R.S.G.B Bulletin

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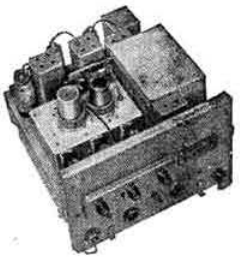

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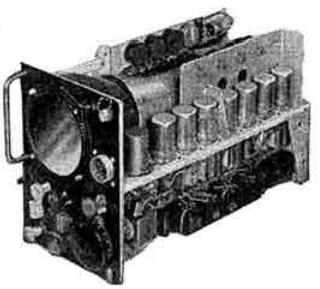

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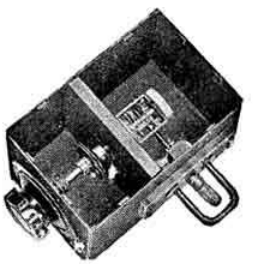

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Current Comment

Enquire Before Calling !

THE season is now almost upon us when members in their thousands will be closing up the shack for a week or two and moving off for the annual holiday. To many the vacation will mean a complete severance from matters connected with Amateur Radio—no bad thing, perhaps, to take a brief holiday from the hobby as well as from the job: new ideas will germinate all the more prolifically for practical application on the return.

Many hundreds of members, however, who do not set it aside while on vacation will be giving high priority to visits to local amateur stations. Such is the freemasonry of the Amateur Radio movement that almost everywhere they will be received with a warm welcome, whether they are acquainted or not. (No doubt many fond illusions, created by contact over the air, will be shattered when the first "personal QSO" is made; conversely, many a favourable impression created by the other man's key or microphone manner will be enhanced upon meeting.)

Because station visits are such an important part of the fabric of Amateur Radio it is as well to remember that this same fabric can become slightly strained at times—if not positively torn! In other words, too many visits received by amateurs in popular holiday resorts can end up by being quite embarrassing. It is not only metaphorical fabrics that are strained but pocket books as well, in the finding of cigarettes and sustenance and general hospitality which "the true ham" insists on furnishing for his brethren.

One well-known South Coast member observed to us that he received *hundreds* of Amateur Radio callers during the summer season, and could, did he so wish, make a better living by means of a "Hams' Guest House" than at his chosen profession. This case is typical.

It is therefore tactful and good-mannered to enquire first of the local amateur if it will be convenient to call upon him, remembering always that *he* will still be preoccupied with his daily job whereas *you* will not !—J. H.

B For Mutton

NOWADAYS, when a voice over a Service line or radio telephone makes the romantic-sounding statement, "November Tango Romeo," it means, unexcitingly in fact, only N.T.R.—Nothing to Report. In the last war, and until a short time ago, the voice (meaning the same thing) would have said Nan Tare Roger, and before 1942 would have said Nuts Toc Robert. Thus, drastically have "they" changed yet again the Signals phonetic alphabet designed to prevent confusion between letters when named singly. This time, it is understood, it has been with an eye, or rather, an ear, to the matter of the comprehension of the many-tongued men of the forces of the November Alpha Tango Oscar countries.

Certainly things today in this branch of Service verbal communications are a lot less simple than the Ack Beer Charlie of the signallers of the First World War, or even the Able Baker Charlie of the Second. Though, to be sure, Charlie still goes on. It is still he who follows the Alpha Bravo of the latest phonetic alphabet, and X-ray too appears to be as steady and constant as might be expected, while Victor, who once was "matily" just Vic, at least is staying as he was during the last war. But it is disturbing to see that William has taken to Whisky, and sad that Peter, the pleasant though on the whole less effective successor to the strong, unmistakable Pip of long ago, now gives place to a most feeble Papa. Time-honoured Sugar is somewhat inadequately succeeded by Sierra, and good old George, after all these years, is going in for Golf.

Yet there is one Army Signals unit, once of yeomanry, now of parachutists, who doubtless will stick to using, among themselves, their own peculiar phonetic alphabet evolved in the Western Desert by the squadron which served with the 22nd Armoured Brigade. This began bluntly with A for 'Orses (hay for horses), B for Mutton (beef or mutton), C for Thighlanders (Seaforth Highlanders), and went on in an ascending scale of the higher lunacy to verbal atrocities like M for Sis (emphasis), R for Askey (Arthur Askey), and X for Breakfast (eggs for Breakfast). But even by those unorthodox practitioners the receipt of a message was strictly acknowledged, as messages still are acknowledged (in spite of Romeo), by the regulation formula, Roger (meaning R or "received")—Out!

(The above appeared as a leader in *The Times* on Saturday, May 19, 1956, and is reproduced with the permission of the Editor.)

Morse, Keys, Keying and Codes

Some Random Comments

By JOHN PIGGOTT, B.Sc., A.M.I.Mech.E., A.M.I.E.E. (G2PT)*

In this article the author discusses the history and use of telegraphic codes and considers their future in the light of modern information theory.

IT is surprising that although a high proportion of the amateur's time "on the air" is spent in sending and receiving Morse characters, little is written about it nowadays. Perhaps the subject is considered to have been exhausted already or maybe it is because the more interesting circuit techniques have occupied so much attention.

However, it can be the boast of amateurs that amongst their ranks are to be found operators who send magnificently and who can read signals against a background of noise that commercial operators would not be expected to tolerate. Although no measurements are available it is certain that, despite filters, noise-to-signal ratios of at least 10db—probably much more on occasions—are overcome regularly in the crowded bands of today. A signal-to-noise ratio is a relief to be enjoyed!

The truly remarkable ability of the human operator to read incredibly weak signals in the face of strong distractions is well worth a few moments' consideration. Other relevant matters regarding keys and keying can conveniently be reviewed at the same time, and such is the purpose of this article.

It is, of course, the fact that amateur messages are personal which provides the driving force behind the very intense concentration required. In addition, the reception is assisted by the transmission of the characters in an individual manner which gives valuable clues to the more obscure sections of the coded information. If all Morse messages were transmitted in text-book fashion and all keys were electronic and perfectly adjusted, then reception of these identical signals would actually become more difficult than at present in periods of intense interference. It would be even more difficult if all these signals were being transmitted at the same rate. So whilst *some* may adopt idealised characters it will always be useful if others keep their individuality in order to retain a measure of the wonderful—and sometimes weird—variety of "fists" to be heard in our narrow allocations. Highly individual methods, however, must not be overdone since, beyond a certain point, reception by many different operators becomes increasingly difficult and the loss is greater than the gain. (The final result can sometimes be heard—nobody can read the signals!) The foregoing remarks are, of course, not applicable to perfect transmission conditions, but even then would not the boredom of universally perfect Morse become intolerable? As it is, it is possible to recognise many stations after a few ciphers only, by a knowledge of their individual rhythm and formation. It has even been said that whole nations have a Morse 'dialect'; certainly there *are* points of difference which can be given a national label. For example, is it imagination that the dashes of many a W station, longer by a few milliseconds perhaps than the average, represent an 'accent'? Have G stations a similar recognisable trait? Or is it merely the result of national habits in the placing of the key, or is it psychological? Methods of training may provide an element of differentiation, although presumably all aim at perfection.

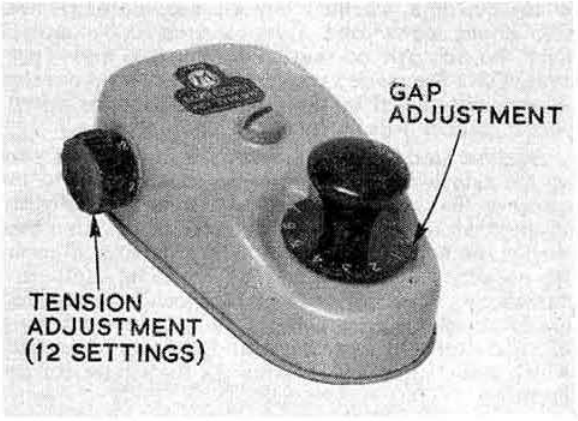
This is a fascinating subject which, being concerned with fleeting differences mixed with personal prejudice, will produce a lot of argument and maybe "Letters to the Editor."

Perhaps it will be of interest to consider next a 'plain' key design of especial value.

A Scientifically Designed Key

Most designers, both amateur and professional, have generally considered the Morse key as being only a peculiar type of simple switch, and arbitrary decisions as to materials, size, shape, etc., have been taken. This is not to say that unsatisfactory keys have always resulted, although amongst operators considerable difference of opinion has existed about any one design. Personal preferences are usually expressed in vague and unscientific terms and past experience with any particular key influences opinions upon any new design. The "feel" of a key might be expressed as "woolly" or, if liked, "it sends for you" and is "definite." What particular features produced these effects few are prepared to say.

One of the most recent investigations[1] into key design was made by Mr. H. J. Wassell, an engineer in Marconi's Wireless Telegraph Co., Ltd., of Chelmsford. Mr. Wassell



The Wassell key showing the external controls for rapid individual adjustment.

(Photo by courtesy of Marconi's Wireless Telegraph Co., Ltd.)

had decided that he would examine the theoretical and fundamental requirements of an ideal key and apply scientific method so far as was possible. A heavy mathematical attack on such a simple device seems at first to be a steam hammer to crack a nut. In point of fact a most interesting design of key has resulted. Although it has not been brought to the notice of amateurs, and is unlikely to be adopted, the design procedure is well worth studying.

The force required to operate a plain Morse key is, ignoring friction, a function of the spring pressure, rate of keying, and the mass of the moving parts. A large force is obviously undesirable (to avoid fatigue) yet

*155 Northwood Way, Northwood, Middlesex

the spring must be sufficiently strong to ensure a rapid return, although the hand pressure has its effect. The rate of keying being determined, the force is a function of the travel or gap setting; fortunately modern circuits allow a very small gap. The mass of the moving parts is, therefore, the determining feature.

The designer of this new key has pointed out that not only has the mass of the knob and bar to be accelerated but also that of the hand itself. Thus the mass of the hand behaves mechanically in a similar manner to the internal impedance of an electric generator. A mass of

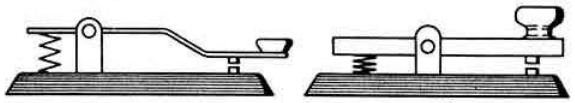


Fig. 1 (a) American and (b) British Morse keys.

2oz for the moving parts of the key is to be regarded as a maximum; less should be the aim. It is of interest to note that older operators may have been so conditioned to larger gaps by early circuit techniques that a change is unwelcome.

The kinetic energy of the moving parts has to be dissipated when impact occurs with the fixed contact and very undesirable effects can be produced. Any vibrations set up in the bar of the key will cause confusion to the operator, particularly if their natural period is greater than or near to the period of key movement.

The difficulty results from forces being applied to the hand by the key, and such forces are found to be present in arbitrary designs, when the key is operated at high speed. In the new key all vibrations are damped out before they can affect the relative pressure between hand and knob. This is because of the small mass and cross-section of the arm and the high "damping factor" of the material. Vibrations persist much longer in steel and brass than in aluminium, so that the lightest material is also the most effective in reducing the reactive forces.

Certain other mechanical features have been taken into account; for instance, to ensure minimum reaction on the bearings the relative positions of the pivot and the contacts can be calculated. Further, the height of the knob above table level is another factor to be considered and its value depends upon whether the operator uses a common British layout—with the key mounted more or less at the front of the table—when a figure of 1 to 2in. is allowable, or the American method—with the key at arm's length across the table—when less height is desirable. These factors account for the well-known differences in key design shown in Fig. 1.

Having had all these details thought out—and others not mentioned here—the Wassell key gives the following figures:—

Feature Compared	Old Type Key	Wassell Key
Mass of moving parts	4½ oz	2 oz
Natural rate of vibration	470 c/s	4,200 c/s
Amplitude of vibration for given impact	1 unit	¼ unit

Other features are:—

Spring tension externally adjustable by simple calibrated knob.

Gap adjustable by simply rotating the main knob (12 positions marked).

The conclusions reached during practical trials with commercial operators indicated a definite preference for the new key compared with other types all fitted with identical knobs and encased to make all appear alike. The keys were adjusted for gap and tension to the known desires of each operator. The gap preference varied, although the majority of operators preferred gaps of 0.010in. to 0.020in. (minimum of the range). The hand and muscles do not favour very small movements, and shorter gaps, although technically possible, give rise to physiological weariness. Adjustments for spring tension were less widely scattered, and varied between 200 and 450 grams at the knob; the majority of operators preferred the heavier pressures, in the range 300 to 450 grams. Test the setting of your key.

An Analysis of Keying

Hand transmission speeds are restricted by physical limitations. "Bug" keys and electronic keys increase the maximum speed probably by a factor of up to about 2. Twelve hand movements per second is about the average maximum attainment. At that rate the movements are made more difficult if of a complex pattern. Many operators cannot send more than 10 impulses per second however hard they try (test yourself and also the man who says he sends at 35 w.p.m.).

Let us now consider what performance is demanded from the operator of a plain Morse key when sending at, say, 12 words per minute. When discussing speeds it should be remembered that a "word" is taken as "5 letters and 1 word-space." It is, however, difficult to assess the exact composition of the "average" word because of the differing relative frequencies of letters and the fact that not all characters are of equal length. Ideally the length of letter-ciphers should be inversely proportional to the frequency of occurrence.

Samuel Morse appreciated this[2] when he visited a New Jersey printing works in 1837 and counted the quantities of type for each letter of the alphabet. He found that the letter 'E' headed the list with 12,000, whilst several letters (N, O, A, I, S) had 8,000 each; 'Z' came last with 200. As a result of his observations he modified his original alphabet. A year later the first public transmission took place. The inaugural message ran:—

"Attention the Universe. By Kingdoms, Right-wheel." (How is that for an inter-planetary CQ?)

As a point of interest the original Morse alphabet differed from that used today. The space between letter

Table I

The table below shows where the 1851 Continental and International Code differed from the 1838 Morse Code, and omits those letters where the two codes were identical.

	Morse 1838 *	Continental (later International) 1851		Morse 1838 *	Continental (later International) 1851
C	‒ ‒ ‒ †	‒ ‒ ‒ ‒	Q	‒ ‒ ‒ ‒	‒ ‒ ‒ ‒
F	‒ ‒ ‒ ‒	‒ ‒ ‒ ‒	R	‒ ‒ ‒ †	‒ ‒ ‒ ‒
J	‒ ‒ ‒ ‒	‒ ‒ ‒ ‒	X	‒ ‒ ‒ ‒	‒ ‒ ‒ ‒
L	‒ ‒ ‡	‒ ‒ ‒ ‒	Y	‒ ‒ ‒ ‒ †	‒ ‒ ‒ ‒
O	‒ ‒ ‒ †	‒ ‒ ‒ ‒	Z	‒ ‒ ‒ ‒ †	‒ ‒ ‒ ‒
P	‒ ‒ ‒ ‒ ‒	‒ ‒ ‒ ‒			

*The 1838 Code was a re-arrangement of a previous one (1837) and was evolved by Morse after visiting a printing works. The only present day survivors of the 1837 Code are E, H, K and N.

†The 1838 Code for these letters included spaces of double length as shown. All double spaces were omitted from the 1851 Code as they were likely to cause error. For example, if "E E" were mistaken for "O" (‒ ‒), "meet her" might become "mother" with possibly disastrous results.

‡The 1838 Code for L was an extra long dash.

symbols was much longer so that although 'E' was a single "dit," and 'I' "dit-dit," 'O' was "dit . . . dit." Double 'E' could be distinguished by the longer space "dit . . . . . dit."

The development of telegraphy in Europe was rapid and, being independent, other modifications of the code were in vogue. (Incidentally, Samuel Morse visited Europe but received little recognition.) At last, when international telegrams were technically possible, a new European standard became essential. At the Vienna Conference[3] in 1851 the present International Morse Code was adopted. In this code the length of the symbol-space was reduced to a constant in all characters, making higher speeds and accuracy possible. All codes have used "dit" for 'E,' but 'O' has had a varied career. The finally agreed "dah-dah-dah" was undoubtedly a compromise, for 'O' is frequent in English (fifth in importance) but relatively infrequent in French and German (9th and 13th)[4]. Fifteen of Morse's original letter codes (1838) are still used.

A detailed analysis of a short phrase might now be of assistance in answering the question posed earlier: What is demanded of an operator when sending Morse? Let us examine the following sentence which is a modified but convenient variation of the telegraph testing signal. THOSE QUICK BROWN FOXES JUMP OVER LAZILY SNORING DOGS. The sentence contains all the letters of the alphabet.

Here we have 9 words, average 5 letters each, 8 word-spaces and 45 characters. Further examination shows 61 dashes, 71 dots, 87 signal-element spaces (i.e. between dots or dashes) and 36 spaces between letters. The total time to transmit can be expressed as so many "dot" times. If one dash equals 3 dots, one signal-element space equals 1 dot, one letter-space equals 3 dots, and 1 word-space equals 5 dots[5], then the above phrase occupies the time of 440 dots. It may be noticed that even in this unusual sample of "English" the average letter contains only 1.35 dashes and 1.58 dots. The probable overall averages are less than these figures, but the task of obtaining the correct figures is not one to be undertaken lightly!

Continuing, therefore, with the above result and assuming that the transmission speed is 12 w.p.m., the total time taken is 45 seconds: hence each dot must last approximately 0.1 seconds. This represents a series of dot units at 5 per second, since the spaces each equal the length of one dot. This is quite an astonishing rate for the first stage of attainment—the G.P.O. test. At 35 w.p.m.—admittedly an exceptional performance on a plain key—the dots will occupy only 0.034 second (nearly 15 dot units per second). This short interval is the "operate" time of some relays. These short times are those of the "dwell" time on the "make" contact of the key, the movements to control the key occupying similar times.

When sending at the highest rate the *velocity* of hand movement is, however, quite low; it is the oft-repeated reversals of direction which limit performance.

Bug-keys and Side-swipers

In order to increase sending speeds for the "average" operator it became necessary to invent an automatic "dit" producer; the hand could cope with the "dahs." Thus came the "bug" key and, later, the electronic key. These improvements, however, place a greater strain upon the receiving operator for more than one reason, as will be seen later. Some people can manage side-ways movements better than up-and-down and hence the "side-swiper" has many advocates.

From a consideration of the above facts it seems that on a plain key the average person is unlikely to reach 30 w.p.m. Twelve w.p.m. is quite a good attainment; twice that figure excellent. Exceptional performers rise to 30 and the very outstanding ones—almost freak—can go beyond that figure.

Learning Morse

Learning to send the Morse code properly is to acquire a mental-manual skill; the "dits" and "dahs" are only a means to an end. The real aim is to possess a complex set of *automatic* muscular movement patterns so that defined motions may be made as required. It is analogous to writing, typing, etc. Firstly, patterns for single letters are learnt; secondly, longer groups are memorized such as "73 de," or a call-sign. Eventually many words, forming an oft-repeated address, for example, can be absorbed and repeated automatically—without conscious thought. Experts can send and talk to room companions at the same time—for others, it is "one thing at a time." Some never transmit without "hearing" their signals mentally; others need to have side-tone. A minority perhaps go "straight" to key movement and have no mental or aural accompaniment.

The most usual experience in learning Morse is to reach a few words per minute after one or two weeks of practice giving, say, 40 to 60 minutes a day. Speed increases with further training until a "ceiling" is encountered in the range 7 to 10 w.p.m. This is the point at which many give up the struggle as progress seems too slow, but it is essential to persevere because this is the critical stage of acquisition of the two special memories and conscious coding is being by-passed by the new ability in that most wonderful control instrument, the brain. Once this stage has been passed and the new "connections" in the brain established, a new lease of life seems to be obtained and progress up to the higher outputs is steady and apparently quite rapid. Once learnt to this degree and used for several years, it is rare that the unconscious abilities are lost, even after ten years of inactivity.

Reaction Times

The rapid movements of the hand when sending Morse, as shown in the analysis below (34 milliseconds for a *dit*), are all the more remarkable when considered in the knowledge that human reactions to instructions or external stimuli take place relatively slowly. Some interesting problems in "information storage" therefore arise, but these are outside the terms of reference of the R.S.G.B. It takes about 150 m.s. to 200 m.s. before any movement of the hand occurs following a simple visual or aural instruction[6]. It is somewhat longer for the foot and maybe this is the reason for the signal QLF: "Send with the left foot, please OM."

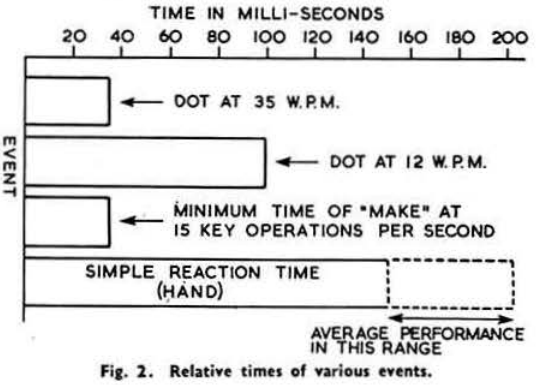


Fig. 2. Relative times of various events.

This so-called reaction time includes receptor time (eye, ear), brain time, nerve transmission time and muscle time. It is therefore obvious that the mind of the sender of high-speed Morse must be "ahead" of his hand movements—probably by several words or characters and the nerve signals must be of a special character. The upper limit of speed is, perhaps, determined by the muscles rather than the mind (see Fig. 2). What amazing and complex nerve signals are transmitted down the arm on their way to be translated automatically in the muscles and transmitted as high-speed Morse by key! It is, therefore, fairly certain that there is no individual nerve signal for each transit movement of the key. Most probably one complex set of signal impulses released from the brain controls a series of movements and *such* are the nerve signals to be acquired for low-fatigue transmitting!

Receiving Morse

Reception is found by most would-be operators to be more difficult to master than keying and this is the cause of many giving up. Why is this? It is probably because the time lag which occurs in the whole procedure (except at very low speeds indeed) is more confusing than that in transmission because the "speed control" is with the other end. It is essential for a learner to concentrate hard and not to panic if a character found to be of greater difficulty is not de-coded and written down before the time comes to consider the next. It is advisable to "drop" an occasional letter in order to keep in step with the sender, otherwise it is all too easy to lose a whole row of characters in the subsequent mental efforts. It is a good plan to listen during practice to the oft-repeated call-signs of commercial stations and to receive a letter at a time if necessary. A new mental facility has to be learnt, and it may be many months before all the special patterns of *sound* are each recognised as a unity.

The automatic memories for writing have already been learnt by all would-be operators, but in receiving Morse the movements of the hand have to be triggered-off directly from the pattern of received sounds.

Here again, as in transmission, after years of working, whole words and oft-repeated phrases become a single impression, and it is possible to receive at an extraordinary rate; isolated words in a message being machine sent at 100 w.p.m. can be recognised. Expert operators can simultaneously carry on a conversation and receive at quite high speeds.

The normal limit for speed of reception is, perhaps, slightly lower than the corresponding limit for transmission, although some operators are exceptions even to this generalisation. Many when in charge of a key seem to forget this difference!

Form of the Transmitted Signal

In addition to the comments already made regarding the relation between the ease of reception and the character of the signal being transmitted, it must be realised that the "fist" can be augmented by the wave-form of the signal. The resulting heterodyne note can possess a recognisable individuality which facilitates reception. If all notes were T9X and *absolutely* identical a miserable effect would be produced. Here again reason must temper the variety otherwise the undue increase in bandwidth will be a menace. Many distinctive notes can be produced each having a total bandwidth of 10 to 20 c/s. The gain in readability of the whole band can soon be lost if this idea is extended beyond quite minute differences in signal wave-form. That these already exist is demonstrated by the great variety of notes, all given T9 (some incorrectly).

The Future of Morse

Experts in modern "information theory," the study of which is being encouraged by the need to conserve channel space in all transmission systems, have analysed language (spoken and written) as a medium of information and have shown that the English language (in both forms) contains a high percentage of redundant elements. The information in this issue of the BULLETIN could be condensed into far less pages if our language could be reconstructed on scientific lines! Fortunately the unnecessary details—the redundancy—is of some value when the language is being transmitted in the presence of interference, for it is often possible to insert the missing elements.

If the following is received:

THI S N T AN X G ERATION

all will write down with complete confidence what was actually sent. Not so in a perfect (theoretical) language in which every letter or element is *essential;* a detail missed is a message lost.

The greater the redundancy in a passage the greater can be the failure in reception through interference, without any loss in the "information" being transmitted. This is true of speech as well as Morse. Modern telephony transmission engineers have attempted to use this principle and to compress the essential features of the sound into a narrow frequency range. The essence of spoken English can be transmitted *in coded-form*[1] in a bandwidth of only 40 c/s, although 300 c/s is necessary to give some resemblance to the original voice.

