerials caused considerable reduction in signal strengths. G3MPS has been testing on the receiving side. G8RW is active again, but G3FP lost half of his 8-over-8 during a blizzard.

10,000 Mc/s

G3GVM (nr. Worthing) and G3JHM (South Downs) have gear for 10,000 Mc/s and worked over a 27½ mile path with 15 mW input between Reigate Hill and the South Downs in the latter part of 1962, signals being 59+. They are after the British 10,000 Mc/s record next.

QRP on 420 Mc/s

"WHAT IS THOUGHT to be the largest thermionic valve in the world is being constructed at the Admiralty's Microwave Electronics Division of the Services Electronics Research Laboratory at Harlow, Essex. It is 18 ft. long, over 7 ft. high and 6 ft. wide and weighs 4½ tons. It is a travelling-wave tube designed to provide 100 mW pulses at a frequency of 420 Mc/s. To obtain this power, electrons will be accelerated to four-fifths the speed of light by means of a modulator that gives pulses of up to 500 kV at 500 amps. To protect operators from X-rays, the valve will be housed in a pit having lead walls and a 7 in. thick lead roof. The valve will be used for research into the upper atmosphere, sponsored by the Ministry of Aviation."—*Proc. I.E.E.*, December, 1962.

Re-calibration of Meters

THE EDITOR WILL BE pleased to consider an article giving practical advice on the re-calibration of surplus meters.

Society News

Mr. Norman Caws, G3BVG, Installed as President

THERE WAS AN ATTENDANCE of more than 80 members and their ladies at a Social Evening held in London on Burns' Night, January 25, 1963.

During the evening Mr. E. G. Ingram, GM6IZ, Immediate Past-President, installed Mr. Norman Caws, F.C.A., G3BVG, as the Society's 29th President. After formally handing over the presidential chain of office, Mr. Ingram presented a haggis and a bottle of Scotch whisky to Mr. Caws.

Honorary Treasurer

THE PRESIDENT (MR. NORMAN CAWS, F.C.A.) having resigned from the office of Honorary Treasurer, Mr. D. A. Findlay, D.F.C., F.C.A. (G3BZG) has been appointed by the Council to serve in that office for the year 1963. Mr. Findlay was Honorary Treasurer from January 1952 to December 1956 and served in the office of President for the year 1957.

Nominations invited for the Vacant Office of Zone A Representative

NOMINATIONS ARE INVITED to fill the casual vacancy in the Council in the office of Zone A Representative created by the death of Philip H. Wade, G2BPJ.

Any 10 Corporate Members resident in Zone A (Regions 1 and 2) may nominate any other duly qualified person resident in that Zone by delivering their nomination in writing in a single document to the Secretary, together with the written consent of such person to accept office if elected, but each such nominator shall be debarred from nominating any other person for this election.

Nomination papers must reach the Secretary not later than 12 noon, **April 5, 1963.**

In the event of more than one duly qualified person being nominated for the vacancy a ballot will be conducted, details of which will be published in the May 1963 issue of the Society's Journal.

Zone A comprises the counties of Cheshire, Lancashire, Cumberland, Westmorland and Isle of Man (forming Region 1) and the counties of Durham, Northumberland, and Yorkshire (forming Region 2).

After formally installing Mr. Norman Caws, G3BVG, as the Society's President on January 25, 1963, Mr. E. G. Ingram, GM6IZ, presented him with a bottle of Scotch and a haggis.
(Photo by courtesy of Electronics Weekly)

Committees of the Council 1963

THE FOLLOWING MEMBERS have been appointed to serve on the committees of the Council for 1963:

Contests. *Council Members:* D. A. Findlay (G3BZG), J. W. Swinnerton (G2YS). *Non-Council Members:* R. S. Biggs (G2FLG), M. Harrington (B.R.S.20249), W. H. Matthews (G2CD), M. Pharaoh (G3LCH), H. W. Rees (G3HWR), N. A. Ross (G3LAR).

Exhibition. *Council Member:* E. W. Yeomanson (G3IIR). *Non-Council Members:* C. R. Emary (G5GH), G. W. Norris (G3ICI), F. F. Ruth (G2BRH), R. G. B. Vaughan (G3FRV), C. L. Waterman (G3NKX), A. J. Worrall (G3IWA).

Finance and Staff. *Council Members:* D. A. Findlay (G3BZG), E. G. Ingram (GM6IZ), L. E. Newnham (G6NZ), G. M. C. Stone (G3FZL), E. W. Yeomanson (G3IIR).

G.P.O. Liaison. *Council Members:* J. D. Kay (G3AAE), L. E. Newnham (G6NZ), R. F. Stevens (G2BVN), J. W. Swinnerton (G2YS), E. W. Yeomanson (G3IIR).

Golden Jubilee Celebrations. *Council Members:* E. G. Ingram (GM6IZ), J. D. Kay (G3AAE), G. M. C. Stone (G3FZL). *Non-Council Member:* F. W. Fletcher (G2FUX).

Headquarters Building. *Council Member:* R. F. Stevens (G2BVN). *Non-Council Member:* R. Levi (G3NQT).

Membership and Representation. *Council Members:* H. A. Bartlett (G5QA), J. D. Kay (G3AAE), F. K. Parker (G3FUR), A. D. Patterson (GI3KYP), A. C. Williams (GW5VX), E. W. Yeomanson (G3IIR).

Mobile. *Council Members:* F. K. Parker (G3FUR), E. W. Yeomanson (G3IIR). *Non-Council Members:* J. M. Appleyard (G3JMA), G. C. Clark (G3NJL), C. L. Fenton (G3ABB), N. O. Miller (G3MVV), C. L. Waterman (G3NKX).

R.A.E.N. *Council Members:* L. E. Newnham (G6NZ), E. W. Yeomanson (G3IIR). *Non-Council Members:* G. A. Allcock (G3ION), E. R. L. Bassett (B.R.S.16075), C. L. Fenton (G3ABB), R. Ferguson (G4VF), A. C. Gee (G2UK), J. D. Kingston (G3VK), E. A. Matthews (G3FZW).

Scientific Studies. *Council Members:* R. C. Hills (G3HRH), G. M. C. Stone (G3FZL). *Non-Council Members:* W. H. Allen (G2UJ), R. G. Flavell (G3LTP), H. L. Gibson (B.R.S.1224), J. W. Mathews (G6LL), C. E. Newton (G2FKZ), W. E. D. Parker (G6BY).

Technical. *Council Members:* R. C. Hills (G3HRH), R. F. Stevens (G2BVN). *Non-Council Members:* W. H. Allen (G2UJ), D. N. Corfield (G5CD), G. C. Fox (G3AEX), G. R. Jessop (G6JP), J. W. Mathews (G6LL).

TVI/BCI. *Council Members:* L. E. Newnham (G6NZ), J. W. Swinnerton (G2YS), E. W. Yeomanson (G3IIR).

V.H.F. *Council Members:* R. C. Hills (G3HRH), G. M. C. Stone (G3FZL). *Non-Council Members:* W. H. Allen (G2UJ), R. G. Flavell (G3LTP), F. A. Griffiths (G3MED/T), F. E. A. Green (G3GMY), J. H. Hum (G5UM), A. L. Mynett (G3HBW).

The President is an ex-officio member of all Committees.

Region 12 Representative

DUE TO PRESSURE of business Mr. A. G. Anderson, GM3BCL, of Aberdeen has tendered his resignation from the office of Region 12 Representative.

Nominations for his successor, who must be a Corporate Member resident in Region 12, should be sent to reach the

At the Social Evening held in London on January 25, 1963 (left to right): D. C. Jardine, G5DJ, J. Douglas Kay, G3AAE (Member of Council), the late H. A. M. Clark, G6OT, Raymond Caws, G3BRL (Chairman, Radar and Electronics Association) and Jack Hum, G5UM (Member of V.H.F. Committee).
(Photo by courtesy of Electronics Weekly)

General Secretary not later than April 15, 1963. Every nomination must be supported by five Corporate members resident in the Region. In the event of more than one member being nominated a ballot will be arranged.

Mr. Anderson has also relinquished his appointment as a deputy news bulletin reader but no new appointment will be made unless a member is nominated by the membership in the North-east of Scotland.

The Council has placed on record its thanks to Mr. Anderson for his past services to the Society.

Headquarters Fund—List No. 17

THE FOLLOWING IS the 17th list of those who had contributed to the Headquarters Fund up to February 8, 1963:

A. O. Milne (G2MI), P. B. Dodd (G3PBD), J. R. Gazeley (B.R.S.20533), F. C. Beadle (G3KLI), S. G. Marsh (G2CZU), J. E. Forde (G2FSP), F. Legge (ON4MN), C. R. F. Spain (B.R.S.22159), D. Nimmo (Non-member), J. P. Attard (B.R.S.24933), Dr. L. Harbin (VP4PL), N. Mackinnon (GW3PPQ), E. G. Augood (G3MML).

Total amount contributed to date: £1,631 13s. 8d.

Hampshire R.A.E.N. Group win Raynet Trophy

FIRST WINNERS OF the recently donated Raynet Trophy are the Hampshire R.A.E.N. Group. The award was made by the Council on the recommendation of the R.A.E.N. Committee who considered that the Group had contributed most towards the good standing and prestige of R.A.E.N. during the year 1962. Before reaching its decision the Committee took into account the general conduct of the Group, the progress made relative to the opportunity available and other relevant factors.

Radio Amateurs' Examination to be held in December

THE CITY AND GUILDS of London Institute has announced that in order to overcome the difficulties experienced by some colleges last year, the autumn 1963 Radio Amateurs' Examination will be held on Friday, December 6, from 6.30 p.m. to 9.30 p.m. Applications to sit the examination must be made to technical colleges by November 1, 1963.

Radio Amateurs' Examination

FROM TIME TO TIME the Society has been asked to produce specimen answers to the questions set in the City and Guilds of London Institute's Radio Amateurs' Examination. Arrangements have now been made for such answers to be prepared by Mr. Alan Bayliss, B.Sc., G8PD, who has conducted a class in preparation for the examination for some years.

Mr. Bayliss' specimen answers to the questions set in May, 1962, are published as a supplement to this issue. For convenience, the supplement may be easily removed without upsetting the page numbering of the BULLETIN.

Recordings for Sightless Amateurs

SIGHTLESS MEMBERS will be interested to know that a tape recording of the Radio Amateurs' Examination supplement in this issue of the BULLETIN will be available during March from the Cultural Society of the Disabled, 57 Fitzallan Road, Finchley, London, N.3.

Posting Certificate

ALL COPIES OF THE February issue of the R.S.G.B. BULLETIN were posted on Tuesday, February 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.

R.S.G.B. News Bulletin Service

WITH EFFECT FROM FEBRUARY 24, 1963, the Society's News Bulletin Service was extended to Northern Ireland. The News Bulletin is transmitted from Belfast on 3·6 Mc/s at 10.15 a.m. and on 145·8 Mc/s at 11.30 a.m. (beaming west) and at 11.45 a.m. (beaming north-east).

The revised schedule of transmissions under the call-sign GB2RS is on page 496 of this issue.

London Lecture Meeting

THE LONDON LECTURE MEETING at the Institution of Electrical Engineers, arranged for March 29, 1963, will not now take place.

Golden Jubilee Celebrations

DETAILS OF THE preliminary programme of events to celebrate the Society's fiftieth anniversary during the period July 1-5, 1963, were given on page 371 of the January issue of the BULLETIN.

More Pirates Fined

On October 18, 1962, at Hull Magistrates' Court, John William Baxter of 5 Freehold Street, Hull, Yorkshire, pleaded guilty to a charge of using wireless telegraphy transmitting apparatus without the necessary licence. He was fined £15.

On January 2, 1963, at Brighton Magistrates' Juvenile Court, two 15-year-old youths each pleaded guilty to a charge of using wireless telegraphy transmitting apparatus without the necessary licence. Each was fined £2 and ordered to forfeit the apparatus to the P.M.G.

On January 15, 1963, at Northampton Borough Magistrates' Court, Raymond Moseley of 80 Gordon Street, Northampton, pleaded guilty to using wireless telegraphy transmitting equipment without a licence. He was fined £5 and ordered to pay £5 5s. costs. On January 23, 1963, at Northampton Borough Juvenile Court, a 16-year-old youth pleaded guilty to a similar charge and was fined £3 and ordered to pay £3 costs. On January 23, 1963, at Northampton Magistrates' Court, Henry Bosworth of 9 Tiverton Avenue, Whitehills, Northampton, pleaded guilty to a similar charge, was fined £2 and ordered to pay £3 3s. costs.

Silent Keys

C. H. L. EDWARDS (G8TL)

During the evening of Monday, January 28, 1963, the Council of the R.S.G.B. met in London. Among those present was Cecil Herbert Lambourn Edwards, A.M.I.E.E., A.M.Brit.I.R.E., G8TL. Decisions were reached that evening which demanded executive action by the President and G8TL. Early in the morning of Thursday, January 31, G3BVG and G8TL were in earnest telephone conversation on a variety of matters—less than three hours later G8TL had passed from the mortal scene.

" Eddie " Edwards was probably known by name or in person to more members than anyone else in the Society. First licensed in 1926 as 2BOV he became G8TL in 1937. His first contribution to the Society's Journal appeared in a pre-war issue of the *T. & R. Bulletin* when he described his mobile equipment and the adventures it brought him when he drove his car around London.

