R·S·G·B AMATEUR RADIO

BULLETIN

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

VOLUME 29 No. 2 PRICE 1/6

AUGUST 1953

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R·S·G·B· BULLETIN

Devoted to the Science and Advancement of Amateur Radio

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Current Comment...

Time to Consider

THE proposed Special General Meeting that was to have been called for September 25 has been postponed until October 23. Urgent as is the need for more income from an increased subscription, there are the best of reasons for not holding the S.G.M. needed to approve the increase until full information is in the possession of the Council, and time has been found to consider it.

This "full information" consists mainly of the financial statement for the year ended June 30, 1953—and financial statements take time to prepare. A special meeting of the Council was therefore called for August 11 to examine the all-important income and expenditure account for 1952-3. After that it should be possible to send out, with the September BULLETIN, the statutory notice and proxy form in ample time for a Special General Meeting in October. It is also planned to publish a simple guide to the use of a proxy form —which is something many members have asked for.

The August 11 Council meeting had also further to examine the redraft of the revised Articles of Association, which have been returned to the Society's legal advisers by the Board of Trade, bearing a large number of amendments. These Articles had been in the hands of the Board of Trade for a fair time, and the numerous changes which have been recommended will themselves demand time for digestion.

But first things first—and finance *is* the first thing. The Council discussed this subject only a few days ago at that August 11 meeting—the first opportunity they had to do so after receipt of the year-end financial statement. And in discussing it they had one major objective in view: to keep the inevitable increase in the subscription at a level acceptable to all—and *seen* to be acceptable. For none, surely, will cavil at an increase that is truly economic both for the Society as a whole and for the private member individually.

So now, till next month . . . further information then.

Co-operation (V.H.F. Style)

COMMENT here in the last two issues has laid stress upon the value and importance of close co-operation between all the radio amateurs of this country if they are to act in concert and speak with one voice.

An excellent example of such co-operation was afforded on July 2 last when representatives of just about all the organisations and periodicals that have anything to do with Amateur Radio in this country got together at R.S.G.B. Headquarters to discuss band-planning on our v.h.f. and u.h.f. allocations.

Of the events that led up to the meeting those members who read "Council Proceedings" will be aware. It was by no means certain, however, that all the interests involved—and they were many—would be able to agree on what is, when one comes to look at it, quite a technically complex subject. Gratification at the outcome of the meeting was two-fold, by virtue of the fact that agreement *was* secured—and it was unanimous.

One problem of the many that were faced and overcome concerned the use of self-excited transmitters and receivers on the 70 cm band. Arguments that this technique is outmoded and ought not to be encouraged are balanced by the point of view that controlled transmitters and receivers are expensive and difficult to construct for the ultra-high-frequencies. It is for this reason that many amateurs prefer to make a start with the simple construction and economy afforded by low tolerance transmitters and super-regenerative receivers.

The technique *is* outmoded, of course, but it ought not to be regarded with too ascetic an eye if it is going to promote occupancy of the 420 Mc/s band. Its limitations are such that its adherents will assuredly realise before long that there are better methods of doing the job than the s.e.o.—and increasing experience of the frequency will instil in them confidence in tackling the more ambitious forms of construction that are inescapable if real results are to be achieved.

It would have been wrong, therefore, for the band-planning conference to ignore the users of simple equipment by omitting any allocation for them. The 5 Mc/s slices at either end of the 420-460 Mc/s band will give them ample room for manoeuvre.

Room to manoeuvre is needed, too, by the "Stroke Tee" enthusiasts for their wide-band picture emissions. They get it in a happy compromise (and *all* band-planning is compromise) that should please everybody.

An interesting provision is that of a channel 10 Mc/s wide for "future amateur development," and the 70 cm band is the ideal one in which new techniques, perhaps at present untried, may be given full rein without embarrassment to other operators. This provision showed the foresight with which those present at the meeting on July 2 looked into the future in their attempt to establish band-plans that have a reasonable permanence about them and will stand the test of time.

This brings us to the second main subject that was discussed at the meeting, for here was something that *had* stood the test of time. It was the zone plan for two metres, originally proposed by a member of this Society, Ian Paul, G3CYY, and advocated by another, E. J. Williams, G2XC (then-conductor of the v.h.f. feature of our contemporary, *The Short Wave Magazine*), with the enthusiasm that springs from the realisation that here was a practical scheme that ought to work.

The 2 metre band-plan *has* worked, and the meeting, after carefully reviewing it, decided that it should be adopted *in toto* as "The British Isles Two Metre Zone Plan." Here again we see a compromise; but as with so many of the compromises that the British character evolves in one field or another, it is a happy one that is not likely to be bettered.

Its main advantage in segregating amateurs into geographical zones related to frequency are that

(*a*) it enables searchers to know where to turn their beams, and (*b*) it obviates searching over the whole of the broad 2 Mc/s spectrum.

There are finally two purely personal comments which one would like to make upon the 2 metre zone plan.

First of all, those two metre operators who have not hitherto been able to bring themselves to conform to the Plan will perhaps now feel they can, since it has been officially accepted by all amateur interests. The one remaining stumbling block—a new crystal—can be overcome in some measure by publishing here and elsewhere lists of crystals which others have available for exchange

Secondly, members might like to ponder the possibility of using the top 500 kc/s of the 144-146 Mc/s allocation as an "escape region" without in any way modifying the Zone Plan as a whole. In other words, if interference is bad in the more heavily populated Zones, or if an operator desires to practice duplex telephony, then the channel 145.5 to 146.0 Mc/s should be used.

This piece of "special pleading" by the writer was not accepted at the meeting on July 2, but one makes no apology for voicing it again in the light of a subsequent significant event—the report of the Television Advisory Committee, and the evidence of covetous eyes being cast on frequencies adjacent to Band III. If we do not use all we have —especially the top 500 kc/s of the 144-146 Mc/s band—we can hardly wonder if others seek to pluck it from us.—J.H.

Society News

Royal Garden Party

THE President (Mr. Leslie Cooper, G5LC), and Mrs. Cooper, together with the General Secretary and Mrs. Clarricoats, were invited to attend the Royal Garden Party in the grounds of Buckingham Palace on July 16.

This signal honour to the President and the General Secretary follows closely on the anouncement, made last November, that His Royal Highness the Duke of Edinburgh, K.G., had been pleased to extend his Patronage to the Society.

Radio Amateurs' Examination

THE G.P.O. announces that a Radio Amateurs' Examination will be held on Saturday, October 3, 1953, from 2.30 to 5.30 p.m. at (a) the Cripplegate Institute, Golden Lane, London, E.C.1 (convenient tube stations—Aldersgate and St. Paul's); (b) the Office of the Radio Surveyor, Custom House, Dock Place, Leith, Edinburgh, and (c) the Office of the Radio Surveyor, Ministry of Transport, Bute Place, Cardiff.

The examination fee (25/-) should be remitted by cheque, money order or postal order made payable to the Postmaster-General and should accompany the candidate's application to sit for the examination, stating the centre at which he desires to attend. Applications, *which must arrive before September 5, 1953*, should be addressed to the Inspector of Wireless Telegraphy, O.T.D., W.T.S., Room 632, Union House, St. Martin's-le-Grand, London, E.C.1.

C.C.I.R. (VIIth) Reunion

THE VIIth Reunion of the International Radio Consultative Committee (C.C.I.R.) will open at Church House, Westminster, on September 3, with some 350 delegates from about 70 countries in attendance. The various Study Groups will meet in nearby Sanctuary Buildings. The Reunion is due to end on October 7.

The Post Office, B.B.C., R.I.C., D.S.I.R., and a number of private companies are arranging a comprehensive social programme which will include visits to Rugby, Daventry, Slough, Dollis Hill and Burnham Radio. There will also be conducted tours of Broadcasting House, Alexandra Palace, Lime Grove, and the B.B.C. Research Station.

The Council of the R.S.G.B. is planning to entertain, informally, those delegates who are also active radio amateurs. Arrangements are also being made for a meeting of the newly-constituted I.A.R.U. Region I International Committee to be held in London during the period of the C.C.I.R. Reunion.

The General Secretary, who is a Member of the United Kingdom General Purposes C.C.I.R. Committee, expects to represent the I.A.R.U. at the Reunion.

Amateur Licences

THE Amateur Licensing Division of the Post Office has recently been transferred from the Engineering Department to the Overseas Telecommunications Department and the staff dealing with this work have been moved from Brent Building to St. Martin's-le-Grand.

All correspondence about Amateur Licences should in future be addressed to:—

Overseas Telecommunications Department,
(Radio Branch) Headquarters Building,
G.P.O.,
London, E.C.1.

R.S.G.B. Amateur Radio Exhibition

The Seventh Annual Amateur Radio Exhibition will be held at the Royal Hotel, Woburn Place, London, W.C.1, from Wednesday, November 25 to Saturday, November 28, 1953.

Enquiries regarding stand space should be addressed to the Exhibition Manager (Mr. H. Freeman), National Publicity Co., Ltd., 36-37 Upper Thames Street, London, E.C.4.

Offers to assist on the Headquarters stand should be made in writing to the General Secretary.

The Moxon Beam

An Improved Two-Element Array

By L. A. MOXON, B.Sc., A.M.I.E.E. (G6XN)*

In this article the author discusses a hitherto neglected method of phasing for use in amateur beam aerials and describes a two-element array evolved as a result of many years of experience and experiment.

MOST types of beam aerial in common use suffer from various defects. In a parasitic array, for example, the currents in the elements are dependent on the adjustment of phase. These currents cannot be adjusted independently of the front-to-back ratio which is impaired when the gain is optimum. On the other hand, driven arrays usually employ so-called matched lines with phasing sections. The inter-dependence of the matching and phasing adjustments makes it difficult to guarantee satisfactory performance, the best results being obtained with non-optimum designs such as the "G8PO" and "ZL Special."

An easier, but hitherto neglected, method of phasing, which consists simply of connecting positive reactance in series with one resonant element and negative reactance in series with the other, will be described in this article. The arrangement—which is practically fool-proof—was applied to the design of a reversible multiband phased array described by the author in the July, 1952 issue of *QST*.

There exists a further criticism of most existing beams in that they are about 25 per cent. longer than necessary. This may not sound much, but in terms of weight, wind resistance and cost it may amount to 50 per cent. or more. There is no particular merit in the usual choice of a half wavelength for beam elements and there are at least two ways of shortening them: the trick of folding the ends down is well-known but it has mechanical and electrical disadvantages. An alternative is to fold the centre of the elements inwards. This method has little effect on the radiation pattern although it reduces efficiency very slightly by lowering the radiation resistance relative to the loss resistance and narrows the band over which it is possible to achieve good matching without re-adjustment. The arrangement, however, enables the elements to be made resonant and at the same time permits them to be connected in parallel at a voltage node, thus permitting the author's method of phasing to be applied in a particularly simple and efficient manner as shown in Fig. 1. The suggested reduction in length can be achieved with negligible loss of efficiency and with adequate feeder matching over the 14 Mc/s band.

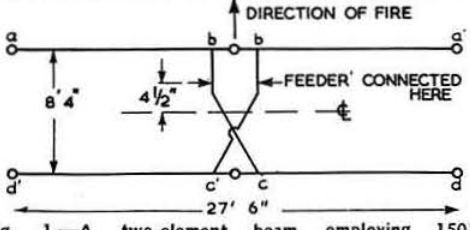

Fig. 1.—A two-element beam employing 150°–155° phasing. For 14.2 Mc/s, the lengths abcd, a'b'c'd' are 35' 4" using 7/23 wire throughout. The overall length is 27' 6", but this should be reducible to about 25' or 26' by using tube or multiple wires for the arms and wire for bc and b'c'.

Satisfactory agreement has been obtained between theory and practice and five experimental arrays of the type illustrated, and five others exploiting the same phasing principle, have been constructed. Among the latter are the multi-band system described in *QST* and some 4-element fixed arrays using wide-spaced pairs of half-waves-in-phase.

Basic Principles

Imagine the two elements shown in Fig. 1 are independent, *i.e.*, ignore any interaction and consider them as two separate but identical resonant systems connected in parallel at a voltage node. Moving the feed point off-centre lengthens one system and shortens the other. For a *small* distance l this is equivalent to connecting a reactance of $(Zo.\ 2\pi l/\lambda)$ ohms in series with the radiation resistance R of each element, Zo being the characteristic impedance of the line between the elements; λ is the wavelength.

The reactance is inductive (*i.e.* positive) for the lengthened side and capacitative for the shortened side but since the reactances have the same magnitude in each case, the currents flowing in the elements must be equal.

The rear element has a phase lag which tends to cancel for the back direction—and increase for the forward direction—the phase difference due to the spacing of the elements. The phase-shift (in radians) for each element is approximately equal to the added reactance divided by the radiation resistance, provided this ratio is less than about 0.5. (Current equality depends only on the electrical length of the system, the adjustment of of phase-angle being quite independent). This explanation has been over-simplified by neglecting interaction between the elements and although it would be possible (by using wide spacings and long resonant feeders) to devise an aerial system which operated in exactly the manner described, close spacing is of greater practical interest.

The interaction between elements can be expressed as a mutual impedance and the gain, radiation resistance and front-to-back ratio calculated with the aid of handbook data (1) and simple geometry. Such calculations reveal some interesting facts, but it is sufficient to note here that the interaction leads to results such as those plotted in Figs. 2 and 3 (which apply to *any* method of phasing) from which it may be seen that the 135° phase angle usually employed with driven arrays does not give the best possible performance.

The mutual impedance may include both resistance and reactance. The reactive component besides making the calculations rather difficult, may cause the elements to have entirely different impedances! Any adjustments of phase (or current inequality) affects both impedances, which generally include a reactive term which has to be tuned-out.

The usual methods of phasing employ separate feeders, which have to be matched individually to the two elements, and "delay sections" which produce a phase-shift. The latter is unpredictable unless the matching is good. It may seem sur-

* *No. 1 Stoner Hill House, Froxfield, nr. Petersfield, Hants.*

prising, therefore, that such systems can be made to work, but for the special case of $\frac{1}{8}\lambda$ spacing or just over and 135° phasing (as used in the "G8PO" aerial) the situation is not as bad as might be expected because the reactive term disappears from the mutual impedance. The radiation resistances of the elements are then equal and comparatively high (30 ohms). There remains the problem of tuning out the the reactive components of the feed-point impedances and transforming the 30 ohms to a more convenient value. It is unfortunate that the radiation resistance rises rapidly and matching becomes easier as the phase difference between the elements is reduced below 135°, whereas the opposite occurs as the angle is increased towards the optimum value of 150° to 160°. For this reason, trial-and-error methods of adjustment tend to produce a somewhat smaller angle than 135°, resulting in a reduction of gain (Fig. 2).

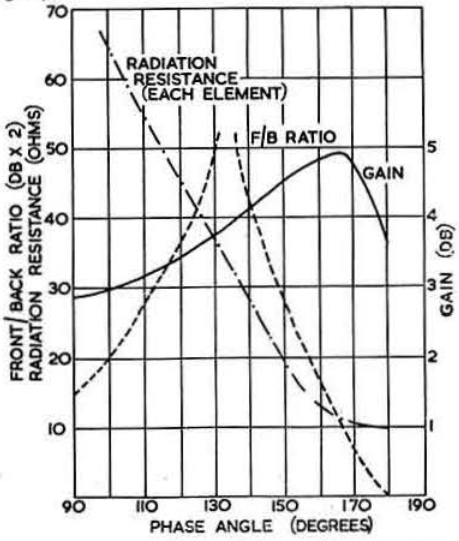

Fig. 2.—Variation of gain, radiation resistance and front-to-back ratio with phase angle for half wave elements spaced $\lambda/8$. A rather high value of loss (2 ohms per element) has been assumed. For elements folded as in Fig. 1, the radiation resistance should be halved.

When close-spacing is used, the resonance method of phasing operates substantially as described for the case of separate dipoles except for the effect of the mutual impedance on the radiation resistance and phase-angle. The method to be described overcomes the difficulties experienced with "delay sections" and adjustment becomes *less* critical as the phase difference is increased from about 135° towards and beyond the preferred value (150°). This is to be expected since the larger the phase-angle the nearer the system approaches the "W8JK" which operates over a wide band, subject to suitable tuning of the main feeder system.

Although $\frac{1}{8}\lambda$ spacing is shown in Fig. 1 and has been used to simplify the calculations, it is not essential to use this in practice because the method of adjustment described in the next section automatically allows for the reactive component of the mutual impedance.

Method of Adjustment

Adjustment is simple provided care is taken to make the lengths, measured from the centre of the system to each of the four ends, exactly equal. When adjusting the lengths, the feed point should be moved further off centre in order to exaggerate the effect of any errors, 8 to 9 inches (135° phasing) being quite suitable. The only test equipment required is a flash-lamp bulb mounted in an ordinary battery-testing probe which can be bridged across a few inches of each feeder in turn to check whether the currents are equal. This assumes access to the centre of the aerial in a position reasonably clear of the ground—at least 15 ft. A better scheme, free from this restriction, is to use two separate bulbs—selected for equal brightness when connected in series across a suitable supply—to measure the currents in the front and back elements. Bulbs have an advantage over meters in that they are visible at a distance.

Provided wire elements are used, the dimensions given in Fig. 1 should be found correct at some point in the band. If they are too short, the inductive side (being nearer to resonance) will draw more current and *vice versa*. In making the adjustments it is essential to shorten or lengthen all four arms by the same amount. The same principles can be applied to other lengths and combinations of elements. At other spacings, the reactive component of the mutual impedance upsets the symmetry of the system, but this is automatically allowed for in the above procedure. As a guide, with the feed 8½ in. off centre, a fairly obvious current difference requires a length adjustment of about 3 in. at the end of each arm, *i.e.*, 6 in. per element. A larger adjustment would be required if it was made at the centre instead of at the ends.

The recommended overall lengths for each element are nearly 2 ft. longer than those required for resonance in conventional systems. When the first trial was made, with 33 ft. 4 in. lengths, it was found that the lamp on the inductive side was very bright but there was no trace of glow on the capacitative side. The explanation is that if the same diameter of conductor is used throughout, the characteristic impedance of the elements is different to that of the cross connection; shortening the elements by an amount l is equivalent to connecting a reactance $-Zo.\pi l/\lambda$ in series whilst the twin-wire portion adds a reactance of $Zo.2\pi l/\lambda$. These quantities must be equal for resonance, but as the values of Zo are different (about 850 and 600 ohms respectively for wire elements) the lengths must also be unequal and hence there is a net change in the overall length of wire required for resonance. This effect does not apply to the earlier system described in *QST* which employs resonant half-wave elements with resonant half-wave feeders. Calculations indicate that it could be neutralised (more or less) by using ½ in. diameter tubing for the elements whilst retaining the wire between them.

The band-width over which the aerial will operate correctly with 135° phasing is just adequate for full coverage of the 14 Mc/s band. It is much wider with 150° to 155° phasing, calculations indicating a band-width in the region of 10 per cent. For comparison, a frequency change of about 3 per cent. causes a complete reversal of some parasitic beams. The operational band-

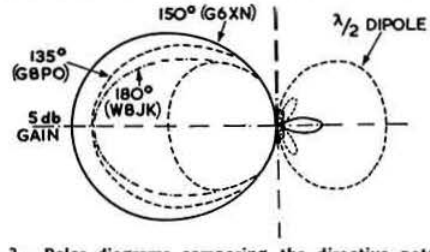

Fig. 3.—Polar diagrams comparing the directive patterns for 135°, 150°, and 180° phasing with that of an ordinary half-wave dipole.

width is, of course, unrelated to the band-width over which a good standing-wave ratio can be obtained without re-tuning the main feeder system.

If the array is rotatable, a good method of checking the phasing is to observe the radiation pattern on some local station, and to compare it with Fig. 3. It should be sufficient, however, to rely on the figure of 4½in. shown in Fig. 1 since the optimum is not critical; even doubling the distance merely reduces the gain about one db and alters the radiation pattern slightly.

Performance of the System.

Fig. 2 shows the calculated variation of gain, nominal front-to-back ratio and radiation resistance as the phase angle is varied; Fig. 4 shows the reactance necessary to produce any given phase shift. Polar diagrams obtained with 135° and 150° phasing are shown in Fig. 3. From these diagrams it will be seen that 150° phasing produces better gain than either the "W8JK" or "G8PO" systems, and results in an intermediate value of radiation resistance. However, the increase in radiation resistance at the smaller phase angles may cause the optimum to move in this direction

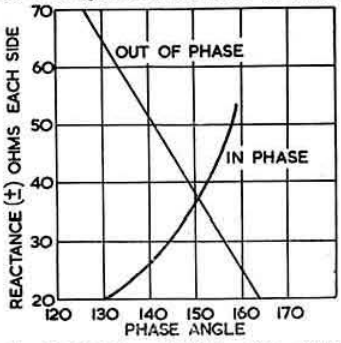

Fig. 4.—Reactance required for full-length elements. For shortened aerials (Fig. 1) divide by 2.

if an attempt is made to reduce the size considerably. (The curves have been calculated for full-length elements). In the case illustrated in Fig. 1, the radiation resistance is reduced to about one half, being roughly 9 ohms for each element; the reactances required are reduced in proportion.

The loss resistance, with wire elements, should not exceed 0.5 ohms for each so that less than 5 per cent. of the input power will be wasted. There is a further loss due to the shortening because in a half-wave system the radiation field produced by a small current flowing near one end of the wire cancels—for directions in line with the wire—the field produced by the current at the other end. This gives the "ordinary" dipole a gain of 0.39 db over an "infinitely short" dipole whereas the gain of the system in Fig. 1 will be slightly less. Even taking these factors into account, the difference in gain between the "Moxon" beam and an efficient 2-element parasitic array should be negligible.

When the out-of-phase connection of Fig. 1 is employed, the mutual impedance acts to oppose the effect of feeding off-centre, whereas with in-phase connection the opposite occurs. The consequences of any disturbance, such as a change of frequency, are therefore greatly exaggerated. Fig. 4. shows that, approximately, the same value of reactance is required to move the phasing from 0° to 150° as from 180° to 150°, thereby explaining the experimental fact that the arrangement of Fig. 1 was readily adjustable, while the in-phase connection (familiar to users of the "G8PO" aerial) was so critical that in this case it had to be dismissed as useless.

Feeder Systems

The impedance of each element at resonance, as "seen" from the main feeder system, appears as a resistance of about 9 ohms in series with a reactance of 2-3 ohms. The two elements in parallel constitute a resistance of about 5 ohms which usually requires to be matched to some non-resonant line of characteristic impedance Zo. Three methods have been used successfully:

(a) using the step-up properties of a simple resonant circuit, the 5 ohm resistance is connected in series with the inductance L and capacity C as given by the formula

$$Zo = \frac{X^2}{5}$$

where $X = \omega L = 1/\omega C$. The line is connected directly across either L or C and a piece of the line can be used as the inductance, according to the formula

$$X \frown \frac{Zo.2\pi l}{\lambda}$$

If the unloaded "Q" of the circuit is 200 and Zo is 600 ohms, $X = 55$ and its loss resistance, (which appears in series with the 5 ohms of the aerial) is 55/200, or 0.275 ohms, so that the loss in the matching circuit is 0.3 db. In practice, a capacity of 168 $\mu\mu$F bridged across the 600 ohm feeder line 2 ft. from the point of connection to the aerial gives satisfactory results. For matching to a 72 ohm line

$$X = \sqrt{72 \times 5} = 19 \text{ ohms};$$

for 14.2 Mc/s L=0.21μH and C=600 $\mu\mu$F. The arrangement is shown in Fig. 5.

(b) A quarter-wavelength of 80 ohm cable will transform the 5 ohm resistance up to 1280 ohms and provide a standing-wave ratio of 0.5 in a 640 ohm line, which is acceptable unless the line is a very long one. The losses will be about the same as for method (a). This is the arrangement mainly used by the author, because it is the easiest, but the change from 5 to 1280 ohms is rather large. It would be better to reduce the impedance of the matching section to about 56 ohms; one way of doing this would be to use two lengths of 100 ohm cable in parallel, binding them tightly together.

(c) A half-wave resonant feeder has also been used successfully, the phasing at the time being 135°. With 155° phasing the losses would be higher (estimated as at least 0.8 db) and the variation in matching over the band would be worse, but the arrangement should permit a 14 Mc/s array to be used as an "W8JK" on 21 and 28 Mc/s subject to suitable tuning of the feeders. This is because the off-centre connection only has a signicant phasing action if there is a current anti-node at or near the centre, which is not so at the higher frequencies.

The resistive component of the aerial impedance is fairly constant over a wide band, but a rapidly increasing reactive component appears in series with it as resonance is departed from; the resulting change of s.w.r. makes it necessary to re-adjust the aerial coupler if a large alteration in frequency is made. In this respect the system is about 2:1 worse than a conventional 2-element parasitic array, owing to the smaller dimensions. In practice there is no difficulty in compensating for the change by re-adjusting the aerial coupler. The s.w.r. is expected to fall to about 0.25 at the edges of the 14 Mc/s band, but this is a theoretical figure which has not been checked by measurement apart from noting that the variation of match did not cause any appreciable inconvenience in practice. The use of larger conductors for the elements will increase the bandwidth both for correct operation of the beam *and* for a given s.w.r. in the feeder,

besides tending further to shorten the overall length as already explained.

Further Possibilities

The beam can be made reversible by means of a relay at the centre. Alternatively, two feeders can be used, one each side of centre, provided the unused feeder is so terminated that it does not exercise an appreciable shunting effect.

There seems to be no reason why the spacing should not be increased to $\lambda/4$, thereby shortening the array to about 20 ft. The increase in radiation resistance due to the wider spacing, would largely offset the reduction due to using shorter elements. No difficulty was experienced with the wide spacing in the case of harmonic operation of the multiband system previously mentioned, and at present a very satisfactory fixed 4-element 14 Mc/s array consisting of two quarter-wave-spaced pairs of half-waves in phase, centre-fed with 18 ft. resonant feeders (with cross-over) and fed 1 ft. off-centre to give 135° phasing, is in use. It is possible, however, that some interaction between the phasing and the length adjustments may be experienced owing to the mutual reactance, especially with a very short array; for this reason a spacing between $\lambda/8$ and $\lambda/6$ is recommended. Theoretically, a much greater degree of shortening can be achieved by capacity loading of the ends of the elements; this is mechanically awkward but may be worth investigating where space is very restricted and wind resistance is no problem, *e.g.* in an attic.

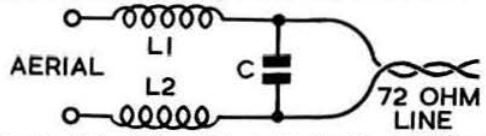

Fig. 5.—Method of matching to 72 ohm line. C, 600 $\mu\mu$F to carry 4.5 A for 100 W radiated power; L1, L2, 0.105 μH; 3 turns 0.65in. diameter, 0.65in. long.

Longer elements can be used if preferred, and the extra length tuned-out by means of series capacity. For example, by increasing the physical length of the Fig. 1 system to $\lambda/2$ and feeding it in the centre, it could be phased by means of two pairs of series-connected 150 $\mu\mu$F variable condensers. Alternatively, $\lambda/2$ resonant feeders could be used as described in the article in *QST*, permitting operation on 14, 21 and 28 Mc/s by suitable arrangement of extra sections.

