THE T&R

BULLETIN

A JOURNAL FOR

RADIO EXPERIMENTERS

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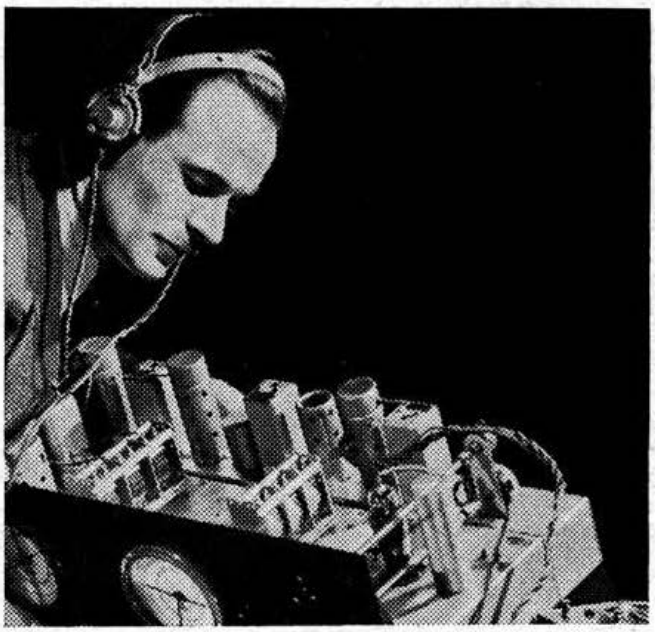

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THE Secretary-Editor will be pleased to consider for publication, articles of technical or general interest. Intending contributors are requested to indicate in advance the scope to be covered by the article under consideration.

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THE T. & R. BULLETIN

OFFICIAL JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

DEVOTED TO THE SCIENCE AND ADVANCEMENT OF AMATEUR RADIO

Hon. Editor: JAMES W. MATHEWS. Secretary-Editor: JOHN CLARRICOATS

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Vol. XVII. No. 1 JULY, 1941

CONTENTS

FROM SERVICE OPERATOR TO POST-WAR AMATEUR

FOR a long while we have felt that a scheme should be evolved whereby Wireless Operators and Mechanics on active service are provided with a document to prove that they have achieved proficiency in accordance with prescribed Navy, Army or Air Force standards. Those who have passed a recent examination for Telegraphist, Signalman, Wireless Operator or Wireless Mechanic know only too well that the standard demanded is far higher than anything the G.P.O. required from an amateur experimenter before the great "Close-Down," yet it seems certain that unless something is done now, the vast majority of Service operators and mechanics who wish to take up, or continue, amateur transmitting after the war will be required to undergo a G.P.O. morse test.

It should be possible, without much difficulty, to provide qualified wireless men on Active Service with a signed certificate setting out the standard reached. These certificates could, we suggest, be prepared at the time of posting, and issued to applicants by the appropriate Trades Test Board.

The recent tremendous boom in membership—no less than 105 applications were approved by Council at its last meeting—provides clear proof of the growing interest in Amateur Radio. The vast majority of these new members, especially those now on active service, will undoubtedly desire to become transmitting amateurs after the war, with the result that applications for licences will descend upon the G.P.O. in hundreds. An arrangement on the lines suggested would materially assist the G.P.O. in dealing with such applications promptly.

The certificate should, we consider, remain valid for three years after the war, after which time an applicant for a licence would be required to take the G.P.O. morse test. It also seems desirable that proof of technical, as well as operating, ability should be included. Just how much weight is likely to be attached to this information we cannot say, but certainly no harm would be done if the "10 watt G" of 1939 could produce evidence to show that he operated a kilowatt service transmitter during the war! There seems little doubt that the technical standard of almost every pre-war transmitting amateur has improved considerably during the past 18 months, a fact which will no doubt be considered when the time comes to re-issue amateur licences.

In the meantime we appeal to every member holding a position of responsibility in any of the three Fighting Services to co-operate with us in bringing to fruition our suggestion that Service operators be given proof of their operating and technical ability. J. C.

A 10 k.c. MULTIVIBRATOR

By J. W. MATHEWS (G6LL)

This instrument has been designed especially for use in conjunction with the Frequency Meter described in the November 1940 issue.

VERY little practical information has been given concerning the multivibrator, but as a study of the circuit in Fig. 1 will show, it is not a very complicated piece of apparatus, and requires only a few components.

It is essentially a resistance-coupled amplifier, with the output fed back to the input, thus giving rise to oscillations of a " square top " formation and rich in harmonics. The frequency of the oscillations is dependent upon the time constant of the grid-anode circuits, or in other words upon the rate of charge and discharge of the grid condensers. It is obvious therefore that the factors governing the frequency are the values of the grid condensers and resistances, and, to a lesser extent, the anode resistances.

Naturally the oscillations thus generated are somewhat unstable, and if listened to on a receiver, produce a rough unpleasant note. Fortunately, however, they are very readily locked by the output from a local oscillator of greater stability, such as that generated by a 100 kc. crystal oscillator. Moreover, since very little locking voltage is required it is possible easily to produce stability on a frequency much less than, but harmonically related to, the fundamental locking frequency.

By this is meant that if we wish to produce 10 kc. oscillations, it is quite feasible to arrange to lock this oscillator from the 10th harmonic of a 100 kc. crystal oscillator.

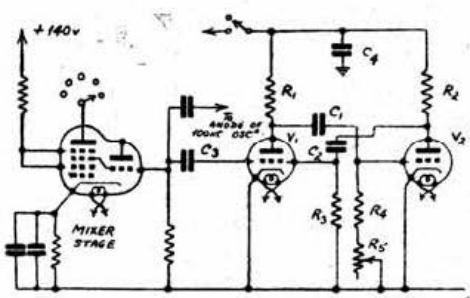


Fig. 1.

Circuit diagram of multivibrator showing method of coupling to the mixer stage in the original frequency meter.

Keyed Components—

R1 40,000 ohms Erie.
R2 40,000 ,, ,,
R3 750,000 ,, ,,
R4 500,000 ,, ,,
R5 250,000 ,, ,,
C1, C2, C3 ·00005μF Dubilier.
C4 2μF ,, Type 9200.
Valves: Mazda HL41.

Other Components—

2 Amphenol Octal valve holders.
1 Bulgin single pole switch, Type S80T.
1 Bulgin double pole switch, Type S104.
1 Bulgin miniature signal lamp, Type D34.

With the particular instrument under consideration, the only concern is with the production of 10 kc. oscillations, and the consistent maintenance of these.

Also the circuit must be suitably modified so that it may be locked from, and also give its output to, the mixer stage in the original frequency meter. This is to ensure that the beat notes between it and the variable oscillator will be audible in the telephones without changing any part of this circuit.

Fortunately no great difficulty is encountered in doing this, and as can be seen from Fig. 1 the input and output voltages are applied to, and taken from the grid of V_1 *via* a ·0005 μF condenser to the triode grid of the mixer stage, to which the output of the 100 kc. oscillator is taken.

The values of components shown are important and should be adhered to, but in order to allow for slight changes the grid leak to V_2 is shown variable. This control may be brought out to the front and used in the final adjustments to ensure that the

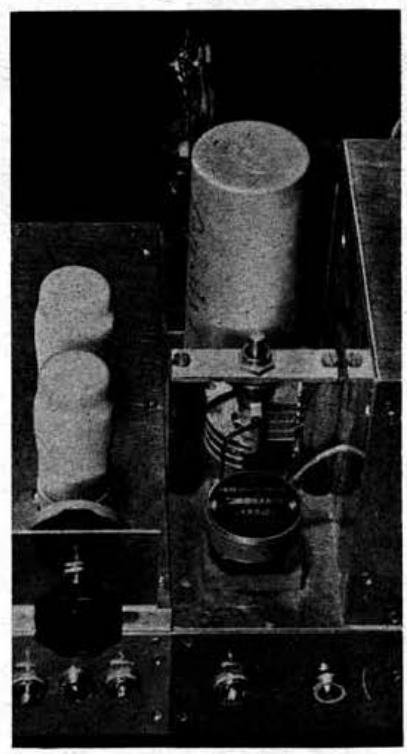


Fig. 2.

Shows the multivibrator attached to the original frequency meter. The left-hand switch controls the heater voltage to the valves, and the right-hand switch the H.T. The signal lamp indicates when the heaters are on.

multivibrator is locking on the 10th harmonic of the crystal oscillator.

Construction and Operation

The instrument is constructed on a brass chassis measuring 10 in. × 3 in. × 2½ in., which will then be found to fit accurately on to the chassis of the original frequency meter so that it may form part of it and draw its sources of H.T. and L.T. from that power supply. The photograph in Fig. 2 shows the complete instrument attached to the frequency meter.

The details of layout and construction can be seen from the photographs. The variable resistance in the grid of V_2 is mounted on a bracket and is seen in the front of the unit in Fig. 2. It might be advantageous to make both the grid resistances variable, in which case they could be mounted one above the other. The unit has a switch in the filament leads as well as the H.T., since it will not be required in operation every time the frequency meter is utilised, and to run the valve heaters needlessly only generates more heat to be dissipated.

It will be found that the method of connecting the multivibrator to the original instrument produces satisfactory harmonics on the 1·7, 3·5, and 7 Mc. bands, but rather weak ones on the 14 Mc. and 28 Mc. bands. These could be increased in strength a little by increasing the output of the variable oscillator at these frequencies.

For calibration purposes the multivibrator is essential since it enables the curves to be drawn accurately to a large scale, thereby making the reading of them quick and easy.

To adjust the instrument, the crystal oscillator should be switched on in order to lock the multivibrator, and the resultant signals listened to on a receiver.

The limits of the 100 kc. oscillator should be noted on the receiver dial, before switching on the multivibrator.

It is then a simple matter to ascertain which harmonics the multivibrator is locking on, and to make adjustments on the variable grid leak, or leaks, until there are 10 points to be counted between the 100 kc. limits on the receiver dial. It should be remembered that the last point should coincide with the 100 kc. mark previously noted.

If the number of points counted are very different from the desired ten, it is probable that the values of some of the resistances, or of the coupling condensers, are not strictly in accordance with their markings and experimental changes should be made accordingly.

Alternatively, instead of using a receiver, the beat notes between the variable oscillator in the frequency meter and the multivibrator harmonics could be listened to by plugging a pair of phones into the jack already provided in the mixer stage. The same procedure of counting beat notes between 100 kc. points should be followed.

Such an instrument when constructed carefully, will be found to be invaluable for calibrating the frequency meter, and also for obtaining marker points on a receiver dial, outside the range of calibration of the meter, and will amply replay any time spent on its construction and adjustment.

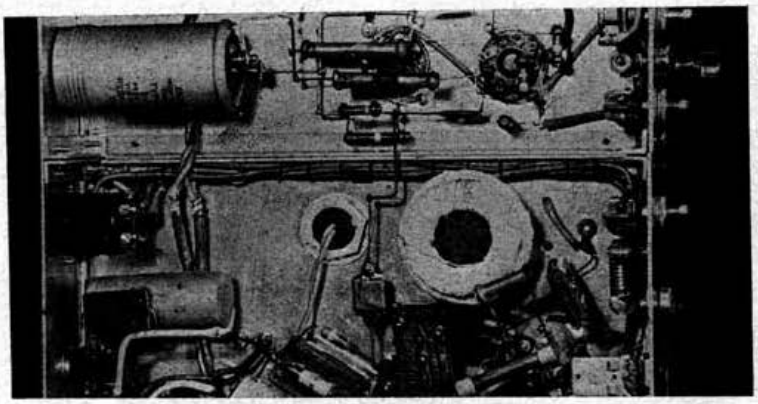


Fig. 3.
Shows the underside of the multivibrator and the layout of the components.

Colonel Angwin Honoured

Warm congratulations are extended to Col. Arthur Angwin, Chief Engineer of the G.P.O., who was created a Knight Bachelor in the last Birthday Honours.

Sir Arthur can rightly be described as a true friend of the British radio amateur, for on many occasions prior to the war, he spoke in high praise of the work done by the Society, and its members. As a practical example of his interest in the R.S.G.B., Sir Arthur who was Chairman of the British delegation, made it possible for our Immediate Past President (Mr. Arthur Watts) to attend the Cairo Telecommunications Conference in 1937, as a semi-official adviser to the delegation.

It was also due to Col. Angwin that the Society was permitted to be represented on several Technical Consultative Committees appointed to prepare for International Conferences. At such meetings Col. Angwin frequently stressed the importance of amateur radio and left no one in doubt of his personal interest in Society activities.

We trust that Sir Arthur and Lady Angwin will enjoy long life and happiness.

ULTRA-HIGH FREQUENCY PROPAGATION*

THE increasing use of ultra-high frequency waves indicates the importance of knowing the characteristics of their propagation. A short summary of the subject is presented in this article.

Although ultra-high frequency propagation is governed by the same laws as ground wave propagation on lower frequencies, many phenomena which are negligible at the lower frequencies become important at the higher frequencies. Trees, buildings and irregularities in the ground produce field distortion in their vicinity as a result of their dimensions being comparable with the wavelength. Further, very small path differences, produce appreciable phase difference. Early experiments established the quasi-optical behaviour of these waves and hence it is possible to apply some of the concepts of optical theory to u.h.f. propagation.

Propagation over Plane Earth

The field at the receiver is due to a combination of direct and reflected waves. The path difference produces a phase difference; in addition, a phase shift (together with a reduction in amplitude) occurs when a ray is reflected by the ground. The reduction in amplitude depends on the dielectric constant and conductivity of the reflecting medium, the angle of incidence of the rays and their polarisation. The magnitude, K, of the reflection coefficient and the phase shift, α, on reflection is shown for various angles of incidence and for horizontal and vertical polarisation in Figs 1 and 2. Fig. 1 is for ground of zero conductivty (Long Island) and Fig. 2 for sea water. It should be noted that for vertical polarisation the reflected wave from sea water lags on the direct wave by the angle shown.

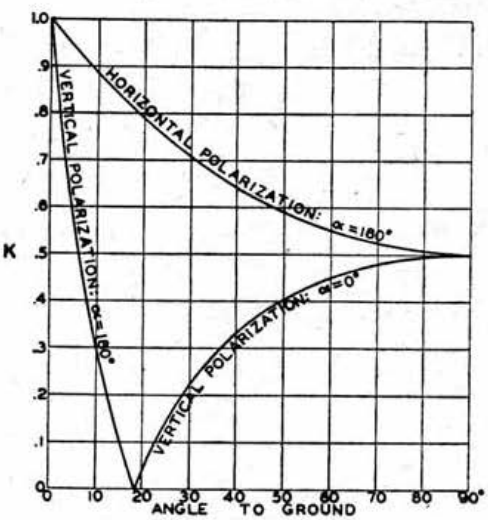


Fig. 1.

Shows the reflection coefficient for both vertical and horizontal polarisation for a ground of zero conductivity and a dielectric constant of 9 (representing Long Island ground), for ultra-high frequencies. In this case the angle at which no reflection takes place for vertical polarisation is about 18°.

The difference in behaviour between horizontal and vertical polarisation on reflection is largely responsible for the differences in propagation of these two polarisations over media of good conductivity. At high frequencies the ratio of vertical to horizontal polarisation field is equal to the dielectric constant. As the frequency is lowered the field increases with vertical polarisation and decreases with horizontal polarisation.

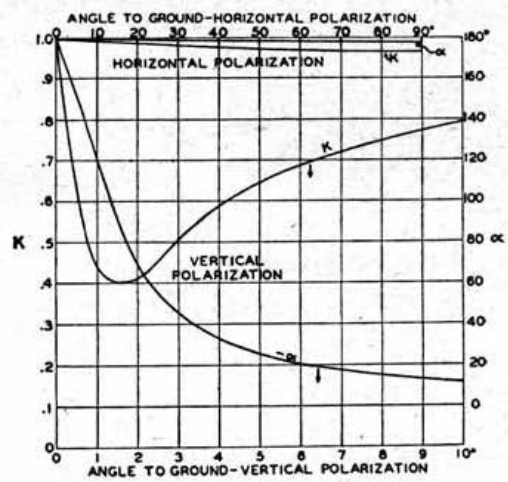


Fig. 2.

The reflection coefficient for sea water for a frequency of 50 megacycles is as illustrated. In this case the dielectric constant is 80 and the conductivity $4 \cdot 10^{-11}$ e.m.u.

The path difference depends on the aerial heights and their separation. When the separation is not large compared with the aerial heights the path difference may amount to several wavelengths. If, then, the aerial height or separation distance is changed, the path difference will change through a number of wavelengths and the field will fluctuate through maxima and minima corresponding to positions where direct and reflected waves are in and out of phase.

The more usual case is when the aerial heights are small compared with their separation. Here it can be shown that, under certain conditions, the field varies inversely as the square of the distance, directly as the aerial heights, and directly as the frequency. In the case of a pure dielectric (*i.e.* the ground) the relation of field to height is found to be

* *A precis of a paper by M. Katzin (W2DTP), R.C.A. Communications, Inc., L.I., New York, published in the September, 1939, issue of "Proc. R.C.A." We acknowledge our indebtedness to author and publishers.*

linear for heights above about ¼ wavelength for horizontal polarisation and above 2 wavelengths for vertical polarisation. For a good conductor (*i.e.* sea water) the field for vertical polarisation shows an initial decrease with increase of height, whereas with horizontal polarisation there is a steady increase of field with height. Thus the great advantage of vertical polarisation for transmission over a good conductor holds only for small aerial heights and at greater heights (above about 84 feet for 50 Mc. transmissions) horizontal polarisation gives greater fields. The inverse square law relation between field and distance has been confirmed by experiments, during the course of which it was noticed that aeroplanes caused large variations in received signal strength as they moved along, due to interference between the signal reflected from the planes and the normal signal.

