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Vol. XXVI No. 3 **Contents** SEPTEMBER 1950

Forthcoming Events

REGION 1

Ashton-under-Lyne.—October 1, 3 p.m., New Jerusalem Schools.
Blackpool.—October 10, 7.30 p.m., Chamber of Trade Buildings, Queen Street.
Bolton.—October 3, 8 p.m., Y.M.C.A.
Bury.—October 5, 7.30 p.m., Y.M.C.A.
Darwen & Blackburn.—October 6, 7.30 p.m., Y.M.C.A., Limbrick, Blackburn.
Liverpool.—September 23, 2.30 p.m., 29 Derby Lane, Old Swan.
Manchester.—October 2, 7.30 p.m., Reynolds Hall, School of Technology, Sackville Street.
Oldham.—Alternate Wednesdays, 7.30 p.m., Civic Centre, Clegg Street.
Preston.—September 29, October 13, 7.30 p.m., Three Tuns Hotel, North Road.
Rochdale.—October 1, 3 p.m., Drill Hall, Baron Street.
Southport.—October 16, 8 p.m., 38a Forest Road.
Wirrall.—September 27, October 11, 8 p.m., Y.M.C.A., Whetstone Lane, Birkenhead.

REGION 2

Barnsley.—October 13, 7.30 p.m., King George Hotel, Peel Street.
Bradford.—October 10, 7.30 p.m., 66 Little Horton Lane.
Catterick.—Tuesdays, 7 p.m., Loos Lines, Catterick Camp.
Darlington.—Thursdays, 7.30 p.m., 25 Coniscliffe Road.
Doncaster.—October 11, 7.30 p.m., Black Bull Hotel, Market Place.
Gateshead.—Thursdays, 7 p.m., Y.M.C.A., Sutherland Hall, Durham Road.
Hull.—September 27, 7.30 p.m., R.E.M.E. Barracks, Walton Street.
Leeds.—Fridays, 7.30 p.m., Swarthmore Settlement, Woodhouse Square.
Middlesbrough.—Thursdays, 7.30 p.m., All Saints Hall, Grange Road.
Newcastle-on-Tyne.—October 23, 8 p.m., British Legion Rooms, 1 Jesmond Road.
Scarborough.—Thursdays, 7.30 p.m., L.N.E.R. Rifle Club, West Parade Road.
Sheffield.—September 27, 8 p.m., "Dog and Partridge," Trippet Lane; October 11, 8 p.m., Albreda Works, Lydgate Lane.
Spenborough.—October 4, 7.30 p.m., Temperance Hall, Cleckheaton.
York.—Wednesdays, 7.30 p.m., Community House, Falsgrave Crescent.

REGION 3

Birmingham (M.A.R.S.).—October 17, 6.45 p.m., Imperial Hotel.
Birmingham (South).—October 1, 15, 10.30 a.m., Stirchley Institute.
Stourbridge (S. & D.A.R.S.).—October 3, King Edward VI Schools; October 6, Annual Dinner, "White Horse," Amblecote; October 25-28, Hobbies Exhibition, Town Hall.

REGION 4

Derby (D. & D.A.R.S.).—Wednesdays, 7.30 p.m., Club Room, No. 4 School of Art, 119 Green Lane.
Leicester (L.A.R.S.).—October 2, 16, 7.30 p.m., Holly Bush Hotel, Belgrave Gate.
Loughborough.—October 11, 7.30 p.m., Science Laboratory, Limehurst School.
Mansfield (M. & D.A.R.S.).—October 1, 3 p.m., Swan Hotel.
Northampton (N.S.W.C.).—Fridays, 6 p.m. (except October 6, 7 p.m.), Club Room, 8 Duke Street.
Nottingham (South).—October 10, 7.30 p.m., Trent Bridge Hotel.
Peterborough.—October 3, 7.30 p.m., St. John Ambulance H.Q., Cowgate.
Retford.—October 1, 3 p.m., Community Centre, Chapel Gate.
Spalding.—September 28, 7.30 p.m., 10 South Parade.
Worksop.—October 2, 7.30 p.m., King Edward Hotel.

REGION 5

Chelmsford.—October 3, 7.30 p.m., Smith's Radio Shop, Moulsham Street.
Little Hallingbury.—October 1, G6UT's Annual "Ham Party," 2.30 p.m., Normandale, New Barn Lane. Ladies welcome.
Southend.—September 21, 7.45 p.m., G3CQL, 29 Station Road, Leigh-on-Sea.

REGION 7

Barnes & Richmond.—October 10, 7.30 p.m., 22 Lowther Road, Barnes.
Brentwood.—September 29, October 13, 8 p.m., Drill Hall, Ongar Road.
Chingford.—September 28, October 12, 8 p.m., A.T.C. H.Q., Pretoria Road.
Croydon (Surrey R.C.C.).—October 10, 7.30 p.m., "Blacksmiths Arms," South End.
Dulwich & New Cross.—October 2, November 6, "Kentish Drovers," Rye Lane, Peckham, S.E.15.
East London.—October 2, 3 p.m., Ilford Town Hall.
Edgware (E. & D.R.S.).—Wednesdays, St. Michael's School.
Enfield.—October 15, 3 p.m., George Spicer School, Southbury Road.
Finsbury Park.—October 24, 7.30 p.m., 164 Albion Road, Stoke Newington, N.16.
Guildford.—October 22, 3 p.m., Royal Arms Hotel, North Street. "Projection Television," by R. Addie, G8LT.
Hayes & Uxbridge.—October 6, 7.30 p.m., "The Vine," Uxbridge Road.
Hoddesdon.—October 4, 18, "The Salisbury Arms."
Holloway (Grafton R.S.).—Mondays, Wednesdays and Fridays, 7.30 p.m., Grafton School, Eburne Road, N.7 (1 min. from "Nag's Head").
Plumstead, Woolwich & Abbey Wood.—September 27, 8 p.m., Club Room, Bull Tavern, Vincent Road, S.E.18.
St. Albans.—October 11, 8 p.m., "The Beehive," London Road.
Slough.—October 19, 7.45 p.m., The Golden Eagle Hotel, High Street.
Sutton & Cheam.—October 3, Sutton Adult School, Benhill Avenue.
Welwyn.—October 3, 8 p.m., Council Chambers.

REGION 8

Brighton.—Tuesdays, 7.30 p.m., Eagle Inn, Gloucester Road.

Continued on Page 112.

PREMIER RADIO COMPANY

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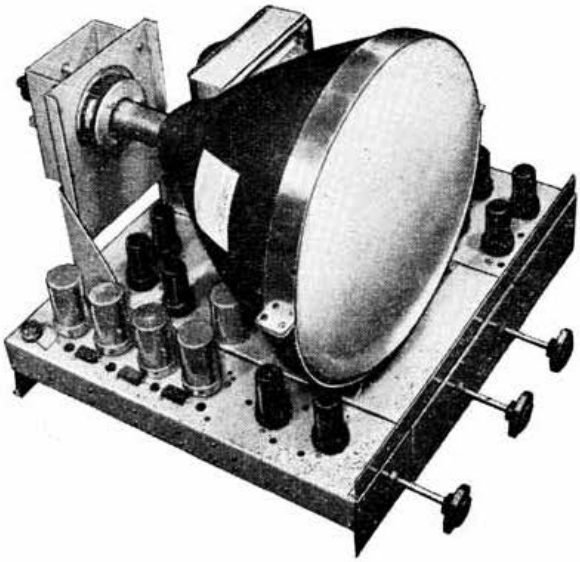

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R·S·G·B

BULLETIN

For the advancement of Amateur Radio

VOLUME XXVI No. 3 SEPTEMBER 1950

CO-OPERATION DECLINED

SOON after the loss of the steam trawler "Milford Viscount" the Society wrote to the Ministry of Transport and suggested that British radio amateurs might be able to place their experience and equipment at the disposal of the appropriate authorities should there be a similar incident in the future.

Attention was drawn to the scheme recently agreed with the Ministry of Civil Aviation and the Air Ministry concerning the use of one of the exclusive amateur bands (7 Mc/s.) for the transmission of urgent distress signals by aircraft.

It was suggested that, as the aid of radio amateurs had been enlisted when the "Milford Viscount" was reported missing, it would be worth-while ensuring that, if a like emergency should arise, their services could be called upon in an organised manner, and in accordance with some pre-arranged plan and that technical information would be made available to them quickly.

It was further suggested that the Minister of Transport should convene a meeting between representatives of the Society, the Ministry and other interested Government and non-Government Departments to discuss the matter and to agree a procedure which could be brought into operation quickly and efficiently.

The Ministry was advised that the Society has a membership of approximately 13,000 which total includes many thousands of licensed amateurs. Emphasis was placed on the fact that most radio amateurs possess receiving equipment designed for extreme selectivity and sensitivity, and that their boundless enthusiasm for their hobby would ensure widespread co-operation if a well-conceived scheme could be brought into being.

After a somewhat lengthy delay the Ministry of Transport replied in the following terms:

"The Minister much appreciates the interest shown by your Council and your members in the arrangements made for receiving distress messages from vessels at sea and is grateful for their offer of co-operation. After discussion with the Postmaster-General, however, he is satisfied that the normal listening watch maintained by the stations of the mobile service should be adequate in all ordinary cases to ensure that any distress message is picked up and acted on. He feels that the occasions on which it would be necessary to call on the services of amateurs, or other members of the public, would be so exceptional and, therefore, so few and far between that it would be more satisfactory not to lay down any hard and fast procedure, but to make the necessary arrangements in the light of the requirements of each individual case."

The Council does not accept the views expressed by the Ministry of Transport and has asked that its earlier request for a meeting shall be reconsidered.

It would be a thousand pities if lives are lost because the Postmaster-General is unwilling to admit that radio amateurs are capable of rendering a service of the nature envisaged.

Amateur Television

LORD WALERAN and Mr. Charles Ian Orr-Ewing, Member of Parliament for North Hendon, are thanked for drawing attention, publicly, to the fact that United Kingdom amateurs are not permitted to transmit television signals except over a closed-circuit.

Lord Waleran's remarks—made in the House of Lords during a recent debate on Television—followed closely on those of Mr. Orr-Ewing at a meeting of the Radio Industries Club and reported upon in June. Since then Mr. Orr-Ewing has asked the Postmaster-General to receive a small deputation to discuss Amateur Television. In making his request, Mr. Orr-Ewing emphasised that amateurs are capable in the field of television of making as worthwhile a contribution as did the amateurs of an earlier age to the development of sound broadcasting. He also stressed that amateurs in the United States and the Netherlands—countries which are competing with the United Kingdom for world television markets—are permitted to transmit television signals, and that considerable success has attended their efforts.

Mr. Orr-Ewing, who served with distinction in the Royal Air Force during the 1939-45 war, pointed out to the Postmaster-General that in

Continued on Page 96.

PANORAMIC RECEPTION

PART I. FUNDAMENTALS

The radio amateur has not been slow to appreciate the value of panoramic reception—which permits the entire activity over any particular frequency band to be immediately observed—as an aid to H.F. and more especially V.H.F. work. Until now, however, published material on this important development has been noticeably meagre. In this, the first of two articles, the author traces the history, application and fundamental considerations of the system. Part II will contain full constructional details of a panoramic converter for the 144-146 Mc/s. band.

PANORAMIC Reception is a method of radio reception in which a receiver is tuned rapidly backwards and forwards over a certain frequency band, and all the signals lying within this band are displayed on a cathode ray tube. The horizontal deflection of the cathode ray tube is arranged to follow the instantaneous frequency to which the receiver is tuned, and the output of the receiver deflects the spot vertically. Every time the receiver tuning passes through the frequency of one of the signals, a pulse appears at the output, so that the picture on the cathode ray tube appears as in Fig. 1. Three signals are shown, one near the low frequency end, one at the centre and one at the high frequency end of the band. In this method of reception, it is not possible, of course, to read the message which each station is sending. One can, however, note certain characteristics of the signals. For example, a steady carrier will produce a pulse of constant amplitude. A modulated signal will produce a pulse with a fuzzy appearance due to the rapidly fluctuating amplitude, while a C.W. signal appears as an intermittent pulse. It might be thought that it would be possible to read a C.W. signal directly from the panoramic display, but in practice this proves to be difficult unless the sending is extremely slow.

By

B. H. BRIGGS*

G2FJD

The following uses of panoramic reception in Amateur Radio may be mentioned. On crowded frequency bands it is useful for finding a clear frequency, and generally for keeping a watch on the activity on frequencies adjacent to the one in use. On the V.H.F. bands, it is useful for the opposite purpose of looking for a signal on a normally empty band. V.H.F. workers who have regularly spent many hours tuning carefully backwards and forwards over an empty band, will readily appreciate the advantage of being able to carry on with other activities, it being necessary only to glance occasionally at the screen of the panoramic receiver to see if any signals are present. A panoramic receiver can also be used for observing the spreading of signals, and for checking transmitter adjustments, such as correct modulation, presence of parasitic oscillations, etc. For these purposes the frequency band swept by the receiver can be quite small, and the arrangement is more properly called a " spectrum analyser " *i.e.* a device which analyses a complex signal into its frequency components.

The amount of published information on panoramic reception is surprisingly small considering the importance of the subject. Most of the standard radio engineering books do not mention it, and there are only a few papers on the subject; these are referred to in the Bibliography. However, in spite of the dearth of published data, the design of a panoramic receiver is fairly straightforward, for it is only necessary to combine a number of well-known circuits, bearing in mind some fundamental limitations which will be mentioned later.

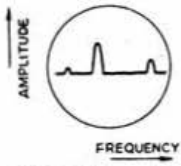

Fig. 1.
Method of displaying signals in panoramic reception.

The first mention of panoramic reception seems to have been in papers by R. M. Wallace (1) (2). These gave details of a navigation system for aircraft which depended upon the simultaneous observation of the strength of the signals from a number of beacons. As it is obviously undesirable to carry a number of complete receivers, a single panoramic receiver was used, and the relative strengths of the beacons were observed directly on the panoramic display. This principle does not appear to have been developed further for navigation purposes. A little later, the " Panadapter " was introduced by the *Hallicrafter Company;* this is an adapter which can be added to any normal communication receiver in order to allow panoramic and normal reception at the same time. Constructional details of a panoramic adapter were given in *QST* (3) and also appear in the *A.R.R.L. Handbook* (4).

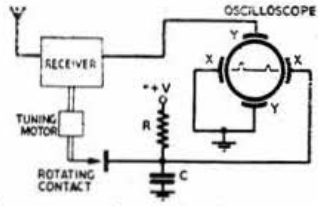

Fig. 2.
Simple form of panoramic receiver.

Panoramic reception was used and developed considerably during the war. It has obvious uses in connection with monitoring frequency bands. Anyone wishing to send messages without being detected will adopt secrecy arrangements, such as making the transmissions of very short duration, and perhaps using a different frequency each time. To keep a continuous watch for such transmissions requires a large number of receiving operators. However, if the transmitter has been approximately located, so that strong signals are assured, a panoramic receiver can be set up and the transmissions will then be seen at once every time they come on. The war-time developments have not been described in the literature; only one short paper has appeared (5). This describes a wide-range panoramic receiver covering 3·5–20 Mc/s., which will be referred to again later.

Simple Form of Panoramic Receiver

The simplest form of panoramic receiver is shown diagrammatically in Fig. 2. This shows a simple

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† *A paper read to the Society at a meeting held on February 24, 950, at the Institution of Electrical Engineers, London, W.C.2.*

mechanical arrangement, in which the receiver tuning is controlled by means of a motor. The easiest way of arranging this is to make the receiver tuning condenser continuously rotating. The use of split-stator tuning condensers is advisable so that the bearings do not carry R.F. currents. The time-base is arranged by having a rotating contact on the motor shaft which discharges the condenser C once per revolution. During the following revolution the condenser charges-up approximately linearly through the resistance R, and the resulting saw-tooth voltage is applied to the X plates of the cathode ray tube. If it is practicable to have the motor speed as high as 1,500 r.p.m. the repetition rate will be 25 c/s., and a normal cathode ray tube will give a continuous picture by the usual visual persistence effect. If, for mechanical reasons, the repetition rate must be slower than this, it will be necessary to use a long after-glow C.R. tube such as the VCR517. The signals are then examined on the afterglow trace. The glare from the main spot can be reduced considerably by the use of one of the orange filters commonly fitted to indicator units, using the VCR517 tube. With slow rotation, a continuously rotating potentiometer on the motor shaft can be used to derive the deflection voltage, instead of the condenser method described above.

This simple arrangement should not be considered too elementary to merit consideration. It has much to recommend it when the receiver itself is fairly simple. For example, if the receiver is a 420 Mc/s. super-regenerative receiver, this is a very simple method of converting it to a panoramic receiver. Such a receiver will have only a single tuning condenser, so that the mechanical problems are simplified.

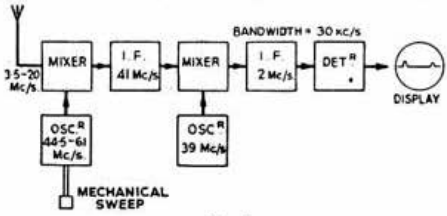


Fig. 3.
Wide range panoramic receiver, 3·5—20 Mc/s.

Fundamental Principles

Before discussing more complicated panoramic receivers, it is necessary to deal with a number of fundamental principles which concern the relation between the bandwidth of the receiver and the permissible sweep rate (6). These are similar, though not identical, to the problems which arise in the design of a frequency modulated oscillator or " wobbulator " for plotting receiver response curves.

It has already been seen that as the receiver tuning passes through a signal, a pulse is produced at the receiver output. The time for which this pulse lasts depends upon the receiver bandwidth. If the best resolution is to be obtained between adjacent signals, this pulse should be as narrow as possible. Also, if the sweep rate is too great, the pulse will decrease in amplitude because the tuned circuits have insufficient time in which to build up. The *noise*, however, appearing on the base line, depends only on the bandwidth of the receiver ; consequently, the signals will disappear down into the noise if the sweep rate is too great. It is desirable that the peak amplitude of the pulse should be equal to the response which would be obtained if the receiver were tuned permanently to the signal in question. In designing a panoramic receiver, therefore, the two problems of *adjacent channel resolution*, and *signal-to-noise ratio* have to be considered.

It is simplest to think of the receiver tuning as fixed, and to consider the response to a signal whose frequency is changing. The receiver is essentially a narrow band circuit, and the response consists of two parts, (i) the response at the instantaneous frequency of the signal, (ii) the transient produced by shock excitation of the circuit as the signal passes through. The latter will consist of a train of damped oscillations at the frequency of the circuit, lasting for a time of the order of the reciprocal of the bandwidth of the circuit.

Let the total frequency sweep of the receiver be F (c/s.).

Let the time taken for one complete sweep be T (sec.).

Let the bandwidth of the receiver be $\triangle f$ (c/s.).

Then the pulse due to (i) lasts for a time $\triangle f . T/F$ (sec.).

The transient due to (ii) lasts for a time $1/\triangle f$ (sec.).

It will be seen that the length of the pulse due to (i) increases as $\triangle f$ increases, while that due to (ii) decreases as $\triangle f$ increases. It follows that there is an optimum value of the bandwidth, $\triangle f$, which occurs when the pulses due to the two effects are of equal length. This gives a final resultant pulse of the *minimum possible* width. Equating the two time intervals given above, it will be found that the optimum bandwidth is given by

$$\triangle f = \sqrt{\frac{F}{T}}$$

This result may at first sight seem rather surprising, for it might be thought that it would be possible to increase the resolution of a panoramic receiver indefinitely, simply by decreasing the bandwidth. This is not the case, because of the transient, which lasts for a longer and longer time as the bandwidth is decreased. Eventually the resolution gets worse when the bandwidth is made smaller than the value given by the above equation. The effect can easily be verified if a panoramic converter is being used in conjunction with a receiver which is fitted with a crystal filter. Switching in the crystal makes the signals on the screen *increase* in apparent width.

By equating the two time intervals (i) and (ii) above, the receiver circuits have been so arranged that they have just time to build up to the full amplitude as the signal passes through. Consequently, the *same* condition gives also the best signal-to-noise ratio. If the bandwidth is less than the value given by the above equation, signal amplitude is lost, while if the bandwidth is greater than this value, the pulse amplitude does not increase any further, but more and more noise is let in as the bandwidth increases.

It may be noted in passing that in designing a " wobbulator " it is necessary to arrange that the transient is not *equal* in length to the desired response, but *very much shorter* than the desired response. This is because it is the detailed shape of the response that is to be investigated. In a panoramic receiver the precise shape of the pulse is of no interest; instead the best resolution between adjacent signals and the best signal-to-noise ratio is required.