Many other applications of the resonant-phasing idea suggest themselves; for example, a reflector or director might be added to a V-beam making it uni-directional and reversible. Two independent arrays could be fed with easily-adjustable phases and amplitude by matching them into resonant lines, connected in parallel, and fed off-centre. With similar arrays, this gives a gain of 3 db and should permit some degree of electronic swinging of the beam, but if the object is merely to obtain increased gain in one direction only, conventional matched-line technique is simpler. It has been successfully applied to two 4-element beams of the type described above. Arrangements of this sort can sometimes be used to great advantage and are easier to achieve than might be expected; for example, if the non-resonant feeders of two fairly well matched arrays are connected in parallel there is a good chance that 2-3 db gain will be obtained even if the feeder lengths are chosen completely at random! In practice, it is quite easy to find a point on one feeder system such that connection of the other one in parallel produces cancellation of received signals, reversal of the connections then producing a 3 db gain. The power sharing need not be equal; a 4:1 inequality causes a loss of only 0.2 db, and there is still a perceptible gain (1 db) with an inequality of 100:1. A gain of 1 db as compared with the best of the two aerials is obtainable even if one is 6 db worse than the other!

Conclusion

The phasing method described has proved to be the easiest solution of a number of diverse aerial problems, although the main emphasis has been placed on the arrangement of Fig. 1 which is thought likely to have the widest appeal. Incidentally, any phased array using imperfectly-matched lines, can be treated as "resonant." Indeed, it should be obvious that unless the principles described are applied, either deliberately or as a consequence of trial-and-error, such systems *cannot* function correctly.

It would seem that the same principles should be applicable to close-spaced end-fire arrays with more than two elements, although much of the simplicity would be lost. Before deciding on further elements, whether parasitic or driven, it should be remembered that at least four more elements must be added to obtain as large an effect as that produced by changing from one element to two. Even with a three-element beam, height may have to be sacrificed because of the extra weight, and taking into account the added difficulty of adjustment and the possible disadvantages of a sharp beam the average performance may well be *worse* with three elements than two. At best, the case for rotary beams with more than two elements is, in the author's opinion, "not proven."

Reference

[1] Terman, *Radio Engineer's Handbook*, 1943 Edition, pp. 777-80, Figs. 10 and 13, Equation 5.

Reception of Pulse-Modulated Transmissions

BY A. T. HICKMAN, B.A. (B.R.S. 4577)*

In the April, 1946, issue of the Bulletin, the author outlined the basic requirements for pulse modulation, and considered the problems involved in the reception of pulse-modulated transmissions. These fundamentals are re-stated in greater detail in the following article which, since the use of pulse modulation by amateurs is now permitted in the s.h.f. bands, will be of practical interest to those anxious to experiment with new techniques.

THE frequencies allocated for pulse modulation (2350-2400 Mc/s 5700-5800 Mc/s and 10050-10450 Mc/s) can be generated only by special valves (*e.g.*, the klystron, the lighthouse triode, and the multi-chamber magnetron), each of which will affect the type of modulation used. The magnetron, for instance, does not lend itself to pulse-amplitude modulation, as its working conditions cannot be greatly varied. All types, however, can be keyed for telegraphy. The power obtainable from all but the multi-chamber magnetron amounts to one or two watts for such transmissions. Magnetrons are capable of greater power output, but require special design for the type of transmission for which they are intended. The continuous power rating of such valves sets a limit to the power that may be transmitted continuously from the aerial while the key is depressed.

The Challenge

Pulse modulation is a wonderful challenge to the amateur. Theoretically it is capable of immense gains in microwave efficiencies though in practice, they cannot yet be achieved. The amateur, with his inventiveness and initiative, is just the person to open up this new field, as he did with the short waves thirty years ago.

Present magnetrons, intended for radar applications, are designed to provide a high ratio of peak-pulse power at a low pulse-repetition rate. For amateur purposes, however, a magnetron is required capable of 15 to 20 times the repetition rate at about one-tenth of the power of radar magnetrons.

Pulse modulation cannot go forward until such a magnetron is made available by the manufacturers, but first there must be sufficient demand to make the "amateurs' magnetron" a commercial proposition. From time to time, articles on microwave techniques will appear in the BULLETIN, *stimulating active interest in this new field so that, eventually, manufacturers will realise that the growing amateur market for s.h.f. valves and equipment is no longer negligible, but is a commercial sphere worthy of development.*

If, however, the Morse key is made to actuate a sub-modulator, which itself switches the transmitter on and off many hundreds or thousands of times a second, then power will not be radiated continuously from the aerial when the key is held down, but will be transmitted in a succession of bursts or *pulses*, the length of which will depend on the design of the sub-modulator. If, for example, the sub-modulator is designed to switch-on the transmitter for a period equal to that of the ensuing switch-off, then no matter how many times this procedure is repeated per second, the *average* power radiated can be only one-half of that required for continuous transmission. The ratio of the time of "switch-on" to "switch-off" is called the *duty ratio*, and in the above example is 0.5. The power radiated during a single pulse is the same as for continuous transmission, and therefore pulses will carry just as far as continuous waves; the power drawn from the supply, however, will be only one-half of what it was previously over a given period. Thus, one of the immediate advantages of pulse modulation would seem to be the economy of power required to produce a given result.

A magnetron capable of supplying continuously a power of 25 W to the aerial could, by using a sub-modulator, be "pulsed" to give a duty ratio of 0.01, the average power taken from the supply being only 0.25 W. The following observations can also be made:

(a) the individual pulses will radiate as far as an equivalent 25-watt continuous transmission;
(b) the magnetron will become only 1/100th as hot; dissipated heat being the final limiting factor in the design of such valves.

Provided the magnetron cathode can supply sufficient electrons, the power radiated during the pulse period can be increased until the average input power limit of 25 W is reached; at this point the peak power in the radiated pulse will be 2.5 kW. This shows the real advantage of pulse modulation at very high frequencies—namely, that sensational peak powers become attainable with valves of modest proportions and design.

The Magnetron

The multi-chamber magnetron is theoretically the ideal transmitting valve for this work, but the practical difficulty is that the valve must be designed for the particular application for which it is intended. The principal factors determining its design are the peak power output and the maximum continuous power rating, and the ratio between these two quantities. The latter fixes the duty ratio. The magnetrons obtainable on the surplus market have maximum power outputs far in excess of the authorised figure, while specifications of one valve at present being made commercially show not only a peak power of 14 kW, but a maximum continuous power of 14 W, giving a duty ratio of only 0.001. Such a valve cannot be under-run to the extent of reducing the peak power to 2.5 kW; it would cease to function long before this figure was reached. It is to be hoped that the radio industry will take urgent steps to provide a magnetron specially designed for amateur purposes so that the fullest opportunity can be given to those interested in exploiting this new field of development.

Modulation of the Pulses

At the receiving end, a pulse transmission of

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fundamental type would sound in the 'phones like a rough note of frequency equal to the number of pulses per second. Thus, a keyed pulse transmission would sound much like coarse i.c.w. If, however, the pulse repetition rate is increased to more than 15,000 c/s, the "note" is no longer within audible range. If now, instead of being keyed, the pulses are varied in amplitude or width, at a speech frequency, it becomes possible to transmit normal speech; this point is illustrated in Fig. 1. In practice there would normally be many cycles of radio frequency in even the shortest pulses.

The Post Office Authorisations

In the case of pulse-width modulation (Fig. 1c) the ratio of pulse length to quiescent time varies at the speech frequency. To take advantage of the maximum powers authorised, the *average* pulse length should be 1/100th of the whole pulse cycle. Since it is difficult to design equipment to transmit pulses much shorter than 1 microsecond, the negative half-cycles of audio frequency should be

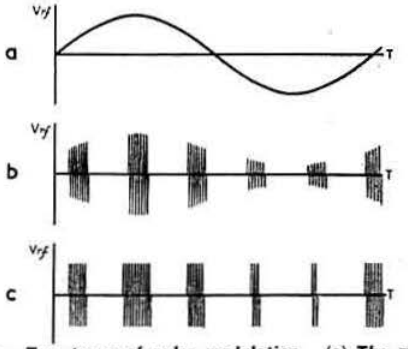

Fig. 1.—Two types of pulse modulation. (a) The modulating audio sine-wave. (b) Pulse-amplitude modulated wave. (c) Pulse-width modulated wave.

calculated to decrease the pulse length to this figure, while the positive half-cycles should increase it to a length of at least 5 microseconds, giving a modulation depth of 4 microseconds peak-to-peak. When there is no speech modulation, the pulses will remain at the mean length, *i.e.*, 3 microseconds (which is also the average pulse length during modulation). Multiplying this figure by 100 will give the minimum time allowed by the Post Office authorisation for a pulse cycle, *i.e.*, 300 microseconds. This represents a pulse repetition rate of only 3,333 per second, which is a figure well within audible range! Thus, so far as pulse-width modulation is concerned, the optimum figures allowed by the authorities can never be attained.

Not only must the pulse repetition rate be above audio frequency, but it must be twice this amount at least if serious speech inversion effects (due to the production of different frequencies between speech and pulses) are to be avoided. For amateur purposes, a minimum repetition rate of about 8,000 per second is indicated, provided that the audio response is limited to a little below 4,000 c/s. Another factor must, however, be considered. Fig. 1 shows that, since the pulses are discontinuous, they cannot represent fully the rise and fall of a continuous audio sine-wave; they are in fact *samples* of the audio amplitude at certain fixed intervals. The receiver will have to "reconstruct" its continuous audio frequencies as best it can from the samples it receives—obviously, the more samples per cycle of the highest audio frequency the better. Since, however, the higher audio frequencies are not fundamental to the intelligence conveyed, a perfectly intelligible transmission is possible at a pulse repetition rate of 8,000 per second—a figure suitable for gaining practical experience of this system of modulation. Quality considerations render the adoption of this figure somewhat problematical; it is rather too low for any but fundamental experiments. Several samples per cycle will normally be required for the best reproduction of the full audio-frequency spectrum.

Assuming a maximum speech frequency of 8 kc/s (the greatest ever likely to be needed by amateurs), a figure of 30 to 40 kc/s is obtained as a suitable pulse repetition rate for good quality transmissions; a convenient rate would therefore be 33,300 pulses per second. The pulse cycle is 30 microseconds long and, with the average pulse length of 3 microseconds previously suggested, the duty ratio is 1/10th. Consequently, if the continuous power of the transmitter is not to exceed 25 W, the peak power output cannot, for pulse-width modulation, exceed 250 W. Taking the minimum figure of 8,000 pulses per second, it will be seen that the pulse cycle will now be 125 microseconds long—the duty ratio is thus improved to 0.024. For a continuous maximum power of 25 W, therefore, the maximum peak power for pulse modulation is raised to just over 1 kW.

The Receiver

Since the bandwidth of a system of pulse modulation will obviously be large, the receiver must be designed with this factor in mind. Because of the very high carrier frequency involved, some form of silicon diode mixer is indicated, with a velocity-modulated valve as local oscillator. The i.f. will be high, the i.f. amplifier being designed for wide-band staggered tuning to give flat response over at least 2 Mc/s for the highest pulse repetition rates. If, however, the i.f. chosen is too high, detection becomes a serious problem. Receivers for use on microwave frequencies have already been described in the BULLETIN [1] [2], and they will not be considered here.

The circuits following the second detector must extract the modulation from the rectified pulses and are less conventional in design. A practical pulse-width demodulator circuit has been evolved by the writer, based on the optimum quality figures suggested above, and is depicted in Fig. 2. The i.f. output is first rectified to give good negative-going pulses at a repetition rate of 33,300 per second, with an unmodulated width of 3 microseconds. For test purposes the pulses were modulated at 50 c/s from roughly 1 microsecond to 5 microseconds pulse width, and were applied to the grid of V1—a 6K7 strapped as a triode. An oscillogram of the input to V1 is shown in Fig 3a (the pulses are inverted by the oscilloscope). The shaded portion arises from the fact that, as the oscilloscope time-base was run at 5.5 kc/s,

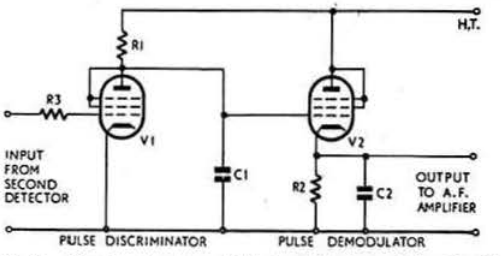

Fig. 2.—Circuit of pulse-width demodulator. (The circuit will also demodulate pulse-amplitude modulated transmissions, but the first stage should preferably be omitted.) R1, 3, 50,000 ohms; R2, 22,000 ohms; C1, 200 μμF; C2, 0.01 μF; V1, 2, 6K7.

pulses of varying widths were being traced one over the other. Thus, the duration of the shaded portion represents modulation "depth."

During the quiescent period, while V1 is conducting, a large voltage drop appears across its load resistor and the anode condenser (C1) receives only a slight charge. When a pulse drives the grid

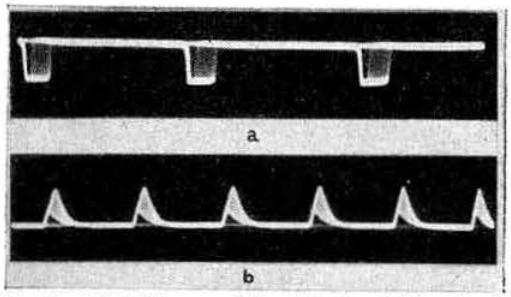

Fig. 3.—(a) Oscillogram of input to demodulator circuit (Fig. 2.) The shaded portion represents the "depth" of the audio modulation of the lengths of the pulses (inverted). (b) Voltage output waveform at the anode of V1.

of V1 negative, the anode condenser is charged through the load resistor, the time constant CR being arranged so that even the widest pulses do not allow C1 to be charged to more than a quarter of its full value before the end of the pulse once more makes V1 fully conducting and the condenser is short-circuited through the valve. The resulting waveform is a positive-going voltage saw-tooth, the height of the individual "teeth" being nearly proportional to the widths of the incoming pulses. If the pulse-width is varied at a speech frequency then the pulse output at the anode of V1 will vary in amplitude at that frequency, as shown in Fig. 3b, which is a photograph of an oscillogram taken at the anode of V1. The shaded portion indicates that the pulses are now of varying amplitude, the

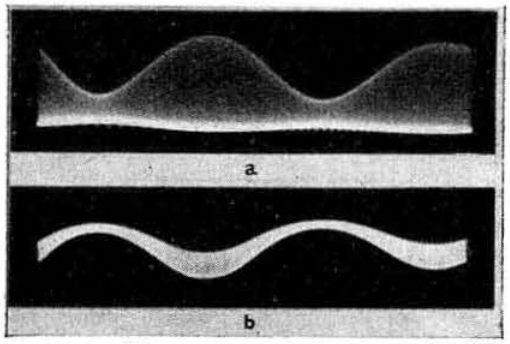

Fig. 4.—(a) Voltage output waveform at anode of V1 with oscilloscope time-base running at 25 c/s. (b) The unfiltered audio frequency output from V2. Both traces were photographed simultaneously on double beam c.r.t. so that (b) is inverted. Some Y-plate amplification was used.

leading edges being the lower part of the charge curve of the anode condenser (C1) through the anode-load resistor (R1). Had these values been made much smaller, the longest pulses would have become "rounded" at the top of the leading edge (due to the anode condenser becoming fully charged) and serious distortion would have occurred. The trailing edge is the discharge curve of C1 through the valve at the end of the input pulse. The oscilloscope was now run at 25 c/s with the Y-plate amplifiers turned on so that the outline of the varying pulse amplitudes could be seen. The result is shown in Fig. 4a.

The second stage of the circuit extracts the audio component from the pulses, leaving as little ripple as possible. A cathode-follower circuit ensures maximum sensitivity, as it provides a very low-impedance path for the current charging C2 and imposes minimum loading on V1, whose operation might otherwise be affected. C2, and its shunting resistance R2, should be chosen to give minimum residual ripple without undue attenuation of the higher audio-frequency components. For design purposes the resistance is not just R2 alone, but the value of this resistance shunted by the output impedance of V2, which has been shown [3] to be roughly $1/g$ where g is the mutual conductance of the valve in amperes per volt.

The oscillogram shown in Fig. 4b, taken across C2, illustrates that with the values given, the proportion of ripple to audio sine-wave is excessive. Ripple disappeared completely when C2 was increased to 0.1 μF but this value is too large. A value of 0.03 μF would provide a suitable compromise between minimum ripple and minimum attenuation of the higher audio frequencies.

After filtering any remaining ripple frequency, pulse fundamental and other unwanted components (if a transmission of pulse repetition rate 8 kc/s is being received), the output from the circuit can be applied to an audio amplifier, having loudspeaker or 'phones, in the normal way.

Limitations of Pulse-width Receivers

It has been stated that a pulse transmission will "carry" as far as a continuous transmission of power equal to the peak power; it will, in fact, result in equivalent signal voltages at the aerial terminals of the receiver. It is also true, however, that if an equivalent amount of intelligence is to be extracted from the wider sidebands of a pulse transmission, the receiver bandwidth must be such that the noise level from the first stages will be greatly increased. In practice, a mathematical analysis of all the factors involved shows that the smaller the duty ratio (or the higher the pulse repetition rate), the greater the noise level due to increasing the receiver bandwidth; the resulting ratio of signal-to-noise from the loudspeaker will be the same as for a continuous transmission of equivalent *mean* power. In other words, nothing seems to be gained by using pulse transmission.

The noise level might conceivably be reduced by taking the output from the second detector, and then amplifying it to saturate the final stage in the amplifier, driving the grid of its valve well beyond cut-off until the arrival of the next pulse. In this

(Continued on page 70.)

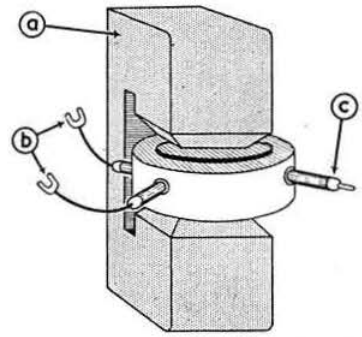

Fig. 5.—Suggested form of magnetron suitable for amateur use showing: (a) Permanent high-efficiency magnet; (b) heater and heater-cathode connections (the valve's metal body would be earthed, the cathode being run several thousand volts negative). (c) r.f. output loop. Cooling fins that might be necessary have been omitted for clarity.

A Two-Ten Converter for the BC342

By E. A. PERKINS (G3MA)*

A disadvantage of the BC342 receiver, is that it cannot normally be used for both 28 Mc/s and 144 Mc/s operation without a converter for each band. The following article describes a novel circuit using a common oscillator from which the required harmonic is selected to work with the mixer of the converter in use, the required band being tuned by altering the intermediate frequency.

THE converters originally used at G3MA were a Type 26 r.f. unit, modified to cover the 28 Mc/s band, and a home-built 144 Mc/s converter using a 6J6 neutralised r.f. amplifier, a 6J6 push-push mixer, and a 6J6 crystal-oscillator-multiplier. The i.f. in both cases was 10 Mc/s at the centre of the bands covered. Either unit could be plugged into the BC342 power supply when required for use.

The aerial system comprised a 4-element Yagi for 144 Mc/s, and a 68 ft. Zepp for the h.f. bands, with a change-over relay for transmit-receive switching.

Eventually, it was arranged to simplify the procedure for changing over converters by combining the two units on one chassis, inputs, outputs and power supplies being switched by means of a multi-pole Yaxley. After a period of experimenting, it was decided to economise by using a common oscillator stage producing harmonics suitable for the mixers of both converters, band selection being accomplished by changing the i.f. (*i.e.* retuning the BC342 to the required output).

The Circuit

A Squier oscillator circuit using a 7500 kc/s crystal forms the basis of the two-in-one converter (Fig. 1). One half of a 6J6 acts as a multiplier, trebling the output frequency to 22.5 Mc/s ; this, applied to the second half of the same valve, is multiplied by six, giving a frequency of 135 Mc/s, which, when applied to the 145 Mc/s mixer stage, produces an i.f. of 10 Mc/s—the centre frequency of the 2 Mc/s band of 9-11 Mc/s over which the BC342 is tuned to receive signals between 144 and 146 Mc/s. This is normal converter design practice.

It was realised, however, that a spare oscillator frequency of 22.5 Mc/s was available at the anode of the first half of the 6J6, and that this could be used to beat with 29 Mc/s (the centre of the 10 m band) to produce an i.f. of 6.5 Mc/s, so that the whole of the band could be tuned over the range of 5.5 to 7.5 Mc/s on the BC342, thus providing 28 to 30 Mc/s coverage. The converter was therefore designed on this basis.

The 6AK5 r.f. stage and the 6AK5 mixer stage

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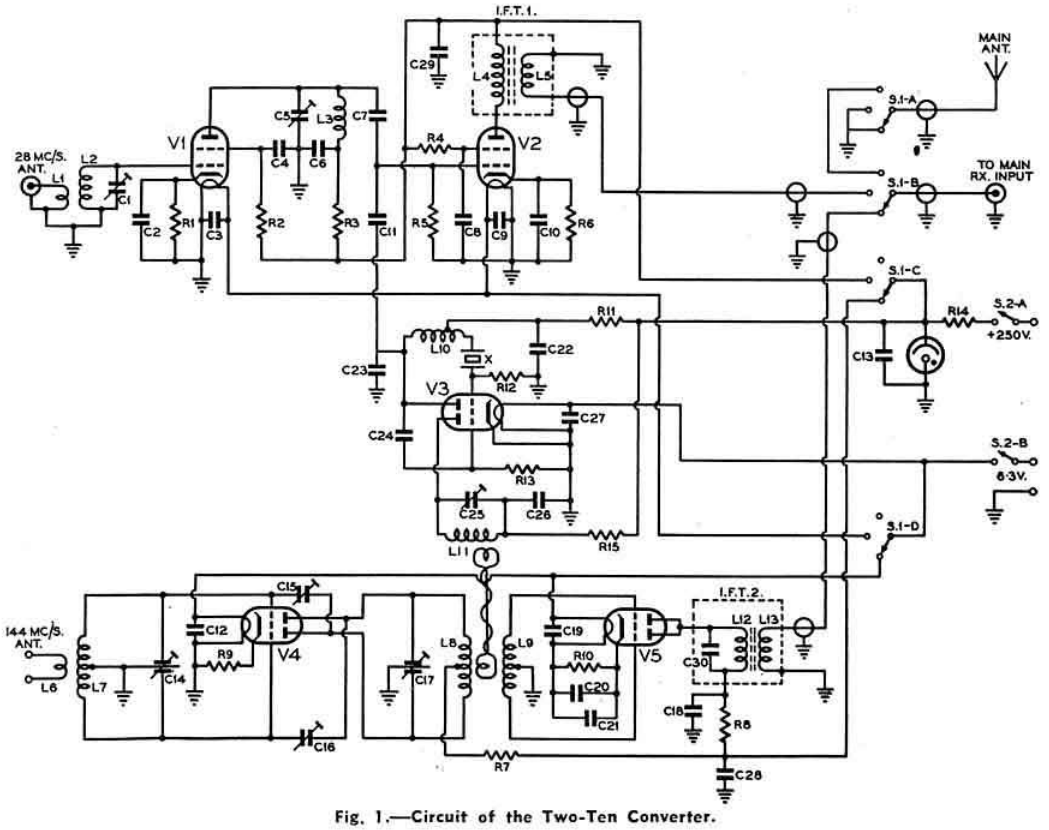


Fig. 1.—Circuit of the Two-Ten Converter.

are constructed on the same chassis, a 2 $\mu\mu$F condenser coupling the oscillator output at 22.5 Mc/s to the grid of the mixer. By varying the i.f. tuning between 9 and 11 Mc/s and 5.5 to 7.5 Mc/s, 144 Mc/s and 28 Mc/s signals can be received respectively.

Construction

The converter was built on a die-cast aluminium chassis measuring $8\times5\times2\frac{1}{2}$ inches. The underchassis layout is illustrated in Fig. 2. The oscillator stage is mounted centrally, with the stabilising valve and its associated dropping resistor and decoupling condenser at the rear†. In front of the oscillator are the two i.f. transformers, and between these, under the chassis, a four-pole three-way Yaxley switch.

On either side of the oscillator section are the r.f. and mixer stages for 28 Mc/s and 144 Mc/s respectively. This method of assembly forms a tidy and compact unit.

In order to keep the current drain on the BC342 power pack as small as possible, l.t. and h.t. are switched to the section in use by means of the wafers on the Yaxley switch. A double-pole toggle switch is included to enable all power to be removed from the converter when other bands are in use.

Alignment

First, the oscillator should be adjusted to its correct frequency, and the tuned circuit in the anode of the first half of the 6J6 valve should resonate at 22.5 Mc/s (*i.e.* the third harmonic of the crystal frequency). This can be checked with an absorption wavemeter while observing the deflection on a milliammeter connected in series with the anode h.t. feed resistor of this stage.

The second half of the 6J6 (the multiplier stage) must now be tuned to 135 Mc/s. Since the meter deflection obtained at the sixth harmonic of 22.5 Mc/s is extremely small, the absorption wavemeter is of little use. An alternative method is to tune the grid circuit of the appropriate mixer stage to 145 Mc/s with the aid of a grid-dip oscillator, then adjust the anode circuit to 10 Mc/s by tuning for maximum noise in the loudspeaker of the BC342, which is set to that frequency. Next, the multiplier tuning is adjusted to produce maximum mixer injection noise in the speaker, with the absorption wavemeter coupled to the multiplier tuned circuit to check whether the correct harmonic has been chosen for injection. As the wavemeter passes through resonance, a reduction in the amount of noise occurs.

During this adjustment, no h.t. is applied to the r.f. stage. Once the mixer is correctly tuned, the r.f. stage can be resonated at 145 Mc/s with the aid of the grid-dip oscillator, and the h.t. re-connected.

The neutralising condensers are set to maximum capacity, and gradually reduced by equal steps until the r.f. stage becomes "docile" as the grid tuning is swung through resonance at 145 Mc/s. During this operation a meter may be used to measure the 6J6 anode current, as it will prove a

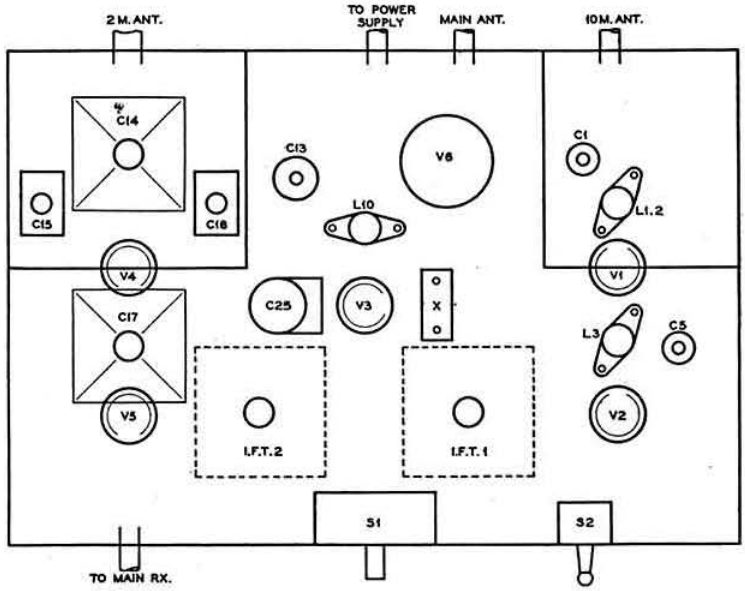


Fig. 2.—Under-chassis layout showing position of main components.

