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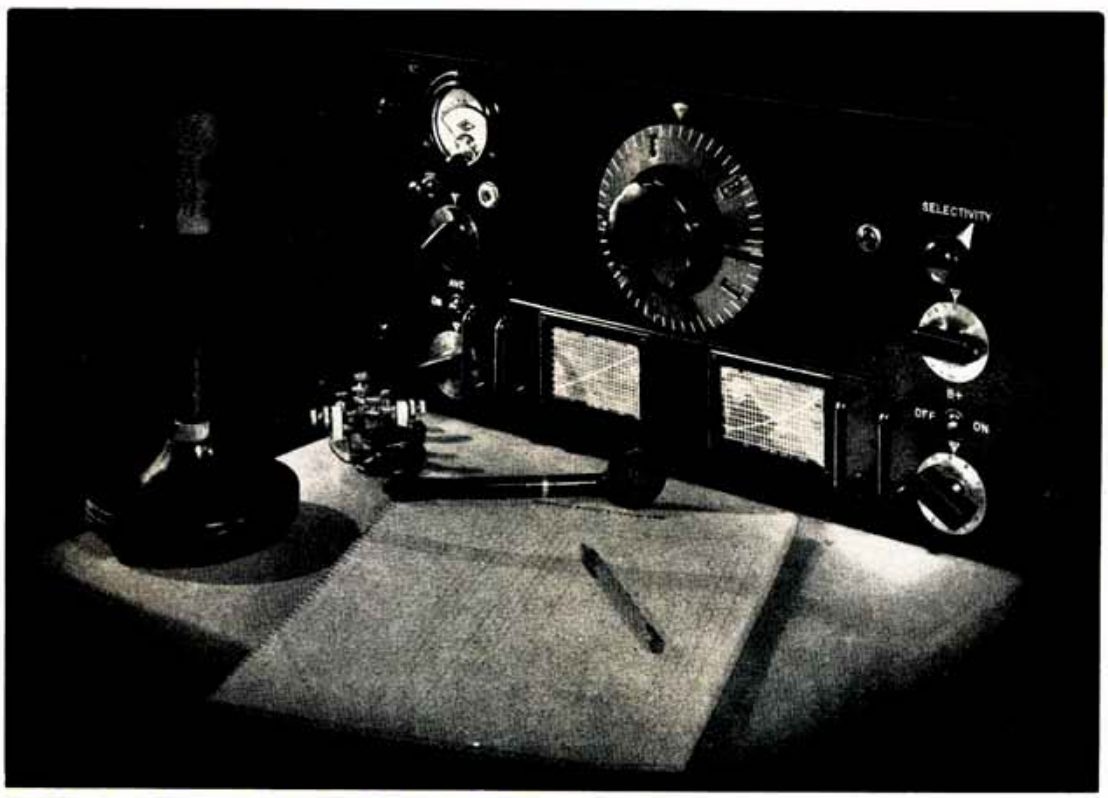

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AT the present time it is the duty of every member who has ambitions for the future to help create a strong organisation which will be in a position to press for the early restoration of licence facilities after the war. Many hundreds of new members have been elected recently, but many more are needed. Members on active service, no less than those following civilian occupations, can help to make the Society strong by introducing its work to their colleagues.

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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

Advertisement Manager: HORACE FREEMAN

Vol. XVI. No. 9 MARCH, 1941

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MATHS. AND ALL THAT

FOR some months prior to publishing the first of the series of articles entitled "Mathematics for the Radio Amateur" we toyed with the idea, not because we were in doubt about the need for such information, but rather for the reason that we were not quite certain whether members generally, would thank us for devoting a portion of our restricted space to a subject, which for many, has never had much appeal. However we risked our reputation, and hoped that we should be let down lightly if we had unwittingly dropped a brick..

Six months have now passed since our experiment was given a trial, sufficient time surely to form an opinion—even among radio amateurs! An opinion *has* been formed and as the result of reading many letters received at Headquarters (not to mention those which have been sent direct to the author of the articles), we can say with some assurance that few more popular contributions have ever appeared in this Journal.

Especial thanks are due to members serving in Signals Establishments and Training Schools who have written in praise of Mr. Theakston's work. Those whose business it is to instruct, no less than their more unfortunate brethren—"the pupils," have frequently emphasised how necessary is a basic knowledge of radio maths. For too long many of us have been content to "twist the knobs" without understanding what we are doing, or why we are doing it. How frequently too have we blinked at a simple formula without having the remotest idea of its derivation?