Similar interference from fixed objects produces a standing-wave pattern in space. Such patterns are experienced near the ground in country districts and can be expected to disappear if the aerials are placed above the interfering objects.

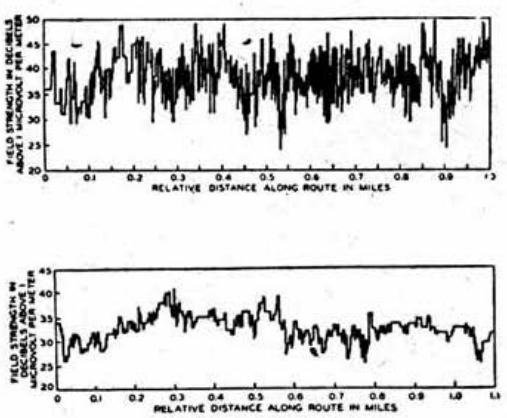


Fig. 3.

Top.—Portion of a record showing the large field strength variations recorded while driving through a business district at a distance of about 1.5 miles from the transmitter.

Bottom.—Portion of a record showing the much smaller variations recorded whilst driving through a residential section of the same town at a distance of about 5 miles from the transmitter.

Urban Characteristics

In urban areas very complicated standing-wave patterns are produced, a slight change in location causing large alteration of field. Entirely different patterns are produced for different frequencies since the phase relationship varies with the frequency. Such effects are of importance in television with its wide band of frequencies, as a distortion of the frequency characteristics results. The effect can be minimised by the use of directive aerials, as this will remove component rays arriving from relatively wide angles. Further, it has been found that the amplitude of the variations is much greater with vertical than horizontal polarisation. An explanation of this is afforded by Fig. 1 where it will be seen that the reflection coefficient for horizontally polarised waves is greater than for vertically polarised. In this case, however, the reflecting surface is vertical and not horizontal like the ground. Hence, the vertical polarisation gives stronger reflected waves. In addition, horizontal polarisation has been found to produce a stronger average field.

The standing wave variations are best illustrated by mobile recording. The contrast between the pattern in the business and residential parts of a city are shown in Fig. 3. From an analysis of many such records it is found that irregular ground decreases the mean average field by about 10 db and imposes a variation of ± 10 db.

Curved Earth

The above considerations apply to a plane earth. To explain propagation beyond the horizon, diffraction and refraction must be considered. The former, depending on the geometry of the circuit, supplies a steady field, while the latter, depending upon temperature, humidity and movement of the air, produces a field, subject to variations. Fading of u.h.f. signals is due to the variations in the refractive index. In addition, reflections from atmospheric irregularities has been demonstrated and probably causes rapid fading.

Diffraction

A rigorous solution of the effects of diffraction is extremely complicated although numerous attempts to assess them have been made. A treatment of the problem for the case of vertical polarisation and based on Maxwell's equations has been worked out. Another method, applying Huyghen's principle, treats the earth as a perfect absorber and allows for reflected ray components. For low aerials it was concluded that the field beyond the horizon could be calculated by applying a correction factor to the field for a plane earth. Further relations between field strength and distance have been obtained by studying experimental data. This last method indicates that at distances beyond the horizon the field varies as a negative power of distance (*i.e.* if both field strength and distance are plotted to a logarithmic scale, a straight line graph is obtained), whereas the theoretical solution based on Maxwell's equations suggests that the relation of field to distance is of exponential form (*i.e.* to obtain a straight line graph, field strength must be plotted to a logarithmic scale and distance to a linear scale.) This theoretical solution has been worked out by Eckersley and Millington and others and their works are all in general agreement. From these theories, and their results in graphical form, the field strength at points beyond the horizon, due to diffraction round the earth's curvature, can be calculated.

Refraction

It has been shown by many workers that received signal strength, especially at points beyond the horizon, is subject to variations. Suggestions that water vapour causes a seasonal variation have been made and the dependence of field strength on air mass conditions has been demonstrated. Strong signals result from temperature inversions in the

(*Continued on page* 36)

MATHEMATICS FOR THE RADIO AMATEUR

By T. R. THEAKSTON, B.Sc. (2DBK).*

SECOND SERIES—PART I

Scope of Series

THESE articles should be regarded as a continuation of the series published in the previous volume. Subjects dealt with will be " Trigonometry " and " Alternating Current " (with their necessary applications), together with certain aspects of mathematics and radio omitted from Series I.

The author will be pleased to receive requests for the special consideration of any subject within the projected scope.

PART I.—TRIGONOMETRY

Trigonometry is the branch of mathematics dealing with the properties of triangles, and with the relations between certain functions (called trigonometrical ratios) of angles.

Some symbols.

$\angle$ = angle.
$\triangle$ = triangle.
$>$ = greater than.
$<$ = less than.
$\perp$ = perpendicular to.

Definition.

In a right-angled $\triangle$ the side opposite the right angle (and therefore the longest side) is called the *hypotenuse* of the $\triangle$.

Angles

Definition.

If the line OX in Fig. 1a revolves round the point O to a new position OP, then the amount of rotation is the angle between OX, the original position, and OP of the new one.

It is agreed to call the angle formed by a counter-clockwise rotation as +ve.; and for a clockwise rotation, *i.e.* so that OP is below OX, as −ve.

Nomenclature.

This angle is called " Angle P,O,X " and written as $\widehat{POX}$. It should be noted that $\widehat{POX}$ can also be written $\widehat{XOP}$. In naming an angle, one passes from one arm along to the vertex (*i.e.* " point "), and then along the other arm, the letter at the vertex thus being the central one of the three. Thus $\widehat{ABC}$ has vertex at B; $\widehat{XYZ}$ has vertex at Y; etc.

When no confusion can arise, that is when at a given point one could only be considering one angle, a further abbreviation is possible; $\widehat{POX}$ can be shortened to $\hat{O}$, meaning the angle at O.

When speaking of angles generally, as in formulæ, letters of the Greek alphabet are commonly used. The one chiefly in use is θ, pronounced " theta."

* "Westwood," Heslington Lane, Fulford, York.

Units.

Angles are measured in two ways.

(1) In degrees :—The unit here, 1° (1 degree), is $\frac{1}{360}$ of the angle swept out by OP if it completed a circle and came back to its original position OX. There are the further subdivisions into minutes and seconds, which are related as,

$$60'' \text{ (seconds)} = 1' \text{ (minute)}$$
$$60' = 1°$$

(2) In radians :—A radian is the scientific unit of angular measurement, and is the angle subtended at the centre of any circle by an arc equal in length to the radius of the circle. *E.g.*—An arc 1 inch long would subtend an angle of 1 radian at the centre of a circle of radius 1 inch.

$$\text{In Fig. 1, O in radians} = \frac{\text{arc}}{\text{radius}} = \frac{\text{arc PX}}{\text{OX}}$$

Relation between radians and degrees.

Consider OP revolving in Fig. 1a.

If it completes a circle, the angle through which it has turned = 360°.

The arc subtended by this angle = circumference of circle

$$= 2\pi \times \text{radius}$$

$$\therefore \text{No. of radians swept out by OP} = \frac{\text{arc}}{\text{radius}} = \frac{2\pi \times \text{radius}}{\text{radius}} = 2\pi.$$

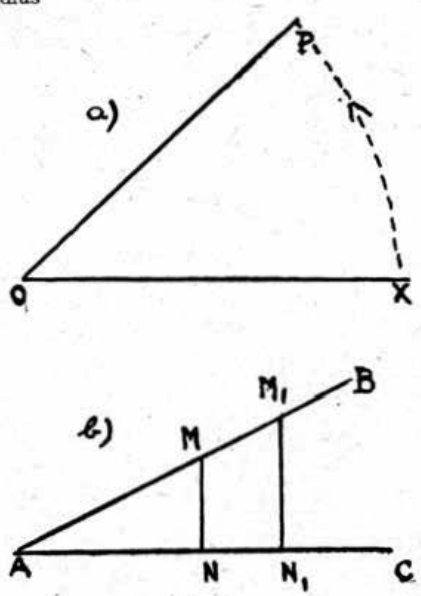


Fig. 1.
(*a*) The formation of an angle.
(*b*) The trigonometrical ratios of angle A are obtained from triangle AMN.

i.e. 2π radians $= 360°$.

Conversion of units.

(i) $360° = 2\pi$ radians

$$\therefore 1° = \frac{2\pi}{360} = \frac{\pi}{180} \text{ radians}$$

$$\therefore d° = d \times \frac{\pi}{180} \text{ radians}$$

$$= d \times 0{\cdot}01745 \text{ radians.}$$

(ii) 2π radians $= 360°$

$$\therefore 1 \text{ radian} = \frac{360°}{2\pi} = \frac{180°}{3{\cdot}1416}$$

$$= 57{\cdot}2958°; \text{ or } 57° 17' 44''.$$

$$\therefore r \text{ radians} = r \times 57{\cdot}2958°.$$

Trigonometrical Ratios

In Fig. 1b, $\overset{\frown}{BAC}$ is any angle. From M, any point in the arm AB, a line MN is drawn $\perp$ AC. Disregarding M_1N_1 for the time being, and considering $\hat{A}$ and the right-angled $\triangle$ AMN,

MN is the side opposite to $\hat{A}$
AM is the hypotenuse
AN is the side adjacent to $\hat{A}$.

We have then the following ratios :—

$\frac{MN}{AM} = \frac{\text{opposite side}}{\text{hypotenuse}}$ is called the *Sine* of $\hat{A}$

$\frac{AN}{AM} = \frac{\text{adjacent side}}{\text{hypotenuse}}$ is called the *Cosine* of $\hat{A}$

$\frac{MN}{AN} = \frac{\text{opposite side}}{\text{adjacent side}}$ is called the *Tangent* of $\hat{A}$

Note.—Many text-books use the words " base " and " perpendicular " for AN and MN respectively. The author has found, however, when teaching these first steps in trigonometry, that the terms used in the definitions above are less confusing should the $\triangle$ be in any position other than the one given in Fig. 1b.

These three principal ratios are abbreviated in notation to sin, cos and tan respectively. Thus, in $\triangle$ MAN

$$\left.\begin{aligned} \frac{\text{opp.}}{\text{hyp.}} &= \frac{MN}{AM} = \sin A \\ \frac{\text{adj.}}{\text{hyp.}} &= \frac{AN}{AM} = \cos A \\ \frac{\text{opp.}}{\text{adj.}} &= \frac{MN}{AN} = \tan A \end{aligned}\right\}$$

There are three other ratios, which are reciprocals of those given. They are :—

Cotangent of $\hat{A} = \frac{1}{\tan A}$ $\quad\therefore \frac{AN}{MN} = \cot A$

Secant of $\hat{A} = \frac{1}{\cos A}$ $\quad\therefore \frac{AM}{AN} = \sec A$

Cosecant of $\hat{A} = \frac{1}{\sin A}$ $\quad\therefore \frac{AM}{MN} = \text{cosec } A$

It must be observed that these functions sin, cos, tan, cot, sec and cosec are ratios between certain lengths ; therefore they are in simple numerical form.

Further, the functions for a particular angle are constant. Thus when we say that sin $30° = \frac{1}{2}$, we mean that for an angle of 30°, when any right-angled $\triangle$ is drawn to include the angle, in every case the ratio $\frac{\text{side opposite the } 30°}{\text{hypotenuse}} = \frac{1}{2}$.

Hence in Fig. 1b, if other points M_1, M_2, etc., are taken, and perpendiculars M_1N_1, M_2N_2, etc., are drawn, then

$$\frac{MN}{AM} = \frac{M_1N_1}{AM_1} = \frac{M_2N_2}{AM_2} = \text{etc.} = \sin A.$$

If A is 30°, 45°, 60°, 90°, 0°, this ratio sin A = 0·5, 0·7071, 0·866, 1·0, 0·0 respectively.

Reading Tables

The values of all the trig. ratios for angles from 0° to 90° are given in tables. (*E.g. Four-Figure Mathematical Tables*, by Knott. Chambers. Price 8d.) Single line extracts are given in Table I.

To find the value of sin 37°, one turns to the table of Natural Sines. Opposite 37 in the left-hand column is found the value 0·6018. Sin 37 = 0·6018.

Suppose sin 37° 30′ (37·5°) is required. Its value is found in the same row, opposite the 37, but in the vertical column marked at the top 30′. Sin 37° 30′ = 0·6088.

Some tables give the fractional part of 1 degree in decimal form. That is, 30′ will be marked as ·5, 15′ as ·25, etc., in the top horizontal column.

The value of a ratio not given directly in the table may be required. (Tables usually rise in steps of either 3′ or 6′ between each degree.) *E.g.*— Required sin 37° 26′. The table gives us sin 37° 24′ (37·4°) = 0·6074. From the columns of mean differences we find, below the 2, and keeping on the same horizontal row, the figure 5. This is added to 6074, and gives us sin 37° 26′ = 0·6079.

The values in the mean differences are *added* for Sines, because sin θ increases as θ increases from 0° to 90°.

On the contrary, inspection of the tables of Cosines reveals that the value of cos θ decreases as θ increases from 0° to 90° ; hence mean differences must be *subtracted*. *E.g.*—Cos 71° 43′ = Cos (71° 42′ + 1′) = (0·3140 − 3) = 0·3137. It should be noted here that in tables of Cosines, Cotangents and Cosecants (*i.e.* the " Co-ratios ") the mean differences are subtracted.

Complementary angles.

When the sum of two angles = 90° (one right-angle) they are said to be *complementary*.

Some collections of tables give a separate table for each of the six ratios. This is not really necessary, although perhaps of maximum convenience. Instead a trig. property of complementary angles is frequently used to give all the requisite ratios in three tables.

Consider Fig. 1b.

The sum of the angles of any $\triangle = 180°$.

By construction, $\hat{N} = 90°$

$\therefore \hat{A} + \hat{M} = 180° - 90° = 90°$,

$\therefore \hat{A}$ and $\hat{M}$ are complementary.

$$\text{Now } \sin A = \frac{\text{opp. (to } \hat{A})}{\text{hyp.}} = \frac{MN}{AM}$$

$$\cos M = \frac{\text{adj. (to } \hat{M})}{\text{hyp.}} = \frac{MN}{AM}$$

i.e. sin A = cos M

or, sin (angle) = cos (complementary angle).

In a similar way, tan A = cot M; sec A = cosec M. And in general terms,

$$\text{Sin } \theta = \text{Cos } (90 - \theta)$$
$$\text{Tan } \theta = \text{Cot } (90 - \theta)$$
$$\text{Sec } \theta = \text{Cosec } (90 - \theta)$$

E.g.—If we know that sin 37° = 0·6018,

$$\therefore \cos (90 - 37)^\circ = \cos 53^\circ = 0{\cdot}6018.$$

If tan 63° 15′ = 1·9841,

$$\therefore \cot (90^\circ - 63^\circ\,15') = \cot 26^\circ\,45' = 1{\cdot}9841.$$

Thus tables giving the values of sin θ, tan θ, sec θ, from θ = 0° to 90°, also give values for cos θ, cot θ, cosec θ, respectively from 90° to 0°.

Some tables are arranged so that two ratios can be read from each table. One will give, in addition to the values of the Sines of angles, the values of the Cosines. The Sines will be read "down" the table, and the Cosines "up" the table. This is shown in the miniature extract of Table II.

Examples

Simple examples based on the △ AMN of Fig. 1b will demonstrate the use of these trig. ratios.

(*a*) Let AM = 10 in.; $\hat{A} = 35^\circ$.

Required the length of MN.

$$\frac{MN}{AM} = \sin A = \sin 35^\circ = 0{\cdot}5736$$

$$i.e. \frac{MN}{10} = 0{\cdot}5736$$

$$\therefore MN = 0{\cdot}5736 \times 10 = 5{\cdot}736 \text{ inches.}$$

(*b*) AM = 10 in.; $\hat{A} = 50^\circ$; required AN.

$$\frac{AN}{AM} = \cos A = \cos 50^\circ = 0{\cdot}6428$$

$$i.e. \frac{AN}{10} = 0{\cdot}6428$$

$$\therefore AN = 0{\cdot}6428 \times 10 = 6{\cdot}428 \text{ inches.}$$

(*c*) MN = 6 in.; $\hat{A} = 60^\circ$; required AN.

$$\frac{AN}{MN} = \cot A = \cot 60^\circ = 0{\cdot}5774$$

$$i.e. \frac{AN}{6} = 0{\cdot}5774$$

$$\therefore AN = 0{\cdot}5774 \times 6 = 3{\cdot}4644 \text{ inches.}$$

(*Note.*—For every pair of sides of a △, there are two trig. ratios, one the reciprocal of the other, each of which will include the two sides in question. Thus linking MN and AM in (*a*) there is, in addition to $\sin A = \frac{MN}{AM}$, the ratio $\frac{AM}{MN} = \text{cosec } A$. Taking the alternative ratio in Example (*c*), the working would have been as follows:—

$$\frac{MN}{AN} = \tan A = \tan 60^\circ = 1{\cdot}7321$$

$$i.e. \frac{6}{AN} = 1{\cdot}7321$$

$$\therefore AN \times 1{\cdot}7321 = 6$$

$$\therefore AN = \frac{6}{1{\cdot}7321}$$

$$= 3{\cdot}4644 \text{ as before.}$$

The evaluation here entails division by the decimal quantity, whereas when the ratio cot A was used, multiplication only was necessary. To aid one in selecting the ratio (from the two which are possible always) which gives least arithmetical work, it should be remembered that the one which is chosen should be that with the unknown side in the *numerator*.