The equation given above is the fundamental design equation for panoramic reception. The total sweep F and the sweep time T are decided at the outset by the purpose for which the receiver is required. (Unless a long afterglow cathode ray tube is used, T cannot be much greater than $\frac{1}{25}$ sec.) This decides at once the optimum bandwidth to use in the receiver. It is possible that the optimum bandwidth may come out large if an attempt is made to cover a wide frequency band. In this case it should be noted that the panoramic receiver will necessarily have a poor signal-to-noise ratio, because it would be possible to receive the signals on a normal receiver of much narrower bandwidth, which would let in correspondingly less noise. It is impossible to avoid this result,

which is simply a consequence of the fact that an attempt is being made to cover a wide band. If, however, Δf is found to be about the same as the bandwidth of a normal receiver, then it should, in principle, be possible to make a panoramic receiver which is no worse as far as signal-to-noise ratio is concerned than a normal receiver for the same frequency.

[As an example, consider the case of a panoramic receiver covering the 144–146 Mc/s. amateur band. Here $F = 2 \times 10^6$ c/s., and with $T = \frac{1}{25}$ sec., it is found that

$$\Delta f = \sqrt{\frac{2 \times 10^6}{\frac{1}{25}}} \simeq 7 \text{ kc/s.},$$

for the optimum bandwidth. This bandwidth is similar to that normally used in receivers for this frequency, and so it should be possible to make a panoramic receiver for this frequency range without loss of signal-to-noise ratio.]

When the optimum bandwidth for the receiver has been decided, the length of the output pulse is also determined. It is equal to the reciprocal of the bandwidth. Audio frequency amplifiers following the detector should be capable of handling pulses of this duration without distortion. This means that the frequency response should preferably extend up to a frequency equal to several times the receiver bandwidth.

Mechanically Driven Panoramic Receiver

A receiver covering 3·5—20 Mc/s. has been described by E. C. H. Seaman (5). This receiver was only required to detect strong signals, and it was possible to dispense with any high frequency amplifiers ahead of the first mixer. The arrangement is shown in Fig. 3. As it is impossible to cover the range 3·5–20 Mc/s. without coil changing, it was necessary to first change the incoming signals to a higher frequency (41 Mc/s.). The first oscillator then covers 44·5–61 Mc/s. a range which can easily be achieved by means of a rotating condenser and a single fixed coil. The signals on 41 Mc/s. are then passed through what is essentially a normal 41 Mc/s. receiver, with an I.F. of 2 Mc/s., and are then detected and passed to the Y plates of the cathode ray tube. The horizontal deflecting voltage is produced by a waveform generator which receives a synchronising pulse once per revolution of the motor. For this receiver, $F = 16 \cdot 5$ Mc/s., $T = \frac{1}{25}$ sec., and these values give an optimum bandwidth of approximately 20 kc/s. This is, of course, the bandwidth required in the 2 Mc/s. I.F. amplifier. (The actual bandwidth used was 30 kc/s.) The resolution and signal-to-noise ratio will be rather poor, but this is an unavoidable consequence of the wide band which is covered. This example is given to show the useful technique of first changing to a high I.F. when a wide band has to be covered at a relatively low frequency.

There are a number of disadvantages inherent in mechanical methods of achieving panoramic reception. These include the difficulty in returning rapidly to a desired frequency in order to listen to a selected signal, and the difficulty of varying the extent of the frequency sweep. For these reasons, and also because of its greater convenience, electronic rather than mechanical methods of frequency control are preferred. It is only practicable to control the frequency of a single tuned circuit by electronic means. Thus, the frequency of the local oscillator of a superheterodyne receiver can be varied, but the high frequency stages cannot be kept in track electronically. This difficulty is usually overcome by making the high frequency stages sufficiently wide-band to avoid the necessity for variable tuning.

Electronic Methods of Frequency Sweep

Electronic methods of controlling the frequency of an oscillator are well known, because of their use in frequency modulation. Similar circuits are used in panoramic receivers. The best known arrangement is the reactor valve, the principle of which is shown in Figs. 4(a) and 4(b). The object of these circuits is to produce between the terminals AB a reactance, the value of which depends upon the slope g_m of the valve. The slope is varied by means of a controlling voltage applied to the grid, which in a panoramic receiver will be a saw-tooth voltage waveform. (The arrangements for applying this voltage are not shown in the simplified circuits of Fig. 4.) The terminals AB are connected across the tuned circuit of an oscillator. It can easily be shown that the impedance appearing between the terminals is as shown in the diagram. Thus the circuit of Fig. 4(a) produces a variable capacity CRg_m, and the circuit of Fig. 4(b) produces a variable inductance CR/g_m. In both cases the

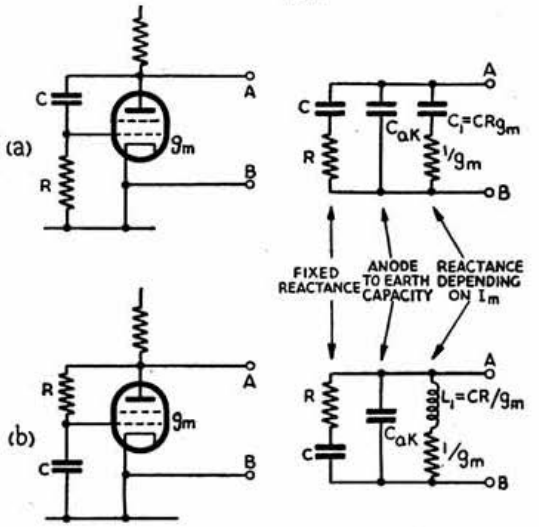
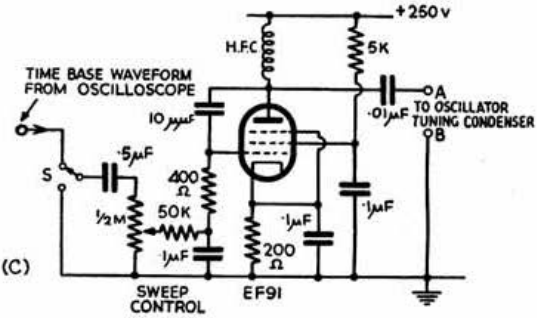


Fig. 4.
(a) and (b). Simplified reactor valve circuits with equivalent networks.

For (a) the Q of both the variable and fixed parts of the reactance are given by $Q = 1/wCR$, and since $C^1 = CRg_m$, it follows that $1/wC = Q/g_m$. Similarly, for (b), $wL = Q/g_m$. Thus either circuit produces a variable reactance equal to Q/g_m.



(c) A practical circuit, producing a maximum capacity change of 20 $\mu\mu$F. with a Q of 9 at 5 Mc/s.

impedance is not a pure reactance, but has in series with it a resistance of value $1/g_m$. In a panoramic receiver, a large frequency variation is often required, so it is important to realise the limitations of the circuits. The permissible frequency deviation is limited by the fact that the reactance is " lossy," so that when the reactance produced by the reactor

valve forms too large a proportion of the total tuning reactance, the oscillator amplitude will decrease, and eventually oscillations will stop. The important factor is the " Q " of the reactance produced by the reactor valve. If it is decided that the Q must have a certain value to avoid too great an amplitude change, this fixes at once the smallest reactance which can be produced with a valve of given slope. (Remember that since the reactance is connected in *parallel* with the oscillator tuned circuit, *small* reactances are more effective than *large* ones.) The equations associated with Fig. 4 show that either circuit will produce a reactance Q/g_m. It follows that a high value of g_m is desirable. The higher the slope of the valve, the smaller the reactance which can be produced for a given Q. As far as the present considerations are concerned, there is nothing to choose between the two circuits of Fig. 4. but in practice the second circuit has the advantage that the condenser C can be formed either wholly or in part by the grid to cathode capacity of the valve. In the first circuit the grid to cathode capacity is an undesirable feature.

An example will perhaps illustrate these points more clearly and will also give an idea of the order of magnitude of the frequency deviation which can be produced. Let the oscillator frequency be 25 Mc/s., and assume that a Q of 10 will be sufficient to minimize amplitude variations. Let the maximum slope of the valve be $g_m = 5mA/V$.

With the circuit of Fig. 4(a), the maximum capacity C_1 which can be produced is found to be about 3·0 $\mu\mu$F. Let the main tuning capacity of the oscillator circuit be C_2. This should be made as small as possible in order to obtain the largest frequency deviation, but a limit will be set by stray capacities, and under the best possible conditions C_2 may be, say, 60 $\mu\mu$F. If δf is the frequency deviation, we then have :—

$$\frac{\delta f}{f} = \frac{1}{2} \cdot \left(\frac{\text{capacity change}}{\text{total capacity}}\right) = \frac{1}{2} \cdot \frac{C1}{C2} = \frac{1}{40}$$

Thus, since $f = 25$ Mc/s., $\delta f = 625$ kc/s. in this case.

Now consider what would happen if the oscillator frequency were 5 Mc/s. For the same Q the value of C_1 is now 5 times as great (see the equations in Fig. 4), but C_2 will be unaltered. Thus :—

$$\frac{\delta f}{f} = \frac{1}{8}$$

and since $f = 5$ Mc/s., $\delta f = 625$ kc/s.

It will be seen that the same *absolute* frequency change can be produced on the two frequencies, but the *fractional* change is, of course, greater on the lower frequency. If the 5 Mc/s. frequency is multiplied up to 25 Mc/s. by a series of multiplying stages, the frequency change at 25 Mc/s. would be 3·1 Mc/s. in the above example.

Thus, to obtain large frequency deviations, it is best to start at a low frequency and multiply up by means of a series of multiplying stages. The tuning of such stages can usually be " staggered " in such a way that the final output is reasonably constant over the required band. In a superhet, it is not essential, of course, that the local oscillator voltage be absolutely constant over the band, provided it is always sufficiently large.

Quite apart from the above considerations, it is difficult to make a reactor valve work properly above 50 Mc/s., so for this and higher frequencies, it is essential to multiply up the frequency.

There is a very simple improvement which may be made to the normal reactor valve circuits, provided that the circuit is not required to control an oscillator which tunes over a wide range. Referring again to Fig. 4(b), it can be shown that the object of the network CR is to produce at the grid of the valve a voltage 90° out of phase with the anode voltage. The reason the reactance produced by the circuit appears " lossy " is because this figure of 90° can never quite be achieved with a single section CR network. A *two* section network can, however, produce exactly 90° phase change, but only at one frequency. In practice it is best to apply this principle as a second-order correction as follows ; first design the circuit in the normal way, then split the resistance R from grid to anode into two equal parts, next place a small trimming condenser from the junction point to earth. It is then possible to adjust this trimmer so that, on one frequency, the impedance produced by the reactor valve is a pure reactance.

The adjustment is found in practice to hold over the frequency band swept by the circuit, and the trimmer should be adjusted as follows. An indication of oscillator output will be needed. This may be an actual measure of the oscillator voltage obtained with a valve voltmeter or simply a measure of the grid current of the oscillator. A D.C. control voltage should be applied to the reactor valve in place of the sweep voltage, so that the valve may be held at any point on its characteristic. Without the trimming condenser connected, it will be found that the oscillation amplitude decreases as g_m increases (increasing frequency deviation). If the condenser is too large, the amplitude will increase as g_m increases. Between the two conditions a setting should be found which gives approximately constant amplitude over the control range of the reactor valve.

A similar method may be applied to the circuit of Fig. 4(a) by splitting the condenser C into two parts and placing a resistance from the junction to earth, but this circuit is not so convenient in practice.

This method of compensation is very useful, but it is a little tricky to adjust, and it should be remembered that it can only hold over a small frequency range.

Modification of an Existing Superheterodyne Receiver for Panoramic Reception

It is possible to convert an existing receiver for panoramic reception by the addition of only one extra valve, provided that an oscilloscope which has a suitable time base (25 or 50 c/s., saw tooth) is available. This valve is simply a reactor valve, connected in parallel with the oscillator tuning condenser. Only a small frequency range can be covered because of the narrow bandwidth of the high frequency stages. However, if some loss of gain and increase of second channel breakthrough are tolerated, the latter can be made considerably wider in response by staggering the tuning and by the use of damping resistances in parallel with the tuned circuits.

In a receiver covering a wide frequency range, the coils are switched to different values, but the tuning condenser is not changed. The circuit of Fig. 4(a) is preferable to that of Fig. 4(b) because it produces a certain capacity change, rather than a certain inductance change. The frequency deviation is more nearly constant, therefore, with this circuit, though it will, of course, vary considerably, depending on the setting of the main tuning condenser.

Suitable component values are shown in Fig. 4(c). If a miniature valve such as an EF91 is used, the whole reactor valve unit can be mounted very near to the oscillator section of the main tuning condenser, so that the lead from the anode of the reactor valve to the tuning condenser can be made very short. It may be found that the oscillator will stop oscillating on some frequencies, due to the loading effect of the reactor valve, but small adjustments to the oscillator circuit values will usually correct this, and it will be possible to arrange the operation to be satisfactory, at least over selected frequency ranges such as the

amateur bands, if not over the whole tuning range of the receiver.

Output to the Y plates of the oscilloscope can simply be taken from the anode of the output valve of the receiver, but it may be found that the signal pulses are somewhat distorted, due to the limited high frequency response. In this case an output should be taken direct from the second detector. This may be amplified by a single stage amplifier using an EF50 or similar valve.

The switch S enables the panoramic sweep to be switched on or off at will: Fig. 4(c.) If the main receiver tuning is adjusted until a selected signal appears exactly in the centre of the oscilloscope screen, and the sweep is then switched off, this signal will be heard.

F.M. Oscillator of New Type

A completely new type of frequency modulated oscillator has been described recently by K. C. Johnson (7). This would appear to have many advantages for use as a local oscillator in panoramic receivers because the frequency range may be large, without associated amplitude changes, and the circuit can probably be made to work at quite high frequencies. Further, the reactor valve and oscillator are combined, thus saving a valve. The principle of this circuit can be seen from Fig. 5. It depends upon

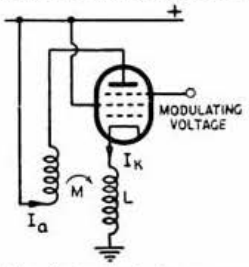


Fig. 5.
New type of frequency modulated oscillator devised by K. C. Johnson.

the fact that in a pentode valve, the division of current between the anode and the screen grid can be controlled by means of a negative potential applied to the suppressor grid, without, however, appreciably changing the total cathode current. The effective inductance in the cathode lead depends upon the current flowing in the anode coil, because of the coupling between this coil and the coil in the cathode lead. If, therefore, the anode current is varied by applying a modulating voltage to the suppressor grid, the effective inductance in the cathode circuit will vary in sympathy with the modulating voltage. This can be seen mathematically as follows. If I_k is the cathode current, and I_a the anode current, the total voltage between cathode and earth is

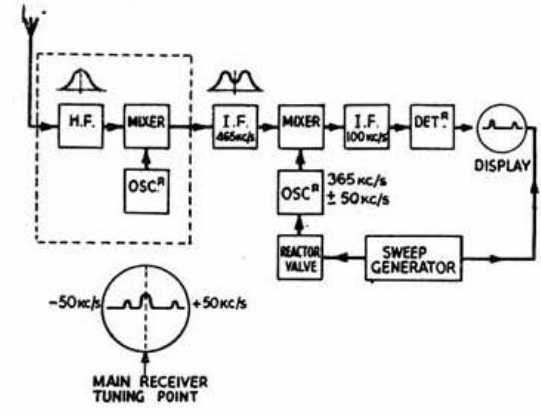


Fig. 6.
Block diagram showing the principle of a panoramic adapter.

$j\omega LI_k \pm j\omega MI_a$, (the sign depending on which way round the coils are connected). Now if there were simply an inductance L^1 in the cathode lead, the cathode voltage would be $j\omega L^1 I_k$. Equating the two expressions, it can be seen that the circuit behaves as if there were an effective inductance L^1 in the cathode lead, given by :—

$$L^1 = L \pm M \frac{I_a}{I_k}$$

This can be varied by means of the suppressor grid voltage, which alters I_a without altering I_k. If the coupling is arranged so that the negative sign holds, and the mutual inductance M is made large enough, it will be seen that it is possible, in principle, to vary the effective inductance from a value which is zero (or even negative), up to the value L (when the suppressor grid is made so negative that $I_a = 0$). Thus the effective inductance can be varied over a wide range, and it remains all the time a pure inductance, apart from inevitable losses in the coils. For the method of making the same valve oscillate at a frequency determined by the effective cathode inductance, reference should be made to the original article.

We will now pass on to consider some examples of panoramic receivers, using conventional reactor valve circuits to produce the frequency variation.

The Panoramic Adapter

A panoramic adapter is a unit designed to work in conjunction with a normal communication receiver in order to provide panoramic reception simultaneously with normal reception on the receiver. Full constructional details of such a unit are given in the A.R.R.L. *Radio Amateur's Handbook*. The block diagram of Fig. 6 will suffice to explain the principle.

The first three units enclosed in dotted lines are in the main communication receiver, output being taken to the adapter from the mixer anode. The signal to which the main receiver is tuned will appear at this point as a signal at the I.F. (465 kc/s.). The panoramic adapter consists of a single stage at 465 kc/s., followed by a mixer to change the signals to an I.F. of 100 kc/s., the oscillator frequency being swept from 315 to 415 kc/s. by means of a saw-tooth voltage applied to a reactor valve. The same saw-tooth voltage provides the X-deflection for the oscilloscope. It should now be clear that the result is to produce a panoramic display of 100 kc/s. total sweep, the centre of which corresponds to the frequency to which the main receiver is tuned. This signal can be heard on the main receiver, while on the panoramic display the signal under observation can be seen, as well as all signals lying within $\pm$ 50 kc/s. As the main receiver tuning is varied, the whole picture will move across the screen in one direction or the other.

As the high frequency stages of the main receiver will have a bandwidth of less than 100 kc/s., the first stage of the panoramic adapter is given a complementary response curve, as shown in the diagram, so that the overall response is approximately flat over the 100 kc/s. range.

For this arrangement $F = 100$ kc/s. and $T = \frac{1}{25}$ sec. Thus the optimum bandwidth is $\Delta f = 1 \cdot 6$ kc/s. The bandwidth of the 100 kc/s. I.F. amplifier is not stated in the original design, but it will clearly be of the order of one or two kilocycles, so that the design is sound in this respect. The resolution is very good (of the order of 1 kc/s.), so that the arrangement is useful as a spectrum analyser. For example, it can be used to observe the side bands produced by amplitude or frequency modulation of a carrier, provided that the modulation frequency is greater than a few kilocycles.

The panoramic adapter is a useful arrangement, because it is possible to listen to a selected signal on

the main receiver without stopping the panoramic sweep. This is possible because there are really two complete receivers in operation, only the first few stages being common to both.

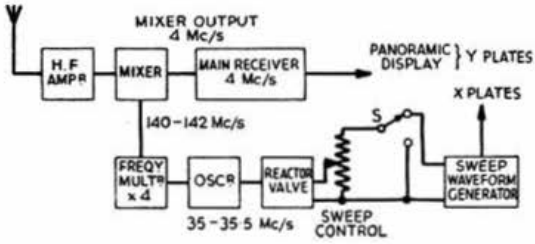


Fig. 7.
Block diagram showing principle of a panoramic converter.

The Panoramic Converter

A panoramic converter is the natural method of making a panoramic receiver for the V.H.F. bands. It is normal practice to use a converter for these bands, and further, the high frequency stages often have their tuning pre-set. It is therefore only necessary to arrange to sweep the frequency of the oscillator in the converter. It has already been pointed out that if the 144–146 Mc/s. band is covered with a 25 c/s. repetition rate, the optimum bandwidth is 7 kc/s., a very convenient value.

Fig. 7 shows a block diagram of a panoramic converter for this band. The primary oscillator frequency is 35 Mc/s., and this is multiplied four times to produce a final output varying from 140–142 Mc/s. As usual, the extent of the sweep is controlled by means of a potentiometer which in turn controls the fraction of the sweep voltage applied to the reactor valve; provision is made for switching-off the sweep for normal reception. The mixer output at 4 Mc/s. passes to the input of a normal communication receiver, and the output of this receiver feeds the Y plates of the oscilloscope in the usual way.

(To be continued next month.)

References

1. *Electronics*, July, 1938, p.36.
2. "Panoramic Reception," *Electronics*, June, 1940.
3. *QST*, March, 1946.
4. *A.R.R.L. Radio Amateur's Handbook.*
5. E. C. H. Seaman, "A Panoramic Receiver, 3·5–20 Mc/s." *J.I.E.E.*, Part IIIA, No. 13, 1945.
6. E. M. Williams, "Radio-Frequency Spectrum Analysers" *Proc. I.R.E.*, Jan., 1946.
7. K. C. Johnson, "A New Type of Frequency Modulated Oscillator," *Wireless World*, April, May, 1949.