Telegraphic codes have not saved bandwidth but by reducing the time of channel occupancy have achieved the same economic result. (Telegraphy saves bandwidth as compared with telephony but the information takes longer to transmit; the expression "Information is a function of bandwidth multiplied by time" is to be recalled in this connection). New and improved systems have recently been introduced commercially and among these the "self-checking" codes are the most interesting. Every symbol has to contain a certain characteristic and when this is missing a "failure" is registered. For example, the symbols for letters could each contain seven elements, 4 spaces and 3 marks, in an individual sequence. The loss of either a space or mark will upset the balance of the symbol and this can be arranged to register an error in transmission. Nature never gives something for nothing and these codes have a high level of redundancy, which means more time to transmit a given message. However, there is a distinct gain in the control of a link and traffic can be rigidly controlled and errors almost eliminated.

As the noise factor of circuits has been reduced and faster means of transmission demanded, so has Morse been ousted. It seems probable that many services using Morse today will ultimately replace it with other codes sent and received mechanically.

However intricate, machine systems of reception are very unlikely to achieve the degree of selection and perception of the skilled Morse operator who can approach the theoretical limit when picking out a weak signal from noise. Whether amateurs will ever take up new codes seriously is arguable but at present it looks as if the last stronghold of Morse will be the amateur bands.

Conclusion

These random notes have been prompted by the thought that the background to the æsthetic pleasures undoubtedly enjoyed by many c.w. men may not be fully realised and certainly is seldom discussed. Further, it was considered possible that an analysis of this nature

(*Concluded on page* 461)

Speech Amplifiers

By G. L. BENBOW, M.Sc., A.M.I.E.E. (ex-G3HB)*

THE term *speech amplifier* is generally applied to the stage or stages of an a.f. amplifier whose function it is to amplify the low output of a microphone to a suitable level to drive the output valves. The speech amplifier may consist entirely of *voltage amplifiers, i.e.,* amplifiers which amplify voltage only, or in some cases, the final stage of the speech amplifier may be a *power amplifier.* This is only necessary when the output valves are driven into grid current, *i.e.,* they consume power, but the earlier stages of the speech amplifier are, of course, voltage amplifiers.

Voltage Amplifiers

Audio-frequency voltage amplifiers may be divided into two categories, resistance-capacity (RC) coupled amplifiers, and transformer-coupled amplifiers. The basic circuit of an RC coupled amplifier is shown in Fig. 1. The voltage gain of such a stage is given by the expression

$$\frac{V_{OUT}}{V_{IN}} = \mu \times \frac{R_L}{R_L + r_a}$$

it being assumed that the value of R_g, the following grid resistor, is much greater than $\frac{R \cdot r_a}{R_L + r_a}$, a condition which is generally fulfilled.

In the expression,

μ = the amplification factor of the valve V1.
r_a = anode resistance of the valve V1.
R_L = external anode load of the valve V1.

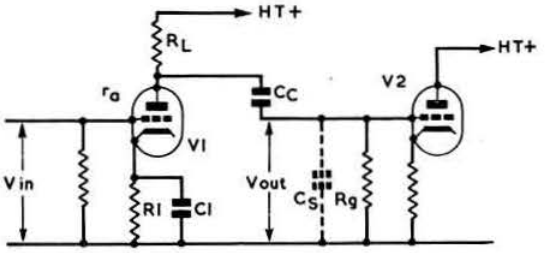


Fig. 1. Basic circuit of voltage amplifier.

It will be seen from this relationship that in order to achieve high gain, R_L must be large compared with r_a. If, however, R_L is very large, the d.c. voltage drop across it will be excessive and a high d.c. voltage will be necessary in order to maintain adequate voltage at the anode of V1. In practice, R_L is made three to five times r_a. Grid bias for V1 is obtained by the voltage drop across the cathode resistor R1, which is by-passed by C1.

In the case of a pentode being used for V1, the empirical rule that R_L should be 3 to 5 times r_a would mean that R_L would be several Megohms. In practice, a compromise is reached, and values for R_L of 100,000-330,000 ohms are normally used with pentode voltage amplifiers.

The frequency response or variation of gain over the frequency range of such a stage is determined principally by the values of three capacitances.

1. The cathode by-pass condenser C1.
2. The coupling condenser C_c.
3. The total input capacity, C_s, of the following stage.

The first two affect the response at low frequencies and have negligible effect at high frequencies, whilst the third affects the high-frequency response.

To prevent negative current feedback and the resulting loss of gain, the cathode bias resistor is by-passed by a condenser C1. The value of this condenser should be such that its reactance at the lowest frequency at which amplification is desired should be low compared with the value of the cathode bias resistor. This condenser also serves a useful purpose in that it by-passes a.c. hum voltages between the cathode and the heater, hence it is advantageous to use a somewhat larger condenser than that dictated by low-frequency response considerations. For amateur use, a 20μF condenser, which has a reactance of 26.5 ohms at a frequency of 300 c/s is adequate in most cases.

At low frequencies, the reactance of the coupling condenser C_c becomes large, and, as C_c and R_g form a potentiometer, the voltage appearing across R_g, or the input to the following stage, falls correspondingly. The gain at any given frequency, with respect to that at medium frequencies may be found from the expression

$$\sqrt{\frac{R_g}{R_g^2 + \frac{1}{\omega^2 C_c^2}}} \times 100\%$$

where R_g and C_c are the values of the following stage grid leak and the coupling condenser respectively and $\omega = 2\pi f$. In practice, this means that a high value of coupling condenser (up to 0.5μF) is necessary for good l.f. response. However, in amateur practice, where good response below 300 c/s is not essential, a value of 0.001 μF to 0.01μF is adequate for use with values of R_g above 0.1 MΩ.

At high frequencies, the reactance of C_s falls and as this capacitance is, in effect, in parallel with the output of the previous stage, appreciable loss can occur. C_s is composed of the various stray capacities of the circuit and the input capacitance of valve V2.

The input capacitance of a valve with a resistance load is

$$C_{IN} = C_{ge} + (M + 1)\, C_{ga}$$

where C_{ge} = grid/cathode capacitance of the valve.
C_{ga} = grid/anode capacitance of the valve.
M = stage gain.

This reflection of the grid/anode impedance into the grid circuit is known as the "Miller Effect" and in some circumstances it may make the input capacitance quite large.

The gain at high frequencies with respect to that at medium frequencies may be calculated from the expression

$$\sqrt{\frac{1}{1 + \omega^2 R^2 C_s^2}} \times 100\%$$

where R = equivalent resistance of R_L, r_a and R_g in parallel.
C_s = total shunt capacitance.

For the frequency range of most interest in amateur communication, *i.e.,* 300 c/s to 3,000 c/s it is reasonable to ignore the high frequency loss, although it would

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obviously need to be taken into consideration in the design of a high-fidelity amplifier.

RC coupling is a cheap and convenient form of coupling between stages and is the form most generally used. It has the added advantage that it is not prone to hum pick-up from stray magnetic fields. It may be used with either triodes or pentodes, and, in fact, it is the only suitable form of coupling for use with high-mu valves because of the practical difficulty of realising a sufficiently high load impedance with a transformer in the anode circuit of such a valve.

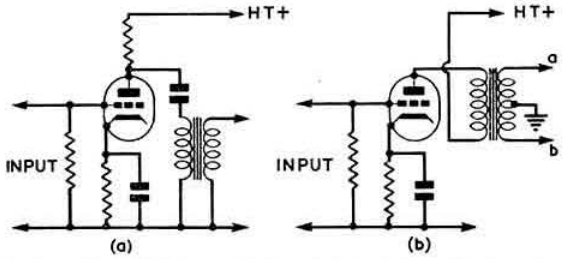

Fig. 2. Alternative arrangements of transformer-coupled amplifiers.

Transformer-coupled Amplifier

Transformer-coupled amplifiers are only used when it is desired to transfer power as distinct from voltage or when a push-pull output is required from a single-ended input. For most effective operation, low-mu triodes operating in class A only are used, as then the primary of the transformer presents a reasonable load.

Two alternative arrangements are shown in Fig. 2. At (a), parallel-feed to the transformer is shown, hence there is no d.c. flowing in the primary and so the primary inductance is maintained. The overall gain of this arrangement is

$$Gain = \mu \times \frac{R_L}{R_L + r_a} \times \left(\frac{N_S}{N_P}\right)$$

i.e., the gain is the product of the gain as an RC coupled amplifier and the turns ratio of the transformer.

In arrangement (b) of Fig. 2 the primary of the transformer carries the d.c. anode current of the valve and so the effective primary inductance is reduced. The gain, assuming the following stage does not run into grid current, is given by

$$Gain \simeq \mu \times \left(\frac{N_S}{N_P}\right)$$

In this arrangement, a centre tapped secondary winding is shown, so that a push-pull output is available between "a" and "b."

In both cases, the frequency response is governed mainly by the characteristics of the transformer. At low frequencies, the inductive reactance of the primary winding is low and hence the valve is working into a low anode load and the gain is small. For good l.f. response, a high primary inductance is necessary. At high frequencies, the self capacitance and leakage inductance of the transformer becomes important, and to maintain a uniform response, it is necessary to sectionalize the windings.

Several voltage amplifiers may be operated in cascade. The overall gain is then the product of the individual gains of each stage. The overall gain must be carefully proportioned between individual stages to avoid overloading any one stage. In such a high-gain amplifier, it is essential to prevent stray coupling between stages both by correct layout of components and also by adequate decoupling of the h.t. feed to each stage. A resistor of 10,000 ohms to 33,000 ohms and a 4 to 8μF condenser is normally sufficient. The gain control should be included as early as possible in the amplifier chain to prevent over-loading of the early stages. This may often mean putting the control in the grid circuit of, for example, a fairly high-gain stage immediately following a crystal microphone. In such a case, the operating voltage level is very low and the circuit must be adequately screened to prevent hum pick-up. A gain control potentiometer is an obvious embarrassment in such circumstances, and should preferably be used immediately after the first stage.

Driving a Push-pull Stage

A push-pull output stage obviously requires a push-pull input, *i.e.*, the two grids must be driven by identical voltages differing in phase by 180°. A further condition of a push-pull drive circuit is fixed by the mode of operation of the driven stage. The output stage may only require voltage to drive it, or on the other hand it may run into grid current and consume power. This power must be supplied by the driver stage, which must also present to the output stage a low impedance, as the amount of power required will vary over the audio cycle, and the drive voltage must be as constant as possible.

Methods of Obtaining a Push-pull Output

The transformer-coupled amplifier using a centre-tapped transformer (Fig. 2b) is clearly the most convenient way of obtaining a push-pull output, and is, in fact, the only way of obtaining a push-pull power output, RC coupling being unsuitable for this purpose. A preferred circuit arrangement for driving a push-pull stage

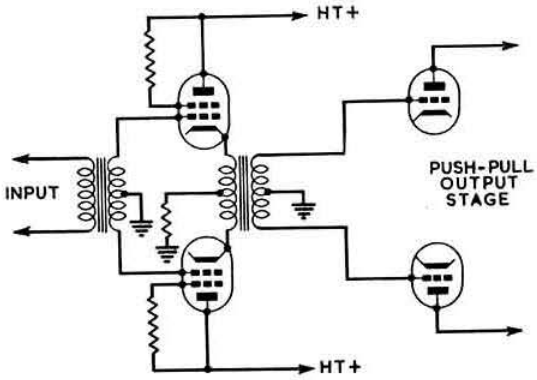

Fig. 3. Push-pull low impedance cathode follower driver stage.

which requires a low-impedance drive source is shown in Fig. 3. This utilises the property of the low-impedance output of a cathode follower, with either a centre-tapped transformer or alternatively two separate transformers in the cathode circuit of the driver stage.

A simpler arrangement is the cathode-coupled driver circuit, illustrated in Fig. 4. Here the push-pull grids of the output stage are fed directly from the cathodes of a push-pull triode driver stage. Although the driver stage requires a push-pull input, this arrangement has the advantage that no transformers are required.

Phase Splitting

There are several phase-splitting circuits which do not use a transformer to provide a push-pull output from a single-ended input. They all utilise modified forms of RC coupling with single or double valves, and as stated earlier, are essentially voltage amplifiers.

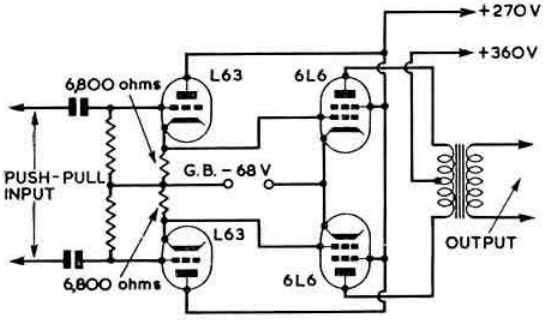

Fig. 4. Cathode-coupled push-pull driver stage.

Paraphase Circuit

This system employs two similar valves or a double valve (generally a double triode, as shown in Fig. 5). V1 acts as a normal voltage amplifier, its output appearing across R1+R2. Part of this output is applied to the grid of V2, and this, due to the phase reversal which

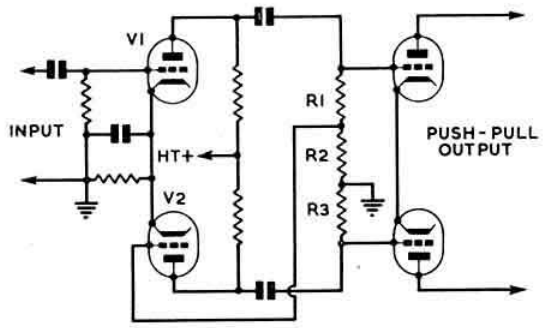

Fig. 5. Paraphase phase inverter circuit.

occurs across a valve, is in antiphase to the voltage at the grid of V1. The balance conditions for equal and opposite outputs are that (R1+R2)/R2 should be equal to the voltage gain of V2 and that R1+R2 should be equal to R3. The use of close-tolerance high-stability resistors (2 or 5 per cent.) is recommended for R1, R2 and R3. The value of the cathode-bias resistor should be half the normal value for the valves concerned.

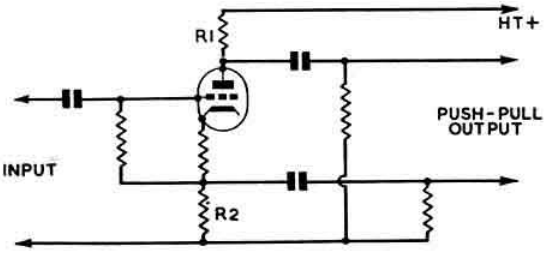

Fig. 6. Split-load phase inverter circuit.

Split-load Phase Inverter

This circuit uses a single valve but with the anode load split into two halves, one in the anode circuit (R1) and one in the cathode circuit (R2) as shown in Fig. 6. Since the same current flows in R1 and R2, equal voltages are developed across both resistors. Although in this circuit the two voltages are equal in magnitude, their source impedances are different because the valve acts as a normal amplifier as far as R1 is concerned but as a cathode-follower in the case of R2. Operating conditions may be determined by considering the stage as an RC coupled

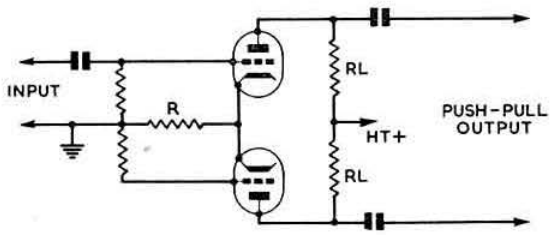

Fig. 7. Cathode-coupled amplifier circuit.

amplifier with R2 omitted, and R1 equal to twice the value to be used. The effective output voltage will be half this value.

Cathode-coupled Phase-Splitter

This circuit uses two similar valves coupled together by the common impedance R as shown in Fig. 7. The signal is applied to one grid only, the other grid being undriven. Push-pull output is obtained from the anodes of the two valves. The overall gain is less than half that of normal RC conditions.

The Anode Follower

If an anode-follower circuit is arranged so that it has a very high degree of feed-back, the stage-gain will be unity and the output will be equal in voltage but opposite in phase to the input. Referring to Fig. 8, if R1=R2 and C1=C2 and if the voltage-amplification without feedback is high, then the gain is unity. As in the split-load phase-inverter, the source impedances of the two voltages are different. One output has the impedance of the input to the anode follower while the other has an impedance equal to $2/gm$, where gm is the mutual conductance of the valve used (preferably a high-slope pentode).

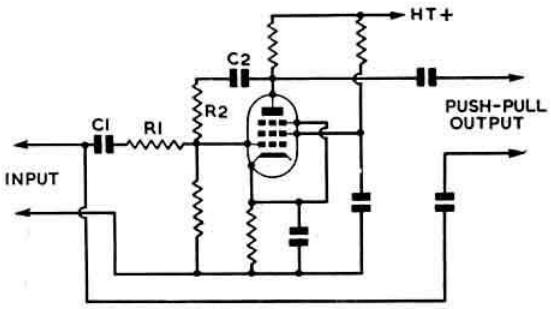

Fig. 8. The anode follower used as a phase splitter.

Negative Feed-back

Although the use of negative feed-back is almost universal in high-fidelity a.f. amplifiers, its use in the modulators of amateur transmitters is by no means common.

The application of negative feed-back to an a.f. amplifier consists merely of feeding-back to an earlier stage a proportion of the output of the amplifier. The feed-back must be of the correct phase relationship, and may be applied over one stage or the whole amplifier. Since it automatically causes a reduction in sensitivity, an extra stage of amplification is often required.

The advantages to be gained by the use of negative feed-back may be summarised as follows:

1. Greater stability with regard to changes in valve characteristics and supply voltages.
2. Reduction of phase and harmonic distortion.
3. Improvement in linearity of frequency response.
4. The output impedance of the amplifier can be reduced if desired.

It is the last property which can be of great interest in modulator design as it presents a convenient means of providing a low-impedance driver stage for a push-pull modulator which requires a power drive.

The feed-back voltage may be obtained in various ways, the two most commonly used are (i) the provision of a separate secondary winding on the output transformer, and (ii) a fairly high-resistance potentiometer across the output of one stage with the tapping point returned to an earlier stage or the input of the same stage.

A typical circuit showing the use of negative feed-back on a push-pull driver stage is illustrated in Fig. 9. The magnitude of the feed-back voltage is governed by the relative values of R1 and R2, for which suggested values are 150,000 ohms and 33,000 ohms. C1 is a 0.1μF blocking condenser, which prevents the d.c. anode voltage from reaching the grid. Feed-back is over one stage only, the correct phase relationship being achieved by feeding from the anode back to the grid of the same valve.

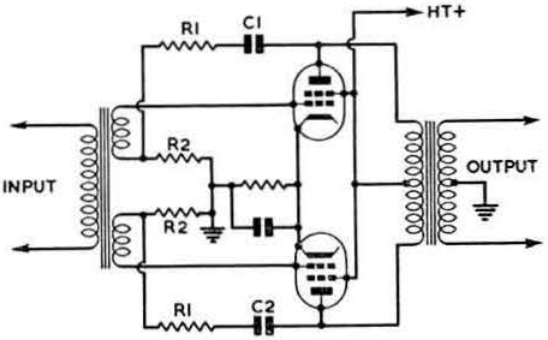

Fig. 9. Application of negative feed-back to a push-pull driver stage.

Valves Suitable for Use in Speech Amplifying Stages

The principal characteristics of valves commonly used in speech amplifiers are given in Table 1.

Table 1

Table showing basic characteristics of some valves commonly used as voltage amplifiers.

Type No.	Class	Heater V	Heater A	Va	Vg2	gm (mA/V)	ra (ohms)	μ	Base
Replacement Types									
6C5	Triode	6·3	0·3	250		2·0	10,000	20	Octal
6F5	Triode	6·3	0·3	250		1·5	66,000	100	Octal
6J5	Triode	6·3	0·3	250		2·6	7,700	20	Octal
6SL7GT	Double Triode	6·3	0·3	250		1·6	44,000	70	Octal
6SN7GT	Double Triode	6·3	0·6	250		2·6	7,700	20	Octal
6J7	Pentode	6·3	0·3	250	100	1·25	1·5MΩ		Octal
EF50	Pentode	6·3	0·3	250	250	6·5	1MΩ		B9G
SP41	Pentode	4	0·95	200	200	8·5	0·7MΩ		M.O.
SP61	Pentode	6·3	0·6	200	200	8·5	0·7MΩ		M.O.
Current Types									
6C4	Triode	6·3	0·15	300		1·7	7,700	17	B7G
12AT7	Double Triode	6·3 12·6	0·3 0·15	250		5·5	10,000	55	B9A
12AU7	Double Triode	6·3 12·6	0·3 0·15	250		2·2	7,700	17	B9A
12AX7	Double Triode	6·3 12·6	0·3 0·15	250		1·6	62,500	100	B9A
6AM6	Pentode	6·3	0·3	250	250	7·5	1MΩ		B7G
EF80/Z719	Pentode	6·3	0·3	170	170	7·4	0·4MΩ		B9A
EF86/Z729	Pentode	6·3	0·2	250	140	1·8	2·5MΩ		B9A
EF37A	Pentode	6·3	0·2	250	100	1·8	2·5MΩ		Octal

A Curious Story

THE issue of *Weekend Mail* dated March 8-12, 1956, contained an article, entitled " Calling all Girls." The article claimed that members of the Greenhayes Aero and Wireless Club, Southport, Lancashire, were using home-made walkie-talkies for the purpose of fixing " dates " with girls. A copy of the article was sent to the G.P.O. with a request that the story be checked.

The G.P.O. have now advised Headquarters that, although extensive enquiries have been made in the area, there is no evidence that wireless equipment has been used in the manner described in the article in question, nor has it been possible to obtain any information about the so-called " club."

We can only suppose that publication of the article was a journalistic " stunt " of some kind.

Morse, Keys, Keying and Codes

Continued from page 457

could stimulate interest in the subject and might prove of value to learners of the art.

The attractions of skilful Morse operating are very real; this is *not* to advocate " down with telephony," but rather to proclaim " long live c.w.! "

" Attention the Universe. By Kingdoms, Right Wheel."

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Single Sideband Technique

Part VI—Test Equipment

By H. M. HUMPHREYS (GI3EVU)*

This article, the concluding one in the present series, was written with the needs of the single sideband operator particularly in mind but the equipment described should prove of interest to many readers who have not yet started using the system.

ALTHOUGH a c.w. transmitter may be built and operated satisfactorily with nothing more elaborate in the way of measuring gear than a d.c. milliammeter and a wavemeter, rather more comprehensive test equipment is desirable for any form of telephony transmission and absolutely essential for single sideband. If this is purchased it will make a hole in even the deepest pocket. A wide range of excellent test instruments may, however, be constructed at home for a fraction of the cost of their commercial counterparts. Three such instruments, which are of special value in connection with s.s.b. transmission, are described in this article.

Cathode Ray Oscilloscope

The cathode ray oscilloscope is by far the most useful instrument which an amateur interested in any form of telephony transmission can possess. Commercial instruments are elaborate and expensive, and, therefore, out of the reach of most of us. Many of the features which add to their cost are not, however, necessary for monitoring amateur transmissions, so by omitting them and by taking advantage of the fact that suitable cathode ray tubes are available as ex-Government surplus, an instrument designed expressly for 'phone monitoring may be constructed very cheaply. The writer's first modulation monitor was built some years ago for less than 30s. Allowing for the increased prices which rule today a similar unit may be built for about £2. Of all the surplus tubes available, the 3BP1 has features which make it perhaps the most suitable. Its screen is large enough to give an unambiguous picture, and although it is a short and handy tube, it has a fair deflection sensitivity so that a high input is not required. This obviates the need for deflection amplifiers in monitor service. A number of tubes of this type have been tested and all of them were found to have the electron guns so well centred that the spot appeared in the centre of the screen without the assistance of a shift-control network. This simplifies construction and cuts cost. The anode voltage requirements are modest; many tubes will give a reasonably well focused spot at voltages as low as 400-500, and nearly all will work excellently at from 700 volts upwards. Last, but not least, a brand-new 3BP1 may be obtained for 20s. to 25s. from BULLETIN advertisers.