Elsie and "Eddie" Edwards

During the first four years of the war he was a frequent visitor to the North London home of the General Secretary (then the temporary Headquarters of the Society) and it was whilst on one of those visits that he offered to help with the administration of the R.S.G.B. Prisoner of War Fund. The enthusiasm with which he tackled that job was an example of the zeal and assiduity with which in later years he undertook other tasks of great importance to the Society. Members who were prisoners of war will always owe a debt to " Eddie " for the care and attention he devoted to the task of selecting goods for the P.O.W. parcels.

Shortly after the war (in 1947) G8TL was nominated to serve on the Council and, except for one year, he remained a member of that body continuously from then until his death. During 1947, when the Society was given the chance of obtaining surplus Government radio equipment cheaply for its members, it was " Eddie " who stepped in and offered to organize the scheme of distribution. The effectiveness of his methods was recognized by every member who availed himself of the opportunity to participate in the scheme. Later the chance occurred for the Society to assist the Lifeboat Service. Again it was G8TL who offered his services. Then in 1953 came the East Coast Flood disasters and the birth, in November of that year, of R.A.E.N. " Eddie," by virtue of his job as a consulting and surveying engineer for a large insurance company, and whose duties extended throughout East Anglia, was alive to the possibilities of another disaster. With his enthusiasm he helped to organize R.A.E.N. in his own county of Essex, becoming in time County Controller. For years he laboured devotedly for R.A.E.N. and his contacts with the Essex Constabulary led to the establishment of county-wide exercises of which the country had no parallel. " Eddie " became a member of the R.A.E.N. Committee shortly after the Network started and he was Chairman of that Committee at the time of his death.

It was perhaps as Chairman of the Society's Exhibition Committee that he was known to the greatest number of members because for many years he had made a point of " signing on " aspirants for membership at succeeding radio exhibitions. It was on such occasions that he showed the true spirit of Amateur Radio when by word and deed he made the newcomer feel really welcome. Exhibitions, too, provided him with the opportunity of showing examples of his own beautifully made pieces of home-constructed equipment.

His third great interest lay in the work of the Society's Mobile Committee, of which body he was also Chairman at the time of his death. He had been the driving force behind several of the Society's National Mobile Rallies, and in particular his contacts with the United States Air Force Station at Wethersfield, Essex, led to a successful Rally being organized there in 1962.

The Society's Slow Morse Practice Transmissions were organized by G8TL and he also played an important role in seeing that aspirants for an Amateur (Sound) Licence living in East London and Essex were provided with adequate facilities for technical instruction locally.

During the 15 years he served on the Council he had represented that body at Society meetings in many parts of the country and even when not a member of the official delegation he frequently attended functions at his own expense.

In all his Society work he had the active and affectionate support of his wife, Elsie, who for several years has served as Hon. Secretary of the Exhibition and Mobile Committees. Elsie and " Eddie " were inseparable and frequently she and daughter Gillian waited patiently in the family car outside R.S.G.B. Headquarters when " Eddie " had been held up at a late Council meeting. About five years ago " Eddie " suffered a heart attack and from that time onwards he had been urged to go slow. How slow he went only his wife and family know but we who were closely associated with him almost to the end of his days did not notice any real relaxation of the great effort he made to serve the Society.

By his death the Amateur Radio movement throughout Great Britain has suffered an irreparable loss. The name of " Eddie " Edwards—he was seldom known by his formal Christian names or as Mr. Edwards—will long remain as a shining example of what one man was prepared to do to further the interests of Amateur Radio in general and the Society in particular.

Professionally Mr. Edwards was a chartered electrical and electronic engineer. He was an Associate Member of the Institution of Electrical Engineers and an Associate Member of the British Institution of Radio Engineers.

All who knew G8TL either personally or by call-sign will wish to be associated with the President, Council and Headquarters staff in expressing their deepest sympathies to Mrs. Edwards and her family.

A Silent Key that will long be remembered.

* * *

The funeral took place at the City of London Cemetery, Manor Park, London, E.12 on Thursday, February 7, 1963.

In addition to the family mourners there were present Mr. Norman Caws (President of the R.S.G.B.), Mr. G. M. C. Stone (Executive Vice-President), Mr. H. A. M. Clark (Vice-President), Messrs. R. C. Hills, F. K. Parker and E. W. Yeomanson (Members of Council), Mr. P. A. Thorogood (Region 7 Representative), Messrs. W. D. Gilmour and M. C. McBrayne (Region 7 Deputy Regional Representatives), Mr. John Clarricoats (General Secretary), Miss May Gadsden (Assistant Secretary), Sgt. R. Hodson (representing the Essex Constabulary) and about 30 other members and close friends.

There were upwards of 40 floral tributes. J. C.

H. A. M. CLARK (G6OT)

Suddenly, whilst in his office on Thursday, February 14, 1963, death came to Henry Arthur Maish Clark, G6OT. " Ham " Clark, as he was known to hundreds of radio amateurs because of the coincidence of his initials, had been Chairman of the Society's Technical Committee for more than 25 years and during that time he had helped to steer through most of the major technical problems of the Society.

First licensed in 1926 Harry Clark had been an active amateur throughout most of his adult life. He was a member of the Council for many years and was elected a Vice-President in 1951.

Mr. Clark was a Graduate of London University (holding an engineering degree in the Faculty of Science) and a Member of the Institution of Electrical Engineers. He was Technical Director of E.M.I. Ltd. Records and International Division.

A full tribute to his memory will appear in the April issue.

* * *

Cremation was at Marylebone Crematorium, East Finchley, London, on Thursday, February 21, 1963. J. C.

H. J. HUNT (G5HH)

We are sorry to announce the death of Henry Hunt (G5HH) of Reading, on January 4, 1963, at the age of 63. He had been in failing health for some months.

Henry was first licensed in 1935, and operated on all h.f. bands, being particularly interested in 160m mobile work during recent years. He was a real old-timer and a master of improvization, as anyone who had seen his gear can testify. Many younger members will remember him and his enthusiasm to help. All his friends will miss him greatly, especially on Top Band.

The funeral service, followed by cremation, was held at Caversham on January 10, and attended by G2YB and G6WO.

To his family we offer our deepest sympathy. L. G. W.

Silent Keys

ARTHUR H. BIRD (ex-G6AQ)

The death occurred on January 11, 1963, of Arthur H. Bird (ex-G6AQ) of Nunhead, London, S.E.15 at the advanced age of 86.

Arthur Bird was for many years President of the International Short Wave League and Hon. Secretary of the World Friendship Society of Radio Amateurs. He was also associated with the Baird Television Society and did useful work at the Norwood Institute for the Blind.

He was first licensed as G6AQ in 1925 and he held that call until 1962. He was very active in the years between the wars but had been inactive since 1952. L. H.

C. BOWTELL (G5GN)

It is with deep regret that we have to announce the death, at the age of 59 years, of Cyril Bowtell (G5GN) of Hinckly, Leicestershire. Although he had suffered from ill health for a number of years, the end came suddenly on Sunday, December 30, 1962, and was a great shock to all who knew him.

Cyril was a radio enthusiast who lived for his hobby, and was always ready to help others in difficulties. Although active on all h.f. bands, he had concentrated latterly on 2m, and his cheery voice will be greatly missed by many Midlands v.h.f. amateurs.

To his widow, Lou, we offer our deepest sympathy.

G2DMN

V. DUNK (G2SG)

It is with deep sorrow that we record the death of Vic Dunk (G2SG), who died suddenly on December 23, 1963.

Vic was an active member prior to and after the war, and up to the time of his death he was to be heard on all bands from 160 to 2m, with a preference for c.w. His first interest in radio was aroused during his service with the early wireless cars of the Metropolitan Police and he obtained the call G2SG in 1934. During the war he served in the Merchant Navy as a Radio Officer.

To his widow, Connie, sons Roger and Kenneth, and daughter Jennifer we extend our condolences. D. F. C.

R. C. HARRISON (G2RH, 9G1CC)

It is our sad duty to record the death on January 27, 1963, of R. C. Harrison (G2RH), at the age of 53.

Reg Harrison seemed to possess an inexhaustable fund of energy, and upon moving to Burton he was responsible for the formation of the present Burton-upon-Trent and District Radio Society in 1947. He remained the popular Chairman of that society until 1956, when he left the service of the Post Office to take up an appointment at the Telecommunications Engineering School in Ghana where he was a very popular member of the staff. He will be greatly missed by his friends in Accra, particularly those interested in Amateur Radio and in golf. He will long be remembered, too, by the many young Ghanians to whom he taught radio and who benefited so much from his lucid teaching and his friendly and humorous personality.

To his widow, two sons and daughter we extend our deepest sympathy. H. H. and 9G1AB

H. J. PARKER (B.R.S.24758)

It is also our sad duty to record the death of Mr. H. J. Parker (B.R.S.24758) of Aylesbury, Bucks. Mr. Parker had been a member just over a year at the time of his death on January 4, 1963.

A. PETHERICK (B.R.S.14251)

We regret to report the death of Mr. A. Petherick (B.R.S. 14251), whose home address was near Tonbridge, Kent. Mr. Petherick joined the Society in 1946.

EARLE TURNER (VE2CA)

Canadian Amateur Radio has suffered a severe loss by the death, on December 31, 1962, of Earle Turner, VE2CA. Earle Turner was a very old timer having been licensed shortly after World War 1. For some years before the Second World War he was the Society's B.E.R.U. Representative for the Canadian VE2 Division and throughout that period and always afterwards he took a lively interest in the affairs and activities of the R.S.G.B. His call was frequently heard during B.E.R.U. Contests and on a number of occasions he finished in a good position among the Canadian entrants. He was a pre-war Empire Link station and co-operated annually in the Loyal Relay to the Society's then Patron (H.R.H. The Prince of Wales, K.G., now The Duke of Windsor).

The sympathies of all members who knew Earle personally or by call-sign are extended to his widow, Phyllis, who also operates as VE2CA. The London Members' Luncheon Club had the pleasure of having Phyllis as a guest of the Club last summer. J. C.

TOM VICKERY (ex-G5VY)

It is with deep regret we record the passing of Tom Vickery, ex-G5VY, of Enfield, Middlesex, on January 24, 1963.

Tom was a founder member of the Enfield and District R.S.G.B. Group in 1946, subsequently becoming Chairman and T.R., offices he held until 1950. The first meetings took place at his home.

Tom was always interested in v.h.f. and operated on 56 Mc/s and 112 Mc/s prior to the introduction of the present 144 Mc/s band. Enfield members chiefly remember his 420 Mc/s self-excited oscillator experiments and the assistance he gave to the Group exhibit at the Enfield Show until ill-health forced him to give up Amateur Radio some years ago.

Tom Vickery will be sadly missed by all who knew him. Deepest sympathy is extended to his widow. B.R.S.20533

R. A. WALKER-ALEXANDER (G5RA, ex-VS7RA)

The death occurred in January at his home in Ludlow, Shropshire of Mr. Reginald A. Walker-Alexander, G5RA. He was perhaps better known to earlier generations of amateurs as VS7RA for it was from Ceylon during the hey-day of B.E.R.U. that he transmitted a characteristic signal. Since his return to England he had operated occasionally on 80 metres.

Mr. L. F. Ivin, G5IC, who reported G5RA's death to Headquarters, frequently visited his shack for a ragchew about the old days. G5IC attended the cremation service at Hereford on January 17, 1963. J. C.

From Mrs. Elsie Edwards

I would like to express the sincere appreciation of my family and myself for the many kind expressions and tokens of sympathy received in our sad loss.

I am sorry that I cannot reply to each one personally, but I should like to assure all those who wrote to me, including the Clubs, Societies, and Groups, R.A.E.N., Chelmsford Police Headquarters, and TV amateurs, that their letters will always be remembered with gratitude.

Theydon Bois, Essex,
February 10, 1963.

G3IEC Bereaved

FRIENDS OF GEORGE VERRILL, G3IEC, will be sorry to learn that he was recently bereaved by the loss of his mother at the advanced age of 92 years. During the time that Mr. Verrill acted as one of the Society's QSL Sub-Managers, his mother frequently assisted him in the sealing of envelopes. She was well known to many amateurs and especially to Norman Booth, G2DSF.

G3OOA Bereaved

FRIENDS OF RAY HOWLEY, G3OOA, will be sorry to learn that his mother, affectionally known as " Dora," died on January 8, 1963. Dora will long be remembered by the many amateurs who visited her home at Goostrey, Cheshire, and enjoyed her excellent meals. She will be sadly missed, for she understood Amateur Radio and had a close link with the movement. E. C. W. B.

QRA Locator Maps

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

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 Friday, December 14, 1962, at 6 p.m.

Present: The President (Mr. E. G. Ingram in the Chair), Messrs. H. A. Bartlett, N. Caws, C. H. L. Edwards, R. C. Hills, A. O. Milne, L. E. Newnham, A. D. Patterson, R. F. Stevens, G. M. C. Stone, J. W. Swinnerton, P. H. Wade, E. W. Yeomanson (Members of the Council) and John Clarricoats (General Secretary).

Apologies:
Apologies for absence were received from Major-General E. S. Cole and Mr. F. K. Parker.

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

Membership
Resolved (i) to elect 65 Corporate members and 19 Associates; (ii) to grant Corporate membership to seven Associates who had applied for transfer.

The Office of Honorary Treasurer
The Honorary Treasurer and President-Elect (Mr. Norman Caws) formally gave notice of his intention to resign from the office of Honorary Treasurer on December 31, 1962.
Resolved (i) to accept Mr. Caws' resignation from the office of Honorary Treasurer as from December 31, 1962;
(ii) to declare that a casual vacancy will exist in that office as from January 1, 1963;
(iii) to invite Mr. D. A. Findlay, D.F.C., F.C.A. (G3BZG) to fill the vacancy created.