The question of technical instruction is becoming increasingly important in all three fighting services, as all engaged in Signals duties well know. Unfortunately very few sound text books are available to the average serving soldier, sailor, or airman, at a price within the limits of his restricted income. For that reason, more than any other, the Council of the Society agreed in December last to reprint a further 5,000 copies of the Handbook. From far and wide orders have been pouring in. Single copies, orders for a dozen or twenty and, dare we mention it? a really handsome one for 1,000 copies from one of our most regular advertisers! In addition, large orders have come from His Majesty's Stationery Office and other Government Departments, proving that the Society's Handbook is living up to its claim to be Britain's foremost manual of radio instruction.

This urge to acquire sound theoretical, as well as practical, knowledge augers well for the future, for it means that many hundreds of members and others, are getting down to the whys and wherefores of radio communication in a manner unheard of, a couple of years ago.

At the present rate of progress we may even find the 7 Mc. band being used, after the war, as a debating ground for technical topics! Assuredly it will never revert back to the days when King Blurb held Court.

J. C.

MATHEMATICS FOR THE RADIO AMATEUR

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

PART V.—POWERS, INDICES, ROOTS.

Definitions

A NUMBER can often be expressed as the product of a certain number of equal factors; *e.g.* 1,000 can be expressed as $10 \times 10 \times 10$, and then in index form as 10^3.

The number which shows how many equal factors have been multiplied together is termed the *index* (plural *indices*); the product is known as the *power*; the factor is known as the *base*, or *root* of the power.

Thus $1{,}000 = 10^3$. Here 3 is the index, for 3 equal factors have been multiplied together; the power, or product is 1,000, and the base is the factor, and is 10.

For the second power of a number we have the special term "squared"—*i.e.* $25 = 5 \times 5 = 5^2$, read as "5 squared."

For the third power we have the term "cubed"—*i.e.* $27 = 3 \times 3 \times 3 = 3^3$, read as "3 cubed."

Now $32 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5$, which is read as "2 to the fifth," this being short for "2 raised to the fifth power."

When a number is raised to a power the process is termed *involution*. This process can be reversed, and the base, or one of the equal factors of a power determined. This process is known as *evolution*. To express the root of a number the special root sign, or radical, $\sqrt{\ }$, is used. In the angle of the radical a small figure is placed to show which root is meant, except in the case of the square root when no figure is used.

E.g. $\sqrt{9}$ means "the second or square root of 9"; and since $9 = 3 \times 3$, $\sqrt{9} = 3$.

$\sqrt[3]{125}$ means "the third or cube root of 125"; and since $125 = 5 \times 5 \times 5$, $\sqrt[3]{125} = 5$.

$\sqrt[6]{64}$ means "the sixth root of 64"; and since $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$, $\sqrt[6]{64} = 2$.

Expressing this in general terms (and please do not be afraid of this it is only stating a case for which any numbers can apply)—

1. $x \times x \times x \times x \times \ldots$ n times $= x^n$. That is x raised to the nth power by multiplying together n factors each equal to x.

2. $\sqrt[m]{y}$ = the mth root of y, *i.e.* that factor, m of which multiplied together give the product y.

To Evaluate the Square Root of any Number

It seems appropriate at this juncture to revise the arithmetical method of evaluating the square root of a number. The method can best be demonstrated by working through an actual example, step by step.

Preliminary Note.—1. The squares of the first ten natural numbers must be known.

Number	1	2	3	4	5	6	7	8	9
Square	1	4	9	16	25	36	49	64	81

2. It should be appreciated that the square root of any number from 1 to 99 inclusive has only one digit; that of any number from 100 to 9,999 inclusive has two digits, etc.

Example.—Evaluate $\sqrt{54756}$

Step 1.

Divide the number, by means of a small mark, into groups, or periods, of two figures beginning with the units figure (6). The last period to be marked off will have one figure only.

We have now 5′47′56

As there are three periods there will be three digits in the square root.

Step 2.

Consider the left-hand period, 5 (really $5 \times 10{,}000$). Find the highest number whose square is contained in this number.

It is 2, since $2^2 = 4$.

Put this (2) in the root, and subtract its square (4) from the left-hand period.

To the remainder, 1, bring down the next period, 47, making 147.

We have now
```
   2
)54756
  4
 )147
```

Step 3.