Many readers may by now be wondering how it is proposed to provide a power supply for the tube within the amount budgeted. For the limited application in mind, it is sufficient to provide a heater supply only, because the existing power supply for the transmitter final will almost invariably be capable of giving the few milliamperes drawn by the cathode-ray tube and its control network. It is unfortunate that external fields are liable to cause trouble unless the final anode and the deflector plates of the tube are operated at earth potential. It is therefore highly desirable to provide the few components needed to furnish a negative h.t. supply for the tube's cathode.

The circuit of a cathode-ray oscilloscope embodying the foregoing principles is given in Fig. 41. This, though deliberately modest, is adequate for setting up all the equipment described in this series with the exception of the W2KUJ audio phase shift network of Fig. 22, Part III. The lead from the heater of the VU111 may be connected to either end of the high-voltage secondary of the p.a. power supply transformer, and after smoothing in the r.c. filter comprised of C5, R8 and C4, a negative d.c. output of almost 1.4 times the r.m.s. half-secondary voltage will be provided for the cathode-ray tube. Thanks to the negligible current drain, r.c. filtering is adequate. Brilliance of the pattern is controlled by VR3, and focus by VR2. Those who are unfamiliar with cathode-ray tubes should note that a high-intensity spot should not be permitted to remain stationary on the screen for any length of time, otherwise it will leave a permanent blemish on the fluorescent phosphor. To keep costs down, 50 c/s a.c. taken from the mains is used to provide the horizontal sweep. It is therefore necessary to make sure that C1 is connected to the live side of the mains. If no sweep is obtained on switching on, it is clear that C1 is connected to the neutral lead, and the fault should be rectified either by transferring it to the other side of the heater transformer primary or by reversing the mains plug in its socket. A 50 c/s sweep admittedly causes distortion of the display, but this may be kept within reasonable limits by using a high sweep amplitude so that only the centre portion of the sweep appears on the screen. The resulting trace is linear enough for most monitoring work. The sweep amplitude may be reduced by VR1, but as explained above, this control should be set at maximum when

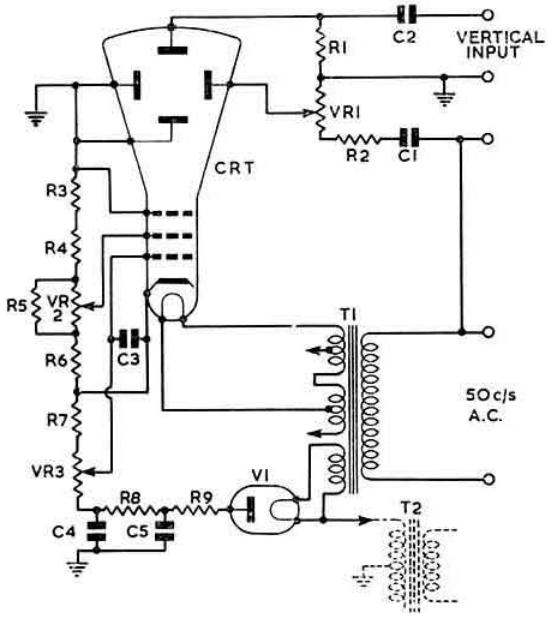

Fig. 41. Oscilloscope Display Unit: C1, 2, 0.01 μF mica, 1000 V wkg.; C3, 1 μF 100 V; C4, 5, 2 to 4 μF, working voltage to suit T2; CRT, 3BP1; R1, 1 Megohm 1 watt; R2, 9, 100 ohms 1/10 watt; R3, 4, 5, 100,000 ohms 1 watt; R6, 82,000 ohms 1 watt; R7, 1000 ohms 1 watt; R8, 4700 ohms 1 watt; T1, 6.3 V and 4 V heater transformer; T2, existing p.a. power supply transformer (see text); V1, VU111; VR1, 2, 1 Megohm potentiometer; VR3, 25,000 ohms potentiometer.

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monitoring is being carried out. If much other work is contemplated, it would probably be wise to go to the extra expense of including some form of linear horizontal sweep. The Miller-transitron oscillator, which is shown in its most elementary form in Fig. 42, has much to commend it to the beginner. Almost any straight pentode may be used in this circuit, so long as it has the suppressor brought out to a separate pin. As the valve requires only a few milliamperes of h.t. at 200-300 volts, it will probably be possible to "borrow" the necessary supply from an existing power-pack. If the linear sweep of Fig. 42 is preferred to the 50 c/s mains sweep, C1 in Fig. 41 should be disconnected from the primary of the heater transformer and connected to the anode of the oscillator valve.

The small 1/10th watt resistors R2 and R9 are the only components of Fig. 41 which remain to be explained. They have merely been included to act as fuses in the event of other components breaking down.

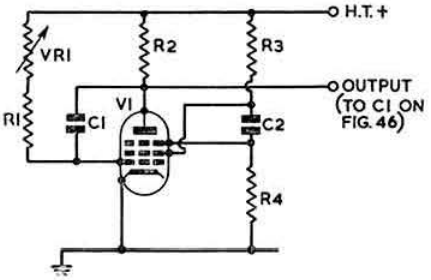

Fig. 42. Miller-transitron Sawtooth Timebase Generator. Approximate frequency range 20–500 c/s. C1, 0.01 μF; C2, 0.02 μF; R1, 4, 100,000 ohms; R2, 3, 47,000 ohms; V1, 6SJ7 6AM6 (see text); VR1, 5 Megohm potentiometer.

Audio Oscillator

Almost any type of audio oscillator may be used for the alignment of crystal-filter exciters and linear amplifiers, but a rather more ambitious instrument is needed for the adjustment of a valve-type phasing unit such as that described in Part III.

By leaving out non-essentials, the amateur can build an oscillator which will serve his purpose every bit as well as a commercial model, but at much less cost. The basic requirements for a suitable instrument are:—

(i) Good waveform over the full operating range;
(ii) Stability and accuracy of calibration—both long and short term;
(iii) Absence of critical settings;
(iv) Minimum of expensive or hard-to-get components;
(v) Simplicity of construction with hand tools.

Experimental work with quite a few audio oscillators has convinced the writer that all of the better-known circuits are capable of excellent results, provided that they are properly constructed, adjusted and operated. The circuit in Fig 43, however, represents the best balance between constructional simplicity and quality of output which has yet been met. Further simplification could be made only at the expense of distortion of the output waveform; on the other hand, further refinement would lead to constructional complications which would be out of proportion to the small improvement in waveform which might result.

A full discussion of the theory underlying this circuit would be inappropriate here, but it might not be out of place to say that V1 is the oscillator, which operates because of regenerative feedback from anode to grid by way of the phase-reversing valve V2 and the tunable frequency-sensitive r.c. network consisting of VC1 and its associated components. V3 plays no real part in the operation of the circuit. It is merely a buffer stage, and has been arranged to provide both high and low impedance outputs. Output level may be controlled by VR2. As with all oscillators, the waveform is at its purest when oscillation is just established and no more. This desirable state of affairs is brought about by the negative feedback network VR1-LP1; as LP1 has a pronounced positive temperature coefficient, it forms an extremely efficient automatic amplitude control. The lamp is admittedly somewhat bulky and inconvenient to fit in, but it is absolutely essential and should on no account be replaced by a linear resistor.

The rotor and frame of the two-gang variable condenser used for frequency adjustment are not at earth potential, which is inconvenient from the point of view of construction. Some designers have tried to get around this difficulty by replacing the variable by a pair of fixed condensers, and by using a two-gang variable resistor for frequency control. At first sight, this may seem to be a most attractive solution, but it leads to complications of its own. Maximum purity of waveform is obtained when the paired resistors (e.g. R1a and R1b) are identically equal. No commercially available ganged variable resistor can be guaranteed to track to the required degree of accuracy over the complete range of adjustment. In addition, few variable resistors are free enough from backlash to enable them to be set to the hairline accuracy necessary for an instrument of this type. Variable condensers are, however, designed for precision and stability, and are almost invariably used in commercial audio oscillators. Mounting presents something of a problem,

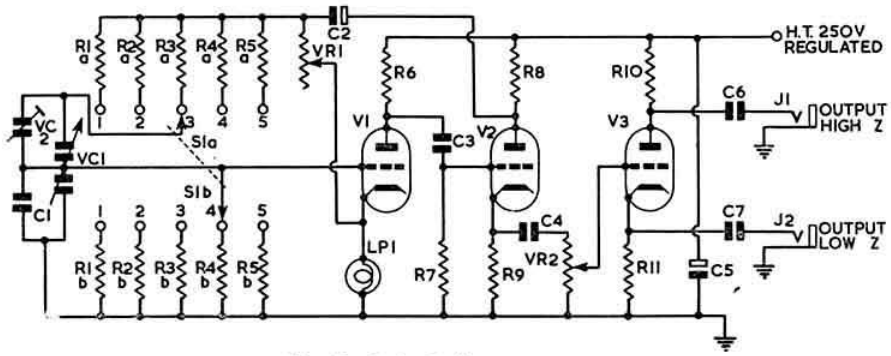

Fig. 43. Audio Oscillator.

C1, 100 μμF silver mica; C2, 6, 32 μF 350 V electrolytic; C3, 1 μF paper; C4, 7, 50 μF 50 V electrolytic; C5, 100 μF 350 V electrolytic; J1, 2, closed circuit jacks; LP1, 230 V 15 watt lamp; R1a, b, 10 Megohm; R2a, b, 2.2 Megohm; R3a, b, 0.56 Megohm; R4a, b, 0.15 Megohm; R5a, b, 39,000 ohms (R1 to 5, see text); R6, 10, 47,000 ohms; R7, 1 Megohm; R8, 22,000 ohms; R9, 1000 ohms; R11, 1500 ohms; S1a, b, 2 pole 6 way rotary switch; V1, 2, ½ 12AU7; V3, 6C4; VC1, 500 μμF two gang receiver variable; VC2, 250 μμF trimmer.

as an extremely high degree of insulation from chassis has to be combined with absolute rigidity and freedom from backlash. The amateur constructor would be well advised to follow the lead of at least one commercial designer in this connection, by cutting a rectangular hole, slightly larger than the overall size of the variable condenser, in the chassis where the component is to be mounted. A piece of ¼ in. thick polystyrene sheet, approximately half-an-inch wider all round than the hole, should then be bolted firmly over the opening, after which the variable may be affixed to the polystyrene. The padders C1 and VC2 may also be conveniently located on this sheet. A large-diameter ceramic insulated coupling should be used on the shaft to avoid leakage. A good slow-motion dial is of course essential. The front panel should be of rigid metal, adequately earthed to prevent hand-capacity effects from spoiling the accuracy of calibration.

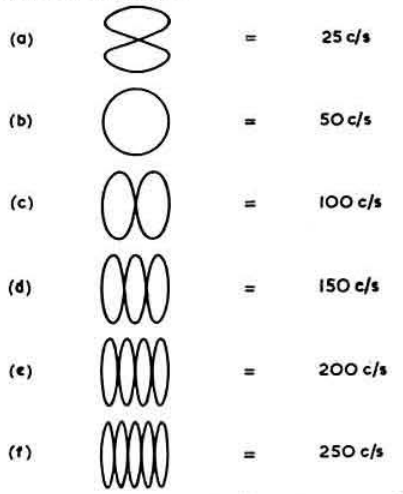

Fig. 44. Calibration of the Audio Oscillator by means of Lissajous' Figures.

The pairs of frequency-determining resistors (R1a-b to R5a-b) should match as closely as possible, otherwise waveform will suffer. High-stability close tolerance components, matched to ½ per cent. or better, are strongly recommended for these positions, and some form of thermal shunt should be used when soldering them in, to guard against their values being altered by heat. If the job is done quickly, with a really hot iron, it will usually suffice to hold the leads in a pair of long-nosed pliers while the solder is being applied. Because of the high values of resistance used on the lower frequency ranges, a little leakage at the switch can ruin the performance of an otherwise perfect oscillator. A ceramic switch wafer for S1 is therefore desirable. The only other points to watch relate to C2 and C3. C2 should have negligible leakage, otherwise it may play havoc with the operation of V1. C3 should not be reduced in value because the secret of obtaining a good waveform with any RC oscillator is to keep phase shift where it is wanted, and can be controlled. It must not be allowed to creep in elsewhere.

The first step in setting up the oscillator is to adjust VC2, which enables the bridge to be balanced by compensating for the input capacitance of V1 and other circuit strays. It should be adjusted with VC1 set to minimum capacity, because it has greatest effect at that setting. For this adjustment, the largest-value pair of resistors should be switched into circuit. With VR1 adjusted for minimum stable oscillation, and the output displayed on an oscilloscope, VC2 should be trimmed for best symmetry of waveform obtainable. The optimum setting of VR1 is to some extent dependent on VC2, so it is advisable to "go round again" several times until it becomes clear that no further improvement can be made. The instrument should then be tested for stability of operation over its complete frequency range. Should it cease to oscillate at any point, VR1 should be adjusted very slightly until stable operation is re-established. Only the slightest movement of VR1 should be necessary; anything appreciable indicates that there is a fault in the construction. If trouble occurs on one particular frequency range only, inequality in the resistors or dirty switch-contacts are probable causes. If it occurs on all ranges, a dirty wiper contact on the tuning condenser should be suspected. When VC2 and VR1 have been set, they may be sealed, as subsequent accidental movement would upset the calibration of the oscillator.

Lissajous figures are often suggested as the best means of calibrating an instrument of the type described, and indeed they are hard to beat for the lower frequencies. The method of using them is as follows. With 50 c/s (mains frequency) a.c. voltage fed into the horizontal deflecting plates of the oscilloscope, the output of the audio oscillator should be applied to the vertical plates and the tuning control adjusted until the pattern of Fig. 44 (a) appears on the screen. The oscillator frequency is then 25 c/s, and the scale may be appropriately marked. The tuning control may then be rotated until the pattern of Fig. 44 (b) appears, which indicates a frequency of 50 c/s. Similarly, the calibration points relating to the range 100-250 c/s may be fixed by reference to the patterns shown in Fig. 44 (c)-(f); finally the whole scale may be calibrated accurately by interpolation. There are of course many intermediate Lissajous figures which may be obtained in addition to those shown in Fig. 44. Readers who wish to work out the frequencies for which these apply may do so from the method given in Fig. 45.

Above 4-500 c/s, calibration against the mains ceases to be practicable. One way to go on from there is to use a second oscillator which may be set to an intermediate point (say 200 c/s) and used to calibrate the first oscillator by means of Lissajous figures up to 1000 c/s or thereabouts. The auxiliary oscillator may thereupon be set to 1000 c/s, and the process repeated in sequence until the full range has been covered. The principal requirement of the auxiliary oscillator is frequency stability; purity of waveform is unimportant.

Alternatively, the instrument may be calibrated aurally by connecting a pair of 'phones across the output and comparing the pitch of the note with that of a musical instrument of known accuracy. A piano tuned to concert pitch is extremely suitable; the frequencies of the notes in its range are given in Table IV. The advantages of this method is that errors are not cumulative, whereas they may be if the

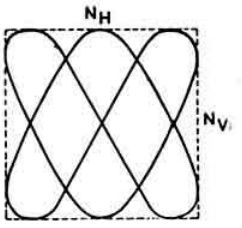

Fig. 45. If a sine-wave of unknown frequency is fed to the horizontal deflecting plates of the oscilloscope, and a signal from a calibrated source is fed to the vertical plates, a stationary pattern such as that shown above may be obtained by adjusting the frequency of the calibrated source. The number of loops in both horizontal and vertical planes should be counted, and the unknown frequency may then be calculated from the following equation: Unknown frequency = NV/NH × frequency of calibrated source. In the diagram, the unknown frequency is 2/3 of the calibrating frequency.

auxiliary oscillator scheme is used. A good ear is, however, essential, and anyone who is not blessed with this attribute is strongly advised to enlist the aid of a musical friend. This is especially desirable when the higher frequencies are being calibrated, because these do not come within the fundamental range of the piano and must consequently be fixed harmonically.

Valve Voltmeter

Even in its simplest form, the valve voltmeter can be of inestimable value in amateur stations, especially those in which experimental work is the main interest. One of its most useful applications is the direct measurement of voltage across the grid resistor of any stage drawing grid current, which makes it unnecessary to provide jacks, meters or their associated decoupling components in the grid return circuit. The valve voltmeter is thus exceptionally convenient for testing or adjusting any form of balanced modulator. It is also useful for amplifier testing. For instance, if it is connected between the grid of a linear amplifier and earth, it will indicate whether or not the regulation of the bias supply is sufficiently good. Due to its high input resistance, it enables potentials of a fraction of a volt and upwards to be measured with little or no disturbance to the circuit to which it is connected. By the addition of a simple probe, r.f. voltages may be measured as easily as d.c. These are only a few examples of the uses to which the instrument may be put; practice will suggest hundreds of others.

In addition to its high input resistance, the valve voltmeter has the advantage that large deflections may be obtained on a relatively insensitive meter movement. It

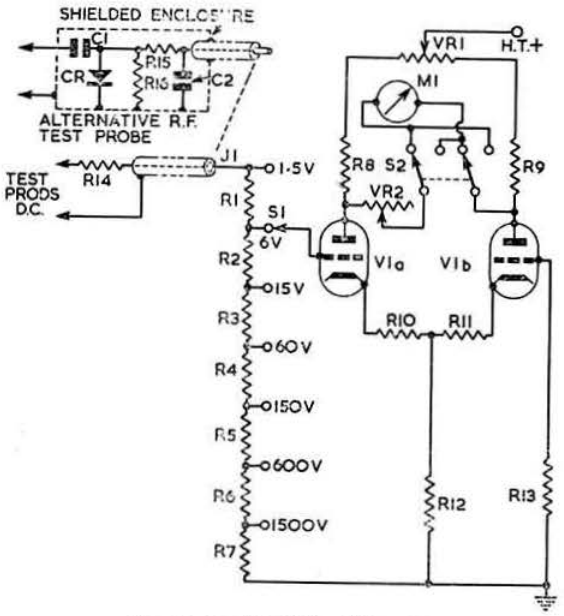

Fig. 46. Simplified Valve Voltmeter.

C1, 100 $\mu\mu$F; C2, 0.001 μF; CR, germanium diode; J1, co-axial socket; M, 500 μA meter scaled 0–1.5 V and 0–6 V; R1, 10 Megohm; R2, 2 Megohm; R3, 1 Megohm; R4, 0.2 Megohm; R5, 0.1 Megohm; R6, 20,000 ohms; R7, 13,000 ohms (R1 to 7 should be 1 per cent tolerance type); R8, 9, 22,000 ohms; R10, 11, 100 ohms; R12, 1,000 ohms; R13, 14, 15, 1 Megohm; R16, 68,000 ohms.; S1, single pole 7 way selector switch (ceramic); S2, 2 pole 2 way switch; V1a, b, 12AU7; VR1, 10,000 ohms potentiometer; VR2, 25,000 ohms potentiometer.

TABLE IV

Frequencies of Notes in Range of Standard Piano, Tuned to Concert Pitch

	Note	Frequency c/s
Third octave below Middle C	A 1	28
	A♯1	29
	B 1	31
	C 0	33
	C♯0	35
	D 0	37
	D♯0	39
	E 0	41
	F 0	44
	F♯0	46
	G 0	49
	G♯0	52
	A 0	55
	A♯0	58
	B 0	62
Second octave below Middle C	C 1	65
	C♯1	69
	D 1	73
	D♯1	78
	E 1	82
	F 1	87
	F♯1	93
	G 1	98
	G♯1	104
	A 1	110
	A♯1	117
	B 1	123
Octave below Middle C	C 2	131
	C♯2	139
	D 2	147
	D♯2	156
	E 2	165
	F 2	175
	F♯2	185
	G 2	196
	G♯2	208
	A 2	220
	A♯2	233
	B 2	247
Middle C (C 3)		262
Octave above Middle C	C♯3	277
	D 3	294
	D♯3	311
	E 3	330
	F 3	349
	F♯3	370
	G 3	392
	G♯3	415
	A 3	440
	A♯3	466
	B 3	494
Second octave above Middle C	C 4	523
	C♯4	554
	D 4	587
	D♯4	622
	E 4	659
	F 4	698
	F♯4	740
	G 4	784
	G♯4	831
	A 4	880
	A♯4	932
	B 4	988
Third octave above Middle C	C 5	1047
	C♯5	1109
	D 5	1175
	D♯5	1245
	E 5	1319
	F 5	1397
	F♯5	1480
	G 5	1568
	G♯5	1661
	A 5	1760
	A♯5	1865
	B 5	1978
Fourth octave above Middle C	C 6	2093
	C♯6	2217
	D 6	2349
	D♯6	2489
	E 6	2637
	F 6	2794
	F♯6	2960
	G 6	3136
	G♯6	3322
	A 6	3520

is also much less susceptible to damage by a heavy overload than a sensitive voltmeter of the normal type.

Fig. 46 shows the circuit of a simple but extremely reliable instrument. In some respects the design is not ideal, but it will be found adequate for the demands which most amateurs are likely to make upon it. On the credit side, it will work from almost any receiver or low-voltage transmitter power supply, because it is not unduly sensitive to variations in h.t. voltage. Neither does it need the negative voltage supply which is essential for so many of its more elegant counterparts. Layout is completely non-critical, although it is advisable to use a ceramic valveholder because of the high resistance in the grid circuit at the lower voltage ranges. For the same reason, a ceramic switch wafer for the range switch S1 is also a good idea. S1 should naturally be mounted on the front panel, as should VR1, which is the zero-adjusting control. S2 is provided so that the polarity of the microammeter may be reversed, thereby allowing both positive and negative voltages to be read directly. This control is useful rather than essential, and if it is included it should be fitted on the front panel. VR2 is used to adjust the calibration of the instrument. With luck, it should be set initially and then forgotten, so it may be mounted anywhere on the chassis and should for convenience have a slotted spindle.

Adjustment is extremely simple. The instrument should be allowed to warm up for ten or fifteen minutes, and then VR1 should be adjusted for zero deflection of the meter. While this is being done, it is desirable to short

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TWO METRES AND DOWN

By F. G. LAMBETH (G2AIW)*

IT could, of course, be due to the recent state of the v.h.f./u.h.f. bands but it seems more likely that the lack of constructional and technical news is due to masterly inactivity running parallel to a similar situation on the operating side. At one time it was thought that if little or nothing was to be heard or worked, that was the time for re-building the p.a. or constructing equipment for another band. The present day trend involves more plumbing the higher the frequency desired, and this, perhaps has frightened off some enthusiasts.

Reports from F3SK published recently show that these problems are being actively pursued in France, but we must not let our neighbours get too far ahead of us, even in friendly rivalry! Admittedly some members are operating 1250 Mc/s equipment, but the membership as a whole is awaiting some hard news—what to do and how to do it. The constructional snags are believed to be by no means so difficult as they at first appear, so it only remains for those who have the "know-how" to impart some of this knowledge in the way of BULLETIN articles.

The London U.H.F. Group has done a great deal in this direction, and the efforts of its members are greatly appreciated but there are many others from whom little is heard. In this connection we are greatly indebted to GM6WL whose letters on his 1250 Mc/s experiments are quoted later in this feature.

Manchester V.H.F./U.H.F. Convention

A V.H.F./U.H.F. Convention, under the auspices of the R.S.G.B., is to be held in Manchester, probably in the autumn. The Committee which organized the highly successful event last year is again responsible and is headed by Henry Shields (G3GB).

Station Reports—2 metres

The long period of winter conditions appears to be passing. Until recently the bands were very empty apart from locals but in the last few days of April a change has gradually come about. Conditions have been better to the West and North from the Home Counties, and although they cannot be said to be good yet, the omens are quite promising. The Continentals are appearing again, notably ON4BZ and PA0FB (PE1PL is nearly always audible at strength).

B.R.S.19162 (Dewsbury) found only one good night (April 2) when G2NY was heard for the first time at S7. Many local stations have appeared on 2m, but some are using self-excited transmitters and super-regen receivers and the local racket is unbelievable! '19162 says they would not dream of riding about on "penny farthings" for fear of derision, but it seems quite all right to put the radio equivalent on the air! In an effort to find satisfactory pre-amplifiers for the R.S.G.B. Converter, a borrowed and very precious 6BQ7 plus EC91 worked very well, but the 6BQ7 had to go back and a 6AK5 is no substitute. In default of another 6BQ7, some form of grounded grid amplifier is to be tried.