QSL Bureau
The Society's QSL Manager (Mr. A. O. Milne) submitted a report on the activities of the QSL Bureau during the past year.
Resolved (i) to receive the Report submitted by Mr. Milne;
(ii) to thank Mr. Milne for the Report;
(iii) to award honoraria amounting to £94 10s to the 13 Sub-Managers listed in the Report.

Trophies
Consideration was given to two offers, one from the Amateur Radio Mobile Society and the other from a non-member of the R.S.G.B., to donate silver trophies for annual award in connection with mobile work.
After full discussion it was
Resolved to inform the Amateur Radio Mobile Society and the non-member concerned that the Council appreciates their kind offers but does not wish to accept any trophies for mobile work.

Orbital Times—Artificial Earth Satellites
It was reported that the G.P.O. had declined to grant permission for an extension of the News Bulletin Service to permit the transmission of orbital times on weekday evenings.

Region 1 Lecture
The Region 1 Representative (Mr. B. O'Brien) reported upon the highly successful Regional lecture delivered recently in Liverpool by Dr. R. C. Jennison of the Jodrell Bank Radio Observatory.
The Secretary was instructed to write on behalf of the Council and congratulate Mr. O'Brien on the success of the lecture and to thank him for his generosity in making a donation towards the expenses of the event so that no charge fell on the Society.

Official Regional Meetings
Resolved to authorize (i) the Region 3 Representative to hold an O.R.M. at Trentham Gardens, Staffordshire, on Sunday, April 21, 1963; (ii) the Region 10 Representative to hold an O.R.M. in Cardiff, during mid September 1963.

Reports of Committees

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

Committee	*Date of Meeting*
Exhibition	November 14, 1962
Contests	November 15, November 22, 1962
Mobile	November 16, 1962
Scientific Studies	November 26, 1962
Finance & Staff	December 1, 1962

The Minutes of a meeting of the Technical Development Sub-Committee were submitted for information.
Resolved to receive the Reports and to accept certain of the recommendations contained therein.
The recommendations dealt *inter alia*, with financial matters concerning the retirement of Mr. John Clarricoats from the office of General Secretary and Editor on January 12, 1963, and from the office of General Secretary on December 31, 1963; staff Christmas boxes, contests, mobile rallies during 1963, the use of v.h.f. contest logs by the Scientific Studies Committee.

The meeting terminated at 10.25 p.m.

Affiliated Society Representatives

THE following are additions to the list of Affiliated Society Representatives published in the January issue.

AINSDALE RADIO CLUB
Dr. J. C. Craig (G3LMD), 352 Liverpool Road, Birkdale, Southport, Lancs.

CIVIL SERVICE RADIO SOCIETY
D. E. Tomkinson (G3IIE), 24 Meadway, Old Coulsdon, Surrey.

CRYSTAL PALACE & DISTRICT RADIO CLUB
G. M. C. Stone (G3FZL), 10 Liphook Crescent, Forest Hill, London, S.E.23.

EDGWARE & DISTRICT RADIO SOCIETY
R. H. Newland (G3VW), 10 Holmstall Avenue, Edgware, Middx.

MIDLAND AMATEUR RADIO SOCIETY
M. A. Brett (G3HBE), 55 Chestnut Drive, Birmingham 24.

MIDLAND RADIO CONTEST CLUB
J. J. Lockyer (G3OVA), 153 Ivor Road, Birmingham 11.

NEWBURY & DISTRICT AMATEUR RADIO SOCIETY
J. A. Gale (G3LLK), Wild Hedges, Crookham Common, Newbury, Berks.

SOUTH SHIELDS & DISTRICT AMATEUR RADIO CLUB
Ken Sketheway (B.R.S.20185), 51 Baret Road, Newcastle-on-Tyne 6, Northumberland.

YORK AMATEUR RADIO SOCIETY
A. Horner (G3FTS), 54 Plantation Drive, Boroughbridge Road, York.

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.

R.S.G.B. 7 Mc/s DX Contest 1962

THE FIRST CONTEST organized by the R.S.G.B. on a world-wide basis for 7 Mc/s met with mixed success. The C.W. Section, held on November 3-4, 1962, was well supported but unfortunately the same cannot be said for the Phone Section, held the previous weekend. Admittedly there was for the latter an unfortunate clash with another contest, the Contest Committee not being aware of the date for the other event.

The C.W. section attracted 129 entrants, 96 from overseas. The overall winner was P. J. Broom, G5DQ, with 2,535 points from 273 contacts, 59 of which carried a bonus. In second place was A. J. Slater, G3FXB, with 2,304 points from 262 contacts, 51 with bonus.

Though there is no award made for the leading overseas entrant, it is interesting to note that the result was a tie between G. Vollema, PA0LV, and Cpl. Technician D. S. Roden, ZB1BX, with 1,649 points occupying a joint seventh place in the final table.

C.W. SECTION

Position	Call-sign	Points	Position	Call-sign	Points
1	G5DQ*	2,535	66	G2ZR	685
2	G3FXB*	2,304	67	SM5AQI	679
3	G3HDA	1,839	68	SM5CZQ	670
4	G2DC	1,759	69	PA0PDG	655
5	GW3JI*	1,659	70	OH2BR	650
6	G3EYN	1,655	71	YO4CT*	645
7	PA0LV*	1,649	72	ZB1CR	640
	ZB1BX*	1,649	73	G8KU	625
9	PA0VB	1,595	74	SP2CO	610
10	G3DYY	1,510	75	YO4SA	600
11	DJ4GA*	1,505	76	LA2Q*	595
12	G3KSH	1,440		SM5AFE	595
13	PA0KF	1,390		W2JAE*	595
14	SM6DED*	1,388	79	SM6CUK	570
15	DJ2XP	1,310	80	OK1OO	555
16	SM5CCE	1,300	81	OK1QM	540
17	G3MZV	1,290	82	SP2AHD	530
18	G3NWD	1,270	83	DL1WJ	515
19	G5JU	1,255	84	SM5ARQ	514
20	G3POI	1,250	85	G3OYU	485
21	G8PB	1,195		LZ1KAA*	485
22	DL4FT	1,175	87	SP2RS	479
23	OH2EW*	1,167	88	OZ3LI	475
24	OK1RX*	1,124		SP8AAH	475
	SM3TW	1,124	90	PA0MAR	470
26	IT1AGA*	1,115		UA1TL*	470
27	G3KZR	1,110	92	SP2ANY	450
28	UB5ZE*	1,085	93	UB5TR	440
†	SP5PKN	1,084	94	SP5AHW	430
30	OH2QV	1,065	95	SP9AGS	415
31	DJ2ZX	1,040	†	OK2KJU	399
	G6VC	1,040	97	OH2IS	395
33	G8KP	1,010	98	EI5F*	380
34	DJ5JH	969		UO5AA*	380
35	G3JKY	960	100	G3IRM	365
36	SM5CEW	935		YO3AC	365
37	G2GM	930	102	SM5CAK	360
	SP8MJ*	930	103	SP8YA	330
39	SM5BFJ	920	104	G3CWL	320
40	G2YK	905	105	SM7DRB	315
41	F2PO*	900	106	OK3EA	310
42	F2NZ	860	107	F8FU	300
43	G3MPB	825		YU1SF*	300
44	PA0NW	815	109	VK3TL*	295
45	G3VW	814	110	SP5HS	290
46	OH1VA	810	111	SP3HD	285
47	G6TC	799		UQ2CC*	285
48	G3GSZ	795	113	G3MWZ	275
49	SP5AKG	765	114	SM5ASX	270
50	F9DW	760	115	SP8CK	260
51	G2BLA	755	116	SP9AJA	255
	OZ2NU*	755	117	SP4NL	230
53	G2QT	745	118	OH1VR	229
	SM5CON	745	119	G2KW	184
55	G3FTQ	743	120	UA9WL*	180
56	OH1SH	739	121	SP9AMA	170
57	ON4CE*	735		VK3XB*	170
	UB5KAK	735	123	VQ4IN*	130
59	HB9QA*	715	124	KR6LJ*	125
	OZ4H	715		SM4AZD	125
	SP2KDS	715	126	CE1BD*	115
62	DJ5QK	700	127	SM4DRD	110
	SM5BDY	700		VK4SS*	110
	SM6BTZ	700	129	W1ET	60
65	SM5BPJ	690			

TELEPHONY SECTION

Position	Call-sign	Points	Position	Call-sign	Points
1	G3KSH*	610	7	GW3OCD*	200
2	G3MTB*	597	8	F9DW*	130
†	GB2SM	480	9	SM5CAK*	120
4	G3MXP	385	10	CT1HX*	70
5	PA0LV*	287	11	CT1KH	55
6	OH0NI*	235		OH1VA	55

* Certificate winners. † Multi-operator.

Comments

In view of the fact that this was the first contest on 7 Mc/s and the rules were unfamiliar, the logging standards were extremely high. Mistakes were few and the clarity of logs was very good in almost all cases. Contestants made some criticisms concerning the duration and points scored and these are to be carefully considered when the rules for the next contest are drawn up.

The Contests Committee was disappointed in the comparatively low number of home entrants, many contest stalwarts being absent. Others were possibly frightened away by the reputation of 7 Mc/s and its accompanying "noises off." They may now read, perhaps with chagrin, that such calls as OX3BZ, HC1DC, VS1FJ, VS1FZ and KZ5MQ were not only heard but worked by the British Isles operators.

From the comments made on the logs it would appear that the contest was enjoyable, several operators mentioning working new countries.

There is little that can be said about the Phone Section. Suffice to say that from 12 entries A. R. Gilding, G3KSH, emerged triumphant with 610 points made from 54 contacts. G. W. B. Parish, G3MTB, came a very close second with 597 points, also from 54 contacts.

The leading overseas entry came again from PA0LV with 287 points. He was one of five who entered both sections, and must be congratulated on his effort.

Conditions for the two weekends were not good though there were some fine openings at times. Otherwise it was mainly short-skip European contacts that supplied the points.

Check logs from G2AOL, G3ALI, G3GUP, OH2AF, PA0VG, SL2CU, SM3CUS and a listener, ONL383, were received for the c.w. contest and are acknowledged with thanks.

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.

CONTEST NEWS

RESULTS — REPORTS — RULES

First 144 Mc/s Portable Contest 1963

R.S.G.B. members throughout Europe are again invited to take part in this contest, the details of which are as shown below. Contestants are strongly recommended to operate in accordance with the British Isles Two Metre Band Plan.

1. **When:** 10.00 G.M.T. to 19.00 G.M.T. on **Sunday, May 5, 1963.**
2. **Eligible Entrants:** All fully paid-up members of the R.S.G.B. resident in Europe. Multi-operator entries will be accepted provided only one call-sign is used.
3. The General Rules relating to R.S.G.B. Contests, as published in the January, 1963 issue of the *R.S.G.B. Bulletin*, will apply except as superseded by the rules of this Contest.
4. **Power Supplies:** Power for any part of the station shall not be derived from supply mains.
5. **Contacts:** May be made on either A1, A3, A3a or F3 with an input not exceeding 25 watts to any stage in the transmitter.
6. **Scoring:** Points will be scored on the basis of one point per mile for contacts with fixed stations and two points per mile for contacts with other portables or mobiles.
7. **Contest Exchanges:** RST or RS reports followed by the contact number and location (e.g. RST559001 5NE Luton). This location must be identifiable on the 10 mile to the inch Ordnance Survey Map.
8. **Logs:** (a) Must be tabulated in columns headed (in this order) " Date/Time (G.M.T.)," " Call-sign of station contacted," " My report on his signals and serial number sent," " His report on my signals and serial numbers received," " Location of station contacted as received," " Distance," " Points claimed."

   (b) The cover sheet must be made out in accordance with R.S.G.B. Contests Rule 5 and the declaration signed. The QTH as sent and National Grid Reference (full six figure grid reference) must be recorded on the cover sheet for entries from G, GD, GM and GW. In all other cases, entrants must show latitude and longitude.

   (c) Entries must be postmarked not later than **Tuesday, May 21, 1963.**
9. **Awards:** At the discretion of the Council, a **miniature cup** will be awarded to the winner and **certificates of merit** to the runner-up and to the non-transmitting member submitting the best check log in the opinion of the Contests Committee.

First 420 Mc/s Open Contest 1963

MEMBERS taking part in this contest are strongly recommended to operate in accordance with the British Isles Seventy Centimetre Band Plan.

1. **When:** 18.00 G.M.T. on Saturday to 18.00 G.M.T. on Sunday, **May 25-26, 1963.**
2. **Station Locations:** Stations may be operated from more than one site but the National Grid Full Six Figure reference must be recorded in the log for each location in the case of entries from G, GD, GM and GW. In all other cases, entrants must show latitude and longitude.
3. The General Rules relating to R.S.G.B. Contests, as published in the January, 1963 issue of the *R.S.G.B. Bulletin*, will apply except as superseded by the rules of this Contest.
4. **Eligible Entrants:** All fully paid-up members of the R.S.G.B. resident in Europe. Multiple-operator entries will be accepted provided only one call-sign is used. /T stations are not eligible to take part.
5. **Contacts:** May be made on either A1, A3, A3a or F3.
6. **Scoring:** Points will be scored on the basis of one point per mile.
7. **Contest Exchanges:** RST (RS) reports followed by the contact number and location (e.g. RST559001 5NE Wigan). This location must be identifiable on the 10 mile to the inch Ordnance Survey Map.
8. **Logs:** (a) Must be tabulated in columns headed (in this order) " Date/Time (G.M.T.) " " Call-sign of station contacted," " My report on his signals and serial number sent," " His report on my signals and serial number received," " Location of station contacted as received." " Points claimed."

   Logs must show clearly when station locations are changed.