† *Although the stabilising circuit is not necessary with a crystal oscillator, it was included to ensure that the h.t. voltage supply to the 6J6s would not exceed the maximum rated value.*

Component List

R1, 140 ohms
R2, 47,000 ohms
R3, 12, 4,700 ohms
R4, 5, 1 megohm
R6, 15,000 ohms
R7, 8, 11, 15, 2,200 ohms
R9, 100 ohms
R10, 150 ohms
R13, 220,000 ohms
R14, 3,500 ohms

All resistances are half-watt types, except R14 which is rated at 10 W.

C1, 5, 3–30 $\mu\mu$F Philips concentric trimmer
C2, 4, 8, 10, 18, 20, 29, 0.1 μF tubular paper, 350 V wkg.
C3, 6, 9, 12, 19, 21, 22, 26, 27, 28, 500 $\mu\mu$F mica, 350 V wkg.
C7, 30 $\mu\mu$F silver mica, 350 V wkg.
C11, 2 $\mu\mu$F ceramic, 350 V wkg.
C13, 4 μF electrolytic, 350 V wkg.
C14, 17, 8+8 $\mu\mu$F butterfly tuning condenser
C15, 16, 1–3 $\mu\mu$F trimmer
C23, 25 $\mu\mu$F ceramic
C24, 10 $\mu\mu$F ceramic
C25, 1–8 $\mu\mu$F Philips trimmer
C30, 10 $\mu\mu$F ceramic
L1, 2 turns p.v.c. flex close-wound at earth end of L2
L2, 3, 13 turns 26 s.w.g. d.c.c. close-wound on Aladdin $\frac{3}{8}$in former
L4, 28 turns 26 s.w.g. d.c.c. close-wound on Aladdin $\frac{3}{8}$in former, slug tuned
L5, 5 turns 26 s.w.g. d.c.c. close-wound over earth end of L4
L6, 2 turns p.v.c. flex close-wound over centre of L7
L7, 6 turns 16 s.w.g. enamel $\frac{1}{4}$in i.d. $\frac{3}{4}$in long centre-tapped
L8, 2 sections each 3 turns, $\frac{1}{4}$in i.d. $\frac{1}{4}$in long, spaced $\frac{1}{4}$in at centre, with centre tap.
L9, 6 turns 16 s.w.g. enam. $\frac{1}{4}$in. i.d. close-wound between sections of L8
L10 17 turns 26 s.w.g. d.c.c., tapped at 4 turns from grid end on $\frac{1}{4}$in. Aladdin former, slug tuned.
L11 3 turns 16 s.w.g. enamel, $\frac{1}{4}$in. o.d., $\frac{1}{4}$in. long.
L12 20 turns 18 s.w.g. enamel close wound on Aladdin $\frac{3}{8}$in. former, slug tuned.
L13 5 turns 26 s.w.g. d.c.c. close wound on earth end of L12.
Link from L9 to L11 is one turn p.v.c flex round each coil.
S1A, S1B 4-pole 3-way.
S1C, S1D Yaxley type
S2A, S2B D.P.D.T. toggle.
V1, 2, 6AK5
V3, 4, 5, 6J6
VR, Cossor S130
X, 7,500 kc/s crystal.

useful indicator of neutralisation, registering a high current of about 20 mA when the stage is in oscillation, falling to a minimum of about 12 mA at the point of correct neutralisation. [*The simplest way to neutralise an r.f. stage is to remove the h.t., apply a signal, and adjust the neutralising condensers carefully for minimum signal output—a procedure similar to the neutralisation of a transmitter.*—ED.]

Alignment of the 28 Mc/s section of the converter is similar to that described above, and final trimming may be carried out on signals heard on both bands

Results

No break-through occurred from i.f. signals around 10 Mc/s when the converter was in use on 145 Mc/s, but i.f. break-through was experienced from powerful broadcasting stations around 7 Mc/s when the converter was operating on 28 Mc/s. This effect was minimised, however, by earthing the "normal" BC342 aerial to the chassis *via* one wafer of the Yaxley switch when using either 28 or 145 Mc/s. Although the i.f. break-through was not completely eliminated, the spurious signals were reduced to a tolerable level, and since the remainder fell between 7.2 and 7.5 Mc/s (29.7 and 30 Mc/s on the converter), it was decided to ignore them, as under the Atlantic City plan this portion of the band is to be withdrawn from amateur use.

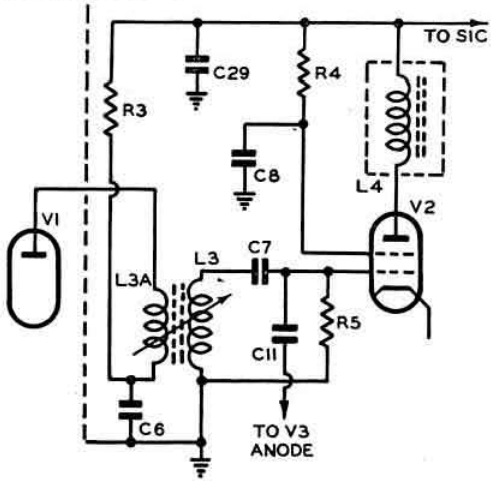


Fig. 3.—Modified circuit of the ten-metre section.

The results obtained compared favourably with those of other converters used previously, there being no detectable difference in sensitivity or selectivity on either band. Greater stability and freedom from drift was achieved, as compared with the Type 26 unit, with an improvement in the rendering of T9 notes. The outstanding advantage of the converter is that band-changing is effected by the turn of a switch.

Experimental work is in progress to enable the unit to cater for the 21 Mc/s band. Using a crystal frequency of about 7660 kc/s, it should be possible to beat the third harmonic (about 23 Mc/s) with the 21 Mc/s signals to produce an i.f. of 1.5 to 2 Mc/s, covering the 450 kc/s allocation. Signals in the 28 Mc/s band should similarly beat with the 23 Mc/s harmonic to produce an i.f. of 5 to 7 Mc/s covering 28 to 30 Mc/s on the converter. It is intended to use a 2-gang condenser to peak the r.f. and mixer stages of the 21/28 Mc/s section in either of these bands. For 145 Mc/s operation, a multiplied oscillator harmonic frequency of 138 Mc/s would produce an i.f. of 6 to 8 Mc/s for full band coverage.

Such a converter would give the BC342 (or similar receiver with limited frequency range) complete coverage of all amateur bands between 1.8 Mc/s and 146 Mc/s.

Appendix.

When the r.f. amplifier valve in the ten-metre section was replaced, it was found that some valves tended to be unstable.

The coupling circuit between the r.f. amplifier and the mixer was, therefore, modified, as shown in Fig. 3. The only additional components are the coupling coil L3A and an iron dust core in the L3 former. C5 was removed.

L3 was re-wound with 14 turns of 28 s.w.g. d.c.c. wire close-wound at the top of the former; L3A was wound with 5 turns of the same wire, spaced $\frac{1}{16}$in. from the "earthy" end of L3.

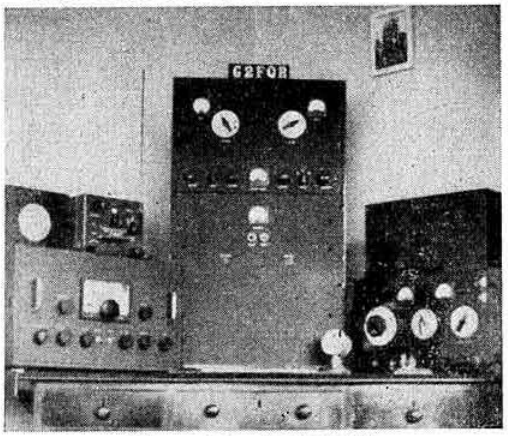
The iron dust core was peaked at the centre of the band.

The Station Behind the Call—G2FQR

PICTURED this month is the operating position at G2FQR (first licensed as 2FQR in 1938) owned and operated by N. W. Austin, 99 Bescot Road, Walsall, Staffordshire. Until 1949 the station was located at Stafford, but since moving to the present site it has undergone a complete re-build, one object being the reduction in size of the equipment to conform to modern table-top style.

Shown on the left, surmounted by the loudspeaker and Class "D" wavemeter, is a home-built receiver covering 150 kc/s to 30 Mc/s in six switched bands. This receiver, based on the CR100, incorporates two r.f. stages using EF54 and EF50 valves, three i.f. stages, switched crystal filter, electrical bandspread, tuning indicator, b.f.o., noise limiter and 6V6 output.

In the centre can be seen the main transmitter,



The neat layout at G2FQR.

operating at 120-150 watts input, and contained in four sections of standard rack and panel construction. The lower deck houses the power supplies for p.a. and modulator, and all heater supplies. On the chassis above is the modulator, using push-pull 807s in zero-bias Class B, together with the power packs for the sub-modulator and exciter. Mounted on the 3½in. panel above the modulator is the band-switched exciter giving output in the 7, 14, 21 and 28 Mc/s band. This exciter, crystal controlled, with

(Continued on page 67)

Extending the Range of the All-Band G.D.O.

By C. H. L. Edwards, A.M.I.E.E. (G8TL)

THE versatility of the grid-dip oscillator described by the author in the November, 1950, issue of the R.S.G.B. BULLETIN may be considerably augmented by arranging for it to cover frequencies down to 85 kc/s.

The original oscillator covered 1.5 to 220 Mc/s using a 100+100 $\mu\mu$F twin gang tuning condenser,

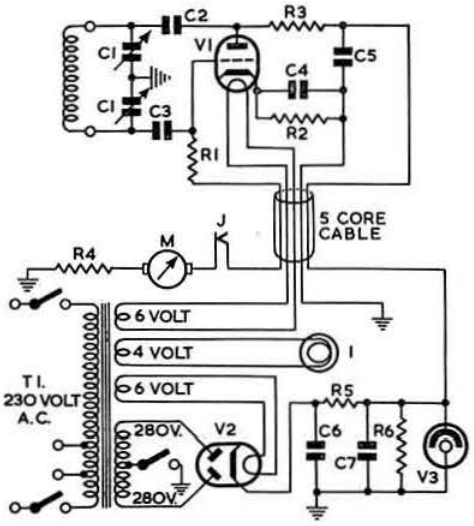


Fig. 1.—Circuit of the l.f. grid-dip oscillator unit and the associated power supply and indicating meter. Connection between the units is by 5-core cable.

C1, 500 $\mu\mu$F twin-gang variable; C2, 0.001 $\mu\mu$F; C3, 0.01 μF; C4, 5, 300 $\mu\mu$F; C6, 7, 16, 16 μF; R1, 20,000 ohms, ½ W; R2, 200 ohms, ½ W; R3, 10,000 ohms, ½ W; R4, 30,000 ohms, ½ W; R5, 10,000 ohms, 10 W; R6, 47,000 ohms, ½ W; M, 0–500 microammeter; I, indicator lamp; V1, 955; V2, 6X5; V3, Neon stabiliser; J, Headphone jack.

the limited capacity range of which would require a large number of coils to cover the lower frequencies. For this reason, it was decided to build a new oscillator unit (Fig. 1), similar in design and construction to the earlier one, which would use the same power supply and indicating meter. A 500 $\mu\mu$F twin gang condenser is employed for tuning and the other values of capacity and resistance are arranged to give sufficient feedback to produce almost full-scale readings on the microammeter.

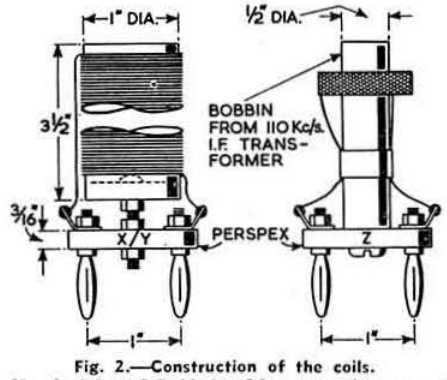


Fig. 2.—Construction of the coils.

X, 600 kc/s to 2.5 Mc/s; 36 s.w.g., d.s.c., on 1in. former, 1⅝in. close wound.

Y 250 kc/s to 1.3 Mc/s; 38 s.w.g., enam., on 1in. former, 3⅛in. close wound, or pile-wound coil from 465 kc/s i.f. transformer.

Z 85 to 300 kc/s; pile-wound coil from 110 kc/s i.f. transformer.

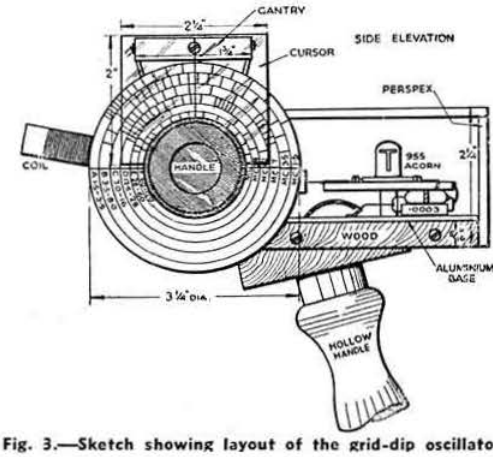


Fig. 3.—Sketch showing layout of the grid-dip oscillator.

The original coil "A" (1.5 to 3.5 Mc/s) is used too for the range from 600 kc/s to 2.5 Mc/s; details of the other coils required are given in Fig. 2. Calibration of the new ranges was carried out with the aid of a 100 kc/s oscillator and a receiver.

The complete equipment now covers 85 kc/s to 220 Mc/s and is most useful.

THE STATION BEHIND THE CALL—**(Contd. from page 66)**

provision for v.f.o. input, is fully screened against TVI. The p.a., using push-pull 807s occupies the top chassis and is fully screened and TVI-proofed. By thorough screening and anti-parasitic measures, harmonic traps and filters in the co-axial link to the aerial tuning unit have been dispensed with, as the station is in an area of high field strength from Sutton Coldfield.

So far, it has been found possible to operate on any amateur band at full power without causing TVI.

To the lower right is a completely self-contained "Top Band" transmitter, v.f.o. controlled with an input of 8 watts. The valve line-up is 6C5, 6V6 b.a. 807 p.a. screen modulated with a 6J5 and 6V6.

Above this transmitter is a pre-amplifier for the crystal microphone using 6J7, 6SL7 and 6L6 to drive the modulator in the main transmitter.

As aerial space is severely restricted it has only been possible to date to instal a dipole for 14 Mc/s and a 132 ft. long wire. Unfortunately the long wire seems to dissipate most of its energy into the eaves of the roof being only 30 ft. "in the clear" at a height of 20 ft. It has, however, proved quite effective for local work on "Top Band."

Achievements in the way of DX are by no means startling, as operating time is limited, and the main emphasis is on construction. Long-term plans, however, include the construction of equipment for the 144 Mc/s band.

LAUSANNE CONFERENCE

Report of Technical Committee

RSM Code Proposed — Transmission Systems Reviewed — TVI Problems Discussed
VHF Officers to be Appointed — Licence Conditions Examined.

THE agenda for the Technical Committee of the I.A.R.U. (Region I) Conference held in Lausanne from May 14 to 16 was framed to permit detailed discussion on all amateur techniques which might benefit from standardisation or more international collaboration. The Committee had not been in session for very long before it became clear that in the technical, as well as in the administrative, field the Region I Bureau could play an important part by correlating new developments, encouraging improved technical operation, and exchanging information.

Technical Operating Practice

As was to be expected, a lively discussion quickly developed over the misuse of the overcrowded amateur bands. As primary causes it was agreed that local contacts on DX bands, and badly adjusted telephony transmissions were high on the list. To minimise the former it was agreed to:

Recommend to the Plenary Assembly that to avoid unnecessary local contacts on the 14 and 21 Mc/s bands, the use of such bands in National and/or International Contests shall be subject to I.A.R.U. Region I Bureau approval.

To facilitate the accurate reporting of telephony quality, and thereby to encourage frank criticism of selfish operation, it was proposed that an addition should be made to the existing "RS Code" so as to include a third index related to "quality." Thus an "RSM Code" would be introduced which would be analogous to the "RST Code" for telegraphy.

Suggested methods of diagnosis of the numerous defects in amateur telephony were examined; these included the use of receiver b.f.o. to show up unintentional frequency modulation and parasitic sidebands, and the attachment of a neon tube indicator to one terminal of modulation transformers to betray high frequency oscillation in audio frequency modulators.

It was recognised that selfish operation could be due to deliberate "high-fidelity" transmissions as well as to ignorance and mal-adjustment, and it was thought desirable to draw attention once more to the recommendations of the Paris I.A.R.U. Conference of 1950. These were designed to restrict the bandwidth of telephony transmissions to the minimum necessary for good speech intelligibility.

Many of the delegates were at first inclined to invoke the licensing authorities to enforce such restrictions, but after discussion it was decided to try a policy of example and leadership, leaving any form of compulsion to be discussed at the next Conference in three years' time.

The Committee therefore agreed to

Recommend to the Plenary Assembly that A3 transmissions shall be given quality ratings in terms of the RSM Code;

R standing for Readability
S „ „ Signal Strength
M „ „ Modulation Quality

The M rating shall comprise the following five steps:

M1—unintelligible modulation.
M2—defective modulation due to spurious or parasitic oscillations or to causes unknown.
M3—defective modulation due to frequency modulation of the carrier.
M4—defective modulation due to over modulation.
M5—good modulation, not exceeding 100%.

A further suggestion was offered, namely to encourage the formation of a telephony equivalent of the existing "A1 Operators' Club" for telegraphy.

Systems of Transmission

Various systems of transmission were examined with a view to establishing standardisation, and standards of good practice.

(a) Frequency shift keying (F.S.K.)

On account of the enlarged bandwidth demands of this system of telegraphy it was thought to be unwise to encourage its use.

(b) Frequency Modulation (F.M.) and Narrow-Band Frequency Modulation (N.B.F.M.)

A distinction between F M. and N.B.F.M. was drawn; N.B.F.M. being restricted in accordance with the Paris (1950) recommendations, and used on all bands below 30 Mc/s. The standards for N.B.F.M. now agreed are precisely as set out in the G.P.O. licence for U.K. amateurs.

F.M. (i.e. wider deviation and/or higher fidelity modulation than N.B.F.M.) is to be discouraged on bands below 30 Mc/s in countries where licensing conditions now permit its use.

(c) Single-Sideband Suppressed Carrier (S.S.S.C.)

Internationally observed standards for this system of transmission are particularly necessary to ensure that on a given band all stations radiate the same sideband. Certain methods of sideband generation, particularly those using crystal filters and frequency changing by the heterodyne process,

Lausanne Conference

The General Secretary of the R.S.G.B. speaking at a meeting of the Administrative Committee. The Chairman of the Committee (W. J. L. Dalmijn, PA0DD), is on the left and Dr. Arthur Gee, G2UK (Editor, "The Radio Amateur") on the right. Dr. Gee was an observer at the Conference.

bring about more convenient upper sideband generation on one band and lower sideband on another. Furthermore on 3.5 Mc/s, where the great majority of S.S.S.C. stations start their activity, it has already become established that the lower sideband is radiated. Frequency conversion by heterodyning to a higher frequency band, *e.g.* 14 Mc/s, has similarly resulted in a convention to transmit the upper sideband.

The transmission characteristics for the width of the sideband should be, it was decided, similarly specified as for N.B.F.M., so that the bandwidth would be effectively restricted to 4 kc/s.

(d) Radio Control of Models

The Committee discussed the subject from the frequency allocation viewpoint and agreed that as this form of transmission was not essentially amateur activity special frequencies should be assigned outside amateur bands.

(e) Amateur Television Transmissions

Although at present very little activity in this field is occurring in Region I, at any rate outside the U.K., it was recognised that interest would grow with the development of television broadcasting in the various countries, and with the availability of reasonably priced special components, such as camera tubes.

Further discussion made it clear that no transmission standards could be formulated for amateur practice since these would inevitably follow the broadcasting systems on account of television receiver design. Nevertheless Region I Bureau could serve amateurs most effectively by circulating information from time to time so as to reveal problems at the earliest possible moment.

The Committee accordingly agreed to

Recommend the Plenary Assembly to adopt the following resolutions:

F.S.K.: Its use on any band shall be discouraged.

F.M.: Above 30 Mc/s only, using Paris (1950) standards.

N.B.F.M.: Below 30 Mc/s, using Paris (1950) standards, *viz:* max. modulating frequency 4,000 c/s; max. frequency deviation 2,500 c/s; 26 db attenuation for modulation frequencies above 4 kc/s; median frequency to be within 10 kc/s of band edge.

Radio Control of Models

The Committee was pleased to note that in many countries special non-amateur band frequencies have already been set aside for the radio control of models. The following frequencies should be assigned:

13.56 Mc/s, 27.12 Mc/s, 72 Mc/s, 465 Mc/s.

Single Sideband

In view of the heterodyne method of obtaining the S.S.B. characteristics it was resolved to recommend the adoption of the following specifications:

L.F. sideband for frequencies below 4 Mc/s
H.F. sideband for frequencies above 14 Mc/s

It was further resolved to recommend that a sub-carrier frequency around 5.2 Mc/s be used, thus making it possible to use one fundamental oscillator only to generate by its harmonics, both frequencies falling into the amateur bands in the sub-carrier region. This then would result in h.f. sideband operation on the 7 Mc/s band. The suppression ratio for the unwanted sideband and the carrier should not be lower than 40 db. The A.M. specification shall be the same as for N.B.F.M.

Amateur Television

It was generally felt that Amateur Television will be severely handicapped in regard to the setting-up of standards by the multitude of television systems in operation in Europe. Notwithstanding, the Committee recommended that Region I Bureau should be kept fully informed on the activity and licensing conditions for amateur television in the various countries, as well as to the availability of specialised television components at reasonable prices.

Television Interference

Three different kinds of interference to television reception were recognised:

(a) Interference due to radiation of energy by amateur transmitters within the television channel.
(b) Interference due to faulty receiver design.
(c) Non-linear effects beyond the control of either amateur or receiver manufacturer (*e.g.*, contact rectification).

Again in view of the many systems in operation in Europe it was felt that it would constitute too formidable a task to set out detailed interference-elimination rules for TVI.

The Committee agreed to

Recommend to the Plenary Assembly to accept the following resolutions:

That National Societies be recommended:

(a) to induce their appropriate governmental bodies to elaborate a legislation dealing, qualitatively as well as quantitatively, with the elimination of TVI and BCI generally (e.g. protected field strength limits, discrete frequencies to be protected, protection ratios, etc.),
(b) to promote to the fullest possible extent the exchange of information regarding TVI elimination between the various countries, particularly those using the same standards of television broadcasting and channelling.
(c) to agree that all articles dealing with TVI published in National Society journals may be copied and/or translated, either in part or in full, subject to full acknowledgement being given to both author and source. Printer's blocks to be made available to Societies asking for their loan.

V.H.F. Propagation

The Committee decided, after a lengthy discussion, that a "V.H.F. Officer" should be appointed in each country to co-ordinate V.H.F. work. The Committee also decided that a regular schedule should be observed to facilitate the study of long distance communication.

To avoid independent action in the matter of helical aerials, the Committee decided that a standard "right-handed thread" should be adopted.

The Committee agreed to

Recommend to the Plenary Assembly that

(a) All V.H.F. Officers should receive, regularly, complimentary copies of all National Society journals, and should be in possession of a constantly revised list of addresses of other V.H.F. Officers. The use of the broadcasting facilities of the Societies (if licensed) is encouraged.
(b) Region I Bureau should be kept fully informed of V.H.F. developments.

The Committee was of the opinion that all I.A.R.U. Societies should exchange at least two complimentary copies of their respective journals

with all other National Societies, and that one copy should be addressed to the Secretary and the other to the V.H.F. Officer.

To increase the probability of V.H.F. long-distance communication in Europe the Committee elaborated a V.H.F. time/transmission schedule, details of which will be published separately.

(c) Helical beam aerials should have a right-handed thread.

Microwave Development

The Committee felt that owing to the highly specialised nature of the components and valves required for microwave work it would be advisable for National Societies in Region I to

(a) exchange information on that subject *via* Region I Bureau.

(b) study closely the component market situation in their respective countries.

Licence Conditions

The Committee compiled a statistical table of the present licensing conditions, relating to technical matters, as applied to the various countries represented at the Lausanne Conference.

As a result of an analysis of these statistics it has been possible to derive a set of "Standard Licensing Conditions" which combine the average conditions existing in Region I with certain clarifications and improvements to which all representatives agreed. It was not the intention to seek a universal application of these conditions, but it was thought that nearly all Societies might be able to strengthen their negotiations with licensing authorities if a widespread agreement had been reached throughout the Region.

The main clause of immediate interest in these standard conditions concerns the power rating of amateur transmitters. The Committee devoted much time and thought to this problem and reached the conclusion that the time honoured "power input" measurement could not adequately cover modern conditions. The recommended clause was therefore phrased so as to cater for modern systems without any irresponsible attempt to secure a general increase of the radiated power.

The aim in formulating the clause was to achieve equality of peak power output from the transmitter, irrespective of the system employed. To this end a transmitter employing a class C anode-modulated output stage was taken as the criterion, being the type of transmitter where the anode current remains substantially constant. It was considered that high efficiency telephony systems should not be penalised by any stipulated method of measurement which restricts the power output to a lesser value than that obtainable from an anode-modulated class C amplifier.

It was therefore agreed that a suitable and equitable way of rating the power of transmitter is as follows:

(a) for transmission systems where the anode current of the final amplifier remains substantially stationary (including c.w. key-down conditions) either by the product of anode voltage and anode current (d.c.) or by the final valve(s) anode dissipation figure, the ratio of the two values being 3:1 (assumed efficiency of 66⅔%), and

(b) for high-efficiency telephony systems (*e.g.* super-modulation, s.s.s.c.) by the instantaneous radio-frequency peak power, averaged over one radio-frequency cycle. It is the task of the applicant to demonstrate, by means of suitable measuring instruments, that this power does not exceed a value three times the anode d.c. input or nine times the anode dissipation figure as under (a) above.

Conclusion of Committee's Work

At the close of the Conference the Chairman of the Technical Committee (Mr. H. Latt, HB9GA), expressed his appreciation of the fine spirit of co-operation and devotion to the common ideal of the members of the Committee.

Members of Technical Committee

The following delegates served on the Technical Committee.

Chairman: Harry A. Latt, HB9GA

Austria:	*Italy:*
E. Heitler, OE1—o1o	P. Cannito, I1AIV
W. Blaschek, OE3—oo4	G. Sommer, I1WMS
Belgium:	*United Kingdom:*
J. Mussche, ON4BK	R. H. Hammans, G2IG
Denmark:	*Switzerland:*
H B. Hansen, OZ7DR	H. Besson, HB9FF
Germany:	*Yugoslavia:*
H. Bauer, DL1DX	J. Znidarsic, YU1AA
G. Merz, DL1BB	

PULSE MODULATED TRANSMISSIONS.—(Continued from page 63).

way, reasonable amounts of noise could be eliminated, since the demodulator (being a discriminator of pulse widths) would be relatively inefficient as a discriminator of the irregular pulse widths of noise voltages. The system might lead to considerable improvement when the signal-to-noise ratio is above a certain level; but when this falls to near unity, the receiver gain must be correspondingly increased, and the noise peaks would inevitably paralyse the whole system.

This, unfortunately, means that, while amateurs may hope for good readability at medium ranges, under record-breaking DX conditions pulse transmission can hold out little hope of sensational increases in distance worked for a given transmitted continuous power—unless a completely revolutionary system of reception, which eliminates inherent receiver noise, can be evolved.