B.R.S.6327 (Earlsfield) heard many stations up to April 19 ranging from Lincolnshire southwards, including some very powerful R.A.F. stations which have appeared in the band. '6327 asks "Why is there not more activity between 19.00 and 22.00 G.M.T. ? Surely everybody is not a slave to the one-eyed monster ? And why do some operators switch on their transmitters, and blow, puff and whistle for minutes on end without any identification ? Perhaps these individuals are unlicensed or shy ? "

B.R.S.16075 (Shirley, Southampton) is now using a 4 over 4 slot matched Yagi array and results seem good at the present height (12 to 15 ft). Portable stations to look for from the Southampton area are G3ION, '3GOP and '3HKT. Other members of the Southampton gang (G5OB, '2ATT, '3BHS, '3CGE and '3HXJ) are also active and looking for contacts.

G5BM (Highnam, Glos.) went to the Northampton Mobile Rally on April 8 when many mobile contacts

The v.h.f. aerial system at G2BVW.
(Photo by courtesy of the Leicester Evening Mail)

*21 Bridge Way, Whitton, Twickenham, Middlesex.

were made including G2HCG/A (over 38 miles), G3GVF/M, '3XC/M, '3IER, '6SN/P and '8UQ. A new 13 channel television receiver is found very useful for checking band conditions. Sutton Coldfield and Wenvoe are normally the only ones audible but lately London, Holme Moss and Rowridge have been well received, all on the fixed Sutton Coldfield aerial. On checking 2m, stations were heard coming in well from the same directions, but it was not then possible to transmit. Since then the TV stations have been weak or inaudible.

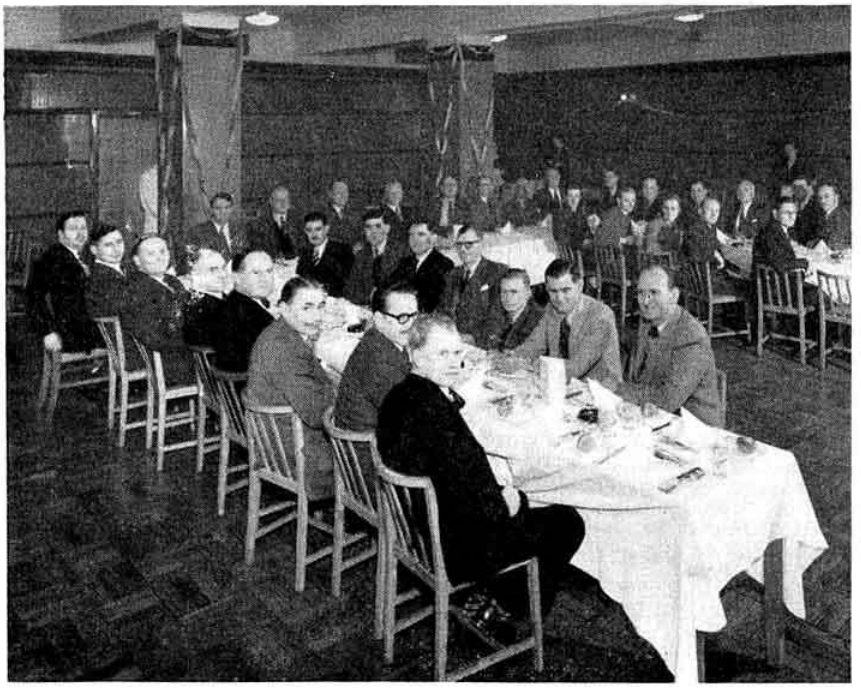
G5DW (Ashcott, Somerset) has been on 2m for a few weeks and is looking for QSOs. He is putting a very good signal into the London area. **G3WW** (Wimblington) will report again when he has something worthwhile, and remarks that he is certain that by now (after seven years on 144 Mc/s) everyone is sick and tired of what G3WW has or has not done! We venture to disagree: the '3WW screeds are always interesting!

G3JGJ (Plympton) has heard '3AUS (Torquay) on several occasions and has had a few QSOs on 2m and cross-band 2m/80m. G3GRA has a 2m transmitter working and expects to have the converter going by the time this appears. Efforts are being made to form a V.H.F. Group in Plymouth and anyone (whether transmitting amateur or listener) interested in 2m and/or 70 cm is assured of a hearty welcome if he will get in touch with G3JGJ at Boringdon House, Plympton.

G3KHA (Knowle, Bristol) found the main period of activity March 10-11. There have been isolated east/west openings and an interesting one occurred during the very stormy period at the beginning of April. A cross-band (2m/70 cm) QSO has been made with G6NB (Brill). '3KHA is not keen to listen on 70 cm whilst 2m needs activity but he will welcome any tests. '3KHA comments on "TVI-proof transmitters" and says this implies that one only has to construct and operate the equipment in accordance with the book and all will be well. However, says '3KHA, if the television receiver has a spurious response in the 2m band, severe interference can still be caused. Several cases in the last six months have all been traced to the TV receiver. One of these, cured later by a tuned stub at the receiver, was three miles away! The fact that some operators would rather stay off than cure TVI is probably one reason for inactivity. For the benefit of anyone who wishes to be certain that his 2m transmitter is not radiating appreciably outside the band it is suggested that a high starting frequency (by overtone oscillator) should be used and all multiplying done at low power, followed by 144-6 Mc/s tuned amplifiers. Any starting frequency having a harmonic falling within television or v.h.f. (f.m.) broadcasting bands should be avoided.

G3FIH (Bath) did not find the month very exciting although the evening of April 9 was good for east/west contacts with G5KW, '4PS, '3KEQ, '3XC and '3JXN worked in rapid succession. **G5MR** (Hythe, Kent) has spent most of his time at the bench and still has not been able to get the '2UJ local oscillator to work satisfactorily. Accordingly, a 6C4 Clapp oscillator with the anode earthed for r.f., similar to that previously used, has been constructed. Output is taken from the cathode to a straightforward 6J6 trebler/doubler. '5MR is now working on the ECC84 cascode, 12AT7 mixer and first i.f. stages. Operating conditions have been generally poor but some Midlands stations were heard on April 15. The fall in activity since September, 1955, has been very marked and '5MR feels that the opening of the DX bands has somthing to do with it. G5MR is sorry to see that the V.H.F./U.H.F. Contest rules accepted by the Continental I.A.R.U. Societies are not to be used by the R.S.G.B. this year.

GW3GWA (Wrexham) has had trouble with the rotation of his beam and has not been able to operate much lately. However, he expects to be active both fixed and portable during the coming months, so we may look forward to more QSOs with Denbighshire!



Despite poor weather, thirty-five members attended the Fourth Annual Dinner of the London U.H.F. Group at the Bedford Corner Hotel, London, recently. The guest of honour was Dr. R. L. Smith-Rose, Acting Director of the National Physical Laboratory, who is seated at the top table between G4KD and G5CD. *(Photo by the Tella Co., Ltd.)*

News from Scotland—Two Metres

GM2FHH (Aberdeen) is back on 2m with a new 12-element stack and a "pepped up" transmitter and receiver. There is a little more local interest and some of the Aberdeen area stations are getting ready to give '2FHH some competition (which is all to the good). He says he will believe it when he hears them.

GM6WL (Glasgow) says activity there is still rather low, but a new recruit is GM8MN (Crieff) who has been working '6KH, '3NG and '3GAB nearly every evening on phone. When the present fixed beam can be rotated the sphere of influence will be correspondingly widened. **GM6XW** (Larbert) is also occasionally on working the same three stations.

—Seventy Centimetres

G8PX (Oxford) hopes to be portable on 70 cm (and also on 2m) when the better weather appears. GM6WL reports that **GM3FOW,** one of the Scottish pioneers, is back on the band after a long absence.

—Twenty-five Centimetres

GM6WL coupled his 25 cm transmitter to a proper aerial (stacked corner reflectors as suggested by G6CJ in *Aerial Reflections*) and was quite surprised at the field strength shown on a meter. A test was carried out on April 21, signals over a 2¼ mile optical path being very strong and the carrier and receiver reasonably steady. The next step was to get some modulation on the signal. This was accomplished on April 24 and received by GM3INK at a distance of ½ mile. This path was not optical, being obscured by a house 50 ft away. The signal was S9+ and '3INK reported very good quality. Although a good report had been expected both operators were pleasantly surprised about the modulation as a form of quiescent carrier was being tried in which the 1296 Mc/s output increased from 0.2 mA to 1.0 mA on modulation peaks or sustained tone, as shown on a field strength meter placed in front and slightly out of radiation line of the small 6-element Yagi transmitting aerial. '3INK replied and reported on 2m. GM6WL's transmitter is crystal controlled and uses a 446A lighthouse tripling to 1296 Mc/s from the 420 Mc/s rig. The receiver comprises a converter with an s.e.o. on 424 Mc/s tripling in a co-axial cavity to 1272 Mc/s and a mixer in a similar co-ax cavity with silicon crystal mixer feeding into a BC454 modified to 24 Mc/s. Searching is done with the BC454, the s.e.o. being used as a bandset. The receiving aerial is two stacked corner reflectors with two sets of co-linear folded dipoles.

Danish V.H.F. Contest

The E.D.R. V.H.F. Contest will be held during the week-end of August 25-26, 1956. Full information can be obtained from the Traffic Department, E.D.R., Box 335, Aalborg, Denmark.

R.S.G.B. 2 Metre Field Day

During the first 2 metre Field Day on May 6, conditions were fair, but not outstanding, and activity appeared to be excellent. Stations were workable in the Home Counties from all directions up to 100-150 miles, while some of the portable stations made over 50 contacts; in one case the figure is reported to be over 100. French stations active included F3CA, F3PD, F3SK, F8LO, F8VF and F9CQ. The day was excellent for portable working, the weather being fine throughout the country. It is hoped that some reports of contest activities will be received from regular correspondents who were active.

Valves for Multiplier Stages

What valves to use for multiplier stages? A plea for the humble EC52 (VR137) triode is put forward by **G5UM.** This valve, he says, might be rather less of a drug on the market if v.h.f. operators were more aware of the various uses to which it can be put. He himself has incorporated it in a prototype 2m converter which is being handed round to the various members of Welwyn Garden City Group in order to encourage them to build similar converters themselves. The crystal oscillator on 7.4 Mc/s is an EF50 multiplying by 3 in the anode circuit. This is followed by an EC52 triode *which multiplies by 6* and gives more than adequate injection for a 6F12 mixer (to complete the tale it might be mentioned that the mixer is preceded by an EC91 grounded grid r.f. stage).

Observing the efficiency of the EC52 as a multiplier, G2FMJ decided to use one, since they are so plentiful, in a new transmitter he was completing. It was incorporated in the second stage multiplier from 24 to 72 Mc/s where it gives sufficient output to drive the following QV04/7 doubler.

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After the June issue, the BULLETIN will be back to normal again and reports for the July issue should therefore reach the writer by June 20. Meanwhile, good hunting!

Single Sideband Technique

Continued from page 465

the tip of the d.c. test probe to the chassis. It will be noticed that unless the prod is earthed, the meter needle will tend to stray a little on the two lower voltage ranges. This is a natural effect with most valve voltmeters, and need cause no misgiving. The resistance of most of the circuits to which the instrument is likely to be connected will be low enough to nullify all tendency to error under practical working conditions. A 1.5 volt dry cell of proven accuracy should then be placed across the input. With the range switch set to 1.5 V and S2 at the correct polarity, VR2 should be adjusted until the meter reads 1.5 V. As a final check, the polarity of both the battery and S2 should be reversed and the reading noted. If it is unchanged, all is well. If not, the valve is out of balance and should be changed. A very small amount of unbalance may of course be tolerated, but that is a matter for each individual constructor to decide for himself.

The probes should be more or less self-explanatory. Quarter-inch coaxial cable makes excellent test lead, and although R14 may be a little difficult to attach securely to the inner conductor, it should not be omitted, because it serves to isolate the circuit under measurement from the self-capacitance of the test lead. This enables d.c. to be measured in the presence of r.f. without upsetting the r.f. operation of the circuit. The alternative test probe allows r.f. to be measured in the presence of d.c. The germanium diode should be tested for high reverse resistance, otherwise misleading results may be obtained. C1 should be capable of withstanding the highest d.c. voltage which it is likely to meet. R15, C2 play no part in the operation of the probe; they are merely a low-pass filter to prevent r.f. leaking back into the valve voltmeter itself.

In operation, the valve voltmeter behaves just like the more conventional instrument. It is, however, desirable to check the zero-adjustment before making a measurement, as this is liable to fluctuate slightly.

THE MONTH ON THE AIR

By S. A. HERBERT (G3ATU)*

SUMMER seems to have coincided with a considerable drop in DX conditions. Or perhaps the extremely good spell we enjoyed during the winter makes the present state of affairs seem worse than it really is. At any rate, the higher frequencies are all affected in one way or another. Ten metres is opening less frequently, as can be expected at this time of the year and will presumably continue to be unreliable until autumn, when things should start happening in quite a big way. Fifteen remains a good bet for world-wide DX, especially the phone variety, and has been open until the early hours on occasion, but mornings have been disappointing and what DX there has been—VK, ZL and the like—has been weak and subject to deep fading. Twenty continues to provide sundry worthwhile prefixes, but working, or even hearing them is often something of a headache through the seemingly ever-present European cacophony. The number of really fruity notes on the c.w. band suggests that certain people are trying hard to produce an honest-to-goodness T1—and lots of them appear to be near success! There may be a moral in the fact that most of these characters send code that Samuel Morse would certainly disown and they haven't a vestigial clue about how to operate. Ah, well! better days are on the way! Enough invective for the moment and now to business.

Twenty Metres

Despite the above-mentioned efforts and "an appalling QTH," **G5JR** (Reading) found himself working such choice c.w. as FB8ZZ, VQ5GC, W7EMY/KH6, VE8PF, ZL2FI, '4CK, '4JP, K6 and W0, before the band went dead on him. Buck encloses a cutting from a national daily to the effect that U.S.A. amateurs report Russians making a mass attempt to contact them "one night" for the first time since 1950 and asking for QSLs through the R.S.G.B.! '5JR worked a UP2 who "re-prefixed" him and worked him as SP5JR, asking for a QSL via Bulgaria and a UB worked him using the "QRZ" technique. Odd Us do seem to work all and sundry—a UC2 was talking to CX recently, but in the main they seem firmly fixed in their world of WSEM. For how long is anybody's guess. They might even be talking to us when you read these words.

B.R.S.20106 (Petts Wood) notes the drop in DX conditions but he still managed to hear some good ones. Highlights on c.w. were FK8AL, FB8BX, FB8ZZ, KA2OZ, JA6AB, JA9AA, JZ0PS, UA0AA, '0KJA, VK, ZL4, VS1, VE8 and VU (all between 16.00 and 20.00), KJ6BN (07.40), VE6KX, YI2DX, EA9DF (Rio de Oro), KR6AI, OH1RT/0 (Aaland Is.), KG4AO, VK7, VQ6 and OY. A strange one on phone was YU0C while M1B is again active. Norman finds that his score so far this year has reached 38Z and 189C, which is good going. **B.R.S.20317** (Bromley) stuck to c.w. for AP2RH, FB8BF (Diego Suarez), FB8ZZ, FK8AH (19.00), HK3PC, KR6QW, UA0GF, '0GR (21.30-22.30), ZD6BX, ZS7C, LU1ZW, '4ZS, VS1, VS2 and VU, plus three he is not so happy about—SV8WR (Sifnos), HV2AB(!) and PX2Q(!). **A.1290** (Blackheath, S.E.3) found CR5SP on phone at 20.00 during a brief QRM-free period.

G3ATU was interested to hear **KC4USV** one morning at 10.30 with quite a respectable c.w. signal, which improved steadily until 12.30 G.M.T., when he was S7 for a time. KC4USV is at the Air Operating Facility on McMurdo Sound, Little America, and is one of the stations attached to the U.S.A. Antarctic Expedition. KC4USA at Kainan Bay should also be active by now, while other KC4s at various advance bases will come into action in late '56 or early '57. When heard, '4USV was working Ws only and presumably a very large part of his time will be taken up with traffic to the States. The first batch of QSLs is due to leave next November, when the first plane is expected to be available. In this connection, the newspapers report the sad news that our own expedition at Vahsel Bay has had the extreme bad luck to lose many tons of stores, including coal, petrol and kerosene, when a storm detached the sea-ice used as a temporary dump. Apparently, enough fuel remains to enable them to carry on, but it seems inevitable that economies will lead to reduced use of radio. Further north, New Amsterdam's FB8ZZ buzz-saws away as busily as ever, while FB8s 'BF, 'BS, 'BX and 'BR keep the pot boiling on Madagascar. FB8BR is especially worth keeping an eye on, as he is liable to pop up unexpectedly from Comoro Is. as FB8BR/FB. Seekers after Mexico may like to note that XE1AX, '1MB and '2LA have all been on recently. Early mornings seem the best time to catch them, with late afternoons the next best. A QSL from **JZ0AG** makes it clear that cards for him should go exclusively via H. Koppes (PA0KOP), Marktweg 38, The Hague, Holland.

Fifteen Metres

In recent weeks the band has provided quite a fascinating variety of DX, with many of the rarer calls appearing, albeit mostly on phone. The usual jamming noises remain as pestilential as ever—even so, it looks as if twenty is taking second place as a DX band, at least for the time being. **A.1291** (Ashstead) has now heard 141C on phone only and puts in as his latest such DX as KX6ZB (Majoro Is.), VP8BL (Grahamland), VP8BS (South Shetlands), DU6IV, ZD8SC, CR4AP, '5SP, VK9BS, VP4TM, ST2DB, FB8BZ, SV0WE (Rhodes) and KC6AL. **A.1290** heard ET2KM, VR2CG, ZD4AE, KA, KH6, VE5, VE8 and ZL, while **B.R.S.20106** logged VP5FH (Turks Is.—only licensed since May 3), VU2RC, '2JP, FQ8AK, EL2F, KR6QV, '6RB (17.15), KG1FR, MP4BBF, VE4 and VE7. One morning the band was open at 02.30, when Norman heard TG9WB and ZL4KE. Things are getting good! The c.w. band was not forgotten, however, and CX2FB, ZS7H, VS6CO (17.00), UA9CC and some VKs were duly pulled in. **G3KFT** (Cheltenham) thinks people may be interested in ZM6AS, worked at 06.35Z and ZK1BS

*Roker House, St. George's Terrace, Roker, Sunderland.

(08.35) and KM6AX, heard in the U.S. phone band at 08.00. Guess he's right!

Ten Metres

Ten is not the band it was some weeks back, but still it can and does produce the odd opening and when it *does* open, anything can happen. **B.R.S.20106,** reports phone signals from ZS7C, 'OA5G (22.00), ZD8SC, VU2EJ and some CXs. **A.1291** pulled out a plum with VR2CG (10.00) and followed up with CT2AG, HI6EC, VP1FR, XE1GE, VP9L, FY7YE, MP4QAL, HP1EH, VS1FE, CR7AL, PZ1AD and SV0WE. **A.1290** was happy with CE3AB, CR9AH, K5CTN/VE8 (Baffin Is.), YN1HF, '4HA, MP4BBW, VQ2 and ZLs '1DK, '2PI and '2RZ. **GB2SM** was also around!

Forty and Eighty Metres

Very little to comment on here, but **B.R.S.20106** got a good one on forty c.w. with LA9P/P on Jan Mayen, while **B.R.S.20317** logged CT3AB, VP6GT, ZS1JN, UI8ADW and some UA9s. Bill even heard something on eighty, where 3V8AB, '8FA and a UB5 were on c.w.

Operating Awards

Two new awards have recently become available and details follow for the benefit of all "sheep-skin" collectors. The Radio Society of East Africa announces the *Worked All VQ Areas Certificate,* available to any amateur who submits confirmations thus: one from VQ1; ten from VQ2; five from VQ3; twenty from VQ4; five from VQ5; one from VQ6; one from VQ8 (Chagos); one from VQ8 (Mauritius); one from VQ9. Five extra confirmations from *any* VQ area may be substituted for any one missing card; a check list must accompany all claims. Certificates will be issued for c.w. and for phone and contacts must be either c.w. to c.w. or phone to phone, with a minimum report of R3 and T8. Confirmations must be sent to VQ4RF, Box 264, Nakuru, Kenya, together with six shillings sterling, the equivalent in foreign currency (U.S.A. 1 dollar), or 20 I.R.C.s, to cover return postage on QSLs and certificate.

The *OH-Award* is offered by the Finnish Society to amateurs who can prove contact since June 10, 1947, with Finnish fixed stations in the call-areas OH1 to OH0. Applicants in LA, OZ and SM will be required to work at least 50 different OH stations in eight areas on one band, plus eight different call-areas on the other bands. Other Europeans must work 20 OH stations in seven areas. The maximum QSO number per band is 15, so that at least two bands must be used. Non-European applicants must work 15 OH stations in five areas. Contacts may be on one band, but 3.5 Mc/s QSOs will count as two QSOs on other bands. C.w., phone or both are allowed with minimum reports of RST338 and RSM334. Applications, together with a check list and 5 I.R.C.s should be addressed to the OHA Manager, Box 306, Helsinki. If worked before June 1, 1954, these stations count as OH9; OH8s 'ND, 'NJ, 'NS, 'NV, 'NX, 'OA, 'OB, 'OC, 'OG, 'OI, 'ON, 'OP, 'OQ, 'OR, 'OU, 'OX, 'OZ, 'PA, 'PB, 'PD, 'PF, 'PL, 'PM, 'PQ.

News from Overseas

Operation Zanzibar. Mal Geddes, **ZE3JO** (and G2SO for many years before that) has been granted the call **VQ1JO** and will be trying it out from Zanzibar during the period August 13 to September 4, 1956. The rig used will be a B2, with 20 watts on 14 Mc/s c.w. only. Mal will decide on his aerial arrangements when he gets to the island and surveys the local possibilities. He remarks that the hours of operation are uncertain (his XYL will be in attendance and will undoubtedly have something to say on that score!), but he has every intention of working as many stations as possible in the shortest time. What is more, everyone worked will get a QSL via the R.S.S.R. Bureau (of which ZE3JO is Manager!). A reassuring note for those who in the past have wasted fruitless hours tuning for rare expeditions when, in fact, the members still had to set sail—'3JO has his hotel and boat passages booked already. See him in August! *Operation Aves.* YV5BX was heard to say that **YV0AA** will be active from the Aves (Bird) Is. from June 17 to June 24. Operation will be on phone and c.w. on all bands from 3.5 to 28 Mc/s. Tests will also be carried out on 50 and 144 Mc/s. YV0AA will not answer calls on its operating frequency. Call not less than 10 kc/s above or below.

Emmet G. Riggle (Massillon, Ohio) draws attention to **VE7ASL/VR3,** heard strongly on 28 Mc/s phone. Emmet thinks he operates from Christmas Is. and that he is with South Pacific Airways. Look for him around 28480 kc/s. Fergus Walshe, **MP4QAL,** should now be back home in Dublin after a tour of duty during which he was active from both Halul Is. and the Qatar mainland, with a short spell of activity from Bahrain as MP4QAL/B. His departure will leave Qatar with only MP4QAI, MP4QAJ and MP4QAB. 'QAI seems interested mainly in talking to his friends in Kuwait, Saudi-Arabia and The Lebanon and 'QAJ pays only flying visits to the country. 'QAB, however, should be active enough. The call has been allotted to Jim Tierney, who is converting a Collins 150 watt commercial transmitter. Fergus is up to date with his QSLs on the principle of one sent for one received, but if anyone needs his card, a note to 14 Merrion Avenue, Blackrock, Dublin, will do the trick. Louis Dacatrel, **HP1EH** (ex-HH2LD) is another who finds that the "one for one" policy pays. At first, he QSL'd on request, but found his returns were almost nil. It seems that some people, as soon as they receive a DX QSL, want a Jaguar as well before they send their own card! But Louis still enjoys his radio after eighteen years in the game. QSL to Box 189, Panama City, Republic of Panama.

Liberia. A recent visitor to R.S.G.B. Headquarters was W9GTX (ex-EL12A/EL2C), who shed light on current happenings in the republic. As from March 1, all Liberian calls were altered and some of the new ones are EL2A (Tommie Curtis), EL2B, EL2D (Dr. John West, an old-timer, formerly EL5A), EL2L (Sam Butler, who is in charge of the Amateur Section of the Liberian Communications Commission), EL2M (Henry Grimes, head of the Communications Commission), EL12A, EL12G, EL6A, EL6B, EL8A, EL4A. ELs '4B, 'C, 'D, are with Le Tourneau (the road-making firm) at Baffu Bay. EL0A (Earl Tonges, W4DGW) and EL0B (Paul Fracker, W8QOH) are both on U.S. ships. All EL0 calls are *maritime mobile* and the Liberian Government will consider licence applications from amateurs serving aboard ships flying the Liberian flag. Fred Pilkington, **G3IAG** (*M.V. British Earl*) adds further news. On a recent trip down the West African coast, he talked to EL2A, Tommy Curtis, who is at the U.S. Embassy, Monrovia, who plans to operate on s.s.b. He says the new calls will be issued with each figure indicating a different area of Liberia. EL2, for instance, is Monrovia.