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

   (c) Entries must be postmarked not later than **Tuesday, June 11, 1963.**
9. **Awards:** At the discretion of the Council, a **miniature cup** will be awarded to the winner and **certificates of merit** to the runner-up, the leading portable station and to the non-transmitting member submitting the best check log in the opinion of the Contests Committee.

This contest coincides with the I.A.R.U. Region 1 U.H.F. Contest.

1250 Mc/s Tests

IN THE REPORT on the 1250 Mc/s Tests published in the February issue of the BULLETIN, the owner of the call-sign G3FP should have been shown as B. R. Arnold.

Mr. R. E. Dabbs (G2RD) has pointed out that Fig. 3, the diagram of the rectangular cavity for 1296 Mc/s, is incorrect. Mr. Dabbs is preparing new drawings for publication in due course.

Grafton Radio Society Top Band Contest 1963

THE OPEN SECTION of the Grafton Radio Society's " G2AAN " Top Band Contest will be held on Saturdays, March 23 (c.w.) and March 30 (phone), at 22.30 to 01.00 G.M.T. Each contact must consist of RST (or RS) exchanges, followed by the serial number, starting with any number between 001 and 100. One point per contact will be scored, the final score being the sum of the scores in the c.w. and phone sections. Certificates will be awarded to those placed first and second. Further certificates will be awarded to the winners of the individual c.w. and phone sections. Logs should be submitted *not later than April 10*, to A. W. H. Wennell (G2CJN), 145 Uxendon Hill, Wembley Park, Middlesex, with the usual declaration.

CONTESTS DIARY

March 9–10	A.R.R.L. DX Contest (phone). (For details, see page 356, January 1963).
March 16–17	First 1.8 Mc/s Contest (For details, see page 374, January 1963).
March 16–17	YL/OM Contest (c.w.).
March 23–24	A.R.R.L. DX Contest (c.w.). (For details, see page 356, January 1963).
March 23	Pakistan Day DX Contest.
March 30–31	CQ W.W. S.S.B. Contest. (For details, see page 422, February, 1963).
March 30–31	R.E.F. (c.w.).
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).
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 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.*

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.

Is It Still Amateur Radio?

DEAR SIR,—According to my dictionary, an amateur is " One who is fond of; one who cultivates a thing as a pastime." There is nothing about not doing the same thing as a profession, or constructing the tools oneself. To me, an amateur is someone who cultivates some part of the activities of amateurs in general, construction, operating, v.h.f., s.s.b., RTTY, etc. I am quite prepared to let him choose whatever he likes, provided he will do the same for me.

On the question of technical complexity of the BULLETIN, is it not significant that *Technical Topics* seems to find almost universal approval from the last readership survey. A comment from a local amateur was " Best thing in the BULL' . . . I don't understand it all, *but it gives me some good ideas.*" After all, isn't this the object of a journal, to report the current state of the art, not to be an inconvenient form of textbook for the beginner? Between them, the *Handbook* and the *Build-it-Yourself* leaflets seem to cater well for the beginner, or do some amateurs intend to stay beginners for ever?

Thus to G3BYY I would say live and let live, OM, and don't forget a lot of amateurs were not born in 1935, and so don't have your outlook. To G3EGC, by all means let us avoid technical snobbery, and also non-technical inverted snobbery.

Finally, " mathematical considerations " led me to question the statement that a coil of extremely high Q is necessary for a Q multiplier. Consequently I tried a cheap coil I had handy, with very satisfying results. Thus mathematics seems to have put me 10s. or so up—or is this commercializing Amateur Radio?

Yours faithfully,
B. PRIESTLEY, B.Sc. (G3JGO)

Cheadle, Cheshire.

Keep Up the Technical Standard

DEAR SIR,—I must protest strongly against any suggestion to down-grade the technical standard of the BULLETIN or to introduce " humorous " articles. I feel sure that there are enough commercial pseudo-technical publications which would, or may well already print the type of writing which Mr. Hoban (G3EGC) seems to prefer.

This request for humourous articles if followed up would lower the standard of the BULL.

Surely the R.S.G.B. caters very adequately for the newcomer in the *Handbook*. The BULLETIN must be used for keeping the membership up to date on the latest techniques, for matters of organization and administration and for information such as DX data and propagation forecasts which are only of value for a limited period.

Yours faithfully,
RALPH C. TAYLOR (G2HCJ)

Rainhill, Liverpool.

DEAR SIR,—In view of recent criticism levelled at the standard of technical articles appearing in the BULLETIN, I would like to voice my strongest support for the decisions taken by the Technical Committee of the R.S.G.B. in their choice of published material. Whilst I would cheerfully assure the dissident factions that I also find some of the mathematical dissertations far beyond my comprehension, it is entirely unrealistic to assume that all the readers of the BULLETIN are equally dim.

To yearn for the techniques of the 'thirties is retrogressive *in excelsis* and to deny information on latest developments and techniques to those who can understand and profit therefrom is criminal. To those who may think otherwise I would suggest that they build an 0-V-1 from a pre-war design, acknowledge the passing of the years, and be thankful that up and coming young squirts of the rising generation *can* understand these very well presented articles.

Yours faithfully,
PETER BAILEY (VQ4KPB)

Kikuyu, Kenya.

Gaining N.F.D. Experience

DEAR SIR,—I am writing on behalf of the Southgate and District R.S.G.B. Group regarding a problem which we believe must face many other groups and clubs taking part in National Field Day.

We run a single station entry every year which does pretty well in its class and we hope that some day we may be able enough to carry off the Bristol Trophy, but in entering in a competitive spirit we find that we have to exclude many operators who are anxious to participate but not up to " first team " standards even for second operating. We find that this does not help morale and discourages interested people who may eventually lose interest in both N.F.D. and Morse operation through lack of experience. We should therefore like to give these people experience under N.F.D. conditions on the more popular N.F.D. bands phased in with our competing station's operation. Both to ensure proper co-ordination and a reservoir of manpower for use on the main station, we should like to organize a /P station in close proximity to the main station for use by these operators. We fear, however, that to do so might cause us to fall foul of the rule dealing with the use of two receivers and so on, and we should therefore like to know what conditions the Contests Committee would lay down for this kind of scheme.

We think that the idea is a good one and we should point out that we are concerned with using the 160m, 80m and 40m bands for both stations because most experience and points can be gained there. It must be stressed that the organization of the auxiliary station would be on a more casual basis in all respects, with the possible use of a mobile rig and simple vertical or tree borne aerials, but ready for operation by any licensed member who is not in a position to be active on the main /P station.

Yours faithfully,
I. S. DAVIES (G3KZR)

London, N.13.

(Editorial note: The Contests Committee point out that there is nothing in the rules for National Field Day 1963 to prevent additional stations being entered provided that they are separately identifiable groups. This means that the group title, operators, equipment, entry forms, call-signs, etc., must be kept entirely separate from other entries. Minor changes of title are permissible provided that confusion is avoided, e.g., " Bury Main Group," " Bury Reserve Group," " Bury Junior Group," etc.)

The Band Plan

DEAR SIR,—The letters from Mr. W. Blanchard (G3JKV), and Major L. Beaumont, published in the January issue of the BULLETIN, both caught my eye.

Whatever our views may be on the Band Plan, and it so happens that 95 per cent of the activity of my own station is on c.w., I think there are two other points in need of urgent attention. As Hon. Organizer of the R.S.G.B. Intruder Watch, I spend much more time listening than transmitting. I am concerned to note that more and more stations are operating outside the amateur bands, especially at the l.f. ends. This practice can do a lot of harm, however enraged we may be to find " our " frequency occupied by a broadcast or commercial station. Secondly, until the phone stations get the large allocation advocated by G3JKV, could we ask a few more of them to clear at least a few frequencies at the l.f. end!

To Major Beaumont, I simply say don't despair! It took me from 1946 to 1962 to sow the seeds of an Army Amateur Radio organization having official blessing. His Fairy Godmother may arrive yet; but I think she finds the blue tape of R.N. and R.A.F. a little easier to master than the red tape elsewhere.

Yours faithfully,
D. W. J. HAYLOCK (G3ADZ),
Major, R. Signals, R.A.R.O.
Hon. Organizer, R.S.G.B. Intruder Watch.

Warblington, Havant, Hants.

Exhibitions

DEAR SIR,—The letters which have been published recently about the scarcity of components at the recent Radio Communications Exhibition, have led me to write my first letter after about 30 years of membership.

Whether we decide to build our own equipment or to purchase it ready-made depends upon our technical ability, our particular interests, and our pocket-book. But there is one aspect where the " public image " of Amateur Radio is concerned. Surely, when stations are operated before the general public, at exhibitions, jamborees, museums, etc., every effort should be made to see that the main equipment at least is amateur built. It is, no doubt, very generous of commercial firms to lend equipment for these purposes but I regard it as a let-down for the amateur movement. That there is no lack of skill both in design and construction is evident from the pages of this journal. I would think that many of the contributors would be proud to loan their equipment and so maintain our reputation before the public as amateurs in the old sense of the word, i.e., builders and operators of their stations.

I read with astonishment and dismay that the R.A.F. have purchased commercial equipment for G8FC. If they cannot find members with the necessary technical know-how, then, Sir, you may one day find me sporting some commercial product. Heaven forbid!

Yours faithfully,
(Rev.) L. C. HODGE (G6LH).

Boston, Lincs.

Northern Amateur Radio Mobile Society

DEAR SIR,—I am instructed by my committee to reply to the letter published in the December, 1962, issue of the BULLETIN mentioning the similarity of the name of the Northern Amateur Radio Mobile Society with the name of another organization. In our opinion by virtue of the prefix Northern, we are quite happy in saying that no confusion should arise, and that we are in fact a northern society catering for the Amateur Radio mobile enthusiast.

We are as a society now truly established and interested in the advancement of Amateur Radio in general, and the mobile aspect of Amateur Radio in particular. We should not like to cross swords with anyone; we do in fact extend the hand of friendship to any Amateur Radio organization interested in the furthering of our aims, and offer to co-operate with them.

Yours faithfully,
BERNARD CRISP (G3LHQ)
Hon-Secretary, Northern Amateur Radio Mobile Society

Birkenshaw, near Bradford.

Gold Tinted Lacquer

DEAR SIR,—As a result of changing QTH I have somewhat belatedly got around to my November, 1962 copy of the BULLETIN and noticed the letter from Mr. Matthews, G2CD, in reply to my enquiry for information on instrument lacquers. I should like to thank Mr. Matthews and to say that his formula certainly strikes a chord in my memory as I can recall that one of the requirements of the early process was that the metal components be heated before applying the lacquer.

I must also pay tribute to the kindness of those many members who wrote to me directly enclosing formulae and, in one case, a supply of lacquer to do the job! All these have been answered through the post but I welcome this opportunity of expressing my thanks through the medium of *Letters to the Editor* and to point the fact that the " ham spirit " seems as strong as ever.

Yours faithfully,
JAMES FOYE (ZS5JF)

Durban, South Africa

Mullard Booklet

CIRCUITS for Audio Servicing Equipment is the title of a booklet which describes a transistor a.f. oscillator, a resistance capacitance bridge and a signal tracer. Requests for this booklet should be made to Technical Information Department, Mullard House, Torrington Place, London, W.C.1, and should quote the reference number TP500.

Can You Help?

● J. A. Rouse, c/o R.S.G.B. Headquarters, who requires the circuit diagram and/or service manual for the M.C.R.1 receiver?

Regional and Club News

The Amateur Tape Recorders League.—Membership is open to all who own tape recorders, and applications may be sent to the Chairman, M. G. Foster, 50 Goring Road, North Dagenham, Essex. Members receive a monthly 9-minute news tape which includes anything from interviews with "pop" singers to talks on aerials and equipment. A newsletter, the *A.T.R.L. Review*, is also sent regularly to members.

Acton, Brentford and Chiswick Radio Club.—The following have been re-elected as officers: *Chairman*—R. G. Hindes (G3IGM); *Vice-Chairman*—R. Cole (G6RC); *Hon. Secretary, Treasurer and Press Officer*—W. Dyer (G3GEH); *Committee Members*—J. Tovell (G5LQ), R. T. Wright (G5ZA), and A. Bryan (G2CAJ). For particulars of meetings see *Forthcoming Events*. Hon Secretary: W. G. Dyer (G3GEH), 188 Gunnersbury Road, Acton, London, W.3.

Barnet Radio Club.—A lecture on " Hints and Kinks for Constructors," together with a demonstration of equipment constructed by the lecturer, K. Clarke (G3KRC), attracted a good attendance at the meeting on January 29 at the Red Lion, Barnet. Further details of the club's activities may be obtained from the *Chairman/Hon. Secretary:* F. E. A. Green (G3GMY), 48 Borough Way, Potters Bar, Middlesex.

City of Belfast Y.M.C.A. Radio Club.—The club, which meets every Wednesday and Saturday at 8 p.m., is at present only active on c.w. but a s.s.b. transmitter is nearing completion, and new receiving equipment is planned. Constructional facilities have been increased, a library is available for members' use, and a programme of lectures and visits has been arranged for the next few months. A history of the club, which was founded in 1922, is being prepared. Information, especially about the early days of the club, should be sent to the *Hon. Secretary:* R. H. Payne, 25 Arundel Street, Belfast, 12.

Braintree Radio Society.—It is proposed to form a radio society in Braintree, and the first meeting will be held on March 19, at 7.15 p.m. at the Braintree College of Further Education Further details may be obtained from T. C. Lathwood (G3MUL), c/o Braintree College of Further Education, Church Lane, Braintree, Essex.

