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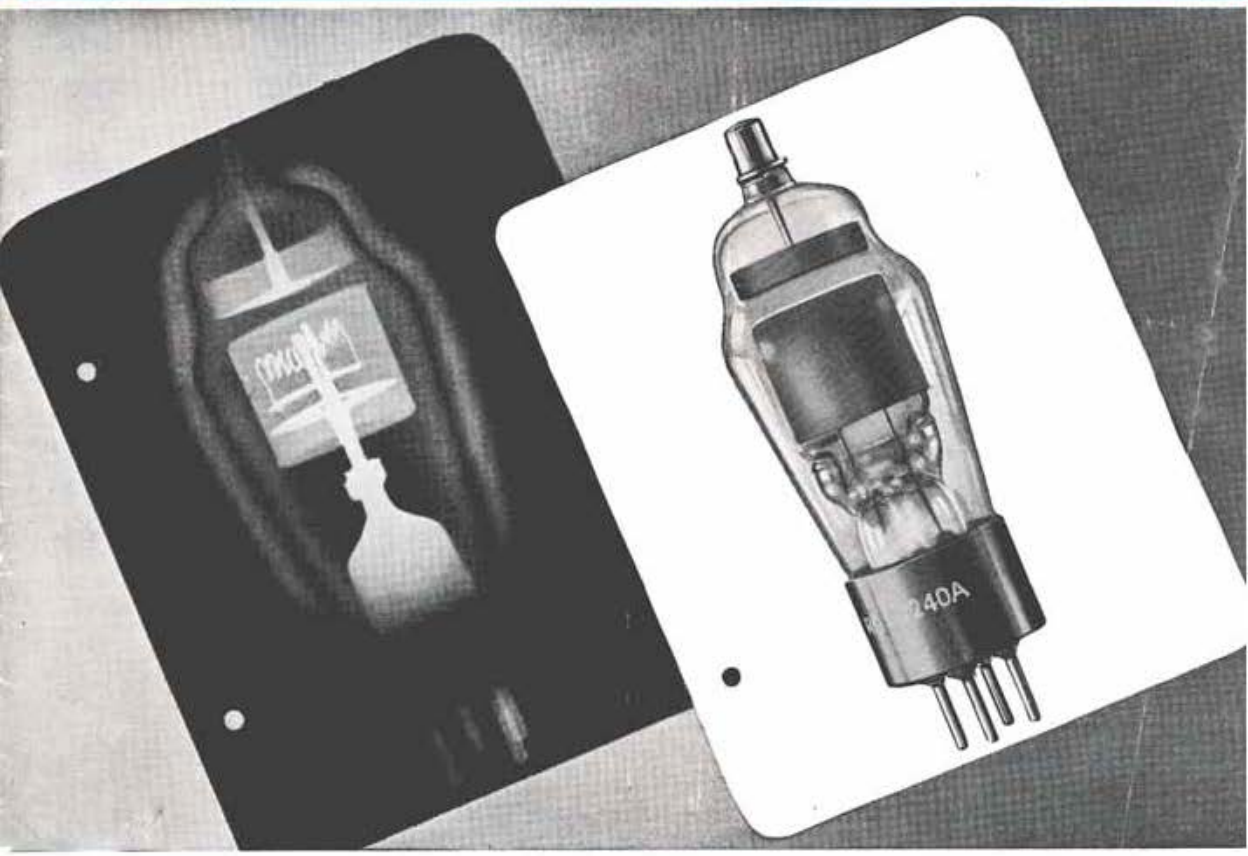
BULLETIN

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN



- FIVE METRE PROPAGATION CHARACTERISTICS
- THE E.M.I. PRESENTATION
- FIVE METRE CONTEST
- PORTABLE DIRECTION FINDING

R.S.G.B. BULLETIN

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VOL XXII — No. 7

ENCOURAGEMENT IN CONCRETE FORM

SIR ERNEST FISK, Managing Director of *Electric and Musical Industries Ltd.*, made three important points in his speech when he presented a specially designed transmitter and other equipment to the Society last month.

Firstly he said "*As designers and makers of radio equipment, we had the idea of doing something to encourage not only the radio amateur of this country but also the Amateur Radio movement itself.*"

Secondly "*Amateurs having pioneered, they must maintain their lead.*"

And finally, "*As a Society you should do a bit of boosting with the gear we have given you, remembering all the time that not all the advances in radio technique have come from the other side of the Atlantic.*"

It is refreshing to find the Chief Executive of a great commercial concern, with world-wide connections, coming out so strongly on the side of the amateur. Sir Ernest Fisk has always taken a keen interest in the Amateur Radio movement, and he was in fact instrumental after the first world war in reforming the Wireless Institute of New South Wales, but he must have surprised many of his listeners by speaking in their own "language." Phrases which are sacrosanct to the amateur fell easily from his lips and were obviously as familiar to him as they are to ourselves. No wonder then that he could claim to speak with authority on amateur matters; no wonder that he could tell us clearly and precisely how he would like us to use the new equipment. Is it too much to hope that other leaders in the Radio Industry, many of whom have graduated from the ranks of Amateur Radio, will in due time by action and word do something to encourage the Amateur movement ?

We wonder whether Sir Ernest Fisk was aware when he made the presentation that only nine days earlier a British amateur had for the first time in history received 6-metre signals from a North American amateur station. The Heightman-Tilton achievement was no accident. It was in fact the culmination of years of effort and close study of conditions on the part of both participants. How intense was that study can be gleaned partially from the outstanding contribution by Heightman and Williams in this issue. So long as we have men of their calibre in our ranks the pioneer spirit will never die.

The Society must do a bit of boosting, said Sir Ernest. We agree, but unfortunately "shooting a line" is not a characteristic British trait. Yet unless we *do* boost Amateur Radio, other interests, with powerful voices will attempt to deprive us of the hard-won facilities we now enjoy. Special events, in which Amateur Radio plays a part, invariably produce fleeting publicity, but we should aim for as much "day to day" publicity as we can obtain.

The average Man-in-the-Street, notwithstanding his keen interest in broadcasting, has only the vaguest conception of Amateur Radio. Would it not be a good thing occasionally to throw open our stations and invite our neighbours—including the B.C.L. who complains—to see what we do and how we do it ? Perhaps some of our more enterprising T.R.s will consider the possibilities of organising exhibitions in some suitable place to which the public can be invited. And, how about installing amateur stations at open air events during the summer ? Provided permission is obtained from the G.P.O. to operate from a specified alternate address, there appears to be no reason why an amateur cannot beneficially stage a demonstration of his activities in public. But beware—no message handling.

By adopting such methods and others of a similar nature we should be going some way to make the public appreciate the importance of Amateur Radio. Furthermore we should be showing that the Amateur movement is deserving of every encouragement.

Model Control Group.

We recently had an opportunity of reading through the first four Letter Budgets circulated by F/Lt. J. Oswald Dykes, Sunnybank, Llanthony, Nr. Abergavenny, Mon., to members of the Model Control Group. Pressure on our very limited space prevents us, at present, from giving wide publicity to the work of this very go-ahead Group, but we commend its activities wholeheartedly to all who are interested in the radio control of models.

Many of the articles included in the Letter Budgets are not only first-class technical contributions, but they show clearly that the authors are fully alive to the future possibilities of radio control.

We offer congratulations and best wishes to F/Lt. Dykes and to the 50 odd members who at present form the Group. J. C.

FIVE METRE PROPAGATION CHARACTERISTICS*

By D. W. HEIGHTMAN, A.M.Brit.I.R.E. (G6DH)
and E. J. WILLIAMS, B.Sc. (G2XC)

AS with waves of lower frequencies, propagation of five metre waves can be conveniently considered under the following main headings:

(1) Optical (including ground wave).
(2) Tropospheric (or lower atmospheric)
(3) Ionospheric. Sporadic E layer.
(4) Ionospheric. F layer.

In the present instance, we are chiefly concerned with propagation of class (2) *i.e.* tropospheric, but in passing, it will probably be as well to briefly refer to ionospheric propagation.

Sporadic E

Sporadic E, or short skip conditions, occur almost entirely during the late Spring and Summer from May to August, and may suddenly appear at any time from early morning until late evening. Signals are frequently of high intensity, and arrive at fairly high angles, so that low angle beam aerials are often unnecessary. The signal path is not always a great circle and, consequently, beam aerials sometimes should be turned away from the direction of the station being received or contacted. Distances covered are almost always single hops of 500–1,000 miles, 800 miles being about average—and directions south of east and west appear more favoured from this country. The conditions are fairly localised and times of appearance may vary at stations less than 100 miles apart. Similarly Northern Europe is seldom, if ever, heard at the same time as Southern Europe. The exact nature of the medium of reflection and its causes, are not at all clear at present, but there is undoubtedly, some connection with solar activity. It is very probable, also, that tropospheric bending assists in the reflection of waves both by the sporadic E and F layers. There is very little increase in skip distance, under sporadic E conditions, from 30 to 60 Mc/s. so the layer must have a fairly clearly defined surface, giving efficient reflection. The most useful indication of the possibility of 60 Mc/s. signals being reflected is to observe reception conditions from 30 Mc/s. upwards. Ten metre conditions are always very good when 5 metres is open.

F. Layer

So far as ionospheric F layer reflection is concerned, the exact opposites of the E layer characteristics apply, in most instances. Reflection by this layer is at maximum in the Winter months, particularly at the periods Oct./Nov. and Feb./Mar., with a slight drop in mid-Winter. During the Summer, the F layer upper frequency limit, even at sunspot maximum years, is only about 32 Mc/s. or less, but in the Winter this limit increases to an average of 40 Mc/s. (for low angle signals) and on exceptionally good days can peak up to about 60 Mc/s. for favourable signal paths. On the high frequencies we are considering, signals reflected by the F layer come in at very low angles, and beam aerials giving maximum horizontal directivity and low vertical angle of radiation, are essential. The ideal site for a station will, of course, be on high ground. Distances likely to be covered between 50 and 60 Mc/s. are of the order of 2,500 to 5,000 miles, and there is some evidence to show that directions broadly East and West, will give higher peak frequencies than due South. Conditions will tend to peak when it is midday, at a position half way between stations separated by the above-mentioned distances.

It is unfortunate that we are not allowed to operate on the lower band of 50/54 Mc/s. granted to American amateurs, as there is a far greater possibility of Trans-Atlantic contacts on 50 Mc/s. than on 60 Mc/s.† Matters are also complicated by the unsuitability of 60 Mc/s beam aerials for reception on 50 Mc/s.

We are now nearing another sunspot maximum, which is expected to occur next winter, and at the present time (November, 1946) F layer reflections are peaking up to 50 Mc/s.

Tropospheric

Because of its erratic nature, ionospheric propagation of 5 metre waves cannot be of practical value—only so far as observation on such propagation can enhance our knowledge of the ionosphere generally. On the other hand, tropospheric propagation, which increases considerably over optical distance the semi-ground wave coverage of very high frequency stations, is a very important factor in communication on these frequencies.

During the past six months, observations on tropospheric propagation, commenced before the war, have been continued at G2XC and G6DH. The former station is situated 200 ft. above sea level on the Northern slope of a 350 ft. hill, just North of Portsmouth, while the latter is on flat, open country, about a mile from the North Sea, at Clacton, Essex, and about 60 ft. above sea level. Powers of the order of 25 watts and three-element horizontal rotary beam aerials, are used at both stations. Regular daily tests have been made between G2XC, G2MV and G6DH. G2MV is in a direct line (S.W.) from G6DH to G2XC, the distance to G2MV being 70 miles, and to G2XC, 120 miles. G2MV is in a favourable location, being 600 ft. above sea level. These tests, together with a series between G2XC and G6KB (Henley-on-Thames), over a 47 mile path, and observations on other stations, provided us with the following data.

(*a*) Signals from distances up to the order of 35 miles, are received at good intensity, and almost free of fading, with the exception of very occasional rapid and regular fading, probably due to the in-and-out-of-phase effect, caused by reflections from aircraft. None of the stations in this range is within optical distance of G2XC, yet almost all run the "S" meter to many db over S9. In some cases, considerable optical screening from hills as high as 900 ft. appears to have little effect. There have been no stations active within this range of G6DH, so that such observations have been confined to G2XC.

(*b*) Signals from stations up to 50 miles, in any but the worst locations, are receivable under all conditions yet met, but fading is occasionally present. This fading is usually of a sudden nature, and short and deep fades are separated by long periods of steady, strong, or fairly strong, signals. The fading can, to a large

* *A paper read at a Meeting of the Society held on October* 18, 1946

† *This contention has been proved correct for, as readers are now aware, Mr. Heightman received* 50 *Mc/s. signals from West Hartford, Conn., U.S.A., on November* 24, 1946.—ED.

extent, be overcome, by using good aerial systems and although this does not remove the fading, it enables the signal to remain at a readable level for a greater proportion of the time. For two stations located on high ground (220 ft. or higher) the periods during which fading reduces the signal below 100 per cent. intelligibility, is considerably less than 1 per cent. of the total time. During lengthy tests at all times of day, between G6KB near Henley, and G2XC, over a 47 mile path propagation conditions have never dropped the signals sufficiently for any loss of intelligibility. These tests have been made in all types of weather which make up a British Summer. There is, however, some day to day variation in signal strength which, together with the fading, suggest either a multipath circuit and/or a path of variable attenuation or other variable characteristic.