Where Pulse Modulation Will Score

Pulse modulation does, however, promise many advantages in ultra-high frequency working. It is, in practice, a more business-like method of modulation with magnetrons and other very high frequency valves. Moreover, the bandwidth of conventional s.h.f. receivers is so large that the noise level is inevitably higher than it need be. This is the strongest case for pulse modulation: not that pulse modulation receivers are, in themselves, more efficient, but rather that the ordinary receiver is—thanks to its high pass-band compared with the bandwidth of continuous transmissions—relatively inefficient. Any successful attempt at pre-amplification at s.h.f. will widen the gap in receiver efficiency between the two systems. Once pulse modulation becomes established, first efforts should be directed towards the design of suitable pre-amplifiers for receivers.

Choice of Pulse-Repetition Rates

The final important consideration is choice of pulse repetition rates; 33,000 per second seems eminently suitable for high quality transmission—and the quality available with pulse modulation is one of its chief attractions. A pulse repetition rate of 8 kc/s would be suitable for experimental transmissions of a fundamental nature. A good compromise figure for general purposes would, therefore, seem to be 15 kc/s.

References

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An Early Experience in Northern Ireland

An Account of Wireless Equipment in Use Fifty Years Ago

BY MAURICE CHILD, F.R.S.A. (ex-NWX and 2DC)

As we commemorate the 40th Anniversary of the foundation of the Society, it seems appropriate to look back to the early days of wireless. In this account Mr. Child—a Vice-President of the Society and one of its earliest members—describes the equipment in use at a coastal station soon after the turn of the century when wireless was hesitantly replacing the semaphore flag. How vast have been the strides made in radio communication since the events recalled here.

THE interesting article, based on entries in the diary of the late G. S. Kemp, on experimental communication between Ballycastle and Rathlin Island, in the February, 1953, issue of the R.S.G.B. BULLETIN recalls personal memories of the summer of 1903.

After initial experiments to which the earlier article refers, the apparatus at both stations was transferred to Malin Head and Inishtrahull, the latter being an island about nine miles north of the former.

The Stations

Malin Head is the most northerly point on the Irish mainland, the headland itself rising about 200 ft. above sea level. At the time there was an old look-out tower used by Lloyds as a Signal Station and it was there that the wireless apparatus was installed. Adjoining was a coastguard look-out hut with a semaphore post used for visual communication both to naval vessels and to the staff living quarters about 1¼ miles east of Malin Quay.

Access to the W/T Station had, normally, to be made along the beach on foot—very rough going—but there was also a rough track to Malin Town near the south end of Lough Swilly along which very meagre stores occasionally arrived by horse and cart.

A telegraph line, operated by Lloyds, was connected by day to the nearest Post Office at Ballygorman five miles away, and was switched through direct to Londonderry when the former was closed. A single needle telegraph instrument was worked by a few Leclanché cells. This circuit by "earth return" was—apart from the wireless—the sole means of outside communication. The station had also some meterological apparatus and twice a day sent reports to "Weather, London," comprising Wind Direction and Force, Barometer, Thermometer and Rainfall, etc.

Inishtrahull is a rock about ½ mile long and ¼ mile wide, its greatest length lying approximately east and west. At its eastern end there was a lighthouse and at the western end Lloyds' Signal Station. The island was Lloyds' property in 1903.

Prior to the installation of a *Marconi* set, communication between the island and Malin Head could only be carried out on clear days with the use of the International Flag Code and a telescope.

The island was a great danger to shipping on the North Atlantic route and only in clear weather would vessels attempt to pass between it and the mainland.

The Transmitter

At both stations the equipment was simplicity itself. The "power plant" consisted primarily of a huge battery of 98 *Siemens* M-type dry cells arranged in series-parallel, i.e., 7 parallel rows of 14 cells each in series giving from 14 to 16 volts when charging a 12-volt accumulator battery. As there were no voltmeters or ammeters one had to rely on listening to the accumulator "gassing" to know if it was fully charged. For "topping up" there was no dearth of rainwater on which the staff depended for "refreshment" purposes.

The accumulator battery supplied a current of 6 to 8 amperes r.m.s. to a 10 in. induction coil, the secondary winding of which was connected direct to a small spark discharger mounted on the coil base itself. One knob of the discharger was permanently earthed and the other—as modified by the author—was connected to the aerial for transmitting. No h.t. capacitor was used, the aerial-earth capacity itself being sufficient.

Fig. 1 shows the original arrangement before modification and has been purposely drawn to indicate the general layout. In circuit with the primary winding of the coil was the "pump-handle key," a massive brass affair with a pair of ¼ in. diameter platinum contacts, worth in those days 30s. each.

As will be seen from the diagram, a long arm of ebonite was attached to the back of the lever at the end of which was a terminal joined to the aerial through a piece of loose flex. There was no back stop to limit the movement of the key lever and the sending of dots and dashes had to be done standing up and grasping the handle firmly at the top and limiting the amount of play as best one could. Upon being released, the ebonite arm fell back on to the contact connected to the receiver through a length of lead-covered cable, the lead itself being "earthed" on to the iron box containing the receiver.

The spark length was adjustable and varied from 2 mm. to 1.2 cm. according to the distance of the ship or fixed station away, the longer gap being used for the greater distance. Nothing was gained by using a longer spark than about 1.2 cm. since the damping of the wave train, due to the extra spark resistance, reduced the oscillation efficiency. Dots of the Morse Code consisted of one or perhaps two sparks and dashes—six to twelve according to the speed of sending which by virtue of the nature of the receiver rarely exceeded eight words per minute and usually averaged about five. The system for the generation of waves was known as "plain aerial."

The Receiver

Compared with modern circuitry the receiver was delightfully simple, but nevertheless required most careful attention and a good deal of skill and above all patience to get it to function. It is interesting to note that signals could be read in three ways:

(1) From the sound of the decoherer D vibrating against the coherer CH;
(2) From the call bell itself; and
(3) From ink marks of dots and dashes made by the Morse printer (P).

The weight of the long ebonite arm of the key kept the aerial normally connected through to the receiver, reliance being on the choke effect of the secondary winding of the induction coil from shunting the h.f. signals to earth. It is highly probable that the self capacity of the secondary winding was more than sufficient to act as a capacitive shunt when one considers the frequency of the aerial system—some 8-10 Mc/s.

coils were wound to have a resistance of 10,000 ohms so that the operating current was of the order of 0.2mA. These relays were in airtight cases, the adjusting screw working through a stuffing gland; dry Fuller's Earth was placed in a porous tray to absorb any moisture due to condensation.

The armature was balanced accurately so as to be unaffected by the rolling of a ship. Provided the coherer resistance fell to a value below

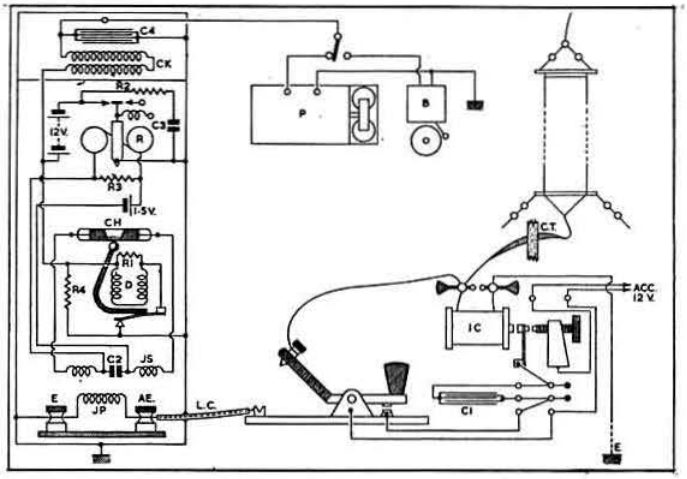


Fig. 1.—Circuit diagram of the Marconi installations at Malin Head and Inishtrahull.

B Call bell, 500 ohms
C1, C3, C4 2 μF
C2 0.01 μF approximately
CH Coherer (Marconi type)
CT Cowtail insulator (lead-in)
D Decoherer
IC 10in. Apps induction coil
JP Receiver jigger primary
JS Receiver jigger secondary
LC Lead covered cable
P Morse printer, 500 ohms
R Polarised relay (Siemens), 10,000 ohms
R1, R2 1,000 ohms, wire-wound, non-inductive
R3 10,000 ohms, wire-wound, non-inductive

Coherers

For the sake of those who have never heard of coherers or how they worked I would explain that there were several varieties but for reliability the steel wheel sharpened to a razor edge, revolving on the surface of a globule of mercury on which a minute film of thin oil was present and designed by Sir Oliver Lodge, was the best. Compared with the *Marconi* variety it was less sensitive, but more reliable.

The *Marconi* type consisted of two silver plugs in a small glass tube and attached to platinum wires sealed in the ends of the tube. The plugs were separated at the centre of the tube by a space of about 1 mm. but were shaped to form a V gap. In the gap but only partially occupying the space was a fine metallic dust of pure nickel to which about 4% of silver was said to be added. With a voltage of 1.4 from a single dry cell the dust was practically non-conductive, but if a momentary extra peak voltage of 1 or 2 V. was superimposed on the steady 1.4 then the dust suddenly became conductive and a few milliamperes might pass through the tube. The powder or dust remained conductive once it had been stimulated unless it was mechanically shaken or jarred. In the *Marconi* receiver at Malin Head this shaking was accomplished by arranging for the knob of an ordinary trembler bell mechanism to strike the tube at a point just under the gap or powder.

Apart from the coherer itself, for which Marconi deserves the highest credit for his painstaking work and patient experimentation in improving the relatively crude forms previously used for laboratory experiments, the sensitivity of the apparatus was also largely due to Siemens Brothers & Company, Ltd., of Woolwich, who designed and manufactured a beautiful polarised relay. Its sensitivity could be adjusted with a micrometer screw and was such that with a single dry cell it would close the "marking" contacts through an external resistance of from 60,000-80,000 ohms with the voltage of 1.4. The magnet

60,000 ohms signals were recorded.

All sparking due to self-induction of the decoherer and Morse printer coils had to be entirely eliminated and this was done successfuily by using methods similar to those adopted by the Post Office with their telegraphic apparatus, by providing non-inductive shunts across the coils and shunts in series with 2μF capacitors as shown in Fig. 1. No tuning of the receiver was attempted but a form of h.f. transformer was used as had been suggested by Sir Oliver Lodge. The receiver had to be entirely enclosed in a metal box when transmitting, and to avoid h.f. currents getting into it from the Morse printer connection, h.f. chokes were used in this lead.

The Aerial

This was of the parallel twin vertical type, the wires being spaced by two bamboo "spreaders" 6 ft. long, top and bottom. The "spreader" at the top of the 120 ft. mast was supported by two pairs of ebonite rod insulators 1 in. diameter with brass screw eyes firmly fixed in the ends and forming a triangular arrangement with the "spreader" as the base and mast halyard as the apex. The wires were always joined together at the top and bottom, the lower ends being soldered on the "cow-tail" leading-in insulator. The natural period of the aerial was about 8-10 Mc/s but there was no method of measuring this and it could only be estimated.

Adjustments

The reader will appreciate the simplicity of the installation but its successful operation was not easy. During communication with a mobile station, periodic variations of adjustment to both the transmitter and receiver were necessary to maintain readable signals.

There was no means of adjustment of wavelength which it was entirely dependent on the constants of the aerial-earth circuit itself; variations of the power radiated had to be made as the distance to be signalled changed. This was effected by increasing or lessening the spark length

and at the same time tightening or slacking off the tension of the contact breaker spring of the induction coil so as to maintain a blue crackling spark free from arcing, the latter condition causing weak and unreliable oscillations with consequent failing of signals at the receiving end.

For maximum distance (60-80 miles) a spark length of 10-12 mm. was about right; it was reduced to 2-3 mm. for distances of 10 miles or less.

Signals which were too strong were just as unreadable as those which were too weak. In the former case dots and dashes merged into one almost uninterrupted line on the Morse printer owing to the decoherer failing to give the coherer a sufficiently strong mechanical blow to restore it to its non-conductive condition between the successive signals.

The adjustment of the receiver was the most difficult operation and required constant variation according to signal strength and the sensitivity of the coherer. The more the coherer was worked the more sensitive it became. On the other hand, if it was decohered too violently it would become insensitive, hence a very nice balance had to be maintained. The margin of tolerance between the two alternatives was very narrow and only practical experience, together with a certain amount of acquired instinct, enabled one to keep up reasonably good communication.

The merging of dots and dashes could be also caused by the relay contacts sticking and periodical checking and adjustment was necessary. Adjustment was done by disconnecting the coherer and gripping the terminals off and on with moistened thumb and forefinger of each hand, the body conducting just about the right amount of current from the 1.4 volt cell to work the relay satisfactorily.

The receiving aerial which depended entirely on "shock excitation" from the distant transmitter was completely untuned and responded well to atmospherics!

A local testing buzzer on the bench worked from a single large dry cell with a foot or two of "aerial" attached to the "hot end" of the magnet coil was essential to work-up the coherer to a sensitive condition for picking-up a station at extreme range. The buzzer had of course to be of the sparking type.

Thunderstorms

My mission to Malin Head was primarily brought about following damage occasioned by a local thunderstorm. It might be thought that an aerial 120 ft. high on top of a 200 ft. headland in an area where there were no trees within a radius of 10 miles presented a good "jumping off" ground for electrons wishing to make a journey to an overhead cloud and the reader would be right in his deduction. In fact, the aerial was struck twice that summer, the second time whilst I was sitting by the receiver which, as a precaution, was completely enclosed in its iron "coffin," the aerial being directly "earthed" to the box itself. The only damage sustained in this instance was to one of the pairs of 15 in. ebonite rod insulators at the masthead which were completely fused through in several places. Incidentally, the remaining pair were unaffected and continued to support the aerial although lopsidedly. Owing to the inductance of the rather long earth lead some of the discharge sparked into me by way of a hand which was rather too close to the "coffin." The coastguards who had seen the aerial in its convulsions and whose curiosity was thereby awakened were good enough to apply a little restoration aided with a measure of Admiralty rum and my recovery was soon complete.

During a previous storm a lightning discharge had been conducted through the lead-sheathed cable to the receiver and had flashed to earth through the insulation to the lead screening; in doing so the copper connection to the key socket had been fused.

As no similar cable was available the signalman had substituted a length of cotton-covered bell wire, not of course appreciating the consequences when the transmitter was used. He reasoned that one piece of wire was as good as another but in this case it did not work out as he had hoped. As a result all his spare coherers were immediately destroyed when connected up and the transmitter "sparked." Details of the trouble were not known when I left London.

Communication Restored

As a potential radio amateur I had constructed a coherer receiver out of various bits and pieces and also my own coherers for experimenting, little thinking they might one day work commercially.

In my coherers I used hard brass filings between two plugs of soft solder $\frac{1}{8}$ in. diameter cast when molten into the short glass tube (previously heated) to be used. The plugs on cooling were pushed out of the tube, the inside adjacent surfaces filed up and then refitted with the filings between them in a gap of about 1/16 in. This construction enabled filings replacement to be easily made by extracting one of the plugs which were long enough to project outside the glass tube and to which flexible wires were securely bound.

I took two or three of these coherers with me to Malin Head, and after altering the arrangement of the aerial so that it could be plugged either to the transmitter or the receiver, eliminating the necessity for both the key aerial connections, communication was re-established with Inishtrahull within an hour or two.

I found my coherers were quite effective at the normal range of the station (60 miles) with ships fitted with a *Marconi* installation. Only three such vessels at that time (1903) passed on the Northerly track to Montreal, viz. the Allan liners—*Tunisian, Sardinian* and *Parisian,* code calls TN, SN and PN respectively.

Inishtrahull

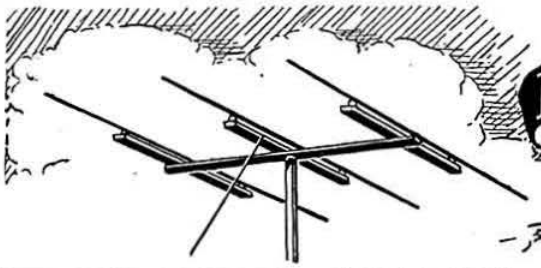
The crossing of this part of the Atlantic from Malin Head had to be effected in a small open boat fitted with one sail and three bags of beach cobbles of considerable size as ballast.

The only more or less regular service was once a week when a small bag of mail was carried together with some very slender food supplies for three island families who for some reason unknown to me preferred to live on the island.

Only once a month did a small steamer arrive there from Glasgow with stores for the lighthouse and Lloyds' station and this service was frequently interrupted by weather conditions.

I had to transfer the wireless installation to a new hut which had just been built but this did not present any difficulty and communication with Malin Head was maintained daily without trouble, atmospherics excepted.

I left this wild but healthy spot after a sojourn of about two months' duration, most of which was spent in initiating the signalmen into the theory and practice of radio communication as it was known at that time and in turn obtaining an insight into the fun of signalling to ships by the International Flag Code by day and coloured flares at night.



AROUND THE V.H.F.s

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

NEW 24 cm RECORD

THE holders of the 24 cm world record, C. H. Edlin (G3QC) and Robert Tunney (G8DD), with a 75-mile two-way contact in October, 1950, improved on their previous performance when they worked one another over a distance of 100 miles at 1225 B.S.T. on July 26, 1953. On this occasion the stations were established on Clee Hill, near Ludlow, Worcestershire, and on a site south of Lancaster. Contact was made without difficulty over a non-optical path, which augurs well for further work on this band in the future.

The transmitters were cavity oscillators employing CV90s. Super-regenerative receivers were used in order to cut down both weight and bulk.

The operators wish to acknowledge the assistance of Dr. Montgomery, Mr. M. W. Sudbury and G3FZU at Lancaster, and G3BPF, 3CZV and 8QZ at Clee Hill, without whose help the attempt could not have been made.

Highlights of the Month.

CONDITIONS on both 2 m and on 70 cm have been anything but consistent during the past month. There were, however, sufficient spells of exceptional propagation to keep all concerned on their toes. One new country was worked from England on 2 m, namely Norway, whilst Austria, represented by OE5EB, was heard by G5YV. At the time of writing no two way OE/G contact has been reported, but it is likely that this will be an accomplished fact before many weeks are past.

LA8RB at Sandefjord, south of Oslo, was heard by **G6LI** (Ludborough, Lincs.) soon after midnight on June 29, but unfortunately the contact was not completed due to fading, and the first two-way was made by **G6NB** (Brill, Bucks.), about 30 minutes later. Just previously a Swedish station was heard and some idea of the area of good conditions existing at the time may be gained from the fact that, in Lincolnshire, both EI2W and the Danish stations were heard simultaneously earlier in the evening.

G3CFK (Gt. Yarmouth, Norfolk), gave LA8RB his second English contact at 2028 B.S.T. on June 30, the Norwegian station being RST 579 and reporting 3CFK's 'phone RS57. A little earlier G3CFK had worked OZ2FR and OZ2IZ.

GW2ADZ and **G3IOO** (Oswestry) had QSOs with OZ2FR, IZ, 3WK, 5AA and SM6QP. All except SM6QP were worked on 'phone and signal strengths were S7/9 although the SM was subject to fading. On the following evening GW2ADZ and PA0NL (Amsterdam) made the first 70 cm contact between their respective countries. G2WJ, 3BKQ and 4RO were also excellent signals with 2ADZ.

During a contact with G8AO/MM around 2000 B.S.T. on July 1, **G2UJ** was informed that, according to the radar on board the *Mitcham*, conditions should be really good that evening. It appears that, with experience, quite an accurate estimation of two metre conditions may be made by the appearance of the coast line on the radar screen. This prediction was almost immediately fulfilled, for within a minute or two of signing with G2UJ G8AO was in contact with DL1LB. The *Mitcham* was then in the Thames Estuary off Southend.

Late in the evening of July 20, two metre signals from the west of England were received at tremendous strength by G2UJ. G2BMZ (Torquay), working G2WJ (Dunmow, Essex), was like a local and 2WJ was able to read his 70 cm signals. C.W. transmissions from G3AUS, also in Torquay, were nearly as strong; likewise G3FIH (Radstock, Som.), 5YK (nr. Stow-on-the-Wold, Glos.), and GW8UH (Cardiff).

Station Reports—Two Metres

G6MN (Nottingham) logged 51 stations during the recent R.S.G.B. 2 m Field Day from a site 4½ miles from Leek, Staffs., at a height of 1,605 ft. a.s.l.

G6XX (Goole, Yorks.), now uses an input of 70 watts to an 829B which gives him an increase of one or two S points over his previous 15 watts input. Although he did not work Norway during the northern opening, '6XX remarks that G6NB was "working one LA after another." As we have knowledge of only two—LA8RB and LA8RM—we should like to know how many have been heard over here so far. Bigger and better stacks should enable **G5YV** (Leeds) to hear and work even more than he has done up to now. A 16-element model, shortly to be increased to 24 elements, has been erected and on both transmission and reception signals are up by 12 db as compared with the 4-over-4 Yagi array previously in use.

G2AHP (Perivale, Middx.), with a new transmitter running 35 watts to an 832, has pushed up his total of stations worked to 380: new contacts include G2BMZ (Torquay), 3GVC (Portsmouth), 5YK (Stow-on-the-Wold, Glos.), 3IOO and 5YV G2AHP/A will shortly be on the air between 1300 and 1400 B.S.T. daily and skeds. would be appreciated.

B.R.S.19283 (Worthing, Sx.), found conditions fair during the past month with July 1 to 5 as the best period. His extensive log includes:—G3BKQ(RS58), 3DLU (559), 5YK (57), 5YV (56), 8AO/MM (579) when 15m east of Harwich, GC3EBK (599) and F3JN, F8GH and F9DI all at S9. G2BMZ is the most reliable G-DX station, being always fully readable during his nightly sked. with G8OU at 2300 B.S.T. Among the portable 2 m stations heard during the month were G2DSP/P (nr. Petworth, Sx.), 2HCG/P (I.O.W.), 3GOP/P (nr. Southampton), 3IAI/P (Lulworth, Dorset) and 5MA/P (Walbury Hill, Berks.) **B.R.S. 18989** (Shirley, Birmingham), who was 2AKN pre-war, has had some 20 years experience of

* 32 Earls Road, Tunbridge Wells, Kent.

Amateur Radio. Forsaking the h.f. bands where, since 1950, he has heard more than 100 countries all on 'phone, he commenced listening on the 2 m band on June 21. A 3-element indoor beam is in use, the receiver being a modified RF26 unit feeding an *Eddystone* S640. So far 35 stations have been heard, G3BKQ (Blaby, Leics.) being the most consistent. He suggests that more frequent mention of the frequency of operation by stations on the band would be of considerable assistance to newcomers and those wishing to calibrate receivers.

G3AGS, assisted by G2ALN and 3RP, operated portable, 4m n.w. of Rochdale, Lancs., during the R.S.G.B. Field Day, but there was almost continuous rain and conditions were very poor. It is intended to return to this site for Field Day No. 2 on August 30.

G5MR (Hythe, Kent), made a very nice start on the 1953/4 "Ladder" by contacting G5YV, 6CW and GC3EBK. The installation of a resonant line matching section at the receiver end of the feeder has resulted in a considerable increase in signal strength, the continuous carrier of one of the Police link stations on 146.2 Mc/s having proved an invaluable test signal for the tuning adjustments. Since **G5BD** (Mablethorpe, Lincs.), raised his 16-element stack to 48 ft. three months ago, the increased height has produced a great improvement in results. GM3EGW at 241 miles was worked 26 times in 33 days and up to June 30, stations in 11 countries had been heard or contacted including DJ1DC, DL3QA, DL3VJ, EI2W, OZ2FR, IZ, 3WK, 5AA and SM6QP.

G8VN (Rugby), using an indoor Yagi, heard or worked G2FO, 2PU, 3BKQ, 3FMI, 4KD, 6RH, 8DV/A, 8OU, GW2ADZ and ON4HC, all between 2350 B.S.T. on June 28, and 0030 B.S.T. on the following day. He often calls G6PG, 6XX and 8OU, but has not raised them so far. **G8AO/MM,** in search of an omni-directional array with as much gain as possible, has fitted four double slots 20 in. in front of the mast on the *Mitcham*. The slots are all connected in parallel and fed at the centre with 300 ohm cable. On June 25, while travelling north up the east coast he worked a German, five Dutch, four Belgian, and two French stations on 2 m. His present receiver employs two *Mullard* EC91 e.g.t.s to the design given in the April, 1951, BULLETIN followed by a cascode. The latter (6AK5/6J4) will shortly be replaced by a 6BQ7.

70 cm. News.

G8PX (Oxford) is building a transmitter with a *Mullard* QQVO6-40 in the p.a., designed for an input of 25 watts. The tank circuits consist of ½ in. wide silver plated copper strip tuned by small disc variable capacitors at the "cold" end. It is hoped to have this rig on the air in time for the R.S.G.B. 70 cm Tests on September 13.

G2DDD (Littlehampton, Sx.), should be on the band by the time these notes appear.

G2FKZ (Dulwich, S.E.22), is experiencing considerable interference from self-excited stations in East London, who spread into the c.c. portion of the band at least as high as 434 Mc/s.

Owing to holidays G2RD has not been in a position to supply his usual activity list this month. **G3ECA** (Ilford) however, reports that the following stations have been heard or worked on 70 cm during the six weeks ending June 28:—G2BRH, FKZ, MV, RD, ECA, EOH, DNL, FP, HWG, IRR, JCF, 5DT, 6AH, HU, NF, YP, 8SK, TL, VR. G2WJ is just audible to G3ECA on a modified ASB8 receiver and beam, but G3JCF, only two miles away, can read him with a superregen. receiver and omni-directional aerial.

Space Communication.

With reference to the recent interest—at present somewhat misplaced—in extra-terrestrial radio operation, **B.R.S.19383** draws attention to a lecture by G. O. Smith given last year at the Second Symposium on Space Travel in New York dealing with the problem of communicating with a space-ship on a journey to the Moon. Assuming a frequency of 10,000 Mc/s, parabolic mirrors six feet in diameter and a signal-to-noise ratio of 20 db and allowing a generous margin for fading, etc., Mr. Smith arrived at the conclusion that a power of only 300 *milliwatts* would be sufficient for reliable two-way communication all the way to the Moon. The lecture was published in the *Journal of the British Interplanetary Society* for January, 1953.

The Irish 2 m Transatlantic Tests.

These tests, sponsored by the International V.H.F. Society, duly took place from Kilkee, Co. Clare, between July 4 and 12, when signals were radiated from two transmitters respectively on 'phone and c.w. on frequencies of 144.18 and 144.196 Mc/s. One phone and two c.w. transmissions were made each hour, interspersed with listening periods. The operators, EI2G, 2W, 3B, 3W, 4R, 5C, 5J, 6G, 6X and 9U were assisted by GI5HV as log keeper. The tests were run in conjunction with the A.R.R.L., Ed. Tilton, (W1HDQ) V.H.F. Editor of *QST*, having done much to organise 2 m effort on his side of the Atlantic.

On July 7, at 0014 G.M.T. and again on July 8, at 1433 G.M.T. weak and unidentified c.w. signals were received, but the real thrill came at 0118 G.M.T. on July 11, when GI5HV read a c.w. signal signing "de W4" on 145.3 Mc/s. This signal had been heard earlier by both EI2W and 3W, was on the correct bearing for the district indicated and moreover broke and resumed transmission at the times prescribed in the U.S.A. test schedule. A.R.R.L. were informed by cable and asked to investigate. Unfortunately, certain of the Irish newspapers who had reporters on the spot decided that this was "it" and some pretty optimistic reports subsequently appeared in the press.

The Regional V.H.F. Ladders.