From the *F.O.C. Circular Letter,* comes news that Ray Baty, **VR3A/VK2ANB,** is in London, before returning to Fanning Is. He can be reached c/o Australia House, London, W.C.2. The same source reveals that ex-MF2AG is now G3KEI. Duncan is about to burst forth on the DX bands with a pair of 6L6s and a ground plane. Mention in the March *M.O.T.A.* that G2DHV had a 21 Mc/s

QSL for VQ6LQ returned marked "pirate," brings the news via **G2HPF** (Chelmsford) that VQ6LQ has in fact been on the band since January and finds conditions for "G" working are best between 13.30-15.00 G.M.T.

Falkland Islands. In a letter to G6CL, Vic Harrison **(VP8BL/G3CUO,** P.O. Box 182, Stanley) passes on the news that Bernard Taylor (VP8BD), formerly at Port Lockroy, George Millburn (VP8BQ), of Hunting Aero Survey, who was on Deception Island, and Graham Ramsey (VP8BF), are all homeward bound to the U.K.

Ralph Lenton (VP8AO) is at Vahsel Bay with Major Watson (VP8BP), and Mr. Williams (VP8BO). Newcomers to F.I.D.S. bases are South African A. K. Donnelly (VP8BR), at Horseshoe Bay, Grahamland; Mike Royle (VP8BS), at Admiralty Bay, South Shetlands; and Stan Ward (VP8BT), at Signey Island, South Orkneys. VP8BS has been working the U.K. on 21 Mc/s phone and c.w.

The QSL situation in the Falklands is now under control; Edgar Roberts (VP8BC) will probably take over when VP8BL returns home. During February and March the latter worked from Port Lockroy on 14 and 21 Mc/s from where he made several contacts with the U.K. G4NT/A was probably a little surprised to work VP8BD/A, VP8BL/A and VP8BS, at one sitting, whilst all three were at Admiralty Bay. He might have made it a foursome if VP8BM (on the *R.R.S. Shackleton*) had been active at the time!

Those who want contacts with the Falkland Islands and Dependencies should watch 14, 21 or 28 Mc/s, 21 Mc/s being the most reliable at about 18.00 G.M.T.

VP8BL states that some U.S. Antarctic based amateurs are now operating but so far he has not worked any of them.

* * *

Which seems about all for this time. Fortunately, things are back to normal again in the printing world and *M.O.T.A.* should be rather less "ancient history" than it has been recently! Good hunting until next time and 73.

TVI on ITV

A CHANGEOVER of the shack from one room to another involved alterations to the transmitting aerials and to the earth connections. An unexpected result was the appearance of vision and sound interference on the I.T.A. (London) transmissions which had not been there before. The interference was present on phone at any modulation level, except zero, when working any band, i.e., 0.7, 2, 10 and 160 metres. Other bands were not tried, and it occurred only on the I.T.A., not on the B.B.C. The interference was not tunable at the transmitters or at the Band III converter. The television screen and the sound channel were clear if the I.T.A. station was not working, hence the interference depended on the I.T.A. transmissions to carry it. This is akin to cross-modulation, whereby one strong signal impresses its modulation on to another one, a process which usually takes place in the first r.f. stage. On the television receiver side the Band I aerial had a co-axial feeder and the Band III aerial had a 300 ohm ribbon leading to the converter described in the BULLETIN.[1]

The cure was a simple one and involved earthing the aerial coupling coil L1 by scraping a spot of enamel off the centre turn and soldering a miniature 0.001μF condenser from there to chassis. The same difficulties can arise with Band I receivers if unearthed balanced feeders are used and these few words may give a lead to some TVI troubles which will not yield to normal treatment.

—G3ECA.

1 "Band III Converter," A. H. Koster, R.S.G.B. BULLETIN, August, 1955.

Bands Available

THE following is a summary of the bands in which amateur operation is permitted. The table also shows the maximum power input and types of emission allowed to holders of Amateur (Sound) Licences. Holders of Amateur (Sound Mobile) Licences are permitted to operate under the same conditions.

Frequency in Mc/s	Maximum d.c. input (Watts)	Types of Emission
1.8–2.0	10	A1, A2, A3, A3a, F1, F2 and F3
3.5–3.8	150	A1, A2, A3, A3a, F1, F2 and F3
7.0–7.150	150	A1, A2, A3, A3a, F1, F2 and F3
14.0–14.35	150	A1, A2, A3, A3a, F1, F2 and F3
21.0–21.45	150	A1, A2, A3, A3a, F1, F2 and F3
28.0–30.0	150	A1, A2, A3, A3a, F1, F2 and F3
144.0–144.5	150	A1, A2, A3 and A3a
144.5–145.5	150	A1, A2, A3, A3a, F1, F2 and F3
145.5–146.0	150	A1, A2, A3 and A3a
420–460	150	A1, A2, A3, A3a, F1, F2 and F3
1215–1300	150	A1, A2, A3, A3a, F1, F2 and F3
2300–2450	150	A1, A2, A3, A3a, F1, F2 and F3
2350–2400	25 (mean) and 2.5 kW peak	P1, P2d, P2e, P3d and P3e
5650–5850	150	A1, A2, A3, A3a, F1, F2 and F3
5700–5800	25 (mean) and 2.5 kW peak	P1, P2d, P2e, P3d and P3e
10000–10500	150	A1, A2, A3, A3a, F1, F2 and F3
10050–10450	25 (mean) and 2.5 kW peak	P1, P2d, P2e, P3d and P3e

Types of Emission

IN accordance with regulations drawn up at the Atlantic City Radio Conference in 1947 all emissions are designated according to their classification and the width of the frequency band occupied by them and are classified and symbolised according to the following characteristics: (1) Type of modulation. (2) Type of transmission. (3) Supplementary characteristics.

Types of Modulation	Symbol
(a) Amplitude	A
(b) Frequency (or Phase)	F
(c) Pulse	P
Types of Tranmission	
(a) Absence of any modulation intended to carry information	0
(b) Telegraphy without the use of modulating audio frequency	1
(c) Telegraphy by the keying of a modulating audio frequency or audio frequencies or by the keying of the modulated emission (special case: an unkeyed modulation emission)	2
(d) Telephony	3
(e) Facsimile	4
(f) Television	5
(g) Composite transmissions and cases not covered by the above	9
Supplementary Characteristics	
(a) Double sideband, full carrier	(none)
(b) Single sideband, reduced carrier	a
(c) Two independent sidebands, reduced carrier	b
(d) Other emissions, reduced carrier	c
(e) Pulse, amplitude modulated	d
(f) Pulse, width modulated	e
(g) Pulse, phase (or position) modulated	f
As an exception to the above principles, damped waves are designated by	B

Types of Emission Available to U.K. Amateurs

From the above information, the meanings of the various types of emission available to British radio amateurs may be ascertained. Examples are as follows:—

A1	Telegraphy without the use of modulating audio frequency (on-off keying).
A3	Amplitude modulated telephony, double sideband, full carrier.
A3a	Amplitude modulated telephony, single sideband, reduced carrier.
F3	Frequency modulated telephony.
P1	Pulse modulated telegraphy without the use of modulating audio frequency.

The Story Behind the Call—VP2VB/P.

THE story behind the call VP2VB/P is one of high adventure. The owner of that call is Danny Weil, a recently-joined member of the R.S.G.B. who hails from Christchurch, Hampshire. Mr. Weil is now in the second year of a single-handed voyage round the world—a voyage made more interesting by the fact that for the last 12 months he has operated an amateur station from the yacht *Yasme*. Much of the radio equipment was provided by Dick Spenceley (KV4AA), who is the DX Editor of *CQ Magazine*, although other amateurs are known to have contributed to the cost.

Yasme was purchased about four years ago for £200 but its conversion from a mud-flat into a sea-worthy craft cost another £2,000, plus a further £1,000 to make it fit for a round-the-world voyage. Much of the work was done by Mr. Weil himself who stripped down the boat to the bare hull. He completely redesigned the cabin accommodation, installed extra water tanks and fitted fuel tanks for the auxiliary engine. The yacht was then converted from gaff to Bermuda rig, with twin stay sails and Genoas for Trade Wind sailing.

Mr. Weil left Falmouth on August 2, 1954, reaching Vigo six days later. After a week's rest he sailed for Portugal, Gibraltar and the Canary Islands. He crossed the Atlantic to Antigua in the record time of 23 days. From there he went on to Tortola where he met the Governor of the British West Indies and the Island Commissioner. While on Antigua he qualified for an amateur licence. At Road Harbour, one of the towns on the island, Mr. Weil's craft as a watchmaker came into use. He repaired the Town Hall clock which had not received attention for 100 years. He found a lizard hanging on the pendulum!

When at St. Thomas in the Virgin Island, his radio equipment was installed. From there he steered a course for Cristobel, Panama.

At the present time Mr. Weil is completing one of the longest stages of his voyage—a 2,500 miles cruise from Panama to the South Sea Islands. He expects to be at sea for about 60 days. The Marquesas will be his first port of call, then on to Tahiti and Tonga where he hopes to meet Queen Salote. From there his route will be to the Samoa and Phoenix Groups through the Torres Strait and on to Darwin, his only Australian port of call. Throughout the South Pacific voyage the *Yasme* is acting as a weather ship for the U.S. Air Force, sending frequent weather reports back to the mainland. VP2VB/P is also licensed as FO8AN and VR1B.

A view of the radio cabin on board " Yasme."

Frequency Predictions for June, 1956

PREPARED BY J. DOUGLAS KAY (G3AAE)

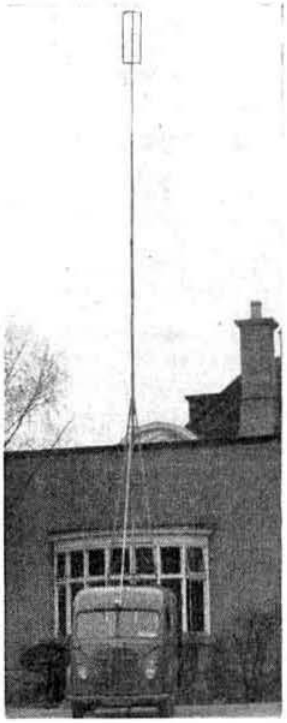
BAND	NORTH AMERICA	CENTRAL AMERICA	SOUTH AMERICA	SOUTH AFRICA	NEAR EAST	MIDDLE EAST	FAR EAST	AUSTRALIA
28 Mc/s	2200	1900—2100	1400—2130	0800—1730	1000—2130	0800—1400	0830	0800
21 Mc/s	1300—0100	0930—0100	1030—0000	0700—1830	0600—2330	0700—2230	0700—1900	0700—0900 2100—0100
14 Mc/s	ALL DAY	ALL DAY	ALL DAY	0630—2100	ALL DAY	ALL DAY	0700—0000	2100—0700
7 Mc/s	0200—0600	0200—0600	0800	0200	2300—0200	0100	2200	2000
3.5 Mc/s	0600	0600	0800	0200	0200	0100	2200	2000

These predictions are based on information provided by the Engineer-in-Chief of the Post Office. All times are G.M.T.

Between approximately May and September Sporadic E reflection may result in short skip conditions on the higher frequency bands. The incidence of Sporadic E is unpredictable but is most pronounced around mid-day and dusk.

The Northampton Mobile Rally

DESPITE cold, almost wintry weather, about 200 attended the Mobile Rally organized by the Northampton Short Wave Radio Club at Overstone Solarium on April 8, 1956. From as far afield as London, Gloucestershire, Sussex, Surrey, and Scotland they came to the first big Amateur Radio gathering of the year. This second mobile rally proved conclusively that the Oxford event last year was no mere flash-in-the-pan. Some of those who travelled long distances included GM3DIQ, G5BM, G2LW, G2VB, G3IIR, G3FZL, G3HCK, G8UQ and G2AHL. Remembering that these rallies were only suggested a little over a year ago (*Mobile Column*, February, 1955) the success at Northampton is all the more astonishing. But one point is clear: the combination of a day out for the family, Amateur Radio and a hamfest is one which has caught the imagination of those who operate /M.



This is not the mobile with the tallest mast but the aerial system used by the 2 metre control station.
(Photo by G3GHU)

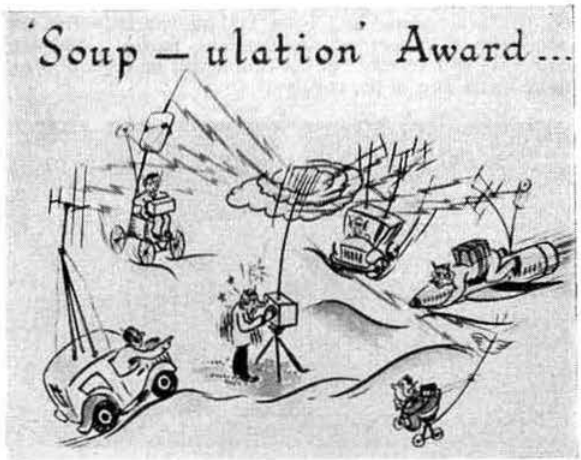
Highlights of the day at Overstone were lunch attended by about 80 people, tea for 150, and some amusing contests, including treasure hunts on 2m and Top Band and, of course, rag-chewing in the best traditions of the hobby.

The forest of aerials on the parked cars was a most impressive sight, whilst some of the individual arrays were little short of startling, as anyone who saw G5ML/M (complete with single skeleton slot on a 16ft mast) in the 2m Treasure Hunt will confirm. For the lower frequencies, 16ft whips are commonplace in comparison.

The ZC1 continues to be a hot favourite, but more and more equipment is being specially built, although one ambitious set-up included a Bendix RA1-B receiver under the dash! Another visitor was using a Gonset Communicator, possibly the most popular 2m commercial equipment used in the U.S.A. Of the home-built rigs, the two-and-ten mobile station of G3GVF/M was one of the most interesting. Two complete bandswitched transmitters running 10 watts input are used: the 2m line-up starts with a half 12AT7 with a 36 Mc/s overtone crystal followed by two EL91 doublers and a QQV03/10 push-pull p.a. For 10m, two EL91s, starting with a 7 Mc/s crystal, drive a 6BW6. On the receiving side, the arrangement is essentially a 10m receiver, tuning 28-30 Mc/s, consisting of an

A corner of the crowded car park at the Northampton Mobile Rally on April 8, 1956, which was attended by about 200 people.
(R.S.G.B. Bulletin photo)

EF91 r.f. stage, ECH81 frequency changer, two 12BA6 i.f. stages, EB91 noise limiter and detector, ECL80 audio stage and 12AT6 b.f.o. and a.v.c. For 2m, a crystal controlled converter, part of the same unit, is switched in by the bandswitch. A quarter-wave whip is used for 10m and a horizontal circular dipole, gamma matched and mounted 1ft. above the car roof, for 2m. This equipment is an example of the type many mobile en-



"Soup-ulation" Awards were made to G2CVD/M and G3GGK/M for the highest field strengths on 2 metres and Top Band respectively. Visitors to the Rally will not regard the aerial systems pictured here as at all unusual.
(Photo by G3GHU)

thusiasts will wish to have during the next few years when DX on ten will be a practical possibility. It is hoped therefore to describe its design and construction in detail in an early issue of the BULLETIN.

Many other pieces of equipment of great interest were to be seen—in fact, without any arranged diversions, the whole day could have been spent in looking over the gear and absorbing the many good ideas mobile enthusiasts are using. As it was, Northampton Shortwave Radio Club kept the programme going and are to be congratulated on the excellence of their arrangements, right down to such details as a first-class public

G5ML's single slot for two metres at a height of 16 ft was one of the more ambitious mobile aerial systems seen at the Rally.

(R.S.G.B. Bulletin photo)

address system and a really well equipped control station which even included a panoramic adaptor! If one may be allowed to make one minor criticism for the benefit of future organizers, it was a pity that no items on the programme had been laid-on specially for the non-radio members of the various parties. Nothing elaborate is necessary: at Oxford, it will be remembered, there was a tour of the colleges.

Two control stations for "talking in" mobiles were in operation. G2HCG/A was on 144 Mc/s and G3GWB/A on Top Band and 3.5 Mc/s. In this picture V. R. Hartopp (B.R.S.15304), of the Northampton Short Wave Radio Club, is listening on the low frequency bands.

(Photo by G3GHU)

Plans are already afoot for another Mobile Rally in the autumn in the Tunbridge Wells area. Full details will be announced in due course.

The ZC1 Again

G3COI (Birmingham) is active using a New Zealand ZC1 with a 6 ft loaded whip on Top Band. However, G3COI deplores the lack of *fixed* station operation except on Sundays and says that it is often difficult to get a contact. On one occasion, he called CQ for 45 minutes without a single reply!

Reports on activities and mobile topics generally will be welcome and should be sent to Headquarters as soon as possible. —J.A.R.

Belgian Amateurs in Luxembourg

DURING the weekend of June 9 to 10, 1956, a party of Belgian amateurs from Antwerp will be active in Luxembourg using their own call-signs followed by /LUX.

Those taking part will be ON4CC and ON4AB on 3.5 Mc/s phone, ON4FU on 7 Mc/s telegraphy, ON4CC and ON4AB on 7 Mc/s phone, ON4TQ, ON4FU and ON4QX on 14 Mc/s telegraphy and ON4LJ on 14 Mc/s phone. ON4RB and ON4DE will operate on 144 Mc/s. Contacts with British stations will be appreciated.

What Do You Know ?

1. Why are r.f. voltages less dangerous than ordinary supply frequencies or d.c.?
2. Who was the amateur who initiated Empire Broadcasting?
3. What is the function of a suppressor grid?
4. How far do radio waves travel in one microsecond?
5. What is the function of a Faraday screen?
6. What is the time constant of an RC combination?
7. What is a cootie key?
8. What is the sparking voltage in air between flat surfaces 1 mm. apart and 1 cm. apart?
9. What was the first transatlantic amateur contact?
10. What is the relation between a watt and a joule?
11. What is the effect of short-circuiting part of an inductance coil?
12. What is Z.F. current?
13. What is the material used for coating indirectly-heated cathodes?
14. What was Marconi's magnetic detector?
15. What is the chief danger to remember when accumulators are being charged?
16. What is the specific gravity of the acid in an accumulator?
17. What are Lissajous figures?
18. Why is the voltage-drop across a mercury-vapour rectifier so very low?
19. What is the mechanical analogue of (a) inductance, (b) capacitance?
20. What is the difference between a variable-μ valve and a super-control valve?

Answers to these questions will be found on p. 476

Rochester Antique Wireless Association

By E. F. PEACOX (W2AXR)*

Old Timers, in particular, will be interested to read this article by a member of the recently-formed Rochester (New York) Antique Wireless Association. The primary purpose of the Association is to preserve items of historic wireless importance. A few years ago the Council of the R.S.G.B. considered a proposal to establish a museum of early experimental wireless equipment and valves but it had to be abandoned because no suitable accommodation could be found. The project is still alive if any public-spirited member can provide the necessary facilities.

THE Rochester Antique Wireless Association — a recently organized club of "Old Timers" who live in the vicinity of Rochester, a city of about 350,000 population—includes among its members many holders of pre-World War I Amateur Radio operators' licences. Affiliated to the Rochester Amateur Radio Association, the new organization is one of several radio clubs which flourish in this part of New York State. Others are the Rochester DX Association, the Rochester Amateur Mobile Club and the Rochester V.H.F. Group.

In the past meetings of Old Timers have been held at intervals of two years; the Antique Wireless Association plans another in the fall of 1956. Meanwhile interest is kept alive through the activity of collectors of ancient wireless apparatus, led by the Chairman, Bruce Kelley (W2ICE-W2OCP) who has become Curator of the Association's Museum housed in a large barn on his estate. The barn also contains a "switching room" for W2ICE's various rhombic aerials at the same time supporting a 70 foot vertical radiator.

Many pieces of old wireless gear are now on display in the museum after being unearthed (no pun) in cellars and attics throughout the Rochester area. Several complete stations have been assembled in authentic fashion from gear preserved from early days, including a complete spark-coil sender with helix and a galena crystal detector with a loose-coupler tuning receiver from pre-World War I. There is also the complete 1,000 watt station used by 8GB, donated by George Batterson, now W2GB, who is one of the Association's founders.

Among the prized possessions are hundreds of early valves made by DeForest, Marconi, Philips and Mullard; numerous copies of early wireless publications, magazines, and books, including the famous first edition of the E.I. Co. catalogue (Electro-Importing Company of Gernsback fame) dated 1914, and early catalogues of the William B. Duck Company. Incidentally many old timers gleaned their first knowledge of wireless from perusal of these catalogues, and—unable to afford the purchase—constructed replicas by hand in order to hear their first wireless signals.

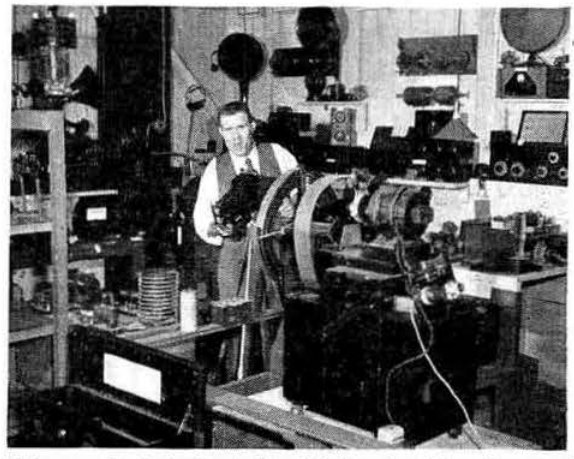
Memories of the First Trans-Atlantics

Included in the collection are home-made crystal receivers with single-slide tuning, tapped loading coils and occasional variable condensers. There are also examples of variometer-variocoupler regenerative sets of the early '20s, Reinartz tuners, honeycomb coil tuners, and neutrodyne receivers. Commercial receivers are also displayed,

Valves of all ages are displayed in this room in the Museum. The Curator holds a modern broadcast type modulator (849) as he looks into a case containing a choice collection of old receiving valves. Decorating the wall in left background is a collection of two-letter QSL cards. Almost every variety of valve ever made in the U.S.A. plus many foreign brands are included in the collection.

including the famous Paragon RA- and RD-versions of Paul Godley's pioneering days; the well-known IP-500 and several U.S. Navy receivers with the combination valve detector-two-stage audio amplifier which had a stand-by crystal detector and buzzer to test reception.

Various transmitters from the early trans-Atlantic testing days have been assembled and are on display, including one using the celebrated "five watt" UV-202. Examples are also shown of the record-breaking 100 watt c.w. transmitter similar to those used by John Reinartz (1XAM) and Ken Warner (1MO) when communicating with the well-remembered Léon Deloy (8AB)



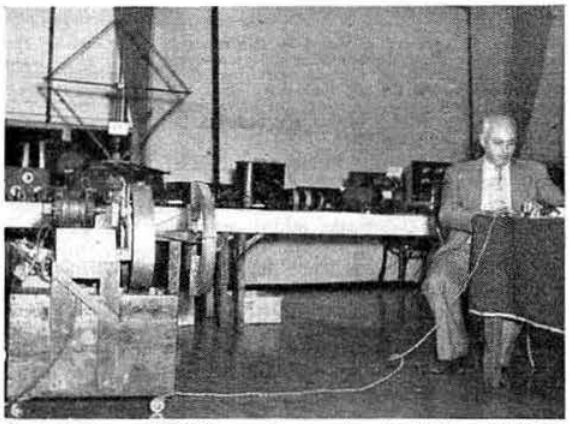
Main room in Rochester Antique Wireless Association Museum of antique gear. In the foreground (right) is an amateur spark transmitter used by George Batterson (2GB) in 1920. Ancient loudspeakers and receivers adorn the walls. In this picture the Curator, Bruce Kelley (W2ICE/W2QCP) is taking a photograph of a pre-World War I receiver and transmitter.

*155 Iroquois Street, Webster, N.Y., U.S.A.

of Nice, Gerald Marcuse (2NM) of Caterham, E. J. Simmonds (2OD) of Gerrards Cross, Jack Partridge (2KF) of London and 0NL and 0BA in Holland.

Members of the Antique Wireless Association recently visited the site of the now defunct wireless station WSC at Tuckerton, N.J., where photographs were taken of the aerial systems and transmitting installations.