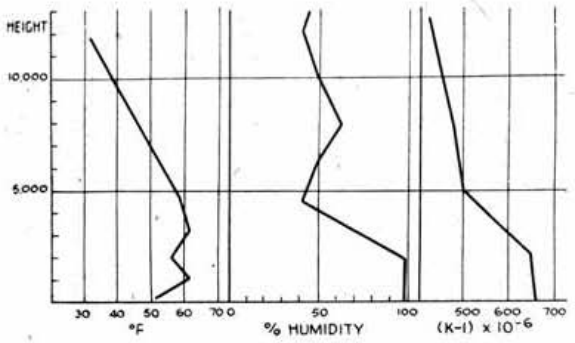

Fig. 1.
Changes of temperature, humidity and dielectric constant at 06.00 G.M.T., August 5, 1946 (Larkhill).

(*c*) Signals from stations between 50 miles and about 120 miles are receivable with fair consistency, but are very subject to fading and considerable variation in strength over comparatively short periods, there being some occasions when signals are inaudible. At times, what can best be described as "patchy" conditions are observed, when a signal may be fairly steady for say 5 minutes, and then disappear completely. A high location, say in excess of 200 ft., may have the effect of giving stations in this zone the characteristics of stations in zone B above, *e.g.* G3CQ at 72 miles and G6VX at 60 miles from G2XC, and G2MV 70 miles from G6DH, received on a par with the stations at 35 to 50 miles; similarly signals from G2XC and G6DH reach these stations at a corresponding strength. Contrary to the opinion generally held, a few months ago, reception of signals from these distances does not appear to be influenced to any great extent by time of day. A series of tests during August, 1946, between G2XC, G2MV and G6DH, at four different times of day, namely, 07.00, 12.00, 17.30, and 21.30 G.M.T., showed no greater degree of reliability or strength at any of these times. The exact figures will be given later, when considering the mechanism of propagation of these signals. Generally signals from stations at these distances do not exceed S6 to 7, but very exceptionally a period is encountered when signal strengths are much above normal and in every way comparable to a good signal from zone B. These periods may last from a few minutes up to several hours, and have so far only been noticed in the middle and late evening periods, and early mornings during the Summer, but this may be due to the general inactivity on the band at other hours.

(*d*) Signals from distances of 150 miles or more are receivable under exceptionally good conditions. Such signals are usually not very strong and are subject to fading which may reduce the strength to zero for several minutes at a time, but at other times, signals may be 100 per cent. readable for periods of fifteen minutes or more. No regular tests have been made with stations at these distances.

As a general observation relevant to all the above zones it must be pointed out that stations situated at greater heights than G2XC and G6DH probably find that the conditions they experience are more favourable than those described, whereas stations nearer sea level will have more adverse conditions. No great screening effect to the South or South West of G2XC has been noticed, as a result of the location on the northern slope of Portsdown Hill.

It has been observed that between G6DH and G2XC what appears to be one-way transmission takes place. On occasions G2XC receives G6DH quite well when signals from G2XC are inaudible at G6DH. The reasons for this, are the subject of present investigation.

Whilst it may have no direct bearing on the present considerations, it is interesting to observe that recent tests between G2MV and G6DH, comparing tropospheric conditions on 5 and 10 metres, by changing rapidly from one band to the other, have shown that 10 metre waves are at least as much subject to tropospheric bending and possibly more so.

There is in fact, no clear division where tropospheric propagation commences, but on lower frequencies its effects are frequently masked by the greater degree of ionospheric reflection. The effect is probably of considerable importance in assisting 10 metre DX communications.

Physical Principles

Before proceeding to a detailed study of the propagation of 5 metre signals over distances up to several hundred miles, it is useful to refer very briefly to some of the phenomena encountered in the propagation of light waves. Both light and radio waves are electromagnetic, the difference being one of frequency and hence there is a close relationship between their behaviours.

Refraction

When an electromagnetic wave passes from one medium to another of different dielectric constant (K) its velocity of propagation changes—the larger the value of K the slower the speed. This change of velocity is the cause of the bending, or refraction, of light passing from air to water, or *vice versa*, at oblique incidence. The degree of refraction produced by any particular medium with respect to a wave travelling in vacuo is known as its refractive index (μ) and is the ratio of the sines of the angles of incidence and refraction. Since the refraction is due to the change in K, it is not surprising to find that K and

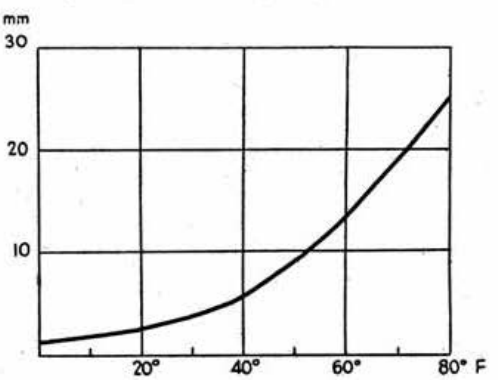

Fig. 2.
Vapour pressure (in mms of mercury) for 100 per cent. humidity at various temperatures.

μ are related by the simple formula $K = \mu^2$. This formula must be modified if absorption of certain frequencies is occurring in the medium, but for gases it is very closely true.

Reflection

In addition to the refracted wave which travels on into the second medium, a reflected wave is produced at the boundary of the two media. The amplitude of the reflected and refracted waves is dependent on the angle of incidence, the refractive index and the nature of the boundary. If the incident ray approaches a grazing condition the reflected wave is of almost equal amplitude to the incident ray. As the ray is moved further from the grazing incidence the intensity of the reflected wave decreases. In the case of propagation from a medium of high K to one of lower K, the refracted ray is further from the perpendicular to the boundary than is the incident ray and if the angle of incidence is made sufficiently large the angle of refraction becomes 90° and any further increase in the angle of incidence produces total reflection (*i.e.* no refracted wave).

Diffraction

It is a well-known fact that the shadow of an object is never completely dark. Some light reaches the shadow by reflection from other objects, dust particles, etc., but if all these means are removed some light still reaches the shadow. This bending of light round the edge of an object is known as diffraction.

Application to 5 Metre Signals

The optical horizon for various heights above sea level is given in numerous reference books including *The Amateur Radio Handbook*. These distances are, of course, reduced somewhat by hills, buildings, etc., and it is clear from the foregoing summary of observations on the 5 metre band that signals reach well beyond this horizon. This extension beyond the optical horizon and over hill tops is probably due in the first place to diffraction. The effect will be greater on lower frequencies as the distances into the shadow are not so large compared with the wavelength involved. A certain amount of bending round the earth's curvature will result from the absorption of energy from the foot of the wave by the earth. This slows up the base of the wave front and tilts it forward. The effect increases with frequency and is the cause of the rapid attenuation of V.H.F. signals. Both of these effects should produce steady signals and the fading usually experienced at distances much beyond the optical horizon suggests other means of propagation.

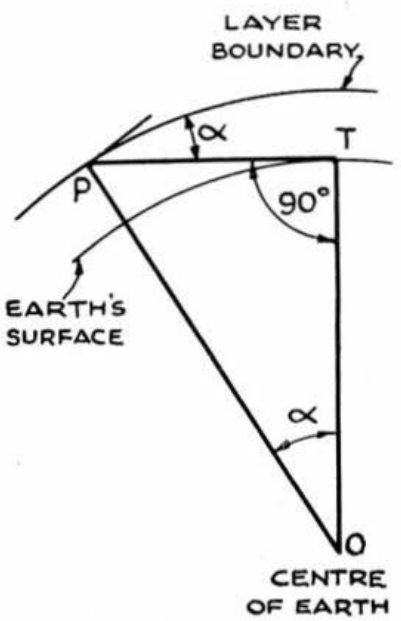

Fig. 3.
Incidence of horizontal ray from transmitter T on layer at point P

It has been suggested that refraction occurs in the lower atmosphere and it is now proposed to examine the possibilities of this effect. The dielectric constant of air is very nearly unity. For dry air at 760 mm. of mercury pressure and at 32° F. it is approximately 1.000586. For a small value of K such as this, it can be shown that K—1 is proportional to the density of the medium. Hence, changes of pressure and temperature will effect the dielectric constant. Density is proportional to pressure and inversely proportional to temperature (measured in degrees Absolute). This means that a decrease in pressure or an increase in temperature will cause a decrease in the dielectric constant. As altitude is increased both pressure and temperature normally decrease. These have opposite effects on K but the overall effect is that K decreases by about .000012 per 1,000 ft. increase in height. This change is far from sufficient to bend rays back to earth and its effect is usually ignored in studying propagation on frequencies where ionosphere bending is the dominating feature. However, in conjunction with the diffraction already mentioned it may extend the ground ray range somewhat. It is of interest to note that the bending of the sun's rays in passing through the entire atmosphere does not exceed 35 ft. even at sunrise and sunset when the refraction is at a maximum. It does, however, result in the sun being visible above the horizon when it is in fact completely below.

Temperature Inversions

This steady decrease in K with height may be interrupted by a more sudden fall if a temperature inversion occurs. Such is the case when a warm layer of air lies over a cooler layer and the temperature rises as altitude is increased. The density and hence the dielectric constant now decreases much more rapidly. The condition is stable and under calm weather conditions will tend to persist.

Humidity Gradients

So far we have only considered the case of dry air, but in practice the air is often far from dry and the water vapour content of the air increases the dielectric constant appreciably, for example, dry air at 60° F. at sea level has a dielectric constant of about 1.00055, while the same air saturated has a K of 1.00069. These values have been calculated using Zahn's formula and assuming that $(K - 1)$ is additive for gases and vapours. Thus it will be seen that a layer of dry air over wet air can produce a sharp drop in the value of K.

Fig. 1 shows the changes of K with temperature inversions and humidity changes on the morning of August 5, 1946. There are two large inversions of temperature, one of 10° F., between ground level and 1,000 ft., and another of 4° between 2,000 ft. and 3,000 ft. The lower of these is not effective in producing a large change in K because the humidity remains at 100 per cent. throughout the inversion and as a result the water vapour content of the air is greater at 1,000 ft. than at ground level. This is due to the fact that with an increase in temperature the quantity of vapour the air can hold increases rapidly. (See Fig. 2.) The inversion at 2,000 ft. is accompanied by a large drop in humidity and in consequence the dielectric constant changes rapidly. It will, thus, be realised that at low altitudes humidity is more likely

to be the controlling feature than are inversions, while at greater altitudes where the air temperature is lower the effect of humidity changes will become less marked due to the small water vapour content of the air even with 100 per cent. humidity.

The presence of a layer where the dielectric constant decreases more rapidly than normal will result in increased refraction, and if the gradient is sufficiently steep, appreciable reflection will occur at grazing incidence. It is useful to consider the possible angle of incidence. If no bending is experienced previous to reaching the layer boundary, it will be seen from Fig. 3 that the angle between the layer and the ray at the point of incidence is equal to the angle subtended at the centre of the earth by the point of transmission T and the point of incidence on the layer P, in the case of a very low angle transmission. With a layer at about 2,000 ft. this angle will be about 1°. If the layer is at higher altitude the angle of incidence will be further from the grazing condition. The change in refractive index is still insufficient to bend rays through these large angles but the incidence is probably sufficiently grazing for appreciable reflection, the magnitude of which will depend on the sharpness of the boundary. In general, a low layer will be more likely to produce effective reflection, but will restrict the ranges obtainable and be more subject to obstruction by hills, etc. There is, therefore, an optimum height for any given path depending on the distance to be covered and the topography of the intervening country, particularly that within say, 20 to 30 miles of each end. This is well illustrated by the diagram (Fig. 4) showing the obstacles encountered by a ray leaving the aerial at G2XC (Portsdown Hill) horizontally in the direction of G6DH (Clacton). The upward curvature of this ray in the diagram is due to the fact that the curvature of the earth has been omitted in the topographical section. Corresponding diagrams for G5TX (Arreton Down, Isle of Wight) and for the G6DH end of the path are also given. For good results between G2XC and G6DH the layer would appear to have to be above about 3,000 ft. as with a lower layer the hills at the G2XC end of the path would form an obstruction, while with G5TX and G6DH a much lower layer would be effective. Hence, it is desirable to raise transmitting and receiving stations as high as possible to avoid attenuation of the all-important low angle radiation which is to give grazing incidence on the layer. It also becomes important to radiate as much as possible of the energy at a very low angle. Summarising, it appears that the field strength at a distant point will depend on the layer height, its diffuseness, the local topography at the ends of the path, and the vertical polar diagram of transmitting and receiving aerials. A simple calculation will show that for one hop the distance covered with stations at sea level and with the reflecting boundary at 3,000 ft. will be about 160 miles. Diffraction will, in conjunction with height above sea level, extend this range to the order of 200 miles although signal strength will fall off considerably.

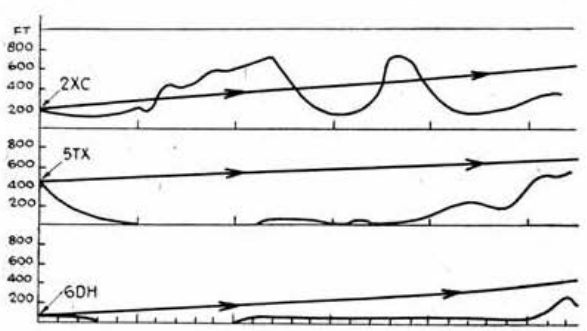

Fig. 4.
Paths of rays leaving G2XC, 5TX and 6DH horizontally, with respect to local topography.