Bristol.—At the January meeting, Eric Chambers (G2FYT) gave a talk on " Certificates and Awards, DX Working and Operating Procedure." The group's venue has been changed, and meetings are now held at the Small Physics Lecture Theatre, Royal Fort, University of Bristol on the fourth Friday of each month at 7.30 p.m. Visitors are always welcome. *Hon. Secretary:* E. C. Halliday (G3JMY), 4 Parkside Avenue, Winterbourne, Bristol.

Caithness Amateur Radio Society.—The A.G.M. was held on January 29, when the following were elected: *President*—J. M. Lyon (GM3GUJ); *Hon. Secretary/Treasurer*—W. N. Hardie (GM3NQB), 24 Brownhill Road, Thurso, Caithness; *Committee Member*—GM3RNZ. Meetings are held on the second Tuesday of each month, and a new club station is in the process of being built.

Clifton Amateur Radio Society.—The junk sale held on January 18 unfortunately coincided with a local power failure, necessitating the goods being auctioned by the light of a N.F.D. hurricane lamp! Work is now under way on equipment for the V.H.F. N.F.D., in which the club hopes to improve its position this year. *Hon. Secretary:* C. E. Godsmark (G3IWL), 211 Manwood Road, London, S.E.4.

Crawley Amateur Radio Club.—Among recent events, a lecture on " Unusual Radio Equipment " was given by G3GVV; and the club participated in the R.S.G.B. Affiliated Societies' Contest under the call-sign G3TR. At the principal meeting this month G3FRV will lecture on " Single Sideband " on March 27. *Hon. Secretary:* R. G. B. Vaughan (G3FRV), 9 Hawkins Road, Tilgate, Crawley, Sussex

Derby and District Amateur Radio Society.—At the A.G.M., the following officers were elected: *Chairman*—J. Anthony (G3KQF); *Vice-Chairman*—B. Speakman (B.R.S. 23256); *Hon. Treasurer*—J. Pell (G3PEL); *Hon. Secretary*: F. C. Ward (G2CVV), 5 Uplands Avenue, Littleover, Derby; *Assistant Hon. Secretary*—B. J. C. Brown (G3JFD); *Management Committee*—T. Darn (G3FGY), K. J. Pegg (G3FSH), F. Allsopp (G3IFA), A. Hitchcock (G3ESB), H. Shaw and M. Shardlow; *Hon Auditors*—T. W. Brown and C. M. Swift (G3IUK).

East Dereham and District Radio Society.—The first meeting of this new society was due to take place on February 28. At present it is only possible to hold meetings every two months, but full details can be obtained from H. A. J. Gray (B.R.S.23279), " Eleven," Swanton Drive, East Dereham, Norfolk.

Dorking and District Radio Society.—An application is to be made for the re-issue of the society's call-sign, G3CZU, for use during contests and local activities. The society has been invited

The Annual Dinner and Social of the Barnsley and District Amateur Radio Club was held at the King George Hotel, Peel Street, Barnsley, on January 19, 1963, when there was an attendance of more than 60.

to participate in a local Hobbies Exhibition, and a " Junk Sale " is scheduled for March 26, at 8 p.m. at the Star and Garter, Dorking. Visitors will be very welcome, with or without junk. Regular meetings are held on the second and fourth Tuesdays of each month, and nets on Fridays at 9 p.m. on 1910 kc/s. *Hon. Secretary:* J. E. Greenwell (G3AEZ), Eastfield, Beare Green, Dorking.

East London Group.—At the January meeting, an unprepared talk on " Satellite Tracking " was given by B. J. P. Howlett (G3JAM), owing to the illness of the scheduled speaker. The lecture proved to be very interesting and informative. *District Representative:* M. McBrayne (G3KGU), 25 Purlieu Way, Theydon Bois, Essex.

Flintshire Radio Society.—The A.G.M. took place on January 28, when the following officers were elected: *Chairman*—J. T. Lawrence (GW3JGA/T); *Hon. Secretary*—A. Antley, " Fairfield," Fairfield Avenue, Rhyll. *Hon. Treasurer*—L. W. Barnes (GW3PCZ/T); *Committee Members*—P. F. Jones (GW3FPF), W. Davies (GW3PKH/T) and A. Mossford. Meetings continue to be held on the last Monday in each month at the Railway Hotel, Prestatyn.

Grimsby Amateur Radio Society.—A " Good Old Fashioned Ham Fest " is to be held at the Birds' Nest Cafe, Boating Lake, Cleethorpes, on May 12, 1963, at 2 p.m. Tickets, price 10s. (inclusive of high tea and car-park fee), are obtainable from the *Hon. Secretary:* B. Walster, 47 Richard Street, Grimsby.

Halifax and District Amateur Radio Society.—On February 5, G3MZG gave a lecture and demonstration entited " Cheap and Easy Radio." The next meeting, " Queries Night," will be held at the Beehive and Crosskeys Inn at 7.45 p.m. on March 5. Attempts are being made to obtain a permanent club room. Laboratory facilities are available at the Halifax Technical College.

Radio Society of Harrow.—At the A.G.M. held on January 18, the following were elected: *President*—P. Parry (G3KOE); *Chairman*—B. Hummerstone (G3HBR); *Hon. Treasurer*—R. Ray (G2TA); *Hon. Secretary*—A Biddell (G3GNM); *Committee Members*—A. L. Mynett (G3HBW), F. Hunt (G3LNQ), D. Nappin (G3MLS), C. Barr (G3PFO) and P. Handover (G3PUK). A junk sale is to be held on March 15, and on March 29 B. Hummerstone (G3HBR) will lecture on " Portable and Mobile Operation." A series of lectures for R.A.E. candidates is being given on Fridays at 7.30 p.m. by R. Ray (G2TA). *Hon. Secretary:* A. C. W. Biddell (G3GNM), 114 Kingshill Avenue, Kenton, Harrow, Middlesex.

London Members' Luncheon Club.—The winter weather reduced the attendance at the January meeting to 20, but two overseas visitors, MP4BBW and HE9EZX, managed to attend. All visitors will be warmly welcomed at all meetings—bookings may be made by telephoning either G2FUX at RUIslip 2763 or to Headquarters at HOLborn 7373. The club will be taking an active part in the Golden Jubilee celebrations with a special luncheon on Wednesday, July 3, and all members are asked to make this known, both at home and overseas.

The Plymouth Radio Club held its Annual Dinner at the Magnet Restaurant, Plymouth, on January 19. In this picture (left to right) are G3KHU, G3GDC, G3LMG, G5ZT (President) and G3SN.
(Photo by Ex-press Photos, Plymouth)

Maidstone and District Radio Society.—The inaugural meeting of this proposed society was held on February 6. All amateurs and S.W.L.'s resident in the district are welcome to join, details being available from E. J. Bonner (G8LZ), 9 Allington Way, Maidstone, Kent. In order to elect society officers, and decide finally on the premises to be used, a meeting is scheduled for March 6 at 7.30 p.m. at the Y.M.C.A. Institute, Union Street, Maidstone.

Newbury and District Amateur Radio Society.—A considerable number of members recently attended a reception in honour of G. T. Allen (G3JTK) and his family on their departure to East Africa. The proceedings culminated with a suitable presentation. It is regretted that the last two meetings, usually on the last Friday of each month, have had to be cancelled owing to bad weather, but the next meeting, the A.G.M., will be held on March 29, at the canteen of Elliots of Newbury Ltd., West Street, Newbury. Visitors and new members welcome.

Northern Heights Amateur Radio Society.—A number of past meetings have been informal, although Mrs. M. I. Shaw (G3OMM) recently gave a talk on " Radio on Stamps." On April 10, the A.G.M. takes place, and a discussion on the Amateur (Sound) Licence will be held on April 24. On May 8 there will be a visit to the Manchester Radio Society. *Hon. Secretary:* A. Robinson (G3MDW), Candy Cabin, Ogden, Halifax.

Paddington and District Amateur Radio Society.—C.W. classes are held every Wednesday evening at 7.30 p.m. before the main meeting. Visitors are welcome. *Hon. Secretary:* B. R. Timms (G3MLE), 7 Nottingham Street, London, W.1.

Peterborough Amateur Radio Society.—On January 11, a new type of valve-tester was demonstrated by J. Worthington at Peterborough Technical College, while the February meeting included a film show to which XYLs and YLs were invited. The main feature was *Mirror in the Sky*, and was supported by a colour film showing the D/F capabilities of honey-bees. Members were due to visit a local generating station on February 15. *Hon. Secretary:* D. Byrne (G3KPO), Jersey House, Eye, Peterborough.

Plymouth Radio Club.—A very successful dinner was held on January 19 with visitors from a wide area, in spite of very arduous weather conditions, the total attendance being 57. The splendid array of prizes offered in the radio draw was a valuable contribution to the success of the dinner. For details of future meetings see *Forthcoming Events. Hon. Secretary:* R. Hooper (B.R.S. 22861), 2 Chestnut Road, Peverell, Plymouth, Devon.

Portsmouth and District Radio Society.—On January 8, at the A.G.M. a new committee was elected. A sub-committee was formed for the purpose of arranging a local Top Band contest. A programme of events for the coming year is to be arranged at the next meeting. *Hon. Secretary:* H. R. Woodman (G3ORR), 71 Gladstone Street, Mile End, Portsmouth.

Reading Amateur Radio Club.—At the A.G.M., the following officers were elected for 1963:- *Chairman*—R. Page (G5TP); *Hon. Secretary*—R. G. Nash (G3EJA), " Peacehaven," 9 Holybrook Road, Reading; *Hon. Treasurer*—A. Myles (G3ASU); *Contest Manager*—G. Preston (G3OLA). The March 30 meeting will be held with the Field Day and contest arrangements in mind, and the new club transmitter will be on show. Future meetings will take place in a larger room at the Palmer Hall, West Street, Reading, owing to increasing membership. Two mobile picnics are scheduled for this year, one on Whit Sunday, June 2, and another on August 25, both at the Childe Beale Trust Pavilion, Lower Basildon, near Pangbourne, Berks.

Reigate Amateur Transmitting Society.—The new officials for the coming year, elected at the fourth A.G.M. on January 19, are as follows: *Chairman*—C. T. Cowan (B.R.S.22458); *Hon. Secretary and Contests Secretary*—F. D. Thom (G3NKT), 12 Willow Road, Redhill, Surrey; *Hon. Treasurer*—G. E. Mac'Krell (G3KAX); *Committee Members*—P. Mellett (G3PIJ), J. Duckworth (G3FM) and M. Harman (G3NZP); *Hon. Auditor*—R. A. Eldridge (G3RAE). It was revealed at the meeting that 24 licences were held by the 41 members. Crawley and Hastings clubs were represented at the Annual Dinner and Dance at the Mill House, Salfords, on January 26, when P. A. Thorogood (G4KD), the Regional Representative, was the chief guest. T. Withers will be lecturing on v.h.f. equipment on March 16 at 7.30 p.m. at the Tower, High Street, Redhill.

Rotherham and District Radio Club.—A new committee was elected at the A.G.M. held recently at the new club-room, the Temperance Hall, Welgate, Rotherham, where meetings are held on alternate Fridays. It is hoped that the club transmitter

Among those at the Christmas 1962 Social of the Flintshire Radio Society were, left to right (backrow), Alan Antley (Acting Hon. Secretary), GW3FPF, GW3NQP, Gwyn Chambers, GW3QN, GW3JI (Regional Representative) and GW3JGA; (front row) Miss Wisdom, Mrs. GW3JGA, Mrs. Antley, Mrs. GW3NQP, Miss Heaton and Mrs. GW3JI.

(Photo by GW3JGA)

(G3OAM) will be active on all bands at most meetings. Visitors are most welcome to attend. *Hon. Secretary:* M. Parkin (B.R.S. 22843), 51 Far Lane, East Dene, Rotherham, Yorks.

Scarborough Amateur Radio Society.—At the A.G.M. the following officials were elected: *President*—J. M. Hargreaves (G5VO); *Chairman*—E. C. Gibbins (G3JTG, ex-4S7GE); *Vice-Chairman*—J. E. Agar (B.R.S.23427); *Hon. Treasurer*—H. C. Hopkins (G3NRI); *Hon. Secretary:* P. B. Briscombe (G8KU), "Roseacre," Irton, near Scarborough, Yorks; *Librarian*—G. H. Brown (G3FVW); *Committee Members*—D. P. Tipper (G3JBR), R. S. Scales (G3NRS), P. Watson (G3PEJ), M. R. Tilley (G3RIX), and F. C. Powell (B.R.S. 18461). A full weekly programme is being drawn up for the future, meetings being held at 7.30 p.m. every Thursday in the club headquarters—see *Forthcoming Events*.

Shefford and District Amateur Radio Society.—Despite the weather all meetings have been held, talks being given on the Drake 2B Receiver by G3JOY, on "Frequency Standards" by D. Elmer, and on "Mobile Working" by G3IEX. *Hon. Secretary:* G. R. Cobb (G3IXG), 75 Ampthill Road, Shefford, Bedfordshire.

South Dorset Radio Society.—On January 30, several members visited the Mullard Transistor Plant at Southampton, and at the February meeting in Weymouth an R.S.G.B. recorded lecture on V.H.F. Propagation was the main item of the evening. *Hon. Secretary:* C. E. Biggs (G2TZ), 54 Prince of Wales Road, Dorchester, Dorset

South London Mobile Club.—Although only recently formed, this club now boasts nearly 40 members, who meet regularly every other Saturday at the Manor Baths, Clapham, at 8 p.m. The next meeting will be held on March 16. Parking is no problem. For further details contact the *Hon. Secretary:* B. Negri (G3LXN), 17 Voltaire Road, Clapham, London, S.W.4.