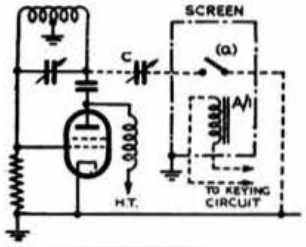
Frequency-Shift Keying for Break-in Operation

BY J. WHITE, (VS7NX)*

IN a recent article (†) it was suggested that where unusual systems of break-in operation are found effective, a short description should be forwarded to the BULLETIN. This suggestion was recalled when, after a lengthy series of unsuccessful attempts to convert a 100 watt commerically-built transmitter to BK operation, a new and this time effective approach was made using frequency-shift keying. While similar systems have been used commercially for many years in order to overcome some of the difficulties associated with the sudden switching on and off of the large currents found in L.F. transmitters, the object in this case is to avoid the chirps and clicks which so often occur when any attempt is made to key a master oscillator. The space-wave, the bugbear of the commercial system, is eliminated by simultaneous keying of the later stages of the transmitter, and—if necessary—by complete screening of the V.F.O.

The Circuit

Fig. 1 shows the system as fitted to a Hartley oscillator: but the circuit could easily be adapted to produce similar results with an E.C.O. or Clapp oscillator. The keying relay R—with low-loss contacts—is used in conjunction with the normal keying relay which provides grid block keying of all later stages. When R is closed an additional capacity C (50 $\mu\mu$F. trimmer) is switched into circuit and lowers the frequency of the oscillator. The oscillator tuning and C are adjusted so that on keying, the frequency of the transmitter is changed from approximately 14,400 kc/s. to the working frequency of, say, 14,050 kc/s. The frequency change of the oscillator itself, which will usually be on 3·5 or 7 Mc/s., will be much less than this figure. The action of the normal keying relay prevents the emission of the 14,400 kc/s. spacer. A frequency shift of this order prevents the V.F.O. from blocking or interfering with reception over the entire 14 Mc/s. band. Alternatively a change-over relay can be arranged so that C is out of circuit when the key is pressed, and the space-wave is then on the L.F. side of the working frequency.



Skeleton circuit showing frequency shift keying fitted to a Hartley oscillator.

It will be appreciated that in order to avoid a poor note the mechanical vibration of the relay must not be communicated to the V.F.O. At VS7NX the relay has been mounted on a soft rubber base and is connected to the oscillator by short lengths of *plastic flex*. These precautions have been sufficient to obtain T9 and T9x reports, while a number of stations have commented upon the excellence of the keying characteristics at speeds up to 45 w.p.m. Careful checks by VS7SV and VS7GR (who is less than a mile away) have revealed no trace of the space-wave. As with almost all BK systems, muting of the receiver is necessary: this has been described elsewhere (†).

At the time of writing, the system has been on trial for almost a month. No snags have been encountered and much enjoyment has been derived from working some half-a-dozen stations—the majority in Europe—equipped for full BK operation. The system has also much to commend it even for normal working. Finally, VS7NX would be interested to hear from other stations adopting F.S. keying.

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(†) "Simple Break-In Systems," by J. P. Hawker, G3VA, R.S.G.B. BULLETIN, October, 1949.

A GENERAL PURPOSE TRANSMITTER using surplus GP7 tuning units

By R. C. ELDRIDGE (G3AGQ) *

Although certain types of surplus tuning units have achieved wide popularity amongst British amateurs, the CAY-47155, which originally formed part of the U.S. Navy 125 watt GP-7 transmitter, has been rather overlooked. Here G3AGQ describes how two of these units can be modified to form the basis of a compact 25 watt V.F.O. transmitter with built-in aerial matching network, for use on 1·8, 3·5, 7 and 14 Mc/s. Cathode keying of the oscillator makes the transmitter particularly suitable for break-in operation.

THE tuning units Type CAY-47155, designed for use with U.S. Naval Aircraft GP-7 radio equipment, offer an advantage over the more widely known BC375 units (TU5B etc.) in that besides the M.O. and P.A. tuned circuits, an aerial tuning and coupling circuit is incorporated. The units are very well constructed, and all the P.A. section components are rated in excess of 2000 volts; the switches are ceramic insulated and have sturdy contacts. The GP-7 transmitters originally employed an 801 oscillator driving an 803 P.A., using several tuning units to cover a continuous frequency range. With minor modifications to the Range C (normally 1·5 to 3·0 Mc/s.) and the Range F (6 to 9 Mc/s.) it is possible to cover the 1·8, 3·5, 7, and 14 Mc/s. amateur bands with only these two units. Figs. 1 and 2 show the two units as modified for 1·8–3·5 and 7–14 Mc/s. Details of the modifications appear later in the text.

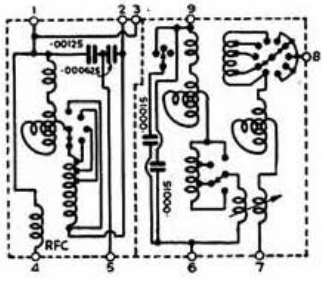

Fig. 1. Circuit of the CAY-47155 tuning unit Range C.

The Circuit

After experimenting with triode and electron coupled oscillator circuits, the circuit shown in Fig. 3 was adopted, this arrangement fulfilling break-in requirements. In the GP-7 transmitters, oscillator keying is accomplished by means of a relay at point X of Fig. 3, in the grid return, but this was discarded because of a slight " yip " on breaks. Cathode keying is completely chirp-free, and although repeated requests have been made during contacts for reports, not a single station has reported any trace of clicks on make or break of the key. Except for the keying method, the circuit of Fig. 1 approximates very closely to the general design of the GP-7.

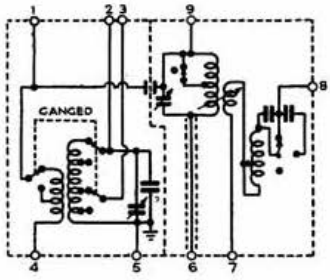

Fig. 2. Circuit of the CAY-47155 tuning unit Range F.

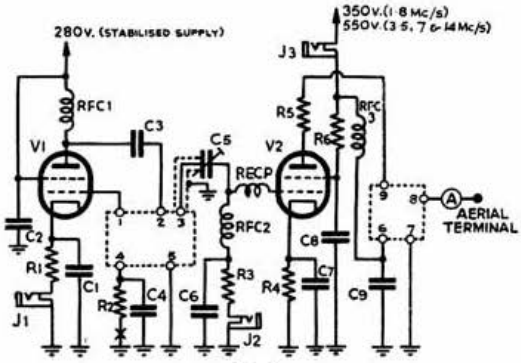

Fig. 3.

Circuit of the transmitter unit mounted on a small chassis designed to plug into the rear of the tuning unit in use.

C1	1 μF.	R5	50 ohms.
C2, 3, 4, 6, 7, 8, 9	·01 μF.	R6	30,000 ohms.
C5	100 μμF.	RFC1, RFC2, RFC3	2·5 μH. all dissimilar types.
R1	800 ohms.	RFCP	V.H.F. parasitic choke.
R2	100,000 ohms.	V1	6L6
R3	5,000 ohms.	V2	807
R4	1,000 ohms.		

The circuit constants were arrived at by practical experiment. It was essential that the M.O. should be keyed for full break-in working, and the most satisfactory method was found to be that of running the P.A. with standing bias and keying the M.O. cathode only. Hence the high value cathode resistor for the 807 and the relatively low value grid leak. If the grid leak value were increased, tighter coupling would be necessary in C5 to maintain P.A. grid drive, which would result in pulling of the oscillator frequency as the P.A. is tuned through resonance. With the values of R3 and R4 as shown, ample drive can be obtained with C5 at only about 25 μμF., and variation of oscillator frequency while tuning the P.A. is less than 500 c/s. on 2·0 Mc/s. R1 was inserted to serve as a measure of protection for V1. The by-pass condenser C1 is larger than normal because the key is in the circuit from terminal 5 of the tuning unit to V1 cathode (*via* earth). Terminal 5 cannot be connected direct to V1 cathode as this terminal is short-circuited to earth inside the Range F unit owing to the nature of its mechanical construction. Deletion of R1 results in an increase of 3 mA. in the oscillator plate current with no change in any other respect. In some cases an R.F.C. will be found necessary between J1 and earth to keep R.F. out of the key leads. At G3AGQ, chokes and click filter are also incorporated in the key itself.

Originally V1 was a 6K6, but this valve would not sustain oscillation with the higher C/L ratio used

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when the Range C unit was modified to cover 3·5 Mc/s.; this was replaced by a 6L6 which oscillates perfectly to the upper limit of the M.O. range (3·95 Mc/s.).

The Outboard Chassis

The valves, associated components, and voltage stabiliser, are all accommodated on a small chassis which plugs into the rear of the tuning unit in use, the 807 being located as close as possible to the left rear corner of the tuning unit so as to keep the anode lead short.

This chassis can take a variety of forms, depending upon individual requirements, and whether the power supply is to be separate or incorporated in the transmitter. The chassis shown in the photograph is slightly larger than is strictly necessary, and incorporates the voltage dividing networks and an STV280/40 voltage regulator but not the power pack. The following points in chassis design should be watched :— avoid interaction between M.O. and P.A. components, especially R.F chokes; keep all wires carrying R.F. as short as possible; efficiently by-pass the heater leads to earth at the valve-holders, and at point of entry to the chassis; mount C5 in such a position that it can be easily adjusted when changing bands, preferably mid-way between the plug panel and 807 valve-holder. If C5 is fitted with a knob, and the chassis marked to indicate minimum coupling usable on each band without loss of R.F. in the aerial, band changing is simplified.

Where the transmitter is to be used only on 1·8 and 3·5 Mc/s. (Range C unit) it will be found neat and convenient to mount the chassis on the top of the tuning unit. However since the connecting leads from tuning unit to chassis and 807 anode are much longer in this method of construction, it is not recommended for use with the Range F tuning unit.

Modifying the Tuning Units

To obviate the fitting of an extra connection to bond the tuning unit chassis to earth, terminal 5 of the Range C unit is strapped to the chassis inside the unit. The Range F unit is already built in this way so no alteration in this respect is necessary.

External additions to the tuning units are :

(1) Short-circuit terminal 7 to chassis.
(2) Solder to terminal 8 a lead for connection to aerial ammeter.
(3) Solder to terminal 9 a lead incorporating R5 and terminating in the top cap connection for the 807.

Modification to Range C unit to cover 3·5 Mc/s.:

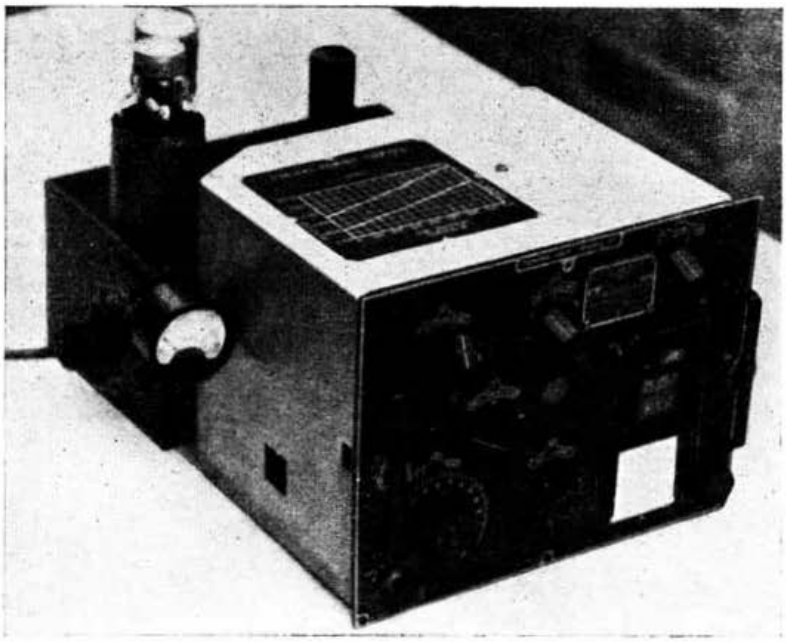
(1) *M.O. Section.*—Identify wire from stud 5 of M.O. tuning step switch to tap on coil. Snip wire from coil tap terminal and resolder to the terminal next to it which holds the top end of the coil winding.

(2) *P.A. Section.*—Identify wire from stud 4 of P.A. tuning step switch to highest tap on coil (5 turns from the top). Snip the wire from the tap, bend it back towards the front panel, and solder it to the terminal at the end of the variometer section of the coil. The 3·5 Mc/s. band will now appear on M.O. step 5 and P.A. step 4.

Modification to Range F unit to cover 14 Mc/s. :

(1) Identify wire from Range 2 stud of P.A. range switch, tapped to P.A. coil 5 turns from end.

(2) Snip wire from tap, remove from switch tag. Solder new length of wire from switch tag to a new tapping point 8 turns from the end. The original wire is not long enough to reach the new tap.



General view of the CAY–47155 showing the transmitter chassis mounted to the rear of the tuning unit.

It has not been found possible to modify the M.O. to cover 14 Mc/s. on fundamental whilst preserving clean stable oscillator keying, and in any case screening and layout must be very carefully designed in the rear chassis if the transmitter is to be stable on 14 Mc/s. with both M.O. and P.A. tuned to the fundamental frequency. The oscillator is therefore left on 7 Mc/s. and doubling is accomplished in the P.A. Good reports have been received on the 14 Mc/s. signals, but it is emphasised that really efficient neutralising is necessary to avoid radiating on both bands at once, and to ensure a T9 note.

The most convenient method of neutralising is to

Continued on Page 96

ETCHING OF QUARTZ CRYSTALS

BY H. E. BENNETT (G8PF) *

These days most amateurs have in their junk boxes a number of quartz crystals whose frequencies are unsuitable for their requirements. The traditional remedy—crystal grinding—is not always so simple or reliable as the textbooks suggest. Here are full details of an alternative frequency-shifting system which is comparatively little known and which possesses many important advantages.

ALMOST every amateur has at least an elementary knowledge of the art of quartz crystal grinding or—to use the correct term—lapping. It is surprising, however, that more attention has not been paid to the alternative system of etching. Far less skill is required, and, with a little care and experience, a selected frequency can be readily attained. Unlike after lapping, the surface of the crystal is not left in a relatively disturbed state which often persists for several weeks and which results in reduced activity as well as some uncertainty as to the final frequency at which the crystal will settle.

Etching is based on a chemical process which many members will remember from the simple but striking experiment of their schooldays. After a piece of glass had been coated with wax, a signature was scratched in the wax with an ordinary needle, the glass then immersed in a particular acid, and after a few minutes removed and wiped clean of wax. It was then found (if no pupil had succeeded in defeating the patient efforts of the master) that the signature remained "etched" in the glass. This same chemical technique can be adapted to quartz crystals: in this case, however, the process causes the crystal to become thinner at an even rate over its entire surface, thus raising the resonant frequency.

* *c/o* 10 *Martin Grove, Morden, Surrey.*

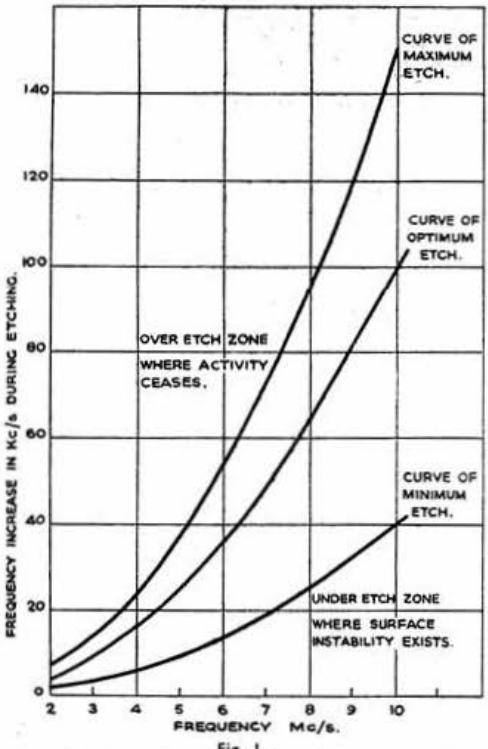


Fig. 1.
Graph showing minimum, optimum and maximum etch for 2–10 Mc/s. crystals.

Limits of Etching

Before detailing the practical technique of etching, it is necessary to provide a few figures as a rough guide to what can—and cannot—be achieved by this system. To obtain the best service from a crystal there is an optimum frequency shift obtainable by etching following lapping. It is determined largely by the nominal frequency of the crystal. This can be easily ascertained as it represents—in kilocycles—the square of the crystal frequency in megacycles. For example the optimum etch for a 7 Mc/s. crystal is of the order of 49 kc/s.

On either side of this optimum figure there are further guiding limits which can be defined as the minimum and maximum etch figures. The minimum etch is achieved when a fairly stable surface is reached: while beyond the maximum etch the surface of the crystal starts to become clear (like glass) causing activity to fall rapidly. Approximate limits for these two figures are:

$$\text{Minimum etch (in kc/s.)} = 0{\cdot}5 \times f^2$$
$$\text{Maximum etch (in kc/s.)} = 1{\cdot}5 \times f^2$$

where f is the nominal frequency of the crystal in megacycles. It will thus be seen that for a 7 Mc/s. crystal, the minimum etch is roughly 25 kc/s. and the maximum etch roughly 75 kc/s. While these figures apply to most types of crystals in common use, it should be appreciated that although the optimum etch is invariably f^2kc/s. the maximum etch can extend up to above 2 f^2kc/s. When it is required to shift the frequency of a crystal more than the maximum etch, it will be necessary to carry out preliminary lapping. Where this is done, the aim should be to lap the crystal frequency to approximately the optimum etch frequency below the final figure required. The graph of Fig. 1 will form a guide. Any lapping must leave the crystal surfaces flat and parallel, while edge grinding or bevelling should be completed before etching is begun.

Materials required

The following materials, tools and equipment are required for etching.

A quantity of etching acid (see details later).

A cleansing agent such as chromic acid, trichlorethylene or carbon-tetra-chloride.

A supply of clean water, preferably warm and running.

A pair of tongs (see details later).

A plastic dish and stirring rod.

A watch or clock.

A drying device; an electric hair drier is almost ideal providing that the crystal is not held too close to the heating element, or in the main airblast.

An oscillator in which the frequency of the crystal can be readily checked, either in its own or in a temporary holder which should be clean and dry.

A frequency meter or accurately calibrated receiver.

In case of accidents, an acid neutralising agent should be kept handy; a solution of bicarbonate of soda is perhaps the most satisfactory, although a concentrated solution of washing soda provides a good alternative.

The Acid Solution

The recommended etching acid is an aqueous solution of *ammonium bi fluoride*. The necessary crystals can be obtained from most chemists, and should be kept in a dry airtight container until required for use: the acid itself is difficult to keep for long periods. The solution is made by dissolving the crystals in warm water in the ratio of 1 lb. of crystals to one pint of water, or *pro rata*. With the help of a little gentle stirring, the crystals should dissolve in about 15 minutes at normal room temperature (60–65 degrees F.). The solution should not be used for a period of at least one hour, and preferably not for 12 hours or so.

Since this acid attacks most metals and all silicates including glass, it must be made and kept in a plastic container. Suitable perspex containers, and also plastic funnels and stirring rods, can be obtained from most photographers' accessories stores. It must be emphasised that the solution is highly corrosive and accordingly should be handled with care; spilt drops may easily cause damage. However the acid is not harmful to the fingers providing that contact is for a few seconds only, that there are no cuts in the skin, and that the hands are immediately rinsed in clean water. The slight fumes given off should not be inhaled continuously for long periods: use of a small fan, or the hair drier previously mentioned, to circulate the air is advisable and the room should be well ventilated.

A pair of perspex tongs is necessary in order to hold the crystal, by its edges, in the acid. Again, standard photographic equipment is suitable after a slight modification has been carried out. Fig. 2 will give a good idea of what is required. To form a slot in which to hold the crystal, the jaws of the tongs are held together in a vice and a $\frac{3}{32}$ in. hole drilled along the join. If the tongs are of an awkward shape, it may be necessary to reshape them slightly in hot water, or hot air. When completed the natural spring of the tongs should comfortably hold the crystal by its edges in the prepared slots.

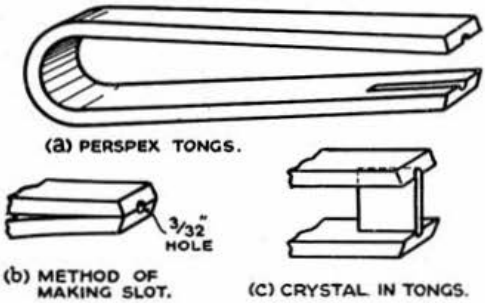


Fig. 2.
Modification of perspex tongs.