Suitable Weather Conditions

It is perhaps pertinent to ask under what sort of general weather conditions such inversions and humidity gradients are likely to be produced. It is difficult to give an exact answer but it is fairly certain that such conditions will not exist during the passage of a depression. In addition, it frequently happens that an anticyclone *does* produce ideal conditions. The persistent anticyclone during the early and middle part of October, 1946, with its strato-cumulus cloud layer at about 3,000 ft. was accompanied by a large and enduring inversion at the top of the cloud layer, together with a very rapid decrease in humidity with height at the same level. Once such an inversion is formed it may tend to become permanent until the weather system moves, as the condition of less dense air over denser is obviously stable, and the moist air from below cannot move up through it.

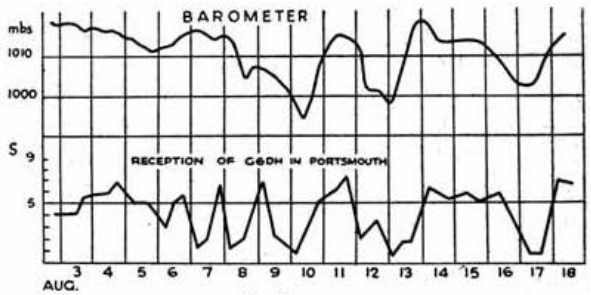

Fig. 5.
Barometric pressure and 5 metre conditions

That there may be a diurnal variation is possible, but examination of the data regarding upper air has not yet revealed this, although of course the inversions at levels near the ground, due to cooling of the earth after a warm day, will show such variations. However, due to humidity considerations such inversions are not likely to be the main cause of long distance communication. Thus, it seems that good conditions may occur irrespective of season or time of day.

Correlation of Radio and Weather Conditions

It is now proposed to examine some of the results obtained during the recent tests on 60 Mc/s. in the light of the foregoing considerations. Firstly, as an indication of the rather negligible effect of time of day we give the following statistics obtained during August by the observation of signals from G6DH at Clacton in Portsmouth.

G.M.T.	Percentage of Transmissions heard	Average Strength (Usual S scale)
07.00	85	3.3
12.00	87	2.7
17.30	100	3.3
21.30	50	2.6

The figures for 21.30 G.M.T. may be slightly unreliable but are probably not far wrong, and there is certainly no pronounced indication of a diurnal effect.

Secondly, as an indication of general weather effect we have a graph of reception of G6DH compared with barometer readings. Notice the effect of the depressions on August 8, 10, 12, 13 and 17. (Fig. 5.)

To examine here the full test period in detail is an impossibility, but in actual fact the whole results from July 1, 1946, onwards have been tested against data obtained from Air Ministry. Upper air temperatures, humidities, winds, etc., are available for a number of locations in the British Isles. Data is available for four times daily, namely, 00.00, 06.00, 12.00 and 18.00 G.M.T. The temperatures and humidities are given at intervals of 50 mbs. (*i.e.* about 1,600 ft.), and more exact data is given when temperature inversions occur. From this data graphs have been drawn for all times under review and a selection of these is given here.

Fig. 6 shows the temperature, humidity and dielectric constant gradients for July 12, 1946. This particular evening came at the end of a week of fine weather and was characterised by a clear sky and calm conditions. It will be seen that there was a sharp drop in humidity accompanying an isothermal just over 5,000 ft. and these produced a marked fall in the dielectric constant. Note that the inversion from the ground up to 1,500 ft. did not produce a large change in K. Conditions were very good on 5 metres, particularly to the south-west, signals from Devonshire being very strong and steady in Portsmouth. In addition G6DH was strength S6 and G2AK (Birmingham) was S7, at G2XC.

Conditions on July 23 are shown in Fig. 7. A ground fog developed in Portsmouth soon after 18.00 G.M.T. with a clear sky above. Temperature and humidity changes are effective in producing a large fall in K at about 3,000 ft. This evening was one of the best of the summer for 5 metre transmission, signals from distances up to 200 miles being audible.

In contrast August 7 (Fig. 8) was particularly poor during the morning hours, G6DH being only just audible in Portsmouth. The weather was rain and drizzle due to the passage of a trough of low pressure across southern England. Later in the day when an inversion and humidity drop developed at 6,500 ft. conditions improved noticeably.

Finally, the graphs for midnight on October 11 (Fig. 9)—an exceptionally good evening—show an extraordinarily sharp fall in the value of K at about 2,800 ft. It is regretted that space will not permit the reproduction of more examples, but those interested will find it an easy matter to draw out their own graphs. Particulars of how to obtain the data from Air Ministry have already been given in the October, 1946, R.S.G.B. Bulletin.

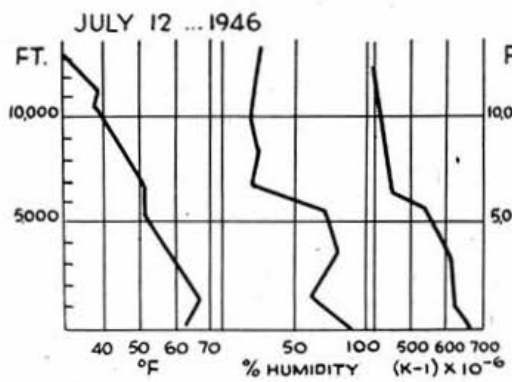

Fig. 6.
July 12, 1946. Midnight

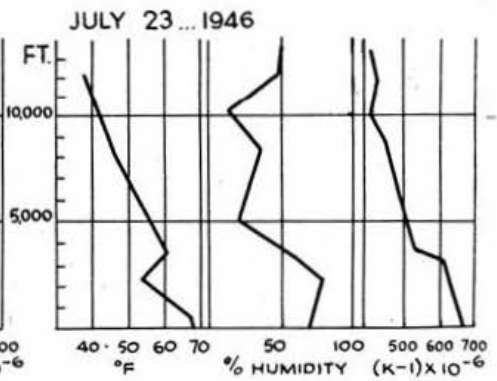

Fig. 7.
July 23, 1946. 18.00 G.M.T.

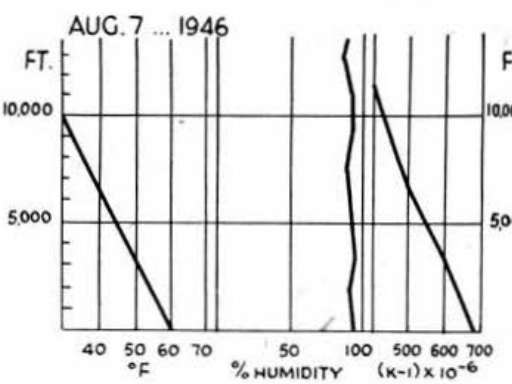

Fig. 8.
August 7, 1946. 06.00 G.M.T.

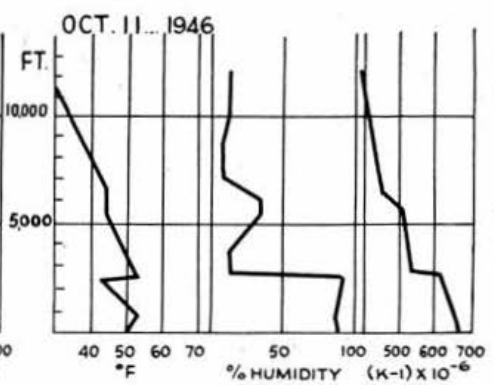

Fig. 9.
October 11, 1946. Midnight.

THE E.M.I. PRESENTATION

Technical Details of the Equipment,

By F. CHARMAN, B.E.M. (G6CJ)*

THE presentation made to the Society by *Electric and Musical Industries Ltd.* was briefly referred to in the December issue. In this article it is proposed to give some technical details of the equipment, which comprises a powerful short-wave transmitter, a standard frequency meter and a universal modulation meter. The instruments incorporate several features which could be used to advantage in amateur stations; and all are based on designs which have been manufactured for the Armed Forces by *E.M.I.* As a point of interest many amateurs have been concerned in their design and manufacture.

THE TRANSMITTER

The transmitter, illustrated in Fig. 1, is a self-contained unit capable of delivering 300 watts, C.W. telegraphy or telephony, to a concentric-link cable, over a frequency range of 1.5 to 20 Mc/s. It thus covers most of the amateur communication bands. In addition it can be used at lower output on 28 Mc/s. by operating the power amplifier stage as a frequency doubler. The frequency can be controlled by a master oscillator of high stability, by plug-in crystals, or by means of an adaptor from an external source.

All controls are brought out to switches or dials on the front; thus a change of frequency can be effected in a few seconds. There is no coil changing. Facilities are also provided for remote control over a single pair of wires, giving activation for C.W. or 'phone, keying or modulation and intercom. telephone circuit. The modulator has automatic compression to prevent over-modulation, and also mutes itself against modulation from room noises.

The transmitter proper comprises an oscillator (delivering a fundamental frequency, a second or a third harmonic), a buffer or multiplier stage and a power amplifier. In addition there is a speech amplifier and modulator. These several sections and all relevant controls are built into one unit. H.T. supplies occupy a second unit. The two main units withdraw from the cabinet on rails, thus making all parts of the transmitter accessible from the front. The valves used are familiar types: 807 for oscillator and multiplier, with two 813's in parallel for the P.A. Modulation is applied to anode and screen of the P.A. valves from another pair of 813's working push-pull Class B. H.T. is obtained from low-impedance hard rectifiers (U23).—an arrangement which indicates the modern tendency to avoid mercury tubes.

The Oscillator

This uses the familiar "E.C.O." principle in a rather unfamiliar way. The cathode tap into the main oscillator circuit is of the Colpitts type, *i.e.*, at the junction of two condensers which, in series, make up the main tuning capacitance. This capacitance is fixed, and tuning is effected by means of a variable inductance which comprises a rotatable coil with roller contact. With a 100 division tuning dial directly coupled to the coil, and 30 turns to traverse, the provision of a turn counter gives a very simple "open scale" of 3,000 divisions. The addition of a vernier makes it possible to set the M.O. frequency from calibration to within one kilocycle at 14 Mc/s. As accurate as the average crystal!

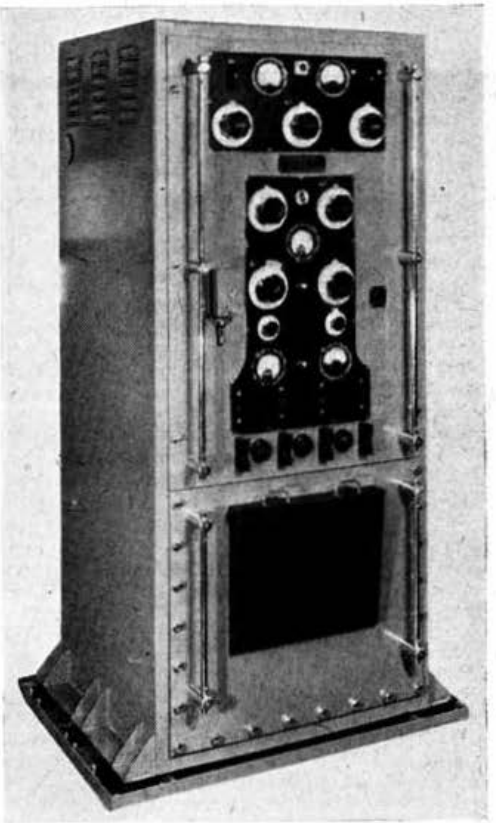

Fig. 1.
The Transmitter.

As the rotating coil is mechanically coupled to a similar coil in the anode circuit, it is only necessary to switch-in various pre-set anode tuning capacitors, for the output to "follow" the oscillator frequency fundamental, second or third harmonic. In this way, the oscillator remains in the range 1.5–2.5 Mc/s. Further, it avoids any switches in its closed circuit, whilst it produces enough output to drive another 807 at any frequency between 1.5 and 7.5 Mc/s.

The high frequency stability obtained, coupled with freedom from chirp and drift, is the result of a number of design features. For instance, the main closed circuit is constructed of heavily silver-plated Invar steel (with infinitesimal temperature coefficient), whilst the main capacitor is large and uses air spacing —one plate of the assembly is mounted on long brass pillars to provide an expanding gap which compensates for temperature-drift in the rest of the circuit. The cathode tap is half-way between grid and earth, and with a large value of capacitance in the closed circuit, the valve oscillates only gently (D.C. connection to the cathode is, of course, through a choke). The power supplies to the valve are stabilised—the H.T. by means of a chain of S.130 tubes, and the L.T. by means of a barretter.

The combination of all these factors results in a master oscillator with a stability and general performance equal to that of a good "X-cut" crystal oscillator.

* Engineering Staff E.M.I. Ltd., Hayes, Middlesex.

When using crystal control, the main oscillatory circuit is disconnected, and the crystal placed between grid and earth. There is insufficient coupling-back from the anode circuit to maintain oscillation, and a little additional feedback is provided by means of a small capacitor from cathode to earth.