Only one member was successful in working all R.S.G.B. Regions on 2 metres between July 1, 1952 and June 30, this year and we offer our hearty congratulations to Bill Hodgson (G3BW), of Whitehaven, Cumberland, who accomplished this feat as early as September last year. A description of his station appears elsewhere in this issue.

Harold Beaumont (G5YV), who rolled-up the enormous total of 401 stations worked in 14 Regions for second place, also worked the greatest number of countries—13. A "dark horse" in the person of John Stace (G3CCH) of Scunthorpe, Lincs., appeared for the first time right on the post and came into third place one Region ahead of Richard Thurlow (G3WW) who, incidently, worked 12 countries among his score of 290 stations.

Casting an eye down the list reveals the high proportion of entrants who worked stations in ten or more Regions and also those with scores of more than 200 different stations during the year—hardly a case of lack of activity on 2 m !

Special mention should be made of G8VN who, although only just on the Ladder did not commence 2 m operation until April 28.

Surely one of the most consistently active stations in the country must be G2YB who was on the air on 330 days during the year making 962 contacts in 38 counties.

Only two entries were received for the 70 cm

Regional V.H.F. Ladder

TWO METRE BAND
FINAL PLACINGS

Psn.	Call & Location	Worked: Regions	Stations	Countries
1.	G3BW *Whitehaven, Cumbs.*	15	83	5
2.	G5YV *Leeds, Yorks.*	14	401	13
3.	G3CCH *Scunthorpe, Lincs.*	14	121	11
4.	G3WW *Wimblington, Cambs.*	13	290	12
5.	G6XX *Goole, Yorks.*	13	133	10
6.	G2HIF *Wantage, Berks.*	13	115	9
7.	G6RH *Bexley, Kent.*	12	253	10
8.	G3GHO *Roade, Northants.*	12	194	8
9.	G6LI *Ludborough, Lincs.*	12	96	9
10.	G2YB *Caversham, Berks.*	11	253	7
11.	G5DS *Surbiton, Sy.*	11	248	7
12.	G3GBO *Denham, Bucks.*	11	243	7
13.	G3FAN *Ryde, I.O.W.*	11	222	8
14.	G6TA *London, S.W.12.*	11	179	4
15.	G3FD *London, N.14.*	11	164	7
16.	G4RO *St. Albans, Herts.*	11	136	4
17.	G6CI *Kenilworth, Warks.*	11	93	6
18.	G6YU *Coventry, Warks.*	11	81	7
19.	G2DKH/P *Stanley, Co. Durham.*	11	81	6
20.	G2FNW *Melton Mowbray, Leics.*	11	78	3
21.	G2FJR *Sutton Bridge, Lincs.*	10	141	6
22.	G3HBW *Wembley, Middx.*	10	113	4
23.	G2DDD *Littlehampton, Sx.*	10	112	5
24.	G3BHS *Eastleigh, Hants.*	10	103	4
25.	G5MR *Hythe, Kent.*	10	97	6
26.	G3DO *Sutton Coldfield, Warks.*	10	91	4
27.	G5BM *Cheltenham, Glos.*	10	86	4
28.	G3GOP *Southampton, Hants.*	10	81	2
29.	G3BNC *Southsea, Hants.*	10	75	8
30.	G3AGS *Manchester, 8.*	10	55	4
31.	G2AHP *Perivale, Middx.*	9	107	2
32.	G8PX *Oxford.*	9	100	4
33.	G3FIJ *Colchester, Essex.*	9	78	7
34.	G3BVU *Witney, Oxon.*	9	70	3
35.	GW8UH *Cardiff, Glam.*	9	65	3
36.	G3AEP *Whittlesey, Cambs.*	8	38	1
37.	G5UM *Bulls Green, Herts.*	7	122	4
38.	G8VN *Rugby, Warks.*	7	43	1

SEVENTY CENTIMETRE BAND
FINAL PLACINGS

Psn.	Call & Location	Worked: Regions	Stations	Countries
1.	G2FKZ *London, S.E.22.*	6	22	2
2.	GW2ADZ *Llanymynech, Mont.*	6	19	2

Ladder. Both entrants worked 6 Regions, but Charlie Newton (G2FKZ), managed to contact three more stations than Bill Parker (GW2ADZ) and therefore qualifies for the R.S.G.B. U.H.F. Proficiency Certificate. As G2FKZ was quick to point out, 2ADZ's performance was outstanding. There is virtually no local activity, with the exception of G3IOO four miles away, and due to heavy screening by mountains in nearly every direction it has proved impossible to work another GW station. Of the stations worked, 10 lie between 100 and 165 miles distant, 7 between 50 and 100 miles while ON4UV heads the list at 362 miles—a *world record for the 70 cm band.*

We now come to the question of whether the Ladder competition has been responsible for increased activity on the bands. **G2YB** says that it failed because the number of Regions worked was the determining factor. Thus a station luckily situated might work all Regions but comparatively few stations while another, although more active, never gets beyond, say, eleven Regions due to sheer physical impossibility. G2YB considers, therefore, that the number of stations worked should be the criterion and would like to see a scheme which, while not discouraging those stations in favourable locations with first class apparatus and in the best position to advance v.h.f. techniques, would encourage those less fortunately placed to spend more time on the band.

G5MR, in rather a poor location for inter-G working, suggests that the Ladder should take into account Countries, Regions and Stations in that order. He adds that he has had a lot of fun in the competition and hopes to see it continued in some form. **G6LI** considers that with the present system of scoring the best stations have reached the top. Although the number of stations worked is considered before countries, and therefore provides the incentive for local working, it is noteworthy that the top men on the Ladder are mainly those most successful with DX. Therefore "greatest distance achieved during the year" on the lines of the *QST* standings might be worthy of consideration. He continues "Otherwise no comment except that I like the Ladder, wish more people would bother to put in an entry for it, and hope that you will continue this feature through the next year."

In view of the foregoing and of other favourable comments, the 2 m Regional Ladder will continue for a further year starting from scratch on July 1, 1953, and ending on June 30, 1954, with the same rules as at present.

As for the 70 cm Ladder it is fairly obvious that it created little interest and the only comments so far received have been from GW2ADZ and G2FKZ, neither of whom think that a competition on these lines is of real benefit as the outlook of 70 cm operators is somewhat different from the majority of those on 2 m, being biassed more towards the experimental, rather than the purely operational side. We must say that we understand and agree with this view and in consequence have decided not to run a 70 cm Ladder for 1953/54. Another year, perhaps, things will be different.

* * *

Correspondents are thanked for the many letters received this month, and failure to quote from them more fully is entirely due to the necessary limitations on space and is no reflection on their interest value. Please continue the good work and remember the next two v.h.f. events—the second Two Metre Field Day on August 30, and the R.S.G.B. 70 cm Tests on September 13. Reports for the September issue, please, by August 21—and don't forget your 2 m Ladder entry.

V.H.F. Stalwarts

No. 2—Bill Hodgson G3BW

BILL HODGSON, the operator at G3BW, leading station in the 2 m Regional Ladder for 1952/3, has been interested in v.h.f. work for many years and migrated from 5 m when the 2 m band was allocated to U.K. amateurs in 1948.

In the early days, when equipment and aerial systems at most stations lacked much in efficiency and his nearest 2 m station was 100 miles away, contacts were few and far between. However, being remotely situated in Whitehaven, Cumberland, '3BW had the satisfaction of being a much sought-after station and many beams were turned in his direction. All contests were entered with enthusiasm, even if without much hope of success, and many Gs are indebted to Bill Hodgson for the thrill of an early DX contact on 2 m.

By dint of much patience and by using improved gear G3BW has contrived to get his signals into Scotland, Wales, Northern Ireland and Eire, as well as into every English county with the exception of Sussex and Cornwall. Although he has never heard a Continental on 2 m, signals from his station have often been received on the other side of the Channel.

"Just put the beam on the roof, old man."

Equipment

His present transmitter consists of an EL91 c.o./tripler, EL91 tripler, QVO4-7 doubler, 832 buffer and 829B p.a. running 60 watts input. All work is on the key, the reason for this is that he has heard so many unintelligible carriers which would have been workable c.w. signals that he has no desire to add to other people's disappointment. For reception, a G2IQ-type converter was used for a considerable time, but this has now been replaced by a c.c. cascode. A 16-element stack, is his favourite array, but unfortunately it has proved impossible to keep such a large structure in position because of the Atlantic gales. Most of the work has, therefore, been done with a much lighter and more compact 4-over-4 arrangement.

If G3BW cannot aspire to any spectacular long distance records he can lay claim to what is almost certainly the first *underground* QSO on 2 m. This occurred during experiments carried out to assist rescue operations in the coal mining industry, to which G3BW belongs. He is looking forward to a repetition of these tests on 70 cm as it will be easier to get the beams for that band through the narrow "roadways" than was the case with the 3 and 6-element Yagis employed in the initial tests.

"VHF QSY"

With the initiation of "The British Isles Two Metre Zone Plan" it is possible that some members will wish to secure crystals to allow them to move into their own zone, or to dispose of crystals for other zones.

To allow this reshuffling to take place an appropriate list of such crystals will be published here free of charge. It will relate only to crystals suitable for the 2 m band.

Address requests to "VHF QSY," R.S.G.B. BULLETIN.

Crystals Offered

By G5UM, Bulls Green, Knebworth, Herts. 6000, 6020, 6007.69 at ¾ inch spacing. 4800, 8062 at 1¾ inch spacing.

Crystals Wanted

By G5UM, as above, anything between 8036.1 and 8047.2 or between 6027 and 6035.

LONDON U.H.F. GROUP

will meet at the Bedford Corner Hotel, Bayley Street, Tottenham Court Road,
at 7.30 p.m., on September 3.
All u.h.f. enthusiasts welcome.

Affiliated Societies

THE following are additions to the list of Affiliated Societies published in the July, 1953, issue of the BULLETIN:—

AIRCRAFT APPRENTICES RADIO CLUB, c/o Officer in Charge, No. 1 Radio School, R.A.F. Locking, Weston-super-Mare, Somerset.
GREAT PORTLAND RADIO CLUB, c/o F. V. Turner, 18 Henley Road, Edmonton, London, N.9.
H.M.S. ARIEL AMATEUR RADIO SOCIETY, c/o The Training Commander, H.M.S. Ariel, Nr. Winchester, Hants.
MANSFIELD RADIO SOCIETY, c/o G. Aldridge, 13 Felley Avenue, East Kirkby, Notts.
WELLS AND DISTRICT RADIO AND TELEVISION SOCIETY, c/o G. Sotham, Milton Lane, Wells.
WORTHING & DISTRICT AMATEUR RADIO CLUB, c/o R. L. Chidzey, 33 Bruce Avenue, West Worthing, Sussex.

The following are amended particulars:—

MERSEYSIDE RADIO SOCIETY, c/o Hon. Secretary, J. B. Trueman, 141 Ince Avenue, Liverpool, 4.
WOOLWICH RADIO SOCIETY, c/o S. Hollinghurst, 30 Conway Road, London, S.E.18.

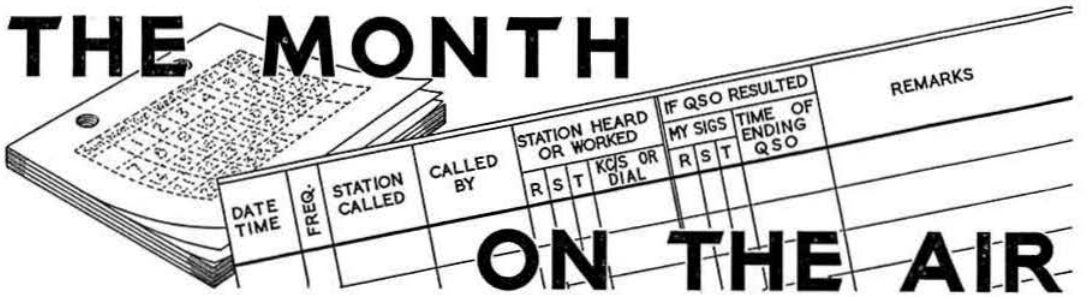
Contests Diary

1953

August 16	D.F. Qualifying (Rugby/Slade)*
August 30	144 Mc/s Field Day (No. 2)†
September 6	Low Power Field Day†
September 6	D.F. Qualifying (Romford/Southend)*
September 13	420 Mc/s Tests†
September 27	D.F. National Final*
October 3-4	Low Power
November 7-8	"Top Band" (No. 2)

* *For rules, see page 400, R.S.G.B. Bulletin, March, 1953.*
† *For rules, see pages 84 and 85 this issue.*

THE MONTH ON THE AIR



*BY ARTHUR O. MILNE, G2MI**

DX-pedition

RON GLAISHER (G6LX) and John Roscoe (G4QK) are back from their trip to Monaco (3A2) having worked 440 stations in 52 countries. QSL cards will be sent only on a card-for-card basis. A full story is promised for next month's issue.

Pot Pourri

Bob Pybus has heard CR6BH on 28 Mc/s at S4-7, but apart from a few I and DJ stations the band has been empty. W2QHH, the redoubtable low power DX-er, having increased his power from 35 to 70 watts, is anxious to contact YI2AM. 'QHH is surprised by the amount of DX worked on 21 Mc/s from Europe as the band has not been much good in the U.S.

The West Gulf DX Club (P.O. Box 81, Honey Grove, Texas) offers the W.G. DX certificate and a

R.S.G.B. QSL BUREAU: G2MI, BROMLEY, KENT

year's subscription to either *QST* or *CQ Magazine*. Only a list of stations worked need be sent. A full list of members may be had on application. From the Club's *DX Bulletin* we learn that TI2TG hopes soon to operate from Clipperton Island as FO8UXX and from Cocos Island as TI9UXX. KS4AU is active but has a poor receiver.

G2DPY, in a masterpiece of understatement, says 14 Mc/s has been patchy but opens around 0600 G.M.T. for W6 and W7 about two mornings out of three. At G2MI, it is about one in seven! Incidentally, 'DPY wonders if he will have to use 'phone to work Utah and Nevada. ZK1AB (14035) can always be heard when the W7s are coming in. VK1BJ was missed recently on about 14055 at 0720 B.S.T. VR1A has also been heard on the same frequency. 'DPY still awaits a card from ZS9I to complete his A.A.A. VQ2RCC was heard at 589 on July 12 with VQ2W (ex-G3EDW) operating. Although 21 Mc/s has been disappointing EA9AP is a new station heard by many. G3AAT/OX has a much improved signal now that a rhombic is in use at the site, which is 8,500 ft. a.s.l. The operator said they were having "Glorious weather, not at all cold—21° F!" W5NZE reports KS6AD (14290) active in the early morning. G3DXC reports working UB5KAB on 14070 kc/s. Russian *club* stations are evidently again permitted to work stations outside the U.S.S.R. On 14 Mc/s CE0AA (Easter Island) was active for a few days starting August 7, 1953.

CQ Contest

The first leg of this year's World Wide DX Contest (*CQ* Contest) will commence at 0200 G.M.T. on October 24 and end at 0200 G.M.T. on October 26. The second leg will run between the same times on October 31 and November 2. According to the "Zero Bias" column in *CQ*, the contest will not be sponsored by that magazine but by a separate organisation.

L.A.B.R.E. Contest

The c.w. section of the L.A.B.R.E. contest, organised by the Brazilian society, will be held between 0001 G.M.T. on September 5 and 2400 G.M.T. on September 6. The 'phone section will run over the same period on September 12 and 13. No cross-band or A1 to A3 contacts will be allowed to count for points. Contacts between

Many contacts were made by 5A2CA while in operation at the recent Benghazi Hobbies Exhibition. The station aroused much interest amongst members of the British community.

stations in the same country score no points but are allowed for the purpose of obtaining multipliers. Stations will exchange serial numbers consisting of the RST report and the number of the contact, starting with 001. Entries, which must be postmarked not later than November 30, should be addressed to the L.A.B.R.E. Contest Commission, Caixa Postal 2353, Rio de Janeiro, Brazil.

New Prefixes

The prefix for Ceylon is now 4S7. Stations in the Eastern Zone of Germany are using the prefix DM followed by the figure 2 and three letters. The last letter of the call-sign indicates the district in which the station is located. *viz.* A, Rostock; B, Schwerin; C, Neu-Brandenberg; D, Potsdam; E, Frankfurt/Oder; F, Cottbus; G, Magdeburg; H, Halle; I, Gera; K, Suhl; L, Dresden; M, Leipzig; N, Chemnitz, and O, Berlin. The technical conditions of the licence are substantially the same as in Western Germany but only "politically reliable" persons who are members of the "Society for Sport and Technical Education" are eligible!

* *29 Kechill Gardens, Hayes, Bromley, Kent.*

Who's Who

ZC4XP has returned to the U.K. The new QSL Manager for Cyprus is Mrs. G. Barrett (wife of ZC4IP), Box 219, Limassol, Cyprus. ST2UU may be visiting Afghanistan (YA) again soon. As there is also a possibility of some operation from Nepal, watch out for a 'UU call. His present address is Box 801, Khartoum.

The photograph reproduced on this page comes from G3HCJ (R.A.F. Station, Ballykelly, N.I.). It was taken at a hamfest held in honour of G3HCJ and G3IJU whilst on an "official" visit to Norway. LA5BA acted as host. 'HCJ has the highest praise for the wonderful Norwegian hospitality.

M. B. Skinner finished up as GW3DOF with 157 countries worked, 131 confirmed, and 44 States. He hopes to have a VE call soon. Good luck, O.M. G3AGF, now ZC4GF, says a 25-watt licence is quite easy to obtain in Cyprus but it costs £5. ZC4DW has returned to England. ZC4CA is ex-G3CAA. G3AHU requires the present address of the operator of the station who signed as AP2R in December, 1948.

* * *

Reports for this column should arrive not later than the 20th of the month preceding publication.

HAMFEST IN NORWAY

G2HCJ and G3IJU were warmly welcomed by local amateurs during a recent visit to Norway

Jim MacIntosh Bereaved

IT is with deep sorrow we record the death, after a long illness, of Maimee MacIntosh, wife of Jim MacIntosh, GM3IAA, ex-VS1AA.

During the war Mrs. MacIntosh, like her husband, was interned by the Japanese at whose hands she suffered great privations. Her death was undoubtedly hastened as the result of the treatment she received whilst held captive.

Jim MacIntosh was for very many years the Society's representative in Malaya, during which time he received the ardent support of his wife, who was greatly interested in Amateur Radio. Jim and Maimee returned to the United Kingdom about two years ago and settled at Cradlehall, Inverness.

To Mr. MacIntosh and his relatives we extend our heartfelt sympathies in their great loss.

G3JFP's Thanks

JOHN PROCTOR (G3JFP), the recently licenced sightless amateur, wishes to express his sincere thanks to the anonymous donor of a Top Band crystal controlled transmitter which was sent to him following the note in the June, 1953, issue of the BULLETIN. The only clue to the sender's identity was the signature "John, Middlesex."

Slow Morse Practice Transmissions

The following slow Morse transmissions, sponsored by the Society, are intended to assist those who aspire to obtain an amateur transmitting licence. More volunteers are still required for parts of the British Isles not already covered, particularly in the London Area. Stations listed who find themselves unable to continue transmissions should immediately notify the organiser, Mr. C. H. L. Edwards, A.M.I.E.E. (G8TL), 10 Chepstow Crescent, Newbury Park, Ilford, Essex.

** Each station will operate in turn.*

B.S.T.	Call	kc/s	Town
Sundays			
09.00	G3LP	1850	Cheltenham
09.30	G3BKE	1900	Newcastle-on-Tyne
10.00	G6MH	1990	Southend-on-Sea
10.30	G3GIO	1915	Guildford
10.30 *	G3CYS, G3ESP, G3HCX, G3HNC, G3IDT, G3US	1990	Pontefract
11.00	G2FXA	1900	Stockton-on-Tees
11.00	G3GZA	1837.5	Bristol
12.00	G15UR	1860	Belfast
14.00	G5AM	1900	Witnesham, Ipswich
21.00	G2FIX	1812	Nr. Salisbury
Mondays			
19.00	G3NC	1825	Swindon
20.30 *	G3BFP, G3BLP, G6LX	1875	Croydon
21.00	G3BLN	1900	Bournemouth
22.00	G3GIO	1915	Guildford
22.15	G2BRH	1900	Ilford
22.30	G8TL	1900	Ilford
Tuesdays			
18.30	G2FXA	1900	Stockton-on-Tees
19.00	G3IBL	1883	Derby
21.00	G3EFA	1855	Southport

B.S.T	Call	kc/s	Town
Tuesdays (cont.)			
22.00	G3GIO	1915	Guildford
Wednesdays			
19.00	G3GZA	1837.5	Bristol
22.00	G3DLC	1800	Grays, Essex
22.00	G3HXN	1850	Cambridge, Glos.
22.00	G3GIO	1915	Guildford
22.00	G2BND	1918	Dalston
22.45	GM3GUS	1800	Dunfermline
Thursdays			
19.00	G3NC	1825	Swindon
20.00	G3FVH	1920	Hull, Yorks
21.30	G3ICX	1915	Sutton Coldfield
22.00	G3GIO	1915	Guildford
22.00	G3IFX	1910	Derby
22.30	G3OB	1803	Manchester
22.30	G3ADZ	1940	Southsea
23.00 *	G3LA, G4AK	1915	Brentwood
Fridays			
19.00	G3BLN	1900	Bournemouth
20.00	G3CSG	1870	Wirral
22.00	G3GIO	1915	Guildford
Saturdays			
13.00	G2FXA	1900	Stockton-on-Tees
22.00	G3GIO	1915	Guildford

MEMBERS USING THIS SERVICE ARE REQUESTED TO SEND LISTENER REPORTS TO THE STATIONS CONCERNED

CQ Single Sideband

By H. F. Knott, (G3CU)*

Notes and News

THERE are now at least 46 British and 21 other European stations using single sideband regularly, which averages out to just over one new station a month since the system was first introduced to amateurs in this part of the world.

G2AW and G3ECH joined the ranks in June, both using W2UNJ-type phasing rigs and "S.S.B. Jr." audio phase-shift networks. G2AW has four 12A6 tetrodes in his balanced modulator circuit driving a CV57 (zero bias) power amplifier. HB9OJ, OZ3EA and DL4GR are now to be heard with filter type transmitters, the last mentioned confining his activities principally to 14 Mc/s. To SM7HZ who is again active belongs the honour of being the first European to operate s.s.b., his transmitter having been built, tested and put on the air as far back as January, 1948. SM7HZ's interests are mainly experimental, and have been responsible for many electronic gadgets such as the vectorscope or signal analyser. G3IMW, stationed at Honiton, is able to make occasional week-end contacts despite his Service call-up.

G3CWC has made various modifications to his TCS12 receiver with a view to improving s.s.b. reception. The latest of these is to modify the b.f.o. control so that it gives rapid change of frequency in the centre of the crystal filter pass-band and fine variation at the edges. This permits quick change of sideband, while only using a single bandpass filter, yet retaining the slow rate of tuning where it is most needed.

Single Sideband DX

Undoubtedly, s.s.b. is showing its paces when conditions permit distant stations to be worked. In fact, transatlantic contacts are a regular feature these days even on 3.5 Mc/s. During July, DL6WL and G2NH were about to finish a QSO at 01.20 B.S.T. when they were called by W4YCM/VO2 (St. Johns, Newfoundland), who had been following the contact for some time; he gave the former RS59 and the latter RS57. W4YCM was using A3, but although R5 when receiving him with exalted carrier, *i.e.* in the usual s.s.b. reception condition, he was unreadable without the b.f.o. Similar contacts were also made by G8OO, OZ7T and ON4CC.

G3BWH reports that W2JJC is now operating regularly on 7300 kc/s using the lower sideband. Europeans are urged to work on frequencies between those used by commercial stations operating in this band. It is there that the Americans are looking for contacts.

Single Sideband Conventionette

An S.S.B. Conventionette will be held during the afternoon of the last day of the R.S.G.B. Amateur Radio Exhibition in November. The function will be open to all those who are interested in the subject, and tickets and further information will be available shortly. It is hoped to provide tea for those attending.

Voice Controlled Break-in

The circuit shown in Fig. 1 was sent in by PA0KC who, until recently, was one of the few amateurs employing voice controlled break-in. Any break-in system has greater significance when used with single sideband than with any other form of modulation. In the absence of a carrier there is not the usual heterodyne as when two a.m. stations are "netted"; a third station may conveniently call in on the channel as a voice superimposed on the other signal, with little or no loss of intelligence to the listener. A contact, too, may be conducted similarly to duplex, but using a single channel.

With voice control, the time constant of the circuit may be adjusted to suit the individual operator. It should be such that the time taken to operate is short enough not to cut the first syllable, and hold on during a period of speech at conversational rate, returning to the receiving position should the operator hesitate. The time constants quoted for Fig. 1 are optimum values for

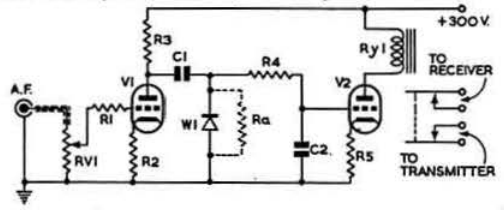


Fig. 1.—Voice controlled break-in system. The switching-on time is determined by the time constant of C2 and R4 (5 microseconds). The hold-on time (750 microseconds approximately) is controlled by C1, C2, R4 and Ra. R4 must be less than Ra. C1, 2, 0.02 μF; R1, 330 ohms; R2, 1000 ohms; R3, 100,000 ohms; R4, 250,000 ohms; R5, 500 ohms; RV1, 1 Megohm variable; Ry1, 10,000 ohms relay; V1, 2 12AT7; W1, Westector type WX1.

the conditions stated above. Only a few volts are required to operate the circuit, and may be conveniently taken from the audio amplifier of the s.s.b. driver unit. RV1 is a threshold sensitivity control which is advantageous where room noise is present; its purpose is to lower the sensitivity of the voice control to prevent false operation.

Two methods may be used for operating the control circuits: mechanical (which has the disadvantage of being noisy) or electronic. In the latter, a valve may be so adjusted that the voltage drop across its anode load resistor (when the valve is conducting) may be used as bias (d.c. coupling) to cut off various valves in the exciter, so disabling the transmitter. In either case some form of receiver protection is necessary and may be taken care of by an artificial quarter wave line, an aerial change-over relay, shorting diode or some similar device.

Circuit diagrams

Circuit diagrams of the G3CWC-type phasing transmitter, a crystal filter rig designed by G2NH and the "S.S.B. Jr." may now be obtained from G3FHL, G2NH or G3CU on receipt of a stamped addressed envelope.

* * *

Details of transmitters and circuit arrangements are required for this feature whilst news items should arrive by the 20th of the month preceding publication. Reports from newcomers to single sideband will be particularly welcome.

R.E.F. Council

FERNAND RAOULT, F9AA, has succeeded Marcel de Marcheville, F8NH, as President of R.E.F. Robert Brochut, F9VR, is Secretary to the Council, and Daniel Cools, F8KB, is the Treasurer. Lucien Aubry, F8TM, and the brothers, Gilbert and Jacques Montagne (F8MX and F9CQ), continue in office as Members of the Governing Body.

The address of R.E.F. is now P.O. Box 42-01, Paris RP, and that of the R.E.F. QSL Bureau, P.O. Box 26, Versailles (S. and O.).

* 5 Kevington Drive, St. Paul's Cray, Orpington, Kent.

It's Topical

A NEW **Receiving and Measuring Station** operated by the European Broadcasting Union at Jurbise, near Mons, Belgium, was opened on July 22, 1953. The station will contribute to the technical research work undertaken by the Union with the object of improving general reception conditions.