Time of Immersion

It is important, before commencing operations, to calculate the approximate time of immersion. A rough guide can be obtained from Fig. 3 which shows the etch time in minutes per 1 kc/s. shift for various fundamental crystal frequencies. The actual time, however, will vary with different qualities and cuts of quartz, and with the temperature of the solution. The graph is based on normal room temperature but the rate of etch can be increased by raising the temperature; the safe limit is about 120 degrees F. It is also possible to speed up the rate of etching by adding a few drops of either (but not both) sulphuric acid or hydrofluoric acid. The process will be slowed down by the use of a weaker solution of *ammonium bi fluoride* or by the recurrent use of the same solution.

In the initial stages, *i.e.* below minimum etch, a BT cut crystal generally etches at a faster rate than an AT cut crystal. If the optimum etch is reached in T minutes, then a BT cut crystal will reach minimum etch in 0·4 T minutes, while an AT cut crystal will take 0·6 T minutes. Although not essential to the process of etching, it is often desirable to know the cut of a particular crystal. This can be easily found with the aid of a micrometer and the following formula:—

$$K = \text{Frequency in Mc/s.} \times \text{Thickness in thousandths of an inch.}$$

Then the approximate value of K, for different types of cut, is: AT 66; BT 100; X 112; and Y 77. This calculation can be avoided by the use of Fig. 4 which shows the thickness of the two most common types of cut (AT and BT) for various frequencies.

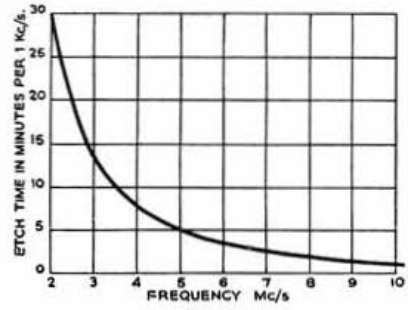


Fig. 3.
Graph showing approximate rate of etch for 2–10 Mc/s. crystals.

The Etching

After an approximate time of etch has been calculated, the crystal should be placed in the slots on the tongs and immersed and agitated in the cleansing agent. The crystal should then be thoroughly rinsed in water and a check made to ensure that all grease has been removed. This can be done by observing whether or not there are any discontinuities in the surface moisture when the crystal is taken out of the water. If the crystal is satisfactory it may then be transferred to the etching bath, and left completely immersed. During these processes the crystal must not, of course, be directly handled.

After a period of not more than half the estimated etching time has elapsed, the crystal should be removed from the acid, immediately rinsed, and then dried (the hair-drier or similar arrangement is a valuable time-saver at this stage). The frequency of the crystal should now be checked and the

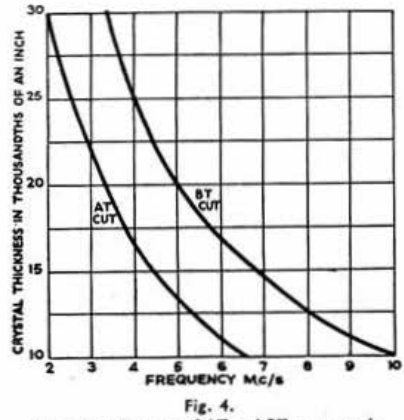


Fig. 4.
Crystal thicknesses of AT and BT cut crystals.

frequency shift compared with the original estimate. This will allow a second, and more accurate etching time to be calculated, after which the process is continued. Until some experience has been obtained, it will be advisable to check the frequency of the crystal several times as it approaches the desired frequency.

When this has been reached, the crystal and the electrodes of the holder should be thoroughly cleaned and dried. During the final assembly great care should be taken not to touch either the crystal or the electrodes. Finally the joints of an enclosed type holder should be given a coating of shellac to make it air and damp proof. If these precautions are carried out then the crystal should give reliable service over a long period.

Hints and Tips

(1) Some crystals have a tendency to "jump" a proportion of their etch frequency; although fortunately this is generally confined to the section between optimum and maximum etch points. If frequency checks show a rate of etch far in excess of Fig. 3 it will be necessary to proceed warily, and to increase the number of checks.

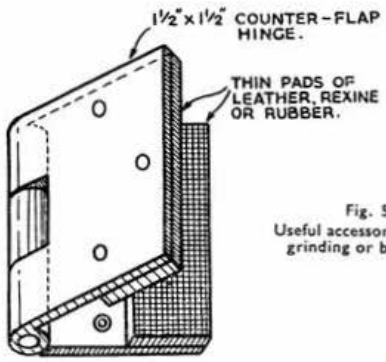


Fig. 5.
Useful accessory for edge grinding or bevelling.

(2) A "sluggish" crystal can generally be improved by slight edge grinding or bevelling. This process has been described elsewhere, but a useful accessory is shown in Fig. 5. This is a device in which to hold the crystal while edge grinding and consists of a 1½ in. square counter-flap hinge with a strip of thin rubber, rexine, soft leather, or cork stuck to each of the inside faces of the hinge.

(3) A chromic acid solution for cleaning quartz crystals can be made by mixing *chromium trioxide* crystals in warm water in the ratio of 1 gram of crystals to 1 c.c. of water. A workable figure is to mix the contents of a 500 gram bottle of crystals with half a pint of water. When the solution develops a green tinge, its useful life is over and it should be neutralised and discarded. Chromic acid will burn the flesh, so take care!

Acknowledgment

The writer is indebted to Mr. K. Clayton, VS1BG, who initiated him into the art of crystal etching, whilst in Singapore a few years ago.

Bibliography

"Piezo-electricity, Quartz Crystals and Frequency Stabilisation," T. & R. BULLETIN, Vol. XII, March, 1937, p. 384.
"A Crystal Hint," T. & R. BULLETIN, Vol. XIV, July, 1938, p. 19.
"Quartz Crystals," *Proc. of the R.S.G.B.*, No. 3, Spring, 1948.
"The Development of Quartz Crystal Production." *Journal of the I.E.E.*, Vol. 94, Part 3A, No. 16, 1947, p. 899.

A GENERAL PURPOSE TRANSMITTER

Continued from Page 96

insert a blank plug into J3 thus removing H.T. from the power amplifier. Next plug a milliammeter into J2, close the key and adjust the neutralising condenser until no flick appears in grid current when the P.A. tuning condenser is swung through resonance on 7 Mc/s. As a check, re-apply H.T. to the power amplifier and ensure that maximum P.A. grid current coincides with minimum plate current on resonance. Make any minute changes in neutralising condenser capacity which may be necessary but remember that one side of this condenser is at H.T. potential!

The oscillator H.T. is stabilised at 280 volts with an STV280/40. With 350 volts on the P.A. ten watts input can be obtained comfortably on 1·8 Mc/s. On the other bands 550 volts is used on the P.A., under which conditions standing current in the 807 is less than 40 mA. with key up (no interference from "noise radiation" has been experienced); with key down the 807 can be loaded to 25 watts.

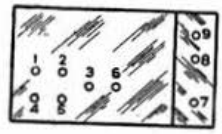


Fig. 4.
Rear view of tuning units, showing terminal numbering. These numbers correspond to those of the original U.S. Navy diagrams.

A 250 ft. end fed aerial is used on all bands, connected direct to the transmitter without a supplementary aerial tuning unit. This aerial can be brought to resonance solely by means of the aerial tuning and coupling controls on the tuning units. The aerial loading control enables the M.O. to be adjusted and the P.A. brought to resonance without radiating one of those disagreeable swishing signals which are too often heard. The aerial tuning is very broad, so that adjustment of aerial tuning is necessary only when changing frequency by 50 kc/s. or more on 1·8 Mc/s. On 3·5 Mc/s. one setting will cover the C.W. band without further adjustment.

The writer would be interested in receiving comments on these tuning units, especially from any member who has succeeded in producing a stable 14 Mc/s. signal from the Range F unit running both M.O. and P.A. on 14 Mc/s. The assistance of K2BK in obtaining data on the GP-7 range of transmitters is gratefully acknowledged.

Editorial

(continued from page 85)

the strategic field radio amateurs might well be called upon to operate and maintain point-to-point links: a further good ground for encouraging amateur television.

The closed-circuit experiments reported in the May issue of the BULLETIN served to show that radio amateurs of the present generation are as resourceful as those of an earlier age. In that connection it is interesting to recall that as far back as 1927, Captain A. G. Wilson and Mr. E. L. Gardiner (now a Past President of the R.S.G.B.) demonstrated with great success their 120-line television equipment at University College, London, during an exhibition arranged by the Television Society. Visitors were televised at one end of the large Physics Laboratory and projected images were displayed at the other end of the room. Those who witnessed the experiments still speak with enthusiasm of the excellent results achieved at a time when television was still a long way from becoming a national form of entertainment.

J.C.

THE TALKING BOOK

THE Talking Book Service for blind people has been in operation for nearly fourteen years, providing the blind or nearly blind with long playing recordings of modern and classical fiction, biography, history, travel and Biblical selections, free of charge. The aim of the library—at present—is essentially to provide recreation: foreign language records and study courses are not available. Comparatively little publicity has been given to this work, since the number of record-players, which are usually purchased by the blind people themselves, is limited and there is already a long waiting list.*

The books are recorded on 12 in. double-sided records, similar in appearance to ordinary gramophone records, at a speed of 24 r.p.m. and with 200 grooves to the inch, giving a playing time of approximately 25 minutes per side. American recordings—and some British ones—have been made at 33 r.p.m., giving a playing time of about 17 minutes. The record-players are adjustable for either speed. Each book comprises several records, the even-numbered sides of which carry ordinary printed labels. The first odd-numbered side is embossed with Braille lettering, and subsequent records with Braille and Arabic figures. Blind listeners can thus select records for themselves.

There are two main types of record-players in common use, both manufactured by *Decca:* an all-electric model for A.C. mains; and a model with a double-spring *Garrard* clockwork motor and a battery amplifier. There are also in use a few models manufactured by *H.M.V.* with rim drive motors and some special types for persons who are unable to use their hands. Each unit uses an electrical pick-up with a simple audio amplifier, the circuit diagram of which is affixed to the inside of the case.

The Apparatus Used for Talking Books.

Pick-up and Needle

Three types of *Decca* pick-up heads are in use: type "A" (with knurled thumb-screw) with a D.C. resistance of about 23 ohms; type "C" with a D.C. resistance of about 500 ohms; and type "D" with a D.C. resistance of about 3,500 ohms. The heads are fitted to the pick-up arm by means of a miniature bayonet fitting, similar to, but much smaller than, an ordinary electric lamp plug and socket. Each needle is expected to play about 400 records (usually equivalent to 12 months use) after which the heads must be returned to the Library where new needles are fitted. Occasionally a needle is suspected to be faulty when the real trouble is a worn record; a new recording is therefore sent for test purposes on request. With the type "A" head, the fitting sometimes becomes loose due to the grub screw failing to grip the socket: such heads have to be returned for replacement. To prevent damage to the needle, the pick-up head should always be removed when carrrying out inspections or repairs.

Pick-up setting device

An ingenious lifting and lowering device has been specially developed to reduce wear in the first grooves of the record when the instrument is operated by a blind person. This device incorporates a middle position to enable the head to be lifted from the record during playing, and then

* Applications must be submitted to the National Institute for the Blind, 224 Great Portland Street, London, W.1, or —in the case of ex-Servicemen—to St. Dunstan's, 191 Marylebone Road, London, N.W.1.

AN URGENT APPEAL

THE Sound Recording Board of Directors of the National Institute for the Blind and St. Dunstan's has asked the Council of the R.S.G.B. to enlist the aid of members who would be willing to advise present and future users of the Talking Book Library in the correct operation of their record-players.

This remarkable library service, which has been in existence for 14 years, enables blind and nearly blind persons to enjoy the facilities of a lending library. Many full-length books have been specially recorded on long-playing discs for use in their homes. Just think what this would mean to you, if you were blind.

But it has been found, all too often, that the best use is not made of the equipment: the records are played at wrong speeds; the tone control is ignored; the special setting device is poorly operated . . . little faults, easily explained by personal contact, but almost impossible to rectify by correspondence!

A list is, therefore, being compiled of members in the U.K. who would be willing to give advice to users of this library in their own district. It is not likely that there will be many calls for the assistance of any particular volunteer, but it will, nevertheless, be of the utmost value to the organisations concerned in this humanitarian work to know that there are people, with a radio background, ready in every town to help, if required.

Just send YOUR name and address to the National Institute for the Blind, Talking Book Dept., 12 Oval Road, Camden Town, London, N.W.1. As soon as your postcard or letter is received, further information will be sent. *WRITE TODAY!*

replaced later in approximately the same position. The knob which controls this device has to be operated smoothly and gently, otherwise the first few grooves may be lost. The recommended method is to move the knob to the middle position, changing the grip before moving it right over. If the device does not function correctly, or is stiff in operation, it may require lubricating with a small amount of thin oil. A less frequent fault, which may result in the pick-up arm sliding inwards when operating the device, is due to the pedestal which supports the base of the pick-up spreading slightly and thus permitting the end of the pick-up to drop. The remedy is to fit a washer (about 11/32 in.) between the bush in which the spindle revolves and the pedestal itself. The Library readily supplies full instructions for performing this operation.

Motors

The motors are of a special type with the field winding and gearing designed for long-playing records. Faults, when they occur, can usually be cleared by simple adjustment and lubrication. The motors are adjusted by means of a brass bush at the end of the motor casing: if too loose, the motor will "hunt"; if too tight, it will not start. Oiler holes are provided for lubrication which should also be applied to the brake pads when necessary.

Requests for replacement parts should be sent direct to the National Institute for the Blind, Talking Book Dept., 12 Oval Road, Camden Town, London, N.W.1, enclosing the faulty parts.

Common Difficulties

While real faults, such as some of those described above, do, of course, develop from time to time and are generally dealt with by a radio service engineer, many blind people fail to make the best use of their record-players because of the difficulty of instructing them by correspondence in the correct use of their apparatus. Frequent causes of unsatisfactory performance are:—

(1) Inability of the blind person to appreciate the function of the speed regulator, fitted to enable either 24 or 33 r.p.m. records to be played. These regulators are not calibrated but should be adjusted until the speech sounds of normal pitch.

(2) Failure to use the tone control to reduce background and scratch noise on worn records.

(3) Failure to operate the lifting and lowering device correctly, particularly the use of the middle position which enables records to be interrupted without the need to play the entire side through when listening is resumed.

(4) Wrongly assuming that noisy reproduction necessarily means that the needle requires replacement (unfortunately some records have to be issued in a worn condition).

(5) Wasting the batteries or mains supply by leaving the amplifier switched on.

(6) Plugging headphones into the record-player without first reducing the volume. As this practice can have bad effects on the listener, advice is always given never to connect headphones while the record is running.

(7) Inability to change the pick-up head when the replacement is received.

(8) Not knowing what to do if even the slightest fault develops.

It is important to remember that a blind person sees through his hands: when describing anything which can normally be seen and which is safe to touch, an instructor should place the hands of the blind person on that part.

More D/F Contest Results

KEEN competition was evident at all centres in the qualifying rounds of the 1950 R.S.G.B. D/F Contest, some entrants travelling considerable distances to take part in one or more events. In addition to the events at Edgware, Romford and High Wycombe, a contest was also held in the Birmingham district under the auspices of the Slade Radio Society. Fourteen teams have been invited to take part in the final event on October 1, organised by Mr. J. M. S. Watson.

Romford: August 13, 1950. Twelve competitors participated, of whom six succeeded in locating the transmitter, carefully concealed in bracken and fern in Epping Forest, near Theydon Bois. Advantage was taken of low-flying jet aircraft to prevent the operator's voice from reaching the D/F teams directly in the final stages of the event when several entrants passed within a few feet of the hidden transmitter without spotting it.

Place	*Competitor*	*Time of Arrival*
1	S. T. Smith, G3BSI (Southend)	1602
2	J. Frings, G3FFH (Southend)	1616
3 (Tie)	W. F. Holdaway, BRS15028 (Chadwell Heath)	1624
	F. Wisdom, G3DNL (Romford)	
	J. L. Salter, G3DQC (High Wycombe)	
6	P. Charlton, G3CPC (Romford)	1629

Birmingham: August 27, 1950. Seven teams entered (one non-starter), of whom four located the transmitter. First home was Mr. J. K. Finch, BRS15688, who succeeded the following week in leading the field at High Wycombe. Tea was afterwards provided at The Globe, Alcester.

Place	*Competitor*	*Time of Arrival*
1	J. K. Finch, BRS15688 (High Wycombe)	1529
2	C. N. Smart (Slade Radio)	1555
3	C. H. Young, G2AK (Birmingham)	1627
4	S. J. Phillips (Birmingham)	1627

High Wycombe: September 3, 1950. This event attracted the largest entry of the series: 19 (two non-starters), of whom ten succeeded in locating the transmitter hidden in dense undergrowth on Coombe Hill, near Wendover. With the transmitter more than half a mile from the nearest road, the narrow tracks and muddy conditions proved a considerable handicap, but this did not prevent BRS15688 from reaching the hideout in 65 minutes (total transmission time 18 minutes). Some seventy competitors and friends afterwards sat down to tea at the Little Abbey, Missenden. Local prizes, generously donated by G4NT, were presented to the first three competitors and the first lady to arrive at the transmitter.

Place	*Competitor*	*Time of Arrival*
1	J. K. Finch, BRS15688 (High Wycombe)	1505
2	J. Salter, G3DQC (High Wycombe)	1533
3	W. F. Holdaway, BRS15028 (Romford)	1535
4	R. K. Seabrook (Southend)	1603
5	C. H. Smart (Slade Radio)	1605
6	F. A. Wisdom, G3DNL (Romford)	1611
7	R. D. Charlton, G3CPC (Romford)	1612
8	R. H. Sumner, G3BTV (Oxford)	1623
9	C. H. Young, G2AK (Birmingham)	1624
10	J. Frings, G3FFH (Southend)	1629

The Short Wave Magazine

WHILST the recent dispute in the printing industry was at its most critical stage, and it appeared unlikely that the September issue of the BULLETIN would be published at all, Mr. Austin Forsyth, Managing Editor of *The Short Wave Magazine*, offered to let the Society have one full page in his October issue for R.S.G.B. notices or announcements.

Although the dispute terminated in time for this issue to appear during September, the President, Council and Editorial wish to put on record their appreciation of Mr. Forsyth's kind offer.

QUA

MORE than 400 **emergency messages** were handled by Australian amateurs during floods in the Forbes and Dubbo areas of New South Wales last April. This raises the number of occasions on which VK stations have carried out similar work in the last eighteen months to eight. During the severe floods in Winnipeg, Canada, commercial communication services were not disrupted but nevertheless Canadian amateurs helped speed the overflow of official and personal enquiry messages. Traffic drill and practice runs are held regularly in the United States, Australia, Canada and New Zealand.

Under the title *Don't blame the Ham—take his advice*, **"Flyback"** writing in the *Liverpool Echo* offers timely advice to viewers who blame radio amateurs for all their television troubles. He stresses that amateurs are only too glad to help and advise ordinary listeners and viewers, and that they are usually responsible for only a fraction of the interference for which they are blamed.

That **Safety First** should be the motto of every amateur has been brought home all too vividly to **G. D. Davies, G2FXA.** Examining his 1,250-volt power supply—with the mains disconnected and the assurance that a high wattage resistor was across the high voltage condensers—G2FXA was about to plunge his hand inside when he thought of those BULLETIN warnings. So just to make quite certain he put an insulated screwdriver across the condensers: whereupon it immediately disintegrated into thousands of fragments of red hot metal. Yes, the bleeder resistor *had* burnt out.

The recent cross-channel television broadcasts have produced some interesting observations on **micro-wave propagation.** Engineers testing the Calais-Dover link found that the strength of signal received at Dover fluctuated with changes in the weather and the tides, and was even affected by the passage of ships through the Strait. Very careful siting of the receiving equipment was necessary to overcome these difficulties. The 95 miles from Calais to London were covered in four hops; Calais-Dover; Dover-Warren Street (near Lenham); Warren Street-Harvel; Harvel-Senate House, Bloomsbury.

Date: August 11, 1950. Time: 1720 B.S.T. Place: 7 Mc/s. Station: G——. Message: *R SOLID OM . . . PSE GIVE QTH AGAIN.* Comment superfluous.

The Cornish *Radio Link* tells how **G3AET** and **G3AGA** spent several pleasant summer afternoons dashing off to the beach, parking the family on the sands, stringing up an aerial to the nearest tree or bush, and then going into action as G3AET/P. Unfortunately their first effort was somewhat marred by the fact that although they took enough gear to work China both operators forgot . . .? The Morse Key! But by the end of the afternoon they could manage a comfortable 6 w.p.m. on two bits of wire. An otherwise enjoyable contact, with an F8 ended abruptly when, by mistake, AGA caught hold of the bared ends of the wire!

The keen interest shown in Amateur Radio by trainees at the Portland Training College for the Disabled, near Mansfield—the first school of its type in the Midlands—has been commented upon in the *Derby Evening Telegraph*. Responsible for this enthusiasm is **Harold Clamp, G2CRL,** who has set up his station at the College. Injured 20 years ago in a works accident, G2CRL is receiving a six-month training as a craftsman; and is, in turn, helping to bring new horizons to those who might otherwise be condemned to a life of inactivity.