Mr. Kelley has assembled, with the help of members, a slide collection of pictures of early wireless equipment (including Nicola Tesla's early experimental station for the transmission of power by wireless in eastern Massachusetts) and has added a sound track of narration explaining the historical significance of the slides. Having enjoyed wide circulation throughout the United States, the Association has now handed over the collection to the A.R.R.L. for use at hamfests and conventions. An important feature of the slide collection is the "Paul Godley Story" which relates pictorially the attempts made by Godley in the early 1920's at Androssan, Scotland, to receive signals from the U.S.A. In these tests he had the full co-operation of amateurs in the United Kingdom and reference is made in the slide collection to the successful reception of signals from U.S. transmitters by British amateurs as well, notably Mr. R. K. Bourne, in London.



George Batterson (W2GB) recently opened an "Old Timers' Night" at Rochester, N.Y., by sending "QST de 2GB—greetings to all radio amateurs" on his 1920 spark transmitter, a 1 kw synchronous rotary spark gap. Most of the space in the box on which the transmitter is mounted contains a 1000μF 30,000 volt condenser made of plate glass and copper foil submerged in oil!

An important object of the Association is to call attention to the fact that much antique wireless gear is still in existence in attics and out-of-the-way places which deserves to be preserved rather than lost. The Association calls on amateurs throughout the world to collect this gear together under the auspices of similar organizations with a view to maintaining it in proper condition for posterity. Frequently the only reason for failure to preserve this valuable memorabilia is the lack of a central point of collection and sufficient interest among amateurs of the present day to put in the required work on its restoration. The Rochester Antique Wireless Association offers such a means of preserving wireless gear and is always glad to hear from amateurs who may have knowledge of the existence of early apparatus. The Association recommends that wherever sufficient suitable gear can be found, local amateurs should form an organization and find means of placing it on display in the fashion of the Museum established in Rochester. Delay now may result in the loss of the apparatus through negligence in understanding its historical value.

What Do You Know?

Answers to questions on page 474

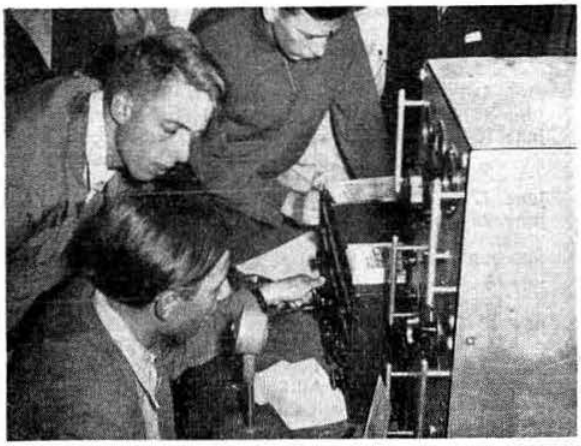
1. At radio frequency a current travels only on the surface of a conductor. When the human body comes into contact with an r.f. supply, the current is confined to the skin and does not penetrate into the nervous system.
2. Gerald Marcuse, G2NM.
3. A suppressor grid serves to prevent the flow of secondary electrons from the anode (caused by bombardment of the anode by primary electrons from the cathode) when the anode voltage falls below the screen voltage.
4. Approximately 1,000 feet.
5. A Faraday screen prevents electrostatic coupling while at the same time permitting electromagnetic coupling.
6. The product of R (in Megohms) and C (in microfarads) gives the time (in seconds) for the voltage across the capacitance C to drop to 1/e of its original value (i.e., about 37%) when it is allowed to discharge through the resistance R.
7. A cootie key is a bug key or "side-swiper," a key consisting of a lever, usually of springy material, moving horizontally and making contact on either side of its swing.
8. Sparking will occur at 4,300 volts for 1 mm. and at 30,000 volts for 1 cm.
9. American 1MO worked French 8AB on 110 metres in November, 1923.
10. A joule corresponds to one watt passing for one second.
11. The inductance value is lowered.
12. Z.F. current signifies zero-frequency current, a term sometimes used for direct current.
13. Mainly barium oxide.
14. The detector consisted of an endless cord of fine iron wires passing over a pair of slowly rotating pulleys and subject to magnetization by incoming signal currents: a pickup coil yielded an a.f. voltage which was applied directly to the headphones.
15. Hydrogen is evolved during charging and an explosion can be caused by sparks or naked lights.
16. The specific gravity is 1.28-1.30 when fully charged: this falls to 1.15-1.17 when fully discharged.
17. Lissajous figures are produced by the combination of two sinusoidal motions mutually at right angles and having variously related frequencies.
18. In a vacuum-type rectifier the current is restricted by the negative space charge round the cathode, whereas in a mercury-vapour rectifier the space charge is neutralized by positive ions in the vapour: the voltage-drop is approximately constant at about 15 volts.
19. Inductance = inertia; capacitance = elasticity.
20. There is no difference.

Amateur Radio in Poland

By ALAN DAVIES (G3INW)*

IT is no myth that radio amateurs and the Ham Spirit are the same whoever issues the licences, as the writer found on a trip to Poland last summer when a hamfest was held in Warsaw in connection with the Youth Festival. For the first time since the war, amateurs from the West were able to meet Polish amateurs including SP3AN, SP3PK, SP5FM and SP6WM and many others. The most notable feature of these amateurs was their youthfulness. The war took a fantastic toll of pre-war Polish amateurs and there are now only about 60 active in spite of much recruiting done by "club" stations. The pre-war organisation, with its periodical, has disappeared, its remnants being merged into the State sponsored LPZ—the organisation for scientific sports which includes motor-cyclists, glider-pilots and rifle marksmen! Not altogether a happy arrangement.

Polish amateurs are fairly well provided for with technical periodicals, such as the Polish *Radioamator*, Russian *Radio* (which is comparable in size to *QST*) and the Czech *Amatorske Radio*. The latter is the only Amateur Radio magazine as we know it, the others being curious mixtures of professional and amateur interest with political articles occupying the space usually devoted to advertising in Western magazines! Among their books, which are very cheap, are nearly all the familiar authors popular in the West. A set of Terman in Russian or Polish can be bought for less than 10s.!



G3JEJ and G3INW operating the Central Radio Club station SP5KAB in Warsaw. Note the AR88 receiver!

During the hamfest two British amateurs (G3INW and G3JEJ) had an opportunity of operating SP5KAB, the Central Club station, whose equipment includes a transmitter using Russian-made 954s and 6AG7s in the v.f.o., a German RL12P35 buffer stage and an American 808 p.a. Among the stations worked by the British amateurs were GB3GP at Gilwell Park and MP4KAB.

At the time, members of the Central Radio Club were preparing for a v.h.f. field day which was a combination of a radio contest and a camping holiday in the mountains. The valves used for v.h.f. work are either ex-German Army or Russian 829 and 832 type valves. Considering the difficulties, the results are very creditable. Stations in Germany, Czecho-Slovakia and Austria have been worked on 144 Mc/s and Czecho-Slovakia on 420 Mc/s.

Another visit was to Warsaw Experimental Television Station which operates on 95.75 Mc/s sound and 89.25 Mc/s vision. The equipment is somewhat primitive and the programme quality of a type one would expect with only two cameras and an E.M.I. flying spot film scanner. Continental standards are used with a peak power of 500 watts to a four element turnstile aerial.

Amateur licence arrangements in Poland follow the familiar pattern of all the countries in Eastern Europe. There are three classes, the first grade permitting the use of low power and telegraphy only. Promotion is by examination. A typical question from an examination was "Describe the operation of a low noise r.f. stage for use on 420 Mc/s." The obverse of this is the tale of the local postmaster who took to issuing transmitting licences! At one time v.h.f. licences were issued and identified by U as the first letter after the figure in the call-sign in the same way that K indicates a club station. Incidentally, there appears to be no political test connected with the licence, although security measures are tight by British standards.

Among the many small kindnesses shown the writer during his visit was the gift of a Russian 807 which is now running alongside its much less rugged American prototype. Whilst this may be symbolic of the new turn in world affairs, it introduces considerable distortion into the modulator!

*39 Pullan Avenue, Eccleshill, Bradford, 2.

G5RV/VP6RV

FRIENDS of Louis Varney (G5RV), late of Chelmsford, will be glad to learn that he and his family have settled down very well in Caracas, Venezuela. Mr. Varney, who is Technical and Commercial Representative of Marconi's Wireless Telegraph Company, Ltd., in South America, is sadly missing his Amateur Radio activities. He has heard several G stations at good strength on 21 Mc/s. Unfortunately during recent weeks Mr. Varney has been seriously ill but just before this issue closed for press a letter came from Mr. Varney to say he was making a good recovery. He is now licensed as VP6RV and will be active on 14, 21 and 28 Mc/s whenever he manages to visit Barbados.

W.A.C.-YL for VK3YL

R.S.G.B. Member Austine Henry (VK3YL), of Murrumbeena, Victoria, Australia, is the first YL to be awarded the W.A.C.-YL certificate. The certificate is the 11th to be issued.

The President and Mrs. Hammans (left) with Mrs. Clarricoats and Mr. G. A. Chapman (G2IC), President Thanet Radio Society, at the Society's recent dinner.

Tests and Contests

Direction Finding Contests

DETAILS of the South Manchester qualifying event are as follows:—

Sunday, June 24

Organizer: M. Barnsley (G3HZM), 17 Score Street, Bradford, Manchester, 11.

Frequency: 1820 kc/s.

Call-sign: G3FVA/P.

Map: Ordnance Survey, New Popular Edition, Sheet 101.

Assembly Point: Ladybarn House Boys' Club, Mauldeth Road, Manchester, 20. N.G.R. (SJ) 33/855933.

Assembly Time: 13.30 B.S.T.

Intending competitors should notify the Organizer at least 7 days in advance, stating the number in their party requiring tea. The venue for tea will be announced later.

★ ★ ★

DETAILS of the High Wycombe qualifying event are as follows:—

Sunday, July 8

Organizer: G. T. Peck, c/o Ernest Turner Electrical Instruments, Ltd., Chiltern Works, High Wycombe, Bucks.

Frequency: 1854 kc/s.

Call-sign: G8VZ/P.

Map: Ordnance Survey, New Popular Edition, Sheet 159.

Assembly Point: Cholesbury Common, 2½ miles south of Tring, 250 yards west of the "Full Moon," N.G.R. 42/933071.

Assembly Time: 13.30 B.S.T.

Tea: "Little Abbey" Hotel, Great Missenden, N.G.R. 41/903997.

Intending competitors should notify the Organizer as soon as possible stating the number in their party requiring tea.

★ ★ ★

THE first of the 1956 series of qualifying events was organized by the Slade Radio Society, and twelve competitors assembled at the start near Eckington on May 6. Just before the commencement of the transmission schedule a fault was discovered in the modulator section of the hidden transmitter (G3JBN/P), and all the efforts of the operators failed to put matters right. However, a good carrier was being radiated and the starter, Mr. G. Williams, was satisfied that the transmission had been correctly identified when he waved the usual white flag to release the competitors at 14.05.

First to locate the transmitter was M. W. Fowler (G3GKZ) of Slade Radio Society at 15.19, followed by T. C. Reynolds (B.T.H., Rugby) at 15.24, J. A. Walley (Slade) at 15.40, and P. N. Prior (B.T.H., Rugby) at 15.42. These four competitors qualified for the National final. Other competitors who were successful in locating the transmitter were Messrs. Grant (B.T.H., Rugby) at 15.43, P. Williams (Slade) at 15.43½, and Peck (High Wycombe) at 16.17. Enquiries made after the event showed that none of the competitors was seriously troubled by the lack of speech in identifying the transmissions.

The transmitter was located on a hillock known as North Hill in the Malvern Hills, just over ten miles from the start and at an altitude of 1,000ft. The terrain was considered sufficient handicap and the transmitter was not concealed with the usual ingenuity: some amusing spectacles were witnessed by the operators as competitors approached.

The day was marred by an accident sustained by one of the competitors, Mr. G. C. Simmonds (Chairman of the Slade Radio Society), who slipped on a flight of stone steps leading from one of the approaches to the hill and severely wrenched his left knee. Considerable anxiety was felt as to the extent of the injury, but the latest news is that it is responding to treatment and the patient is progressing.

After tea at the Cop Cut Hotel, Droitwich, Mrs. Young, wife of the President of Slade Radio Society, presented a silver trophy to Mr. Fowler. This trophy is competed for annually between members of the Slade Radio Society and the B.T.H. Rugby Group, who take it in turns to organize the Midlands qualifying event. Prizes were also presented to Messrs. Fowler, Reynolds and Walley as the first three competitors to locate the transmitter, to Mr. P. Williams as the competitor travelling the shortest distance by car, and to Mrs. Reynolds as the first wife of a competitor to arrive at the transmitter.

The Organizer, Mr. T. A. Griffin, thanked all the competitors for their support, and also Messrs. Morris (G3AYJ), Pye (G3EVC) and Wyatt, who assisted with the transport of equipment.

Unsuccessful competitors were Messrs. G. C. Simmonds, N. B. Simmonds and C. H. Young (Slade Radio Society), and Messrs. P. J. Evans and O. L. Harding (B.T.H., Rugby). Messrs. N. B. Simmonds and O. L. Harding used cycles for transport during the event.

Contests Diary

1956

June 2–3	-	National Field Day[1]
June 10	-	D/F Qualifying Event (Edgware)[2]
June 16–17	-	Region 1 V.H.F. Contests[3] (organized by individual national societies)
June 17	-	420 Mc/s Contest No.1[4]
June 24	-	D/F Qualifying Event (South Manchester)
July 7–8	-	144 Mc/s Contest[5]
July 8	-	D/F Qualifying Event (High Wycombe)
July 14–15	-	*Short Wave Magazine* All-European V.H.F. Contest[6]
July 21–22	-	*Short Wave Magazine* All-European V.H.F. Contest[4]
August 18–19		Region 1 V.H.F. Contests[3] (organized by individual national societies)
August 19	-	144 Mc/s Field Day No. 2
September 2	-	Low Power Field Day
September 2	-	1250 Mc/s Tests
September 8–9	-	European V.H.F. Contest (organized by D.A.R.C.)
September 9	-	D/F National Final
September 9	-	420 Mc/s Contest No. 2
October 6–7	-	Low Power Contest
November 10–11		Top Band Contest No. 2
November 24–25		21–28 Mc/s Phone Contest

Unless otherwise indicated all contests are arranged by the R.S.G.B.

[1] For rules, see page 284, R.S.G.B. Bulletin, December, 1955.
[2] For details, see page 431, R.S.G.B. Bulletin, April, 1956.
[3] See page 285, December, 1955, and page 386, March, 1956.
[4] For rules, see page 431, R.S.G.B. Bulletin, April, 1956.
[5] For rules, see page 431, R.S.G.B. Bulletin, April, 1956.
[6] For rules, see *Short Wave Magazine*, May, 1956.

The Twentieth B.E.R.U. Contest

Simplified Scoring and Logs

MAIN feature of the Twentieth B.E.R.U. Contests, to be held on January 26-27, 1957, is the introduction of a new system of scoring, making for simplified entries, and the replacement of scoring zones by a straight bonus for each new Empire area worked.

The old sliding scale of points, which began in the 'thirties, had many merits, but in recent years the percentage of logs received compared with the total number of participants has dropped sharply; it is believed that many amateurs have been discouraged from making an entry by the complications of the old analysis sheet and the intricacies of "balancing the books." The new system eliminates these difficulties, and thus brings B.E.R.U. into line with most other R.S.G.B. events but, at the same time, retains the unique nature of this historic contest, considered by many amateurs as undoubtedly the "highlight" of the DX season.

With the 1957 promise of high maximum usable frequencies and the likelihood of excellent DX conditions, the high frequency bands of 14, 21 and 28 Mc/s should offer opportunities unequalled for many years (ionospheric storms permitting), particularly for amateurs with restricted space for aerials and masts of limited height.

The Contests Committee is endeavouring to secure the maximum amount of overseas publicity for the 1957 event but solicits the assistance of all members in bringing the dates and revised rules to the notice of stations throughout the Commonwealth. More than 400 stations participated in the 1956 event, but we hope to see a great increase in 1957. Remember B.E.R.U. offers the chance of completing your score of Empire prefixes for E.DX.C., B.E.R.T.A. or W.B.E. . . . make sure you are ready on all bands . . . and afterwards please submit an entry or check log.

B.E.R.U. CONTEST, JANUARY 26-27, 1957

Name..... Section..... Claimed score.....

Address..... Call-sign.....

Transmitter..... Input power to final stage.....watts

Receiver..... Aerial(s).....

Date	Band Mc/s	Time GMT	Call-sign of station worked	My report on his signals	His report on my signals	Points claimed	Bonus Points	Leave blank
26	14	0005	G3XXX	569001	559002	5	20	
26	14	0009	VK2ZZZ	579002	569034	5	20	
26	14	0012	GM3YYY	569003	579012	5	—	
26	21	0730	GW8XXX	589004	589054	5	20	
			Total (Points Claimed + Bonus Points)			20	+ 60 =	80

Declaration : I hereby certify that I have operated within the terms of my licence and in accordance with the rules and spirit of the contest. I agree that the decision of the Council of the R.S.G.B. shall be final in all cases of dispute. I certify that the input power to the final stage of the transmitter was ..... watts.

Date..... Signed.....

Rules

1. The contest is divided into two sections, namely:—(a) Senior—maximum licensed power; (b) Junior—maximum input 25 watts.
2. The contest (both sections) will start at 00.01 G.M.T. on Saturday, January 26, and end at 23.59 G.M.T. on Sunday, January 27, 1957.
3. The contest is open to all fully-paid-up members of the R.S.G.B. within the United Kingdom; to all British subjects outside the U.K. but within the British Empire and British Mandated Territories; and to members of British Forces of Occupation operating properly authorized stations. All entrants agree to be bound by the rules of the contest.
4. Only the entrant will be permitted to operate the station for the duration of the contest.
5. Entries must be set out as shown in the example above, using one side of the paper only. Entries must be postmarked not later than February 11, 1957, and must be addressed to R.S.G.B. Contests Committee, New Ruskin House, 28/30 Little Russell Street, London, W.C.1. The closing date for acceptance of entries is March 31, 1957.
6. Operation is restricted to the following bands: 3.5, 7, 14, 21 and 28 Mc/s. Transmissions must be of type A1 (pure c.w.) only, and frequent tone reports of T8 or less may result in disqualification.

Appendix

The following call areas are recognised for the purposes of scoring in this contest:—

G, GC, GD, GI, GM, GW—as one call area.	VQ9
MP4 (Bahrein, Muscat & Oman).	VR1 (Gilbert & Ellice Islands).
MP4 (Qatar).	VR1 (British Phoenix Islands).
MP4 (Trucial Oman).	VR2
VE1	VR3
VE2	VR4
VE3	VR5
VE4	VR6
VE5	VS1
VE6	VS2
VE7	VS4
VE8A-L (Yukon Territory).	VS5
VE8M-Z (N.W. Territories).	VS6
VK1 (Australian Antarctic).	VS9 (Aden).
VK1 (Heard Island).	VS9 (Maldive Islands).
VK1 (McQuarie Island).	VU2
VK2	VU4
VK3	ZB1
VK4	ZB2
VK5	ZC2
VK6	ZC3
VK7	ZC4
VK9 (Norfolk Island).	ZC5
VK9 (Papua).	ZD1
VK9 (New Guinea, Bismark & Admiralty Islands).	ZD2
VO	ZD3
VP1	ZD4
VP2 (Leeward Islands).	ZD6
VP2 (Windward Islands).	ZD7
VP3	ZD8
VP4	ZD9
VP5 (Jamaica).	ZE
VP5 (Cayman Islands).	ZK1 (Cook Islands).
VP5 (Turks & Caicos Islands).	ZK1 (Lord Howe Island).
VP6	ZK2
VP7	ZL1
VP8 (Falkland Islands).	ZL2
VP8 (Grahamsland).	ZL3
VP8 (Sandwich Islands).	ZL4
VP8 (South Georgia).	ZM6
VP8 (South Orkney Islands).	ZS1
VP8 (South Shetland Islands).	ZS2
VP9	ZS3
VQ1	ZS4
VQ2	ZS5
VQ3	ZS6
VQ4	ZS7
VQ5	ZS8
VQ6	ZS9
VQ8 (Chagos).	AP
VQ8 (Mauritius).	ST2
	4S7
	DL2

7. Entrants must operate within the terms of their licences. The input to the valve or valves delivering power to the aerial must not exceed 25 watts in the Junior section.

8. Contacts may be made with any station using a British Empire or DL2 callsign, except contacts within the entrant's own call area. British Isles stations may not work each other for points, and contacts with unlicensed stations in places where licences are obtainable will not count for points. The decision as to whether or not a station is valid will rest with the R.S.G.B. Contests Committee. Only one contact per band will count for points, but duplicate contacts should be logged.

9. Each completed contact will score 5 points. In addition a bonus of 20 points may be claimed for the first contact with each new Empire call area (as defined in the appendix) on each band. All British Isles stations (G, GC, GD, GI, GM and GW) count as only one call area.

10. Serial numbers must be exchanged and acknowledged before a contact can count for points. The serial number of 6 figures is made up of the RST report plus three figures which may start with any number between 001 and 100 for the first contact and will increase in value by one for each successive contact, e.g., 087 for the first and 088 for the second contact, etc.

11. A trophy or miniature will be awarded to the winner of each section, and certificates will be awarded to the first three entrants in each section. In addition a certificate will be awarded to the leading entrant in each call area regardless of the number of entrants in his call area provided that his score exceeds 1,000 points in the Senior section or 500 points in the Junior section. A certificate will be awarded in each call area in which there are ten or more entrants, to the runner-up, provided his score exceeds 1,000 points in the Senior section or 500 points in the Junior section.

Receiving Contest

1. To count for points the log must show in columns, (a) date, (b) band, (c) Time G.M.T., (d) station heard, (e) serial number sent, (f) station worked, (g) points claimed, (h) bonus points claimed. CQ or TEST calls will not count for points.

2. Each logging will score points in the same way as contacts in the Transmitting contest (see Rule 9 earlier).

3. The same station may be logged only once on each band.

4. Logs must be addressed and postmarked as for entries in the Transmitting contest.

The R.S.G.B. Telephony Contest

United Kingdom versus The Rest on 21 and 28 Mc/s.

THE first-ever R.S.G.B. contest exclusively for telephony operation and open to stations throughout the world is to be held on November 24-25, 1956. Its aim is to encourage stations to operate on the 21 and 28 Mc/s bands during the years of high sunspot activity. Contacts between any station in the British Isles with any station in the rest of the world (including Europe) will count for points—the first time, incidentally, that any R.S.G.B. contest on these lines has been arranged.

The contest runs for a straight 36 hours but, since these bands will almost certainly close during the night, it is anticipated that activity will be confined mainly to the daylight hours of the Saturday and Sunday, and should thus prove particularly attractive to those who find most DX contests unduly arduous.

The availability of the two bands should enable amateurs whose second harmonics fall in local TV channels to operate on at least one band at any time throughout the contest. High- and low-power sections will be run concurrently.

A simple scoring system has been adopted: 5 points for each completed contact, with an additional bonus each time a new country is worked. Countries will be defined in accordance with the official list (as used for DXCC) ruling at the time of the contest with the following exceptions: in VE, VK, W (K), ZL and ZS the call areas will each count as a separate country (e.g., it will be possible for a U.K. station to obtain a bonus of 200 points by working all the ten call districts of the United States).

It is suggested that participants should call " CQ RSGB." Overseas stations should note that the maximum possible number of British Isles zones providing a bonus of 50 points is 36 (six prefixes each with six numbers).

Rules

1. The contest is open to licensed amateurs in any part of the world.

2. The contest is divided into two sections, namely (a) low power—maximum input 25 watts, (b) high power—maximum licensed power.

3. The contest (both sections) will start at 07.00 G.M.T. on Saturday, November 24, and end at 19.00 G.M.T. on Sunday, November 25, 1956.

4. Any type of telephony transmission for which the station is licensed may be used, e.g., AM, NBFM, SSB, etc.

5. Only the entrant will be permitted to operate the station for the duration of the contest.

6. Entries must be set out as shown in the example below, using one side of the paper only. Entries must be postmarked not later than December 10, 1956, and must be addressed to R.S.G.B. Contests Committee, New Ruskin House, 28/30 Little Russell Street, London, W.C.1. The closing date for acceptance of entries is January 31, 1957.