Double the root obtained ($2 \times 2 = 4$) and place the 4 in the new divisor with space for one figure following it to complete the divisor.

To obtain the missing figure in the divisor, a method of trial is used, as follows:—

Divide the dividend without its last figure, *i.e.* 147 without the 7 = 14, by the known figure of the divisor = 4. $14 \div 4 = 3$, hence 3 is apparently the figure required.

Place the 3 in the root and in the divisor.

We have now
```
   2 3
)5′47′56
  4
43)147
```

Step 4.

Multiply the completed divisor, 43, by the figure just obtained as the second digit of the root, *i.e.* $43 \times 3 = 129$.

Subtract 129 from 147. Remainder = 18.

Bring down next period 56, making 1856.

We have now
```
   2 3
)5′47′56
  4
43)147
   129
 ) 1856
```

Step 5.

A repetition of the method of Step 3.

Double root so far obtained, $2 \times 23 = 46$, and place as partial divisor.

Obtain the third figure of the divisor by dividing 185, the dividend 1856 without its last figure, by 46 the partial divisor. $185 \div 46 = 4$.

Place the 4 in the root and in the divisor.

Multiply 464, the completed divisor, by 4, the figure just obtained, and subtract from 1856.

$464 \times 4 = 1856$. $\therefore$ remainder $= 0$.

$$\therefore \sqrt{54756} = 234.$$

and the completed working is :—

```
   2  3  4
 )5'47'56
   4              (= 2 × 2)
43)147
   129            (= 3 × 43)
464) 1856
   1856           (= 4 × 464)
   ....
```

Notes.—1. The above process is repeated until the root is evaluated as far as necessary. In the example the root was determined exactly without going into decimals.

2. When finding the square root of a decimal quantity it is marked off in periods *right and left* from the decimal point. To complete a period in the decimal portion a cipher is added. Periods of two ciphers can of course be added to the decimal portion if required.

E.g. 1367·439 would be marked off as 13'67·43'90.

The method is then as before, but the decimal point is inserted in the answer when it is reached in the number.

Example 2.—Evaluate, correct to one decimal place, $\sqrt{1085 \cdot 4}$.

If the root is required to one place of decimals we must work to two places. The full working, with marginal notes, is :—

```
                3  2·9  4
              )10'85·40'00
3 ×   3 =       9
2 ×   3 = 6   62)185      18 ÷ 6 = 3, but
                          3 × 63 = 189.
2 ×  62 =       124       ∴ 3 is too large for
2 ×  32 = 64  649)6140    trial divisor.
9 × 649 =       5841
2 × 329 = 658 6584)29900
4 × 6584 =      26336
```

$\therefore$ correct to one place of decimals,

$$\sqrt{1085 \cdot 4} = 32 \cdot 9$$

Using Tables for Determining Square Roots

It may be mentioned here that tables usually give values for the square roots of numbers in two sections. One is for numbers from 1 to 10, and the other for numbers from 10 to 100. This does not mean that one cannot determine from these tables the roots of numbers which are outside these limits ; *i.e.* the square roots of 0·573, 761, 3682, etc.

Remembering that $\sqrt{100} = 10$,

then $\sqrt{0 \cdot 573} = \sqrt{\frac{573}{100}} = \frac{\sqrt{57 \cdot 3}}{10}$

$\sqrt{761} = \sqrt{7 \cdot 61 \times 100} = \sqrt{7 \cdot 61} \times 10$

$\sqrt{3682} = \sqrt{36 \cdot 82 \times 100} = \sqrt{36 \cdot 82} \times 10$

and the values under the radicals are now in the specified limits of the tables; the first and third in the 10 to 100 table, and the second in the 1 to 10 table.

As a check we remember that every period of two figures in the number gives one digit in the square root, and therefore $\sqrt{761} = \sqrt{7'61 \cdot 00'}$ gives two digits before the decimal point, and $\sqrt{3682} = \sqrt{36'82 \cdot 00'}$ also gives two figures before the decimal point.

This quick and simple check should be made automatically when evaluating the square root ; the decimal point would never be wrongly placed if it were done always.

The Laws of Indices

Numbers which are expressed as powers can be manipulated by following certain laws, the truth of which is easily demonstrated.