Thus requiring MN and given AN, sin A would be used; requiring AM and given AN, sec A would be used; etc.)

The three examples given demonstrate the fact that in any right-angled △, given the length of any one side and the size of another angle, with the aid of trig. tables the lengths of the other sides can be determined.

Conversely, given the lengths of two sides of a right-angled △, the sizes of the angles can be found.

The most obvious use of this is to calculate

Degrees	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Differences				
	0·0°	0·1°	0·2°	0·3°	0·4°	0·5°	0·6°	0·7°	0·8°	0·9°	1′	2′	3′	4′	5′
36	·5878														
37	·6018	6032	6046	6060	6074	6088	6101	6115	6129	6143	2	5	7	9	12
38	·6157														

(*a*) Natural Sines.

70	.3420														
71	.3256	3239	3223	3206	3190	3173	3156	3140	3123	3107	3	6	8	11	14
72	.3090														

(*b*) Natural Cosines.

Table I.

Single line extracts from the Tables of Sines and Cosines.

heights or distances of objects, usually inaccessible, when direct measurement is impossible.

(*d*) Suppose in Fig. 1b MN is a distant tower which is known to be 220 ft. high. At A, a distant point, the angle of elevation (angle through which a telescope, originally horizontal, at A would have to be elevated so that M could be sighted) is found to be 5° 12′. The distance of A from N, the foot of the tower is required.

$$\frac{AN}{MN} = \cot A = \cot 5° 12' = 10 \cdot 988$$

$$i.e. \frac{AN}{220} = 10 \cdot 988$$

$$\therefore AN = 10 \cdot 988 \times 220$$

$$= 2417 \cdot 36 \text{ feet.}$$

(*e*) Again using Fig. 1b, suppose M,N are two points exactly opposite to each other and on opposite banks of a river, the width of which is unknown and required.

If at right angles to MN, *i.e.* normally along the bank, a known distance NA is measured out, and the angle subtended by MN at A found, the width MN can be calculated.

Suppose the measured distance AN = 100 yds.; the measured angle A = 24°.

$$\frac{MN}{AN} = \tan 24° = 0 \cdot 4452$$

$$i.e. \frac{MN}{100} = 0 \cdot 4452$$

$$\therefore MN = 0 \cdot 4452 \times 100 \text{ yds.}$$

$$= 44 \cdot 52 \text{ yards.}$$

Sines		
0	·0000	90
19	·3256	71
37	·6018	53
55	·8192	35
70	·9397	20
90	1·0000	0
	Cosines	

Table II.

A miniature illustration of a Table which uses the Trigonometrical properties of Complementary Angles.

Suggested Exercises

Clearly, the first task is to become thoroughly familiar with (i) the ratios as defined and named; (ii) reading tables; and (iii) evaluating an unknown side in a △, using the trig. ratios.

For (i) and (ii), different types of right-angled triangles can be drawn, the sides and angles measured, and from these measurements the ratios calculated—all the ratios for each angle being evaluated. Then, by reference to tables and knowing the size of the angles, the values of sin, cos, etc. (derived arithmetically) can be checked. There should be a fairly close approximation of result. For (iii), examples should be constructed. *E.g.* "Required the hypotenuse in a right-angled △ when the side opposite an angle of 40° = 3 inches"; etc. Working out the result by trig. the △ could then be drawn to scale as an approximate check.

Problems

(1) A △ ABC has $\hat{B}$ the right-angle; AB = 3″.; CB = 4″.; AC = 5″. Write down the values of sin, cos, tan, cot, sec, cosec (*a*) for $\hat{C}$; (*b*) for $\hat{A}$.

(2) Write down from tables the values of:—sin 58°; sec 70° 16′; cos 75°; cosec 85° 43′; cot 29° 37′; tan 51° 24′.

(3) Change to radians, 60°; to degrees, 1·25 radians.

(4) What is θ if (*a*) sin θ = 0·5195; (*b*) tan θ = 1·1592; (*c*) cosec θ = 1·6759?

(5) A right-angled △ ABC has $\hat{B}$ = 90°; $\hat{C}$ = 50°; AC = 5″. What is the length (*a*) of CB; (*b*) of BA?

(6) A vertical pole has an angle of elevation of 30° at a point 60′ from its foot. What is its height?

Solution to Problems (Vol. 16, No. 12)

(34) (*a*) 24; (*b*) 30; (*c*) 57; (*d*) 61; (*e*) 1.

(35) (*a*) $W = \frac{E^2t}{R}$; (*b*) $E = \sqrt{\frac{RW}{t}}$;

(*c*) W = 120 joules.

(36) (*a*) $I = \frac{E}{2\pi fL}$; (*b*) $E = 2\pi fLI$; (*c*) $L = \frac{E}{2\pi fI}$.

(37) $L = \left(\frac{\lambda}{1 \cdot 885}\right)^2 \times \frac{1}{C}$, or $= \frac{\lambda^2}{3 \cdot 553 \times C}$.

(38) "The impedance (Z) of a circuit is equal to the square root of the sum of the squares of the resistance (R) and the reactance (X)."

(39) (*a*) 7; (*b*) 144; (*c*) $\frac{2}{3}$; (*d*) $1\frac{1}{2}$; (*e*) ±5; (*f*) 7 or 2.

(To be continued.)

Book Review

ELEMENTARY MATHEMATICS FOR WIRELESS OPERATORS. By W. E. Crook, A.M.I.E.E., A.F.R.Ae.S. Published by Sir Isaac Pitman & Sons, Ltd., London, 63 pages; Price 3s. 6d.

The present day wireless operator, unlike his predecessor of that other Great War, must possess a sound elementary knowledge of mathematics as well as radio theory.

This new *Pitman* publication from the pen of Mr. W. E. Crook, provides a clear explanation of the essential maths. which an operator will need in order to qualify him for a job of responsibility. The five chapters deal with Arithmetic, Algebra, Geometry and Trigonometry, Graphs and Mechanics.

It is safe to say that anyone who makes a diligent study of the subject matter prior to enlisting will "walk away" with a mustering examination.

Air Cadets, too, will find the book of very great assistance in their studies for Air and Ground Crews. The examples have a topical appeal, whilst the text is livened by nearly 50 diagrams.

We most strongly recommend this publication to all who wish to brush up their maths., without being bored to tears.

J. C.

EXPERIMENTAL SECTION

IT is proposed this month to discuss the generation of audio frequency oscillations for modulating a Signal Generator. The simplest method is to use such a value of grid leak and condenser for the R.F. oscillator that the valve super-regenerates at audio frequency; the resulting R.F. will then be modulated at that frequency. This method is neither convenient nor very satisfactory, and a separate A.F. generator is to be recommended. In the ideal case a beat-frequency oscillator should be used, but this would be very expensive and the construction of a suitable instrument is outside the scope of these notes.

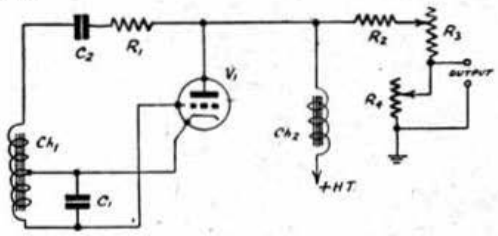


Fig. 1.

V1	30 (battery) or 27, 37 or 6C5.
C1	·05 μF.
C2	·02 μF.
R1	50,000 ohms.
R2, 3, 4	250,000 ,,
Ch1 and Ch2	= 12 to 15 H. chokes.

One of the chief problems in the design of A.F. oscillators is the wave form of the oscillation. We are not so much bothered with this difficulty in R.F. circuits because the latter are more sharply tuned and the fundamental is amplified to a greater degree relative to the harmonics. Waveform can be considerably improved by the use of negative feedback and for the best results the valves should either be under-run or automatic oscillation control fitted (see April, 1941, issue). It is also advisable to reduce the iron cores to the bearest minimum and transformer output should be avoided if possible.

Two very simple but effective circuits are shown in Figs. 1 and 2. Almost any triode will function as an oscillator and an output of 4 to 5 volts should be obtained with no appreciable harmonic content.

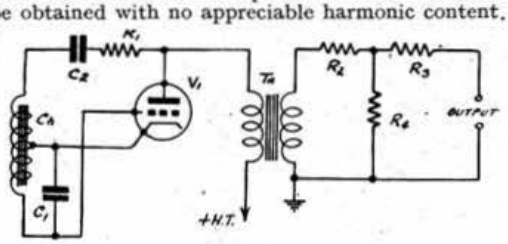


Fig. 2.

V1	30 or 27, 37, or 6C5.
C1	·05 μF.
C2	·02 μF.
R1	50,000 ohms.
R2, 3	100 ohms.
R4	150 ,,
TR	= Small A.F. transformer.
Ch	= 12 to 15 H. choke.

Fig. 1 shows a circuit arranged for high impedance output, whilst Fig. 2 shows a circuit whose output impedance is about 200 ohms. This latter value is suitable for testing amplifiers with low impedance inputs as well as for signal generators.

The circuits as shown are arranged for a fixed frequency of about 400 c.p.s., but any other desired frequency can be obtained by altering the value of C_1 or fitting several condensers, which may be selected by a multi-point switch. Care should be taken to reduce R_1 if high capacities are used, otherwise harmonic distortion will be introduced.

An interesting circuit for the production of audio frequencies was shown in the March, 1941, issue of *Television and Short Wave World*. G5HF.

Detecting Metallic Foreign Bodies

On May 16 a speaker on the German radio described a new device by which, he claimed, bullets, shell splinters, needles, and other metal objects can be readily located. This metal-finder, developed by the firm of Siemens and their medical advisers, depends on the use of a high-frequency oscillator of small intensity. The tuning coil of a small short-wave transmitter is fitted into a sterilisable porcelain probe, 10 cm. long and 10 mm. in diameter; if this coil approaches a metallic substance—such as a splinter in the operation area—the inductance of the coil will change, and hence so will the frequency of the transmitter. The change of frequency, which may be very minute, can be made audible by combining these oscillations with those of a second short-wave transmitter oscillating at a slightly different frequency, and so obtaining oscillations at the beat frequency, amplifying them and passing them to a loud-speaker. The apparatus has an equally good reaction to all metals, including the large group of light metals now being increasingly used which cannot be located by magnetism. It is also extremely sensitive and can trace the minutest particles. Tests carried out during more than a hundred operations have proved its worth, and so far it has never failed, even in such delicate cases as the localisation of a sewing needle in the lungs or a splinter the size of a pin's head in the knee-joint. On the contrary, " such difficult operations can only be attempted with the hope of certain success," said the broadcaster, " with the aid of the metal-finder." The apparatus is so sensitive that all metal instruments within a 10 cm. radius must be removed while the probe is in use; porcelain towel clips have therefore been introduced and have proved satisfactory. The Germans are hoping to begin distribution of the apparatus to hospitals and field hospitals within the next few months.—*Extract from " The Lancet " dated May* 31, 1941.

An Offer

Mr. W. H. Gundill, BRS1151, Sawley House, Dewsbury, Yorks, will be pleased to donate a collection of recent back issues of *QST* to any member on active service.

Order Please!

Lt. Don Knock, VK2NO, sends this gem from a Wireless Theory exam. paper. " The electrons in a triode valve cause an intense state of disorder, and the grid is put there to restore order." B.V.A. please copy!

KHAKI AND BLUE

Congratulations to W. E. (Bill) Brigden, G6WU, who has been promoted to the rank of Lt.-Com., R.N.V.R. G6WU, a prominent DX phone operator before the war, recently had the pleasant surprise of meeting one of his regular " contacts " in person—Andrew Boa, SU5BO ex-G5BO. " BO " is still in Alex., having left North London some years ago to serve with *Cables and Wireless, Ltd.*

* * *

Congrats. also to Ian Orr-Ewing, G5OG, on his promotion to Wing Commander—the first ham to reach this high rank from " scratch." Ian was commissioned to the R.A.F.V.R. on September 3rd, 1939.

* * *

After an appreciable delay news has at last come to hand from F./Lt. Stan Henton, G5VU. With him in the Middle East are F./Lts. Maurice Brookes, G5OI, and Starkey, GW6KY, as well as F./Lt. Maddox, BRS3828, and F./Lt. Money, BRS4267. In an early reference we confused Mr. Money with G2UP who bears the same name. Stan Henton reports having met Bill Marsh, SU1WM, and S./Ldr. Assig, G5HI. He is looking forward to that Victory Convention. Aren't we all ?

* * *

Sgt. Harry Waddington, one-time operator of ZB2B, is now living at 10 Somerset Street, Llandudno. He will be pleased to hear from old friends.

* * *

From G5US we learn that Capt. E. Shackleton, G6SN, who was captured at St. Valerie last year, is fit and well except for a sore back due to sunbathing !

* * *

Writing from Binghampton, New York, on May 15, Sgt. T. Wimbush, SU2TW, G6HP, advised us of an impending move to Port Albert, Ontario. During his stay in America he had a very enjoyable time but was unable to go on the air. Tom, who saw much service abroad before the war, has been awarded the General Service Medal and the " Palestine " clasp.

* * *

L.A.C. G. V. Catt, G4FV, now stationed in Sussex, met G3CC and W2JGH whilst on a Wireless Mechs. course last month. He has also enjoyed a personal QSO with ZU6P who is in the R.A.F. If John Ayre, G3AT, should see this paragraph he is asked to write to 4FV *via* his home address.

* * *

Friends of F. M. Caine, G5CN, will be interested to hear that he is now a P./O. in the R.A.F. Mr. Caine's home address is " Riverside," Promenade, West Kirby, his previous home in Wallasey having been damaged.

* * *

Cpl. J. D. Morris, 2DRR, who is serving as a Radio Mechanic, with G5MY in Scotland, would like to hear from G4HK and 2BKO *via* his home address, 17 Lynton Road, Heaton Moor, Stockport, Ches.

* * *

After six months R.A.F. service in Western Scotland, L.A.C. Raymond Evans, G6CU, has been posted to No. 2 S.S. preparatory to leaving for overseas with G8DM and VE3AKQ.

* * *

Guernsey members now living in England will be interested to hear that F./O. F. E. Atkins, G3ZU, has been serving with the R.A.F. since May, 1940.

* * *

Cpl. Middle, G4CM, is serving with the R. Signals in Aden. When he wrote in April he was fit and well.

* * *

Writing from H.M.S. *Hermes*, R. Foster, GW4LK, ex-BERS444, reports promotion to P.O. Tel. He always carries with him a pack of QSL cards, but so far has had little chance of meeting hams. Those contacted have given him a very good time.

* * *

Sgt. J. D. Cameron, GM8CN, who recently had the pleasure of meeting G6TI of Ipswich, has now moved into Berks, where he is looking forward to a contact with G8PX of Oxford, and other local hams. His service address can be obtained from G8PX.

HONEYMOON !

P./O. Jimmy Watson, G6CT (*right*) on honeymoon somewhere in Devonshire. Here he is with F./O. Noel Simmons, G3AD.

Cpl. L. Mottershead, BRS4090, and L.A.C. J. Collins, BRS4088, who are attached to an R.A.F. station in N.E. Scotland, would like to hear from BRS3788, G3CI, 3GW and 5MY. Letters should be sent to BRS4090, c/o. 55 Lorne Road, Clarendon Park, Leicester, his home address.

* * *

James McK. Archer, GM4GR, a 1st Radio Officer in the Merchant Navy, has been getting around the world a bit. During a visit to the New York World's Fair he had the good fortune to meet many American amateurs at W2USA. He sends 73 to all old friends.

* * *

A Nice Gesture

Due to prevailing conditions and the dispersal of members, it has not been possible to continue regular Club meetings in Gibraltar. Acting in accordance with the wishes of his colleagues, Tel. Rowland Beardow, G3FT, has forwarded to Headquarters the balance of cash in hand amounting to 9/6.

The Council has much pleasure in acknowledging receipt and desires to record its appreciations to Mr. Beardow and his friends.

Sticker Stories

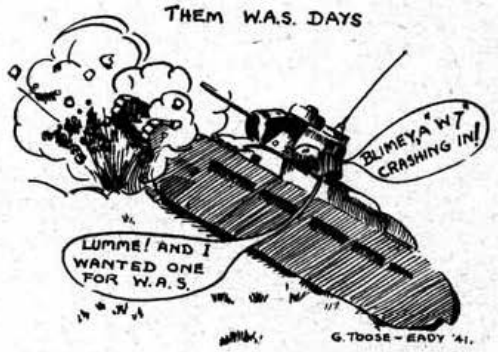
Every month we hear of ham contacts being established through the medium of the R.S.G.B. sticker. 2HAX of Reading, for example, found himself stationed near Bolton. Shortly after arrival he chanced to see a car bearing a sticker being cleaned—result a personal QSO with 2BTO and other local members.