7. Entrants must operate within the terms of their licences.

8. Only one contact per band with each station will count for points, but duplicate contacts should be logged. Cross-band contacts are not allowed.

9. Overseas stations may only claim points for contacts with British Isles stations (G, GC, GD, GI, GM, GW). British Isles stations may not work each other for points.

10. For each completed contact British Isles stations will score 5 points. In addition a bonus of 20 points may be claimed for the first contact with each new country on each band. For the purpose of this rule the official countries list will apply, with the exception that VE, VK, W, ZS and ZL call areas will each count as a separate country. Overseas stations will score 5 points for each completed contact with a British Isles station. In addition a bonus of 50 points may be claimed for the first contact with each British Isles country-numerical prefix, e.g., G2—, G3—, G5—, GW2—, GM3—, GI5—, etc.

11. Serial numbers must be exchanged and acknowledged before points may be claimed. The serial number of 5 figures consists of the RS report plus 3 figures which may start with any number between 001 and 100 for the first contact and will increase by one for each successive contact, e.g., 087 for the first and 088 for the second contact, etc.

12. The Metcalfe Trophy will be awarded to the leading British Isles station in the low power section and the Whitworth Trophy to the leading British Isles station in the high power section. In addition certificates will be awarded to the leading station in each section in each of the other five British Isles country-prefix zones, and also to the runners-up in the Trophy winners' zones. Certificates will also be awarded to the leading station in each overseas country, VE, VK, W, ZL and ZS call areas counting separately as in rule 10.

R.S.G.B. 21-28 Mc/s TELEPHONY CONTEST, NOVEMBER 24-25, 1956

Name..... Section..... Claimed score.....

Address..... Call-sign.....

Transmitter..... Input..... watts.....

Modulation system(s) used..... Receiver.....

Aerial(s).....

Date	Band Mc/s	Time GMT	Call-sign of station worked	My report on his signals	His report on my signals	Points claimed	Bonus Points.	Leave blank
24	21	0706	G3XXX	57001	57003	5	50	
24	21	0714	G3ZZZ	56002	55006	5	—	
24	21	0750	GM3YYY	55003	57013	5	50	
24	28	0758	G3ZZZ	54004	55015	5	50	
					Total (Points Claimed + Bonus Points)		20 +150 =	170

Declaration : I hereby certify that I have operated within the terms of my licence and in accordance with the rules and spirit of the contest. I agree that the decision of the Council of the R.S.G.B. shall be final in all cases of dispute. I certify that the input power to the final stage of the transmitter was :.....watts.

Date..... Signed.....

CHECK LOGS FROM NON-COMPETING STATIONS WILL BE WELCOMED

Council Proceedings

Résumé of the Minutes of the Proceedings at a Meeting of the Council of the Radio Society of Great Britain, held at New Ruskin House, Little Russell Street, London, W.C.1, on Tuesday, March 20, 1956, at 6 p.m.

Present.—The President (Mr. R. H. Hammans in the Chair), Messrs. W. H. Allen, H. A. Bartlett, C. H. L. Edwards, K. E. S. Ellis, D. A. Findlay, A. O. Milne, L. E. Newnham, W. A. Scarr, J. Taylor, and John Clarricoats (General Secretary).

Apology for absence was submitted on behalf of Mr. H. W. Mitchell.

* * *

Membership

(a) *Resolved* (i) to elect 56 Corporate Members and 6 Associates; (ii) to grant Corporate Membership to 3 Associates who had applied for transfer.

(b) The Secretary reported that of the 678 members whose subscription became due on December 1, 1955, 84 became 3 months overdue on February 29, 1956. Of this number 23 were London, 38 were Country, 18 were Overseas Corporate Members and 5 were Associates. Of those overdue 13 London, 20 Country and 14 Overseas Members held call-signs.

(c) The Secretary reported that 10 members wrote to resign during the four weeks ended March 17, 1956. Of this number one gave no reason, and 9 stated they had lost interest.

Applications for Affiliation

Resolved to grant affiliation to the Bury Radio Society.

Amateur Radio Exhibition

The Secretary submitted a letter from Mr. O'Brien (Region 1 Representative) in which he stated that it was not thought wise to hold an Amateur Radio Exhibition in Manchester during 1956.

Resolved to authorize the Honorary Treasurer to settle the fee for the 1955 Exhibition with the Exhibition Manager (Mr. P. A. Thorogood).

National Radio Show, Earls Court 1956

Resolved to accept an invitation from the Radio Industry Council to participate in the National Radio Show.

I.A.R.U. Region I Division Contribution 1956

Resolved to authorize the General Secretary to pay the R.S.G.B. contribution to I.A.R.U. Region I Funds 2 and 3—£112 to each Fund.

Regional and County Meetings

The Secretary reported that the Regional Representatives concerned were prepared to hold Regional Meetings as follows:—

Region 1	Liverpool	November, 1956
„ 2	York	July, 1956
„ 5	Cambridge	July, 1956
„ 9	Torquay	Autumn, 1956
„ 10	South Wales	Autumn, 1956
„ 11	Llandudno	Autumn, 1956
„ 12	Aberdeen	September, 1956

Zonal Representation on Council

Attention was drawn to the difficulty of operating effectively Article 28 of the Articles of Association which deals with the election and retirement of Council Members.

Resolved to authorize the Secretary to consult the Society's legal advisers regarding zonal representation on the Council and the present arrangements for electing the Council.

Letter from Mr. Yeomanson

A letter was submitted from Mr. E. W. Yeomanson (G3IIR) regarding the minutes of the 29th Annual General Meeting as published in the January, 1956, issue of the Society's journal.

The President stated that he and the Immediate Past President were satisfied with the accuracy of the minutes. He proposed to inform Mr. Yeomanson accordingly.

DX Convention

The Secretary was authorized to explore the possibilities of holding a DX Convention in London during the autumn or winter of 1956.

QRP Society

The Secretary was instructed to inform the Hon. Secretary of the QRP Society (Mr. Whitehead) that he had been instructed by the Council to inaugurate a QRP column in the R.S.G.B. BULLETIN provided the QRP Society can suggest the name of an R.S.G.B. member who would be prepared to produce the contribution.

Cash Account

Resolved to accept and adopt the Cash Account for February, 1956, as prepared and submitted by the Secretary.

Honorary Treasurer's Report

Resolved to accept and adopt the Report of the Honorary Treasurer.

Reports of Committees

Resolved to receive, as a report, the Minutes of a Meeting of the Finance and Staff Committee held on March 2, 1956.

The meeting terminated at 9 p.m.

Society News

R.S.G.B. News Bulletin Service

AS from Sunday, June 10, 1956, the R.S.G.B. News Bulletin will be transmitted on 3600 kc/s by G3DQ (Flamborough Head, Yorkshire) at 12.00 B.S.T. on Sundays. This transmission will be in addition to the regular transmission made at 10.00 B.S.T. by G6MB (Walton-on-Thames, Surrey).

As from Sunday, July 1, 1956, the 10.00 B.S.T. transmission will be radiated by either G6MB or G2MI. The name of the actual operator will be given at the beginning of the transmission. From the same date the repeat telephony transmission will cease.

The Council has deferred, for the time being, a proposal to extend the service to a frequency in the 7 Mc/s band. The proposal will, however, again be considered after experience has been obtained in regard to the additional 3.6 Mc/s transmission.

Application Forms

MEMBERS are reminded that applications forms for the use of prospective Corporate and Associate members can be obtained on request from Headquarters.

T.R.s are invited to apply for a small supply of forms for distribution at local meetings or other functions.

Full details of membership and a complimentary copy of the current issue of the R.S.G.B. BULLETIN will be sent to any address on request to Headquarters.

Technical Articles Wanted

THE Editor will be pleased to consider for publication articles which have a bearing on any aspect of Amateur Radio, including Amateur Television. Short articles of a constructional nature are particularly required.

Silent Keys

COMMANDER R. J. B. HIPPISLEY, C.B.E., D.L., J.P. (G2CW)

It is with profound regret that we have to record the death on March 27, 1956, of Commander R. J. Baytun Hippisley (G2CW) of Ston Easton Park, near Bath, at the age of 90. He was a vice-president of the Society and one of the real old-timers, having been licensed since 1910 when his call-sign was HLX.

Commander Hippisley was educated at Rugby and on leaving school became a premium apprentice with the Brush Electrical Engineers in 1880. He was Lord of the Manor of Ston Easton, a magistrate and Deputy Lieutenant of Somerset. He became High Sheriff of the county in 1906.

The O.B.E. (Military) was awarded to him in 1915 for his work in the erection of receiving stations around the coast of Britain for the interception of enemy signals. In 1937 he became a C.B.E. (Civil) for public services.

Experiments in sending and receiving ordinary written telegrams by radio using the Belin principle occupied him for a considerable time; this work was carried on between his station and another at Warminster. But it is his early work that should go down in radio history. Commander Hippisley started his experiments in 1902 and by 1904 had built a magnetic detector. His licence for "sending" was granted in 1910 and soon after signals from HLX could be heard working WUX (Claude Willsop of Warminster), DXK (Rev. C. E. Downing of Bath), THX (Russell Clarke of Abergavenny), Sir Henry Norman, the Assistant P.M.G., of Surrey, and OBX (O. H. Hayldon of Newton St. Loe). Later, the writer of this tribute was privileged to add TBX to his log. The equipment at HLX at that time was a 12in. spark coil with rotary break and a crystal detector with a Brown relay as receiver.

After the First World War Commander Hippisley took part in experiments in the detection of the movements of tanks by observing the sound through the earth by seismograph. During the Second World War he was entrusted by the Admiralty with precision work which was carried out in his private workshops where the machine tools would be a surprise to the average amateur.

Commander Hippisley was active in his workshops until his death. G.W.T.

RICHARD BARRY (G3HBK, ex-MP4HBK)

We regret to report the sudden death, as a result of a heart attack, of Richard (Ricky) Barry, G3HBK, ex-MP4HBK.

To his wife and daughter we extend our deepest sympathy at this time. F.F.

W. FARMER (ASSOCIATE)

It is with deep regret that we record the death, as the result of a motor accident, of W. Farmer (Associate) of Taunton, Somerset. Our sympathy is extended to his mother.

CLAUDE FIELD (G3KBL)

With sorrow we mourn the passing of Claude Field (G3KBL), of Warley, Birmingham. Although only recently licensed Claude had made many friends over the air. He was an enthusiastic supporter of activities arranged by the Stourbridge and Midland Amateur Radio Societies. He was also a Freemason and a member of several Lodges.

Many local amateurs were present at the cremation service on May 12.

Our sympathies are extended to Mrs. Field and her son. H.L.

JACK FORRESTER (GM3IPU)

The tragic death on April 20 of Jack Forrester, GM3IPU (C.R. for Selkirk) at the early age of 41, after a short illness, has removed one of the Border's keenest amateurs. His cheerful voice on 80 metres will be greatly missed by his many friends, both on and off the air.

To his widow, who helped him so much with his hobby, we express our heartfelt sympathy. J.D.G.

N. V. PATTERSON (EI4X)

We regret to record the death on March 16, 1956, of Victor Patterson who was well known to DX operators throughout the world. EI4Z.

JOHN N. PIPER (GM3COE)

His many friends will mourn the death of John N. Piper, formerly of Freeland, Gateside, Fifeshire, who died on March 19, after a short illness. Although Johnny worked on all bands he was especially well known on 7 Mc/s in the years immediately after the last war. We extend our deepest sympathy to his widow and daughter and will long retain our many happy memories. A.A.C.

MISS JANE E. C. RAINIE (GM3AKR)

It is with regret that we record the death on March 31, 1956, of Miss Jane Rainie. Apart from her interest in Amateur Radio Miss Rainie was vice-president of the Ayr Amateur Opera Company and a patron of the Ayrshire Philharmonic Opera Society. During the First World War she served in the Women's Royal Naval Service where she gained her electrical background. Miss Rainie will be deeply mourned by all who knew her. GM6MD.

R. H. ROWE (ZL3GR)

New Zealand Amateur Radio has lost one of its staunchest adherents by the death last month of Richard Henry Rowe (ZL3GR). Mr. Rowe was licensed in 1932, since when he had remained faithful to the key. He maintained a regular weekly schedule with his brother Harold (ZL3JA) and was always active in B.E.R.U. Contests—not as a competitor but to give points to others.

Sympathies are offered to Mrs. Rowe and to her family and to Mr. Harold Rowe, who was earlier bereaved when his elder brother, ZL3GB, died last year whilst serving with the R.N.Z.A.F.

CHARLES H. SULLENS (G3FQU)

It is with very much regret that we learn of the passing of Charles H. Sullens (G3FQU), of 29 Bridge Way, Whitton, Middlesex, who died on May 2 after a painful illness, borne with the greatest fortitude. His cheerful activities with the "Skylarks," of whom he was a prominent member, on 80 metres, were well known, and his loss will be widely felt by a large number, including many short wave listeners, whose reports he always valued. He was 65.

Our sincere sympathy is extended to his wife, Stella, and to his mother. F. G. L.

Eastern Regional Meeting

to be held on

SUNDAY, JULY 1, 1956

at

THE DRILL HALL,

EAST ROAD, CAMBRIDGE

Programme

Assemble	11 a.m.
Lunch	1 p.m.
Business Meeting	2.30 p.m.
Tea, followed by draw for prizes	4.30 p.m.

Tickets, price 12/6 each, may be obtained from the R.R., T. A. T. Davies (G2ALL), Meadowside, Comberton, Cambridge, and from the T.R., H. Waton (G3GGT), Arkengarthdale, New Road, Barton, Cambridge, not later than June 25, 1956.

There will be an organized tour of the colleges. Messrs. C. H. L. Edwards (G8TL) and W. H. Matthews (G2CD) will represent Council.

Control stations will be operating on Top Band and 144 Mc/s using the call-signs G3BK and G3IIT.

North Eastern Regional Meeting

to be held on

SUNDAY, JULY 8, 1956

at

THE WINDMILL HOTEL,

BLOSSOM STREET, YORK

Programme

Assemble	1.0–1.30 p.m.
Meeting	2 p.m.
Lecture (To be announced)	3.30–4.30 p.m.
High Tea	5.30 p.m.
Draw for Prizes	6.15 p.m.
Group Photo	6.30 p.m.

Tickets, price 8/6 each, may be obtained from the T.R., G. Nottinghom, (G3DTA), 23 Abbotsway, Muncaster, York.

An Official Guide will be provided to conduct those not attending the meeting on a sight-seeing tour. For the benefit of those coming by road, Control stations will be operating on 1910-1925 kc/s and 3650 kc/s.

Cooking Band

ACCORDING to a report in the *News Chronicle*, the American Federal Communications Commission has assigned 2400 Mc/s to a new electronic oven for domestic use. Cooking by u.h.f. leaves the utensils cool—only the food absorbs energy, thus generating heat.

I.T.A. Northern Region Station

THE first northern transmitter of the I.T.A. at Winter Hill, near Bolton, commenced operation on May 3. The station operates on Channel 9 and has an effective radiated power of approximately 100kW.

G5KC in Hospital

FRIENDS of George Kelley (G5KC), of York, will be sorry to learn that he is now in Gateforth Hospital (4 South Pavilion), Hambleton, near Selby. Any overdue QSLs and unanswered correspondence will be attended to in due course.

R.S.G.B. News Bulletin Service

GB2RS	**Sundays**	**3600 kc/s**
10.00 B.S.T.		**12.00 B.S.T.**

Slow Morse Practice Transmissions

B.S.T.	Call	kc/s	Town
Sundays			
09.00	G3GYV	1900	Hartford, near Northwich
09.30	G3BKE	1900	Newcastle-on-Tyne
10.00	G6MH	1990	Southend-on-Sea
10.30†	G3DGN, G3GZB	1930	North London
11.00	G2FXA	1900	Stockton-on-Tees
12.00	G3LP	1850	Cheltenham
12.00	G3KAN	1850	Northampton
12.00	GI5UR	1860	Belfast
14.00	G5AM	1900	Witnesham, Ipswich
21.00	G2FIX	1812	Nr. Salisbury
22.00	G3ARM	1919	Guildford
Mondays			
19.00	G3NC	1825	Swindon
21.00	G3BLN	1900	Bournemouth
22.15	G2BRH	1900	Ilford
Tuesdays			
18.30	G2FXA	1900	Stockton-on-Tees
19.00	G2HDR	1860	Bristol
20.30	G3GDZ	1905	Kingsbury, N.W.9
21.00	G3EFA	1855	Southport
21.45†	G3ETP, G3JMX	1875, 1860	Lowestoft
22.30†	G3IIR, G3GQK	1915	Norwood
Wednesdays			
18.30	G3GCY	1830	R.A.F., Dishforth
19.00	G3HUB/A	1902	Chelmsford
22.30	G3FBA	1910	Bath
Thursdays			
19.00	G3NC	1825	Swindon
20.00–†...	G2ABR, G3FCY	1919	Hull, Yorks.
21.00	G3GWT, G3KTO		
20.30	G3JQM	1878	Barwick, Yeovil
22.30	G3ADZ	1940	Southsea
Fridays			
19.00	G3BLN	1900	Bournemouth
20.00†	G2FNI, G3EGX, G3ERB	1875	Wirral
20.30	G3ICX	1915	Sutton Coldfield
21.30†	G3KLZ	1860	Bradford
	G3INW (or G3KSS)		Bradford
	G3KEP		Bingley
Saturdays			
13.00	G2FXA	1900	Stockton-on-Tees
21.00	G3HWI	1987	Blackburn, Lancs.

† *Alternately.*

Slow Morse transmissions are organized by Mr. C. H. L. Edwards (G8TL), 28 Morgan Crescent, Theydon Bois, Essex. Members using the service are requested to send listener-reports to the stations concerned.

TRADE WINDS

Band III Converters. Graham Taylor, Ltd., 7 Stanhope Row, London, W.1, have introduced a new Band III external converter, which is pre-set and has two aerial inputs. The same Company also offer an internally fitted converter (i.f. injected) as a frequency tuned unit to suit individual makes of sets. Four types are normally available but exceptional i.f. types can be made to order.

Gecalloy Radio Cores. A comprehensive catalogue giving details of Gecalloy disc and cylinder cores, screw cores, pot cores, brass insert cores and bobbins may be obtained from Salford Electrical Instruments Ltd., Peel Works, Silk Street, Salford 3, Lancashire.

Aerial Prices. Aerialite Ltd. have reduced the price of their twin band Model 805 television aerial to £7 7s. This aerial incorporates a dipole and reflector for Band I reception with a five-element Band III array placed alongside. The Band III section can be rotated to give different directivity from that of the Band I section. Further information may be obtained from the manufacturers at Castle Works, Stalybridge, Cheshire.

Labgear Companion Power Unit-Modulator. Full details of the new power unit and modulator for the LG. 300 Mk. II transmitter can be obtained by sending a large stamped addressed envelope to Labgear (Cambridge), Ltd., Willow Place, Cambridge. The unit costs £80, complete with all valves and interconnecting leads, in the United Kingdom.

G.E.C. Valves. The General Electric Co., Ltd., has announced that, from now on, all electronic valves hitherto sold under the name Osram will be marketed under the trade mark G.E.C. No change in the familiar blue carton is contemplated.

Miniature Copper Oxide Rectifiers. Salford Electrical Instruments, Ltd., have introduced a new range of miniature rectifiers in moulded polythene and resin-bonded paper tube units. The moulded polythene type is supplied in half-wave assemblies of up to four series elements and the paper tube type up to 220 elements. Mean output voltages in half-wave connection are from 3.6 to 14.5 volts for the moulded polythene units (which may be suspended by the connecting wires) and from 18 to 792 volts from the tubular rectifiers.

Solder for Printed Circuits. As many home constructor radio, television, tuner and amplifier kits incorporating printed circuits are becoming available, Multicore Solders, Ltd., are marketing a special printed circuit solder pack containing about 40 ft. of 22 s.w.g. high tin content Ersin Multicore solder. It costs 2s. 6d.

Tropicalized Test Instruments. The Automatic Coil Winder and Electrical Equipment Co., Ltd., can now supply specially tropicalized test meters known as the Models 7X, 40X, 8X and 8(S)X Avometers. In these instruments certain components are "potted" in an epoxy casting resin which renders them completely impervious to the ingress of moisture, while the Model 8(S)X also incorporates an anti-magnetic shield permitting the instrument to be used in the vicinity of a strong magnetic field.

T.C.C. Leaflets. The Telegraph Condenser Co., Ltd., North Acton, London, W.3, has recently issued two new brochures. Special Products Bulletin No. 6 gives details of a standard range of aerial cross-over units and filters while the other deals with the problem of American replacement condensers to ML-C-25A specification.

Transistors. The list prices of Mullard OC70 and OC71 transistors have been reduced from 30s. to 21s. and 24s. respectively. The OC72, a new type, is listed at 30s. A useful leaflet *Junction Transistors in Audio Applications* is available on request from Technical Service Department, Mullard, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

Interference Suppression. The Labgear range of interference suppression devices has been expanded and now comprises mains suppressors and three TV receiver filters which plug into the receiver between the aerial socket and feeder. Model E.5031, for the suppression of v.h.f. break-through, has a cut-off at 70 Mc/s and negligible loss over Band I. Model E.5037 is a combined high pass and i.f. filter for insertion in the aerial feeder. The cut-off is 40 Mc/s, with negligible insertion loss over Bands I, II and III. Model E.5038 is a composite Band I and III filter which is also fitted in the aerial feeder and allows only Band I and III signals to pass. Owing to the complexity of this model there is slightly higher insertion loss than with models E.5031 and E.5037 but is not serious except under extreme fringe conditions.

Television Aerials. A catalogue giving full details of the J-Beam range of aerials for television and Band II, including the new Hornbeam 13 channel array, may be obtained from J-Beam Aerials, Ltd., Westonia, Weston Favell, Northampton.

* * *

Members are asked to mention the R.S.G.B. BULLETIN when writing to manufacturers for further information regarding any of the products mentioned in this feature.

The North Kent Radio Society had their club station in operation on Top Band, 3.5 and 144 Mc/s at their exhibition in Bexleyheath on May 12, 1956, which was attended by nearly 5,000 people. In this picture G3HKX is operating G3ENT.

Regional & Club News

Amateur Radio Club of Nottingham.—The first general meeting of the club was held at Sherwood Community Centre on May 8 when it was reported that a transmitter for the club station was complete. Further details of activities may be obtained from the *Hon. Secretary:* J. W. Rayner, 28 Tettenbury Road, Basford, Nottingham.

Bristol.—E. C. Halliday (G3JMY) will give a talk on "Oscilloscope Circuits and Applications" at the meeting on June 15. *Hon. Secretary:* D. F. Davies (G3RQ), 51 Theresa Avenue, Bishopston, Bristol 7.

British Amateur Television Club (Chelmsford).—At the meeting at 10 Baddow Place Avenue, Great Baddow, at 7.30 p.m. on June 14, F. Turner (G3FVI) will lecture on "70 cm Transmitters." *Hon. Secretary:* D. S. Reid, 4 Bishop Road, Chelmsford, Essex.

Derby & District Amateur Radio Society.—Recent activities have included a visit to the Rolls-Royce Laboratories and lectures on "Colour Photography" and "Pi-networks" by E. Phillips and W. Jones (G3JXL) respectively. Meetings are held on Wednesdays at the School of Arts and Crafts, Green Lane, Derby. One evening a month is devoted to a series of practical demonstrations under the general title of "Elementary Principles for Beginners." A film show is arranged for June 20. *Hon. Secretary:* F. C. Ward (G2CVV), 5 Uplands Avenue, Littleover, Derby.

East Kent Radio Society.—Meetings are now held every Tuesday at 7 p.m. at the society's new headquarters in The Basement, Technical College, Longhurst Street, Canterbury. A c.w. transmitter for Top Band and 3.5 Mc/s is under construction. Morse classes are in charge of G2BBT whilst lectures on radio theory are given by D. Williams. There is keen interest in D/F work. Visitors and prospective members are invited to attend meetings. *Hon. Secretary:* D. Williams, Llandogo, Bridge, near Canterbury.

Edinburgh Amateur Radio Club.—At the A.G.M. last month the following were elected: *President:* W. B. Henniker (GM3FUU); *Hon. Treasurer:* A. Henderson; *Hon. Secretary:* M. Darke (GM3KGK); *Committee Members:* J. Fraser (GM3KLW), D. A. E. Samson and D. Patrick. During the summer, meetings will be held on the first Wednesday in each month but weekly meetings will be resumed in the autumn. *Hon. Secretary:* M. Darke (GM3KGK), 7 Joppa Gardens, Joppa, Portobello, Midlothian.