1. *First Index Law—for multiplication of powers.*

By the definition of a power,

(*a*) $10^3 \times 10^4$
$= (10 \times 10 \times 10) \times (10 \times 10 \times 10 \times 10)$
$= 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$
$= 10^7$, or 10^{3+4}

(*b*) $x^4 \times x$
$= (x \times x \times x \times x) \times (x)$
$= x \times x \times x \times x \times x = x^5$, or x^{4+1}

I.e. To multiply powers of the same quantity add the individual indices to obtain the index of the product.

2. *Second Index Law—for the division of powers.*

By the definition of a power,

(*a*) $10^3 \div 10^2 = \frac{10 \times 10 \times 10}{10 \times 10}$, and cancelling common factors $= 10$, or 10^1, or 10^{3-2}

(*b*) $x^4 \div x^2 = \frac{x \times x \times x \times x}{x \times x} = x \times x = x^2$, or x^{4-2}

I.e. To divide powers of the same quantity, the index of the quotient is the difference of the individual indices of the dividend and divisor.

Two special cases which should be noted are dependent on this law.

(1) By definition,

$$10^2 \div 10^4 = \frac{10 \times 10}{10 \times 10 \times 10 \times 10}$$

and cancelling $= \frac{1}{10^2}$

But by the second law,

$$10^2 \div 10^4 = 10^{2-4} = 10^{-2}$$

$\therefore 10^{-2} = \frac{1}{10^2}$, and similarly $x^{-3} = \frac{1}{x^3}$, etc.

I.e. To transfer a power from the numerator to the denominator of a fraction, and vice versa, *change the sign of the index.*

(2) By definition, $10^3 \div 10^3 = (10 \times 10 \times 10) \div (10 \times 10 \times 10) = 1$

By the second law, $10^3 \div 10^3 = 10^{3-3} = 10^0$

$\therefore 10^0 = 1$, and similarly $x^0 = 1$, $17^0 = 1$, etc.

I.e. Any power having the index zero, equals 1.

3. *Third Index Law-raising powers and products to a power.*

(*a*) $(10^2)^3 = (10 \times 10)^3$
$= (10 \times 10) \times (10 \times 10) \times (10 \times 10)$
$= 10^6$, or $10^{2\times3}$

$(x^3)^3 = (x \times x \times x)^3$
$= (x\times x\times x) \times (x\times x\times x) \times (x\times x\times x)$
$= x^9$, or $x^{3\times3}$

I.e. To raise a power to a further power multiply the indices.

(*b*) $(5 \times 10)^3 = (5 \times 10) \times (5 \times 10) \times (5 \times 10)$
$= (5 \times 5 \times 5) \times (10 \times 10 \times 10)$
$= 5^3 \times 10^3$

Similarly $(xy)^4 = (x \times y)^4 = x^4 \times y^4$

I.e. To raise a product to a power raise each factor to that power.

For rapid reference the laws just obtained will be summarised. One example using the factor 10 as illustration will be given, as the laws in connection with this number form the basis of the theory and practice of logarithms; and further, in conversion of radio units, powers of 10 are always involved. The second illustrative example will be in general terms.

Law 1.

$10^7 \times 10^5 = 10^{7+5} = 10^{12}$ $\quad x^a \times x^b = x^{a+b}$

Law 2.

(*a*) $10^3 \div 10^3 = 10^{3-6} = 10^2$ $\quad x^a \div x^b = x^{a-b}$

(*b*) $10^{-6} = \frac{1}{10^6}$ $\quad x^{a-} = \frac{1}{x^a}$

(*c*) $10^0 = 1$ $\quad x^0 = 1$

Law 3.

(*a*) $(10^3)^4 = 10^{3\times4} = 10^{12}$ $\quad (x^a)^b = x^{a\times b}$

(*b*) $(10 \times 4)^2 = (10^2 \times 4^2)$ $\quad (x\times y)^a = x^a \times y^a$

Fractional Indices

The laws as stated apply to indices of all types, whether positive or negative, whole numbers or fractions.