If *you* have a good Sticker Story send it in, and don't forget the new R.S.G.B. publicity poster which is issued free, on application, from Headquarters.

Sgt. G. Barrett, G8IP, is serving with the R.A.F. somewhere in Northern Ireland.

VK. Hospitality

Jim Corbin, VK2YC, and his colleague, Wal Ryan, VK2TI, extend a warm welcome to any member who finds himself near Sydney, New South Wales. Jim can be reached on Mascot 560 at any time, as can Wal Ryan, whose telephone number is FX3305. The latter is Hon. Secretary of W.I.A., N.S.W. Division.



73 •

G3IP (15 Checker Street, King's Lynn), to G2NJ, 2SO, 3HB, 3HG, 8BW, 8GI, 8QJ, 8TL, GM3UA, 3LO, GW4CZ.

* * *

G3LB (R.A.F.), to G3AH, 3AO, 3HZ, 3IP, 3IR, 3MR, 3SR, 4JN, 8HG, 2FPM, EI5L, W8OGK.

* * *

G3YY (1A Dover Road, Brighton), to G2HV, 2XC, 3PR, 3SS, 5PP, 6FU, GW2UH, 3YL, GM6WD, 2AAH, 2CIL, and BRS3003.

* * *

G5CI (Whitstable, Kent), to G2UJ, 3BD, 3TO, 4BY, 4FI, 5PY, 6FV, 2AAN, 2AXU, 2BIB.

* * *

G5RL (R.A.F.), to G3NC, 4GG, 5DR, 8NS, 8OR, 8ST, 2DSL, 2AHP, BRS1357, ZL2MN, and all District 8 members.

* * *

G6BP (R.A.F.), to G3BN, 3IJ, 3HJ, 3RN, 3UY, 5LK, 5NF, 6GZ, 6XM, 8CV, GM3UA, 2DDX.

* * *

G8SM (134A Walton Road, E. Molesey, Surrey), to G2YN, 3AH, 3BR, 6PK, 8DI, 8IP, 8MK, GI5QX, 5UW, 6TK, 2AMW.

* * *

GW6AA ("The Flagstaff," Colwyn Bay, N. Wales), to G2MF, 2RF, 6WH, 8JV, GW2PH, 3GL, 3JI, 5OD, 6KY, 8JY, VU2FO (G2DC), and all old Snowdon 56 Mc. Test co-operators.

* * *

BRS3766 (R.C. of S.), to G2MN, 2XS, 3BW, 3RK, 3RW, 3UC, 5QO, 8SA, BRS2999, 3468, 3821, VE5ZM.

* * *

VE5ZM (R.A.F.), to G2LB, 2MI, 3HT, 5LT, 6NF, 6UR, GI6TK, VE3SG, VS2AL, VU2FX, ZS6DM.

* * *

ON ACTIVE SERVICE

TWENTY-SECOND LIST

WE publish below our twenty-second list of radio amateurs on active service. Additional details and corrections should be advised to Headquarters as early as possible. The present list contains information received up to July 1, 1941.

Rank and Name	Regiment or Branch	Pre-war Call or B.R.S.
Sig. W. D. Andrews ...	R.C. of S. ...	2DHM
L.A.C. W. F. Badcock...	R.A.F. ...	2BAP
A.C.2 J. L. Bell ...	,, ...	2BJI
Tpr. M. C. Blake ...	Royal Tank Corps	2CJB
A.C.2 G. Bonner ...	R.A.F. ...	4259
A.C.2 E. Brown ...	,, ...	4235
P./O. F. M. Caine ...	,, ...	G5CN
L./Tel. R. A. Hutcheson-Collins.	R.N. ...	4250
Gnr. W. J. Cook ...	R.A. ...	2454
Cpl. G. Crawley ...	R.A.F. ...	4276
A.C.1 W. T. Creighton	,, ...	4242
A.C.2 J. Dain	,, ...	2FMM
A.C.2 S. Dennis ...	,, ...	3674
Sig. A. C. Emeny ...	R.C. of S. ...	4238
2nd Lt. R. A. Fell ...	,, ...	2826
A.C.2 A. M. Fyfe ...	R.A.F. ...	4230
P.O. Tel. G. R. Frood...	R.N. ...	4264
Pte. D. W. Haigh ...	R.A.C. ...	2403
A.C.2 G. G. P. Holden...	R.A.F. ...	2HIX
Capt. M. Holden ...	R.W.A.F.F.	BERS 410
P.O. Tel. J. Kippax ...	R.N. ...	G8AK
Sig. R. W. Lay ...	R.C. of S. ...	4268
A.C.2 W. F. Leivers ...	R.A.F. ...	2APT
Air Com. O. G. Lywood, C.B.E.	R.A.F. ...	4243
Ft./Lt. A. T. Mathews	,, ...	4258
Sgt. H. E. Mead ...	,, ...	4278
Cpl. S. R. Minson ...	,, ...	2FGB
Ft./Lt. R. W. Money...	,, ...	4267
A.C.2 F. Monk ...	,, ...	4297
L.A.C. T. G. Morriss ...	,, ...	4234
L.A.C. R. H. Newland	,, ...	G3VW
L.A.C. P. N. Nield ...	,, ...	G8SH
A.C.1 C. C. Piper ...	,, ...	4280
2nd Lt. V. G. Prins ...	R.C. of S. ...	2HIU
Cpl. A. Rose	R.A.F. ...	4270
A.C.2 M. Salter ...	,, ...	4233
A.C.2 H. S. Sayers ...	,, ...	4277
A.C.1 L. Sisson ...	,, ...	4239
A.C.2 R. Sloan... ...	,, ...	4281
A.C.1 F. G. Stangle ...	,, ...	4228
Writer T. L. Stevens ...	R.N. ...	G3XV
L./Cpl. B. H. Stubbs ...	R.A.O.C. ...	1735
Tel. R. P. Swaffield ...	R.N. ...	G3JM
Sgt. P. Taylor	R.A.F. ...	4237
A.C.1 C. S. Vane-Tempest.	,, ...	4285
O./Tel. J. Thomson ...	R.N. ...	2929
Pte. A. B. W. Wales ...	Argyle & S. Highlanders	3644
P./O. J. E. P. Walford	R.A.F. ...	2FVN
Pte. A. T. W. West ...	R.A.O.C. ...	G2RG
Tel. H. F. West ...	R.N. ...	4241
Spr. T. C. Williamson...	R.E. ...	4251
A.C.1 H. O. Wills ...	R.A.F. ...	2HKF

Squadron Leader C. A. Jamblin, M.B.E., G6BT

Congratulations to Squadron Leader Cecil Jamblin, G6BT, who has recently been created a Member of the Order of the British Empire (Military Division).

Sq./Ldr. Jamblin was the Society's first QSL Manager, an office he held for several years from about 1925. An early member of the old T. & R. Committee, G6BT has had a long and distinguished career as an amateur. He saw service in the last war and rejoined the R.A.F. on the outbreak of hostilities in September, 1939.

Aeroplane Recognition Test

From the offices of the *Air Training Corps Gazette*, 1A Pall Mall East, London, S.W.1, there has just been published a wall chart of British, American, German and Italian aeroplanes. The drawings are arranged in mixed order, but all are numbered so that the name of each machine can be obtained by reference to the key. To add zest to the task of recognition, a " potted " description is given of each of the types illustrated.

In addition to the 192 sketches illustrating the front, side and underside views of the 64 machines listed, large cut-away drawings of the Spitfire, Hurricane and Lysander are included.

Copies of this informative and useful chart are available from R.S.G.B. Sales Dept. Price 6d. each, post free.

New Books Received

WIRELESS SERVICING MANUAL. By W. T. Cocking, A.M.I.E.E. Published by Iliffe & Sons, London, 300 pages ; Price 6s. 0d. nett.

The popularity of this standard text book continues. Published originally some years before the war it leaped to the fore as one of the most practical of all servicing manuals. The new edition has been extensively revised to include fresh information on Automatic Frequency Control and testing apparatus. The greater portion of the book is devoted to methods of locating and remedying the many defects which can develop in receiving equipment.

Well printed and profusely illustrated it is assured of a ready sale. J. C.

AIR TRAINING CORPS

THE following members are serving as Signals Officers or Civilian Instructors with the Air Training Corps. Alterations or additions to this list should be notified to G6CL by the end of July.

Squad. No.	Squadron Name	Name	Call Sign
5	Islington ...	F./O. W. H. C. Jennings.	BRS3854*
9	Northampton ...	W. C. Thomson ...	G6FP
13 & 1169	Exeter	H. A. Bartlett ...	G5QA†
42	Kings Lynn ...	A. W. Brookson ...	G3IP
57	Potters Bar and Northaw.	J. Goddard ...	G2GO
72	Bradford ...	C. Sharp	G6KU
80	Bolton	W. B. Bennett ...	2BDA
81	Ripon	Cpl. A. R. Yates ...	G3LB
85	Southgate ...	P. Solder	G5FA
85	,, ...	F./O. J. Clarricoats	G6CL*
85	,, ...	S. Howard	G8TY
87	Horsham (Collier's School	G. T. Sparkes ...	2DCT
150	Oxford	F. A. Jefferies ...	G8PX
164	Wimbledon ...	P./O. E. Williams...	G2HI*
188	Ipswich	F./O. L. H. Peplar, M.C.	G2JD*
200	Torquay	P./O. W. B. Sydenham.	G5SY*
213	Rochester ...	A. W. Wells ...	G2XW
247	Ashton-under-Lyne.	P./O. K. Gooding ... W. F. Mudford ...	G3PM* G6BK
277	Pontllanfraith ...		
288	5th City of Edinburgh.	P./O. P. Borthwick	GM8LA*
296	Stoke Newington	R. C. Harris ...	2BAB
308	Clacton	D. Heightman ...	G6DH
332	High Wycombe	H. Lassman ...	G2PX
350	Wallington ...	P./O. W. W. Barnes	G2FI*
365	Llurcher	J. Watkins ...	2AMA
410	Edgware ...	E. R. Radford ...	G2IM
441	Bungay	D. R. G.-Johnson ...	2AJX
457	Farnborough (Hants).	E. H. Jones ...	G3CJ
493	Birmingham ...	G. Belsey	G4PX
493	,, ...	I. Aulton	G3UJ
558	Llandudno ...	R. G. Norman ...	G5DP (ex)
757	Newport (I. of W.)	T. W. Hudson ...	G4DC
915	Hertford Grammar	P. Winsford ...	2BHA
977	Winchester ...	D. L. Davies ...	G8QW
1002	Ross-on-Wye ...	E. H. D. Coates ...	G3NA
1002	,, ...	V. Plascott ...	G5PT
1005	Radcliffe and Whitefield.	C. Turner	G8NL
1005	,,	E. Kay	2HCY
1013	Quantock (Washford).	C. J. Fish	G4OM
1066	Hitchin	E. Johnson ...	G2HR
1075	Camberley ...	A.C.1 C. Lister ...	BRS4108
1087	... ...	E. C. Cosh	2DDD
1096	Bishops Stortford	A. E. J. Cooper ...	G5VT
1115 & 1312	Southend ...	M. Geddes ... E. Taylor	G2SO G5VC
1137	East Belfast ...	F./LT. J. C. Graham	G3TR*
1155	Cheshunt ...	H. T. McFarlane ...	G8SV
1228	Louth	C. Thackery ...	BRS3880
1288	Enfield	T. Vickery	G5VY
1388	Tonbridge ...	F. Barnard ...	G4FB
	Aboyne	G. Strachan ...	2CJR
	,, ...	E. F. Fowler ...	GM5UT
	Arbroath ...	J. Banner	G3ZV
	Carshalton ...	E. Taylor	G3FK
	Edinburgh ...	J. Wilson	GM6IX
	Mablethorpe ...	A. C. Simons ...	G5BD
	Runcorn	S. Palmer	G8IZ
	Sutton-in-Ashfield	A. W. Fowler ...	G3FR
	,, ,,	G. H. Martin ...	G3WK
	,, ,,	S. Stanley	G8GO
	,, ,,	H. Dove	G8MR
	,, ,,	A. J. Marriott ...	G8UZ
	,, ,,	I. Casson	3593

* *Denotes Commissioned R.A.F.V.R. (Training Branch).*
† *Denotes awaiting commission.*

J. North, G2KO, is a member of the Driffield (Yorkshire) Squadron Committee.

W. A. Scarr, G2WS, is a member of the Beckenham Squadron Committee and lecturer in aircraft recognition to Beckenham and Bromley Squadrons.

The Application of Quartz Crystals in Telecommunications

The June, 1941, issue of *The Journal of the Institution of Electrical Engineers (Proceedings of the Wireless Section)* contains an extremely interesting and valuable contribution from Mr. C. F. Booth, of the G.P.O., on the subject of quartz oscillators.

The paper discusses some of the more important applications of the quartz crystal in the telecommunication art. In particular, the applications of both quartz oscillators and resonators by the Radio Branch of the Post Office are outlined and the performance of representative eqnipments incorporating crystals is described. In view of their importance, the methods which have been developed in the G.P.O. for the production of the necessary quartz oscillators and resonators are considered in some detail.

Interested members should make every effort to study this contribution.

Silent Keys

We regret to announce the death at sea by enemy action of Radio Officer G. E. Flint, BRS469, late of Sidley, near Bexhill, Sussex.

Mr. Flint was serving at the time with Radio Officer G. W. Sands, G3DC, whose death was reported last month.

We extend our deep sympathies to Mrs. Flint and her family.

* * *

It is also our sad duty to record the death, on June 8th, in hospital, of Maurice Glenster, 2CHR. Mr. Glenster's home was at Cranford, but he was better known in South London, having lived at Charlton for many years.

We offer condolences to his widow and other relatives.

THE MONTH "OFF" THE AIR—June, 1941

By A. O. MILNE (G2MI)

Anniversary

WITH the present issue, the perpetrator of this monthly review of "this and that" starts on his third year in office. When it is realised that only three of the twenty-four articles dealt with the Month "ON" the air, it is felt that a word of thanks to all those stalwart correspondents who have regularly supplied the news which makes this feature possible is not inappropriate. Thanks, then, to one and all who have kept things going, and may it soon be "ON" the air once more.

Notes and News

Although the attack on our latest ally, the U.S.S.R., seems to have been followed by a close-down of the Russian amateurs, up till the outbreak of war in Eastern Europe, Russian stations from all over the Union were coming in very well on both 7 and 14 Mc. G8DR reports UK6AA, U6SE, UX6WR and UK8IA, all on 7 Mc. The number of new calls appeared to be increasing rapidly and included UK2AU, UE3KQ, UK5AI, UK5HD, UK5LV and UK5OA. LZ5DQ is another new one; but whether they are Nazis or stations in some other part of Europe will probably never be known. 8DR has met dozens of amateurs in the R.A.F., amongst whom are VE4FN and W2JGH.

G3RB succeeded in copying W1AW on 1,758 kc. on May 2 at 02.45 G.M.T., when his signals were 559; 7 Mc. produced K5EH, 559, 7078; PY2GF, 568, 7137; PY2DV, 558, 7152. On May 6 W6QMD was heard at 04.42 G.M.T., 549, 7201 and K6QUJ at 04.58, 448, 7217 kc.

CM2CT and NY1AE have also been heard on 7 Mc. VU2FX, now at the same station as 3RB, sends 73 to W8HLF.

2HAD, home on leave for a week, spent some of his time at the receiver on the 14 Mc. phone band. K4FAB S9, W2IXY S7 (calling W5ACP), W1MNF S7, W1CQR S8, CO3QO calling OA4B, LU1DX S6 calling CQ2O and YV5AA at S9. Of the C.W. stations the best were K5AO, W2AOJ, UK1AA. He also mentions that PMA, the broadcasting station in Java, is still coming over well at 12.15 G.M.T. with news in English on the 15 metre band. He says these calls are the first entry in his log since January 7, 1940, the date he was called up.

Bill Windle, G8VG, now living in Somerset, says he has complete long-hand records of all his contacts and often reads through them, and remarks how each one brings back some memory.

G3GX says he would give a week's leave to work a W on 14 Mc., and that is saying something! He has certainly heard plenty of them; here are some of the more recently licensed calls heard. W3GX gave him a bit of a jolt, reverse the W nd you have his own call. On the night of June 5–6 he logged: W1LET, MNG, MVE, NIN, NXW, 2LMF, LSW, MJY, MOO, MXK, NDW, 3INZ, JED, JIU, 4JUK, 5GND, 8TDN, VYK, 9RSP, SYN, and also CM2BP, LU3FC, PY1UR and 2IM.

The night of 15–16th produced W1KVV, 2IPR 58, KMQ 59, KJL 57, IJR 57, LXB, LKC, NJS, and HQJ 58, all on phone; W1MAH, MBB, 2MLQ, 3HTM, 3AG 599, 8IKG, UAY, PY1GJ 598 and CX1BO 339 on C.W. Whilst 7 Mc. gave the following: W1EWT, GDE, HWY, JOP, KDF, MBB, MJK, NGJ, 2HZS, HZV, JB, JSF, NQK, 3FYB, JKH, IVQ, OE, 4FQC, GPT, HEV, 8CLX, TLW, UHI and K5AG. "I'd like to have as many quids as times I've called this last one," he says.