The American **CQ magazine** says: "Just as the crossing of the 38th parallel by the North Korean forces demonstrated to the country the need for a strong army of fighting men, so has it demonstrated to us the need for a great team of amateur radio operators, used to working under QRM and QRN conditions . . . or as technicians ready and able to furnish emergency repairs to electronic gear."

The things **thieves** take. VK2JT recently lost a B28 receiver when his shack was broken into. A 12-hour interruption in the transmission of Korean war news was caused by a Japanese who cut out 25 feet of cable to sell in the black market.

After many years of "semi-official" existence, **LX amateurs** are now officially licensed after examination by the Luxembourg Government. Operation is permitted on all bands authorised by international regulations. Close liaison has been established between the authorities and the national society: *Réseau Luxembourgeois des Amateurs d'Ondes Courtes.*

Most fascinating radio story of the month comes from the pages of the *New Yorker*. A lady, whose veracity is vouched for, keeps a cat which habitually sleeps on top of her radio. Restless during the broadcast of a string quartet, the cat jumped on to the table on which the set rests and started turning the knob. After trying a number of stations, giving each one a minute or two, the cat is said to have found a popular programme of gramophone records, jumped back on top of the set and stretched out, purring.

Mrs. Dorothy Evans, W1FTJ, is the new President of the *Young Ladies' Radio League*. Miss Nell Corry, G2YL, is a District Chairman . . . third party messages are now permitted between the U.S. and U.S. possessions, and Canada, Chile and Ecuador . . . D/F contests are generally known on the Continent as "foxhunts" . . . "pirates" are usually termed "bootleggers" in the United States and "black stations" in parts of Europe . . . eighteen British amateurs now hold the W.A.Z. award . . . in certain of the United States, radio amateurs can now use their call letters in place of numbers on their car licence plates.

Licences Withdrawn

AN amateur licence has recently been withdrawn indefinitely by the P.M.G. due to "interference on Safety Watch and Television frequencies, and failure to check frequency before transmitting." Earlier this year another licence was similarly withdrawn due to "infringements of licence conditions: (1) by allowing the station to be operated by unauthorised person in absence of licensee and authorised additional operator; (2) by falsification of log; and (3) by operating the station at an unauthorised address."

Piracy

THE Radio Branch of the Post Office ask that when unlicensed operation is suspected members should report the matter to the local G.P.O. inspector or to R.S.G.B. Headquarters. It is not advisable to communicate with the local press for by so doing the pirate is warned and difficulties then arise in tracing him.

NATIONAL RESU

WINNING GROUP: CHELTENH
RUNNERS-UP: CAMBRIDG
LEADING "A" STATION: COVENTRY
LEADING "B" STATION: WEST CORN

Margaret ("Meg") Mills at the controls of a *Marconi* "Electra" receiver at the Dulwich and New Cross "B" station which used her well-known call, G3ACC/P.

AS has already been recorded in the July issue of the BULLETIN, the number of entries for National Field Day is again a record. Participants could almost certainly be numbered in four figures. Many of the groups near the head of the list will be recognised as regular rivals for the elusive trophy, but it is pleasing to note that newcomers are also well in the running. GW, GI and GM prefixes appear in the first twenty positions, the two leading GM groups being separated by but a single point. The North Buckinghamshire group—reported in the July issue as manning two stations with only three operators—deserve congratulation for their appearance at seventh place.

Leading Groups

Cheltenham, who have gained high positions many times, now win the trophy for the first time. Their "A" Station, G3LP/P, used from 4 to 5 watts to an 807, driven by a 6J5 E.C.O. with a 6V6 as buffer or doubler. A 268ft. aerial, centre-fed with tuned 600-ohm feeders was switched between the transmitter and a BC342 receiver. Power was obtained from 12-volt accumulators with a vibrator pack for the oscillator and rotary converters for the remaining stages of the transmitter and also for the receiver. Their "B" Station, G5BM/P, again with 5 watts to an 807 in a three stage transmitter, used a 6AG7 "Clapp" type oscillator

Visiting amateur G3IP took this photograph of GC8NO at the Jersey station. Yes, it *is* a tent!

Psn.	Town or Area.	"A" Station.		"B" Station.		Combined Score
		Call Sign.	Pts.	Call Sign.	Pts.	
1	Cheltenham	G3LP/P	438	G5BM/P	409	847
1	Cambridge	G4MW/P	464	G8PB/P	354	818
3	Slough ...	G3XH/P	466	G6CJ/P	339	805
4	Ealing ...	G8IH/P	517	G3CBN/P	285	802
5	Southampton ...	G6II/P	473	G8FG/P	326	799
6	Bromley and Beckenham	G6HD/P	402	G4AU/P	391	793
7	North Buckinghamshire	G2DTD/P	488	G3AZ/P	303	791
8	Dulwich and New Cross	G3CU/P	413	G3ACC/P	370	783
9	East Molesey	G6GB/P	398	G8IP/P	384	782
10	Cranwell ...	G6PZ/P	459	G2LR/P	317	776
11	Burnley ...	G8TD/P	407	G3SJ/P	362	769
12	Croydon ...	G2RD/P	429	G5BZ/P	322	751
13	Brighton and Hove ...	G5AO/P	410	G3YY/P	340	750
14	Brentwood	G3LA/P	377	G8RC/P	369	746
15	Neath and Port Talbot	GW4NZ/P	461	GW2AVV/P	274	735
16	Belfast ...	GI5SJ/P	308	GI2FHN/P	426	734
17	Boston ...	G8BQ/P	407	G2AAS/P	325	732
18	Medway Towns	G2HAU/P	367	G5FN/P	363	730
19	Bristol ...	G6RB/P	394	G3RQ/P	331	725
20	Forfar ...	GM2HIK/P	300	GM3EAK/P	416	716
21	Falkirk ...	GM4JQ/P	289	GM4MF/P	426	715
22	Gravesend and Cray Valley ...	G3FST/P	507	G3MZ/P	195	702
23	Chingford	G8JM/P	427	G8AL/P	272	699
24	Glasgow District	GM8MJ/P	334	GM8RJ/P	364	698
25	Chelmsford	G5RV/P	411	G3BLA/P	283	694
26	Sheffield ...	G8NN/P	398	G5TO/P	292	690
26	Worthing	G3BF/P	362	G4NY/P	328	690
28	Uxbridge	G2FMF/P	459	G6JJ/P	229	688
29	Norwich ...	G2YU/P	426	G3VM/P	229	655
30	Stroud ...	G5HC/P	418	G5WA/P	235	653
31	Stourbridge	G2NV/P	444	G6OJ/P	205	649
23	Northumberland	G4LX/P	353	G4QA/P	291	644
33	Aberdeen	GM3ALB/P	211	GM6LG/P	427	638
34	Derby ...	G3ERD/P	346	G5YY/P	291	637
35	Southend	G5QK/P	325	G5VQ/P	307	632
36	Swindon ...	G2MM/P	354	G4AP/P	276	630
37	Hendon and Edgware	G5FG/P	323	G2IM/P	302	625
38	Loughborough	G4MM/P	345	G2KK/P	275	620
39	Sutton and Cheam	G8DF/P	403	G4DH/P	216	619
40	Reading ...	G6WO/P	347	G8TH/P	263	610
41	Eastbourne	G3DIV/P	373	G4FV/P	232	605
42	Ashford (Kent)	G2JF/P	338	G2QT/P	258	596
43	Bradford	G3ADQ/P	290	G2DJS/P	305	595
44	Grimsby and Cleethorpes	G4GZ/P	394	G4XC/P	188	582
44	Ilford ...	G8TL/P	320	G6HU/P	262	582
46	Bury ...	G2GA/P	379	G3BRS/P	180	579
47	Ipswich ...	G4RW/P	259	G8MU/P	318	577
48	Coulsdon	G2DN/P	361	G2KU/P	215	576
49	Gloucester	G3MA/P	328	G2RT/P	247	575
50	Newport (Mon.)	GW8CT/P	355	G4GR/P	216	571
51	Oxford ...	G8PX/P	323	G2DU/P	242	565
52	Scarborough	G8KU/P	305	G5MV/P	259	564
53	Barnes and Richmond	G6RC/P	320	G4GD/P	240	560
54	Wirral ...	G2AMV/P	384	G3CK/P	173	557
55	Leicester	G4BB/P	359	G2RI/P	188	547
56	High Wycombe	G3FSZ/P	282	G3DQC/P	259	541
57	Rugby ...	G3GG/P	338	G4KK/P	199	537

FIELD DAY LTS

AM (G3LP/P and G5BM/P) .. 847 pts.
E (G4MW/P and G8PB/P) .. 818 pts.
(G5GR/P) .. .. 522 pts.
WALL (G2WW/P) .. .. .. 431 pts.

Pstn.	Town or Area.	"A" Station.		"B" Station.		Combined Score
		Call Sign.	Pts.	Call Sign.	Pts.	
58	Coventry...	G5GR/P	522	—	—	522
59	Liverpool	G8DI/P	296	G3DPZ/P	218	514
60	Stonehaven	GM3EHH/P	161	GM3AXR/P	349	510
61	Berwick-on-Tweed	G2YY/P	259	G6UC/P	250	509
62	Llandudno	GW4MZ/P	221	GW3ELM/P	284	505
63	Torbay ...	G3AVF/P	316	G2GK/P	187	503
64	Hayes (Middx.)	G8FA/P	299	G3XD/P	202	501
65	South Shields and Sunderland	G3DDI/P	259	G3CSR/P	239	498
66	Exeter ...	G3JW/P	200	G5QA/P	278	478
67	Worcester	G3GJL/P	277	G8JC/P	197	474
68	Edinburgh	GM5YW/P	228	GM5HL/P	244	472
69	Bolton ...	G2BTO/P	388	G2HGR/P	83	471
70	West Cumberland	G3SY/P	248	G3GAT/P	221	469
70	Woolwich, Plumstead and Abbey Wood ...	G3EIW/P	355	G3FRB/P	114	469
72	Tunbridge Wells and Tonbridge	G2UJ/P	267	G8KG/P	200	467
73	Hull ...	G2KO/P	284	G3PL/P	172	456
74	Barnsley	G5IV/P	197	G6LZ/P	258	455
74	Montrose	GM3KC/P	277	GM4MQ/P	178	455
76	Slaithwaite	G8NF/P	320	G3ATM/P	130	450
77	East Ham	G2ZZ/P	310	G3CJQ/P	135	445
78	Watford ...	G2QB/P	444	—	—	444
79	Jersey ...	GC8NO/P	258	GC2FMV/P	183	441
80	Lincoln ...	G4BU/P	288	G5XL/P	148	436
81	Romford	G4KF/P	432	—	—	432
82	West Cornwall	—	—	G2WW/P	431	431
83	Great Yarmouth	G3EQS/P	260	G3AJP/P	165	425
*84	Cardiff ...	GW5BI/P	254	GW8UH/P	163	417
85	Portsmouth	G6NZ/P	236	G8WC/P	176	412
86	Christchurch	G3CSX/P	255	G8DL/P	138	393
86	South Birmingham	G8JI/P	251	G8PN/P	142	393
88	Dunfermline	GM3ACD/P	172	GM3EGW/P	214	386
89	Darwen and Blackburn	G2HW/P	365	—	—	365
90	Flintshire	GW4CX/P	364	—	—	364
91	Petersfield	G2XC/P	359	—	—	359
92	Darlington	G2CKN/P	197	G3BQJ/P	159	356
93	Welwyn Garden City	G5UM/P	345	—	—	345
94	Finsbury Park ...	G3DCC/P	264	G2BAB/P	73	337
95	Malvern ..	G2AO/P	181	G2XX/P	155	336
96	Southport	G3EFA/P	328	—	—	328
97	Peterborough	G3EEL/P	210	G3BHD/P	113	323
98	Beaconsfield	G3BI/P	322	—	—	322
99	Dundee ...	GM4HR/P	202	GM4NR/P	115	317
100	Middlesbrough	G5YP/P	95	G3CFC/P	220	315
101	Wanstead and Woodford	—	—	G8PC/P	308	308
102	Barnet ...	—	—	G6CY/P	302	302
102	Luton ...	G3ASD/P	227	G3AST/P	75	302
104	West Wiltshire ...	G2PS/P	297	—	—	297
105	Chester ...	G3GIZ/P	281	—	—	281
106	Thanet ...	G8QB/P	272	—	—	272
107	Preston ...	G8NY/P	107	G3PJ/P	163	270
108	Blackpool	—	—	G8GG/P	261	261
108	York ...	G3FYP/P	80	G5KC/P	181	261
110	Plymouth	G3TX/P	255	—	—	255
111	Dorchester and Weymouth	G2TZ/P	244	—	—	244

Continued on Page 114.

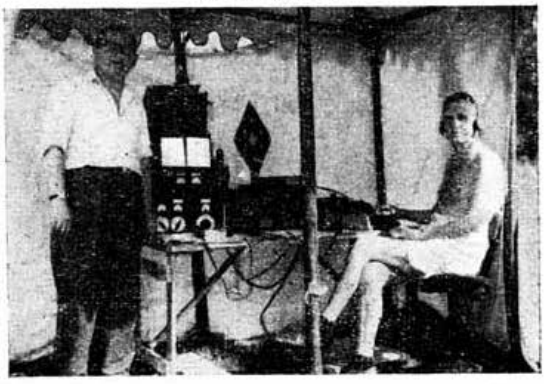
That anxious N.F.D. look appears in this view of G4DC (left) and G3CU (T.R.) at the Dulwich and New Cross "B" station in the grounds of Goldsmiths' College.

and a 6AC7 as buffer or doubler. The receiver was a BC312. The aerial was a dipole, arranged to resonate on either band by a pair of relays about 16 feet from each end. By this means, a low impedance balanced twin (non-resonant) feeder was used, with relay switching between transmitter and receiver. Power was again derived from accumulators with separate rotary converters for transmitter and receiver.

Cambridge take second place, the ubiquitous 807 again finding favour at their "A" Station, G4MW/P. An EF50 E.C.O. supplied the excitation, and an *Eddystone* 640 looked after the incoming signals. Their aerial system was a dipole for 3.5 Mc/s., arranged as a top-loaded quarter-wave for 1.8 Mc/s. Power was derived from a petrol-electric generator. Their "B" Station, G8PB/P, used an E.C.O.—doubler—TT11 P.A. transmitter, the final doubling for 14 Mc/s. A 67ft. wire with 300-ohm line was switched between the transmitter and the HRO receiver. Accumulators supplied the power.

Coventry, runners-up in last year's event, lead the "A" Stations. They used a V.F.O. followed by a TT11 as amplifier or doubler and a BC312, in conjunction with a 200ft. aerial. Generators fed by accumulators were the source of power.

The East Molesey Group, 1949 champions, took along the N.F.D. Shield for inspiration. This view of the "A" station at Broadmoor, Dorking, shows Council Member Les Cooper (G5LC) with Gerry Billison (G6GB) who built the transmitter.



The Gravesend "A" station—G3FST/P—made good use of a neat gang-tuned transmitter built by G3EJK. In this group can be seen: Back row (left to right), G6BQ, VQ4HJP and G3EJK; front row, BRS9195 (T.R. second from left), G3FST (extreme right).

A cheerful group at the combined Rugby station at Water Tower Farm. Left to right: G3AZT, G3AUT, G4RH, G4KK, BRS17034, BRS8711, G3BLB, G3SL, G3IS, G3GG, G3AUF and G3BAA. (*Photo:* G. L. Blackwell.)

G2DCU, 3CRK and 3BWC were among the operators at G3XD/P, Hayes. A National NC173 was used for reception.

The General Secretary (G6CL) was a welcome visitor at the Edgware-Hendon station. In this group are: G2IM, G8KZ, G3BPM, G5DJ, G4KD, G6CL, G3HT and G5FG. (*Photo:* G3EKH.)

Members and friends at the Christchurch (Hants) stations included: BRS2692, G8DL, G3CSX, BRS9196 (T.R.), BRS3762, ex-VU2FV/Z, G3CVE and G3AJG.

The leading "B" Station comes from the remoteness of West Cornwall. Their station, G2WW/P, used an 807 in each of the separate P.A. stages, with a "Clapp" V.F.O. and EF50 intermediate stage. The receiver was an AR88LF and the aerial a 67ft. top, tapped at 22 feet with 300-ohm ribbon feeder. Accumulators supplied heaters and, with a rotary converter, the later stages of the transmitter. Batteries were used for the V.F.O. and receiver H.T.

Comments From Entrants

As is usual with this event, few comments accompanied the entries. It is therefore difficult to assess the general opinion, as views expressed may not be representative. One point, however, is made in all the letters, *viz.* that the event was thoroughly enjoyed.

The simplification of the equipment required received favourable comment from several quarters, but the aerial restrictions seem less popular, in spite of the fact that they were based on a majority view expressed by a large proportion of the groups taking part in the 1949 event. Clearly, they must be considered carefully when rules for the next contest are prepared. The inclusion of the "QTR" in the report receives both praise and criticism.

Comments To Entrants

The general criticism of the inclusion of "QTR" is that it is a waste of time, and slows down contacts. It is therefore necessary to emphasize that one purpose of its inclusion *was* the slowing down of contacts, in the hope that greater accuracy of operation would result. N.F.D. originated as a test of portable operation under emergency conditions, during which it would be necessary to exchange traffic with the other stations. Surely, the *accurate* exchange of "messages" is of more importance than the number of exchanges made.

Comments have been made in the past that the deduction of points for inaccurate exchanges of reports and similar errors is unfair, in that the leading stations are more likely to be accurate than those away down the list. It is true that some entrants set out to win the contest, whilst others merely aim for a pleasant week-end. But it is quite evident from scrutiny of the logs that many of the serious contestants are careless in operating, or log-keeping, or in both. After the 1949 event, comment was made on this inaccuracy. This report would not give a true account of the event without further stressing this point.

Carelessness in observing the rules is the principal cause of the list of disqualifications at the foot of the table.

Thirteen logs were welcomed from overseas. The station providing most points to competitors was ZB1FK/P.

By "DONEX"

In the Workshop

AERIAL RIGGING

A GREAT deal of information has been given in radio publications on aerial systems but unfortunately the simpler points of "rigging" are usually omitted. The obsession with most amateurs appears to be an overwhelming desire to get an aerial system up in the air somehow without any reference to its safety or permanence. Whilst metal or wooden towers grow in popularity for the support of beam arrays, they are inherently more expensive to make or buy than the humbler "scaffold-pole," which remains the popular support for wire aerial ssytems and, in many cases, beam arrays.

As many have discovered, it is no easy job to erect a 30-40 foot pole and rig it so that it will stand up to the rigours of several winters without further attention.

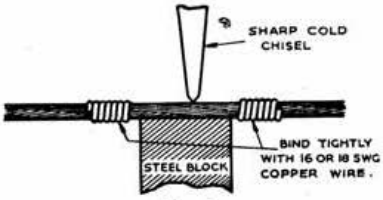


Fig. 1.
Cutting Steel Cable

It is not proposed here to give full instructions on the erection of a mast, as these have appeared on innumerable occasions—but rather to deal with the "do's" and "don'ts" of detail work, and to give guidance on the simpler points, which are too often overlooked.

Treatment of the Pole

Try and select a pole which has the minimum of "shakes" or splits throughout its length. But remember these "shakes" often look more serious than they really are and should not be considered a major defect. Saw off the top of the pole square and apply a liberal dose of creosote. Then cap the pole with a disc of hardwood by means of 2 or 3 long french nails (*i.e.* nails of oval section).

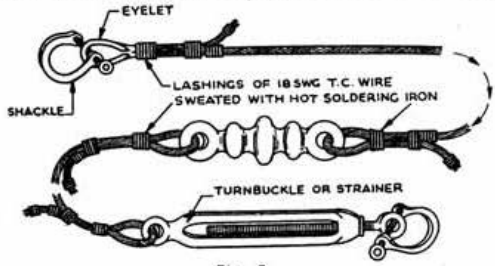


Fig. 2.
Making up Guy Wires

Saw off the butt of the pole square and again treat with creosote. If you cannot afford to treat the whole pole with creosote (as is desirable) pour in a quantity wherever "shakes" appear: this will prolong its life tremendously. Also apply creosote to the visible knots or stubs where branches have been sawn off.

If the pole is to be sunk to some degree in the ground it is necessary to dope the butt heavily especially at the point "between wind and water" where detriment takes place at such an alarming speed. When treating the pole in this manner do not leave it lying on the ground but support it evenly on bricks or similar blocks.