Keying

Keying is applied to the oscillator by means of a relay which closes the screen supply thus making the transmitter suitable for break-in working. In order to assist the keying, particularly when using crystal control, the valve is provided with a small amount of automatic bias from a cathode resistor.

The special features of this circuit, and in particular the use of a large tuning capacitance, the Colpitts tap, and stabilised supplies, are worthy of study by those who contemplate M.O. control. Furthermore, the cathode condenser crystal-feedback is very "kind" to crystals and is much in advance of the common "tritet" circuit.

The Multiplier

Having reached frequencies up to 7·5 Mc/s. with the oscillator, it is necessary to multiply further in order to reach 20 Mc/s. A second 807 with its grid condenser connected directly to the oscillator anode provides for this facility. As the drive is keyed, automatic bias is not suitable, so about 30 volts fixed bias is applied through the grid leak.

The anode circuit, which is similar to that of the oscillator, uses a rotating coil and a number of fixed capacitors for various ranges. With 500 volts H.T. this stage will drive the two 813 P.A. valves from its third harmonic. On lower ranges, where multiplication is not needed, this stage acts as a buffer, and on these ranges the screen voltage is reduced both in the buffer and oscillator, by means of the range switches.

The Power Amplifier

The two 813's in parallel are condenser-coupled to the anode of the previous valve, and again as the valves are not suited to auto-bias the stage is provided with fixed bias. The bias is sufficient to hold down the anode current when there is no drive, whilst a 5,000 ohms gridleak provides enough extra bias for Class C operation.

The anode circuit represents an interesting development since it uses the familiar "Collins" or "Everitt" coupler connected directly between anode and a 50 ohms output load, with, of course, the provision of parallel choke feed and blocking condenser. (See Fig. 12c, page 185, of *The Amateur Radio Handbook*.) This circuit limits harmonics and is delightfully easy to tune. Both capacitors and the coil are variable. The capacitor placed between anode and earth is set to a predetermined value in order to give the correct "*Q*". Tuning is effected on the coil whilst the capacitor across the load adjusts the coupling. The anode and screen voltages are 1,500 and 400 respectively.

The Power Unit

This provides two separate H.T. supplies, *viz.*, 1,500 volts for the anodes of the P.A. and modulator, and 550 volts for the screens and other valves. The stabilisers for the M.O. are fed through a dropping resistor from 1,500 volts. The rectifiers have their own separate filament transformer. There are two special features, namely, a delay switch which allows all heaters to settle before the H.T. can be applied, and an H.T. reducing switch for use when tuning up. The latter device consists of an iron-core coil in the mains supply to the two H.T. transformers which is of sufficient inductance to halve the H.T. voltage. When the transmitter is tuned, the closing of a switch short-circuits this coil and full H.T. is applied.

The filament transformers for the radio unit are mounted near their valves. They also provide a 50 volt A.C. contactor-supply and, by means of metal rectifiers, two bias supplies, one for the R.F. stages and the other for the modulators.

The Modulator

There is nothing unusual about the modulator, except that it has to provide about 250 watts of audio. The output transformer which is rather large has two secondaries, one for the anode of the P.A. and the other for the screen, in a ratio equal to the screen anode voltage-ratio. This is preferable to the arrangement where the screen is supplied through a large dropping resistor from the H.T., and one secondary winding modulates the combined supply.

The modulators are driven by a pair of 807's in push-pull. The stages previous to this include a vari-mu valve which is biased by a voltage derived from the incoming audio signal. This provides a type of A.V.C. which limits the output, and can be set to limit at 100 per cent. modulation. The A.V.C. bias is provided through a rectifier working from a side-amplifier, and is held for several seconds by a condenser with high value leak. The condenser is charged from the signal rectifiers through a non-return diode. Thus the A.V.C. bias is produced quickly by a rise in incoming audio level and then held for a period. The result is that the entire modulation system adjusts its gain to suit the level of audio signal provided, and, if properly set-up, will never overmodulate the transmitter.

STANDARD FREQUENCY GENERATOR

This instrument produces multiples of 1000 kc/s., 100 kc/s. and 10 kc/s. from a standard frequency source for the purpose of calibrating receivers or instruments, or for determining the frequency of a received signal. The range is 1 to 60 Mc/s. The standard frequency is provided by means of a 1 Mc/s. crystal in a "tritet" circuit, the anode load of the oscillator being a high resistance. This is coupled through a 2$\mu\mu$F. capacitor to one grid of a conventional multivibrator which it locks to the tenth sub-harmonic, namely 100 kc/s. The constants of this oscillator are: coupling 100 $\mu\mu$F., gridleaks average 50,000 ohms and anode resistors 10,000 ohms. The 10 kc/s. multivibrator is locked through a 20 $\mu\mu$F. capacitor which is similar to the previous multivibrator, except that the cross coupling capacitors are each 1,000 $\mu\mu$F.

The five valves used in these three oscillators are the familiar EF36. Each oscillator is coupled through a capacity of a few $\mu\mu$F.5 o an EF50 harmonic amplifier

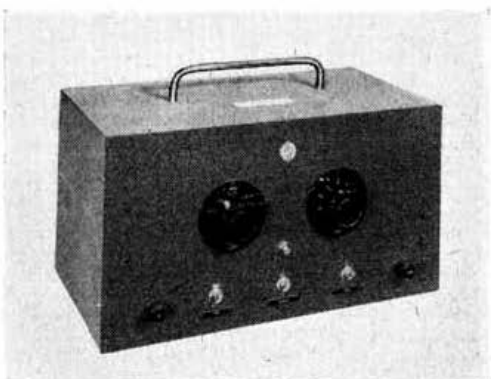

Fig. 2.
The Standard Frequency Generator.

The output of this is choke-capacitance coupled to a high-impedance output socket, to which a short radiator wire can be connected. This output circuit is tuned by a variable condenser and switched coils so that the multiple frequencies can be amplified in any region between 1 and 60 Mc/s.

Each of the multivibrators can be switched off, leaving only the megacycle harmonics. The 100 kc/s. multivibrator can then be switched on to mark the 100 kc/s. points, and so on.

The A.C. power unit is built into the instrument, and the H.T. voltage is stabilised by means of a stabilovolt tube.

THE MODULATION METER

This instrument is designed to measure the percentage modulation of the radiation from a transmitter. It also provides for the monitoring of the outgoing signal by headphones, and incorporates means for making modulation measurements on distant stations.

The modulation measurement is carried out by means of two diodes in cascade. The first diode is fed from a tuned circuit which is switched to cover ranges from 1.5 to 60 Mc/s. and is connected to a short rod aerial for pickup from the transmitter. The radio signal is rectified by this diode; the D.C. output is indicated by a meter, and is set up to a standard reading of 40 microamperes by means of a variable diode cathode resistor.

The audio output of the rectifier is filtered free of R.F. current, amplified and then rectified again by an audio frequency diode rectifier and the D.C. output is indicated on a second meter. Provided the R.F. diode current is set to the given value, the second meter can be calibrated to read modulation percentage. A control is provided to adjust the gain of the audio amplifier by means of an audio signal of known voltage.

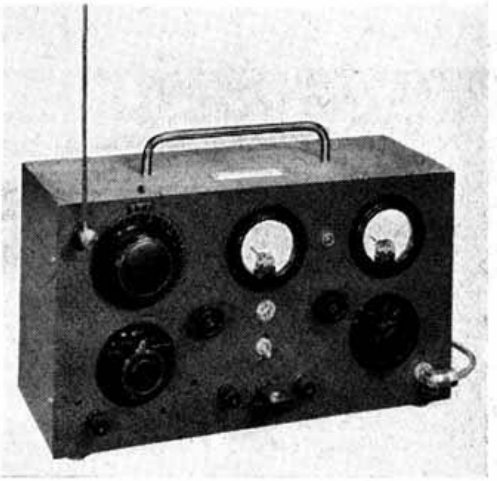

Fig. 3.
The Modulation Meter.

For the measurement of signals from distant transmitters, a separate input socket is provided through which a "sample" may be taken *via* a screened cable from the I.F. amplifier of the receiver. This sample signal is amplified by means of an EF50 valve before rectification.

This instrument also incorporates its own A.C. power supply and has its H.T. voltage stabilised by means of a stabilovolt tube.

* * *

The details given herein serve to show the magnanimity of the gift and how it will provide a sound foundation for the Society's plans to furnish a full technical service to members.

RADIO AMATEURS' EXAMINATION

For the information of those members who are studying for the above examination, we are publishing the paper set by the City and Guilds of London Institute on November 15 last.

The result of this examination will be announced shortly.

1. *Why are frequency multipliers sometimes employed in radio transmitters? Describe, with diagram, a frequency-multiplying stage for a low-power transmitter.* (10 marks.)
2. *What is "fading" and how is it caused?* (10 marks.)
3. *Describe briefly the principles of operation of a superheterodyne receiver, illustrating your answer with a block schematic diagram of a typical receiver.* (10 marks.)
4. *The d.c. feed to the last stage of a transmitter is 250 volts, 60 mA. It is found that the h.f. current flowing in a load resistance of 500 ohms is 0.1 ampere. Calculate:—*
   (a) *the power input;*
   (b) *the power output;*
   (c) *the efficiency of the stage.* (10 marks.)
5. *What are the advantages and disadvantages of directional aerials for transmission and reception? Describe, with diagrams, a simple directional aerial and explain its method of operation.* (10 marks.)
6. *Describe the principle of the heterodyne frequency-meter and explain how you would use it to determine the frequency of a received signal.* (10 marks.)
7. (a) *What is the purpose of key-click filters, and of what do they consist?*
   (b) *An amateur transmitter on the 14 Mc/s. band was found to interfere with television reception on 41–45 Mc/s. How was the interference probably caused and what steps could have been taken to minimize it?* (20 marks.)
8. (a) *What is the procedure laid down by the Postmaster-General for the use of callsigns when making and answering calls?*
   (b) *One condition imposed by the Postmaster-General as regards "Non-interference" is as follows:—*
   "When telephony is used, the system of modulation must be such as to prevent the carrier-wave being modulated more than 100 per cent."
   What are the objections to over-modulation, and how would you minimize the risk of over-modulating? (20 marks.)

Candidates were asked to attempt as many questions as possible. Use of diagrams where applicable was advocated. The maximum possible marks for each question are shown in brackets.

Appreciations

The General Secretary and Miss May Gadsden wish to thank their many friends at home and abroad for the kind messages of greeting which they received at Christmas-tide.

ANNUAL GENERAL MEETING

Minutes of the Twentieth Annual General Meeting of the Incorporated Radio Society of Great Britain, held at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2, on Friday, 20th December, 1946, at 6 p.m.

Present :— The President (Mr. E. L. Gardiner, in the Chair), Messrs. S. K. Lewer (President Elect and Executive Vice-President), H. A. M. Clark (Hon. Secretary), A. J. H. Watson (Hon. Treasurer), A. O. Milne (Hon. Editor), A. D. Gay (Immediate Past President), E. D. Ostermeyer (Past President), H. Bevan Swift (Past President), Gerald Marcuse (Past President), P. C. G. Bradley, C. H. L. Edwards, R. H. Hammans, F. G. Hoare, J. W. Mathews (Members of the Council), Mr. John Clarricoats (General Secretary), Miss A. M. Gadsden (Assistant Secretary), and about 120 members.

Apology :— An apology for absence was presented on behalf of Mr. Arthur E. Watts (Past President).

* *

Notice Convening the Meeting

The Honorary Secretary read the Notice convening the meeting.

Previous Minutes

Mr. Marcuse proposed, Dr. Bloomfield seconded, and it was RESOLVED that the Minutes of the Nineteenth Annual General Meeting as published in the January, 1946, issue of the Society's Journal, be taken as read, and confirmed.

Audited Annual Accounts

In answer to a question the Hon. Treasurer stated that the General Development Reserve Fund had been built up out of the excess of Income over Expenditure arising since 1939, and that during the year ended September 30, 1946, a further sum of £1,000 had been added to the Fund.

To a further question the Hon. Treasurer stated that although the surplus of Income over Expenditure for the year ended September 30, 1946, was sufficient to provide for a transfer of £1,000 to the General Development Reserve Fund and to leave a sum of £996 to be carried forward it was anticipated that owing to the various increases in expenditure referred to in his report there would probably be no surplus income available for the year ended September 30, 1947. Mr. Watson said that he had prepared a statement of the Society's estimated income and expenditure for the forthcoming year, from which it appeared that if the Society were faced with any further additional expenditure an increase in the subscription rates would probably have to be made.

The Treasurer stated that the Society's Capital position was a strong one. In 1939 its total assets amounted to about £1,400, while to-day they were approximately £19,000.

The President pointed out that although the Society possesses a satisfactory Reserve, large expenses such as, for example, representation at the forthcoming International Radio Convention, may have to be borne at an early date.

Mr. Watson moved, Mr. Ostermeyer seconded, and it was RESOLVED that the Honorary Treasurer's Report and the Audited Accounts for the year ended 30th September, 1946, be approved and adopted.

Report of the Council

The President invited questions on the Report or on any phase of the Society's work.

In answer to a question, the President stated that he had no knowledge of a statement having been made that the cost of providing members with the BULLETIN exceeded the amount received from subscriptions. The Hon. Treasurer pointed out that whilst production costs could be assessed from the Accounts, many indirect charges, such as salaries and rent, should be taken into consideration. He agreed that the cost of producing the BULLETIN did not exceed the revenue received from subscriptions.