BRS4175 is busying himself, so far as his health permits, testing various straight receiver circuits and has heard RV15 at Kharbarovsk. This station broadcasts on 4,273 kc. and was identified at 02.00 G.M.T. It has been heard at all hours of the day and night for some weeks, but up till recently could not be identified for certain. Another of 4175's catches is HJ1ABJ at Santa Marta, Colombia, on 6,006 kc. at 03.15 G.M.T.

BRS2763 makes a welcome reappearance with a good list of calls heard and says 7 Mc. still sounds O.K. to him. He has logged all W districts except the 7th and submits the following to back up his statement: KB4FTU, K5AY, KB6GJX, CM2CQ, and several K4's. Of the phoneys, he offers HV1J, SV1GX, HB2GL, HB5R and YU8T. 14 Mc., he tells us, has brightened up a lot lately with K6AYD, 6ETF, 6OQE, 6SRZ, W7ADA, 7BHN and 7HKI on 'phone in the early mornings, also KD4HHS and XU8MY in the evening.

The K4HCG mentioned last month is D4HCG up to his tricks, says 2763. Several D's have adopted this ruse to contact American stations, and it has been made the subject of a special warning broadcast from W1AW and also a notice in *QST*.

BRS4021 gives us the dope on TGWB, mentioned last month by BRS3607. This station is located in Guatemala City and operates on 15·17 Mc. daily between 12.45 and 13.45 E.S.T. The full address is

Ministre de Fomento, Guatemala City. "Fomento," we assume, being a rather apt variation of the word propaganda! Another station in Guatemala City, TG2, has a super modern QSL card, a copy of which has just arrived at the QRA of 4021.

2FJD, although busy with exams, has logged W5AYE, BEK, DUK, GKP, JKP and KA7FS on 14 Mc. He also tells us that 7 Mc. on Sunday, June 8 was full of D's who appeared to be holding a contest, involving the exchange of six-figure groups.

G3YY heard G1XX working YU7AA and sign off as HA1Z/G1XX. He did the same thing when working F3ZA, and in the evening QSO HA1Z quite openly admitted that he was G1XX. HA0AA, S5IH, I1TKM, LZ5DM and SV1GX adorn this month's rogues' gallery!

G8UO says that UK6SU and UK3CU both have YL operators. UK6AA's YL operator is only 16 years of age. UK1AA, also a YL, answers to the name of Larionowa and was heard to ask U9WD if he had an XYL! U9MR gave his location as Sverdlovsk. The only DX heard has been XU8MY and CX1FY, besides W1AW.

G6QN mentions the disappearance of the U's and also a considerable falling off in the number of W's heard. 7 Mc. has remained good, with PY1KJ and 2AP, both at S9, as the best signals on the band. 14 Mc. produced KD4HHS and HH2MC, who was calling CQ in vain. "How I sighed for my little rig," says QN, "I did so want a HH!" Don't worry, OM. He doesn't QSL!

G4AB's Radio Scrapbook

This indefatigable antiquarian has been at it again with his researches into rare countries. Take a look at this lot and see how many of them you can remember!

Cocos Is., off South America, TI5FI, (May, 1932); Abyssinia, ET2IM (Feb., 1932), ET4VIA (Aug., 1932), ET8ADC (April, 1935); Faero Is., ED7JO (Jan., 1928); Noya Zembla, PGO (Dec., 1927); Oman, AODNR (July, 1927); Tripoli, now Libya, FI1CW; French Somaliland, UH1AA and FS3DJI in 1933; and French Cameroons, FQPM in 1930.

Can anyone else add to this list? We suggest FY8A and EL2A as quite a nice little pair from our own stock of DXCC cards, just to help on the good work.

500 kc.

BRS1151 has been doing some more DX on the 600 metre ship band and has logged CLW in Cuba, this when the barometer was just about as low as it can go. Shortly afterwards HON in Panama was heard calling ZCN. So far, the only African station logged on this band is SSC in Egypt. A doubtful OCJ was heard in daylight, but as he was S5 for over an hour he probably was not in Peru! WFZ and a number of three-letter "N's" have been heard and KCN has been definitely identified. BRS1151 is very modest about his logging of YFB in the Dutch East Indies because he has heard that before the war, in certain parts of Australia, they used to hear our medium wave broadcast stations quite regularly. Can anyone confirm this? It certainly sounds a bit tall to us. He mentions that he has tried a twin-wire aerial on the band but it is no improvement over the single wire.

QSL's Waiting

Many of the G8's listed last month have so far not claimed their cards. There are still some very nice ones in the box, lads. Send along that envelope please, and *please send them to the QSL Bureau*, 1 Kent Drive, Harrogate, Yorks—*not to Headquarters*.

This month's list is for the G4's. One envelope each, please. Some of you have more than a dozen cards in file, so come along and claim them. Here is the list: 4**A**F, I, J, M, R, S, T, X, Z, **BI**, P, S, **C**R, U, Z, **D**C, J, N, Q, X, Y, **FC**, F, L, **GA**, I, L, M, N, R, Z, **H**H, J, L, N, R, U, V, X, **ID**, H, J, K, L, M, R, S, U, W, Y, Z, **JC**, D, N, P, U, V, Y, **KA**, I, J, K, O, P, U, V, **LB**, D, F, I, J, M, T, U, V, W, Y, **MA**, C, D, H, I, K, O, S, W, X, Y, **NA**, D, F, H, J, L, N, Q, R, V, X, **OA**, B, D, F, H, J, K, L, N, P, R, S, T, V, W, X, Z, **PB**, F, G, H, L, M, P, R, S, W, Y, Z, **QB**, C, G, O, Q, R.

The 28 Mc. Band

CONDITIONS at the end of May and during June were similar to those of a month earlier, and apart from European harmonics which were audible above the band on most days there were few signals to be heard.

The only amateur station reported was a harmonic of D4CIJ, heard by G4MR at 18.05 G.M.T. on June 11, while QSO D4EJE. The 14 Mc. fundamental was also heard but at lower strength. LSA2 was as usual the most consistent DX signal and was logged by G4MR and BRS3003 on May 26, 27, 29, 30 and June 2–7, 9–14, 17–21 and 23–25. LCP on 29 Mc., heard on May 29, was the only other South American station reported.

Short skip signals were most numerous on May 29, June 11, 12, 16, 22 and 23, and included a number of harmonics of European Broadcast stations. Among the commercial harmonics identified on frequencies above the band were the following:—FYS on 35 Mc., FYT and OZT/OZV on 34 Mc., IRP/IEO/etc. and OXZ on 33 Mc., ODD, FYX and IBT on 32 Mc., FYV, SDC and SDQ on 31 Mc., and RKC on 30 Mc. Others logged above 27 Mc. included DFS, DGZ, EAX, FXI, FYQ, HAS2, HVJ and PCR.

The Hissing Phenomenon was heard at good strength on several occasions during the month, viz on June 4 in the afternoon, on June 9 at intervals 11.20–11.27 G.M.T., on June 11 at 09.14 G.M.T. and later, and on June 24 at 14.16 G.M.T.

Another report received from BERS195 in New Guinea states that from mid-March to mid-April the band was often open from 07.00 to 19.00 local time. The most outstanding signals were those of W6RKI and K6TOL, and other 'phones identified were W6QUC, K6FSF, K6MVV, K6OQM, K6PAH and K6PIR.

Many thanks are due to G4MR, G5BD, BRS3003, BRS3825, BRS4144 and BERS195 for supplying the information on which these notes are based. As the writer will have changed QRA by the time this appears in print, future reports should be sent, not later than the 28th of the month, to Miss N. Corry, Petersmead, Meadow Walk, Walton-on-the-Hill, Tadworth, Surrey. N. C.

"RADIO LOCATION"

THE veil which has shrouded one of the most closely guarded secrets of the war, was lifted a little last month when Lord Beaverbrook and Air Chief Marshal Sir Philip Joubert broadcast an appeal for radio technicians.

In the press notices which followed the disclosures, it was interesting to note that no specific reference to, or appeal for, radio amateurs was made, although there is every reason to believe that many members of R.S.G.B. have played a prominent part in the development of " Radio Location "—the name by which this new secret " weapon " is known.

For reasons which must be obvious to everyone, technical details cannot as yet be disclosed, but it seems clear from the published statements that the system depends for its operation upon the transmission into space of a high frequency signal which, upon impact with an enemy machine, is reflected back to the observer and recorded upon some device, the nature of which has not been revealed.

If, as would appear possible, micro-wave technique *is* employed, it seems all the more unfortunate that the amateurs of Great Britain were not given more encouragement before the war. Many hundreds of our members, interested in ultra-short wave propagation, found themselves prevented from carrying out practical experiments due to the reluctance of the Government to assign frequencies. Fortunately, our American cousins have received full encouragement, and we have little doubt that many of those who possess specialised knowledge will take Lord Beaverbrook's advice and get in on the ground floor of this new development.

The peace-time applications of " Radio Location " in the field of commercial aviation and maritime engineering should provide employment for many thousands of those who, to-day, are engaged in applying the principles to service needs.

The demand for skilled technicians to operate and maintain " R. L." equipment was probably the chief reason for the recent disclosures. Society members have responded to the calls of the Navy, Army and Air Force in splendid style—over 1,400 are now in Khaki and Blue—whilst the amateurs of the Dominions and Colonies have enlisted in hundreds, but the supply from our ranks cannot be expected to continue for ever—new recruits must be found.

The recently formed Air Training Corps will probably become one of the most valuable sources from which keen wireless youngsters can be found to fill the gaps.

Within the pages of this issue appear the names of a large number of members who have voluntarily undertaken the vitally important task of giving instruction to Cadets. This is work which the radio amateur is eminently suited to undertake, for he brings to his job the experimenter's mind and the urge to probe into the mysteries of radio. Air Cadets will benefit from the " amateur approach " to training, even as the Royal Air Force itself has benefited by the influx into its ranks of nearly 1,000 trained amateur experimenters, to say nothing of the many hundreds of others who, although following a civilian role, are just as much in the front line.

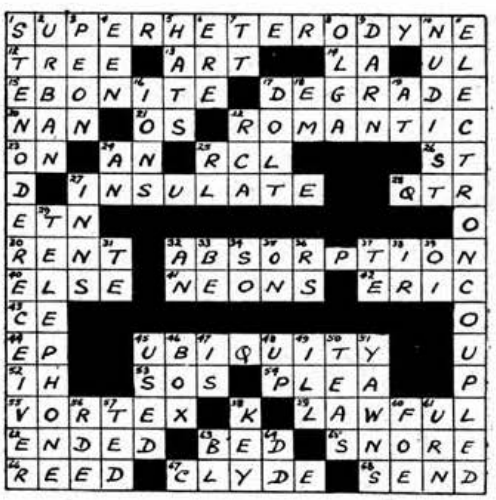
By bringing amateur radio experience into the A.T.C., members have instinctively introduced the true experimenter's spirit. How badly that spirit is needed to-day.

The spirit which pervades our movement has undoubtedly helped to create " Radio Location." That self-same spirit will enter into the lives of hundreds of Air Cadets and others who by force of circumstances find themselves in association with the pre-war amateurs of Great Britain, and the British Empire.

J. C.

"HAM-RADIO" CROSSWORD No. 10

SOLUTION



DISTRICT 12

Monthly meetings in North London and Hertfordshire continue to be well supported. Here is a recent photograph taken at G4DC, Hertford. From left to right: G8SK, 6LL, BRS3425, G2GO, 6CL, 5FA, 6OT, 5QF, 3SH, BRS——, G5VY and G6CL Junior.

BRITISH ISLES NOTES AND NEWS

District Representatives and Deputies.

DISTRICT 1 (North-Western). (*Cheshire, Cumberland, Lancashire, Westmorland.*) MR. H. W. STACEY (G6CX), "Sandleas," Edisbury Road, West Kirby, Wirral, Cheshire.

DISTRICT 2 (North-Eastern). *Yorkshire* (*West Riding, and part of North Riding.*) *Acting:* MR. A. O. MILNE (G2MI), 1 Kent Drive, Harrogate, Yorks.

DISTRICT 3 (West Midlands). (*Shropshire, Staffordshire, Warwick, Worcester.*) MR. V. M. DESMOND (G5VM), 90 Worcester Street, Birmingham.

DISTRICT 4 (East Midlands). (*Derby, Leicester, Northants, Notts.*) Deputy: MR. W. M. VENDY, (G6VD), 9 Cecilia Road, Leicester.

DISTRICT 5 (Western). (*Gloucester, Hereford, Wiltshire.*) MR. R. A. BARTLETT (G6RB), 31 King's Drive, Bristol.

DISTRICT 6 (South-Western). (*Cornwall, Devon, Dorset, Somerset.*) MR. W. B. SYDENHAM (G5SY), "Sherrington," Cleveland Road, Torquay.

DISTRICT 7 (Southern). (*Berkshire, Hampshire, Oxfordshire, Surrey.*) MR. W. E. RUSSELL (G5WP), "Milestones," Westfield Road, Mayford, Woking, Surrey.

DISTRICT 8 (Home Counties). (*Beds., Cambs., Hunts. and the towns of Peterborough and Newmarket.*) MR. S. J. GRANFIELD (G5BQ), 47 Warren Road, Milton Road, Cambridge.

DISTRICT 9 (East Anglia). (*Norfolk and Suffolk.*) MR. H. W. SADLER (G2XS), "The Warren Farm," South Wootton, King's Lynn, Norfolk.

DISTRICT 10 (South Wales and Monmouth). *Scribe:* MR. S. HOWELL (G5FN), 90 Coleridge Avenue, Penarth, Glam.

DISTRICT 11 (North Wales). (*Anglesey, Carnarvon, Denbighshire, Flintshire, Merioneth, Montgomery, Radnorshire, and parts of Shropshire not in District 3.*) *Deputy:* MR. N. E. READ (G6US), 24 Church Street, Oswestry, Salop.

DISTRICT 12 (London North and Herts.). (*North London Postal Districts and Herts., together with the area known as North Middlesex.*) *Deputy:* MR. P. SOLDER (G5FA), 35 Torrington Gardens, New Southgate, N.11.

DISTRICT 13 (London South). To be appointed

DISTRICT 14 (Eastern). (*East London and Essex.*), MR. R. L. VARNEY (G5RV), "Arvika," 184 Galleywood Road, Chelmsford, Essex.

DISTRICT 15 (London West). (*West London Postal Districts, Bucks., and that part of Middlesex not included in District 12.*) MR. H. V. WILKINS (G6WN), 539 Oldfield Lane, Sudbury Hill, Greenford, Middlesex.

DISTRICT 16 (South-Eastern). (*Kent and Sussex.*) *Deputy:* MR. W. A. SCARR, M.A. (G2WS), 8 Beckenham Grove, Shortlands, Kent.

DISTRICT 17 (Mid-East). (*Lincolnshire and Rutland.*) MR. W. GRIEVE (G5GS), "Summerford," New Waltham, Lincs.

DISTRICT 18 (North and East Yorkshire). (*East Riding and part of North Riding.*) MR. E. MITCHELL (G5MV), 40 North Marine Road, Scarborough.

DISTRICT 19 (Northern). (*Northumberland, Durham, and North Yorks.*) MR. R. J. BRADLEY (G2FO), 36 Raby Road, Stockton-on-Tees.

SCOTLAND. MR. JAMES HUNTER (GM6ZV), *Scottish Records Officer:* 51 Camphill Avenue, Langside, Glasgow.

NORTHERN IRELAND. MR. J. N. SMITH. (GI5QX), 19, Hawthornden Drive, Belfast.

New Members are cordially invited to write to their local Representative, enclosing a stamp if a reply is required.

DISTRICT 1 (North Western)

AS no reports have reached the D.R., it is apparent that summer attractions have had their usual effect.

Mr. Spillane (District 11) has written with reference to the monthly meetings held in Prestatyn, and issues a cordial invitation to all members in No. 1 District, so here is an opportunity to spend a pleasant summer's day on the North Wales coast with a good ragchew to wind up with. The next meeting will be held on Sunday, July 20th, at 6 p.m., at "Aunt Jane's Cafe," Prestatyn, and members will see from the notes for District 11 that they can look forward to some interesting contacts if they are able to attend.

G6CX.

* * *

DISTRICT 3 (West Midlands)

A meeting of M.A.R.S. was held on June 10, when Inspector George Brown (G5BJ), City of Birmingham Police Force, gave a very interesting lecture (by kind permission of the Chief Constable) on Police wireless receivers. Eighteen members were present.

2FDR.

DISTRICT 4 (East Midlands)

Nottingham.—The first of a new series of meetings in this area proved a great success. At the meeting, which was held at G8DZ, F./O. H. W. Simpson (G8DI) gave a very interesting and amusing talk of his experiences from the time he went over to France with "The Second Earlies" up to the present day. 8DD brought along plans of the morse recorder which he has recently built, which, after a thorough examination by those present, was voted to be very F.B. Present at the meeting were G3QD, 4KS, 5CG, 5DW, 8DD, 8DI, 8OM, 8DZ, 2DWZ, BRS3819, 4172, 4071 and several prospective members. To wind up the meeting Mrs. 8DZ managed, after some

conjuring tricks with the tea rations, to produce fifteen very welcome cups of tea.