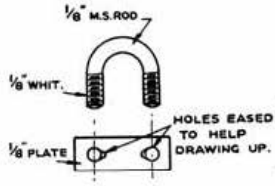


Fig. 3.
"Bull Dog" Clip for Stranded Cable

Guys and Halyards

As stranded steel cable is now readily obtainable as "surplus" it should be used exclusively for guys and halyards. Rope, even if weatherproofed, should never be used for guys except possibly for portable operation. Cable rated at 10cwt. is suitable for guying masts up to 35 feet in height and is about 3/16in. in diameter. For halyards the 5 cwt. rating is ample and is roughly 1/8in. in diameter.

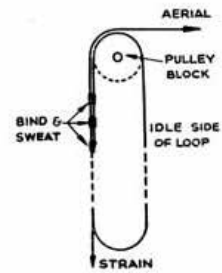


Fig. 4.
Arrangement of Halyard

Before putting the guys and halyards into service, they should be liberally greased. A cheap but somewhat dirty expedient is to soak them in discarded gear oil from the local garage. This should be done after the guys and halyards have been made up.

Stranded cable cannot be satisfactorily knotted or tied like rope, or twisted together like solid wire. Whilst much satisfaction can be derived from "splicing," it is felt that this process is rather outside the scope of the ordinary amateur, and the alternative solution of "lashing" is recommended.

The use of eyelets, shackles and "turnbuckles" or strainers, as shown in the accompanying figures should be considered as essential parts of the making-up process. The "turnbuckles" are particularly recommended, as it will be appreciated that there is really no other satisfactory method of lengthening or shortening a "made-up" guy.

Cutting Steel Cable

The uninitiated have only to cut or gnaw through a piece of stranded cable with cutting pliers to learn the disastrous result—how the strands fray and fly out. The correct method is illustrated in Fig. 1. Bind the cable very tightly for about ¼in. each side of the point of severage with copper wire; then, with a sharp cold chisel and a sharp hammer blow cut the cable between the bindings, using a convenient piece of iron or steel as an anvil.

Making Up Guys

Decide the total length of each guy by simple trigonometry on the assumption that the angle between the guy and the top of the pole should not be less than 30 degrees.

The anchorage of the guys to the top of the pole should be made by "eye-bolts" passing through the pole, and *not on any account* by screw-eyes or staples. The use of eyelets and shackles at the points of termination is indispensable as this allows of easy assembly, and dismantling when required. The method of making-up is best understood by reference to Fig. 2 which shows a complete guy assembly.

In place of the "lashings" which are suggested as an alternative to splices, small clips known as "bulldog clips" secured by nuts may be used, and these, together with eyelets, shackles and turnbuckles can be purchased from most ironmongers or ships-chandlers. Fig. 3 shows a sketch of the clips which can easily be made up from 1/8in. mild steel rod and flat bar.

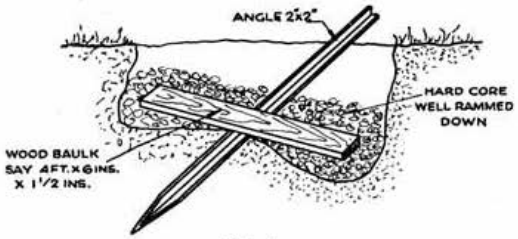


Fig. 5.
Anchorage of Picket

Pickets

The anchorage of the guys to the ground is an important feature, and every care should be taken to ensure adequate security of pickets or stakes. If the ground is firm with a good sub-soil, hardwood stakes, well creosoted, may be used; but by far the best solution is to use pieces of angle-iron not less than 2in. x 2in. and 3ft. to 4ft. long, according to the nature of the ground. The angle iron is sharpened to a point at one end (by sawing or with the aid of the local blacksmith), and is driven in at an angle of 45 degrees to the ground with the inside of the angle *towards* the pole, leaving about 1ft. protruding.

In soft or sandy soil a baulk of timber should be buried across the angle as shown in Fig. 5 and rubble or hard-core rammed in hard. On no account should pieces of gas pipe or round iron be used as these will eventually loosen or tend to draw out of the ground.

Three well secured guys are generally sufficient for poles up to 35ft., and should be arranged at 120 degree intervals, one guy taking the direct strain of the aerial system. For sectional masts, two or more sets of guys are used, but these masts never achieve the permanence of the good single scaffold-pole variety.

Halyards

As already stated a stranded cable halyard is much more satisfactory and permanent than even best quality rope. Here again it is worth while taking every care to ensure against breakage, and to use a scheme which, should a failure take place, obviates the necessity of taking down, or scaling, the pole. For this reason the halyards should be made in the form of a continuous loop with an off-shoot extension to take the aerial: see Fig. 4. With this system, if the wear on the strained portion through the pulley causes a break, the aerial will come down but the halyard can easily be hauled down and a repair made without lowering the pole.

Never try to secure a cable halyard to the base of the pole by knotting it or by twisting it round a rope-cleat. This will weaken and kink the wire, causing much more rapid deterioration than that due to weathering. An eyelet should be looped-in and bound, and this slipped over the cleat to take the strain. A safety lashing of rope round the pole above the cleat is an added security to prevent the eyelet falling off the cleat.

A New Licence Concession

THE Society recently inquired whether the Postmaster-General would be willing to permit newly-licensed amateurs to use telephony on frequencies of 420 Mc/s. and above during the first year of holding a licence.

The Society is pleased to announce that as from September 1 last the necessary authority has been included in all licences issued to "first year" applicants. Existing first year licences will be suitably amended on request.

Sussex R.A.E. Course

A second series of lectures covering the syllabus of the Radio Amateurs' Examination will be given at Brighton, from September 1950 until the examination next May. If there is sufficient demand Morse classes will also be formed. Further details may be obtained from: The Principal, Preston Technical Institute, Coombe Road, Brighton 7. The instructor will again be Mr. F. R. Canning, A.M.I.E.E. (G6YJ).

NOMINATIONS FOR COUNCIL 1951

In accordance with the Articles of Association the following Corporate Members have been nominated by the present Council to serve on the 1951 Council:

OFFICERS.

President: Mr. W. A. Scarr, M.A., G2WS.
Executive Vice-President: Mr. F. Charman, B.E.M., G6CJ.
Hon. Treasurer: Mr. A. J. H. Watson, F.S.A.A., G2YD.
Hon. Secretary: Mr. L. Cooper, G5LC.
Hon. Editor: Mr. A. O. Milne, G2MI.

MEMBERS.

Mr. W. H. Allen, M.B.E., G2UJ.
Mr. A. P. G. Amos, G3AGM.
Mr. W. N. Craig, B.Sc., G6JJ.
Mr. C. H. L. Edwards, A.M.I.E.E., G8TL.
*Mr. T. L. Herdman, B.Sc., G6HD.
*Mr. W. E. Russell, G5WP.
Mr. P. A. Thorogood, G4KD.

* New Nominations as per Article 43

Not later than October 31 next, any ten Corporate Members (but not more than ten) may nominate any other duly qualified Member, by delivering their nomination in writing to the Secretary, Inc. Radio Society of Great Britain, New Ruskin House, Little Russell Street, London, W.C.1, together with the written consent of such Member to accept office if elected, but each such nominator shall be debarred from nominating any other Member for this election.

THE MONTH ON THE AIR

*By A. O. MILNE (G2MI)**

Bucket and Spade

BY sheer chance we happened to be in Worthing on Sunday, August 27, and spent an all too brief few minutes with the 200 or so radio amateurs, their wives and families enjoying a perfect sunny day by the sea. The numbers are quite amazing and a credit to the organisers. It was evident that everyone was having a good time and we pay our humble tribute to those who ran the show.

Low Frequency DX

The outstanding item of news for August—month of aurora, fade-out and flutter—is the extraordinary behaviour of the 3.5 Mc/s. band. Bob Pybus, B.R.S. of the wee-sma' hours in Manchester, has sent in a list of DX which is really quite surprising. For example on July 30 he logged on phone, six VE1's, VE3BBL/VO6, numerous W1's, 2's, 3's, 4's, 5's and 8, with W5GFK in Miss. as the pick of the bunch. In all 33 stations were clearly identified. He also heard YV5DV and CO2HK on 7 Mc/s. phone. On August 6, CO, PY, XE3AS were logged at S9+30 and HR1AZ at S9+30 at 0200 G.M.T. the next morning. Many W's and VE's were also audible on that day but signal strength was poor. New Zealand 3.5 Mc/s. signals were also logged between 0500 and 0600 G.M.T. during most of August and a number of G-ZL QSO's took place.

Thought for the Month

Our Happy Lid with watts galore,
Is pushing up his DX score,
Parallel push-pull 813's
(And grossly over-running these).

* * *

His clicks are heard in Tennessee,
His chirp in Togoland.
In Timbuctoo and Tripoli,
His spacer fills the band.

* * *

But soon there comes a little van
With meters and a gentleman,
Who knows Ohm's Law. And so you see
It pays to stay on QRP.

G3VA

Notes and News

G2FAY of Oldham has contacted W2OXE/MM off Baffin Is. (14080 C.W.). Another contact was with ZE3JQ who wishes to QSO Newquay. '2FAY had been trying to work Rhode Island stations since 1946 and then worked three of them in three days!

BRS1594 of Yeovil logged HE1JJ, HI6EC, VP2DC, VP3HAG and VS7BR during the month on 14 Mc/s. On 28 Mc/s. his bag included CR4AC, ZD1SW, ZD2JHP and KZ5CP. Incidentally HE1JJ has QSL'd all his contacts—good scout. The 28 Mc/s. band opened up for North America once or twice late in the evening during August for a brief spell.

BRS18017 contributes PJ5TR (14030), LX1CF (14090 at 2000 G.M.T.) and ZB2A (14070 at 2000) to the DX bag.

GM3CSM, one of the latest winners of the Empire DX certificate, had the following contacts just before leaving for his summer holiday: KG4AD, CR5AC, CR5AD, FY8AC, FP8AC, CR4AG, YI2UW, KV4AU, CE5AW, VS1BX and HL1US. He gives QTH of CR5AD as Box 206 Bissau, Portuguese Guinea and CR4AG as Box 55, St. Vincent Island, Cape Verde Is.

G6RH worked VQ8AS in Chagos. Others going strong are KX6BA (14085), VK1YN (Heard Is., 14060 T9) and CR5AD (14135 T9).

ZB2I hopes soon to be active on 3567 kc/s. crystal controlled. He says there are no two-letter calls in Gibraltar.

The YI's are now on the air in some strength and a QSL Bureau is now in operation; QSL *via* R.S.G.B. 2UW will soon be back in G-Land.

A1055 of Blackpool pleads for more distinct enunciation of station calls on 'phone. He's got something there, so less gabble please!

On August 2 at 0215 G.M.T., G3FNF worked TT2KA who claimed to be in Tannon Tuva. He gave the name of his town as Chutchia, said he was using 500 watts to a beam and that his name was Yaris. All sounds a bit steep but the frequency was 14040, the direction right and he promised to QSL *via* R.S.G.B. (a tin trumpet if he QSL's). Another new one was FC1AK who roared in at 2112 G.M.T. on 28 Mc/s. and gave his QTH as Ajaccio Corsica.

LA7JA asks G's to listen for LB1KB (14030) who is operating from Kashmir daily at 1530 G.M.T.

GM3GDX reports that "Nick" VU2JP (14030) is active daily around 1630 G.M.T.

G3BDQ says LP2J (14080) active at 1930 is at

HE1JJ, Liechtenstein

Whenever Karl ("Charly") Ramser, HB9JJ, takes a weekend trip over the Swiss border into the little Principality of Liechtenstein, he enters a real Ham-Paradise. With a call like HE1JJ and a location 5,000 feet up in the mountains he can always be sure of plenty of contacts on 'phone and C.W. . . . and plenty of work in keeping up his record of 100 per cent. QSL. The present four-stage transmitter has a pair of 807s in the final, but the power will be increased to 150 watts when a new rig using two LS-50 (ex-Wehrmacht) valves is ready. The receiver is an NC100x, and several aerials are available. Thirty-year-old HB9JJ, who learnt English by radio during the war years, sends 73 to his many British friends.

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

the Weather Station on Jan Mayen Island. QSL *via* N.R.R.L.

BRS18204 of Tonbridge assures us that CS3AA on 14 and 28 'phone is O.K. The station is in the Azores; QSL to A.P.O. 406 c/o P.M., N.Y., N.Y. G3EFY adds that the operator's name is Nick. He says 28 has been open fairly regularly for South America. W2ECZ/MM on this band is in the American liner "La Guardia."

F8RQ/P operates a 3-watt portable in the French Alps.

Pirates

G5AO warns readers that SU2AF is a "pirate" operating in the Brighton area on 14 Mc/s.; one of the few cases where T.V.I. has done Amateur Radio a good turn. It is reported that PX1A was found in Mexico and is now in jail! Talking of pirates, G3EGQ passes along the information that ZS6NB's call is being misused. The genuine call has not been used for some time.

We don't know the status of HY7Q or BM7KA. Both claim to be in Hungary but we are waiting to see if M.R.R.E. return the cards.

We have become heartily sick of the various PX calls and it comes as a welcome relief to learn from W3JTC that ON4QF now has permission to operate from that country. All that is now needed is the signature of the French Minister of P.T.T. Judging by the friendly attitude of this gentleman to the delegates at the I.A.R.U. Congress, this should not present much difficulty.

G3BGP quotes I1ADW who states that HV1AA is another bad 'un. To date, no one has ever succeeded in obtaining permission to operate an amateur station within the Papal State. 'I1ADW hopes soon to obtain this permission and has a 35-watt rig ready for the job.

Several reports received this month mention calls beginning with 9S. G3EFY worked 9S4AR and W3JTC has worked 9S4AX. The stations claim to be in Saarbruecken and to be a new country. We have no authoritative information at present but remember that the Saar (TS) was a separate country before the war.

"Mobile Marine"

—with a difference. G2HDU and G3ALC were hoping to operate from a boat on the Norfolk Broads between September 16 and 23. Input 2 watts C.C. on 1.7, 3.5 and 7 Mc/s. C.W. only.

Here and There

The many friends of G6VD will be interested to learn that he is now ZE3JS and with 100 watts is looking for British Isles contacts at the low end of 14 Mc/s. from 1800 G.M.T. daily. Congratulations to G6CB who has made his DXCC. Like many others he is missing on a card from CR5UP. HZ1KE now has a *permanent* (the italics are ours) house with H. & C. and A.C.! Only about half a mile from the power station and lots of altitude. This news comes from G2CBA of Rochester.

Those of us who will be looking forward to working CR9AG on 28 Mc/s. again this year will miss the charming voice of Pat, his wife. She passed away a few months ago and we feel certain that our members will unite in offering our condolences to John.

Cyprus

One little victory won! Due to the efforts of the R.S.G.B. all MD7's now become ZC4's and so, after all these months, will use the correct prefix for this British Crown Colony. Let us hope that the next step forward will be a civilian licensing scheme similar to all the other Empire territories.

Bill Edwards, MD7WE, is now back in England, has QSL'd all his contacts and hopes to do the same for the listener reports soon. He worked 112 countries during his stay, but so far has only 87 confirmed.

ZC4TF (Sgt. Tyler, No. 2 Wireless Regt.) has a stock of 500 cards and 25 watts and promises to QSL every new contact. The 25 watts should be quite adequate but we can see those cards lasting about a fortnight!

Royalty on the Air

We hear that His Royal Highness Prince Abdulla will soon be on the air as HZ1AF. BRS2404 recently heard him say so from HZ1KE.

Month on the Air

Our grateful and rather surprised thanks to the many kind folk who have offered to take over this feature. We have had such a wide array of talent present itself that we are faced with a dilemma in trying to make a decision which will not be difficult to explain to the unsuccessful applicants! We have therefore decided, for the time being at any rate, to carry on. Thanks are due, however, to those who have offered to help. Writing this feature would be a much easier job if we had more reports. It is surely up to the member to back his own Society journal. This particularly applies to the "top-flight" DX man; so may we hear from *you* O.M., and *you* O.M. and you?

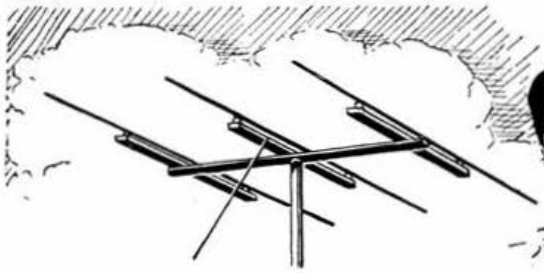
Ten Minute Quiz

This month's posers for the radio enthusiast.

1. *What are the approximate heights (in Km.) above the earth's surface of the F1, E and F2 layers of the ionosphere?*
2. *What are the call sign prefixes for (a) New Zealand (North Island); (b) Hong Kong; and (c) Anglo-Egyptian Sudan?*
3. *What do the figures 1 and 2 indicate in the terms Class AB1 and Class AB2 as applied to audio frequency amplifiers?*
4. *What is the type of valve base and what are the base connections for a 6AK5?*
5. *In which amateur band are R.A.F. aircraft radio operators briefed to make distress calls in certain circumstances?*
6. *Name a type of non-power-consuming meter used to measure a high alternating voltage (say 2,000 volts).*
7. *State the approximate values of components suitable for smoothing a C.R.T. E.H.T. supply.*
8. *What is the reactance of a 0.01 μF. condenser at: (a) 400 c/s.; (b) 1 kc/s.; and (c) 5 kc/s.?*
9. *Put the following cuts of quartz crystal in their correct order of thickness for a given frequency:*

   Y AT X BT
10. *What would be the output voltage of a transformer with 20 volts D.C. applied to the primary, and having a step up turns ratio of 5 to 1 (secondary to primary)?*

Now turn to page 113 and see whether you have beaten the Question Master. — H.E.B.



AROUND THE V.H.F.'s

New European 144 Mc/s. Record

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

Late News

A NEW 144 Mc/s. European record of 520 miles was established by G2BMZ (Torquay) and DL4XS/3KE (Wiesbaden, Germany) on September 13, 1950. This was one of the many long distance contacts recorded during the excellent conditions of September 12-13 when DL4XS/3KE worked a total of 19 British 'phone and C.W. stations in Eastern and Southern England. The new record dates from 0020 B.S.T. on September 13 when a 15-minute 'phone contact took place between the Torquay and Wiesbaden stations, thus beating the previous European record set up by G5BY (S. Devon) and DL3FM (Essen, Germany). Some credit for 'BMZ's success must go to his remarkable 33-element beam array 40 feet above ground. His transmitter was running with 80 watts input to a pair of 8012s in the final stage; his converter is comprised of two 6AJ5 R.F. stages followed by a 6J6 mixer stage. The equipment at DL4XS was described in the July, 1950, issue of the BULLETIN.

During August conditions were above average, GW3EJM (Cardiff) was logged on several occasions in South East England, and on August 4 and 22 was a consistent S8/9 'phone signal for considerable periods with G2UJ. The only other Welsh station heard was GW5SA on August 22, but his C.W. signal was far inferior to 3EJM's 'phone.

French stations are regarded as "locals" by G3DIV/A (Eastbourne) and G3EBW (Hurst Green, Sussex), but conditions have to be very good indeed before they are audible to the writer owing to bad screening in that direction. However, F8MX (20 miles west of Dieppe) has been logged several times on 'phone when no other French stations have been heard.

G3EHY (Banwell, Som.) found that although by all the signs conditions on the band should have been poor, it was nevertheless possible to work quite good DX on most evenings. G2CPL (Lowestoft), at 220 miles, was contacted on several occasions when no other signals were audible. Whether many operators judge the probable two metre conditions purely by weather signs and then refrain from going on if they are not propitious is not known, but there is no doubt that the oft-complained-of deadness of the band is more often attributable to lack of activity than to poor propagation.

Other stations figuring in 'EHY's log during the month include G8SB (Lancs.), worked on most evenings on 'phone around midnight, G3COJ (Hull), raised on several occasions on a lunch-time CQ, G2ADR (York) and GW3KY (Holyhead, Anglesey). The latter is no mean feat, as the 160 mile path lies across most of the Welsh mountains.

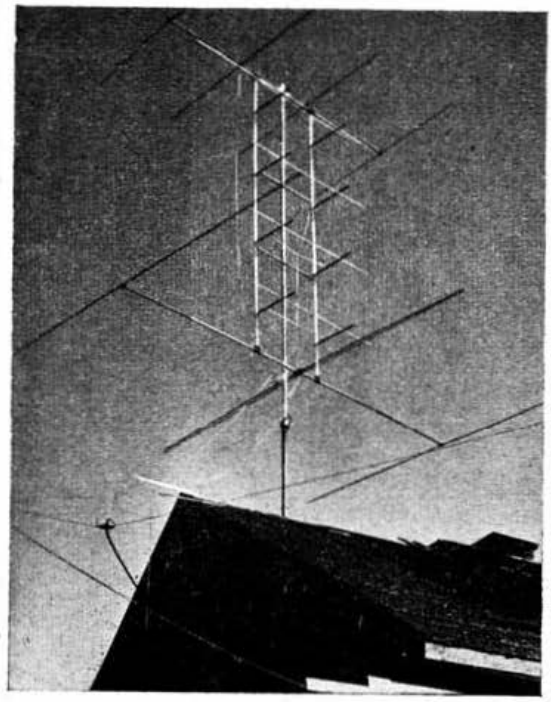
Another Somersetshire station is G3FIH (Radstock) who puts an excellent signal into London and the south-east on approximately 145.6 Mc/s.