South Manchester Radio Club.—Activity nights will be held on March 8 and 22, and a lecture by M. Barnsley (G3HZM), concerning "More on A.C. Theory," will be given on March 15. The annual Hot Pot Supper will be held at "The Swan with Two Necks Hotel," Withy Grove, Manchester, on March 29. The organizer is J. Elliot (G3KIQ), 2 Pennine Close, Higher Blackley, Manchester 9. Tickets are available from the organizer, from F. Nicholls (G3MAX) or from the *Hon. Secretary:* M. Barnsley (G3HZM), "Greenways," 11 Cemetery Road, Denton, Manchester.

Surrey Radio Contact Club.—The talk by Mr. Gregory of Mullard Ltd., on V.H.F./U.H.F. Front-ends has been postponed until March 12. R.S.G.B. members will be most welcome to attend the meeting at the Blacksmith's Arms, South End, Croydon. *Hon. Secretary:* S. A. Morley (G3FWR), 22 Old Farleigh Road, Selsdon, South Croydon, Surrey.

Verulam Amateur Radio Club.—At the A.G.M. in January, the following members were elected: *Chairman*—C. F. Thomas (G3EKU); *Hon. Secretary*—B. Cockell (A.2598), 119 Guernsey Court Road, St. Albans, Herts.; *Hon. Treasurer*—Miss P. Connolly; *Committee Members*—A. Rowley (G3JWZ), D. Gibson (G3JDG), W. C. Dennis (G3NCK), J. Akam, and B. L. Mapley (G3ACO).

Wirral Amateur Radio Society.—Attendances at recent meetings have been good, and a lecture on interference, given by D. Smith (G3LIS) was very well received. On March 6, there will be a discussion on the DX bands, and at the following meeting, on March 20, a discussion on direction finding. On April 3, modification of equipment for 2m will be described. *Hon. Secretary:* A. Seed, (G3FOO), 31 Withert Avenue, Bebington, Wirral, Cheshire.

Ex "G" Radio Club.—To be eligible for membership applicants must have been born in the United Kingdom and subsequently domiciled abroad. The club extends an invitation to any R.S.G.B. members attending Dayton Hamvention to breakfast at the Kittyhawk Room, Dayton Biltmore, at 8.30 a.m. on Saturday, April 27. The host will be W8LUZ. *Hon. Secretary:* Don Rayner (W3CTR), 416 Burkhart Street, Johnstown, Pa., U.S.A.

Spilsby Hamfest and Junk Sale

A HAMFEST AND Junk Sale is to be held at the Bull Hotel, Spilsby, Lincs., at 7 p.m. on Friday, March 15. The bar will be open from 7 p.m. to 10.30 p.m. and suppers will be available. Admission will be 2s. per person. There is ample parking space. Further information may be obtained from N. T. Hodgson (G2ABK), The Bungalow, Raithby Road, Hundleby, Spilsby, Lincs.

Amateur Radio Section of I.P.A.

AMATEURS WHO ARE members of a Police Force and are interested in forming a section of the I.P.A. are asked to contact Miss B. A. Fletcher (B.R.S. 20988), 11a Ickenham Road, Ruislip, Middlesex.

Can You Help?

- L. B. D'Alton (EI4AJ), Department of Electrical Engineering, University College, Science Buildings, Upper Merion Street, Dublin 2, who requires information on the circuit and operation of the U.S. Army Signals Corps Field Strength Meter I-95-AM covering 100-155 Mc/s and manufactured by Colonial Radio Corporation?
- N. T. Hodgson (G2ABK), The Bungalow, Raithby Road, Hundleby, Spilsby, Lincs., who requires manuals for the AR88LF and CR150 receivers?
- D. B. Hill (B.R.S.24890), 10 Vale Road, A.E.R.E., Harwell, near Didcot, Berkshire, who wishes to borrow the circuit diagram of the Hallicrafters Super Skyrider Receiver?
- Alexander Johnston (GM3GCH), "Morven," Garden Street, Macduff, Scotland, who requires the manual for the Army Type 62 Set?
- H. A. Spashett (ex-G3RK), 38 St. Mary's Street, Bungay, Suffolk, who wishes to borrow books in Braille to help him in preparing for the Radio Amateurs' Examination in May?

V.H.F. QSY

Members who wish to acquire or dispose of crystals in connection with the British Isles Two Metre Band Plan are invited to send details to "V.H.F. QSY," R.S.G.B. Bulletin.

Crystals Required

By G3KH, 133 Station Road, Cropston, Leicester. FT243 type between 8060 and 8072 kc/s.

CLOSING DATE FOR APRIL ISSUE
MARCH 8

CLOSING DATE FOR MAY ISSUE
APRIL 3

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.).—March 6 (Junk Sale), March 20 (Lecture by G3OIR), April 3, 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.).—March 12 (Talk by Harry Whalley, G2HW), April 9 (Discussion on N.F.D.), 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.).—Tuesdays, 8 p.m. March 12 (Film Show), March 19 (" Third Method S.S.B." by G3PLX), March 26 (Discussion), The Gladstone Mission Hall, Queens Drive, Stoneycroft.
Macclesfield.—March 19, April 2, 42 Jordongate.
Manchester (M. & D.A.R.S.).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10. **(S.M.R.C.).**—Fridays, 7.45 p.m., Rackhouse Community Centre, " Rackhouse," Daine Avenue, Northenden, March 15 (" More on A.C. Theory " by M. Barnsley, G3HZM), March 29 (Hot Pot Supper at " Swan with Two Necks," Withy Grove).
Morecambe.—March 6, April 3, 125 Regent Road.
Preston.—March 12, 26, April 9, 7.30 p.m., St. Paul's School, Pole Street (Meetings start with Morse practice).
Southport (S.R.S.).—Wednesdays, 8.30 p.m., Sea Cadets Camp, The Esplanade.
Stockport.—March 13, 27, April 10, 8 p.m., The Blossoms Hotel, Buxton Road.
Wirral.—March 6, 20, April 3, 7.45 p.m., Harding House, Park Road West, Claughton.

REGION 2

Barnsley (B. & D.A.R.C.).—March 8 (" Workshop Practice " by J. Walker, G3GNK), 7.30 p.m., King George Hotel, Peel Street.
Catterick (C.A.R.C.).—Tuesdays and Thursdays, 7.30 p.m., Club Room, Vimy Road, Catterick Camp.

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 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.

Heckmondwike (Spen Valley A.R.S.).—March 7 (" D/F " by J. Belcher of G.P.O.), April 4 (" Aerial Problems " by A. R. Bailey, G3IBN), 7.15 p.m., Grammar School, Heckmondwike. March 21, visit to Ultrasonics, High Street, Yeadon. April 27, Annual Dinner at Batley Park Cafe.
Northern Heights (N.H.A.R.S.).—March 13 (Junk Sale), March 27 (Lecture), 7.30 p.m., Sportsman Inn, Ogden, Halifax.
Scarborough (S.A.R.S.).—Thursdays, 7.30 p.m., Chapman's Yard, North Street.

REGION 3

Birmingham (M.A.R.S.).—March 19, 7.30 p.m., Birmingham and Midland Institute, Paradise Street. **(Slade).**—March 22, 7.45 p.m. (" Radio Fundamentals " by G3JZF), The Church House, High Street, Erdington. **Mullard Film Meeting.**—March 8, 7.45 p.m. (" Fuel for the Future " and " The Electroneers "), The Great Hall, Birmingham and Midland Institute, Paradise Street.
Coventry (C.A.R.S.).—Mondays, 8 p.m., Willenhall Scout H.Q., Little Farm Buildings, Littlethorpe, St. James Lane, Willenhall, Coventry.
Stourbridge & District (S.T.A.R.S.).—April 2, 7.45 p.m., Foley College, Stourbridge.
Sutton Coldfield.—March 14, 7.30 p.m. (" Radio Control of Models "), March 28, 7.30 p.m. (" The B.B.C. then and now "), 92 The Parade, Sutton Coldfield.
Wolverhampton (W.A.R.S.).—March 25, April 8, 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), 7.30 p.m., Club Rooms, Stapenhill Institute, Burton-on-Trent. March 13 (" Waveform Shaping " by A. H. Bailey), April 10 (" Receiver Design " by W. Hazeldon).
Chesterfield (C. & D.A.R.S.).—March 13, 27, April 10, 7.30 p.m., Newbold Observatory, Newbold Road, Chesterfield.
Derby (D. & D.A.R.S.).—March 13 (" Car Radio Interference Problems " by R. Barrell, G3FOP), March 20 (Open Evening), March 27 (Hot Pot Supper), April 3 (Surplus Sale), 7.30 p.m., Room No. 4, 119 Green Lane, Derby. **(D.S.W. Exp. Soc.).**—Fridays, 7.30 p.m., Sundays, 10.30 a.m., Club Rooms, Nunsfield House, Boulton Lane, Alvaston, Derby.
Grantham (G. & D.A.R.S.).—Mondays, 7.30 p.m., Club Rooms, rear of Manners Arms Hotel, London Road, Grantham.
Grimsby (G. & D.A.R.S.).—March 12, 26, April 9, 8 p.m., R.A.F.A. Headquarters, Abbey Drive West, Grimsby.
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.).—March 14, 7.30 p.m., St. John Ambulance Hall, Asfordby Hill, Melton Mowbray.
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, over 8 Duke Street, Northampton.
Peterborough (P. & D.A.R.S.).—March 15 (Visit to British Radio Relay Station), April 5 (" Direction Finding "), 7.30 p.m., Room No. 14, Peterborough Technical College.
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.
March (M. & D.A.R.S.).—Tuesdays, 7.30 p.m., Police Headquarters, High Street.

REGION 6

Cheltenham.—First Thursday in each month, 8 p.m., Great Western Hotel, Clarence Street.
Dursley.—March 8, 22, April 5, 19. Venue from G3ILO.
High Wycombe (C.A.R.C.).—Last Thursday in each month, 8 p.m., The British Legion, St. Mary Street, High Wycombe, Bucks. March 28 (Junk Sale and Club Photograph).
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 Friday, March 15, April 19 and May 17, 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.).—March 19 (" Members' Question Panel "), 7.30 p.m., A.E.U. Club, 66 High Road, Chiswick.
Bexleyheath (N.K.R.S.).—March 14, 28, 7.30 p.m., Congregational Hall, Chapel Road, Bexleyheath.
Barnet (B.R.C.).—March 26 (" Survey of v.h.f. during the past decade " by Ray Hills, G3HRH), 8 p.m., Red Lion Hotel, Barnet.
East Ham.—Tuesdays fortnightly, 8 p.m., Leigh Road, East Ham.
East London.—March 17 (" Valve Appreciation " by R. Waldron of M-O Valve Co. Ltd.), 2.30 p.m., Lambourne Room, Town Hall, Ilford, Essex.
East Molesey (T.V.A.R.T.S.).—March 6, April 3, 8 p.m., Carnarvon Castle Hotel, Hampton Court.
Edgware & Hendon (E. & D.R.S.).—March 11 (Contest Results), March 25 (D/F Talk), 8 p.m., John Keeble Hall, Church Close, Deans Lane, Edgware, Middlesex.
Enfield.—March 26 (Junk Sale), 7.30 p.m., George Spicer School, Southbury Road.
Gravesend (G.R.S.).—Thursdays, 7.30 p.m., R.A.F.A. Club, Overcliffe, Gravesend.
Harlow.—Tuesdays, 7.30 p.m., rear of G3ERN, G. E. Read, High Street, Harlow.
Harrow (R.S.H.).—Fridays, 8 p.m., Roxeth Manor County School, Eastcote Lane, Harrow.
Holloway (G.R.S.).—Mondays and Wednesdays, 7 p.m. (R.A.E. and Morse), Fridays (Club), 7.30 p.m., Montem School, Hornsey Road, London, N.7.
Hounslow (H.A.D.R.C.).—Mondays, 7.30 p.m., Isleworth Town School, Twickenham Road, Hounslow.
Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (near Seven King's Station).
Kingston.—Alternate Thursdays, 8 p.m., Y.M.C.A., Eden Street, Kingston. (Morse Classes weekly at 2 Sunray Avenue, Tolworth.)
Mitcham (M. & D.R.S.).—March 15, 7 p.m., " The Canons," Madeira Road, Mitcham.
New Cross (C.A.R.S.).—March 15 (" Transistor Transmitter " by G3NWF), April 5 (" Quiz " by G3OGE), 7.30 p.m., 225 New Cross Road, S.E.14.
Norwood & South London (C.P. & D.R.C.).—March 19, 8 p.m., C.D. Training Centre, Bromley Road, Catford.
Paddington (P. & D.A.R.S.).—Wednesdays,

7.30 p.m., Beauchamp Lodge, 2 Warwick Crescent, London, W.2.

Purley (P. & D.R.C.).—March 15, 29, 7.30 p.m., Railwaymen's Hall (side entrance), Whytecliffe Road, Purley.

Reigate (R.A.T.S.).—March 16 (T. Withers on "V.H.F. Equipment"), 7.30 p.m., The Tower, High Street, Redhill.

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.).—March 19 (Tape Recordings and Informal Meeting, GB2SM at work), April 2 (A.G.M. and Exhibition of Handicrafts), 6 p.m., Science Museum, South Kensington.

Sidcup (C.V.R.S.).—March 7, 8 p.m., Congregational Church Hall, Court Road, Eltham.

Southgate & District.—March 14 (Lecture on "Oscilloscopes"), 8 p.m., Arnos School, Wilmer Way, London, 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.).—March 19, 8 p.m., "The Harrow," High Street, Cheam.