In answer to a question regarding the hour at which the meeting had been called, the President explained that the Society was very largely in the hands of the Institution of Electrical Engineers, who were anxious to close the building by 8.30 p.m. Mr. Gardiner stated that the new Council would, however, consider making arrangements for future A.G.M.'s to commence at a later hour by omitting the lecture. In past years the A.G.M. lecture had been regarded as a great attraction.

In reply to a question regarding advertising, the President stated that it was not possible for the Society to guarantee that every advertiser was in a position to deliver immediately the goods he was advertising. He pointed out that the majority of manufacturing concerns were to-day working against great odds.

In reply to a question regarding membership, the President explained that the Council is required to grant membership to all who make application for election in accordance with the Articles of Association. It was not possible, under the existing Articles, to " tighten up " entry into the Society.

In reply to a question regarding the publication of a small advertisement in each issue of a contemporary publication, inviting persons interested in Amateur Radio to apply to the Society for details of membership, the General Secretary explained that the advertisement in question had been inserted with the approval of war-time Councils, and that as a result of its regular appearance a considerable number of readers had become members. It was agreed to refer the matter to the new Council for consideration.

In reply to a question regarding the London Region subscription, the President explained that Article 20 regulates the matter. The Council would shortly be considering the setting up of a Committee to examine and report upon the Articles of Association.

Mr. Lewer in moving the adoption of the Report spoke of the very considerable increase in membership which had taken place during the year, and of the acute problems which relate to the production of the BULLETIN. He expressed the view that as soon as the paper position improved, the R.S.G.B. BULLETIN would become one of the foremost technical Journals in the country. He regretted that paper restrictions prevented the Council presenting a longer and more detailed Report, but he felt that the information given therein and in the Resumes of Council Meetings, would enable members to obtain a clear conception of the amount of work done by the Council. He referred briefly to the problems which confronted the retiring Council, and suggested that the new Council would be faced with many heavy responsibilities.

Mr. W. H. Allen seconded the motion, and it was RESOLVED to approve and adopt the Council's Annual Report for the year ended 30th September, 1946.

Election of the Council

The President announced that the following Corporate Members had been duly elected to serve on the Council for the year 1947 :—

Officers :

President : Mr. S. K. Lewer, G6LJ
Executive Vice-President : Mr. V. M. Desmond, G5VM
Hon. Secretary : Mr. H. A. M. Clark, G6OT
Hon. Treasurer : Mr. A. J. H. Watson, G2YD
Hon. Editor : Mr. A. O. Milne, G2MI

} Returned unopposed

Members :

Mr. I. D. Auchterlonie, G6OM	..	2,102 votes
Mr. R. H. Hammans, G2IG	..	1,711 ,,
Mr. C. H. L. Edwards, G8TL	..	1,702 ,,
Mr. K. Morton Evans, G5KJ	..	1,585 ,,
Mr. W. A. Scarr, G2WS	..	1,385 ,,
Dr. G. F. Bloomfield, G2NR	..	1,355 ,,
Mr. J. W. Mathews, G6LL	..	1,299 ,,

The President announced that 3,286 Ballot Forms had been accepted and 7 rejected by the Scrutineers. He also announced that the following Corporate Members had been unsuccessful in the Ballot :—

Mr. P. C. G. Bradley, G8KZ	..	1,220 votes
Mr. S. E. Langley, G3ST	..	1,112 ,,
Mr. L. Ridgway, G2RI	..	1,092 ,,
Mr. H. W. Stacey, G6CX	..	968 ,,
Mr. N. Guy, G2DN	..	956 ,,
Mr. H. Hardy, G4GB	..	930 ,,
Mr. R. Barron, G8RN	..	900 ,,
Mr. M. M. D'Arcy, G3AGL	..	890 ,,
Mr. P. W. Winsford, G4DC	..	748 ,,
Mr. L. Fuller, G6LB	..	725 ,,
Mr. E. J. Kentsbeer, G8JB	..	725 ,,
Mr. F. Hamer, G8BW	..	680 ,,

The President thanked the unsuccessful candidates for allowing themselves to be nominated, and on behalf of the retiring Council thanked the scrutineers, Messrs. Cullen, G5KH, S. W. Chapple, G6SC, F. J. Forbes, ex 2BFC, F. G. Hoare, G2DP, F. J. Barnard, G4FB, and I. W. K. Smith, G2BPW, for their co-operation.

Auditors

Mr. Hubbard moved, Mr. Hughes seconded, and it was RESOLVED to re-appoint Edward Moore & Sons, Ltd., Auditors for the current year.

Vote of thanks to I.E.E.

Mr. H. Bevan Swift moved, and it was RESOLVED to record a cordial vote of thanks to the President and Council of the Institution of Electrical Engineers, for allowing the Society to continue to use the building for meetings.

Other Business

The President presented to Mr. Gerald Marcuse, G2NM (Past President) a certificate confirming his election to Honorary Membership. Mr. Marcuse replied suitably.

At the invitation of the President, Mr. Gerald Marcuse presented the Rotab Trophy (which was donated by him in 1924) to Mr. Raymond Evans, G6CU. In making the presentation, Mr. Marcuse explained, for the benefit of newer members, that the letters R.O.T.A.B. signify "Royal Order of Trans-Atlantic Brasspounders," into which order he had been initiated during his visit to Canada and the U.S.A. in 1924.

The President then presented the Wortley-Talbot Trophy to Mr. W. H. Allen, M.B.E., G2UJ, and the Senior B.E.R.U. Trophy and miniature (won in 1939) to Colonel Eric Cole (G2EC ex SU1EC).

Presentation to the President

Mr. S. K. Lewer, on behalf of Council members who had served under Mr. Gardiner, and on behalf of the senior members of the Secretariat, presented book and gramophone record tokens to the President.

Mr. Gardiner thanked Mr. Lewer and all who had been associated with him during his term of office as President. He had deeply appreciated the honour conferred upon him three years earlier, and had been proud to occupy the Presidential Chair after such illustrious predecessors as Sir Oliver Lodge, Sir Henry Jackson, Dr. Eccles, Sir Capel Holden, Gerald Marcuse, Bevan Swift and Arthur Watts. He hoped to be able to render further assistance to the Society during the years ahead.

The Annual General Meeting terminated at 7.10 p.m.

* *

Following the Annual General Meeting, Dr. H. G. Booker, of Christ's College, Cambridge, lectured on "The Dependence of Ultra-Short Wave Radio Propagation on Weather."

Mr. H. A. M. Clark, G6OT, expressed the thanks of the Society to Dr. Booker.

The meeting finally terminated at 8.45 p.m.

CONTRIBUTIONS TO THE R.S.G.B. BULLETIN

ALL contributions to the BULLETIN since its inception in 1925 have been given gratuitously to the Society, although for a long time it has been the practice of the Council to award honoraria to the authors of outstanding and meritorious contributions. In recognition of the initiative and labour of these authors and to encourage new writers, the Council has increased the amount and number of the awards in recent years, but contributors were still asked to assign their copyright to the Society.

The Council now considers that it would be in the best interests of members for the Society to purchase the copyright of all technical articles published in its journal, and it has therefore resolved that as from the current issue, payment will be made in respect of leading technical articles at a rate of three guineas per 1,000 words, and in respect of other technical articles at a rate of two guineas per 1,000 words. Drawings and photographs will also be taken into account in assessing the sum payable to contributors.

With the adoption of this principle the practice of awarding honoraria to contributors will in future be discontinued, but the authors of technical articles published in the BULLETIN during the period July–December, 1946, inclusive, will be considered as eligible for the award of honoraria at the end of the present volume, in accordance with the usual practice of the Council.

Operating Practices

Acting upon the advice of the Codes of Practice Committee the Council has agreed to recommend the adoption of a new Q signal—"QMF," meaning "I am listening for replies close to my own frequency."

The Council also recommends that "CQ" calls should always be sent when general amateur contacts are required, and that "Test" or "CQ Test" calls should only be sent when co-operation is required for the purposes of experiment.

It is hoped that these recommendations will be generally adopted and that publicity will be given to them by others interested in operating practices.

A SUGGESTION FOR AN R-C AUDIO OSCILLATOR

By G. A. DAVIES (BRS9829)*

IN the course of some experimental work with the Fleming-Williams transitron saw-tooth generator it occurred to the writer that here was a possibility of designing an audio oscillator giving a satisfactorily good wave-shape without using coils.

Fig. 1 shows a basic circuit for the transitron saw-tooth generator. If the values of R1 and R2 are suitably chosen this circuit will generate, not a saw-tooth, but a triangular wave, where the charging time is equal to the discharge time.

It is known that if a triangular wave is applied to an integrating circuit, each half-cycle of the triangular wave becomes a parabolic half-cycle, the amplitude depending on the relationship, in terms of time, existing between the time constant of the integrating circuit and the time period of the triangular wave. The larger the time constant of the integrating circuit the smaller the amplitude of the resulting wave-form.

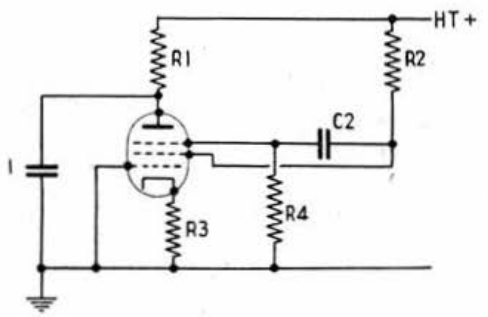

Fig. 1.
Basic circuit of saw-tooth generator.

On inspection of the shape of this waveform, it is seen that it differs only slightly from a sine wave, the difference being so slight that it could most probably be ignored for all practical purposes.

A circuit was designed as in Fig. 2. The triangular wave from V1 is passed through the buffer amplifier V2, to the integrating circuit R8, C5. The output is taken from C6.

C1 is the charging condenser across which the triangular wave is developed, and the size of this condenser controls the frequency of the triangular wave. The frequency can also be controlled by adjustment of the potentiometer R2. With a value of .05μF for C1 the frequency was varied by means of R2 from 315 c/s to 4,000 c/s, the amplitude gradually decreasing as the upper limit was reached. Other values of HT can be used such as 300 volts but this affects the frequency, and those values just quoted would not be obtained. However, it is found that whatever the circuit conditions, the frequency is inversely proportional to the size of C1; *e.g.* if C1 is .05μF and the frequency is 315 c/s, then if C1 is made .005μF the frequency will become 3150 c/s. So by having various values of C1, different ranges can be switched in to extend the frequency coverage. When C1 was .0001μF a frequency of 160 kc/s. was obtained and checked against a frequency meter.

* 143 Walthall St., Crewe, Cheshire.

Circuit Details

Bias is omitted from V1 to improve the shape of the triangular wave and a large electrolytic condenser is needed in the cathode lead to V2 in order to prevent feedback. R8, controlling the time constant of the integrating circuit, is used as an amplitude control, since it maintains a better wave-shape and affects the frequency stability less than if R5 were a potentiometer type of amplitude control. A stabilised HT supply would be necessary to ensure a stable frequency.

Summary

At the time of construction, loading the circuit with a pair of 2,000 ohms phones reduced the amplitude of the output slightly but did not materially affect frequency or waveform. An ordinary low-gain triode amplifier using a 6J5 and a high value of grid leak, say 1 megohm, would no doubt produce a satisfactory output stage.

In regard to power supply, three VR150/30's in series would provide 450 volts stabilised without recourse to a more complicated form of stabilised supply.

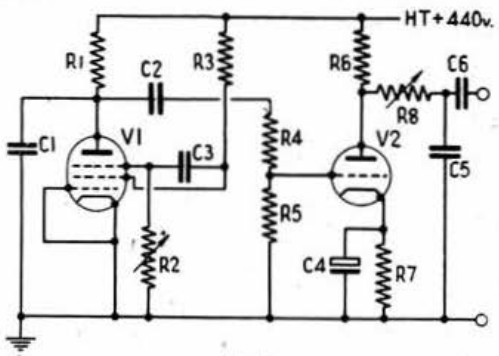

Fig. 2.
Circuit of R-C. audio oscillator.

V1	6SK7.		
V2	6J5.		
C1	0·05μF, but depends on frequency range required.		
C2, 5, 6	0·1μF.		
C3	0·5μF (must be kept relatively large compared with C1).		
C4	15μF electrolytic, low voltage working.		
R1, 3, 5	0·5 Megohm.	R6	25000Ω.
R2	250000Ω potentiometer.	R7	1 Megohm.
R4	830000Ω.	R8	50000Ω potentiometer.

Silent Key

H. H. Phillips, GW4KQ

It is with deep regret we record the passing at the early age of 28, of Hugh Phillips, GW4KQ, of Cardiff, District Representative for South Wales and Monmouthshire. Joining the Society in 1935, he later became T.R. for Cardiff, and local members owe much to his great organising ability. In 1942 he became leader of the V.H.F. and Micro-wave group and in January, 1943, was appointed Acting D.R., becoming D.R. in January, 1946.

Through his death the District and the Society lose a keen and efficient Representative.

To his wife and infant son, we offer our deepest sympathy in their great loss.

L.A.D.