Stations active in the Hastings and Eastbourne area include G2AON (Polegate), 3FXA (Bexhill) and 5RO (Hastings).

Old timer Jack Partridge, G2KF, has been active on two metres for some time, and although his situation at Edenbridge, Kent, is not ideal from the V.H.F. point of view he has worked 52 stations including a couple of 'phone contacts with F8MX. His transmitter is a modified SCR 522 running 20 watts to a 4-element c/s beam, while the receiver side is looked after by a three-stage 6J6 converter into a BC 348. Those wishing to get in touch with him will find his 'phone or C.W. signals on 145.206 Mc/s., his normal times of operation, when his B.B.C. duties permit, being 19.00 to 20.00 and 22.30 to midnight B.S.T. He would particularly appreciate reports from stations to the north and north-west.

New American Two Metre Record

We learn from *QST* that on June 24 a new two metre world's record was set up by W5VY (San Antonio, Texas) and W8WXV (Shiloh, Ohio) over a distance of approximately 1,200 miles.



The aerial system at OH2OK, Helsinki, comprises four and three element Yagis for 50 and 28 Mc/s. respectively, with an 8-element stacked array with wire netting reflector for the two-metre band situated at right angles between them. Two-metre signals from this station were heard by G5QA (Exeter)—a distance of 1,325 miles—last December.

* 32 Earls Road, Tunbridge Wells, Kent

Two Metre Activity in Finland

OH2OK (Helsinki) well known in Scandinavia on two metres, and on 14 and 28 Mc/s. throughout the world, is making a serious attempt this Autumn to achieve two metre contact with Central and Western Europe. It will be recollected that OH2OK was heard on this band by G5QA in December, 1949, at a distance of 1,325 miles. Up to date, more than 70 contacts have been made with Swedish stations, the longest distance being 370 miles. The transmitter runs 150 watts to the P.A. on a frequency of 144.025 Mc/s., a c.c. converter with a noise factor of 4.5 db. is in use, and a photograph of the very efficient-looking 8-element stacked array with wire-net reflector appears on page 107. OH2OK would like to arrange morning or evening skeds. with anyone interested, either by letters to Otto Pätäri, Kauniainen, Petas, Finland, or on 14,080 kc/s., where he is active in the early part of the evening.

Other Finnish stations known to be active on the two metre band are OH2NM, 2OP (Helsinki), 3PP (Lahti) and 6NZ and 6OT somewhat further north. 3PP is stated to be in a particularly favourable position, and has the further advantage of being able to use power up to 500 watts.

Sweden

SM5VL (Stockholm) is still continuing with the SM/G tests as set out in the May issue of the *Bulletin*. He has greatly improved his aerial system by raising his 12-element beam 56 feet above ground on a steel tower erected on the roof of the house. In common with nearly everyone who manages to achieve an increase in aerial height he finds an improvement out of all proportion to the increased elevation. In his case the expected 7 db. improvement in gain of the 12-element array over the previous 4-element Yagi has been realised, plus a further 8 db. due to the increased height. Signals from Gothenburg on the west coast have been heard for the first time, and 5VL is putting out his daily test for this country at 20.15 G.M.T. on 144.24 Mc/s. with renewed hopes of success.

The G5MR/F8OL Effect

It was mentioned last month that G5MR (Hythe, Kent) had noticed momentary increases in strength on the two metre signals from F8OL (Paris) at those times when heavy static was present, and that the greatest peaks in strength corresponded to the loudest bursts of static. These observations have caused some interest, and although no one has reported similar results, several letters have been received offering explanations of the effect. As pointed out by G3CJ and BRS 18,118, static may be caused by a flash of lightning or by a form of corona discharge, either of which result in ionisation of the surrounding air which could, if in a suitable position, act as a temporary reflecting surface for radio waves.

Lightning discharges normally take place comparatively close to the surface of the earth and therefore in a region of relatively high pressure, whereas meteor trails, proved by radar and from observations on the five metre band to be efficient reflectors, occur at much greater heights where air pressure is considerably less. The rate of recombination of electrons and ions after ionisation depends upon pressure and the expected duration of signal peaks due to this cause would be much shorter in the case of storm static than with meteor trails which, in fact, have been observed by G5MR.

G3AUR remarks that in the course of determining the position of thunder storms by radar, the returning signal often has an unusually high field strength which could be the result of efficient reflection from an area of ionisation. Further information regarding this effect is invited, but in the interests of future two metre activity would-be observers with lofty beams are advised that the effect is not necessarily most pronounced when a violent thunderstorm is raging in the immediate vicinity of the station!

French Two Metre DX Test

Too late for inclusion in the last issue it was learned that F3WV would be operating a station on two metres from the summit of Mont Coudon (2,300 feet) a few miles to the north-east of Toulon, on August 4, 5 and 6 with the object of making DX contacts. Although a watch was kept by several stations in this country, no reports of the reception of F3WV's signals have come to hand.

Phone Transmissions

Mention has been made on a previous occasion of the very low level of modulation employed by certain stations operating on the two metre band, with the impossibility of reading their signals even when the carrier is as high as S5, a practice which must lead to many wasted calls.

An additional source of lack of intelligibility is due to the radiation by many stations of an excessive amount of the lower audio frequencies. Carrier power thus utilised does nothing towards increasing the range of reception, and can be a definite disadvantage when, under adverse conditions, the selectivity of the receiver has to be increased, with the result that the proportion of low frequencies in the transmission is raised still further. There is surely no excuse at the present time for lack of audio balance with the amount of information available in the technical press on the subject of audio amplifiers and tone control, and many operators would find it definitely to their advantage to pay more attention to such points. The general quality of C.W. transmissions on the two metre band has improved to the standard set by the best stations on the lower frequencies, but with a few notable exceptions, the same cannot be said of many 'phone transmissions. The type of signal to be aimed at can be heard from certain of the police networks operating to the high frequency side of the amateur band; no suspicion of overmodulation, but a "clean" and crisp quality with good penetrating power. The comments of those who operate 'phone on "two" would be appreciated.

G2FKZ/P, one of the two stations set up by the South London V.H.F. Group during the R.S.G.B. 420 Mc/s. Tests. Left to Right: G3CU, G2FKZ and A1017. The equipment included a crystal controlled receiver and transmitter.

FORTHCOMING CONTESTS

A GLANCE at the "Contest Diary" will show why it is impossible to publish full details of all contests due to be held in the next few months. The best that can be done in the limited space available is to outline their main features and to indicate, where possible, an address from which further particulars can be obtained.

VK/ZL International DX Contest

Organised this year by N.Z.A.R.T. Aim is for stations outside VK and ZL to work as many stations as possible in those countries. A summary of the rules is given on page 74 of the August, 1950, issue of the BULLETIN.

CQ-Magazine World Wide Contest

The third "CQ World Wide Contest" will be similar to that held in 1949. Operation is limited to 7, 14 and 27/28 Mc/s. bands. All stations endeavour to contact as many countries and zones as possible (no limit to the number of contacts with each country). The serial number consists of the report plus "zone" (U.K. is in the 14th zone). Copies of rules and official log sheets can be obtained from CQ Magazine, 342 Madison Avenue, New York 17, N.Y., U.S.A. A self-addressed envelope and *unattached* postage stamps should be sent. For times see "Diary."

All-European DX Contest

The fourth All-European DX Contest is being organised by the Swedish Society—S.S.A. Rules are basically similar to the previous events. Amateurs in Europe will endeavour to contact as many stations in the remaining five continents, with a maximum of three contacts on each band with each country (W and VE licensing districts to count as separate countries). Serial numbers will consist of report plus three figure self-assigned number which remains constant throughout the contest. Bands: 3.5, 7, 14, 28 (and 50) Mc/s. Scoring: a maximum of 3 points can be scored for each completed contact; the score is then multiplied by a number which is the sum of all non-European countries worked on each band. Full information is available from S.S.A. Contest Committee, Box 609, Gothenburg, Sweden. For times see "Diary."

"CQ H22" Contest

This is a new contest organised by the Swiss Society (U.S.K.A.) in order to assist overseas amateurs who wish to claim the "Helvetia 22" certificate. This certificate requires proof of contacts with at least two stations (one, in the case of non-European amateurs) with each of the 22 Cantons of Switzerland. Swiss fixed and portable stations will be operating in all Cantons during the Contest which is open to both telephony and telegraphy stations on all bands. Each Canton has been assigned a two-letter group which will be sent after the call-sign of the Swiss stations. Serial numbers will consist of report plus two numbers showing how many different Cantons have been contacted up to that time on the band in use, *i.e.* first contact on a new band will have the serial number 01, with a maximum number of 22. In the contest each contact will count 1 point and the final multiplier will consist of the number of Cantons contacted on all bands. Not more than one C.W. and one 'phone contact should be made with a specific station on each band. Signed logs together with a summary of the score and a short description of the stations should reach: G. de Montmollin, HB9EQ, Ch. de Villardin 1, Lausanne, Switzerland, not later than November 25, 1950. For times see "Diary."

Contests Diary

G.M.T. From		G.M.T. To		Contest
1201	Sept. 22	1159	Sept. 24	VK/ZL DX Contest (C.W.)
1201	Sept. 29	1159	Oct. 1	VK/ZL DX Contest ('phone)
2300	Sept. 30	2259	Oct. 1	R.S.G.B. Low Power Contest
1201	Oct. 6	1159	Oct. 8	VK/ZL DX Contest (C.W.)
1600	Oct. 7	1600	Oct. 8	USKA "CQ H22"
1201	Oct. 13	1159	Oct. 15	VK/ZL DX Contest ('phone)
0200	Oct. 28	0200	Oct. 30	CQ World-Wide Contest ('phone)
0200	Nov. 4	0200	Nov. 6	CQ World-Wide Contest (C.W.)
2100	Nov. 18	0800	Nov. 19	R.S.G.B. Top Band Contest
0001	Nov. 25	2400	Nov. 26	All-European DX Contest (C.W.)
0001	Dec. 2	2400	Dec. 3	All-European DX Contest ('phone)

Danish Radio Exhibition

MR. W. J. G. HECTOR, B.R.S. 12421, recently on holiday in Copenhagen, sends the following account of the Danish Jubilee Radio Exhibition held August 11-20:

The State Opening of the Exhibition, which also marked the inauguration of the Danish public television service, was graced by the presence of King Frederic IX. The radio industry, the Services and Danish radio amateurs all provided exhibits. Keen interest was evident in television, for which the country is almost ideally situated. V.H.F. radio telephones which have been developed for linking isolated communities were also on show.

The National Amateur Radio Society—*Eksperimenterende Danske Radio Amatorer* (*E.D.R.*)—provided a fine display of home-built equipment including a radio-controlled model battleship which performed admirably. OZ5EDR—housed in a sound-proofed shack—operated daily on 3.5 and 14 Mc/s. telephony although some transmissions were slightly curtailed by T.V.I. The State Radio system also broadcast from the exhibition on 9,520 kc/s., using OZ5HL's transmitter. Numerous Scandinavian and several British amateurs visited the exhibition and were warmly greeted by the OZ members who manned the E.D.R. stand.

1950 B.E.R.U. Contest—Check Logs

THE following check logs received for the 1950 B.E.R.U. contest are gratefully acknowledged. Full results of the contest were published in the August issue.

Telegraphy Section: AP5B, G2BOZ, G2MI, G3AIM, G3AQY, G3COJ, G3RB, G6AT, G6XS, G8PW, GW3FSP, G4CX, VE1DD, VE1PA, VE1SW, VE2BV, VE3BBR, VE3PK, VE7CC, VE7WL, VK5BO, VK5KO, VK5RX, VK5XK, VO1W, VQ3AK, ZL1HY, ZL4GA, ZS1BM, ZS6HO, BERS195.

Telephony Section: G3AIM, G3AQY, G6XN, GM2UU, G4CX, MP4KW, VE4RP, ZD1KO, ZL4GA, BRS250.

The Radio Control of Models

LT.(L) G. C. CHAPMAN, R.N., author of the article "The Radio Control of Models," published in the May, 1950, issue of the BULLETIN, states that the copyright of the original article on the "Mark-space Self-balancing Servo" (R.C.M.S. Bulletin 3) is held by Mr. L. Witcombe of 12 The Crescent, Prestwich, Cheshire, who originated the idea.

Extraordinary Administrative Radio Conference Postponed

THE Society has been officially informed that the Radio Conference originally planned to open in The Hague on September 1 has been postponed at the request of the United States Government.

Members will remember that the Atlantic City Conference of 1947 divided the frequency spectrum between the various services—aeronautical, amateur, broadcasting, maritime, etc.—and made provision for the setting-up of planning boards to prepare schemes for the allocation of frequencies within the various bands to individual users, groups or countries. It had been anticipated that the task of the Hague Conference would be limited to adopting these schemes but, from information to hand, it now seems likely that several completely new schemes may have to be prepared when the Conference takes place.

Until the Conference has finished its deliberations and agreement has been reached between the 60-odd participating Member Countries of the International Telecommunications Union, it will not be possible for the Post Office or any other licence-issuing authority to permit amateurs to use the 21 Mc/s. band. When that band is finally released the 14 Mc/s. band will presumably be reduced by 50 kc/s. and the 7 Mc/s. band by 150 kc/s.

It seems unlikely that the Conference will take place before 1951.

B.B.C. Engineering Research Department

SIR NOEL ASHBRIDGE, B.B.C. Director of Technical Services, has recently described some of the aims and activities of the B.B.C. Engineering Research Department.

In addition to the original converted convent in Nightingale Square, Clapham, a large house at Kingswood Warren, some 20 miles from London, with 27 acres of grounds, now forms the new headquarters of the department. Nine laboratories, television studio, library and drawing office are accommodated in the house, with workshops and stores in what were formerly the stables. A new building—almost complete—is being erected for the Television Section and includes a studio comparable in size with those at Alexandra Palace.

Work is being carried out on a precise evaluation of the possibilities of high-definition and colour television. A vision channel has been developed which can produce at will 405, 525, 625 or 819-line pictures. The problems of sharing frequency channels between a number of television transmitters is another important aspect of the section's activities.

The Aerials Section has been concentrating on designs for the new television transmitting stations and for V.H.F. broadcasting. Small (1:7.5) scale models, using the band 445-496 Mc/s., have been employed to test new systems with considerable saving in time and money. The Field Strength Section, engaged on the testing of sites for new stations, normally operates a mobile transmitter at the most promising sites and then makes extensive field strength measurements throughout the probable service area. Temporary transmitting aerials are suspended up to 600 feet above the ground by means of balloons.

Since 1945 the department has been investigating V.H.F. broadcasting possibilities. The new high power station at Wrotham is now being used for comparative tests of frequency modulated and amplitude modulated systems. In parallel with this work the performance of typical F.M. broadcast receivers and the propagation characteristics of V.H.F. transmission are being studied.

MAKE A NOTE OF THESE DATES

AMATEUR RADIO EXHIBITION

Royal Hotel, London, W.C. 1

NOVEMBER 22nd to 25th, 1950.

Looking Back

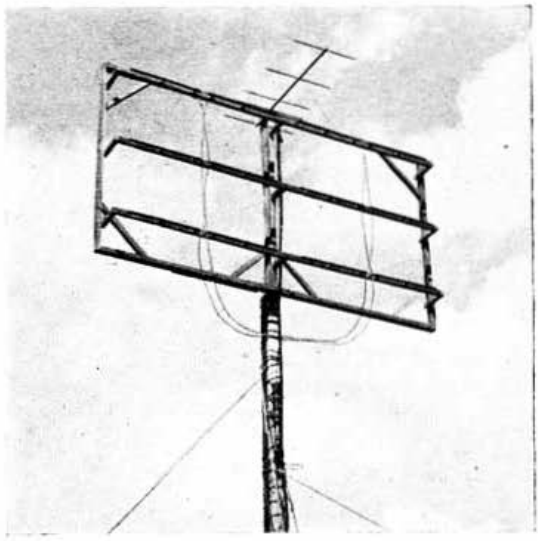
AT a recent meeting of the Derby Wireless Club —or *Derby and District Amateur Radio Society* as it is now called—Mr. A. T. Lee (ex 2DJ) recalled the early days of the club of which he is believed to be the only surviving founder member, and which claims to be the oldest association of its type in the country. Mr. Lee's acquaintance with radio began at school where another boy owned one of the latest "complete wireless installations" consisting of a spark coil and a coherer. In 1911 he and four other enthusiasts formed the club, which met weekly, possessed a library and carried out experiments.

One of their early variable condensers consisted of two buckets, one suspended from a pulley by a cord with which it was raised and lowered into the other which stood on the floor. Many crystal detectors were tested, the "cat's whisker" type then being generally considered too delicate to withstand the heavy currents induced by nearby spark coils. The secret of successful reception was found to be a high aerial and a good pair of headphones (a conclusion which still holds true almost forty years later).

In 1913 the Club moved to a room in Full Street, where it staged an exhibition, followed in December by a more ambitious one at the Mechanics' Institute. Members from all parts of the world joined the club, including Mr. Rene Klein of Hampstead who later founded the Wireless Club of London—forerunner of the Radio Society of Great Britain.

R.N.V.(W.) R. Training

THE Society has been informed that certain R.N.V.(W.) R. training now takes place on 3,640 kc/s. The frequency of 3,525 kc/s. (referred to last month) is no longer used by the Reserve.



The co-linear array and five element Yagi used at C2FKZ/P during the recent R.S.G.B. 420 Mc/s. Tests.

LOW POWER CONTEST

THE 1950 Low Power Contest will be run on identical lines to the 1949 event, which proved so popular. Last year competitors using powers of less than 0.5 watts generally proved most successful.

Up to 5 watts input to the P.A. can be used, but with the maximum permissible power the points per contact will be low.

Any well-smoothed power supply which will keep the input within the stated limits can be used; this feature will be welcomed by those who considered the cost of an H.T. battery to be somewhat prohibitive.

M.C.W. and telephony are not permissible in this contest.

Rules

1. The contest is open to all fully paid-up Corporate members of the Society resident within the British Isles and the British Zone of Germany.

2. The British Isles for the purpose of the contest include England (G), Scotland (GM), Northern Ireland (GI), Wales (GW), Channel Islands (GC), and the Isle of Man (GD).

3. The contest will commence at 2300 G.M.T. on Saturday, September 30, 1950, and continue until 2259 G.M.T. on Sunday, October 1, 1950. Competitors *must record the closing time of their last contact* to establish this rule.

4. Entries will be accepted only if submitted in the form set out below:—

Low Power Contest, 1950

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

Address..... *County No*.....

.....

Transmitter..... *Aerials*..... *Receiver*.....

Date and Power	*G.M.T.*	*Call Sign Worked*	*RST Sent*	*RST Rcvd.*	*Points*	*County Code No. of Stn. Worked*

Points

Total .. .. ..

.....*Counties Worked X* 10 _____

Grand 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. shall be final in all cases of dispute.

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

5. No entry form postmarked later than Monday, October 9, 1950, will be accepted.

6. *Full* circuit details of the transmitter and power supply must be given on a separate sheet, signed by the competitor.

7. All contacts must be made between 3,500 and 3,600 kc/s. with stations located in the British Isles or British personnel in Germany.

8. Only one transmitter may be used by the competitor throughout the contest.

9. The contest is confined to two-way telegraphy contacts and any competitor receiving consistent tone reports lower than T8 will automatically be disqualified.

10. Only one contact will be allowed with any given station unless that station also operates /A or /P, or both, and in such cases only one contact may be made with that station while it is located in any one particular county.

11. Power input, in watts, to the P.A. stage must be recorded in the first column, at the time of contact.

12. No preceding stage may have a power input in excess of that to the P.A.

13. Scoring will be as follows:—

Watts input to the P.A.	Up To 0·5	To 1	To 2	To 3	To 4	To 5
Points per Contact	20	10	5	3	2	1

14. If different power is used at various times during the contest, the scoring must be altered accordingly.

15. Ten points should be added to the score for each new County worked (there is no multiplier).

16. Competitors must use the code numbers of their County whilst calling, *e.g.* CQ, CQ CQ de G.....17 AR. An exchange of RST and Code Number—both of which must be acknowledged by the signal R—will be required before points can be claimed, *e.g.* RST 579 NR 17. Where non-competitors do not give a county number, this may be inserted provided that this fact is indicated on the log sheet.