New TV stations are to be constructed by the B.B.C. at Divis, Northern Ireland (Channel 1), Plymouth (Channel 2), Rowridge, I.o.W. (Channel 3), Aberdeen (Channel 4) and Pontop Pike (Channel 5). All will be medium power stations, using 5 kW for vision transmission and 2 kW for sound. Manufacture of the equipment has already begun. Stations are also to be built in the Channel Islands and in the Isle of Man and will share channels with existing high power stations. The new London television station, to be built at the Crystal Palace, will replace the present Alexandra Palace installation.

A comprehensive system of radio control employing v.h.f. equipment developed by the General Electric Co. Ltd., was used in a **remarkable pilotless jet aircraft** launched for the first time at the Woomera Rocket Range on May 2, 1953. The equipment is hermetically sealed and will operate continuously at temperatures up to 130°F or down to −70°F, in a vacuum or in water.

His Royal Highness the Duke of Edinburgh, K.G., has graciously consented to be Patron of the International Scientific Film Association (I.S.F.A.) Conference to be held in the National Film Theatre and the Royal Festival Hall from September 18 to 27. Scientific films from all over the world will be displayed.

The **"Wireless and Electrical Trader"** is to resume weekly publication on September 19, 1953. It was founded in March, 1923, as a monthly and was a weekly from 1925 until 1941 when the paper position forced it to become a fortnightly.

Two organisations concerned with sponsored television have recently been formed. The **National Television Council** seeks to prevent any form of commercial TV being introduced in the U.K. while the **Popular Television Association** has been established to present the case *for* sponsored programmes, by awakening the "national conscience to the dangers, social, political and artistic, of monopoly, in the rapidly expanding field of television, and to provide the public at the earliest possible moment with alternative programmes which are in keeping with the best standards of British taste." Among the Vice-Presidents of the Association is a Past-President of the R.S.G.B., Lt.-Col. Sir Ian Fraser, C.H., C.B.E., M.P.

N.F.D. Dangers No. 2.—COO-RM.
One of the Glasgow N.F.D. stations received a visitor during the night. Miss Freda Wickham, who was at the station, put forward the idea for this cartoon. "G. Toose Eedy" did the rest.

Television will again be to the forefront at the **National Radio Show** which opens at Earls Court, London, on September 2, and closes on September 12. A specially built TV studio capable of holding nearly 1,000 persons will be used for demonstrations, dress rehearsals and actual TV broadcast performances. The audience will be able to view the pictures on a screen measuring 21ft. by 16ft. The programmes will be controlled from the R.I.C. Control Room, which will itself be an exhibit of considerable technical interest visible to the public through glass walls. More than 200 TV receivers will be working continuously side by side in "Television Avenue."

Members of the Derby and District Amateur Radio Society engaged in producing the special Coronation Issue of the Club magazine. From left to right: G. Taylor, C Richardson, R. Cooke, B. Brown, N. Richins, F. C. Ward (G2CVV) and T. Darn (G3FGY), Editor.

Radio controlled models will again be a feature of the **"Model Engineer" Exhibition,** to be held at the New Horticultural Hall, Westminster, from August 19 to 29.

New methods of producing **special scenic effects** have been recently introduced by the B.B.C. The apparatus employed makes it possible to produce a composite picture from scenes viewed by two separate cameras. Two methods are now in use. In one, termed "inlay," the apparatus removes a chosen area from the first picture thus leaving a "hole" into which the second picture is inserted. In the "overlay" method, the actor moves in front of a white screen while another camera provides the background scenery from a photograph or film. The two pictures are then combined electronically so that the artist appears to be moving about freely in front of the scenery.

The **British Standards Institution** has now moved into new premises at 2 Park Street, London, W.1. (Telephone No. MAYfair 9000). The change of venue will contribute to more efficient working by concentrating the Institution's previously scattered departments under one roof. It will also provide increased and more convenient accommodation for the 13,000 specialists who attend the 3,500 B.S.I. Committee meetings held during the course of each year.

As a result of changes made in connection with the **Voice of America** broadcasting system the **Radio Amateur's Programme** on Sunday evenings has been discontinued.

The Elizabethan

IN response to a number of requests Mr. R. L. Varney, G5RV, designer of the *Elizabethan* transmitter described in the July issue of the BULLETIN, has prepared detailed sketches of the panel and chassis layouts.

The sketches, together with information to guide the intending constructor, will appear in the September issue.

Amateur Radio at Southampton Show

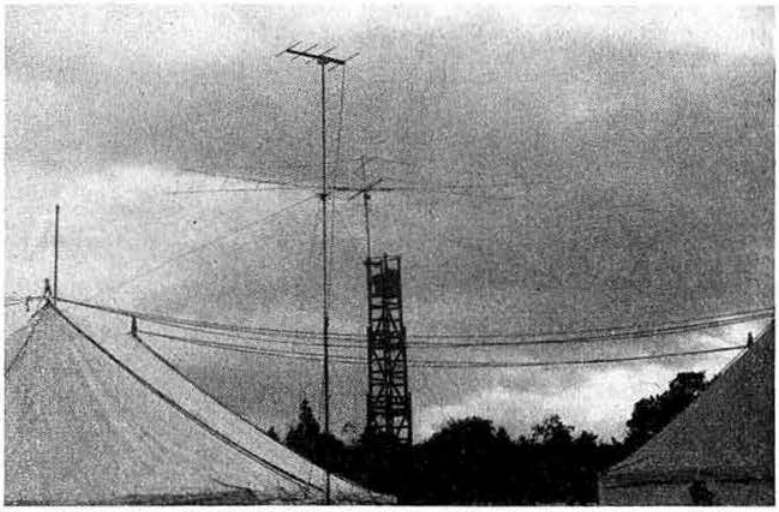
Local Group Make Outstanding Contribution

JULY 17 and 18, 1953, will be recalled by members of the Southampton R.S.G.B. Group for many years to come ; for those two days saw the highly successful culmination of almost twelve months of planning and preparation for the first Amateur Radio Exhibition ever held in the area. Moreover, not only was it the Group's first public enterprise but the occasion was made the more memorable by the presence of the President, Leslie Cooper, G5LC.

The Exhibition, staged in a spacious marquee at the Annual Show on Southampton Common, was opened to the public at 2 p.m. on Friday the 17th. One of the first visitors was the Worshipful the Mayor (Alderman Mrs. V. F. King, J.P.), who showed great interest in the displays, confiding that she often enjoyed listening on the amateur bands. Other visitors included Council Member Len Newnham, G6NZ, and Region 6 Representative Gordon Hunt, G3ECV. Amateurs also came from Portsmouth, Petersfield, Winchester, Romsey, Salisbury, Lymington and Poole.

The theme of the Exhibition was the growth and development of the amateur movement from the earliest days of wireless telegraphy as depicted by items of historic equipment including coherer, magnetic, crystal and early valve receivers, spark and single-valve transmitters. These contrasted sharply with a group of modern commercially-built receivers displayed on an adjoining stand. Sections followed devoted to home-constructed transmitting, measuring, model-control and v.h.f. equipment, all of which demonstrated outstanding ability and workmanship by members of the local Group.

At three strategic points around the Exhibition three complete, separately equipped, TVI-proofed transmitting stations were installed. The first of these, G3BHS/A, built by Alan Partner (G3HKT) embraced an imposing "console" lay-out arranged for operation on 1.7, 3.5 and 7 Mc/s. The second, constructed by John Graham (G3TR), presented the DX angle on 14 and 21 Mc/s, whilst the third, produced by Reg Gardner and operated as G3CGE/A, demonstrated the excellence of v.h.f. communication on 145 Mc/s. Aloft, outside the marquee, were the aerial systems associated with the three stations. These were a 200-ft. long wire, a rotary "ZL-Special" and a rotary 2-metre 4-element Yagi beam.



The outdoor scene. The ZL-Special and 2-Metre Yagi, with the long wire aerial in the background.

The President (Leslie Cooper, G5LC) presenting the Gardner Cup to Wilfred Lacey (G3CWK)

Amateur TV Demonstrated

As if all this were not sufficient attraction, closed-circuit television of still-pictures was demonstrated over a co-axial cable line from one end of the 42 ft. marquee to the other by means of equipment specially built for the occasion by the Hants County Representative, Ron Bassett (B.R.S. 16075). The intervening space between TV transmitter and receiver was occupied by a screen on one side of which was arranged a colourful display of 150 QSL cards from the five continents and on the other a selection of photographs of field-day and social events in the life of the Group. Near the exit, books and R.S.G.B.

publications were on show, together with selected articles from the BULLETIN telling of the history, the patronage and the aims of the Society. The whole presentation was supported by informative matter and descriptive details of the various items of equipment, expertly and tastefully executed and arranged by Norman Avery (G2KC).

Judging of the Exhibits

Judging of the exhibits was conducted on the Saturday morning by the President in company with John Martin (G3ESS). After a careful process of elimination, Wilfred Lacey (G3CWK) was declared winner of the Cup generously donated by Reg Gardner (G3CGE) for the most outstanding advancement of technique in Amateur Radio construction. The items entered by the winner were a v.f.o. exciter, a 75-watt p.a., a 150-watt p.a. and a speech amplifier, the construction of each being of a very high order of merit. John Graham (G3TR) and Jack Watts (G2DSW) were highly commended for their entries of a TVI-proofed transmitter and miniature v.h.f. receiver respectively.

At the end of the show Mr. Cooper paid public tribute to the exhibitors, to the Town Representative, Frank Russell (G3BHS) as organiser, to D. Blake (G3EUQ) for close liaison with the Show Committee, and to many others who had rendered invaluable assistance. He also congratulated the Group as a whole for the team-spirit which had enabled such a project to be successfully carried through.

Medway Coronation Hamfest

TWO hundred and seventy-seven persons attended the Annual Hamfest in Chatham organised by the Medway Amateur Receiving and Transmitting Society, on July 12th—a record attendance despite bad weather. W. E. Nutton, G6NU, presided. Numbered among the many

The fine selection of prizes at the Medway Hamfest.

visitors from other parts of the country were G2IG, 2MI, 2UJ, 3DJD, 4IB, 6CL and 8TL, the latter "walking off" with a brand-new Taylor Signal Generator as first prize in one of the many raffles! No less than thirty-six prizes, valued at more than £80, were offered and more than 3,000 raffle tickets sold. There were overseas visitors from DL, VQ4, VS9, W4 and ZL.

The organising committee thank all those who helped to make the function a success. Plans are already in hand for next year's function which will take place in a larger hall.

Letchworth Jubilee Fair

DURING the period of the Letchworth Jubilee Fair an Amateur Radio Station is to operate under the callsign G3LJF. The Fair will run from Tuesday, September 1, until Thursday, September 3, (2.30 p.m. to 9.30 p.m. daily, except on the first day when the opening time will be 3 p.m.)

Gordon Mather, G3GKA, of 62 Eastern Way, Letchworth, Herts, is organising the Amateur Radio exhibit.

A view of the Purley and District Radio Club's exhibit at the Coronation Fete held in the grounds of Reedham School on June 6. In the foreground (from left to right), R. L. Knight, G3DPW, Ken Parvin (Treasurer) and T. R. Young, G2AYM (Chairman). An Amateur Radio station, equipped with a Panda transmitter, Eddystone 640 receiver and a Radiocraft pre-selector, was in operation on 3.5 and 14 Mc/s.

Army Wireless Reserve Squadron

THE Army Wireless Reserve Squadron's first annual camp was held at Chester from June 14 to 28. An enjoyable feature was the series of official contacts with the American M.A.R.S. station WAR (K4USA). Mersey Port Radar Station was visited, generous hospitality being offered by members of the Chester and District Radio Society. G3ADZ/A and G3EJF/A were active on amateur frequencies.

Recent newcomers to the Squadron include G3AMO, 3DNQ, 3EJF, 3FDU (2 i/c) and 3ICR.

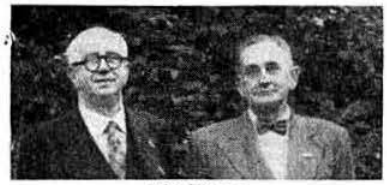
Training on Service frequencies continues and personal contact is maintained on 3565 kc/s on Sunday mornings. Further details of the Squadron may be obtained from Major D. W. J. Haylock (G3ADZ), 230 Devonshire Avenue, Southsea, Hants.

London Members' Luncheon Club

RONALD J. COAKLEY, ZL2RC, and Tom Cadell, ex-PA0TOM, etc., were welcome guests at the Club Luncheon held on Friday, July 17, 1953.

Other visitors included Freddy North, VP6CDI and Fred Olton, VP6FO. The Chairman of the Club—Stanley Vanstone, G2AYC—presided.

The Club is due to meet again on Friday, August 21, 1953, at the Bedford Corner Hotel, Tottenham Court Road, at 12.30 p.m. Provincial and overseas amateurs are assured of a very cordial welcome. Those who wish to attend the luncheon are asked to telephone May Gadsden on HOL 7373 well in advance.



Old Timers

J. E. Nickless (G2KT) and W. H. Evens (G6CH) at the Chatham Coronation Hamfest. "Nick" held a licence prior to the 1914-18 war; "Bill" was licensed in 1926.

Tests and Contests

Second Two-Metre Field Day,

FOR this event, which will be held on August 30, the only major change in the rules affects the scoring system. For a contact with a fixed station an entrant may claim one point per mile and for a contact with another portable station an entrant may claim two points per mile.

Rule 4—as previously—calls for the *full six figure* National Grid Map Reference but this requirement has often been overlooked by entrants in the past. With the change in the method of scoring, however, *all* entrants must now strictly observe this rule.

Rules

1. The event is open to fully paid-up members of the R.S.G.B. resident in the British Isles (G, GC, GD, GI, GM and GW).

2. Contacts may be made on telephony, c.w. or m.c.w.

3. Entrants must operate according to the terms of their licence; the input to any stage of the transmitter must not exceed 25 watts.

4. The station must be operated from the same site for the duration of the event. Except for N. Ireland and Channel Islands entries, the National Grid Full Six Figure Reference must be given.

5. Only one contact with a specific station will count for points.

6. Contacts with unlicensed stations will not be permitted to count for points. Proof of contact may be required.

7. Entries should be written on lined foolscap or quarto paper, or typed on plain paper, and must be set out in the form shown below :

Two-Metre Field Day
August 30, 1953

Name..... Call Sign.....

Home Address..... Claimed Score.....

Site of Station.....

National Grid Full Six Figure Reference.....

Transmitter..... Receiver.....

Aerial System(s).....

B.S.T.	Call sign of station worked	My report on his signals	His report on my signals	Location	Estimated distance	Points claimed
					TOTAL	

Declaration: I declare that my station was operated strictly in accordance with the rules and spirit of the contest, and I agree that the ruling of the Council of the R.S.G.B. will be final in all cases of dispute.

Signed.....

8. Multiple-operator entries will be accepted provided that :

(i) the call sign and signature of the operator concerned is recorded for each contact ;

(ii) the declaration is signed by only one operator, who will be regarded as the entrant.

9. The event will start at 11.00 B.S.T. and finish at 20.00 B.S.T. on Sunday, August 30, 1953.

10. Power supply must not be derived from public or private supply mains.

11. No part of the station may be situated in any building existent on the site prior to the date of the event.

12. No apparatus may be erected on the site prior to the day of the event.

13. An exchange of reports (RS or RST) as well as location will be required before points for contact may be claimed. The location given must consist of distance and direction from the nearest town or village, e.g. " RST 569 6SE Caterham " (i.e. 6 miles south-east of Caterham).

14. 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 portable stations.

15. Entries should be addressed to the Hon. Secretary, R.S.G.B. Contests Committee, New Ruskin House, Little Russell Street, London, W.C.1, and should bear a postmark not later than Monday, September 7, 1953.

16. A miniature cup will be awarded to the winning station, at the discretion of Council, and the runner-up will receive a Certificate of Merit.

Low Power Field Day, 1953

THE rules for the Low Power Field Day to be held on September 6 are the same as in previous years. Competitors are reminded that they must make their own arrangements with the Post Office for the necessary portable facilities.

Rules

1. The event will commence at 11.00 B.S.T. and finish at 18.00 B.S.T. on Sunday, September 6, 1953.

2. The event will be confined to fully paid up Corporate Members of the Society in the prefix zones G, GC, GD, GI, GM and GW. Such members may enter individually, or several may combine to enter a station.

3. Operation will be restricted to c.w. (A1) on the 3.5 and 7 Mc/s bands.

4. Only one contact with a specific station may be made on each band during the Contest.

5. Each contact shall include an exchange of RST and QTH.

6. Entrants receiving frequent tone reports lower than T8 may be disqualified.

7. Each transmission must include the letters LFD and the figure 3 or 7 according to the band in use, e.g. LFD 3 K.

8. Equipment shall be entirely independent of the electrical system of any vehicle, and of any supply mains.

9. The total weight of all equipment shall not exceed 20 lb. The following items, if provided, must be included in this weight : receiver, transmitter, power supply, batteries, headphones, key, frequency meter, aerial wire, insulators, earthing device, and spares—in fact, all radio and electrical apparatus and accessories taken to the site.

10. Subject to the weight limit, there are no restrictions on the number, type or height of aerials that may be used.

11. Entrants not holding licences for portable operation must make their own arrangements with the G.P.O. Entrants must comply with the terms of their transmitting licence.

12. Scoring : **Five points** *will be awarded for each contact with other portable stations, and* **one point** *for each contact with a fixed station.*

13. Proof of contact may be required, and competitors must be prepared to satisfy the Contests Committee that their equipment conformed to the rules.

14. Contacts with unlicensed stations will not be permitted to count for points.

15. Entries should be addressed to the Hon. Secretary, Contests Committee, R.S.G.B., New Ruskin House, Little Russell Street, London, W.C.1, and should bear a postmark not later than Monday, September 14, 1953.

16. Entries should be made in the form set out below, and the declaration must be signed.

17. The Houston Fergus Trophy will be awarded to the winning station, at the discretion of the Council.

Low Power Field Day
September 6, 1953

Name..... Call Sign.....

Home Address .....

Site of Station .....

Transmitter..... Receiver.....

Aerials..... Power Supplies.....

Other Equipment .....

Total Weight.....lb.

B.S.T.	Call sign of station worked	My report on his signals	His report on my signals	Location	Points claimed
				TOTAL	

Declaration: I declare that my station was operated strictly in accordance with the rules and spirit of the contest. I also declare that the weight of my apparatus as defined in Rule 9 was.....lb. I agree that the ruling of the Council of the R.S.G.B. will be final in all cases of dispute.

Signed.....

Fifth Annual 420 Mc/s Tests

MEMBERS interested in the development of the ultra-high frequencies are cordially invited to take part in the fifth R.S.G.B. 420 Mc/s Tests, to be held on September 12-13, 1953. The Tests, which will be conducted along similar lines to the 1952 event, will once again offer an unrivalled opportunity for testing the latest 420 Mc/s gear during a peak activity period and, at the same time, will provide a further chance of gaining one of the Society's most highly prized awards, the "Arthur Watts" Trophy. As in previous years, the award of the Trophy will not be directly dependent upon the number of contacts made or the mileage covered. To be taken into account when assessing the relative merit of the entries will be such factors as evidence of original experimental work and thought; efficiency—or simplicity—of the equipment and the use of modern techniques; the compilation of a well-presented, detailed and illustrated report (including at least block diagrams); and the amount of effort put into the Tests. A glance at the report of the 1952 Tests, published in the October, 1952, issue of the BULLETIN, will show the type of information included in the reports submitted last year.

The strongest appeal is made, this year, to *all* in possession of 420 Mc/s gear to come on the band as much as possible during the Tests; to put out plenty of transmissions; and to submit a report, no matter how brief, on these activities. Even if you are not normally "contest minded," please forget this for a day in order to give encouragement to newcomers on the band.

To members who have previously participated in these outstanding Tests little introduction is required; but to newcomers—and it is hoped that there will be many this year—it should be explained that when the Tests were initiated in 1949, the scattered nature of u.h.f. activity precluded the familiar point-scoring contest. The Contests Committee felt that the conditions resembled in many ways those that existed in the very early days of Amateur Radio when the first enterprising pioneers began to probe the then unknown regions of "100 metres and below" and when were organised the famous Trans-Atlantic Tests that contributed so materially to the development of the short waves.

Band Plan

The attention of participants is drawn to the U.K. Band Plan for 420 Mc/s published last month, *viz.* 420-425 Mc/s s.e.o.; 425-432 Mc/s television; 432-438 Mc/s stabilised transmissions; 438-445 Mc/s television; 445-455 Mc/s future amateur developments; 455-460 Mc/s s.e.o. The stabilised section is further divided on a zonal basis.

Fixed and Portable Operation

It is permissible for a station to use both fixed and portable locations during the Tests and it is suggested that some entrants may find it convenient to operate from their fixed location during the night period and to go portable the following day. Entries from receiving stations will be most welcome and will be eligible for the award.

420 Mc/s TESTS

The "Arthur Watts" Trophy will be awarded in connection with the tests.

Rules

As in previous years the event will have few fixed rules, other than the time limits of from 2100 B.S.T. September 12 to 0030 B.S.T. September 13 and from 1200 B.S.T. to 2200 B.S.T. September 13, and that all entries must be from fully paid-up Corporate Members and accompanied by the Declaration set out below. Any type of operation—fixed or portable—or mode of transmission may be used, providing the entrant adheres to the terms of his (or her) licence.

The entries will be required to include details of stations heard and worked (with distances), and general observations on the band. A full description of all equipment used should be included and this information and any other evidence submitted of work carried out will be taken into consideration when judging the event. The contestant submitting what, in the opinion of the judges is the best entry, will be recommended to Council for the award of the "Arthur Watts" Trophy.

One slight modification has been introduced this year; it has been decided, in fairness to "lone-furrow" participants, that combined entries, covering the work of more than one station, can no longer be accepted; though no limit is placed on the number of operators at any station.

Entries headed "R.S.G.B. 420 Mc/s Tests" must be addressed to the Hon. Secretary, R.S.G.B. Contests Committee, New Ruskin House, Little Russell Street, London, W.C.1, postmarked not later than September 21, 1953, and contain the following declaration:

I declare that my station was operated strictly in accordance with the rules and spirit of the Tests, and I agree that the ruling of the Council of the R.S.G.B. shall be final in all cases of dispute.

Date..... *Signature*.....

Highlights on 420 . . .

Oct. 1, 1948	Band released
Aug. 12, 1949	G3APY–G3ENS win "President's Trophies" (25 miles fixed stations).
Aug. 21, 1949	First R.S.G.B. 420 Mc/s Tests won by G3APY. G3AHB/A–G3FZL, 63 miles. GW4OS/P–G2JT/P, 95 miles.
Aug. 27, 1949	G2JT/P–GW6DP/P, 120 miles.
June 4, 1950	G6LK–G5BY, 161 miles.
July 17, 1951	G3APY–G5BY, 227 miles.
Sept./Oct., 1951	First G contacts with F. ON4 and PA0.
May 1, 1952	First 420 Mc/s Amateur TV Contact G5ZT/T–G3BLV/A/T.
Nov. 1, 1952	Power limit raised to 150 W.
March, 1953	GW2ADZ–ON4UV, 362 miles. DL3FM (70 cm.)–GW2ADZ (2 m), 435 miles.

Direction Finding Field Days

DETAILS of the last qualifying event, to be held on Sunday, September 6, 1953, are as follows:

Organiser: J. H. Barrance, M.B.E. (G3BUJ), 49 Swanage Road, Southend-on-Sea, Essex.

Call Sign: G5QK/P.

Frequency: 1870 kc/s.

Assembly Point: St. Cedd's Caravan Site and Cafe, East End Road, Bradwell-on-Sea, N.G.R. 62/015075.

Map: Ordnance Survey, New Popular Edition, Sheet 162.

Assembly Time: 1330 B.S.T.

This event will be run in accordance with the rules set out on page 400 of the March, 1953, issue of the R.S.G.B. BULLETIN. The rules will also be reproduced on the entry form which each competitor must sign at the start, carry with him, and have signed by the Official Umpire on arrival at the transmitter.

Intending competitors should notify the Organiser by Monday, August 31, stating the number in their party requiring tea at Delph House, Market Place, Rochford, Essex.

Two-Metre Open Contest,

THE following are the results of the Two-Metre Open Contest held on May 2-3, 1953.

Position	Call Sign	Location	Points	Contacts
1	G5YV	Morley, Leeds, Yorks.	13966	117
2	G3WW	Wimblington, Cambs.	8999	103
3	GW5MA/P	Nr. Blaenavon, Mon.	8845	87
*	G3BEX/P	4 m. N.W. Brighton, Sx.	7410	100
4	G4JJ/P	6 m. S. Barnsley, Yorks.	7081	69
5	G2XV	Cambridge.	6727	83
6	G5ML	Coventry, Warwicks.	5774	83
7	G3MY/P	6 m. S.W. Sheffield, Yks.	5381	59
8	G2HCJ/P	4 m. S.E. Aylesbury, Bucks	4555	89
9	G2HIF	Wantage, Berks.	4518	67
10	G6XX	Goole, Yorks.	4489	50
11	G5DS	Surbiton, Surrey.	3663	84
12	G2HDZ	Pinner, Middlesex.	3451	78
13	G2FJR	Spalding, Lincs.	3407	37
14	G3CCH	Scunthorpe, Lincs.	3345	40
15	G3FZL	East Dulwich, S.E.22.	2770	45
16	G3DO	Sutton Coldfield, Warks.	2766	30
17	G2FCL	Shipley, Yorks.	2645	35
18	G2FKZ	East Dulwich, S.E.22.	2627	45
19	G6LI	Grimsby, Lincs.	2460	23
20	G3GBO	Denham, Bucks.	2459	82
21	G5BD	Mablethorpe, Lincs.	2448	24
22	G3BW	Whitehaven, Cumbs.	2411	18
23	G5UM	Nr. Knebworth, Herts.	1907	38
24	G3FD	Southgate, N.14.	1687	46
25	G3ISA	Beckenham, Kent.	1567	42
26	G2DCI	Sutton Coldfield, Warks.	1543	29
27	GM3EGW	Dunfermline, Fife.	1524	15
28	G3IEX	Uxbridge, Middlesex.	1380	49
29	G5MR	Hythe, Kent.	1329	18
30	GW8UH	Cardiff, Glam.	1200	16
31	G3EYV	Clapham, S.W.4.	1146	22
32	G2CZS	Chelmsford, Essex.	707	9
33	G2DHV	Lewisham, S.E.13.	305	18

**Disqualified: No declaration*

The number of points scored was very great; the highest claimed score last year was 6,365. There were 34 entrants compared with 29 in the previous year's event. Apart from a period around midday on May 3, conditions appear to have been generally good. The scoring system was referred to as being about "the fairest possible."

The entry received from G3BEX/P was inadmissible because he allowed three visitors—G3DJD, G3DYQ and G3GNR—to "join in the fun"; he could not, therefore, sign the declaration.

Check Logs: The following are thanked for submitting useful check logs; G2UJ, G2YB, G3AGR, G3DUV, G3DVP, G3GKD and G3HZK.

Radio Amateurs' Examination Instruction Courses

COURSES of instruction have been arranged at the colleges or institutes listed below for the benefit of those who wish to study for the Radio Amateurs' Examination. The courses are held in the evening, and have been planned in conjunction with the Local Education authorities concerned.

Brentford Evening Institute

Radio Amateurs' Examination Course: This includes all the necessary theory, from first principles.

Radio Servicing Course: Covers the theory of the operation of radio receivers from first principles, and fault finding and repairs. Some practical work is included.