A LOW VOLTAGE CATHODE RAY OSCILLOGRAPH

By F. J. FORBES (2BFC)

PART II.—THE TIME-BASE GENERATOR UNIT

This article describes a Time-Base Generator for use with the Cathode Ray Tube Unit, dealt with last month. The Amplifier Unit will be described in Part III.

FOR producing the sweep voltage to the plates of the C.R. Tube, a Mazda T31 thryatron is used in conjunction with a W42 H.F. pentode, the latter acts as a charging arrangement, the charging current being varied by setting the grid voltage of the W42 (Fig. 3). The 500 ohms resistor in the thryatron anode circuit is a limiting device to reduce the current through this valve to a safe value.

The twelve-pole single-way switch is used to provide a rough frequency control. The switch selects one of 12 condensers which vary in capacity from 500 $\mu\mu$F to 1 μF. (For the sake of clarity, only one condenser is shown in the diagram). The maximum frequency for the T31 is given as 15 kc/s., but as this figure is approached the sweep amplitude decreases, making the use of an amplifier necessary.

Synchronism is applied to the grid of the T31 by means of a 0.5 megohm volume control, but the 50,000 ohms amplitude and 25,000 ohms frequency controls are wire wound. All other resistors are of the 1 watt composition type.

The metering circuit is rather a luxury and may be omitted, but for those interested, the 47,000 ohms resistors are selected carbon types, the others are wound with Constantan resistance wire. The full-scale ranges on the meter are :—HT_1 and HT_2, 5mA ; across 7 and 8, 50mA ; across 1 and 2, 500 volts. The switch is a Yaxley pattern with the intermediate contacts not used ; this arrangement prevents the meter switch contacts from short-circuiting two lines at once.

HT and LT supplies are obtained from two mains transformers, although one would suffice if it was large enough to take all the windings. The spare 4-volt winding shown in Fig. 3 is used for calibration or modulating the tube and for other light current work.

The filament transformer was stripped of all but the primary winding ; the three heater sections were then wound on, each one having an interleaving screen of copper foil to reduce interaction. All leads to the transformers are run in screened, twisted pairs for the same reason.

One heater winding supplies the two 6C6 valves in the amplifier at 6.3v, 0.6A, the other two windings feed the T31 and W42 at 4v, 1.5A and 4v, 0.6A, respectively. It is important that the last two valves should have separate heater supplies in order to reduce heater/cathode leakages between them.

The layout can take any convenient form, providing some regard is paid to short leads. The wiring should be crowded as little as possible, especially near the T31 grid circuit, since this is likely to pick up mains hum. Incidentally, mains hum causes the trace to widen at one end and is often mistaken for poor focusing.

In the author's model the time-base was built into a large Eddystone steel cabinet, with sufficient room left to accommodate the two-valve amplifier, thereby making the whole job a compact, easy to get at, unit. Very conveniently the C.R. Tube Unit will stand on the top, and when facing the tube screen the time-base and amplifier controls are on the right hand side.

(*To be continued*).

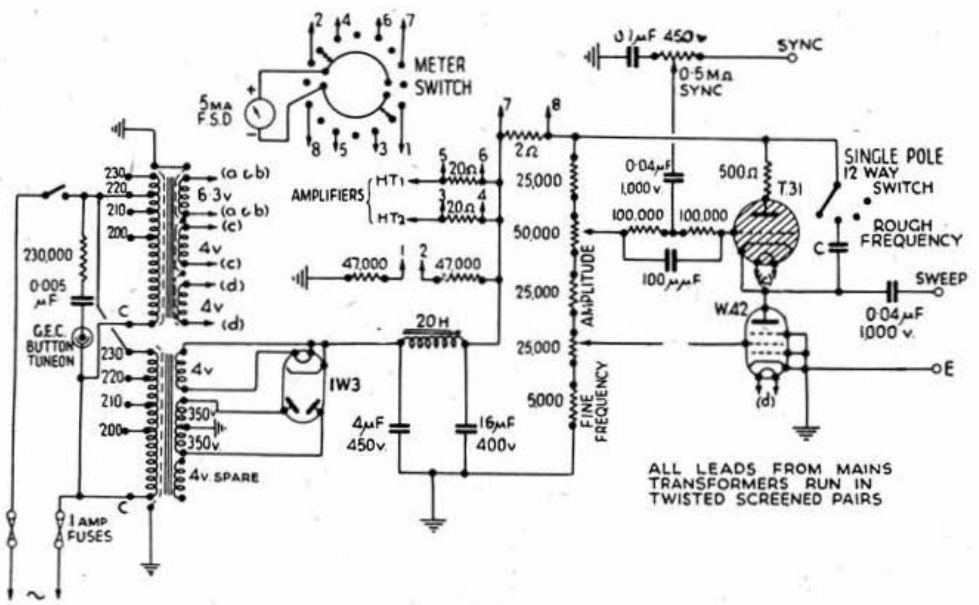

Fig. 3.
Circuit diagram of Cathode Ray Oscillograph Time-Base Unit.

FIVE METRE CONTESTS, 1947

IN organising this, the first R.S.G.B. Five Metre Contest to operate on a points scoring basis, the Contests Committee have carefully considered the changed situation in regard to the popularity of V.H.F. work and the general improvements which have taken place in equipment since events of a similar character took place prior to the war.

The difficulty of arranging a " fair to all " scoring system will be appreciated by members. The system evolved, although, probably, still open to criticism, should offset the advantages possessed by stations in well-represented areas against the disadvantages possessed by those which are located in more remote parts.

Competitors in both sections of the Contest are requested to furnish details of all DX stations heard (apart from those counting for points) as well as information of general interest, such as meteorological and propagation conditions.

Suggestions and criticisms will be welcomed by the Contests Committee who will consider adopting them, if practicable, in future events.

General Rules

1. The Contests will be divided into two sections, namely :—

(*a*) Transmitting Event.
(*b*) Receiving Event.

2. The Contests are open to all fully paid-up members of the R.S.G.B. resident within the British Isles or operating in the British Controlled Area of Germany (D2).

3. The British Isles for the purposes of the Contests include England (G), Scotland (GM), Northern Ireland (GI), Wales (GW), and the Channel Islands (GC).

4. The Transmitting and Receiving Contests will extend from **15.00 G.M.T. on Saturday, February 8, to 22.00 G.M.T. on Sunday, February 9, 1947,** and from **15.00 G.M.T. on Saturday, March 8, to 22.00 G.M.T. on Sunday, March 9, 1947.**

5. Members holding transmitting licences may not enter for the Receiving Contest.

6. Contacts with, or reports from, unlicensed stations will not count for points.

7. Only one person will be permitted to operate a specific station for the duration of the Contests.

8. Stations (transmitting or receiving) must be operated from the same site throughout the Contests.

9. A Trophy will be awarded to the entrant scoring the highest number of points in each section of the Contest. Certificates of Merit will be awarded to the runners-up in each Event.

10. Entries will be accepted only if typed, or submitted on lined foolscap or quarto paper in the relative form set out below.

11. Details at the head of the entry form must be completely filled in and the declaration signed, otherwise the entry will be disqualified.

12. Completed entry forms must be forwarded to the Hon. Secretary, R.S.G.B. Contests Committee, New Ruskin House, Little Russell Street, London, W.C.1, to arrive not later than March 24, 1947, after which date no entry will be accepted. Envelopes must be clearly marked in the top left-hand corner " 5T " in the case of Transmitting entries, or " 5R " in the case of Receiving entries.

13. Council have the right to amend or alter these Rules at any time prior to the commencement of the Contests and their decision will be final in all cases of dispute.

Rules for the Transmitting Contest

1. Competitors who desire to utilise portable facilities may enter providing the terms of their G.P.O. Licence, and of Rule 8 in the General Rules are strictly adhered to.

2. The input power to the final amplifier, or any preceding stage, must not exceed 25 watts.

3. Points will be scored for two-way telegraphy or telephony contacts in either the 50 Mc/s. or the 60 Mc/s. band in accordance with the following scale :—

Area No.	Distance in miles from station.	Points per contact.
1	10–50	1
2	50–100	3 for the first 10 contacts, thereafter 1 point each.
3	100–300	5
4	300–1,000	10
5	1,000–2,000	25
6	over 2,000	50

No points will be scored for contacts made with stations located within a distance of 10 miles from the transmitter.

4. An exchange of R.S.T. (or R.S.) reports and location will be required before points for a contact can be claimed.

5. A specific station may be worked twice, provided that each contact takes place during a different weekend. The same number of points may be claimed for each of these contacts, except in the case of Area 2 where, if 10 contacts have already been made, a second contact with a specific station will then score one point only.

6. Proof of contact may be required.

7. Entries must be submitted in the following form :—

R.S.G.B. Five Metres Transmitting Contest 1947

Name.....

Address ....

Call Sign.....

Site of Station (if different from that above) .....

Details of Equipment and Aerials used.....

Input power to valve or valves delivering power to the aerial.....

Call Sign of Station Worked	Date	G.M.T.	Outgoing Report RST or RS	Incoming Report RST or RS	Estimated Distance in Miles	Points Area					
						1	2	3	4	5	6

DECLARATION.—*I declare that my Station was operated strictly in accordance with the Rules and spirit of the Contest and I agree that the decision of the Council of the R.S.G.B. shall be final in all cases of dispute.*

Signed.....

Rules for the Receiving Contest

1. The Contest is confined to the reception of amateur stations in either the 50 Mc/s. or the 60 Mc/s. band.

2. Points will be awarded in accordance with the same scale as set out in Rule 3 of the Transmitting Contest.

3. CQ or test calls will not be permitted to count for points.

4. Each station may be logged once during each weekend and the reception will count for points.

5. Proof of reception may be required.

6. No points will be scored unless full details of the contact are recorded as required in the entry form which must be submitted in the following form:—

R.S.G.B. Five Metres Receiving Contest 1947

Name.....

Address .....

B.R.S. No. or Call Sign.....

Site of Station (if different from that above) .....

Details of Equipment and Aerials used.....

Call Sign of Station Heard	Call Sign of Station being Worked	Date	G.M.T.	Entrant's Report on Station Heard RST or RS	Report given by Station Heard to Station being Worked RST or RS	Estimated Distance in Miles	Points Area					
							1	2	3	4	5	6

DECLARATION.—*I declare that my Station was operated strictly in accordance with the Rules and spirit of the Contest and I agree that the decision of the Council of the R.S.G.B. shall be final in all cases of dispute.*

Signed.....

PORTABLE DIRECTION FINDING

By J. M. S. Watson (G6CT)*

THE Contest Committee, at the request of members, and with the approval of the Council, is arranging a series of Direction Finding (D/F) events, using frequencies in the "Top-band." The first two events will take place within the London Region during the coming summer but if, as it is hoped, interest spreads to other parts of the country, it may be possible next year for the winners of local events to compete, on neutral ground, in a national final. In selecting the London Region for the 1947 events, the Committee had in mind the fact that prior to the war there was a keen following for D/F work in East London and Essex and it was thought that the experience of several members in those parts would help new-comers to capture something of the thrill of the chase.

The first D/F field day will take place during May when the venue will be north of the Thames. The second will follow two months later when the sphere of operation will move to somewhere south of the river.

Pre-War Activities

Portable D/F is not new, in fact some local societies, notably the Golders Green and Hendon Society and the Slade Radio Society, Birmingham, were holding regular D/F events well over 20 years ago. Sometimes the events have been restricted to walking competitions, but generally speaking the motor car has been pressed into service; thus providing greater scope for the enthusiastic exponent of D/F work. Most of the pre-war events took place on the "top-band" although there are records of 56 Mc/s. D/F field days when the special features peculiar to that band were carefully studied.

The object of a D/F event is to locate, in the shortest possible time, a hidden transmitter which may be secluded 10 or more miles from a pre-determined starting point. This often proves more difficult than it sounds, although success can be, and often is, achieved by competitors using quite simple equipment.

It may perhaps be of interest to describe a typical pre-war D/F field event organised by the Southend and District Radio Society. The competitors came from the sponsoring Society and from four other Societies operating in the East-London and Essex area. This particular event took place during an October night, with no less than 20 car parties taking part. The venue chosen for the start was near Ilford and zero hour was midnight. Entrants were told that the transmitter was hidden somewhere in Essex, that a five minutes transmission would be made at 0001 G.M.T. and that further transmissions would take place at irregular intervals during the night, with a minimum radiating time of two minutes in every 20 minutes period.

The transmitter, a ten-watt remote-control telephony job, had been installed at the edge of a narrow track—one of many running through a thickly-wooded common—at Woodham Walter; some 19 miles from the start. The transmitter was constructed in a shallow box and placed in a ditch about eight yards from the track and at the base of an oak tree. After being covered with a waterproof sheet it was completely hidden with twigs and dry leaves. Control wires, carrying 230 volts A.C. from a small converter, and speech current, were run underground from the transmitter to a thicket some two hundred years away. The aerial, of dirty black flex, was wound round the tree and then slung immediately above the track to another tree some twenty yards away. The final detail was to run a telephone line to a lookout perched in the top of a tree! The hidden observer although able to hear what was going on near the transmitter, was safe from detection and was thus able to suggest times of transmission so that they did not take place when a competitor was passing the vital spot. Yes, an evil-minded organiser is very essential!