18. Proof of contact may be required.

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

20. Only the competitor may operate a specific station during the contest period.

21. Entries must be addressed to the Hon. Secretary, R.S.G.B. Contests Committee, New Ruskin House, Little Russell Street, London, W.C.1.

A list of County Code Numbers is set out below:—

ENGLAND (G).

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

SCOTLAND (GM).

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

WALES (GW).

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

NORTHERN IRELAND (GI).

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

CHANNEL ISLANDS (GC).

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

97. ISLE OF MAN (GD)
98. BRITISH ZONE OF GERMANY (DL2)

AROUND THE TRADE

A small range of miniature neon indicators is now being marketed by **The General Electric Co., Ltd.**, for use in all branches of industry, chiefly as visual indicators for "live" electrical circuits. They should also prove useful as R.F. indicators for amateur transmitters.

The indicators are designed to operate from 200-250 volt supply mains with an external 1-watt resistor of 0.25-0.5 megohm in series.

The range includes "Type F" (4s. 6d.) with a nominal operating current of 0.5 mA., and a small *Edison* screw cap, and "Type G" with a nominal operating current of 0.15 mA. and a miniature bayonet centre contact cap.

* * *

The 50-watt V.H.F. transmitter, type PT.15, recently introduced by **The Plessey Co., Ltd.** is an interesting example of modern commercial practice. The complete equipment comprises an R.F. unit, a modulator combined with a control unit, and a power supply, each in the form of 19 in. panels mounted one above the other in a robust metal cabinet. Operation is extremely simple, band-pass circuits in the R.F. unit reducing the number of tuning controls necessary; switched meter indication is also provided in each stage of this unit. Designed primarily for the 118-132 Mc/s. aircraft band, other ranges between 70-184 Mc/s. can be provided.

* * *

Mullard Electronic Products Ltd. have introduced a miniature voltage reference tube, type 85A2, with a B7G base. Working in a constant-current circuit, the 85A2 provides a voltage source having a short-term stability of better than 0.1 per cent. and a long-term stability of better than 0.2 per cent. This stability is maintained under intermittent switching conditions.

Yeovil Amateur Radio Club

The Club provided a display of Amateur Radio equipment at the annual British Legion fête held at Yeovil on August 19. Telephony transmissions from the Club station G3CMH were monitored and proved of considerable interest to the visitors, who included the Mayor and members of the Yeovil Borough Council. Exhibits included a display of QSL cards, several communication receivers, V.H.F. converters, oscilloscopes and a television receiver chassis.

HEADQUARTERS CALLING

COUNCIL, 1950

President :
WILLIAM A. SCARR, M.A., G2WS.
Executive Vice-President : F. Charman, B.E.M., G6CJ.
Hon. Treasurer : A. J. H. Watson, F.S.A.A., G2YD.
Hon. Secretary : J. W. Mathews, G6LL.
Hon. Editor : Arthur O. Milne, G2MI.
Immediate Past President : V. M. Desmond, G5VM.

Members : W. H. Allen, M.B.E., G2UJ, A. P. G. Amos, G3AGM, L. Cooper, G5LC, D. N. Corfield, D.L.C. (Hons.), A.M.I.E.E., G5CD, W. N. Craig, B.Sc., G6JJ, C. H. L. Edwards, A.M.I.E.E., G8TL, P. A. Thorogood, G4KD.

General Secretary : John Clarricoats, G6CL.

Representation

The Council has received with regret the resignation of Mr. Alan Dyer, GW8UH, from the office of South Wales Regional Representative. Owing to increased pressure of business and lack of staff, Mr. Dyer—who has been in office for the past four years—finds he is unable to devote the necessary time to the duties of R.R.

Nominations for his successor should be made in the form prescribed in the September, 1949, issue of the BULLETIN, and should reach the General Secretary by October 31, 1950.

* * *

Mr. F. G. Lambeth, G2AIW, 21 Bridge Way, Whitton, Twickenham, would be glad to hear from any Corporate Member willing to act as Representative for the Westminster-Chelsea-Fulham area (not Chiswick as previously stated).

Sussex R.N.V.(W.)R.

An opportunity for Sussex members to acquire radio training in the Royal Naval Volunteer (Wireless) Reserve is offered by the recent appointment of a full-time instructor at the Hove and Newhaven training centre. Young men who wish to serve in a radio branch during their National Service will find the Reserve of particular interest. Qualified members are loaned transmitting and receiving gear for use at home. Full details may be obtained by letter or personal call on Monday evenings at the R.N.V.(W.)R. Training Centre, R.N.V.R., Kingsway, Hove 3, Sussex.

LONDON MEETINGS, 1950/51

All meetings are held at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2.

Friday, Sept. 29, 1950: **F. Charman, B.E.M. (G6CJ).** "AERIAL SYSTEMS—LARGE OR SMALL" With Demonstrations.

Friday, Oct. 27, 1950. **H. J. Leak, M. Brit, I.R.E.** "HIGH QUALITY REPRODUTION"

Friday, Nov. 17, 1950. **F. Aughtie, D.Sc., M.Sc., A.M.I.E.E., A.M.I.Mech.E. (G6AT)** "ELECTRONIC COMPUTING."

Friday, Dec. 15, 1950. ANNUAL GENERAL MEETING.

Friday, Jan. 26, 1951. **D. N. Corfield, D.L.C. (Hons.), A.M.I.E.E. (G5CD).** "EQUIPMENT FOR THE 420 Mc/s. BAND."

Friday, Feb. 23, 1951. **H. A. M. Clark, B.Sc. (Eng.), A.M.I.E.E. (G6OT).** "POST-WAR DEVELOPMENTS IN TELEVISION."

Friday, March 30, 1951. **R. H. Hammans (G2IG).** "HIGH SELECTIVITY 'PHONE RECEPTION."

Friday, April 27, 1951. **A. O. Milne (G2MI).** "LOW POWER PORTABLE EQUIPMENT."

All Meetings commence at 6.30 p.m. Tea will be served from 5.30 p.m.

Members are reminded that the meetings listed are open to all members of the Society.

R.S.G.B. Slow Morse Transmissions

B.S.T.	Call	kc/s.	Town
Sundays			
09.30	G6NA	1750	Guildford
10.00	G5XB	1950	Reading
11.00	GM3AVA	1860	Falkirk
22.00	G2FXA	1900	Stockton-on-Tees
Mondays			
13.00	G3AXN	1870	Southend-on-Sea
19.00	G3NC	1825	Swindon
19.30	G3AIX	1760	Birmingham
19.30	G3ESP	1850	Wakefield, Yorks
20.00	G2AJU	1900	Stutton, Ipswich
20.00	G3DSR	1750	Derby
20.00	G2CLD	1775	Tunbridge Wells
21.00	G2BLN	1900	Bournemouth
21.00	G8VR	1850	London, S.E.2
21.00	G3BHS	1820	Eastleigh, Hants
22.00	G8TL	1896	Ilford
22.00	GM4MF	1860	Falkirk
Tuesdays			
13.00	G3AXN	1870	Southend-on-Sea
19.00	G5XB	1905	Reading
19.30	G2AVK	1850	Ossett, Yorks
20.00	GI2HLT	1900	Belfast
21.00	G3EFA	1855	Southport
22.00	G3ELG	1772	Rotherham
22.00	G2FXA	1900	Stockton-on-Tees
22.30	G6JB	1820	Salcombe, Devon
Wednesdays			
20.00	G2NY	1850	Preston
20.00	G3AFD	1783	Southampton
22.00	G6NA	1840	Guildford
22.00	G3DLC	1800	Grays, Essex
22.00	GM4JQ	1860	Falkirk
Thursdays			
18.00	G3AXN	1870	Southend-on-Sea
19.00	G3NC	1825	Swindon
19.30	G2AQN	1850	Ossett, Yorks
20.00	G3NT	1805	Northallerton
21.30	G6DL	1760	Birmingham
22.00	G2FXA	1900	Stockton-on-Tees
22.00	G3ARU	1990	Wanstead
22.30	G3OB	1803	Manchester
Fridays			
13.00	G3AXN	1870	Southend-on-Sea
19.00	G3BLN	1900	Bournemouth
19.30	G3DMP	1850	Wakefield, Yorks
20.00	G2AJU	1900	Stutton, Ipswich
20.00	G3AKW	1860	Wirral
20.30	G8LZ	1868	Gravesend
21.00	G3BHS	1820	Eastleigh, Hants
22.30	G6JB	1820	Salcombe, Devon
Saturdays			
10.00	G3FPS	1800	East Molesey
22.00	GM3OM	1860	Falkirk
23.00	G2FXA	1900	Stockton-on-Tees

OTHER AMATEURS ARE ASKED TO AVOID CAUSING INTERFERENCE TO THESE TRANSMISSIONS

FORTHCOMING EVENTS *Continued from Page 83.*

Eastbourne & District.—October 6, 7.30 p.m., Friends' Meeting House, Wish Road.
Portsmouth.—Tuesdays, 7.30 p.m., Royal Marines' Signal Club, Eastney Barracks.
Southampton.—October 7, 7.30 p.m., 22 Anglesea Road, Shirley.
Reading (Reading R.S.).—September 30, October 12, 14 (instructional), 28, 6.30 p.m., Abbey Gateway.

REGION 9

Bristol.—October 20, 7 p.m., Keen's Cafe, Park Row.
Exeter.—October 6, 7 p.m., Y.M.C.A., 41 St. David's Hill.
Gloucester.—October 5, 19, 7.30 p.m., Spread Eagle Hotel, Market Parade.
North Devon.—October 6, 7.30 p.m., Rose of Torridge Cafe, The Quay, Bideford.
Plymouth.—October 20, 7 p.m., Tothill Community Centre, Tothill Park, Knighton Road, St. Judes.
Stroud.—Wednesdays, 7.30 p.m., Subscription Rooms, Stroud.
Torquay.—October 20, 7.30 p.m., Y.M.C.A., Castle Road.
Weston-super-Mare.—October 10, 7.30 p.m., Y.M.C.A.
West Cornwall (W.C.R.C.).—October 5, 19, "Fifteen Balls," Penryn, Nr. Falmouth.
Yeovil.—Wednesdays, 7.30 p.m., Grove House, Preston Road.

REGION 14

Falkirk.—September 29, October 13, 7.30 p.m., Temperance Cafe, High Street.

AROUND THE REGIONS

Bournemouth Radio and Television Society

All R.S.G.B. members are invited to attend the meetings which take place on the first and third Thursdays of each month (7.30 p.m.) at The Cricketers Arms, Windham Road, Bournemouth. On October 19 the first of the winter lectures will be given by Mr. Walters, of *Belling and Lee Ltd.* The subject will be " Interference Suppression and Television Aerials ". The Hon. Secretary is Mr. F. G. Hamshere, 99 Elmes Road, Winton, Bournemouth.

Brighton and District Radio Club

Membership of the Club is now around the 80 mark. A number of interesting lectures have been arranged for the autumn sesssion. Sussex amateurs and friends are invited to a " Hamfest " to be held on October 21 at the Golden Cross Hotel, Western Road, Brighton. Further details from the Hon. Secretary, Mr. L. Hobden, 17 Hartington Road, Brighton.

EAST SCOTLAND REGIONAL MEETING

SUNDAY, OCTOBER 22, 1950

SCOTIA HOTEL,
7 GREAT KING STREET, EDINBURGH

PROGRAMME

Assemble	2 p.m.
Business Meeting	2.30 p.m.
Supper	5 p.m.
Informal Discussion	6 p.m.

Tickets, 7/6 each, from Mr. W. Baker, G3AFL, 4 Devon Terrace, Berwick-on Tweed, very early please, or from GM5YX, GM3KR, GM6SR, GM3ECW, & GM3EFH.

Coventry

The Group is to co-operate with the B.T.H. Radio Society in a Field Day at the B.T.H. Recreation Ground, Brownhill Green, on October 7-8. It is proposed to work on all bands from 1.8-420 Mc/s., using the calls G3CZN/A, G3ABA/P and G5PP/P. The A.G.M. will be held on Friday, October 20, at 7.30 p.m.

Coventry Amateur Radio Society

An inter-Society transmitting and receiving contest will be run in conjunction with the Midland Amateur Radio Society on October 15. Mr. F. Charman, G6CJ, Executive Vice-President of the R.S.G.B., is to lecture on "Aerials " on October 20. A recent Field Day was successful socially, although radio conditions, following the appearance of the Aurora Borealis, were poor.

Lincolnshire

A Lincolnshire Hamfest will be held at the Masonic Hall, Pinchbeck Street, Spalding, on Sunday, October 1, commencing at 2 p.m. Reservations should be notified as soon as possible to the T.R. : Mr. F. Rose, 10 South Parade, Spalding. The inclusive charge will be 5s. 6d.

NORTH-WESTERN REGIONAL MEETING

SUNDAY, OCTOBER 29, 1950

VICTORIA STATION HOTEL, PRESTON
(opposite Railway Station Approach)

PROGRAMME

Assemble	11.30 a.m.
Luncheon	12.30 p.m.
Business Meeting . .	2.30 p.m.
Tea	5 p.m.

Tickets (9/6 each) from Mr. L. Hall, BRS14580, 7 Lilac Grove, Holme Stack, Preston, by October 22nd latest. A bumper raffle will, as usual, be organised during the day.

Medway Area

The annual visit of the Medway Amateur Transmitting and Receiving Society to the Southend Radio Society proved a great success, altogether 56 members and friends being present. The visit has done much to cement still closer the ties between amateurs in Kent and Essex. R.S.G B. Council Member C. H. L. Edwards, G8TL, spoke on a variety of amateur topics.

Reading Radio Society

At a recent meeting, Mr. F. Ruddle described the construction of his F.M. receiver which was aligned using only Lecher lines, a communications receiver, and a 0-500 μA. meter. The receiver was demonstrated on the 91 Mc/s. experimental F.M. transmissions from the B.B.C. station at Wrotham, Kent, showing the high quality and absence of background noise that can be achieved with this system.

Slade Radio Society

Details of the programme for the period October to December, 1950, are now available from the Hon. Secretary, Mr. C. N. Smart, 110 Woolmore Road, Erdington, Birmingham, 23. Meetings are held at the Parochial Hall, Broomfield Road, Erdington.

Sutton and Cheam Radio Society

After the summer recess, meetings are again being held on the first and third Tuesdays of each month at the Sutton Adult School and Institute, Benhill Avenue. OZ3FN of Copenhagen, in the U.K. for a year to study television, has been made an honorary member. G3GFA, the Club station, has been active. Attempts are being made to stamp out a local outbreak of piracy.

Warrington and District Radio Society

Members participated in the Region 1 field day on August 27. After a late start, due to aerial troubles, 35 contacts were made. A Club bulletin, with the title " QRZ ", has made its first appearance under the editorial direction of Mr. F. E. Loxham. Two members have passed the 1950 Radio Amateurs' Examination.

Piracy

Mr. T. R. Borrill, G3FKK, 321 Priory Road, Hull, reports that unauthorised use of his call-sign has been made over a long period on 3.5 Mc/s. The pirate gives his location as Nottingham and his name as "John ".

Ten Minute Quiz

Answers to the questions set on page 106.

1. F1—200 Km. (124 miles) ; E—100 Km. (62 miles) ; F2—250 to 300 Km. (155 to 186 miles).
2. (a) ZL 1 and 2 ; (b) VS6 ; and (c) ST.
3. The numeral 1 indicates that no grid current flows during any part of the audio cycle ; the numeral 2 indicates that grid current flows for at least a part of the cycle.
4. B7G base. Pin (1) control grid ; (2) and (7) cathode ; (3) and (4) heater ; (5) anode ; and (6) screen grid.
5. 7 Mc/s. (see January, 1950, issue of the BULLETIN).
6. An electrostatic voltmeter.
7. Two condensers of between 0.1 and 0.5 μF. and a 10,000 ohms resistor.
8. (a) 39,800 ohms ; (b) 15,900 ohms ; and (c) 3,180 ohms (from the formula $Xc = 1/2\pi fC$.).
9. The thickest is X cut, followed by BT, Y and AT in that order.
10. Zero.

In the July Quiz the answer to question No. 4 was given as " R *nearly* equals 8." H.E.B. (who was not responsible for this statement) points out that despite Einstein's theory we can still be reasonably certain that R does *equal* 8!

NEW MEMBERS

The following have been elected to membership:—

Corporate Members (Licensed)

G2AFU †J. T. SAWYER, 16 Sanctuary Road, Gillingham, Kent.
G2FWJ F. H. SIMMONS, 28 Melton Gardens, South Street, Romford, Essex.
G3DMU S. L. THOMPSON, 16 High Street, Crowle, Nr. Scunthorpe, Lincs.
G3DTO W. REAT, Heathfield House, Heath Lane, Halifax, Yorks.
G3EJR J B. ARMSTRONG, c/o 20 Thornton Gate, Cleveleys, Nr. Blackpool.
G3EWX J. TAYLOR, 23 Welbeck Road, Hyde, Cheshire.
G3FZG *A. TREANOR, Ward 5, Mill Lane Sanatorium, Wallasey, Cheshire.
G3GIK L. N. DAVIS, 74 Rougemont Avenue, Morden, Surrey.
G3GKU J. E. EDMUNDS, c/o Sgts. Mess, R.A.F., Yatesbury, Wilts.
G3GMY F. E. A. GREEN, 68 The Drive, Barnet, Herts.
G3GOX MISS A. B. WALFORD, The Old Rectory, Farway, Colyton, Devon.
G3GPV J. L. T. CHOWN, 20 Craven Road, Newbury, Berks.
GI3GQA W. P. HEWITT, 77 Benmore Drive, Finaghy, Belfast.
GM3GRG D. R. ROLLO, 44 Woodhead Avenue, Kirkintilloch, Glasgow.
G3GRO D. ATTER, 43 Breck Lane, Dinnington, Nr. Sheffield.
G3GRL *J. A. BONSER, Brookside, Watnall Road, Hucknall, Notts.
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* Denotes transfer from Associate Grade.
† Re-elected to membership.

NATIONAL FIELD DAY RESULTS

Continued from Page 101.

Pos.	Town or Area.	"A" Station.		"B" Station.		Combined Score
		Call Sign.	Pts.	Call Sign.	Pts.	
111	Shefford...	G4OL/P	244	—	—	244
112	Redhill and Reigate	G5LK/P	243	—	—	243
113	Northampton ...	G4MU/P	227	G2AAA/P	10	237
114	Grays ...	G3DLC/P	232	—	—	232
115	Bath ...	G8DX/P	224	—	—	224
116	Banff ...	—	—	GM3DPK/P	222	222
117	North Devon	—	—	G6GM/P	218	218
118	Retford ...	—	—	G3BTU/P	215	215
119	Guernsey	GC2FZC/P	127	GC3ZU/P	55	182
120	Isle of Wight	G3FAN/P	140	—	—	140
121	Lewisham	G2DHV/P	103	—	—	103

* The Cardiff group were unable to meet to erect their stations on the Saturday afternoon, so commenced work on the previous evening. They have, therefore, disclaimed the right to a place.

The following stations were disqualified for failure to observe the rules:—

Barnet "A"; Coventry "B"; Hoddesdon "B"; Mansfield "A"; North Birmingham "A" and "B"; North Devon, "A"; Plymouth "B"; Redhill and Reigate "B"; South West Scotland "A" and "B."

Check logs are gratefully acknowledged from the following stations:—

DL7CW, EI3N/P, EI6U/P, EI7Y/P, EI8P/P, G2BP, 2MI/P, 2ZC, 3DUQ, 3EVV, 3GLV, 3NT/P, 5LY, 5PS, 6UT/P, BRS 12474, HB9IU, xPAØCD, xPAØIF, PAØKC/P, PAØTG/P, ZB1FK, and ZL1MP and ZL1NX, both via GI4RY

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In addition to the above few types we have tremendous stocks of both ex-Govt. new valves at equally competitive prices and B.V.A. valves at current B.O.T. prices.

TRANSMITTING VALVES. 805, ATP4 at **10/-**. Westinghouse 813 at **50/-**, 832 at **15/-**, 866A at **15/-**. Klystron 723A/B at **82/6**. 829B at **59/6**. All brand new and boxed.

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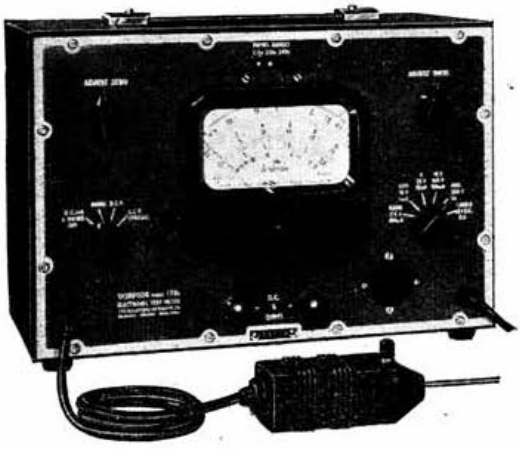

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