Lancaster & District Amateur Radio Society.—Increased membership and a considerably improved financial position were both reported at the A.G.M. held on May 2 when the following were elected: *Chairman:* R. P. Mackrell (G3AEP); *Hon. Treasurer:* C. Bennet; *Hon. Secretary:* B. Parker (G3KOQ), 125 Regent Road, Morecambe, Lancs.; *Committee Members:* A. O. Ellefsen and H. C. Burns. Meetings are held at 7.30 p.m. on the first Wednesday in each month at the George Hotel, Torrisholme.

Medway Amateur Receiving & Transmitting Society.—At the meeting at "The Golden Lion," Old Brompton, on May 7 there was an excellent talk on "Aerials and Aerial Matching" by Mr. Richards. Details of future activities, which include a visit to GNF, "Bring and Buy Sale," a mobile contest and a talk on "How to prepare for the amateur licence," may be obtained from the *Hon. Secretary:* H. G. Cheeseman (G3KNO), 265 Cliffe Road, Strood, Kent.

Montreal Amateur Radio Club.—The new directors of the club, which is affiliated to the R.S.G.B., are: *President:* Ben Halickman (VE2AKT); *Vice-President:* Gordon Webster (VE2BB); *Hon. Treasurer:* Bud Stirber (VE2SU) and *Hon. Secretary:* Miss Ethel L. Pick (VE2HI), 535 Lansdowne Avenue, Westmount, Quebec.

Norwich & District Radio Club (G3JGI).—Meetings are held at "The Golden Lion," St. John Maddermarket, and details may be obtained from the *Hon. Secretary:* P. J. Gowen, 71 Links Avenue, Hellesdon, Norwich.

Nottingham & District Amateur Radio Society.—There was an attendance of 98 at the meeting in the Mechanics' Institute, Nottingham, on April 29 when Council Member Frank Hicks-Arnold (G6MB) described "The Antennamatch" and introduced for the first time his new All-band Coupler. The A.G.M. was attended by Dr. Vance (G8SA), Region 4 Representative, and the following were elected: *Chairman:* B. Shortland (G3DJI); *Hon. Treasurer:* R. Harding (G3AKU); *Hon. Secretary:* Alan Walmsley (G2HIO), Park House, Cinderhill Road, Cinderhill Nottingham; *Committee Members:* K. Spray (G3CMA) and R. Sills (G3IQM). The next meeting will be held at the new venue, Basford Hall Miners' Welfare, Nuthall Road, Cinderhill, Nottingham, on June 15.

Scunthorpe Amateur Radio Society.—Another successful demonstration of Amateur Radio was staged by members of the society at the Arts and Crafts Exhibition held recently in Scunthorpe. The station, using the call-sign G3JWR/A, was active on Top Band, 3.5, 7 and 14 Mc/s using a G5RV-type transmitter. A special feature of the demonstration was a television receiver in operation to show the public that the transmitter does not normally interfere with TV reception. Mobile operation was demonstrated by G3HRP/M who periodically toured the district. Great interest was shown by the public and as a result club membership increased. Thanks are recorded to G. Jackson Ltd. who loaned the television receiver and provided QSL cards.

Sheffield Amateur Radio Club.—Meetings are held at 8 p.m. on the fourth Wednesday in each month at "The Dog and Partridge Hotel," Trippit Lane. The Moorside Edge B.B.C. transmitter was visited recently and a similar visit to Holme Moss is planned. *Hon. Secretary:* G. F. Lyon (G3GJF), 125 Nokeby Road, Sheffield 5.

South Manchester Radio Club.—Meetings will be held at Ladybarn House, Mauldeth Road, Fallowfield, Manchester 20, on June 15 ("Valves and How They Work," by N. Ashton, G3DQU), June 29 ("Interplanetary Travel," a recorded R.S.G.B. lecture by W. A. Scarr, M.A., G2WS), and July 13 (lecture by M. Denny, G6DN). The annual D/F contest, which will be one of the qualifying rounds for the National Final, will be held on June 24. *Hon. Secretary:* M. Barnsley (G3HZM), 17 Score Street, Bradford, Manchester 11.

Representation

Vacancies

Owing to the death of Mr. J. Forrester (GM3IPU) the office of representative for the Counties of Berwickshire, Roxburghshire, Selkirkshire and Peebleshire, is now vacant.

Mr. H. E. Duthie (G3JBK) has resigned as representative for the town of Bexley and Bexleyheath.

Nominations for their successors should be made in the prescribed form and sent to reach the General Secretary, by not later than June 30, 1956.

Change of Address

The address of Mr. H. Peabody (G3KUG), representative for Walsall, Staffordshire, is now 182 Cavendish Road.

Coronation Trophy, 1956

EAST Ham Group, with 278 points, were the winners of this year's competition for the Coronation Trophy, closely followed by Ilford with 267 points. Chingford Group were third with 234 points. East Ham congratulates the losers on their efforts and hopes that more East London groups will take part in the 1957 contest.

Can You Help?

● J. A. Rouse (G2AHL), R.S.G.B. Headquarters, who wishes to borrow the instruction manual for the U.S. Signal Corps Receiver type BC794-B manufactured by Hammarlund ?

● A. Seed (G3FOO), 8 Withert Avenue, Bebington, Wirral, Cheshire, who requires the circuit diagram of the Monitor type 32, Ref. No. 10T/533 and any other details?

LONDON MEMBERS' LUNCHEON CLUB
will meet at the Bedford Corner Hotel, Bayley Street, Tottenham Court Road, at 12.30 p.m. on Fridays, June 15, July 20 and August 17, 1956.
Telephone table reservations to HOL 7373 prior to day of luncheon. Visiting amateurs especially welcome.

Letters to the Editor . . .

TVI in Fringe Areas

DEAR SIR,—I have read the letter written by Alf Reeve (G8WN) in the April issue and while in agreement with him that TVI is very easily caused in this area, I do *not* agree that it is impossible to work during TV hours. In fact I myself have been in operation since being licensed (January, 1954) during TV hours on 3.5, 7 and 14 Mc/s almost every day and have not had one complaint of TVI, this with powers up to 50 watts input on c.w.

This letter is written to encourage new blood in the area, not to put before them " The Ghost of TVI " and frighten them off. The secret is to keep back those harmonics and, if you work Top Band make sure that you do not block the receivers of local amateurs who may be trying to work 28 Mc/s.

Yours faithfully,

Ipswich, Suffolk. O. S. CHILVERS (G3JOC).

The Minibeam

DEAR SIR,—Referring to G4ZU's article on his new " Minibeam " and to the reports given to him during his tests with this station, it seems that those reports have come in for some criticism and have been variously described as " fantastic," " impossible " and " meaningless."

Whether or not they are fantastic is not for me to say, but that they are possible I am willing—with G4ZU's co-operation—to demonstrate to anyone at any time. That they are—in common with all other " S " meter reports—meaningless, unless related to some standard, I readily concede.

There are a number of stations in the London area which are known to be active on 21 Mc/s and 28 Mc/s which are never heard at this QTH. There are many others receivable at strength S1 to S9, but there is only one signal from that area which compares with G4ZU and that is G8KS who of course uses a commercial version of the same beam.

The reports I gave were of signal strength above noise—since my " S " meter reads zero on no signal at normal local noise level. Like all such reports they are of use only for comparison purposes!

The fact remains, however, that G4ZU is a cracking good ground wave signal when he is firing at me, and an exceedingly poor one when he is not!

Yours faithfully,

Stokenchurch, Bucks. F. J. NORTH (G2CDI).

N.F.D. and 21 Mc/s

DEAR SIR,—In reading the 1956 N.F.D. Rules published in the December BULLETIN, I am disappointed that the 21 Mc/s band has not been included. This band would provide excellent contacts with Empire portables, and is a good band for low-powered DX work.

I am sure that the inclusion of the 21 Mc/s band would offer great encouragement to Empire members to put portable stations on the air during N.F.D., and would add much interest to the event.

As one who will be participating with portable equipment, I most earnestly request the Contests Committee to consider this matter.

Yours faithfully,

Eleuthera Island, DAVID MITCHELL
Bahama Islands. (VP7NI, ex-G2II, GW6AA, ZL1MP).

Affiliated Societies' Contest, 1956

DEAR SIR,—Once again the Contest Committee has found it necessary to deduct a large number of points claimed by competitors without any explanation being offered for the reason why those points were deducted.

While we greatly appreciate the work done by this voluntary Committee, and realise that their decision is final, it does seem strange that no reason is given for the deduction of points. Of course individual entrants cannot be informed of their discrepancies but surely some indication of the general reason for deduction could be published in the BULLETIN, if only to help to prevent the claiming of points wrongly in the future.

Personally I feel very strongly on this matter, as the necessary deduction of points may look to an outsider that some attempt has been made by the entrant at cheating. This is not the first time I have brought the matter to the Contests Committee having put it before them at an O.R.M.

If the Committee continues to deduct points without offering an explanation it seems useless to continue to submit entries for Society Contests. I should be interested to hear how other contestants feel in this matter.

Yours faithfully,

Sheffield, 10. JOHN R. PETTY (G4JW).

[*Editorial Note*—G4JW was the call-sign used by the Sheffield Amateur Radio Club in the Affiliated Societies' Contest, 1956.]

DEAR SIR,—I refer to Mr. Petty's comments on deductions made from the claimed score of the Sheffield Amateur Radio Club entry for the 1956 Affiliated Societies' Contest.

I feel that Mr. Petty misses the point of checking the logs submitted for contests. They are checked primarily for accuracy in logging the contacts made and the information exchanged, rather than as a guard against cheating, although there have been occasions when evidence of cheating has been found. Fortunately these are comparatively rare, and special action is taken in such instances.

Points deductions from claimed scores are made for a variety of reasons, e.g. no confirmation of claimed contact in the other station's log, incorrect logging of call-signs, incorrect logging of signal reports, serial numbers or locations, incorrect claims for points, incorrect claims for points for specific contacts, incorrect calculation of total scores, etc. As has been observed by the Committee in reports on contests on several occasions, the frequency of errors tends to increase in those contests in which more than one operator is involved at each station, although no explanation for this phenomenon has yet been found. Deductions from claimed scores do not, therefore, carry the imputation of cheating, and claimed scores are not published, so that only one or two people are usually aware of the exact extent to which a claim has been reduced—the people responsible for the entry.

It may happen that points will be lost because of the carelessness of the operator of another station, who has failed to log his end of the contact or recorded an incorrect call-sign, and this only serves to underline the necessity for care and accuracy in log-keeping. In some instances the full number of points claimed for a contact is not deducted in case of an error; for example, a single error in a signal report might only entail deduction of a proportion of the points claimed, there being evidence in the logs that a contact did take place as claimed. In the case of contests where scoring is based on a number of points in relation to distance between stations, claims are sometimes rather optimistic and have to be reduced, but I might add here that the reverse also applies and on many occasions scores have been increased after checking, when the higher claim by the other operator has been checked and proved correct.

In the particular instance raised by Mr. Petty, the total deduction made from the claimed score was 45 points, arising from five incorrect loggings of signal reports sent by other stations, one contact unconfirmed in the other station's log as having taken place, and one contact unconfirmed by reason of an error in recording the call-sign of the station with which contact was claimed.

In all fairness, the Committee must be absolutely satisfied as to the accuracy of the claimed scores of leading stations before making any recommendation to Council for the award of Society trophies or certificates.

Yours faithfully,

Mill Hill, London. A. W. W. TIMME (G3CWW),
Hon. Secretary, Contests Committee.

QSL Bureaux

DEAR SIR,—I would like to thank G3ESP for his kind reference to the QSL Bureau (April issue). With regard to the I.S.W.L., that body launched a publicity campaign some-time ago and apparently wrote to a number of overseas societies, offering to deliver their cards free of charge. Correspondence ensued between their Secretary and myself and the matter has now been resolved. For a time, however, one or two foreign societies, notably Hungary, sent their

cards to the I.S.W.L. They do so no longer. There is an amicable arrangement between the I.S.W.L. and R.S.G.B. bureaux for the mutual exchange of each other's cards.

All cards which come to the R.S.G.B. Bureau for B.S.W.L. members are still forwarded to the *Short Wave Magazine*, although we believe the B.S.W.L. is now defunct as a separate society. We do not know what volume of cards is handled by the *Short Wave Magazine* Bureau but judging by the very infrequent and small packet of cards which they send on to us, it must be, by R.S.G.B. standards, very small.

The position regarding the CE and LU stations in the Antarctic is that they are operating in British territory without permission. What the A.R.R.L. cares to do about recognising them cannot alter this fact. We wonder what would be the A.R.R.L's attitude should say, a Russian " Expedition " decide to set up stations in northern Alaska? Would they be particularly pleased if the R.S.G.B. were to recognise such activities?

The station now operating in YA is in quite a different category and is not a pirate.

Yours faithfully,

Bromley, Kent. A. O. MILNE (G2MI).

DEAR SIR,—We have read with interest the letter from G3ESP about QSL Bureaux in the April BULLETIN, and we should like to clear up one or two points concerning the I.S.W.L. QSL Bureau.

We forward by direct mail all cards for British amateurs whose addresses have been published in either of the call books, or in magazines, irrespective of whether or not they are members of the League. The call-sign of any British amateur whose QTH we cannot obtain is noted in our records, and cards received for such amateurs are forwarded to the R.S.G.B. QSL Bureau. We also forward cards to the R.S.G.B. for British amateurs, who, for their own reasons, have notified us that they do not wish to receive cards from the I.S.W.L. Bureau. Naturally, only members of the I.S.W.L. can send their cards to the League for onward transmission.

In return, the R.S.G.B. sends us all cards that they receive for I.S.W.L. listener members, together with a limited number of cards for our transmitting members.

By co-operating with each other, there is no need for a single card to be destroyed. We can assure you that no card has been destroyed by the I.S.W.L. at least for the past eight years, and most probably for the ten years the organization has been in existence.

Yours faithfully,

London, N.10 PETER BYSH (*Honorary Secretary and Treasurer/QSL Manager for I.S.W.L.*).

Continental Operators

DEAR SIR,—May I say how greatly I agree with the views expressed by G3ACC in her letter published in the April issue? Such unenlightened remarks as she quotes are most unfortunate and do a great deal of harm.

Although mainly active on two metres, I have, by reason of my location, been privileged to make contact with, and to listen to, a great many French stations during the past few years. I have always been impressed by the dignified tone of their conversations, whether working among themselves or in contact with stations outside their own country.

The amateurs of France, both by reason of their invariable courtesy and their general standard of operating, set an example to us all.

Yours faithfully,

Hythe, Kent. V. G. MELLOR (G5MR).

TV—DX

DEAR SIR,—I think it may be of interest to members of the Society to learn that we have been receiving transmissions from Crystal Palace here in Kumasi for the past five weeks. Television sound broadcasts on 41.5 Mc/s are received regularly from 12.00 until 17.00 G.M.T., and the evening programme from 17.45 until approximately 18.45 G.M.T., received about three times a week. The receiver used is a Hallicrafter SX28, with a 28 Mc/s ground plane as the antenna. Signal strengths on the " S " meter show an average of S4, with occasional peaks lasting for up to 30 minutes of S9 plus. These peaks occur normally at about 13.00 and at 16.30 G.M.T. The signals are peculiar by the total absence of fading, and by the fact that it is not possible to correlate this activity with conditions on the 28 Mc/s band.

Video transmissions have been received on the same receiver with the aid of a converter, with similar characteristics, although signal strengths seem somewhat lower.

The signals appear to be vertically polarised, and probably propagated by means of the " E " layer.

A 4 element television antenna (Multimus) is now erected, 41.5 and 45 Mc/s receivers are under construction and a start has been made with continuous recording of comparative field strengths of the sound signals.

It is interesting to note that the sunspot maximum is still more than eighteen months away, and if the M.U.F. increases at the present rate it might even be possible to get a DXCC on 144 Mc/s.

Yours faithfully,

W. READ (ZD4BO).

Radio Research Laboratory,
Kumasi College of Technology,
Kumasi, Gold Coast.

Top Band Plan

DEAR SIR,—I have, for some time, been convinced that an Amateur Band Plan for 160 metres would be of advantage to all users of the band. Separation of amateur telephony and telegraphy has clearly been justified on other bands.

During the recent " season," congestion on Top Band has been severe. This condition could be relieved considerably by a suitable allocation of frequencies for each type of emission.

Top Band is somewhat different to other bands, in that amateur telephony is usually confined to semi-local operation, whereas amateur c.w. is normally used for longer distances and DX. The ratio of phone to c.w. is considerably less than on other bands.

In my opinion, the use of phone between 1.8 and 1.9 Mc/s is undesirable. One often hears amateur phone stations operating on the frequencies of U.K. coast stations which have allocations in this part of the band. It appears that these amateur phones are working "cross town " since, apparently, they are not troubled by interference from the coast stations. It does not follow that they are not interfering with reception of the coast station. This is a dangerous state of affairs in view of our licence conditions.

The distribution of U.K. coastal services, between 1.8 and 2.0 Mc/s is as follows:—

1827 kc/s	Folkestone H.R. and Wick
1834 kc/s	Niton
1841 kc/s	Cullercoats, Lands End and Malin Head
1848 kc/s	North Foreland and Oban
1855 kc/s	Burnham-on-Sea and Ilfracombe, Newhaven Stonehaven
1911 kc/s	Niton, Seaforth
1925 kc/s	Lands End, Niton, Seaforth
1953 kc/s	G.C.A. (G.P.O.)

U.K. stations are those with which, because of their proximity, we are most likely to interfere. The spaces between each of these official channels, although small, are each sufficient to carry several amateur telegraphy channels. Conversely, one amateur phone signal may occupy the whole space.

The spectrum between 1.9 and 2.0 Mc/s has no density of U.K. coast station allocations. The presence of Loran in this part of the band has less " interference potential " to amateur phone compared with c.w. and vice versa.

I suggest, in view of the foregoing, we would be well advised to divide the band so as to allocate 1.8 Mc/s to 1.9 Mc/s for amateur c.w. operation and 1.9 to 2.0 Mc/s for amateur phone operation.

Perhaps those interested in " Top Band " would care to make their views known to the Society.

Yours faithfully,

Yateley, near Camberley, Surrey. DONALD MAY (G2BB).

New Books

TELEVISION AND RADAR ENCYCLOPÆDIA (Second Edition). Edited by W. MacLanachan. Page size 8¼in. x 5¼in. 216 pages. 225 illustrations. Published by George Newnes Ltd. Price 30/-.

The continuous advance of television and radar techniques, both in Great Britain and the United States, has brought into current use many new terms since this Encyclopædia was first published in 1953. Many new definitions have been included in this edition while a large number of others have been revised in the light of latest practice.

Under the more important headings, the reader will find informative articles contributed by leading authorities in their respective fields, including Sir Edward Appleton, Mr. D. C. Birkenshaw, Mr. T. H. Bridgewater, Mr. O. S. Puckle and Sir Robert Watson-Watt.

A selection of useful tables and data are given at the end of the book.

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THE RADIO HANDBOOK. 14th Edition. Edited by William I. Orr (W6SAI). Page size 9¾in. x 6¾in. 761 pages, profusely illustrated. Published by Editors and Engineers Ltd., Summerland, California. Available in the U.K. from Short Wave Magazine Ltd.

This edition has been thoroughly revised and brought up-to-date particularly in those sections devoted to the construction of equipment. The 32 chapters cover the whole field of radio and include information on semi-conductors, s.s.b. and mobile operation.

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MAGNETIC RECORDING HANDBOOK. By R. E. B. Hickman, M.B.K.S., M.T.S. Page size 8¼in. x 5¼in. 176 pages. 109 illustrations. Published by George Newnes Ltd. Price 21/-.

This book is designed to interest and inform the recording enthusiast—be he amateur or professional—and also the radio service engineer who is concerned with the maintenance of the wide range of magnetic recording devices now on the market.

The first two chapters deal with the development and theory of magnetic recording whilst Chapter 3 describes a typical magnetic recording system. Later chapters cover commercial equipments, practical recording, servicing and maintenance, and special methods and applications. The Appendices give information on home recording and the Law and the recording and reproducing characteristics, as adopted by the C.C.I.R. at the VIIth Plenary Assembly, London (1953). Mr. Hickman's new book should prove of real assistance to all who are concerned with magnetic recording.

* * *

WIRELESS AND ELECTRICAL TRADER YEAR BOOK: Radio, Television and Electrical Appliances 1956. 27th Edition. Trader Publishing Co. Ltd. Size 8¼in. x 5¼in. 344 pages. Bound Linson. Price 12/6.

Features of the 1956 edition include condensed specifications of nearly 250 current commercial television receivers and information on valve and cathode ray tube base connections with more than 300 valve base diagrams.

An addition is a comprehensive table of television tuning frequencies of superhet receivers and sideband characteristics of superhet and t.r.f. models. The comprehensive list of i.f. values of commercial radio receivers which have been marketed during the past eight years has been revised and extended. Other data includes specifications of current radio receivers (covering more than 400 models), legal and licensing information and a directory of trade associations.

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ELECTRICAL INTERFERENCE. By A. P. Hall, Grad.I.E.E. Page size 7¼in. x 4¾in. 122 pages. 100 illustrations. Published by Heywood & Co. Ltd., London. Price 15/-.

When it is remembered that the General Post Office is called upon to investigate about 150,000 complaints of interference with radio and television every year, some idea of the magnitude of the problem can be obtained. Literature on electrical interference is at present scarce, being largely in the form of papers in technical journals.

This book, written from a thoroughly practical point of view, deals with causes of interference, effects of interference, receiver aerial systems, measurement of interference levels, location of the sources of interference, avoidance of interference, basic filters, safety arrangements and Faraday cages. A useful feature is a series of photographs of a television screen showing the effects on the picture of different types of interference.

Curiously enough the author makes no reference to interference caused by Amateur Radio transmitters (other than to reproduce statistical information issued by the G.P.O.) or to the phenomenon which is referred to as "TVI in reverse."

* * *

GERMANIUM DIODES. By Dr. S. D. Boon. Page size 8in. x 5¼in. 93 pages. 105 illustrations. Published by Philips of Eindhoven. Obtainable from Cleaver Hume Press Ltd., London, W.8. Price 9/6.

The nature and structure of semi-conductors are entirely different from those of electronic tubes whose sphere of application they are successfully invading. This new book (another in the Philips' Technical Library, Popular Series) deals specifically with the germanium diode. Examples of practical applications are given.

* * *

BRITISH STANDARDS INSTITUTION ANNUAL REPORT, 1954-5. Published by B.S.I. Price 5/-.

Contains a General Report and Divisional Reports for the Institution's year to March 31, 1955. Information is also given on the various International organisations with which the British Standards Institution is associated.

* * *

THE RADIO AMATEUR OPERATOR'S HANDBOOK: Data Book No. 6. 3rd Edition 1956. 48 pages. Data Publications Ltd. Price 3/-.

Within the pages of this little book will be found a wealth of information to interest both the transmitting amateur and the short-wave listener. Contents include amateur prefixes in alphabetical and country order, radio zone boundaries, maps, charts, call areas, local time conversion and amateur codes.

H. E. Smith (G6UH) writes about the v.h.f. bands, and S. A. Herbert (G3ATU) contributes an article on the DX bands and DX operating techniques.

The present edition has been thoroughly revised and brought up-to-date by the staff of *The Radio Constructor* in collaboration with the International Short Wave League.

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F.M. EXPLAINED. By E. A. W. Spreadbury, M.Brit.I.R.E. Published by Trader Publishing Co. Ltd. Price 2/6.

This is a reprint of articles from *Wireless and Electrical Trader* explaining in simple terms the principles of the f.m. system used in the B.B.C. v.h.f. radio services. Its effect on receiver design and servicing problems is explained, together with methods of circuit alignment.

* * *

HIGH QUALITY SOUND REPRODUCTION. Published by Mullard Ltd. Price 3/6.

This booklet contains reprints of four articles written by Mullard engineers which originally appeared in *Wireless World*. It also includes point-to-point wiring diagrams, chassis diagrams and other information of help to the constructor which did not appear in the original publication.

The first two articles are devoted to the design of a 20-watt high quality amplifier using EL34s in the output stage. The third article describes a pre-amplifier for the EL34 amplifier. Two new articles deal specifically with a 5-valve 10-watt high quality amplifier shown at the 1955 Radio Show.

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Correction

In the list of B.R.S. members published in the April issue, the B.R.S. number of E. Whalley, 103 Mary Slessor Street, Willenhall, Coventry, should have read B.R.S.2571.

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