The winning competitor took a good bearing at the start and obtained a "sense" indication (See *Radio Handbook Supplement*, chapter 5, paras. 10 and 13.) He then drove for about six miles along a road which ran at about 50° to the bearing and in the direction of the sense indication. His second bearing cut the first, a little beyond the transmitter and confirmed the previous sense indication. He and his party

* 23, Eastwood Boulevarde, Westcliff-on-Sea, Essex.

then moved to a spot about one mile above the intersection of the previous two bearings and awaited the third transmission. This bearing when plotted produced a triangle or as it is often called a 'cocked hat.' The common was in the centre of the 'cocked hat.' The party then proceeded towards the side of the common cut by the third bearing and after a search a track was discovered along which they could drive their car. After about two hundred yards the car had to be abandoned and the party proceeded on foot. At this point it should be explained that it was a rule of the contest that the transmitter should be sited within ten yards of a road marked on a Bartholomew's map. Actually, as walkers and hikers know, many roads so marked are no more than bridle paths !

Top-Band Contest, 1946

1st :	G. R. Scott Farnie, G5FI.
2nd :	F. T. V. Ritson, G5RI.
3rd :	H. J. M. Box, G6BQ.
	R. W. Rogers, G6YR.

Full report in later issue

After taking a further bearing and sense indication the immediate location of the transmitter was determined and the party proceeded towards this area. The transmitter was overshot as indicated by a further sense bearing, but by bringing a field strength meter into use the party was able to deduce that they were within about one hundred yards of the transmitter. Accordingly they moved back a little and waited for the next transmission. After zig-zagging the length of the aerial during this further transmission they finally reached a spot where a bearing was obtained on the tank coil of the transmitter which appeared to be radiating from the ground ! The leaves and twigs were brushed away and a card was found giving full directions as to how to reach the control hide-out. The time taken from start to finish was 2 hours 14 minutes. Not bad going for the middle of a dark autumn night !

Several parties were seen during the night but only two others located the transmitter before transmissions ceased at 6 a.m. Enthusiasm for this and other events was so great that several non-radio car owners drove competitors.

"Be Prepared"

During another event just before the war the writer took a bearing at the side of a lane just behind Hornchurch R.A.F. aerodrome. Shortly afterwards, whilst travelling at about 40 m.p.h., in a built-up area, two police cars "gonged" him. After the licence, some headed Society paper, contest rules, various letters and a driving licence had been produced they were satisfied and no reference was made to the excessive speed ! The moral of this story is "always carry a good collection of documents."

It is hoped that these true stories will rouse the interest of readers who have not yet taken part in a D/F event.

Receiver Construction

The following hints may prove useful to those who propose to commence work on the construction of a receiver for D/F purposes.

(1) The sensitivity should be sufficient to produce, in head-phones, a good signal from a ten watt transmission at twenty miles range, bearing in mind that the transmitter may be located in a heavily screened and poor location.

(2) It should be capable of continuous operation for about four hours.

(3) It is an advantage to include a field strength meter.

(4) Provision should be made to damp the aerial so that the receiver will not be swamped when it is operated near to the transmitter.

(5) The addition of a sense indicator is worth while and may save time.

(6) The set should be light enough to rest on the operator's knee whilst in the car and portable enough to be carried for long distances. At the same time it must be rugged enough to withstand rough usage.

(7) The frame aerial must be of a sufficient size to give bearings accurate to a few degrees.

(8) Magnetic material in the receiver should be kept to a minimum.

Team Work

Parties of two, or even solitary, competitors have often been successful, whilst entrants on cycles have frequently put up good performances, but in general it is desirable to make up a team in view of the many incidental jobs that have to be done. An ideal team would comprise :—

The Competitor, who will carry and operate the receiver.

The Plotter, who will be responsible for the accurate plotting of *all* bearings, and for studying the map for likely areas where the transmitter may be located. He will also assist the competitor.

The Navigator or Map Reader, who will pin-point the exact position of the party at all times. It is surprising how often a good bearing, plotted from the wrong lane or corner, has completely misled a party.

The Driver, who should be willing to stick to his seat in the car, drive with the utmost despatch and safety, and obey instructions. He should anticipate a possible turn-round in a narrow lane by backing into suitable gateways, etc.

Taking Bearings

The importance of taking the utmost care with each bearing and of accurate plotting cannot be too strongly stressed. Compass readings should be watched, for it is surprising how magnetic fields from a car can pull the needle. Magnetic variation should also be allowed for. Telephone wires—overhead and even underground cables—should be avoided. Do not waste time listening to what the transmitting operator is talking about, but *do* make sure that you are listening to the correct transmission. On one occasion a party crossed the Thames on the Tilbury Ferry before they discovered that they were listening to an amateur in Kent, testing a new transmitter !

Finally get the YL or OW interested, past experience has shown that they make good map readers ! Many ladies who have little interest in radio have become keen members of teams. A tea or breakfast after the event provides a suitable finale, besides providing an opportunity for the competitors to discuss their mistakes and experiences.

The writer will be pleased, in the limited time at his disposal, to assist members who have had their interest roused by this article.

Television Practice

A course of twelve lectures on Television Practice will commence at 7 p.m. on January 17 at the Northampton Polytechnic, St. John St., London, E.C.1. Production, Transmission, Reproduction and Future Trends are the main sections of the series of lectures. The fee for the course is 15s.

BRS REPORTS

By R. V. STEVENS (G2BVN)*

WITH the increasing number of transmitting stations that are becoming active, both in this country and overseas, reports from listening stations will also grow in number and it is with the view of suggesting how these reports can be made valuable to the amateur transmitter to whom they are sent, that this short article has been prepared. Before the war, many British stations after making numerous DX contacts during the course of a week-end on 14 Mc/s. would receive on Monday a number of listeners' reports, all emanating from places within 20 miles of the station concerned. It should have been obvious that these reports served no useful purpose, and only tended to exasperation, particularly those that said in effect " I received your station yesterday evening on the 20 metre band. Your signals were very loud. Please send me a QSL."

Fortunately, however, there existed a number of B.R.S. who took a considerable amount of trouble in compiling detailed reception reports, spread over periods varying from a week to a month. These reports were generally sent to overseas stations only, excluding those located in Europe, on the East Coast and in the Middle States of the U.S.A., Canada and Newfoundland, to whom even the detailed reports were of no value, owing to the reliability of communication between them and this country on the DX bands.

What is Wanted?

In the view of the writer every reception report should at least contain accurate information regarding the following:

1. (*a*) Signal strength and readibility, in either the RST or QRK–QSA codes.

(*b*) The average signal strength of other stations located in the same area.

2. The degree of fading, which can generally be expressed in one of the following terms: (i) deep slow fading; (ii) shallow rapid fading; (iii) deep rapid fading; or (iv) fading, other than already mentioned, which causes signal distortion.

3. QRM (interference from other radio stations).

4. QRN (static or man-made interference).

5. The frequency of the transmitting station, expressed as accurately as possible in kilocycles/second.

6. The exact time of the reception, taking care to indicate whether B.S.T. or G.M.T.

7. The type of receiver in use.

8. The type, height and direction of the aerial in use.

When giving the location of the receiving station it is often helpful to include accurate co-ordinates of latitude and longitude, as the fact that your QRA is near Ashby-de-la-Zouch, will probably not convey very much to a S. American station!

A report giving accurate information on the above points and covering six or eight different reception periods, would be welcomed by the majority of transmitting amateurs and would furnish valuable data for future experiments. It should be noticed that the phrase " accurate information " has been used. Many listeners are under the impression that a flattering report will be far more likely to earn acknowledgement than one that perhaps gives a truer indication of reception conditions. The average amateur is not interested in false reports, which are absolutely useless to him, and B.R.S. are earnestly requested to refrain from wishful reporting of signal strength and other details.

What should be Reported?

Having outlined the information necessary for an efficient B.R.S. report, attention must now be given to the question—what signals should be reported upon? The best way of dealing with this problem—and it is a problem—is to consider the various frequency bands that are now available for amateur use.

(1) 1.7 Mc/s.

This band is extensively used for low power local QSO's and unless specially requested reports should *not* be sent to stations in the British Isles. Trans-Atlantic working is possible under very good conditions and reception reports would be appreciated.

(2) 3.5 Mc/s.

Reports should not be sent to any European station unless requested.

(3) 7 Mc/s.

Largely used for local work, occasionally a DX QSO is possible through the interference. Again reports should not be sent to European stations. (Under certain conditions of solar activity 7 Mc/s. is a DX band.—ED.)

(4) 14 Mc/s.

Reports should *not* be sent to European, East Coast and Middle State U.S.A. stations, nor to Canada, Newfoundland and N. Africa.

(5) 28 Mc/s.

It is difficult to lay down any rules for this band owing to the extremely variable conditions, which are largely dependent upon solar activity. Generally, however, detailed reception reports would be welcomed by most stations except those in the immediate vicinity of the receiving station.

(6) 56 Mc/s.

As this band is largely experimental, the reception of any signals emanating from more than 20–25 miles away are usually worth a detailed report, but the B.R.S. operator should exercise discretion, as reports to a station in regular contact with another station near to the B.R.S. would be of little value. A careful watch should be kept for 28 Mc/s. harmonics appearing in this band.

Standard Log

As mentioned in the April, 1946, Editorial, a standardized form of log pad designed eventually to supersede the B.R.S. QSL card, is under discussion and the appearance of this will greatly add to the value of listeners' reports.

It is considered that the world-wide adoption by transmitting stations of a code signal to indicate whether or not they require B.R.S. reports would greatly help, and would enable reports to be diverted into the right channels.

A listener's report which has been accurately and carefully prepared as outlined above, would be invaluable to a G station operator who is trying out new gear or aerial systems on one of the UHF bands, and would most certainly meet with a grateful acknowledgement. Generally speaking, however, the same station would not require reports on transmissions in one of the lower frequency bands.

*43 Pettits Lane, Romford, Essex.

THE MONTH ON THE AIR

By A. O. MILNE (G2MI)*

A Bad Habit

WE find the growing habit of calling a station only on his own frequency, rather tiresome. On 14 Mc/s. in particular it is now most unusual to get a reply to a CQ except on or very near to one's own frequency, and it is a waste of time calling a station unless you are on, or can move to his frequency. There was a time when one could expect a reply at least anywhere within the limit of about 150 kc/s., but, since the war, people don't seem to expect or look for calls except on their own frequencies. The whole business is silly ; first because it unfairly penalises the user of crystal control and secondly because half-a-dozen stations all moving their V.F.O.'s to the caller's frequency effectively QRM one another out of existence. Some decide to stop there and so QRM the poor crystal controlled fellow as well.

The V.F.O. has much to answer for but this latest practice has nothing to recommend it and ought to be dropped forthwith. In any case there are not many V.F.O. notes that can hold a candle to crystal control and very few users of V.F.O. on the DX bands are a credit to the good name of Amateur Radio. V.F.O. is like alcohol, a little goes a long way ! The antics of certain users of V.F.O. in South London are reprehensible in the extreme and anyone regularly on 14 or 28 knows precisely who we mean !

QRP

Several interesting letters are to hand this month from real QRP men and they make most heartening reading. First there is G5NF who is confined to a hospital bed. With the aid of G4AJ, G5FF and G8AJ he has a 12 watt rig working into 2½ waves in phase on 28. So far the outstanding DX is W7, VE2, 3 and 6, VK2, 3 and 5, VS9, SU, YR, UA, SM, VO and XZ. Beat that with your input of 150 watts.

GW8WJ is another of them. With a 59/6V6 rig and a W3EDP aerial, he has worked KL, VE8, VK4 and VK7 in addition to numerous W's on 14, W1 on 7 and also two W1's on 3.5.

G2HR rounds off the story. Using a Tritet with 8 watts he has worked numerous W's on 14 and, to cap it all, has received a report on his 1.8 signals from BRS5729 in Nairobi, Kenya !

A Wonderful Achievement

G5QA has just completed his 1,000th contact with ZL2OU on a daily schedule which has run since October, 1938, except for the war years. This surely is a very wonderful achievement. It reminds us of the famous sked between G2LZ and ZL4AO in the old days on 100 metres. That will shake some of your three element rotaries won't it ?

Notes and News

D2VB, ex-G2VB, advises us that local meetings are being held at D2CD, Civilian Vocational Training Schools in Hamburg. Next one is on January 20. G2AO says EP3D at Abadan is on the look-out for G contacts. Frequency is 14,184 or 14,246. Active every morning at 06.00 G.M.T. Send QSL's *via* R.E.F., Paris. 'AO gives J3AAD as A.P.O. 301, c/o P. M., San Francisco, and ZD2G as same as pre-war. GM2UU has worked ZL1KJ on 14 'phone and has received cards from him and J2AAO. YI2WM, YI6T and YI6C can all be QSL'd *via* Signals Officer, R.A.F. Station, Shaiba, Iraq. The rig at 2WM is 15 watts to an 807. G6PJ has heard J4AAB romping in at 08.30 G.M.T. at 559 calling CQ ZL. He appeals to him to take a look for a few of the G's as well. G6FW has had a letter from VK2ANE who is licenced by the Australian P.O. to work from S.S. "Chertsey," a ship in Australian waters. He is a BRS from Lancashire, QSL to 134, Liverpool Road, St. Helens. G3MI passes along the news that VU2AV is on 14 daily from 12.00–19.00 G.M.T. and wants G contacts. This reminds us that the VU2AB mentioned last month as being in Riga should have been UQ2AB !