Welwyn Garden City.—March 19, 7.30 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. March 12 ("TV Servicing" by D. Williams), March 26 ("The Elements of Radio Valve Theory and Manufacture" by Enver H. Chaudri), April 9 (Film).

Crawley (C.A.R.C.).—March 13, informal—for details contact G3FRV. March 27 ("Single Sideband" by G3FRV), 8 p.m., West Green Centre, Crawley.

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

Tunbridge Wells (W.K.A.R.S.).—March 8 (Film Show), March 22 (Informal), 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.—March 18, 7.30 p.m., Committee Room, Bath Technical College, Lower Borough Walls, Bath.

Bristol.—March 22 ("70cm equipment" by H. Gratton, G6GN), 7.15 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. HQ, 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. April meeting is at Weymouth.

Torquay (T.A.R.S.).—March 9 ("Aerials and Propagation" by G3ABU), 7.30 p.m., Club HQ, 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.—April 8 ("Modern P.A. Valves and P.A. Construction" and "A Novel Volume Compressor" by F. R. Clare, GW3NWS), 7.30 p.m. T.A. Centre, Park Street, Cardiff.

Port Talbot.—March 12, 7.30 p.m., 8/10 Jersey Street, Velindre, Port Talbot.

REGION 11

Prestatyn (F.R.S.).—March 25 (7.30 p.m.—Slow Morse, 8 p.m.—"Simple Hints and Kinks" by L. Barnes, GW3PCZ/T, 8.30 p.m.—"Fault Finding" by J. T. Lawrence, GW3JGA/T), Railway Hotel, High Street, Prestatyn.

REGION 13

Edinburgh (L.R.S.).—March 14 ("History of Automobile Communications" by Mr. Russell), March 28 ("Electronics" by Tom Spiers, GM3OWI, and John Hughes, GM3LCP), April 11 ("Ancient Radio at Sea" by Tom Spiers, GM3OWI), 7.30 p.m., Y.M.C.A., 14 South St. Andrews Street, Edinburgh, 2.

REGION 14

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

REGION 17

Newbury (N. & D.A.R.S.).—March 29 (A.G.M.), 7.30 p.m., The Canteen, Elliotts of Newbury Ltd., West Street, Newbury.

North Berks (A.E.R.E.—Harwell A.R.C.).—Third Tuesday in each month, 7.30 p.m., Social Club, A.E.R.E., Harwell.

Area and Town Representatives and club secretaries are asked to note that information for inclusion in *Forthcoming Events* should reach Regional Representatives by the first of the month preceding publication.

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENT RATES. Members' Private Advertisements 3d. per word, minimum charge 5s. Trade Advertisements 9d. per word, minimum charge 12s. All capitals 1s. per word, minimum charge 18s. Write clearly. No responsibility accepted for errors. Use of Box number 1s. 6d. extra. Send copy to Sawell & Sons Ltd., 4 Ludgate Circus, London, E.C.4.

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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.

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).

WANTED FOR CASH.—Good clean communication receivers and s.s.b. equipment. Please state price.—Short Wave (Hull) Radio, 30-32 Princes Avenue, Hull. (Telephone 18953).

WANTED.—AR88D or HRO Receiver and coils covering amateur bands. Collect 30 miles London.—Z55SG, 19 Inchmery Road, Catford, S.E.6. HIT 1795, 6-7 p.m.

WANTED.—By GW3MIS MOHICAN RECEIVER for conversion. Please state price, age and condition.—Shackle, Broad Haven, Haverfordwest, Pembrokeshire.

WANTED.—150 watt AM Tx, or major parts, or part built working or non-working, appearance unimportant. Cash and collect 100 miles.—Rayer, Longdon Heath, Upton-on-Severn, Worcs.

WANTED FOR A.T.U.—Split Stator Condenser 250pF each section or Johnson 500E20 condenser or both.—Bond, 28 Bowes Avenue, Margate.

WANTED: Page printing teleprinter and perforated tape reader buy or exchange as detailed last month's R.S.G.B. Also wanted Pye 45 Mc/s I.F. strip with/without EF50 valves. SALE: Power supplies with "C" core xformers. PU870—1,200v 120 m/a + LTs. PU874—361v 200 m/a + 361v 65 m/a + LTs. PU873—6·3v (7 times, total 15 amps) 665v 48 m/a 800v 5 m/a. All above £3 each plus carriage. Many other units S.A.E. details. Silicon Rectifiers tested at 410v 200 m/a, 2s. each plus 3d. p.p.—G3LMR, 112 Groby Road, Glenfield, Leicestershire.

BUSINESS FOR SALE

BOURNEMOUTH.—Small Electronic Manufacturing Company, going concern, Amateur Transmitters. Illness necessitates sale. Apply Box No. K.7082, c/o R.S.G.B. BULLETIN, 4 Ludgate Circus, London, E.C.4.

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Supplement to the R.S.G.B. Bulletin, March, 1963

Radio Amateurs' Examination, May 1962

Questions* and Specimen Answers

Compiled by Alan Bayliss, B.Sc., G8PD

Part 1 (Compulsory Questions)

Q. 1 (*a*) *What conditions are imposed on the licensee of an Amateur (Sound) Radio station as regards aerials and masts in relation to:*
(*i*) *aerodromes*
(*ii*) *overhead power lines?*
(*b*) *For how long does an Amateur (Sound) Licence remain in force after issue and what must the licensee do to renew it?*
(*c*) *In what circumstances can the Post Office be expected to demand the closing down of an amateur transmitting station.*

A. 1 (*a*) (*i*) If the station is situated within half a mile of the boundary of any aerodrome, the height of the aerial or any mast supporting it must not exceed 50 ft. above the ground level.

(*a*) (*ii*) An aerial which crosses above or is liable to fall or be blown on to any overhead power wire (including electric lighting and tramway wires) or power apparatus must be guarded to the reasonable satisfaction of the owner of the power wire or power apparatus concerned.

(*b*) An Amateur (Sound) Licence continues in force for one year from the date of issue, and thereafter so long as the appropriate renewal fee is paid by the licensee. In order to renew the licence the licensee must pay the renewal fee to the Postmaster General in advance of or on the anniversary of the date of issue of the licence.

(*c*) The Post Office can be expected to demand the closing down of an amateur transmitting station at times of national emergency or when interference is being caused to a Government wireless station or other important service.

Q.2 *Describe three safeguards which can be incorporated in an amateur radio transmitter to ensure that the radiation of harmonics is kept to a minimum.*

A. 2 Three safeguards which may be used to minimize the radiation of harmonics from an amateur transmitter are as follows:

(*a*) Use a harmonic trap circuit.
(*b*) Use a correctly adjusted pi-network tank circuit.
(*c*) Use a low pass filter.

The three measures are illustrated in **Fig. 1** and each will be described in turn.

(*a*) The harmonic trap consists of a high *Q* parallel tuned circuit (rejector circuit) LTCT connected between the anode of the power amplifier valve and its tank circuit. Because it offers a high impedance at resonance the trap will attenuate the harmonic frequency to which it is tuned. It is common practice to tune the harmonic trap to 42 Mc/s to reject the second harmonic of 21 Mc/s (15m band) or the third harmonic of 14 Mc/s (20m band) in order to reduce interference with Band I television reception.

(*b*) The pi-network tank circuit has the advantage, compared with an ordinary parallel tuned circuit, of discriminating more strongly against harmonics of the frequency to which it is tuned. In **Fig. 1(b)** C1 is the tuning capacitor and C2 is the loading capacitor. C1, C2 and L are chosen to give, simultaneously, a correct match between the valve and the load, and a suitable loaded *Q* for the circuit.

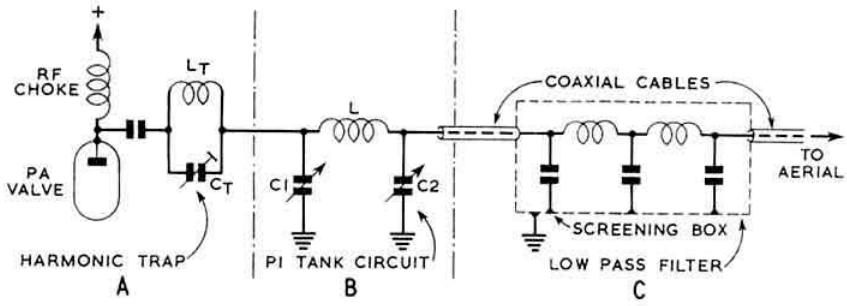

Fig. 1

(*c*) A low pass filter has the characteristic of passing all frequencies below a certain cut-off frequency and attenuating those above that frequency. It is common practice to use a low pass filter in the co-axial feeder circuit between a h.f. transmitter and its aerial. A very simple low pass filter circuit is shown in **Fig. 1(c)** and in practice more complex types are often used. The filter is designed to have a characteristic impedance equal to that of the feeder in which it is inserted and the cut-off frequency is chosen to be slightly above 30 Mc/s. Thus all transmitter frequencies of 30 Mc/s and below are passed through the filter to the aerial with no attenuation, but harmonic frequencies above 30 Mc/s are attenuated by the filter which reduces the risk of interference with television reception and other radio services.

Part 2 (Six Questions only to be attempted)

Q. 3 *Describe and explain the action of a quartz crystal controlled oscillator.*

A. 3 A commonly used quartz crystal oscillator circuit is shown in **Fig. 2.** The crystal X is connected between the grid of the valve V and earth and is shunted by the grid leak R1. A tuned circuit L1 C1 which can be tuned to the crystal frequency is connected in the anode circuit of the valve. R2 and C2 are h.t. decoupling components and R3 and C3 are a cathode bias resistor and bypass capacitor which provide a safety bias to limit the anode current of the valve to a safe value when the circuit is not oscillating.

In the circuit shown the crystal acts as a parallel tuned circuit of very high *Q* and frequency stability. When the

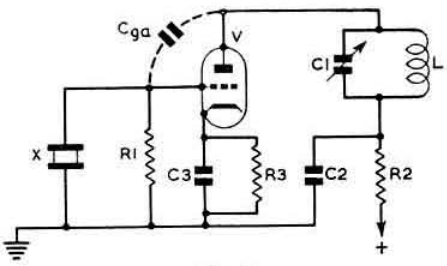

Fig. 2

anode tuned circuit is adjusted to, or near, the crystal frequency feed-back occurs from the anode to the grid circuit through the valve's grid-to-anode capacity C_{ga} and oscillations rapidly build up, as in a tuned-anode-tuned-grid oscillator circuit, at a frequency determined by the parallel resonant frequency of the crystal.

When the circuit starts to oscillate the anode current drops and grid current flows in the resistor R1. Anode current minimum and a grid current maximum occur when the tuned circuit L1, C1 is tuned so that the oscillator is giving maximum output. It is not recommended that the oscillator should be run under the maximum output condition because slight pulling of the crystal frequency occurs as C1 is varied and the oscillator might not start easily when switched on or keyed. Damage to the crystal might also occur due to oscillations of excessive amplitude. **Fig. 3** shows how the anode current and grid current vary as C1 is adjusted and the correct operating condition is indicated at point " X."

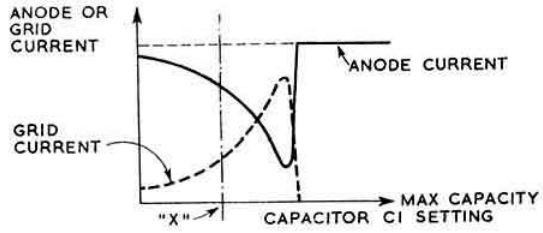

Fig. 3

Q. 4 *Describe and explain the action of the frequency changer stage of a superheterodyne receiver.*

A. 4 A circuit commonly used as a frequency changer in a radio receiver is shown in **Fig. 4.** The valve V is of the triode-hexode type, the triode section being used in a local oscillator circuit and the hexode as the mixer.

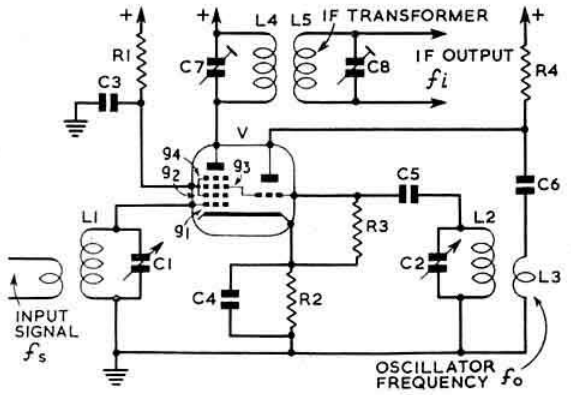

Fig. 4

An incoming signal of frequency f_s is fed via the tuned circuit L1, C1 to the control grid, g1, of the hexode. The triode section of the valve is connected as a tuned grid oscillator whose frequency is determined by the tuned circuit L2, C2. The local oscillator signal is fed into the hexode section by the internal connection shown joining the triode grid and the hexode oscillator injector grid, g3.

The screen grids of the hexode, g2 and g4, are fed from the h.t. supply through the decoupling resistor R1 and bypassed to earth by the capacitor C3. Cathode bias for the hexode is provided by the cathode resistor R2 bypassed by capacitor C4. It is preferable to return the oscillator grid leak R3 to the cathode of the valve rather than to earth, as this assists in easy starting of the oscillator.

A tuned transformer, called an intermediate frequency transformer, L4, C7, L5, C8 is connected in the anode circuit of the hexode and is tuned to the intermediate frequency f_i.