Both courses will be taken by J. R. Hamilton, Assoc.Brit.I.R.E. (G2HKR); the Servicing course on Tuesdays from 7 to 9 p.m., commencing September 22, and the R.A.E. course on Wednesdays from 7 to 9 p.m., commencing Septmber 23. Enrolment may be made any evening during the week September 14 to 18 inclusive.

Grafton School, Eburne Road, London, N.7

A course of instruction for the Radio Amateurs' Examination, including the Morse Test, will be given on Monday evenings. Applications for enrolment should be made in the first instance to A. W. H. Wennell (G2CJN), 145 Uxendon Hill, Wembley Park, Middlesex.

Ilford Literary Institute (High School for Girls), Cranbrook Road, Ilford.

Radio Amateur's Examination Course—an eight months course for those intending to take the examination.

Morse Code and Operating Procedure—a six months course for those who wish to learn Morse up to G.P.O. requirements. Fee for each course 10/-, or 15/- for both. Candidates from outside the Essex County Council area can be admitted provided written authority is given by that Council. Classes commence September 14. Enrolment at the Institute from 7 to 8.30 p.m. September 7-8, but names should be sent to C. H. L. Edwards, A.M.I.E.E. (G8TL), 10 Chepstow Crescent, Newbury Park, Ilford, Essex, at once so that a place may be assured.

Wembley Evening Institute, Copland School, High Road, Wembley

Instruction in preparation for the Radio Amateurs' Examination and the Morse Test will be given at the following times on Monday evenings, commencing September 21. *Morse*—7 to 8 p.m.; *Theory*—8 to 10 p.m. Enrolment will take place at the school from 7 to 9 p.m. during the week September 14 to 18. The fee for the course is 10/-.

LONDON MEMBERS' LUNCHEON CLUB

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

at 12.30 p.m., on August 21 and September 18.

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

Council Proceedings

Résumé of the Minutes of the Proceedings at a Meeting of the Council of the Incorporated Radio Society of Great Britain, held at New Ruskin House, Little Russell Street, London, W.C.1, on Thursday, June 18, 1953, at 6 p.m.

Present.—The President (Mr. Leslie Cooper in the Chair), Messrs. I. D. Auchterlonie, H. A. Bartlett, F. Charman, C. H. L. Edwards, D. A. Findlay, R. H. Hammans, F. Hicks-Arnold, J. H. Hum, A. O. Milne, L. E. Newnham, R. Walker, P. W. Winsford and John Clarricoats (General Secretary).

* * *

Welcome to New Members

The President extended a warm welcome to Messrs. Auchterlonie and Walker, and congratulated them on their re-election to the Council. Messrs. Auchterlonie and Walker made suitable replies.

Membership.

Resolved:—

(a) to elect 52 Corporate Members and 14 Associates;
(b) to grant Corporate Membership to 4 Associates who had applied for Transfer;
(c) to grant Life Membership to Messrs. F. Hague, ZB1H, and A. W. H. Wennell, G2CJN.

Official Meetings.

The Council noted that Mr. R. J. Donald had recommended that no official meeting be held in Region 8 during the year 1953.

Loyal Address and Coronation Relay.

The Secretary reported that the Loyal Address and Coronation Relay messages were handed in to the Home Office on June 3.

Mr. H. A. Bartlett received the congratulations of his colleagues for the efficient manner in which he had dealt with the Coronation Relay messages.

V.H.F. Band Planning.

It was reported that a meeting to discuss V.H.F. Band Planning had been arranged for July 2, and that representatives of "Wireless World," "The Short Wave Magazine," "The Radio Amateur," The Television Society, The British Amateur Television Club and The London U.H.F. Group would be in attendance.

Amateur (Sound) Licences.

The Secretary reported upon certain proposals which had been put forward by the G.P.O. for simplifying the procedure for dealing with Amateur (Sound) Licences.

Amateur (Television) Licences.

It was reported that the G.P.O. propose to issue Amateur (Television) Licences to persons who do not currently hold an Amateur (Sound) Licence, provided such persons can satisfy the G.P.O. on technical grounds. The proposals had been communicated to representatives of The Television Society and The British Amateur Television Club and their views were sought.

London Lecture Meetings.

Resolved that monthly lecture meetings be held at the Institution of Electrical Engineers during the period from October, 1953, to March, 1954.

In reaching its decision the Council kept in mind the prestige value of meetings of the Society held at the Institution of Electrical Engineers.

D.A.R.C. Convention.

Resolved to authorise the President (Mr. Leslie Cooper) to represent the Society at the D.A.R.C. Convention to be held in Iserlohn, Western Germany, during August, 1953.

Revised Articles of Association.

The Secretary submitted a letter from the Society's legal advisers reporting upon certain matters which had been raised by the Board of Trade and Treasury Counsel.

The Secretary and Mr. Walker were appointed to represent the Council at any meeting which the Society's legal advisers may arrange with the Board of Trade and/or Treasury Counsel.

Flood Distress Fund.

Resolved to take no action on a suggestion (put forward by a member living in Norfolk) to set up a fund to assist those who lost gear in the recent floods.

In reaching its decision the Council had in mind that individual cases of hardship are best dealt with on a local basis.

Mr. H. S. Simmons, G8VB.

Correspondence was considered from Mr. H. S. Simmons, G8VB, who had complained that he had not been receiving cards through the QSL Bureau. After receiving a full report from the QSL Manager (Mr. Milne) a member of the Council agreed to draft a reply to Mr. Simmons, the gist of which would be to convey to Mr. Simmons that the Council considers no further action is necessary.

Ilford Meeting.

It was reported that a meeting would be held on Sunday, June 21, at Ilford Town Hall "to discuss an approach to the Authorities directing the G.P.O. Radio Section and in particular to formulate means of protecting the Ham Bands from further encroachment and deterioration due to official and non-official transmissions." The convener of the meeting was Mr. Ray James, of 4 Grove Hill, Woodford, E.18. Invitations to attend the meeting had been sent to various groups in and around London. (Mr. James is T.R. for Woodford).

Members of the Council reported briefly on the reasons which they assumed had prompted Mr. James and those associated with him to organise the projected meeting.

Resolved to take no action at present in regard to the projected meeting in Ilford.

Handicrafts Exhibition.

Resolved to decline with thanks an offer made by the organisers to take space at the Second Annual National Handicrafts and Hobbies Exhibition.

The Secretary was instructed to explain to the organisers that the offer had been declined on the ground that the Society would find it extremely difficult to cope with the task of manning a stand at the Exhibition for a period of 12 days at a time of year only six weeks removed from the opening of the Society's own Exhibition.

Cash Account.

Resolved to accept and adopt the Cash Account for the month ended May 31, 1953, as submitted by the Hon. Treasurer.

Report of I.A.R.U. Region I Conference, Lausanne, Switzerland

The Secretary submitted printed proofs of the Report to the Membership on the I.A.R.U. Region I Conference (Administrative Committee) held in Lausanne from May 14 to 16, 1953. (The Report appeared in the July issue of the BULLETIN.—ED.).

Resolved to accept the Report, as submitted, together with all the Recommendations contained therein except the Recommendation which calls upon the I.A.R.U. to approach the Universal Postal Union on the question of handling QSL cards at the Commercial Paper Rate.

The Secretary explained why he had voted at the Conference against the Recommendation relating to the U.P.U.

The Secretary indicated that, as the Recommendations had now been adopted by the R.S.G.B., arrangements would be made to open an I.A.R.U. Region I Bureau Account with Barclays Bank, Ltd. The R.S.G.B. contribution to Fund A (amounting to £112 and due on July 1, 1953) would, at some convenient date, be transferred from the Society's Current Account to the I.A.R.U. Region I Bureau Account.

At the conclusion of the discussion the President moved and it was Resolved to place on record the warm appreciation of the Council to the Society's delegates to the I.A.R.U. Region I Conference in Lausanne.

The Secretary was congratulated on the presentation of his Report.

The meeting terminated at 10 p.m.

Silent Keys

With deep regret we record the death, recently, in Buenos Aires, Argentina, of Mr. A. M. Leitch, ex-G5YA. Andrew Leitch first became interested in Amateur Radio during the early '20s but the amount of time he was able to devote to that hobby was restricted by other equally diverse interests such as car racing and model aircraft. Prior to the last war he was mainly active on 80 m but in the post-war years his interest centred on the 10 m band. More recently business affairs necessitated his presence frequently in Buenos Aires, and he was planning to become active there with an LU call.

His death will be keenly felt by a large number of radio amateurs both in this country and abroad. Our deepest sympathies are extended to his family.

W.E.R.

It is also with deep regret we record the passing, at the age of 53, of Mr. C. Fenton, G6JZ, of Cockermouth, Cumberland. Although not active in recent years the Spirit of Amateur Radio never left him, in fact shortly before his death, in spite of intense suffering, he expressed a wish to get back on the air.

All who were privileged to know him personally looked upon him as a true amateur—ever helpful, ever friendly. He served his country in both World Wars and was a first-class operator.

Our deepest sympathies are expressed to his widow and daughters in their sad bereavement. W.H.H.

Regional and Club News

BARNET.—The Group has now been re-formed and will hold its next meeting at 7 p.m. on September 11 at the Elizabeth Allan School, Wood Street, Barnet. The A.R. (A. D. Cliff, B.R.S. 19421, 39 Oakleigh Park North, Whetstone, N.20) will be pleased to receive offers to lecture to the Group.

BRISTOL.—At the July meeting, G2IK, 3IFV, 5UH and 6GN acted as the panel in a quiz. There will be a lecture-demonstration on Audio Equipment at the meeting on August 21. *Group Secretary*: D. F. Davies (G3RQ), 51 Theresa Avenue, Bristol, 7.

DERBY & DISTRICT AMATEUR RADIO SOCIETY.—G3FGY will demonstrate his home constructed tape recorder at the meeting on August 26 at 7.15 p.m. in Room 4, 119 Green Lane, Derby. *Hon. Secretary*: F. C. Ward (G2CVV), 5 Uplands Avenue, Littleover, Derby.

DULWICH & NEW CROSS.—All local members are invited to attend the next meeting which will be held at the "Walmer Castle," Peckham, on October 6, 1953.

GRAFTON RADIO SOCIETY.—The first meeting of the new session will take place at the Grafton L.C.C. School, Eburne Road, N.7 (near the "Nag's Head") at 7.15 p.m. on September 4. The A.G.M. is arranged for September 18. *Hon. Secretary*: A. W. H. Wennell (G2CJN), 145 Uxendon Hill, Wembley Park, Middlesex.

KINGSTON & DISTRICT AMATEUR RADIO SOCIETY.—A river trip from Kingston to Windsor and back for members and friends on Sunday, September 6, is being arranged jointly with the Thames Valley and Sutton and Cheam societies. Mr. Colling-Wells (Goodmans Industries, Ltd.), is to give a demonstration-lecture on "High Fidelity Sound Reproduction" on August 26. On September 9, the guest speaker will be R.S.G.B. President Leslie Cooper (G5LC). Meetings are held at 5 Penrhyn Road, Kingston, at 7.45 p.m. *Hon. Secretary*: R. S. Babbs, (G3GVU), 28 Grove Lane, Kingston.

MALTA AMATEUR RADIO SOCIETY.—At the Annual General Meeting, J. Spafford (Argus House, Paceville, St. Julians, Malta) was elected *President and Hon. Secretary*.

MEDWAY AMATEUR RECEIVING AND TRANSMITTING SOCIETY.—The Society no longer meets at 5 Bells Lane and negotiations for new headquarters were incomplete at the time of going to press. Details of meetings are, however, available from the *Hon. Secretary*: D. Brett, 14 Connaught Road, Chatham.

NORWOOD & DISTRICT.—Recent activities have included a junk sale, a visit to the B.B.C. Monitoring Station at Tatsfield and the Worthing Bucket and Spade Party which was attended by a number of members and their families.

ROTHERHAM RADIO CLUB.—Meetings are now held at 8 p.m. on the first and third Wednesdays in each month at the "Cutlers Arms," Westgate. "Recording" is the subject of the talk on September 2. *Hon. Secretary*: W. Darby, 1 New Houses, Fence, Woodhouse Mill, nr. Sheffield.

SLADE RADIO SOCIETY.—Meetings will be held at the Church House, Erdington, on August 21 ("The Radio Amateur's Workshop") and on September 4 (Junk sale). Assemble 7.45 p.m. *Hon. Secretary*: C. N. Smart, 110 Woolmore Road, Erdington, Birmingham, 23.

SOUTH MANCHESTER RADIO CLUB.—The Club now meets on Fridays at Ladybarn House, Mauldeth Road, Fallowfield, 14. On August 28, G3DQU will give a talk on "Building a TV receiver" and on September 11 G2HW will lecture on "Modulation." In the recent Stockport v. S.M.R.C. DX Contest, the transmitting section was narrowly won by the Club and the listening section by the Stockport Society. *Hon. Secretary*: M. Barnsley (G3HZM), 17 Cross Street, Bradford, Manchester, 11.

SOUTH WEST ESSEX RADIO SOCIETY.—Meetings are held at 8 p.m. on Tuesdays at "The Shack," 367 Rush Green Road, Romford. The Club station (G3FZF) will probably be active again soon. A field day is arranged for September 6. *Hon. Secretary*: B. W. Le Grys (G3GOT), 75 Shaftesbury Road, Romford.

SOUTH SHIELDS AND DISTRICT AMATEUR RADIO CLUB.—The Club will be operating an Amateur Radio station under the call-sign G3ELP/A on 3.5 and 14 Mc/s from the South Shields Annual Flower Show from August 28 to 30, 1953 (10 a.m. to 9 p.m. daily). The transmitter will be installed and tested on August 27 between 6 p.m. and 10 p.m. Reception reports should be sent direct to G3ELP/A, Pier Pavilion, South Shields, Co. Durham. *Hon. Secretary*: W. Dennell (G3ATA), 12 South Frederick Street, South Shields.

TORBAY AMATEUR RADIO SOCIETY.—Meetings are held at the Y.M.C.A., Torquay, at 7.30 p.m. on the third Saturday in each month. G2FDV has made a welcome return to Devon. *Hon. Secretary*: L. H. Webber (G3GDW), 43 Lime Tree Walk, Newton Abbot.

Representation

The following is an amendment to the list of Town Representatives published in the February, 1952, issue:

Region 8—Kent

Maidstone

J. Oliver (G3GWG), 6 Shelley Road.

Vacancies

Consequent upon Mr. Simpson's election as Representative for the County of Lancashire East, a vacancy now exists for the area of Darwen-Blackburn.

Messrs. R. C. Harris (G2BAB), L. Gostelow (G2FOW) and S. H. Feldman (G3GBN), have resigned as Representatives for the areas of Finsbury Park, Lincoln, and Southgate, respectively. (Mr. Gostelow's resignation has been brought about for personal reasons because he is shortly to leave the area.— Ed.) Nominations for their successors should be made in the prescribed form and sent to reach the General Secretary by September 30, 1953.

Change of Address

Region 4—Regional Representative

Correspondence intended for Dr. E. S. G. K. Vance (G8SA) should be addressed to "Sycamores," Huthwaite, Sutton-in-Ashfield, Notts.

The Annual Bucket and Spade Party—fast becoming a traditional event in the south of England—took place this year on Sunday, July 26, at Worthing. In this happy group, a few of the bucketeers and their lady spadesters are seen on the front enjoying the fresh air. *[Photo by E. W. Yeomanson, G3IIR.*

Forthcoming Events

REGION 1

Region 1 Field Day, September 13. For details apply to the Regional Representative.
Bury.—August 13, September 10, 7.30 p.m., Y.M.C.A., The Rock, Bury.
Chester (C. & D.A.R.S.).—Tuesdays, 7.30 p.m., Tarran Hut, Y.M.C.A., Chester.
Crosby.—Thursdays, 8 p.m., Scouts' Hall, East Street, South Road, Waterloo, Liverpool.
Darwen & Blackburn.—August 28, 7.30 p.m., Y.M.C.A., Limbrick, Blackburn.
Manchester (M. & D.R.S.).—September 7, Brunswick Hotel, Piccadilly, Manchester.
Rochdale (R.R.T.S.).—Fridays, 7.45 p.m., 1 Law Street, Sudden.
South Manchester (S.M.R.C.).—Alternate Fridays, 7.30 p.m., Ladybarn House, Mauldeth Road, Manchester 14.
Southport.—August 20, September 3, 17, 8 p.m., Y.M.C.A., off Eastbank Street, Southport.
Stockport (S.R.S.).—Alternate Tuesdays, 8 p.m., Blossoms Hotel, 2 Buxton Road, Stockport.
Wirral (W.A.R.S.).—August 19, September 9, 23, 7.45 p.m., Y.M.C.A., Whetstone Lane, Birkenhead.

REGION 2

Barnsley.—September 11 (A.G.M.), 7.30 p.m., King George Hotel, Peel Street.
Bradford.— August 18, September 15, 7.30 p.m., Cambridge House, 66 Little Horton Lane.
Catterick.—Wednesdays, 7 p.m., Loos Lines, Catterick Camp.
Darlington.—Thursdays, 7.30 p.m., 129 Woodlands Road.
Doncaster.—September 9, 7.30 p.m., "Black Bull," Market Place.
Gateshead.—Mondays, 7.30 p.m., Mechanics Institute, 7 Whitehall Road.
Hull.—August 25, September 8, 7.30 p.m., "Rampant Horse," Paisley Street.
Middlesbrough.—Thursdays, 7.30 p.m., Joe Walton's Boys' Club, Feversham Street.
Newcastle.—August 17, 7.30 p.m., British Legion Rooms, 1 Jesmond Road. N.E.A.T.S., September 1, 7.30 p.m., Barras Bridge Hotel, Sandyford Road.
Pontefract.—August 20, September 3, 8 p.m., Fox Inn, Knottingley Road.
Rotherham.—Wednesdays, 7 p.m., "Cutlers Arms," Westgate.
Scarborough.—Thursdays, 7.30 p.m., B.R. Rifle Club, West Parade Road.
Sheffield.—August 26, 8 p.m., "Dog and Partridge," Trippet Lane. September 9, 8 p.m., Albreda Works, Lydgate Lane.
Slaithwaite.—Fridays, 7.30 p.m., 3 Dartmouth Street.
York.—Wednesdays, 7.30 p.m., Club Rooms, Y.A.R.S., Fetter Lane.

REGION 3

Birmingham (South).—September 4, 7.15 p.m., Stirchley Institute (Room 7).
Coventry. — August 22, 7.30 p.m., Priory High School, Wheatley Street.
Kenilworth, Warwick and Leamington.—August 20, September 17, 7.30 p.m., Datehouse Lane.
Stourbridge (S. & D.R.S.).—September 1, 8 p.m., King Edward's School.
Malvern.—September 7, 8 p.m., "Foley Arms."
Wrekin (W.A.R.S.).—Mondays, 8 p.m., Wrekin Service Club, Roseway, Wellington.

REGION 4

Alvaston.—Tuesdays, Thursdays, 7.30 p.m., Sundays, 10.30 a.m., Nunsfield House, Boulton Lane, Alvaston, near Derby.
Chesterfield.—Tuesdays, 7.30 p.m., Bradbury Hall, Chatsworth Road.
Derby (D. & D.A.R.S.).—August 26, 7.30 p.m., Room 4, 119 Green Lane, Derby.
Leicester (L.R.S.).—August 17, September 7, 7.30 p.m., Hollybush Hotel, Belgrave Gate.
Lincoln (L.S.W.C.).—August 19, September 2, 16, 7.30 p.m., Technical College, Cathedral Street.
Loughborough.—August 19, September 16, 7.30 p.m., Great Central Hotel.
Mansfield (M. & D.A.R.S.)—September 6, 3 p.m., Denman's Head Hotel, Market Place, Sutton-in-Ashfield.
Newark.—August 16, 30, September 13, 7 p.m., Northgate House Northgate.
Northampton (N.S.W.C.).—Fridays, 7 p.m., September 4, 6 p.m., Clubroom, 8 Duke Street.
Nottingham.—August 21, Sherwood Community Centre, opposite Woodthorpe Drive, Sherwood.
Peterborough.—September 2, 7.30 p.m., New Inn, New England, Peterborough.
Worksop.—September 7, 7 p.m., King Edward Hotel.

REGION 5

Great Hallingbury. — September 13, 2.30 p.m., G6UT's Annual "Ham Party," Normandale, New Barn Lane. Ladies welcome.
Chelmsford.—September 1, 7.30 p.m., Marconi College, Arbour Lane.
Ipswich.—August 26, September 9, 7.30 p.m., T.A. Drill Hall, Woodbridge Road, Ipswich.
Lowestoft & Beccles (L. & B.A.R.C.).—August 26, September 9, 7.30 p.m., Y.M.C.A., Lowestoft.

REGION 6

Cheltenham.—September 3, 8 p.m., 128 Prestbury Road.
Gloucester.—Thursdays, 7.30 p.m., The Cedars, 83 Hucclecote Road.
Oxford (O. & D.A.R.S.).—Alternate Wednesdays, 7.30 p.m., The Club Room, "Magdalen Arms," Iffley Rd.
Portsmouth.—Tuesdays, 7.30 p.m., Signals Club Room, Royal Marine Barracks, Eastney.
Southampton.—September 5, 7.30 p.m., 1 Prospect Place.
Stroud.—Wednesdays, 7.30 p.m., Subscription Rooms.

REGION 7

Acton, Brentford, Chiswick.—Tuesdays, 7.30 p.m., A.E.U. Rooms, High Street, Chiswick.
Barnes, Putney, Richmond.—September 8, 7.30 p.m., 337 Upper Richmond Road, East Sheen.
Barnet (B.D.R.C.).—Wednesdays, 8 p.m., "Hopedene," The Avenue.
Barnet.—September 11, 7 p.m., Elizabeth Allan School, Wood Street, Barnet.
Bexleyheath (N.K.R.S.).—August 27, September 10, 7.30 p.m., Congregational Hall, Chapel Road, Bexleyheath.
Bromley (N.W.K.A.R.S.).—September 4, 8 p.m., Shortlands Tavern, Station Road, Shortlands.
Croydon (S.R.C.C.).—September 8, 7.30 p.m., "The Blacksmiths Arms," South End, Croydon.
Dorking.—Tuesdays, 7.30 p.m., 5 London Road.
Ealing.—Sundays, 11 a.m., A.B.C. Restaurant, Ealing Broadway.
East Molesey.—September 2, 8 p.m., Carnarvon Castle Hotel, Hampton Court.
Enfield. — September 20, 3 p.m., George Spicer School, Southbury Road.
Finsbury Park.—August 18, September 22, 7.30 p.m., 164 Albion Road, N.16.
Guildford & Woking.—September 20, 3 p.m., Royal Arms Hotel, North Street.
Hendon & Edgware (E.D.R.S.).—Wednesdays, 8 p.m., 22 Goodwins Avenue, Mill Hill.
Hoddesdon.—September 3, 8 p.m., "Salisbury Arms."
Ilford.—Thursdays, 8 p.m., G2BRH, 579 High Road, Ilford.
Kingston (K. & D.A.R.S.).—August 26, September 9, 7.45 p.m., Penrhyn House, Penrhyn Road.
Kensington & Shepherds Bush.—September 11, 8 p.m., 38 Royal Crescent, W.11.
Lewisham (R.A.R.C.).—Wednesdays, 8 p.m., Durham Hill School, Downham.
Norwood.—August 15, September 19, 7.30 p.m., Windermere House, Westow Road, Crystal Palace.
Slough.—August 20, September 17, 7.45 p.m., Labour Hall, Chandos Street.
Southgate & Finchley.—September 10, 7.30 p.m., Arnos School, Wilmer Way, N.11.
Sutton & Cheam (S. & C.R.S.).—August 18, "The Harrow," Cheam Village.
Uxbridge.—September 4, 7.30 p.m., "The Vine," Hillingdon.
Watford (W.A.R.S.).—August 18, September 1, 15, 7.30 p.m., "Cookery Nook," The Parade.

REGION 8

Brighton.—T.R. at Home, Wednesdays, 7.30 p.m., 27 Warren Avenue, Woodingdean.
Chatham (M.A.R.T.S.).—Details from the Hon. Sec., 14 Connaught Road, Chatham.
Isle of Thanet (I.O.T.R.S.).—Fridays, 7.30 p.m., "George Hotel," Hawley Street, Margate.
Maidstone (M.K.A.R.S.).—Fridays, 7.30 p.m., Elms School, London Road.

REGION 9

Bristol.—August 21, September 18, 7.15 p.m., Carwardine's Restaurant, Baldwin Street, Bristol, 1.
Exeter.—September 4, 7 p.m., Y.M.C.A., St. David's Hill.
North Devon.—September 3, 7.30 p.m., Rose of Torridge Cafe, The Quay, Bideford.
Penzance.—September 3, Railway Hotel.
Plymouth.—August 15, September 19, 7 p.m., Tothill Community Centre, Tothill Park, Knighton Road, St. Jude's.
Torquay.—August 15, September 19, 7.30 p.m., Y.M.C.A., Castle Road.
West Cornwall (W.C.R.C.).—August 20, September 3, "Fifteen Balls," Penryn, near Falmouth.
Weston-super-Mare.—September 1, 7.30 p.m., Y.M.C.A.
Yeovil.—Wednesdays, 7.30 p.m., Grove House, Preston Rd.

REGION 10

Cardiff.—September 14, 7.30 p.m., "The British Volunteer," The Hayes, Cardiff.

(Continued on page 91)

Food for Thought

Dear Sir.—Now that the gauntlet has been thrown down in the July editorial, I should be lacking in true Ham qualities were I not to take up the challenge and offer for serious consideration some thoughts on the reasons for the present estrangement in certain quarters and lack of cohesion in matters of paramount importance to each and every amateur.

The dictum since the war, and not peculiar to Amateur Radio, is " what am I getting out of this? " and " what do I get for my money? "

This in itself represents a challenge and must surely be answered to the satisfaction of all. Criticism and comment, collectively and individually, so much a part of our lives, must aim towards and not away from the path this amateur Society (lit. and pract.) must take in furtherance of its integrity, achievements and social standing.

There is an abundant lack of knowledge concerning affairs directly related to Amateur Radio. The storm of verbosity now audible on all bands, and in quiet corners, suggests that we have been let down. " Look at 160—85 kc/s lost " and " Look at 14—50 kc/s lost," to mention only two, are some of the points one hears discussed. " Top band has had it " and " We'll all be plumbers soon " are others.

However, 1947 was six years ago, and this was all agreed at Atlantic City in that same year.

That something is lacking is all too obvious, and here I may perhaps make an observation. Since 1947 I can count on the fingers of one hand the number of T.R. meetings which have been convened by my representatives to discuss Society business.

This, in a London suburb with over 50 members: no wonder the rank and file are lethargic and apathetic; no wonder we only get just over 700 votes for a Council election.

Then there is the matter of liaison with the G.P.O. on frequencies, new allocations and amendments; but is this arrangement entirely satisfactory? On this matter we are all a trifle ignorant, for I doubt if more than a handful know the constitution of the joint consultative committee or how the requirements of the U.K. are planned and presented at International assemblies, or how plans are implemented or ratified. What is the B.J.C.B?*; why does the Society have to lobby the G.P.O?; why, with 10,000 amateurs, do we not have an official representative on the National joint consultative committee to speak on equal terms with other members? After all, the G.P.O. representatives must put first things first, and that is the national need. With due respect, we come second.