The next meeting takes place at G8DD, 37 Meadow Road, Beeston, on July 18th, at 8 p.m.

Leicester.—VS2AR, who is now safely back in VS after a short stay in this country, is looking forward to the time when he will again be able to keep in touch with the old country and his native town by means of Ham Radio. His father, BRS2793, is still busy with his receiver, and is continually " hotting " it up, presumably with the object of monitoring 2AR's transmissions when the time comes.

G2RI reports fit and well. Since joining the R.A.F. he has met a lot of hams including G5QY, 5HA, 6ML and 8HA.

Congratulations to Mr. and Mrs. 6IM on the arrival of a junior opr., we hope that when she gets older she will be able to write a little more frequently than her OM ! What about it, Bram ?

G6VD recently spent a very pleasant week-end at Birmingham with 5UQ and YF. Both are fit and well but very busy on war work ; the " Vicar " sends 73 to all in his 1·7Mc. congregation !

Leicester.—G8CZ is busy but manages to find a little time for the receiver, despite the fact that he expected to be in the R.A.F. several months ago.

Other members reporting active are : 2BLR, 2IX, 3BU, 5MY and 5ZP. G6VD.

DISTRICT 7 (Southern)

Bournemouth.—We hear, on good authority, that G4IJ is busy winding transformers of all shapes and sizes, and that, as a result, his QRA now resembles a wire factory ! 3BM has purchased a RME69 (with DB20) and an Eddystone E.C.R., to add to his collection. Hearty congratulations to 8KX, of whose forthcoming marriage we learned recently. He has just completed a massive home-built 11-valve super with such refinements as push-button tuning on the short waves. To modulate his future transmitter, 2NS has, with the help of 2HMX, arranged to switch over the 76–42–PP42 audio section of his Super-Pro, to a modulation transformer at will. This is done with one switch and the arrangement really *does* work. 2XP and 2HNO have been servicing AC–DC midgets recently and both find that ballast tubes are a likely source of trouble. 5OH has been home from Birmingham for a short stay. (*via* 2HNO).

Coulsdon and Purley.—G2MV continues to keep an ear open on the VHF's whilst 8IN is contemplating building a new Super. Hearty congratulations to K. W. " Bulldog " Drummond, 2CRD, who was married to Miss R. Page on June 14th. The latest news from 2ANR indicates that in spite of being in the " middle of the trouble in the Middle East " he finds life very tolerable. 3179 has had another short spell of leave and has been moved still nearer his home QRA. 3003 has had the pleasure of a visit from 2BLA who hails from GW, and is now stationed at a 'drome close to London (*via* BRS3003).

Croydon.—A successful meeting was held at the TR's QRA on June 8, when G2DP, 2VB, 3ST, 4NI, 6KM, 8TN, 2BLA, 2FWA, 2HHD, 3003, 4150 and Mr. Pilson were present. The next meeting has been arranged for 3 p.m. on Sunday, July 27, at 72 Kimberley Road. 3FP has removed the speaker from his " Sky Champion " and finds it much better on a separate and larger baffle-board. 3003 is constructing a straight VHF receiver. The TR would like to hear from 6QB, should this catch his eye. Whilst we are on the subject we could do with lots more " notes " and those who are suffering from broken arms or a due regard to the paper shortage might try phoning THOrnton Heath 4552.

One of the Society's publicity posters has been exhibited at the Croydon Y.M.C.A., together with the cards of local members. In this way it is hoped to extend hospitality and possibly get in touch with overseas hams who may be in the town. Those interested in this scheme should forward their card to 2FWA, who will arrange for it to be displayed with the others. (*via* 2FWA).

Kingston.—The TR (Frank Wadman) G2GK, has moved his QRA permanently to Torquay. (Many thanks OM for all your efforts on our behalf during the past few years and the best of luck among the wild men of District 6). 2GK sends 73 to all in No. 7. This unexpected departure leaves us without a TR for Kingston and District. Any volunteers ? Offers should be sent to the DR.

Guildford.—An interesting letter from 8IX reveals that he is still stationed in the North and was recently made A.C.1. He bemoans the fact that the C.O. has been moved—he was a VE4 ! 3VB has had some of his audio gear returned by the G.P.O. 5WP is so busy with A.R.P. duties that he gets little time for radio. G5WP.

DISTRICT 8 (Home Counties)

We are again indebted to G2NJ, 5RL and BRS 3585, for reports. A line from some of our members, of whom we have heard nothing for months, would be particularly welcome.

Cambridge.—G5DQ (R.C. of S.) and 8FF (R.A.F.), were recently on leave, so that a re-union was possible. They wished that 8ST, now in India, could have been with them. Two others, Messrs. Bennett and Frost, have been contacted this month, and both are well.

St. Ives.—G5RL has returned from sick-leave, to a new station. He finds his work there very interesting, but would like to try out the old rig on 14Mc.or 3·5Mc.! He has met ZL2MN and 2AHP. 5RL has received an interesting letter from 8ST, who sends his 73 to all old friends, and mentions how much he appreciates the "Bull," even if it takes three months to reach him.

Peterborough.—G2NJ writes from S.W. England to tell of a very compact, entirely self-contained S.W. receiver he is constructing. It is of novel design, and it is a pity that space does not permit of a full description. A friend of 5BQ, upon joining the R.A.F., discovered that the fellow with whom he was sharing a hut was our old friend, Colin Morton (3DY). It's a small world, after all.

Bedfordshire.—2DPQ has acquired from 2FFG a Trophy 8. The latter is serving with the R.A.F. in the N. of England. 2CFV is still busy with Morse practice. BRS3585 has been pleased to welcome 2AYY and BRS3430, who have civilian jobs in his locality. 3KP is stationed here-abouts with the R.A.F. 2DTD (Hitchin) has visited BRS3585 and 2DPQ, who have returned the visit, and have also called on 4OC. 6AN is believed to be in this area, but the locals have not yet met him. (Any visiting amateur would do well to contact RBS3585, at Meppershall, Shefford, as his locality seems to be the healthiest centre of ham activity in the District. D.R.)

Finally—break the QRT, some of you *please!*

G5BQ.

DISTRICT 9 (East Anglia)

Norwich.—Congratulations are offered to Mr. Hoult, 2FAO, on his recent marriage. He informs us that 2YI, of Southend, is working with him and that both are in the Home Guard. We also hear that 8FL is now working in Norwich although still living at North Walsham. What has happened to 5UF? Is he still about?

Yarmouth.—Mr. Buck, BRS3821, reports that BRS3468 and 3766 have been on leave, and that they have contacted G3BW who is stationed near-by. They hope to meet 3GX shortly.

Ipswich.—There is still no news from this town, but we have hopes for the future as GM8CN is stationed in the locality. He has been supplied with all known local addresses. (Sorry G2XS, but the bird has flown again. See Khaki and Blue—Ed.)

G2XS.

DISTRICT 11 (North Wales)

Meetings in Prestatyn continue to be well supported. At the gathering on June 4, at 2HIY, those present were pleased to welcome F./O. Bert Simpson, G8DI.

Later in the month a meeting took place at Aunt Jane's Cafe, when an attendance of 25 (including VE3AAA, 3AKY, 3AKX and 4YG) was registered. Other service visitors were 2CZM, BRS3044, 4176, G4AH and 4NB. An interesting discussion took place in regard to the relative merits of British and American valves. The next meeting has been arranged for 6 p.m. on July 20, at the same venue.

Local news is as follows:—

G8CJ has joined the R.A.F. as a Radio Mechanic. GW4CK was due to leave for an R.A.F. station early in July. 3CF has again been on leave. BRS3044 is back in the District. 2731 contacted VE5EK while motoring through a local village. 4AH has met Lt. Chalk, G3IC, who is S.O. of his unit.

BRS1060, "Woodside," Meliden Road, Prestatyn, will be pleased to furnish details of meetings to any member in the Prestatyn area. G6US.

Forthcoming Events

July 20	District 2 Conventionette at Leeds (see separate announcement).
,, 26	District 15, 7 p.m. at G4IH, 31 Courthope Road, Greenford, Middx.
,, 27	District 14, Conventionette at Chelmsford (see separate announcement).
,, 27	District 12, Open-Air Picnic. Meet 3 p.m. at Arkley Hotel.
,, 27	Scotland "A" District, 2.45 p.m. in the Coffee Room, Y.M.C.A. Residential Club, 100, Bothwell Street, Glasgow.
Aug. 9	War-time Convention at the Institution of Electrical Engineers, Savoy Place, London, W.C.2. (See "Headquarters Calling").

DISTRICT 12 (London North and Hertford)

Memories of N.F.D. were revived on Sunday, June 29, when over 20 members and their ladies gathered at Cuffley under ideal weather conditions. The event, easily the most successful held in the District since the outbreak of war, was noteworthy for the number of full calls on parade. We were especially pleased to welcome Dave Price-Jones, G5SA, who seemed to be going on well after his illness. Mr. and Mrs. Peter Bradley, G8KZ, from District 15 were also with us, as was M. G. from H.Q.

The party, after arriving by various modes of transport, ranging from Mr. Shanks' pony to Mr. Prior's "plain van," spent the early part of the afternoon indulging in a ragchew in the delightful surroundings of G6LL's home. A.T.C. matters again provided a leading topic for conversation, although the minds of many must have turned to those pre-war open-air events when *real*, not synthetic, "Test N.F.D." calls filled the air.

Following tea, an "all in, free for all" cricket match took place between teams "captained" by Bill Winsford, G4DC, and "Clarry." By means of a special application of 2DBK's formulæ, G6CL's side contrived to top their opponents' score by a margin of several hundred runs.

The thanks of all visitors are extended to Mr. and Mrs. Mathews for so kindly acting as host and hostess.

News is scarce this month and although letters have been received from 2CNC, 2DTD, BRS3825 and 4219, they have little to report. We welcome BRS4219, of Tring, as a new member.

BRS3825, of Enfield, now a wireless mechanic in the R.A.F., has just completed a 30-watt amplifier which he hopes eventually to use as a modulator. He suggests that it would be a good plan to circulate

a Letter Budget to District members who are serving in H.M. Forces. What say, fellows? If you're interested send your letters to G5FA, who will see that they are passed round. 2DTD reports meeting 3KP, who is passing through the School at which he is an instructor.

G5FA and 6CL were pleased to meet Capt. Hamilton, ZL4DQ, New Zealand Dental Corps, when in London. He is now in the Basingstoke area seeking ham contacts.

In view of the highly successful open-air event arranged last month, it is proposed to take advantage of the fine weather and long evenings, and hold a picnic tea in the fields around Arkley on Sunday, July 27. Meet outside the Arkley Hotel (terminus of the 107 bus), at 3 p.m. sharp. Trolley bus to Barnet and thence by bus, or direct by 107 bus from Enfield Town and Enfield West (Piccadilly Line). Ladies are specially invited. Further details may be obtained from G5FA (Phone: Ent. 4347).

G5FA.

DISTRICT 13 (London South)

South Central and South East Areas.—Local meetings, which are held at member's homes, continue to prove very successful, the last, at G3ST, being attended by 14 members. We were pleased to welcome BRS4198, a new member.

The next meeting will be held at 2HHD, 85 Bedford Hill, Balham, S.W.12, at 11 a.m., Sunday, July 20. (Nearest station, Balham.)

South Western Area.—Owing to a postal delay of eight days in getting the war-time log across London, and to G4GD " disappearing " from his west country QTH, there have been very few entries from which to extract material for these notes. Apologies to all concerned, but all the gossip will be found in the log, which is out on its rounds again.

We welcome G4OO, 2DJK, BRS4180 and BRS4206 as new members. (The area log will come to you in due course, OM's).

Will Service members who change their address please advise 8QH as early as possible? (4GD please note.)

G8TN.

DISTRICT 14 (Eastern)

Chelmsford.—The June meeting was well supported with Mr. and Mrs. 6LL, Mr. and Mrs. 2SA, and G2KT showing their unabated enthusiasm by making long journeys to attend.

G6LB resents the libellous statement in the last notes and says Mr. Middleton has nothing on him! 5RV apologises, and ventures to suggest a motto for all ex-DX friends who have perforce become victory diggers—*Per ardua ad fertilitatem atque victorium.*

G5HF, 5CA, BRS3650 and 4122 have nothing in particular to report. P./O. F. E. Sperring, GW8RS, writes to say that after the war he hopes to energise the Essex ether with R.F. on 28 and 56Mc. 8JM, a radio Mechanic in the R.A.F., would like to hear from old friends *via* 48 Hawkdene, Chingford, E.4.

Several members have promised to attend the modified " Conventionette " announced in this issue. G6IF who paid a lightning visit to 5RV in June hopes to lead a " gang " from High Wycombe. 8TL has also been a recent visitor to " Arvika."

G2CD reports that G2YH, 3GF, 3LW, 2CIW and BRS4094, are active in Grays, Essex. G2YH and 3GF are studying for A.M.I.E.E. (Good luck, G5RV.) 2CIW is shaping extraordinarily well at morse. 2ZZ (Poplar) continues listening and 6ID (Dagenham) has had the misfortune to be bombed out. 3SV (Romford) has produced an electric hand-drill from a motor-bike generator.

Brentwood.—Sub./Lt. Deane Sainsbury, has sent us a copy of an extremely well produced magazine issued by the Brentwood and District Radio Society from which it seems that most of the local amateurs are doing their bit in the Services—F.B. fellows!

G5RV.

DISTRICT 15 (London West, Middlesex and Buckinghamshire)

The R.A.F. was represented at the June meeting by G5KT (Bristol) and 2DZD and BRS1357 of this district. Also present were G2TJ, 3XC, 4IH, 5FG, 6CO and 6WN. We record our grateful thanks to Mr. and Mrs. G4IH for their hospitality.

One amusing incident occurred when G3XC enquired the identity of 2DZD who had sent him 73 *via* the BULLETIN. Within a few minutes in walked 2DZD who had travelled several hundred miles for a week-end leave and dropped in before going home. Just shows the pulling power of amateur radio!

Cigarettes have recently been sent to 2DZD, 2FCJ, 5KT and 6ZY. The latter, we understand, is stationed at Gib. G3UQ reports 3XI as having been on seven days' leave, and that 4AR is somewhere in the southern half of England. 8VM is expected home shortly. 5JL has reported for duty with the R.A.O.C. 3YM, who was recently commissioned in the R.C.S. has gone overseas.

It is learnt with regret that Sgt./Pilot Eric

District 14
CONVENTIONETTE

Sunday, July 27th, 1941, at

YE OLDE SPOTTED DOG HOTEL
TINDAL STREET, CHELMSFORD

12 noon	Foregather for Ragchew. (No coupons needed.)
1 p.m.	Picnic Lunch. (Visitors are requested to bring sandwiches. Mine host will supply liquid refreshments.)
2 p.m.	Business Meeting. (Very short.)
2.15 p.m.	Technical Talk: " The Story of the Beam," by R. L. Varney, G5RV. Illustrated by slides and models.
3 p.m.	Debate: " QRO *v.* QRP." (Ammunition issued free, but please bring your own revolver.)
4 p.m.	The 20th Letter. Fairy Tales introduced by Baron Rasputin Vladivostock.

INCLUSIVE CHARGE 2/6 PER HEAD.

By special arrangement with the C.I.D., a group photograph for future reference will be taken. Copies will be available on receipt of finger prints and a small token payment to cover costs involved.

Reynolds, R.A.F. (the Acting Scoutmaster, who gave us such valuable help during N.F.D.), has been reported missing after a raid on enemy territory. Although not a ham he was keenly interested in our work and had it not been for his scout activities he would probably have been one. We understand that his last message was to the effect that he was coming down in the sea on his homeward journey.

G6WN.

DISTRICT 16 (South Eastern)

From Brighton and Hove, G3YY reports that several members including G3WR, 4HS and 6CY continue active on the receiving side. G3HP has been copying the A.R.R.L. 35 w.p.m. tests. G3JF, 4KS and 2BAH have been on leave, whilst 3KJ and 2BAH are known to be busy elsewhere in the country.

2DHV, of Sidcup, an active pre-war member of the Gravesend group is now in the R. Signals. Since joining up he has met G2XT, 2OA, 6SY, 8SW, 8RR, 2DBA, 2DXP, 2BZK and 2BIP.

Mr. F. Forbes, 2BFC, 78 West Hill, East Grinstead, is anxious to arouse interest in Society affairs in his area. He reports that 2FTP, 2HFU and 2HNW are serving in the R.A.F., the former as Corporal Instructor and the two latter as Wireless Mechs. 2BFC himself is Radio Instructor to the local A.T.C. squadron. He would like to get in touch with local members ; his phone number is East Grinstead 941.

G2WS.

DISTRICT 17 (Mid East)

The Ham Gathering at G2UK's produced an attendance of eleven, those present being : 6LH, 6TV, 2HT, 2XC, 2FNU, 2CR, 2UK, 2SO, 2BUV, 2BQC and 8HB. There were also present three ex-YL's and one YL. We thank them for allowing us to do the talking for once and for the " eats " they produced.