G2WW knows nothing about OP2C. Has worked W5IFM on 28500 who was on a ship at the island of Rastanura, near Bahrein. He has received a card from VP8AI—Alan S. Betts, Pebble Island, Falkland Island. Incidentally, 2WW has worked Ken Ellis, G5KW, at all his QRA's so far ! He claims the first 'phone QSO with VS9 on June 29 last. Any offers ? BRS11994, L.A.C. Garlick, at Flying Control HQ 239 Wing, R.A.F., C.M.F., is near Venice, and will be pleased to stand by for anyone who wants a report. G3APX says OX5JJ is Jorge Jorgensen, Cape Adelaer, E. Greenland, who will QSL 100 per cent. when the next boat puts in.

We are requested by XADW to mention that the American Forces Station in Rome is on 6060 kc/s. from 06.00–09.00 and 21.00–01.00 G.M.T. Reports are solicited. QSL to Capt Haas, Rome Area Allied Command, Signal Officer, A.P.O. 794, U.S. Army.

W1CPI, Wakefield, Rhode I., U.S.A., is active on 3950 kc/s. and will call CQ DX for U.K. contacts every Wednesday evening at 7.15 E.S.T. (00.15 G.M.T.).

Amateur radio in Roumania is rather a chancy business says G8VR. YR5W tells him that public suspicion is aroused if anyone attempts to communicate with Britain or America. There is a strict postal censorship. All cards should be sent *via* the R.S.G.B. Bureau.

The address of the Indian QSL Bureau is Lt.-Col. Whatman, Royal Signals, C.S.D. (I. & E.), Sunderwala, Dehra Dun, U.P., India. He has a large number of unclaimed cards so will all amateurs in India, who want their cards, please send along some envelopes to him. He is VU2BC.

G5VB has worked a couple of good ones. FF8FP, on an aeroplane flight over French West Africa QSL *via* W2LFI and ZD3AF. QSL to GM3AFG, 37, Landale Road, Peterhead, Scotland.

G2EC

Our old friend, Col. Eric Cole (SU1EC), has been the butt of much mistaken wit since he came on with his new call—several people have told him to "Go and get a licence!" He is perfectly genuine and the call G2EC has been officially allocated.

Personal

G2MI and the members of the QSL Bureau team wish to take this opportunity of thanking those very many kind souls who sent Christmas cards and letters of appreciation. We just have not the time to answer them all but we do thank you all very much indeed.

* 29, Kechill Gardens, Bromley, Kent.

THE MONTH ON FIVE

By W. A. SCARR, M.A. (G2WS)

DECEMBER was a month of reduced activity on the band though conditions were reasonably good during short spells of calm weather. No further reports of "Super-DX" from America or elsewhere have come in and these notes will therefore be confined to the reports received from active G stations.

Incidentally, the writer would like to make it clear that all reports of activity are extremely welcome and brief descriptions of aerials and other equipment are of considerable interest. Data on vertical aerials, F.M., V.F.O. rigs and such like would be appreciated from anyone using them.

G2XC (Portsmouth) sends an informative synopsis of conditions during the month, which he describes as generally poor. The best spell occurred after the shallow depression which moved westwards across the South Midlands on December 19. A marked humidity gradient and associated temperature inversion at about 3,000 ft. made possible some good contacts between the Midlands and the London area at this time, though the good conditions did not reach the South West until after midnight. Best contacts by G2XC during the month were—G5BY (Devon) and G6CW (Nottingham), while new stations contacted included G2CUA, 3CU, 5PY, 6NA and 8MG.

G5LL and G5BD say "nothing much to report from Lincs." 5BD now has a beam aerial and reports greatly improved results with first contacts from G4OS, 6CW, 6OS and 6YU. The nightly sked with G8JV (Nottingham) now totals 126 contacts and the beam has brought reports by 8JV up to S9 from S5. G5GX (Hull) has been heard, but not worked.

G5IG (Cambridge) is rebuilding his receiver and has only been on the air occasionally. Recent contacts have been G2MV, 2YL, 5MA, 6VA and 6VX.

G3CQ (Romford) made many new contacts early in the month. G5UM (St. Albans) was worked "over the top of the hill," his signals sounding "as though they were coming through a mincing machine." (Is this a case of super-bending or re-radiation ?) In more favourable directions, contacts were made with G2CUA, 2FFY, 2JU, 2YL, 3CU, 3FD, 3PW, 4AJ, 4DN, 4JO, 5LQ, 5OJ, 5PY, 6FO, 6FU, 6NA, 6VA, 8DV, 8LY, 8MG, 8SM and 8TS. Commenting on Dr. Booker's lecture, 3CQ would like to ask how it is that sunspots improve ducting so much on five metres. Can anyone supply evidence or explanation ?

REGIONAL REPRESENTATIVES

The Council has appointed the following members to serve as Regional Representatives for the current year :—

No. 1 (*North Western*) : MR. H. W. STACEY, B.E.M., G6CX, Rose Acre, Meols Drive, West Kirby, Ches.

No. 2 (*North Eastern*) : MR. C. A. SHARP, G6KU, 56 Moore Avenue, Wibsey, Bradford, Yorks. *Scribe* : MR. J. H. MACDONALD, G4GJ, "Mayfield," Wagon Lane, Bingley, Yorks.

No. 3 (*West Midlands*) : MR. D. A. G. EDWARDS, G3DO, "Selwyn," Pilkington Avenue, Sutton Coldfield, Warwicks. *Scribe :* MR. T. MARTIN, G2LB, 3 Gladys Road, Yardley, Birmingham.

No. 4 (*East Midlands*) : MR. A. C. SIMONS, G5BD, The Elms, Church Road, Mablethorpe, Lincs.

No. 5 (*Eastern*) : MR. S. GRANFIELD, G5BQ, 47 Warren Road, Cambridge.

No. 6 (*Home Counties*) : To be appointed later.

No. 7 (*London*) : MR. S. A. HOWARD, G8TY, 92 Arlington Road, Southgate, London, N.14.

No. 8 (*Southern*) : MR. W. H. ALLEN, M.B.E., G2UJ, 32 Earls Road, Tunbridge Wells, Kent. *Scribe :* MR. E. H. TROWELL, G2HKU, 27 Unity Street, Sheerness, Kent.

No. 9 (*South Western*) : MR. R. A. BARTLETT, G6RB, 31 King's Drive, Bishopston, Bristol, Glos. *Scribe :* MR. K. HARVEY, G5KT, 33 Howard Road, Bristol, 6.

No. 10 (*South Wales*) : MR. D. ALAN DYER, GW8UH, 29 Ladysmith Road Penylan, Cardiff. *Scribe :* MR. E. HAYWARD, GW2UH, 6 Kenfig Road, Gabalfa, Cardiff.

No. 11 (*North Wales*) : MR. F. J. E. STARKEY, GW6KY, "Endon," Gronant Road, Prestatyn.

No. 12 (*North Scotland*) : MR. A. G. ANDERSON, GM3BCL, 87 Braemar Place, Aberdeen.

No. 13 (*East Scotland*) : MR. J. WILSON, GM6XI, 52 Macdowall Road, Newington, Edinburgh, 9.

No. 14 (*West Scotland*) : MR. J. HUNTER, GM6ZV, 51 Camphill Avenue, Langside, Glasgow.

No. 15 (*Northern Ireland*) : To be appointed later.

Mr. G. R. Scott Farnie, G5FI, and Mr. J. N. Smith, GI5QX, were invited to take office as Representatives for Regions 6 and 15 respectively, but due to pressure of private business, neither has been able to accept.

GREETINGS
FROM
OUR NEW PRESIDENT

IT is my good fortune to be elected to the Presidency of the Society at a time when post-war reconstruction is at its peak and when Amateur Radio is stronger and more widely appreciated than ever before. In extending cordial greetings to all members at home and overseas, I can confidently wish them continued success and prosperity in all their activities.

Especially I send my greetings to those members who have only recently joined the Society and who have not yet been initiated in o the fellowship of Amateur Radio Communication.

On behalf of the Society I wish also to send greetings to the Member Societies of the I.A.R.U. and to express the hope that Amateur Radio may continue to contribute as it always has towards international understanding and world-wide unity.

S. K. LEWER (G6LJ),
President.

London Members' Ladies Night

THE London Ladies' Night—the first purely social event to be sponsored by the Society—took place at the Victoria Rooms, Bloomsbury Square, London, W.C.1, on Saturday, December 7, 1946.

The gentle sex, we are pleased to say, gave their enthusiastic support, and formed nearly half of the company of 230 present. Strong doubts had been expressed prior to the event by certain of them as to whether it would be possible for their menfolk to be cajoled into dancing as opposed to rag chewing in the bar and elsewhere, leaving them as forlorn wall-flowers to discuss ration cuts, queues and the like! But these fears were proved completely false; in fact, when we arrived at the excellently appointed ballroom around 8 p.m. we witnessed the colourful spectacle of large numbers of prominent G's twirling their ladies round the floor to the music of Al Morgan's band every bit as dexterously as they would have twirled the knobs of their receivers!

Popular features of the evening were the spot dances admirably handled by the tireless M.C., Mr. Phil Thorogood, G4KD. Prizes for these, and for the "swindle," were generously provided by *Teleradio* (1943) *Ltd.*, *Webb's Radio*, *Berry's* (*Short Wave*) *Ltd.*, *Hamrad* and *Turner Instruments Ltd.* Among the lucky winners were Mr. Buckmaster, BRS10,777 and Associate Member Stevens, both of whom received bottles—the former filled with Moussec, and the latter bearing the vintage label "100TH." Gerry Jeapes (G2XV) and Sq. Ldr. "Oxo" Hubbard (G5OX), "got away" with a Turner milliammeter and a large "Q-Max" slow-motion dial respectively.

During the course of the evening the President (Mr. E. L. Gardiner, G6GR), welcomed the members and their friends, while following the supper interval some first-rate exhibition dances were performed by Mr. Billy Jones and Miss Dorothy Hanforsythe.

On all sides was evidence of pre-war and war-time acquaintanceships being renewed, and at the conclusion of the festivities all present, we feel, were in agreement with the President's view that this should be but the first of many such functions.

We should like to express the thanks of all who participated to the R.S.G.B. Social Committee, under their chairman, Mr. S. A. Howard, G8TY, for the hard work which undoubtedly preceded this event.

G2UJ.

Admiralty Electronic Scrap Scheme

Since the announcement was published in the November BULLETIN that the Admiralty Electronic scrap scheme had been abandoned insofar as it applied to R.S.G.B. members, the Council has received a number of letters from members and groups of members asking that steps be taken to deal drastically with those who have abused the scheme.

The Council fully appreciates that members are disappointed that the scheme had to be abandoned because of abuse. On the other hand it is necessary to explain that unless specific charges are made, the Society cannot take disciplinary action.

The Council will, of course, carefully consider any case brought to its notice, but no further action is possible unless such information is furnished.

The Council wishes to emphasise that the control of the scheme was not in the hands of the Society. Headquarters was responsible for furnishing letters of authority to the D.R.'s who were asked to issue them on request to members. Clearly the D.R.'s could not be held responsible for what happened after the letters had been issued to members.

County Representative Elections

Consequent upon their appointment to the office of Regional Representative, Messrs. Granfield, G5BQ and Howard, G8TY have resigned as County Representatives to which office they were recently elected.

Members resident in the County of Cambridgeshire and in the North London District (as defined in the July, 1946 BULLETIN) are invited to submit nominations for the office of County Representative, in the following form.

To The General Secretary,
Inc. Radio Society of Great Britain,
New Ruskin House,
Little Russell Street,
London, W.C.1.

County Representation, 1947

I wish to nominate Mr......

(*Call or B.R.S.*).....

of.....(*address*) *as Representative for the County of Cambridgeshire* (*or North London*).

(*Strike out whichever does not apply.*)

and attach hereto his letter of agreement to serve if elected.

Signed .....

Call sign (*or B.R.S.*).....

Address .....

.....

Ballot

In the event of more than one Corporate Member being nominated for each of the two offices, a Ballot will be conducted in the manner prescribed in the July, 1946 BULLETIN.

Nominations

Nominations, accompanied by a letter from the member concerned, agreeing to serve if elected, must be submitted in the prescribed form, and must reach the General Secretary by not later than January 31, 1947.

Trans-Atlantic Work on 5 Metres

Stratton & Co., Ltd., Birmingham, inform us that as far back as 1935 they received a report from an American amateur living in New York, confirming reception of 5 metre telephony signals radiated from their experimental station G6SL. The report agreed with the log at G6SL in respect of time and identification signals. Unfortunately this report, (together with other 5 metre records) was lost when the *Stratton* factory was destroyed by air attack during the war.

Without wishing in any way to detract from the fine achievements of G6DH, G5BY and W1HDQ, *Stratton's* feel that they are entitled to mention these facts.

OUR FRONT COVER

Mullard Mercury Vapour Rectifier Type RG1–240A

THE Mullard Mercury Vapour Rectifier RG1-240A is a half-wave rectifier giving an output of 250 mA at voltages up to approximately 1,500 v. with a voltage drop of approximately 16 v. only. Two valves arranged for full-wave rectification will, of course, give 500 mA at the same voltage. Used under the conditions specified by the makers, the valve has a long life. An additional advantage is that, for its output, the valve is of very compact dimensions.

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