Look at the A.R.R.L. and the F.C.B. [F.C.C?—Ed.]. Surely the R.S.G.B. and the B.J.C.B. are an analogy, or at any rate they should be as regards fundamentals. At any rate, our cousins have a remarkably stronger position than ourselves but an excellent working arrangement with the authorities.

Is the Society looking the right way? Take the case of the proposed National Emergency Amateur Radio Communications Service.

Let the figures speak for themselves. Around 75 per cent. of licensed amateurs are bespoke for recall to the colours on the outbreak of an emergency; of the remainder these are, in the main, participating in home or passive defence organisations, either full- or part-time. Bearing this in mind, for whom and for what purpose would this *amateur* emergency service operate, and where would the volunteers be found in any numbers? This is a fallacy on which administrative effort, energy and hard cash are to be spent without, as far as one can see, the opinion of the members being considered. It has not, after all, been put to the vote.

Another burning problem concerns the amateur *vis-à-vis* authority. Just what exactly is the amateur's status, and how may it best be defined? From the state of the bands during TV, and with apologies for TVI proofed rigs so often given prominence in the Bulletin, one begins to wonder. Surely it is not too much to ask that we may be told in writing just where we stand, particularly in cases where interference is caused by direct transmissions on frequencies for which we are licenced. For the same reason that we, as amateurs with limited resources, have to improve our techniques to reduce harmonics and radiations on unauthorised frequencies, so also should the R.M.A. pay more attention to the design of domestic equipment, particularly in regards to the choice of i.f.'s and oscillator frequencies Let's face it, we have no say in the matter, though the achievements of our fraternity in the field of radio science have been almost overwhelming, and if there is anything we can do, that is to improvise. This may have been all right in 1939, but it is far from being satisfactory or acceptable in 1953.

Then there is the small matter of Affiliated Societies. How do they help or better the Society? Other than subscriptions there seems little gain. As a potential field of new members, this seems doubtful. But perhaps there is some other purpose which at the moment is obscure.

Lastly, it would appear that more space is required in the Bulletin for the publishing of " Letters to the Editor."

Free discussion and expression of opinions by this medium is of paramount importance towards the better understanding of one's fellow amateur.

Now, to sum up, may I put forward a five-point programme which I humbly submit is worthy of consideration, being representative of some of the more important viewpoints being expressed at this time.

1. Recognition and representation of the R.S.G.B. on the joint consultative committee of B.J.C.B.
2. The R.S.G.B. to be represented on the joint industrial consultative committee of R.M.A., etc., to discuss design techniques *vis-à-vis* TVI-BCI and the amateur.
3. The status of the amateur to be defined in cases of TVI-BCI due
   (*a*) to domestic user declining assistance or refusing to have adjustments made;
   (*b*) to domestic user removing filters, etc., after being fitted and then reporting continued interference;
   (*c*) to interference caused from fundamental transmissions on the recognised amateur bands falling on intermediate frequencies, etc.
4. Better organised and more regular town or region meetings, under the chairmanship of T.R.s/R.R.s, for the dissemination of Society news and business.
5. More space in the Bulletin for readers' letters.

So much for the first round! And that fire will be returned, I am as certain of it as I am of tomorrow's sunrise.

I should like to feel that by these few lines I have stimulated discussion further, but that they should reach all members. I may not presume instead to quote " To be or not to be," Pulp or Print?—your pen must decide, though to conclude on a slogan, how about " One Road—*via* R.S.G.B."?

Yours faithfully,

David Deacon, Lieutenant (W), R.N. (G3BCM).

London, S.E.25. Member, British Wireless Dinner Club.

* *B.J.C.B.—British Joint Communications Board.*

[*Mr. Deacon was a candidate in the recent Council By-Election.*—Ed.]

N.F.D. Rules—The Tent Question

Dear Sir.—In the past, it has been the normal practice of the Contests Committee when making rules for N.F.D. to place an embargo on the erection of any tents before the official starting time. Whilst this embargo has been quite fair in its application, and possibly more than justified on occasion, yet it fails to take into consideration one main factor—the English weather.

The last two N.F.D.s have found the members of my local Group busily engaged in moving equipment to the site in most inclement weather. This has meant that equipment, valuable at least to the owner, has had to remain under often inadequate cover until such time as a tent can legally be erected under N.F.D. rules.

It may be suggested that the fault lies within the Group for bringing equipment onto the site before tents have been erected but I would point out that N.F.D. sites are not normally adjacent to members' dwellings and transport difficulties frequently mean that much equipment and stores must be taken to the site irrespective of weather conditions.

I suggest that the Contests Committee, when next framing the rules for N.F.D., give thought to allowing a tent to be erected **before** the normal time of permitted commencement of erection; such tent not to be subsequently used as an operating tent nor to be erected in a position that it could be used for any purpose directly concerned with the A or B stations. Such a tent could be used before the Contest started as a stores tent for the protection of equipment and afterwards as a cook tent, sleeping tent or stores tent but not as an operating tent or generator battery tent.

I feel that such a concession would not allow any one Group an unfair advantage over others but would do much to assist all Groups to safeguard equipment and stores.

Yours faithfully,

E. G. Styles (B.R.S. 15648)

London, N.11.

Can You Help?

● Old Timer Howard Littley, G2NV, " Radiohm," Bridgnorth Road, Stourton, Stourbridge, Worcestershire, who seeks a copy of " English Mechanic and World of Science " No. 2520 dated July 11, 1913. Mr. Littley was a Member of the Birmingham Wireless Association whose activities were reported on Page 537 of that issue.

Book Reviews

SMALL TRANSFORMERS AND INDUCTORS, by K. A. MacFadyen, M.Sc.(Lond.), F.Inst.P. 237 pages. Numerous illustrations. Page size 8¼in. x 5¼in. Published by Chapman & Hall, London. Price 37/6.

This book is not primarily intended for the transformer specialist who has a precise control over his products born of long experience, but for the practical scientist or technologist who wishes to acquire a clear insight into the behaviour of all kinds of transformers and, if necessary, to be able to design and construct out-of-the way types with confidence.

Among the subjects dealt with are Principles of Design, Circuit Theory, The Magnetic Circuit, Power Transformers, Wide-band Transformers, Instrument Transformers, Transformers and Chokes with Magnetic Polarisation, Pulse Transformers, Materials, Mechanical Design and Construction.

* * *

P. H. BRANS' EQUIVALENT RADIO TUBES. Vade Mecum. 10th Edition (1953). Page size 11¼in. x 7¼in. Published by P. H. Brans, Ltd., Antwerp. English Agents, Bailey Bros. and Swinfen, Ltd., London.

As its title implies this particular edition deals with valve equivalents. The task which faced the compilers can be judged from the fact that the data fills more than 300 large pages of type. The book is intended to provide a quick reference for the possible exchange or substitution of various valve types.

The quality of paper is inferior to that used for previous editions, but the type is clear and the text easy to follow.

* * *

MAGNETIC SOUND RECORDING. Compiled by the staffs of the Radio Constructor and The Radio Amateur. Data Book Series No. 8. 44 pages; about 40 diagrams. Page size 8½ in. x 5¼in. Published by Data Publications, Ltd., London, W.9. Price 2/6.

A comprehensive construction section is prefaced by a series of short chapters outlining the principles of magnetic sound recording. Subsequent chapters describe the construction of tape recorders, the construction of heads for wire and tape recording, a radio tuner unit for recorders and magnetic recording equalisers.

E. Kaleveld, PA0XE, and L. F. Sinfield are the contributing authors.

The circuit diagrams and sketches are clear and the text lucid. A most useful little booklet which should be in the hands of all who are interested in the fascinating art of Magnetic Sound Recording.

Back Issues

A limited number of back issues of the R.S.G.B. Bulletin are available from Headquarters. Price 9d. per copy, post free. Write early while stocks last.

When Victor Male (G3HVM), of Hitchin, Herts., was married at Bedford Catholic Church to Miss Honora Ingleson, it was a real radio wedding. The bride had had much experience of radar techniques while in the A.T.S. during the war. The best man was G3IPD, of Huddersfield. Mr. and Mrs. Male are making their home at Harrogate. Victor is a travelling technician for a leading television firm.

FORTHCOMING EVENTS.—(Continued from page 466)

REGION 13

Dunfermline.—Mondays and Thursdays, 7.30 p.m., behind 34 Viewfield Terrace, Dunfermline.
Edinburgh (L.R.S.).—(No details supplied).

REGION 14

Falkirk.—August 28, September 11, 7.30 p.m., The Temperance Cafe, High Street, Falkirk.

Can You Help?

● R. Reynolds (G3IDN), 186 Beech Avenue, Swindon, Wilts., who requires information on Transformer Type A14803 which has three windings, one of which is centre-tapped. The transformer is believed to be from the SCR519.

EAST OF SCOTLAND REGIONAL MEETING

SUNDAY, SEPTEMBER 27, 1953.

SCOTIA HOTEL, 11 GT. KING STREET, EDINBURGH 3.

Assemble - - - -	2.00 p.m.
Business Meeting - - -	2.30 p.m.
High Tea - - - -	5.00 p.m.

Tickets (10s. each) from K. Senior (GM3AEI), 23 Marchmont Crescent, Edinburgh 9, or A. Dewar, 37 Calder Circle, Edinburgh 11.

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Correction

In the List of New Members published in the September, 1952, issue of the BULLETIN, the name of the Member allotted B.R.S. 19672 should have read S. A. Gaunt, 43 Appian Close, Kings Heath, Birmingham, 14. Mr. F. Dobson, who was incorrectly listed as B.R.S. 19672, is now G3INS.

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AR.77, £23 10s. 1224, £4 10s. BC.453, £2. TU6-8-26, new with cases, 15/-. New Woden UM1-UM2, 650 V at 200 mA. 5/25 Henries 250 mA, 250 V at 60 mA. Short Wave Magazine, June 1946-1952. Wireless Worlds, 1947-1953. Bulletins, 1952-1951. QST, 1944-1947, 1950-52. Offers, exchanges. S.A.E. please.—G3AQX, 20 Springfield Crescent, Somercotes, Derby. (579

BC.348 in good working order, built-in power pack (less case), £14; CR.100, new condition, £25; latter seen Halstead, Kent; buyer collects; require QST-49-50-51.—4 Cherrydown Road, Sidcup, Kent. (G3IXL). (564

BC.348R 230 a.c. as new, £25; S27, good condition, £30; 2-21 Mc/s 60 W c.w. transmitter, built in 700 V p.p. only 9 in. cube, working f.b. but needs aerial ammeter, £7. Buyers collect above, Surrey. 45 ft. R.A.F. 2 in. diam. sectional steel mast in carrying case, £6; a.c. prop-pitch motor, £3; Transformer 230 a.c., 500-0-500 200 mA, 30/-; 6 ft. standard rack, £2; E.E. televisor drilled steel chassis, 30/-; 808 (2), 30/- each; Labgear 4 band 150 W p.p. coil turret, £3; Crystals 7053, 7042 kc/s with certificates, 12/6 each. Reasonable offers considered.—Box No. 582, NATIONAL PUBLICITY CO., LTD., 36-37 Upper Thames Street, London, E.C.4. (582

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BENDIX transmitter TA.12D. 3.5 and 7, easily adapted to 14; transmitter type 37, 25 W on 21 and 28 Mc/s, £4 10s. each; D.C. meters, 1 mA, 10 mA, 30 mA, 500 mA, R.F. 3 A, 3.5 A, £1 the lot; Crystals, 100, 500, 463.54 (small i.f. type), 7010, 7168 and 7390 (type B with certs), 15, 100, all for £1; all post paid.—GM2HFV, 23 Noran Avenue, Dundee. (572

COLLINS receiver, 3-12 Mc/s, 7 valves, b.f.o. good condition, £5 10s.—SIDWELL, 7 Abbotsfield Cotts, Wareside, Ware, Herts. (580

COMPLETING Collection.—Any reasonable price given for BULLETINS, August 1926, February 1928, October 1934; " QST," April 1945 and before July 1924; also need " CQ," 1945/46; " Practical Wireless," Nos. 441, 457, 459, 511; most copies of " Radio."—G3IDG, 95 Ramsden Road, London, S.W.12. (565

COMPLETE Ham station for sale: 150 W ph./c.w. band-switched T.V.I. proof transmitter, 6 ft. rack; CR.100/8 stabiliser oscillator circuit; " S " meter manual; BC.221D; D104 microphone: Franklin v.f.o. and remote control unit; £75 complete: large assortment other gear; all kinds spares, valves, etc.—G2FMF, 187 Windsor Avenue, Hillingdon, Middlesex. (562

CR.100 for sale, 60 kc/s-30 Mc/s, " S " meter, stabiliser oscillator, 1944 model in real first-class condition; £18; view after 6 p.m.; buyer collects.—G3CFW, 81 Harlington Road, West, Feltham, Middlesex. (563

DRILLING guides for mounting air spaced trimmers 9" rigid shaft couplings for ¼ in. shaft 9". Other sizes to order. CHANDLER, Hillside, Bayview Road, Whitstable, Kent. (578

EDDYSTONE 740, £25. Nine valve receiver, 2rf, crystal, 10-160 amateur bands only £12 o.n.o.—G. K. ALLEN, 8 Cranbourne Close, Salt Hill, Slough, Bucks. Telephone Slough 25235. (576

EDDYSTONE 750 with speaker, as new; Wilcox-Gay v.f.o. 25 W transmitter, 7-14 Mc/s, ditto 3.5 Mc/s; 100 valves, including 813s (3), CV128 (2), 807s (10), 6L6 (2), 6V6 (5), 6F6 (2), U18 (9), S130 (4), etc.; transformers, condensers, chokes, etc.; £50 lot o.n.o., whole or part.—G3DTO, 10 Mozley Drive, Illingworth, Halifax, Yorks. (573

EXCHANGE.—Ham station for 16 mm sound film projector in good condition. Commercially built table-top rack transmitter; power pack, modulator, r.f. and aerial tuning; crystal on 80, 40, 20, 15, 10. Choice of S.640, high frequency receiver 10-60 Mc/s or H.R.O. Also wavemeter. Most in new condition having had only a few hours operation here. (Also see advert. "Wanted.").—Offers to Box 584, NATIONAL PUBLICITY CO., LTD., 36-37 Upper Thames Street, London, E.C.4. (584

EXCHANGE outright, R.116 and WS.18 Mk. III transceiver complete with accessories; wanted, communications receiver (mains) complete.—DUNCAN, 13 Caledonian Circuit, Cambuslang, Glasgow. (571

FOR SALE.—Four large smoothing condensers 1 μF x 5000 V working, 7/6 each; Eddystone Super-het receiver 358X, 9 coils 30 Mc/s—150 kc/s and power unit, £15; Taylor Universal meter 83 A 4000 ohms p.v. with adaptor unit 313 A for capacity and inductance, £10 10s.; Universal Avo Minor, perfect, £4 15s.; HRO 12 V d.c. power pack, £1 5s.; 1131 Modulator power pack 1000 V and 350 V, £4 10s.; Power pack, voltage doubling, output 1000 V at 180 mA, £2; Rotary coil pack and switch 5 bands with links suitable for 50 W, £1 5s.; Command transmitter, 7 Mc/s, less valves, requires usual mods., £1; TU5B unit, £1 10s.; v.h.f. receiver No. 1147, partly valved, £1; transformer, 230 V input, 1800-0-1800 600 mA output, £2 10s.; 2 chokes for h.v., p.p., take 600 mA each, £1 each. QTH in S.W. London. Please collect or add packing and postage. —Box 587, NATIONAL PUBLICITY CO., LTD., 36-37 Upper Thames Street, London, E.C.4. (587

FOR SALE.—Hallicrafters SX.28, mint, £50; wanted, AR.88D; will collect.—80 Ellesmere Street, Moss Side, Manchester 16. (550

FOR SALE.—Standard 6 ft. heavy channel-type rack, less panels, etc., £5 o.n.o.; buyer must arrange collection.—WAYMAN, 170 Keedonwood Road, Downham, Kent. (HITher Green 5372 after 7 p.m.) (557

G3EMY selling out. 150 W phone table top rig, all band with 20 m coils, 813 P.A. TZ40s modulator, £40. Also BC342 and various other items.—For further details, write G3EMY, 23 Thackeray Road, Birmingham, 30. (575

JUNK Sale, Sunday, August 23, 2.30 p.m.—Includes H.R.O. BC.221, C.R.O. transmitters, valves, etc.; all welcomed. — MORTON, G3DRC, 42 Southfarm Road, Worthing. (559

METALWORK.—All types cabinets, chassis, racks, etc., to your own specifications.—PHILPOTT'S METAL WORKS, LTD. (G4BI), Chapman Street, Loughborough. (99

NATIONAL 10 in mint condition, complete with power pack and coils for 80-200 Mc/s, £9 plus carriage; wanted, 2 metre transmitter, phone and c.w., preferably internal power pack and modulator, table top or compact rig ideal, high standard of construction and finish essential, excellent price paid for equipment to the above or similar specifications, all letters answered; details to Box No. below, National H.F.S. v.h.f. receiver wanted urgently in good condition, absolutely top price paid; v.h.f. converter, 18-205 Mc/s, Q-Max, model RV.2A, absolutely brand new and mint, 12AT7 power pack, G.G. R/F, 12AT7 mixer oscillator, internal power pack, black crackle cabinet, original cost £26, accept £17 10s. o.n.o.—Box 570, THE NATIONAL PUBLICITY CO., LTD., 36-37 Upper Thames Street, London, E.C.4.

PATENTS and Trade Marks. Handbooks and advice free.—KINGS PATENT AGENCY, LTD. (B. T. KING, G5TA, Mem. R.S.G.B., Reg. Pat. Agent), 146A Queen Victoria Street, London, E.C.4. Phone: City 6161. 50 years' refs. (98

QSLs and log book (P.M.G. approved). Samples free. State whether G or B.R.S.—ATKINSON BROS., Printers, Elland. (772

R.1155N.—Four bands, 20, 40, 80 and 160, converted to 6F6 output, with power pack and loudspeaker; good working order but original front panel: £12.—BETTINSON, " Kinkell," London Road, Horndean, Portsmouth, Hants.

SALE.—Avo valve tester, £12 10s.; Rack mounting monitor oscilloscope. £7 10s.: Stabilised power unit, 100/200 V, 50 mA, 25/-; C.R.T. 7BP7, 25/-; G.E.C. type 7A transmitter for 2M conversion, with valves, 25/-; Woden transformer DT.3, 12/6d.; 5 ft. × 19 in. rack, with several used panels, 30/-; 2M converter (r.f. unit), needs aligning, 10/-; buyer collects or pays carriage.—Box 556, THE NATIONAL PUBLICITY CO., LTD., 36-37 Upper Thames Street, London, E.C.4. (556

SALE.—B.28, good condition, £27; RF.24, modified for 10 metres, £3; McMichael radiogram, 1936 model, fitted variable-speed Colaro electric motor, 24 to 78 r.p.m., Marconi T.14 lightweight pick-up (with additional pick-up fitted for long-playing records, the motor would be suitable), £27 10s., or offers for all.—G3UY, 41 Ashenden Road, Guildford 4885. (549

SALE.—New meters: Dials, crystals; Variable condenser, 1-3 gang; I.F.Ts; Coils, valves, etc.—EDWARDS, 1 Nelson Drive, Littleham, Exmouth. (561

SALE or Exchange.—B.28 (CR.100) receiver, range 60 kc/s to 30 Mc/s, double bandspread, variable selectivity, noise limiter, etc., for 200-250 V, specially hotted-up and in first-class condition, £22 10s.; Valves (new, unused), 829, 30/-; 6J5G, 6J7G, 6Q7G, 6C5, 6J7, 1622, 4/6d. each; PT15, 15/- pair; Agfa postcard-size roll film camera, 1940 model, 6.3 lens, compur shutter, perfect, £6; wanted, good portable typewriter, 9 in. electrostatic C.R.T., other T/V parts, 1T4 valves.—ADAMS, G2YN, 70 Shaftesbury Road, Wilton, Salisbury. (558

SALE.—Radiovision preselector, built-in power pack; 3.3-32 Mc/s: as new; £11 or best offer.—Clarkson, 7 John Street, Dunfermline. (569

SALE.—Valves at 4/-, 6K7G (1), EF39 (3), VR105 (1), VR99A (1), PT15 (3). At 15/- matched pair PX25s in original cartons. At 10/- Brookes crystals with certificates 3505, 7019, 7080 kc/s. At 10/- 100 kc/s crystal bar with EF39. At £5 1100 V 400 mA power pack ex 1131 transmitter with 7.5 V twice for pair TZ40s and 6.3 V 4 A. Less valves and carriage paid. Wanted valves 807, VR150, 6SN7GT, 6SL7GT and DLS10. Manual for AR77E—GM3EYP, " Alisdair," 1 Meigle Road, Muirhead, Dundee, Angus. (574

(Continued on page 96)

EXCHANGE & MART SECTION

(Continued from page 95)

TRANSFORMERS ; Super-Pro A.F. Input (2), 5/- each; Heater, Thermador, 200/250 V, 2.5 V 10 A, twice £1; Thermador, 200/250 V, 6.3 V, 6 A 5 V, 6 A, £1; Savage, 230 V, 4, 5, 6.3, 7.5, 10 V, all 10 A, £1 2s. 6d.; Permeko, 230 V, 4 V, 10 A, 6.3 V 10 A, 17/6; H.T. Woden, 200/250 V, 1500 V 200 mA, £2; Gardner, 200/250 V, 660 V, 350 mA, £2; Chokes, 20 H, 250 mA (2), 10/- each; 10 H 150 mA (2), 7/6 each; Woden, 5/25 H 250 mA, £1; Modulation, Woden U.M.1 30 W A.F., £1 17s. 6d.; complete Canadian .58 Walkie-Talkie, Vibra-pack and two accumulators, also manual, £3 17s. 6d.; Rack AB.2 807, Modulators, 500 ohm input, Thermador modulation transformer output, £3 10s.; Rack Power Supply, 230 V, 375 V, 250 mA, 620 V, 200 mA, 6.3 V 4 A, fully fused, £3 17s. 6d.; speech amplifier, 200/250 V 4 stage p.p. 500 ohm output, £3 10s.; Cardwell transmitter, variable 165 $\mu\mu$F, split stator, 10/-; Cyldon transmitter, variable, 60 $\mu\mu$F, split stator, 10/-; Valves, 814 (1), £1; 866 (4), 12/- each; 2E22 (2), 10/- each; EF50s 5/- each; SP61s, 4/- each. Wanted: Denco C.T.4, Weston or Zeiss-Ikophot photo-electric meter.—RON G. BARRELL, 4 Bromyard Road, Tenbury Well, Worcs. (583

T.1154M, 4 range, new, £10; Commercial oscilloscope with instruction book, £15 10s.; Cinema fader control, 240 V 500 W, £2; Avo Minor, perfect, £4; Photo electric cells, PE.50, 30/- each; all above items including carriage.—Box 552, THE NATIONAL PUBLICITY CO., LTD., 36-37 Upper Thames Street, London, E.C.4. (552

WANTED.—BC.610 Hallicrafters, ET.4336 transmitters, SX.28s, AR.88s, receivers, and spare parts for above; best prices.—P.C.A. RADIO, The Arches, Cambridge Grove, W.6. (553

WANTED.—Cheap, Class " D," minus valve and crystal; exchange for gear: Austin 7 three-speed box, 9 ft. wooden airscrew.—ROSCOE, 2 Chichester Road, Croydon.

WANTED CR.100 (B28) chassis and cabinet, complete with dial and drive mechanism if possible. Also manual. State price.—Box No. 577, NATIONAL PUBLICITY CO., LTD., 36-37 Upper Thames Street, London, E.C.4. (577

WANTED for Museum.—Baird spinning-disc type T/V set, Marconi multiple tuner as used in magnetic detector 45 years ago, also Sterling accordion pleated diaphragm speaker used in mid-twenties; collection arranged; any other pre-1925 gear is of interest.—G3DFW, 7 Groby Road, Altrincham, Cheshire. (Altrincham 2984.) (560

WANTED. — H.R.O. coils, receivers, power packs, AR.88Ds, AR.88LFs, SX.28s, BC.348s, AR.77s, etc.—Details please to R.T. & I. SERVICE, 254 Grove Green Road, Leytonstone, E.11. (LEY. 4986.)

WANTED.—Power supply units for No. 33 transmitters (ZA.10729); call or ring.—P.C.A. RADIO, The Arches, Cambridge Grove, W.6. (RIV 3279.) (555

WANTED.—R.C.A. speech amplifiers, type MI-11220, J or K, and aerial tuning units BC.939a.—Offers, stating quantity and price, to P.C.A. RADIO, The Arches, Cambridge Grove, W.6. (554

WANTED. — R.C.A. 4331 transmitters.—P.C.A. RADIO, Cambridge Grove, Hammersmith, W.6. (Telephone RIVerside 3279.) (562

WANTED.—Receiver type 1392, P.38, BC.639, or similar, reasonable; also gen on test set SE.2 and special u.h.f. receiver Mk. II type ZA.11324.—KIMBER, 61 Gale Lane, Acomb, Yorks. (567

WANTED.—Tape recorder and 16 mm cinecamera. For disposal: hundredweights of " junk "—receivers, meters, valves, condensers, wire, chokes, metalwork, transformers and rotary transformers.—Enquiries (S.A.E. please) and offers to Box 584, NATIONAL PUBLICITY CO., LTD., 36-37 Upper Thames Street, London, E.C.4. (584

WILL buy motor alternator MG.8A or alternator type U2 AM 5U/2617 in good condition; state price.—29 Rooley Crescent, Bradford. (568

150 W engineer-built bandswitched transmitter, 10, 15, 20, 40 metre c.w., with input for cathode modulator, 12 valves, crystal switching, separate 4-valve v.f.o., with stabilised power supply, relay controlled 10 W 160, 80 metre c.w. transmitter with internal v.f.o., 20 W, 2 metre, c.w. transmitter; High gain 15 W modulator, speech clipping and filtering, 3 switched outputs to any of above transmitters; all above in enclosed racks or table cabinets; crystal mike; 2 metre 15 dB square-corner beam on 27 ft. cigar mast; buyers collect; no reasonable offers refused.—PARVIN, 19 Fellbrook Avenue, Acomb, Yorks. (Tel. 78283.) (566

45/- paid for new boxed 813s. 20/- for TZ40s, 24Gs, 811s. Send details other new surplus valves.—Box 518, THE NATIONAL PUBLICITY CO., LTD., 36-37 Upper Thames Street, London, E.C.4. (518

APPOINTMENTS SECTION

Official Appointments

WIRELESS STATION SUPERINTENDENT required by the NIGERIA GOVERNMENT Posts and Telegraphs Department for one tour of 18 to 24 months in the first instance. Commencing salary according to experience in scale £864 rising to £1,392 a year. Gratuity £100/£150 a year. Outfit allowance £60. Free passages for officer and wife and assistance towards cost of children's passages or their maintenance in the United Kingdom. Liberal leave on full salary. Candidates must have had wide practical experience of modern radio techniques and equipment, in particular V.H.F. equipment, and preferably also V.H.F. multichannel equipment. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name, in block letters, full qualifications and experience and quote M2C/28927/RC.

(Continued in next column)

Appointments Vacant

RADIO Service Mechanics required by Smiths Radiomobile, North Circular Road, N.W.2. Starting rate £8 12s., with profit sharing bonus and five day week.—Write full details of experience to Personnel Officer. (581

YOUNG man wanted for small electrical workshop. Slight knowledge of radio or electronics an advantage, but commercial or factory experience not essential. Paddington district.—BOX No. B.R., BROCKIE, HASLAM & CO., 231 Strand, London, W.C.2. (586

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