At its start, the meeting resembled a photographic society's field day. A large number of photos and some feet of film were used in recording the event. It is hoped that possibly one photo may turn out suitable for reproduction later in the BULL ! The meeting then got down to business and discussed arrangements for a Conventionette to be held in Lincoln on August 24th. Details of this will be published later.

G2UK has had 2SO and family staying with him. A very enjoyable time has been spent rag-chewing about old times. They visited 6LH and 2BQC. 2BQC and 2BUV have been home on leave. 6LH has recently completed a receiver with an excellent coil changing system.

G2UK.

Northern Ireland

We extend hearty congrats. to GI5AJ upon his promotion to the rank of Captain, R. C. of S., and to 2DYO, now a Sub-Lieutenant, R.N.V.R. The latter is stationed near his home in Belfast.

G3PA has made the acquaintance of several local members as a result of visiting the Y.M.C.A. Radio Club.

The D.R. records a visit from GI6YW and 6GV, both of whom were looking very fit after having been out awheel through the City. 6YW does not have much time for radio, although he has been tinkering with his receiver. He uses a battery job occasionally and likes its quiet background.

Mr. P. Turner (BRS4111), now on a family visit to Belfast, hopes to be stationed in GI shortly. He tells the D.R. that his pre-view of our little part of Empire leads him to believe that he will feel quite at home on our soil.

GI6TK is rapidly recovering from a serious illness, and has gone to the country to recuperate. We all wish him a speedy return to full health, for he is greatly missed at the Club, having been one of its most active members.

Stop Press.—We have just learnt that GI8PA is giving Morse Instruction to the A.T.C. [Details please.—ED.] Nice work for a " Phone Hound." Joe can now punch the key at 25 per ! GI5QX.

Scotland

" A " District.—The June monthly meeting was honoured by the presence of G8SD, BRS4196, BRS4046 (whose brother, GM6JJ, is known to many members), and our old friend Jim Stove, GM5ZX, who was home on holiday from the South. A letter has been received from Douglas Gillies, 2FZT, who is now at sea as a Marine Engineer.

" C " District.—After a long silence we are glad to include the following report from the D.O., GM3IX. " There are clear signs that some modified form of activity will now be possible in the near future. Several of the younger members have asked us to arrange meetings to let them hear of the past history of amateur radio, and also to give them the groundwork so that they also may be able to join the ranks of the active transmitting amateurs after the war. These young lads, now becoming members, may very well form the nucleus of a very much stronger R.S.G.B. in post-war days.

"GM5NW is progressing favourably after his recent accident and we all wish him a speedy and complete recovery. Congrats. to R. H. B. Candow, GM5SC, on his promotion to Major.

"News or suggestions for the carrying on of war-time activities should be sent to the D.O., T. Reay, GM3IX, 52 Nesbit Street, Dundee. Letters from serving members with particulars of rank, unit, etc., would be also welcomed as we are often asked for addresses."

GM6ZV.

Technical Teasers

No. 1

Compiled by J. N. ROE, G2VV

(1) Which has the higher melting point, iron or nickel ?
(2) What is an oscillogram ?
(3) What is the Unit of quantity of electricity ?
(4) What is the second harmonic frequency of 28 Mc/s. ?
(5) Used in an electrical equation, what does the symbol " J " represent ?
(6) Into what two classes may all radio " waves " be divided ?
(7) What is the common term used to denote anything, excepting the æther, which occupies space ?
(8) What are the three classes of electricity movement, stated in " current " ?
(9) What would be the beat frequency of an incoming signal of 48,000 c.p.s. mixing with a hetrodyne note of 47,750 c.p.s. ?
(10) What are the three different effects of a current ?

Letters to the Editor

Communication over Wide Distances by Mechanical Methods

DEAR SIR,—Mr. W. R. Brooks (2DRO) asks whether I came across any supersonic means of communication (using mechanical methods) employed by the Tibetans during my stay in those parts.

The only pipes or horns which I saw in use tended to the opposite extreme, *i.e.* they were very low pitched. Some of the ceremonial temple horns were up to 12 ft. in length and required considerable skill and training to blow correctly. Their deep throbbing note could be heard over very considerable distances.

With acoustical vibrations we are concerned with "ground wave" propagation, as is the case with very low radio frequencies, so that a low audio-frequency vibration would have a greater range than a supersonic vibration in the air. The absorption due to screening being far less for low than for high frequencies, both in the case of longitudinal vibrations in the air and for transverse vibrations in the ether.

I always understood that the long-distance feats of communication by native tribes were attributed to the great carrying power of the low-frequency throbs produced by tom-tom beats or that, in some cases, telepathy was involved.

Low radio-frequency oscillations (electrical) were, of course, produced in the old days by such methods as the Alexanderson alternator, assisted sometimes by saturated iron-core transformer frequency doublers! There were people who claimed to be able to hear some of the old long-wave commercial stations without the aid of a rectifier, crystal or otherwise. The majority of people can hear a frequency of 10 kilocycles per second, corresponding to a wavelength of 30,000 metres. It is largely a matter of finding a pair of 'phones which will respond to such a frequency.

Yours faithfully,
E. Y. NEPEAN, G5DN.
(Ex G5YN, VU2YN, AC4YN.)

DEAR SIR,—I was very interested in the letter appearing in last month's BULLETIN on the relationship of audio and radio frequencies, and I feel that the writer has touched on a subject which will provide interesting material for an article in a future issue. I, for one, would like to see an expert opinion on the many interesting problems which spring to mind when the question is asked, "Where does audio leave off and radio begin?"

I am informed that the upper limit of audible frequencies, so far as the human ear is concerned, is in the region of 10 to 20 kilocycles. What, therefore, would happen when an individual to whom a frequency of 15 kilocycles per second is not supersonic approached a transmitter emitting radio frequencies of that description? Would this person hear a high-pitched note? I see no reason why he should not.

We are all aware that some animals are able to hear sounds of a frequency higher than those acceptable to the human ear. It may well be that to some animals frequencies which we definitely acknowledge to be radio frequencies are, in fact, of an audio nature. How would they react to radio transmission on what was, to them, an audio frequency?

If an individual can in fact hear as a high-pitched audio sound, a C.W. or amplitude modulated 'phone transmission when its frequency is not supersonic to him, what impression would a frequency modulated 'phone transmission have on him? I think it follows that he would actually hear the programme transmitted. Finally, I should like to know the effect of distance on such phenomena, if they are in fact possible.

I hope that someone may be able to satisfy my curiosity on these points.

Yours faithfully,
L. J. J. MORGAN, 2HNO.

After the War

DEAR SIR,—If you can spare space for a short reply to G2QY's excellent letter under the above heading in the June BULLETIN, there are one or two points that I should like to answer.

Firstly, *re* the 15 w.p.m. morse test for Grade B certificates—yes, perhaps 18 or 20 w.p.m. would have been a better suggestion.

Secondly, the vexed question of power! As one who started with "dry batts." and worked some 20 European countries with power never exceeding 1 watt (and generally 0·4 watt!) in the old 45-metre days, I may justly claim to understand the QRP man's point of view. However, perhaps it is my training as a professional electrical engineer that makes me wonder at the British amateurs' apparently ostrich-like attitude to the question of "high power." As I see it, the whole point of the QRM bogey is directly related to the maximum power used by amateurs in *distant* countries as far as any individual country is concerned, and certainly cannot be solved by any one country voluntarily restricting the power of its amateur stations to a very small value.

If Art. B. Ham, W9 —— in Holy Smoke, Mo., lays down an S99 plus signal in the Bronx, N.Y., with his 1,000 watts, then it's tough going for our Wilmer, W2 ——, to copy poor Johnny Jones' valiant but outmatched 10-watt peanut whistle if it happens to be within a kilocycle and a dog's biscuit of Art's little packet!

Now, if Wilmer throws in the crystal filter plus the "Hetrofil" (Advt.; hi!) maybe he can prevent W9 —— from pushing the diaphragms through the ear-pieces of his phones, but the little that is then left of the flea power chirp from Briskett Hogsnorton, is going to be about as hard to find as the cheese in a 1941 mousetrap! Whereas, had Johnnie been pushing out a cool one hundred watts, Britain might, very conceivably, have delivered the goods!

Thirdly, the task of completely re-examining all pre-war holders of amateur licences would add so much work to the hard-pressed P.O. that any advantages that might accrue would be outweighed by the loss of time involved.

Lastly, 2QY's suggestion for limited QTC facilities is quite the soundest I have yet come across.

Yours faithfully,
R. L. VARNEY, G5RV.

HEADQUARTERS CALLING

Council Meetings

Council has decided that in future a résumé of the chief items of interest discussed at their meetings shall be published in the Society's Journal. The résumé will follow the lines of the pre-war D.R. Circular issued each month for dissemination to members attending District meetings.

Members will appreciate that any confidential matters will not be published.

Résumé of Council Meeting held at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, at 6 p.m. on Tuesday, May 22, 1941.

Present.—Messrs. A. D. Gay, A. E. Watts, H. A. M. Clark, J. W. Mathews, D. N. Corfield, S. K. Lewer, W. H. Matthews, H. V. Wilkins and J. Clarricoats.

Apologies.—Messrs. Dedman, Scarr, Watson.

Absent.—Mr. E. L. Gardiner.

1. The monthly statement of account was presented by the Hon. Treasurer and approved.

2. It was agreed to purchase a further £500 worth of 2½% Defence Bonds.

3. Ninety-one members were elected and three resignations accepted. The membership on May 14 was 3,056, a net increase of 103 since February.

4. A satisfactory revenue was obtained from advertising in the second reprint of the Handbook.

*5. Mr. Dedman's resignation from Council was accepted with regret.

6. It was agreed to make inquiries regarding a suggestion that morse practice transmissions be made regularly by the B.B.C.

7. An increase of 10 per cent. in the cost of producing THE T. & R. BULLETIN was approved after correspondence from the Society's printers had been considered, in conjunction with a circular from the Federation of Master Printers.

8. It was reported that triplicate copies of all recent correspondence to and from the G.P.O. had been made and distributed to the President, Immediate Past President and Secretary-Editor.

*9. Correspondence from the G.P.O. regarding B.B.C. transmissions in the 7–7·2 Mc. amateur band was tabled. It was agreed to publish a further statement in THE T. & R. BULLETIN.

*10. The Czech Radio Society in Great Britain was granted honorary affiliation with the R.S.G.B.

11. It was reported that a private meeting between Messrs. Gay and Watts (of R.S.G.B.) and Pocock and Smith (of *Wireless World*) had taken place. The recent difficulties which had arisen were now dissolved.

* *These items were reported upon in the June issue.*

Squadron Leader G. R. Scott Farnie Co-opted to Council

The Council has been pleased to co-opt Sq./Ldr. Scott Farnie, GW5FI, to serve on that body in the place of Mr. E. A. Dedman, whose resignation was reported last month.

Although serving with the R.A.F. in the London area, GW5FI still retains his office as District 10 (South Wales) and Monmouthshire Representative. His appreciation of provincial problems, coupled with his service experience, should prove of great assistance to his colleagues on Council.

Compensation for Loss or Damage to Amateur Equipment Held by the G.P.O.

We have recently been advised by the G.P.O. that the question of compensation for loss or damage to amateur equipment held by the G.P.O. is still receiving the close attention of the Telecommunications Dept.

It is hoped to publish a full statement next month. In the meantime if any member is in difficulty he should communicate with Headquarters.

Prisoners of War

It has been suggested by Mr. David Mitchell, GW6AA, that we should from time to time publish the names and addresses of our members who are prisoners of war.

In order to carry the suggestion into effect Headquarters will be glad to receive details from those who are in touch with prisoners of war. Please use block capitals when passing along information.

WAR TIME

CONVENTION

• • •

In order to keep alive the Spirit of Convention, and to provide an opportunity for informal discussion, arrangements have been made for a meeting to be held on

Saturday, Aug. 9th, 1941

at the INSTITUTION OF ELECTRICAL ENGINEERS, SAVOY PLACE, VICTORIA EMBANKMENT - LONDON. W.C.2

• • •

. . Programme . .

12.30 p.m.	Informal Lunch at Strand Palace Hotel (meet in lounge).
2 p.m.	Presidential Greetings.
2.15 p.m.	Informal Discussions.
4 p.m.	Photographs.
4.15 p.m.	Informal Tea.

Nota Bene

For the benefit of new members we give below the names and addresses of those to whom correspondence relating to specific subjects should be sent.

MR. A. O. MILNE, G2MI, 1 Kent Drive, Harrogate, Yorks. All items of DX news covering frequencies up to 20 Mc.

MISS NELLY CORRY, G2YL, "Petershead," Meadow Walk, Walton-on-the-Hill, Tadworth, Surrey. All items of news covering frequencies from 20 to 50 Mc.

MISS CONSTANCE HALL, G8YL, North Waltham Rectory, Winchester, Hants. All items of news covering frequencies above 50 Mc.

MR. A. O. MILNE, G2MI (address as above). All matters concerning QSL cards.

MR. D. HEIGHTMAN, G6DH, 234 Burrs Road, Gt. Clacton, Essex. All matters connected with the Experimental Section.

MR. T. R. THEAKSTON, 2DBK, "Westwood," Heslington Lane, Fulford, York. All matters connected with the series of articles entitled "Mathematics for the Radio Amateur."

DISTRICT REPRESENTATIVES. All notes and news for publication in THE T. & R. BULLETIN, by the 25th of the month.

HEADQUARTERS. "Ham Hospitality," "73" lists "Active Service" details, "Khaki and Blue."

Returned Bulletins

Readers are asked to assist us in tracing the present whereabouts of the following members who have moved from the address recorded at Headquarters :—

A. Cumming (BRS1134), Dullan Brae, Dufftown, Banffshire.

Otto Fanta (FRS50), 34 Arthur Court, Queensway, W.2.

F. H. Jackson (G2KZ), 3 Clarence Road, Withington, Manchester, 2.

H. B. Jefferies (G8HJ), 18 Massey Park, Wallasey, Cheshire.

G. H. Meara (2AGN), 85 Desmond Avenue, Beverley High Road, Hull.

T. Noblet (G3TN), 14 East Acton Lane, Acton, W.3.

L. A. Vaughan (G2VH), 16 St. Albans Road, Southsea.

J. S. Bamford (G5JB), Greenfields, Bath Road, Devizes.

Handbooks in Northern Ireland

Arrangements have been made for our Northern Ireland D.R., Mr. J. N. Smith, GI5QX, "Ben Venuto," Hawthornden Drive, Belmont, Belfast, to keep a stock of *Amateur Radio Handbooks*. Members living in that country should order direct from Mr. Smith, thereby avoiding Censorship delays.

QST and Radio

The May issue of *QST* reached Headquarters on June 26. The June issue of *Radio* arrived on June 28.

Book List 170

At the invitation of the National Book Council the Secretary-Editor was invited to prepare a list of books dealing with Radio and Telecommunications.

Members may like to know that the list has now been printed and is available, price 2d., from the N.B.C., 3 Henrietta Street, Covent Garden, London, W.C.2.

No less than 39,000 copies of the list have been printed, some 23,000 being for export. This is the largest printing order ever given by the N.B.C. for one of its Book Lists.

Can You Help ?

Mr. G. B. Neale, G8NN, 18 Vainor Road, Sheffield 6, seeks a service sheet or circuit of the 1936 *Telsen* 6-valve superhet.

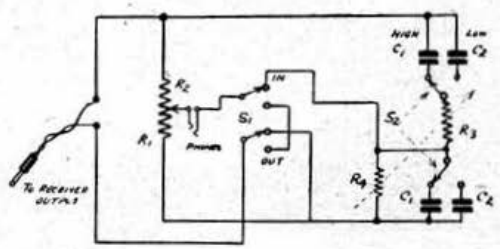
Mr. J. H. Gadsden, 1388A High Road, Whetstone, N.20, who is arranging a series of concerts for the troops, is anxious to hire, loan, or if necessary, purchase, a suitable portable amplifier and loud speaker.

* * *

Mr. L. F. Miller, BRS4030, 7 Eastbourne Terrace, Seaford, Sussex, enquires for a diagram of the *Pye* Model T10 receiver. He also wishes to know the value of the I.F.

Corrections

Two errors crept into the June issue. The first occurred in Mr. Varney's interesting "Heterofil" article where the lead from the junction of the switch and top of R4 in Fig. 2 was shown connected to the top instead of to the bottom of R3. The second error occurred in Mr. Heap's article on



The Heterofil circuit as it should have appeared.

Signal Generators. The resistor R1 in Fig. 1 was not a variable as stated in the text and the control referred to was not included in the circuit. The reference to R2 at the top of page 409 should have read R9.

Apologies are offered to readers who were mislead by the errors.

Technical Teasers

No. 1

Answers

(1) Iron 1,530° C. ; nickel 1,452° C.
(2) Photograph taken through the medium of an oscillograph.
(3) Coulomb.
(4) 56 Mc/s.
(5) Intensity of magnetisation.
(6) Damped (continuous), undamped (intermittent).
(7) Matter.
(8) Conduction currents, displacement currents and convection currents.
(9) 250 c.p.s.
(10) Heating, magnetic and chemical.

Bournemouth Bargain Basement

We hear that G4IJ, of Bournemouth, recently acquired a pair of Brown's "A" phones for one shilling at a Red Cross Depot. The news has resulted in a rush of bookings at the popular Hampshire resort, the rumour having spread that a few HRO's are shortly to be sent to the Depot by the local ham philanthropists.