The anode current of the hexode is controlled by both the signal f_s and the oscillator frequency f_o. Because of the non-linear nature of the valve's characteristics the anode current will contain, beside the signal and oscillator frequency components f_s and f_o, the sum and difference of those frequencies $(f_o + f_s)$ and $(f_o - f_s)$. The difference frequency $(f_o - f_s)$ is the intermediate frequency, and it is selected at the anode of the hexode by the intermediate frequency transformer and passed on to succeeding amplifying stages.

Q. 5 *Describe the construction of a two-gang variable capacitor suitable for use in a superheterodyne receiver. State typical values for the capacitor you have described.*

A. 5 **Fig. 5** shows, in simplified form, the general construction of a two-gang variable capacitor. The capacitor consists of a stout metal frame *A* which carries a spindle *B* which rotates in suitable bearings (not shown) at each end of the frame. The spindle carries two sets of vanes, *C1* and *C2*, which are usually identical in shape and number. In the diagram only three vanes are shown in each set for ease of drawing.

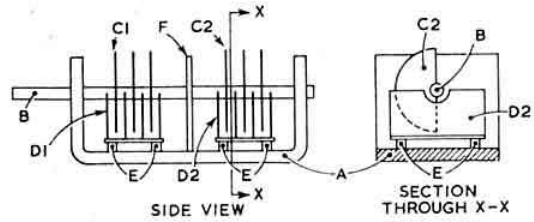

Fig. 5

Two sets of fixed vanes, *D1* and *D2*, are mounted on the frame *A* by means of insulating pillars *E* in such a way as to mesh with the moving vanes. Again for the sake of clarity, only four fixed vanes are shown in each set. The moving and fixed vanes are insulated and separated from one another by the air gaps shown and the capacity between the fixed and moving plates is varied by rotating the spindle to alter the extent to which they mesh. The sectional view of the capacitor shows the moving vanes half way between the positions of minimum capacity (right out) and maximum capacity (right in).

In practice the frame is usually made of steel, the spindle of brass, the vanes of aluminium and the insulating pillars of ceramic material. A metal screen *F*, connected to the frame *A*, is used between the two sets of fixed plates so that there shall be no stray capacity between them. The number and

size of the vanes, and the spacing between them depends on the capacity required.

Typical values of capacity are 500 pF (maximum) for a medium wave receiver and 50 pF (maximum) for a short wave bandspread amateur-band receiver.

Q. 6 *What is an alternating current of sine waveform? What is meant by voltage and current being out of phase and what factors in an a.c. circuit would cause the current to (a) lead, and (b) lag on the voltage?*

A. 6 An alternating current of sine waveform is one whose amplitude varies with the passage of time, in the way illustrated in **Fig. 6** by the solid curve. It will be seen that the magnitude of the current varies smoothly alternately positive and negative, the shape of the curve being known mathematically as a sine curve.

Two alternating quantities are said to be out of phase when there is a time difference between the moments when they are at the same point in their cycles.

Referring again to Fig. 6 the dotted curve and the solid curve are two similar sine waves which are out of phase by an amount of time equal to a quarter of a period (the period is the time taken for one oscillation). The dotted curve, for example, is at its maximum positive value at point *A*, one-

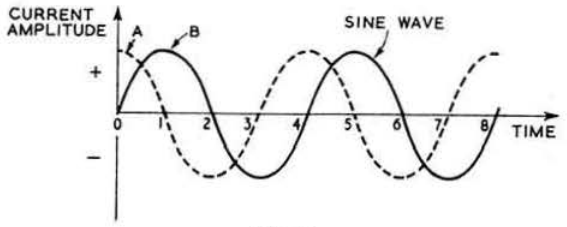

Fig. 6

quarter of a period before the solid curve is at the same point in its cycle, *B*; it thus leads the solid curve.

In an a.c. circuit the current (*a*) leads the voltage if the reactance of the circuit is capacitive and (*b*) lags the voltage if it is inductive.

Q. 7 *Three resistors having values of 10 ohms, 20 ohms and 40 ohms respectively are joined (a) in series and (b) in parallel. What is the total resistance in each case and what current would flow if the combination were connected to a source of d.c. having an e.m.f. of 10 volts and negligible internal resistance?*

A. 7 (*a*) *Series Connection*

The equivalent resistance R_s of the three resistors connected in series as in **Fig. 7(a)** is:

$$R_s = 10 + 20 + 40$$
$$R_s = 70 \text{ ohms.}$$

From Ohm's Law the current flowing, I_1, when the combination is connected to a 10 volt d.c. source is:

$$I_1 = \frac{10}{70}, \text{ i.e. } I_1 = \frac{1}{7} \text{ ampere.}$$

(*b*) *Parallel Connection*

The equivalent resistance, R_p, of the three resistors connected as in **Fig. 7(b)** is given by:

$$\frac{1}{R_p} = \frac{1}{10} + \frac{1}{20} + \frac{1}{40} = \frac{4+2+1}{40} = \frac{7}{40}$$

$$\therefore \quad R_p = \frac{40}{7} = 5\tfrac{5}{7} \text{ ohms.}$$

From Ohm's Law, the current flowing, I_2, when the parallel combination is connected to a 10 volt d.c. supply is:

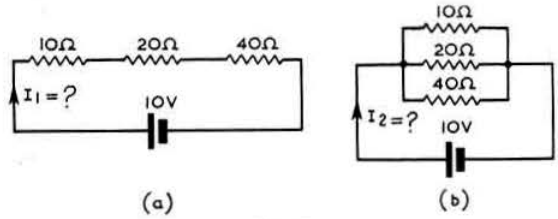

Fig. 7

$$I_2 = \frac{10}{5\frac{5}{7}} \text{ amps} = 10 \times \frac{7}{40} \text{ amps.}$$

$$\therefore \quad I_2 = 1\tfrac{3}{4} \text{ amps.}$$

Q. 8 *With the aid of diagrams explain the effects of the ionospheric layer on signals radiated in (a) the 1·8 Mc/s band, and (b) the 14 Mc/s band.*

A. 8 There are two regions of the ionosphere which play a very important part in radio propagation. They are the *E*-layer, at a height of about 70 miles, and the *F*-layer, at about 200 miles.

(*a*) *1·8 Mc/s Band*

During the daytime sky-wave signals radiated from a 1·8 Mc/s band station are absorbed in the lower levels of the ionosphere, *E*-layer, and communication is therefore restricted to a range of about 30 miles by means of the ground wave as shown in **Fig. 8(a).**

At night sky-wave radiation is not absorbed to such an extent in the ionosphere, as the *E*-layer is then very weak or absent, and the waves pass on to the *F*-layer where they are reflected back to earth as shown in **Fig. 8(b).** Occasionally, under optimum conditions, communication may be established up to a few thousand miles by sky-wave transmission on 1·8 Mc/s at night.

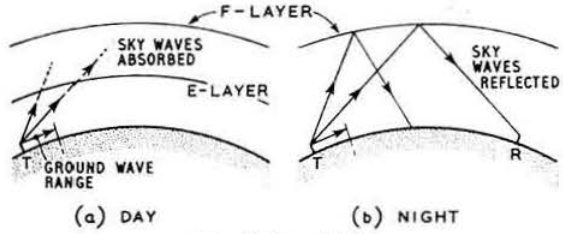

Fig. 8(a) and (b)

(*b*) *14 Mc/s Band*

In the 14 Mc/s band radio waves usually pass through the *E*-layer, suffering some attenuation, and on to the *F*-layer where they may either be returned to earth or pass through into outer space.

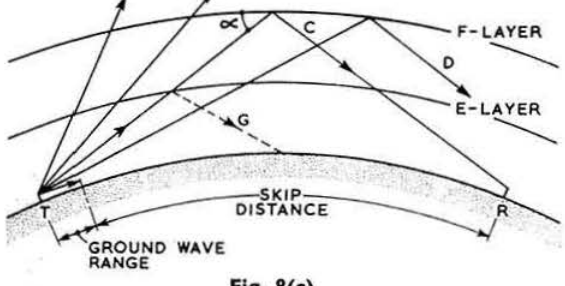

Fig. 8(c)

Factors determining whether 14 Mc/s signals will be bent back to earth by the *F*-layer are:

(i) The intensity of ionization of the layer, which varies according to time of day, the season and an approximately 11-year cycle, and

(ii) the angle of incidence at which the radio waves strike the layer, the angle α in **Fig. 8(c).**

For a given degree of ionization there is a critical angle of incidence above which waves will pass through the *F*-layer as shown at *A* and *B* in **Fig. 8(c).** For an angle of incidence equal to, or less than, the critical value the waves are reflected back to earth as shown at *C* and *D*. It follows that no sky wave will be returned to earth nearer than that shown at *C* and there is therefore a region, called the " skip-distance " or "skip-zone," in which no signals can be received extending from a point near the transmitter where the ground wave fades out to where the first sky wave returns.

Generally speaking signals are stronger at night when they are not so attenuated by the *E*-layer which is then weak or absent. Occasionally the *E*-layer ionization is sufficiently strong to reflect 14 Mc/s signals itself as shown by the dotted ray *G*, in **Fig. 8(c)**; in this case the " skip-distance " is much shortened.

Q. 9 *Describe a frequency meter having crystal check points.*

A. 9 The block diagram of a frequency meter having crystal check points is shown in **Fig. 9.**

Into the mixer are fed the output from a calibrated variable frequency oscillator which also has a good vernier

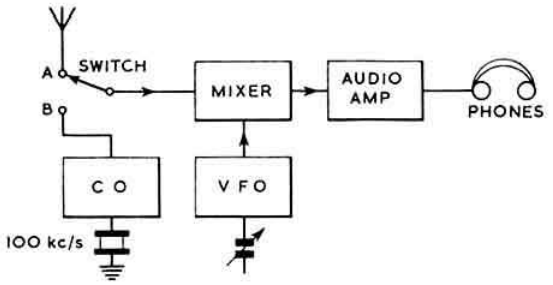

Fig. 9

logging scale, and either the unknown signal to be measured or the harmonic output from a 100 kc/s crystal controlled oscillator.

To measure a frequency the switch is first set to position *A* and the v.f.o. adjusted to zero beat with the unknown frequency; the vernier reading, *X*, is noted. The switch is next set to position *B* and the v.f.o. set to zero beat in turn with the crystal oscillator harmonics immediately above and below the unknown frequency. The corresponding vernier readings *Y* and *Z* are noted.

The exact frequency of the unknown signal may then be calculated by interpolation as follows:

(i) Subtract reading *Z* from reading *Y* to obtain the number of scale degrees corresponding to 100 kc/s in the neighbourhood of the frequency being measured.

(ii) Subtract reading *Z* from reading *X* to obtain the number of scale degrees between the unknown and the crystal harmonic immediately below it.

(iii) The number of kilocycles by which the unknown frequency exceeds the crystal harmonic is then $100\ (X - Z) \div (Y - Z)$ kc/s.

(iv) The complete frequency of the unknown signal is obtained by adding this result to the frequency of the crystal harmonic immediately below the unknown

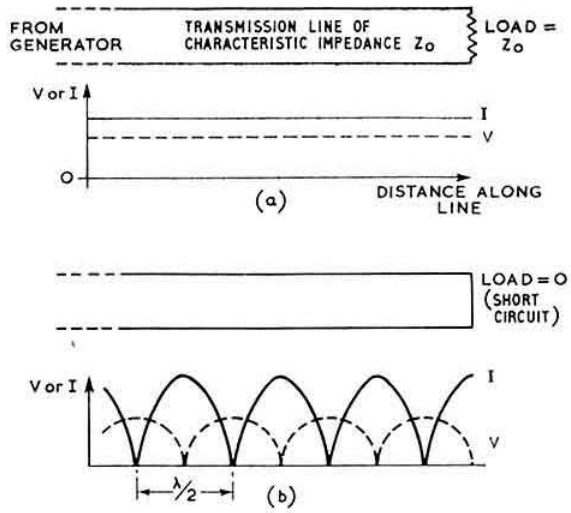

Fig. 10(a) and (b)

frequency, which is easily identified by the rough calibration of the v.f.o. dial.

Q. 10 *What is meant by standing waves on an aerial feeder? How may they be detected and what can be done to reduce them?*

A. 10 When a feeder is terminated in a load equal to its characteristic impedance all the power put into the feeder at the sending end is delivered to the load and the current and voltage are uniform along the length of the feeder, as shown in **Fig. 10(a).** If the feeder is terminated by any other impedance it is said to be mis-matched and energy is reflected from the load end of the feeder back towards the sending end. The interaction between the energy travelling towards, and that reflected back from, the mis-matched load interact so as to cause a non-uniform distribution of current and voltage along the feeder, as shown in **Fig. 10(b)** which illustrates the extreme case of a feeder short circuited at the load end.

Such variations in voltage and current along a feeder are called standing waves. The minimum (or maximum) values are half a wavelength apart. The more closely the load approaches the characteristic impedance of the feeder the smaller will be the amplitude of the standing waves.

Standing waves may be detected on an open wire feeder by clipping a radio frequency ammeter across a fixed length, of a foot or so of one leg of the feeder as shown in **Fig. 10(c)** and noting the current at different points along the feeder. If standing waves are present the current will pass alternately through maximum and minimum values as the meter is moved along the feeder.

Standing waves are reduced by taking precautions to match the aerial as accurately as possible to the feeder.

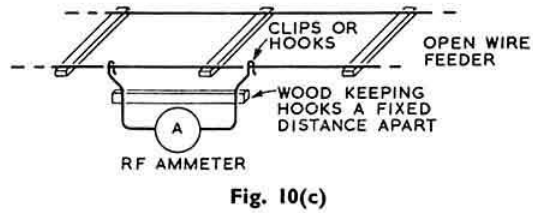

Fig. 10(c)

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