NEW MEMBERS

HOME CORPORATES.

N. L. AVERY (G2KC), 82 Hatherley Road, Winchester, Hants.
A. T. W. WEST (G2RG), 140A Beaconsfield Road, Hastings, Sussex.
R. P. SWAFFIELD (G3JM), 2 Maxwell Road, Arundel, Sussex.
R. H. NEWLAND (G3VW), 42 Bacon Lane, Kingsbury, N.W.9.
A. LATUS (G3VX), 90 Ribbleton Lane, Preston, Lancs.
H. MARSHALL (G4ND), 14 Greenway Close, The Avenue, Sale.
E. C. TAYLOR (G5XW), 35 Grant Road, Addiscombe, Croydon, Surrey.
E. G. HOULDSWORTH (G6NM), 10 The Circuit, Wilmslow, Ches.
R. R. SMITH (G6TQ), 24 Prospect Road, New Barnet, Herts.
J. KIPPAX (G8AK), 81 George Street, Blackpool.
W. H. WENTWORTH (G8IU), 44 Farndale Crescent, Greenford Middx.
C. HINDLE (G8JA), 308 Wensley Street, Blackburn.
F. N. F. BEWLEY (G8HX), "Deansgate," Teverson Road, Pleasley, Mansfield.
H. T. MCFARLANE (G8SK), 15 Rotherfield Road, Enfield Wash, Middlesex.
F. J. DAWES (G8UI), 2 Green Gates, Breck Hill Road, Mapperley, Notts.
E. C. MEADOWS (2ALT), "The Totem Pole," Quarry Road, E. Heswall, Cheshire.
B. F. HUTTON (2BFH), 43 Montana Road, Upper Tooting, S.W.17.
W. T. LARBEY (2DWV), 21 The Hale, Tottenham, N.17.
W. G. DANDY (2DXW), "Devanha," The Chase, Malvern, Worcs.
S. R. MINSON (2FGB), 3 Brecon Road, Fulham, S.W.6.
W. HANNER (2FIM), 159 Bradford Road, Brighouse, Yorks.
A. T. JOHNSON (2FTH), 130 Prospect Road, Woodford Green, Essex.
G. D. P. HOLDEN (2HIX), 22 Cross Street, Chesterfield, Derby.
H. O. WILLS (2HKF), 25 Alfred Street, Rushden, Northants.

WE extend a Cordial Welcome to the

103

NEW MEMBERS

whose names are listed

•

OUR THANKS ARE EXTENDED TO THEIR SPONSORS

K. H. DOVE (2HKZ), 49 Boscombe Road, Merton Park, S.W.19.
F. GARDNER STANGLE (BRS4228), 38 Crosfield Street, Warrington.
N. FRIGOUT (BRS4229), 24 North Gates, High Road, Finchley, N.12.
A. M. FYFE (BRS4230) 2 Hartfield Gardens, Dumbarton, Scotland.
N. L. BOLLAND (BRS4231), 24 Wolstonbury, Woodside Park, N.12.
P. M. MILNER (BRS4232), "Tegelon," Lymington Road, Highcliffe, Hants.
M. SALTER (BRS4233), Newlands, Broad Clyst, Exeter.
T. G. MORRIS (BRS4234), Maryland, Sollershott West, Letchworth.
E. BROWN (BRS4235), 31 North Quadrant, Firth Park, Sheffield, 5
J. HORSFALL (4236), 12 Seaton Road, Alperton, Middlesex (transferred from Associate Grade).
P. TAYLOR (BRS4237), 11 Castle View, Tonbridge, Kent.
A. C. EMENY (BRS4238), 73 Queens Road, Felixstowe, Suffolk.
L. SISSON (BRS4239), 10 Holyoake Terrace, Penrith, Cumb.
J. A. BROWNING (BRS4240), "Meads," Jacobean Lane, Knowle, Nr. Birmingham.
H. F. WEST (BRS4241), H.M.S. *St. Martin*, c/o G.P.O.
W. T. CREIGHTON (BRS4242), Belmont, Enniskillen, Co. Fermanagh, N.I.
A./CMDR. O. G. LYWOOD, C.B.E. (BRS4243), R.A.F.
H. MARTIN (BRS4244), 729 Middleton Road, Chadderton, Nr. Oldham.
R. P. ABRAM (BRS4245), 1 Bankfield Avenue, Manchester, 13.
H. F. HENSHAW (BRS4246), 45 Ferry Road, Hr. Irlam, Manchester.
J. MARTIN (BRS4247), 66 Sighthill View, Edinburgh.
D. P. R. ROESSLER (BRS4248), 7 Oaken Grange Drive, Prittlewell, Essex.
F. T. TAYLOR (BRS4249), 9 Falmer Road, West Green Road, Tottenham, N.15.
R. A. HUTCHESON-COLLINS (BRS4250), Lobleys Farm, Upton Lane, Barnwood, Glos.
T. C. WILLIAMSON (BRS4251), 1 Noel Street, Forest Side, Nottingham.
W. G. ALLEN (BRS4252), Floral Cottage, Brompton-on-Swale, Richmond.
G. F. LAXTON (BRS4253), Rustlewood, Parkside, Bingley, Yorks.
J. WILLY (BRS4254), "Ashbourne," Orchard Avenue, Thames Ditton, Surrey.
C. W. G. DENT (BRS4255), Ardente Acoustic Laboratories Ltd., Limmerslease Compton, Nr. Guildford.
H. FREEMAN (BRS4256), 100 Quay Road, Bridlington, E. Yorks.
S. MUMTAZ UDDIN, M.Sc. (BRS4257), Test Dept., Marconi's Wireless Telegraphy Co., New Street, Chelmsford.
F./Lt. A. T. MATHEWS (BRS4258), R.A.F.
G. F. BONNER (BRS4259), 84 Oatlands Drive, off Stoke Poges Lane, Slough, Bucks.
H. C. LUCAS (BRS4260), The Shieling, Pilgrims Way, Trottiscliffe, West Malling, Kent.
R. C. W. SEWELL (BRS4261), 37 Burnham Road, Dartford, Kent.
S. KRASUSKI (BRS4262), 16 Lytham Road, Blackpool.
H. L. ASHTON (BRS4263), Rediffusion Ltd., Broomhill Road, Wandsworth, S.W.18.
G. R. FROOD (BRS4264), 39 Podsmead Road, Gloucester.
E. N. DAINES (BRS4265), 25 Monkswell Court, Muswell Hill, N.10.
G. D. BRITTAIN (BRS4266), 77 Station Road, Hendon, N.W.4.
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R. W. LAY (BRS4268), 111 Chadacre Road, Ewell, Surrey.
R. PEARSON (BRS4269), 3 Ecclesburn Avenue, Leeds, 9.
A. ROSE (BRS4270), 2 Gloucester Drive, Finsbury Park, N.4.
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G. C. WADDINGTON (BRS4272), 19 Caister Grove, Keighley, Yorks.
H. N. COX (BRS4273), 89 Scriber's Lane, Hall Green, Birmingham, 28.
J. HAWTHORNTHWAITE (BRS4274), 20 St. Annes Road E., Lytham St. Annes.
L. W. GUTTERIDGE (BRS4275), 106 Stanford Road, Norbury, S.W.16.
G. W. CRAWLEY (BRS4276), 241 Belswains Lane, Hemel Hempstead, Herts.
H. S. SAYER (BRS4277), 35 Union Street, Stowmarket, Suffolk.
Sgt. H. E. MEAD (BRS4278), R.A.F.
G. PENTIR-WILLIAMS (BRS4279), Strand Buildings, Bangor, N. Wales.
C. C. PIPER (BRS4280), 25 Eastern Avenue, Shoreham-by-Sea, Sussex.
R. SLOAN (BRS4281), 13 Hawthorne Avenue, Bearsden, Dumbartonshire.
T. COLLINS (BRS4282), 2 Redstone Road, Manchester, 19.
C. D. CHATFIELD (BRS4283), 141 Preston Road, Brighton, 6.
H. O. ARRIDGE (BRS4284), "The Bungalow," West End, Bangor, N. Wales.
C. S. VANE-TEMPEST (BRS4285), Broadhurst Manor, Horsted Keynes, Sussex.
P. W. HAND (BRS4286), 84 Grove Park, Camberwell, S.E.5.
F. G. PRICE (BRS4287), 91 Henley Road, Leicester.
J. RAISTRICK (BRS4288), 75 Austwick Road, Ryelands, Lancaster.
J. BENCE (BRS4289), South Hill House, Amesbury, Nr. Salisbury.
A. R. HAMILTON (BRS4290), 165 Cambridge Road, Kilburn, N.W.6.
R. C. JOHNSON (BRS4291), 57 Third Avenue, Gillingham, Kent.
D. G. M. ALEXANDER (BRS4292), 6 Dighton Road, Wandsworth, S.W.18.
P. F. JONES (BRS4293), 5 Barry Road, Rhyl, N. Wales.
J. LACROIX (BRS4294), "Brockhurst," Templewood Lane, Farnham Common.
P. DEAN (BRS4295), "Sunnyside," Mount Road, Prestwich, Manchester.
E. T. HURLEY (BRS4296), 4 Kelross Road, Highbury, N.5.
F. MONK (BRS4297), Toll Bar Cottage, Stapleton, Leicester.
A. EPTON (BRS4298), 72 Clarendon Road, Hove, 3.

DOMINION AND FOREIGN.

M. SETKOWICZ (SP1HI), R.A.F.
J. SATEK (SP1HA), R.A.F.
S. KIJOWSKI (SP1OY), R.A.F.
DR. E. SAHANEK (OK5DS), 63 Exhibition Road, S.W.7.
M. LJACHOVIC (OK1ML), R.A.F.
C. B. BOORMAN (BERS492), General Delivery, Hamilton, Bermuda.
S. SHROFF (BERS493), 5 Dickman's Lane, Havelock Town, Colombo, Ceylon.

ULTRA-HIGH FREQUENCY PROPAGATION—

(*Continued from page 9*).

lower atmosphere and rapid fading may be caused by turbulence of the air. The fading appears to be of a random nature, but increases with distance. Experiments over ocean paths have shown the presence of multipath propagation. The paths consisted of a " ground " ray plus grazing incidence reflections from air mass boundaries. Thus fading, somewhat similar to that experienced near the edge of the service area of a broadcast station, is produced, although the " sky-wave " originates in a different manner.

Both diffraction and refraction are of importance, the effect of refraction being to increase the effective earth's radius and therefore extend the horizon distance, while diffraction carries the signal beyond this new horizon into the " shadow " region. It is difficult to check the effect of diffraction owing to the variable nature of refraction and the irregular nature of practical types of ground, which differ widely from that on which the theoretical work is based.

In conclusion, attention is drawn to the mobile recording surveys made by Wickizer, of the u.h.f. transmissions from the Empire State Building in New York. Details of some of the results of these surveys were given in the April, 1941 issue of THE T. & R. BULLETIN. E. J. W.

Bombed Out

G4JX. New address, 451 Marfleet Lane, Hull, E. Yorks.

G5CN. New address, " Riverside," Promenade, West Kirby.

EXCHANGE AND MART.

ALL KINDS OF PRINT.—Send your enquiries to G6MN, Worksop.

EXTREMELY well-written and learned Book, " U.S.A. Radio Club." Unorthodox Detection method; theory; circuits. 2/- post free.—D'ARCY FORD (BRS1879), Gandy Street, Exeter.

FOR SALE.—Acorns, USW Bottles, Relays, Valveholders (Jumbo), Condensers (fixed and variable), Acorn holders, Television Diodes. Transformers, Potentiometers. (All values.)—Write to 2DGF, 6 Worthing Road, Southsea.

FOR SALE.—Murphy B5 Battery-operated 5-valve Superhet Receiver; 200–550, 1,000–2,000 metres. Recently revalved and completely overhauled. £11, or nearest.—P. C. SHENTON (2DSL), Graveley Rectory, Huntingdon.

FOR SALE.—RME.69 L.S.I. Model, 230 Mains, excellent condition. Purchased new late 1938. Price £30.—NELSON, Sherwood, Queens Promenade, Douglas, I. of M.

FOR SALE.—S.W. Magazine. 3 Pen-V-Pen Battery. Built Scott-Sessions, 1939. Unused since war. Just overhauled. 9–90 metres. Perfect condition; complete. Best offer over £5 secures. —BRS3277, Kilworth, Maresfield, Sussex.

SALE.—McElroy Automatic Morse Transmitter with 3 reels tape, cost £9 10s. Ideal for learning Morse. As new, in original carton, £6. McElroy Commercial Straight Key, 6/-.—WALSBY, Henstridge, Templecombe, Somerset.

SALE.—9v. Communications Kit, Speaker and Power-pack, £9. Valves, S.W. components, etc. —WALL, 5 Grantham Row, Navenby, Lincs.

S/W RECEIVERS, Eddystone " All-World " 2, £3. 2 Pentode Receiver, 45/-. Valves 6C5, 6J7, 7/6 each.—Highfield, Belgrave Close, Chelmsford.

WANTED.—Cheap Superheterodyne Self-Contained, short, medium, long waver. 200 volts D.C., extension for gramophone and usual controls, etc.—SMITH, 33 St. James' Gardens, London, W.11.

WANTED.—Hallicrafter SX16, also Marconi or Osram U.12 Rectifier.—HAMILTON, 165 Cambridge Road, Kilburn, London, N.W.6.

WANTED.—Hallicrafters SX25 or National Standard H.R.O. Good cash price paid. Part exchange New SX23, unused, more than 5 hours. Wanted, Universal Avominor. All-Wave Oscillator. Steel Aerial mast over 40 ft. Hallicrafters HT7. Fullest details.—2 Church Street, Evesham.

WANTED.—McElroy Bug.—G4GJ, Mayfield, Wagon Lane, Bingley, Yorks.

WANTED.—National 1-10 Receiver with or without valves. State condition and price. —G3SU, 6 Northfield Park, Hayes, Middx.

WANTED.—5ZA, two 6C5 and 1853 Tubes, new or slightly used. Have you any of above Tubes not in use. Price to WILKINSON, c/o. Parrs, 121 Kingsway, London, W.C.2.

INDEX TO DISPLAYED ADVERTISEMENTS

PREMIER RADIO

ALL S.W. KITS NOW INCLUDE PURCHASE TAX

PREMIER SMOOTHING CHOKES

Type	Current mA.	Henrys	Res.	Price
C.40/500	40	20-34 H.	500Ω	6/-
C.60/180	60	8 H.	180Ω	6/-
C.60/400	60	25-34 H.	400Ω	8/8
C.60/500	60	18-30 H.	500Ω	8/8
C.100/400	100	20-34 H.	400Ω	10/8
C.150/185	150	20-34 H.	185Ω	15/4
C.200/145	200	20-34 H.	145Ω	18/-
C.250/120	250	25 H.	120Ω	20/-

MOVING COIL SPEAKERS

All complete with transformer. Rola 6½ in., 15/-; 10 in. P.M.s, 22/6; Goodmans 8 in. P.M.s, 20/-.

ENERGISED MODELS

Plessy 8 in. 175 ohm field ... 7/6

CONDENSERS, Etc.

Bakelite Dielectric Variable Condensers, .0005 mf. Suitable Tuning or Reaction, 1/6 each.

Short-Wave H.F. Chokes. 10-100 m., 10½d. each.

Lissen Dual Range Screened Coils. Medium and Long Waves, 2/9 each.

Small 2-gang .0005 with Trimmers, 3/6. Ditto 3-gang, fully screened, 5/-.

2,000 ohm 25-watt Res. with 5 tapping clips, 1/6.

MAINS TRANSFORMERS

Wire-ends. All L.T. Windings Centre-Tapped.

S.P.250—250-0-250 v. 60 m.a., 4 v. 1-2 a., 4 v. 2-3 a., 4 v. 2-3 a. 13/4

S.P.300—300-0-300 v. 60 m.a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 2-3 a. 13/4

S P.301—300-300 v. 150 m.a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 1 a., 4 v. 1 a. ... 17/4

S.P.350A—350-350 v. 100 m.a., 5 v. 2 a. (not C.T.), 6.3 v. 2-3 a. ... 16/-

S.P.350B—350-350 v. 100 m.a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 2-3 a. 16/-

S.P.351—350-350 v. 150 m.a., 4 v. 1-2 a., 4 v. 2-3 a., 4 v. 3-4 a. 17/4

S.P.351A—350-350 v. 150 m.a., 4 v 2-3 a., 4 v. 2-3a., 4 v. 1 a., 4 v. 1 a. 22/-

S.P.352—350-350 v. 150 m.a., 5 v. 2 a, 6.3 v. 2 a., 6.3 v. 2 a. 18/-

S.P.811—300-300 v., 4 v. 5 a., 4 v. 1 a 8/11

Auto Transformers. Step up or down. 100-125 v. to 200, 230 or 250 v. A.C., 60 watts, 11/4; 125 watts, 15/-; 250 watts, 22/-.

L.T. Transformers, all C.T.

4 v. 2-3 a. ... 11/4	6.3 v. 2-3 a. ... 11/4
2.5 v. 5 a. ... 11/4	7.5 v. 3 a. ... 11/4
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