Thus $x^{\frac{1}{2}} \times x^{\frac{1}{2}} = x^{\frac{1}{2}+\frac{1}{2}} = x^{\frac{2}{2}}$

$10^{\frac{1}{2}} \times 10^{\frac{1}{2}} = 10^{\frac{1}{2}+\frac{1}{2}} = 10^{\frac{2}{2}}$

$x^{1\cdot7} \times x^{1\cdot3} = x^{1\cdot7+1\cdot3} = x^3$

$10^{2\cdot5} \div 10^{1\cdot8} = 10^{2\cdot5-1\cdot8} = 10^{\cdot7}$

Since $x^{\frac{1}{2}} \times x^{\frac{1}{2}} = x^{\frac{1}{2}+\frac{1}{2}} = x^1 = x$

$\therefore x^{\frac{1}{2}} = \sqrt{x}$

Similarly $x^{\frac{1}{3}} = \sqrt[3]{x}$

$x^{2\cdot5} = x^{\frac{5}{2}} = \sqrt{x^5}$

$10^{-\frac{1}{2}} = \frac{1}{10^{\frac{1}{2}}} = \frac{1}{\sqrt{10}}$

Hence any power with a fractional index can be converted into a root of a power with an index which is a whole number. This conversion simplifies evaluation.

Examples of Evaluation of Powers

1. $\sqrt{\frac{10^{12}}{10^6}}$. To simplify this, instead of laboriously writing out the factor 10 twelve times, etc., by applying the laws we have

$$\sqrt{\frac{10^{12}}{10^6}} = \sqrt{10^{12-6}} = \sqrt{10^6} = (10^6)^{\frac{1}{2}} = 10^{6\times\frac{1}{2}} = 10^3 = \mathbf{1000}$$

2. $10^6 \div 10^8 = 10^{6-8} = 10^{-2} = \frac{1}{10^2} = \frac{1}{100} = \mathbf{0{\cdot}01}$

3. $\frac{10^4 \times 10^3}{10^2} = 10^{4+3-2} = 10^{7-2} = 10^5 = \mathbf{100000}$

4. By applying the index laws to the resonant frequency formula in Part IV.—January *Bulletin*, p. 219—the reader will see how the simplified formula was obtained, if by any chance it was not too clear at the first reading.

Problems

(17) Evaluate: (*a*) 4^4; 8^3; 27^0; 10^{-3}

(*b*) $\sqrt[4]{81}$; $100^{\frac{1}{2}}$; $8^{-\frac{1}{3}}$; $\sqrt[3]{10^6}$

(18) Simplify, giving answer as a power of 10:—

(*a*) $10^3 \times 10^7$; $10^4 \times 10^2$; $\sqrt{10} \times 10^{\frac{1}{2}}$; $10^6 \times 10^{-3}$

(*b*) $10^7 \div 10^4$; $10^4 \div 10^7$; $10^{\frac{1}{2}} \div 10^{\frac{1}{2}}$; $10^6 \div 10^6$

(*c*) $(10^2)^3$; $(10^3)^3$; $(\sqrt{10})^4$; $(\sqrt[3]{10})^3$

(19) Simplify: $\sqrt{\frac{10^6 \times 10^4}{10^3 \times 10}}$

(20) $\sqrt{169} = 13$. Write down, by inspection,

$\sqrt{1\cdot69}$; $\sqrt{16900}$; $\sqrt{0\cdot0169}$

(21) Use the arithmetical method to evaluate:—

$\sqrt{519841}$; $\sqrt{148\cdot84}$; $\sqrt{8\cdot5849}$

Suggested Exercises—Preparation for Logarithms

The idea and manipulation of negative numbers is essential for work in logarithms.

Note the following brief examples and rules which will serve as an introduction.

(*a*) $(-3) + (-2) = -5$; $(-2) + (-1) = -3$;
$(-2) + (+3) = +1$; $(+2) + (-3) = -1$

When both signs are alike, *i.e.* both + or both —, add in the ordinary way and prefix the sign of the numbers.

When signs are unlike, obtain the difference of the numbers and prefix the sign which is in the majority, *i.e.* in the last example the difference between 3 and 2 is 1, and the sign for the larger number is —ve, hence answer is —1.

(*b*) $(+3) - (-2) = +3 + 2 = +5$;
$(-3) - (+4) = -3 - 4 = -7$;
$(-3) - (-4) = -3 + 4 = +1$;
$(+3) - (+4) = +3 - 4 = -1$.

To subtract numbers, change the sign of the number being subtracted, and add; the addition being performed as in section (*a*) above.

(*c*) $(+4) \times (+2) = +8$; $(-4) \times (-2) = +8$;
$(-4) \times (+2) = -8$; $(+4) \times (-2) = -8$

When multiplying, like signs (both +ve or both

(*Continued on page* 308)

ANALYSIS OF THE EFFECT OF SCATTERING IN RADIO TRANSMISSION*

Introduction

THE general features of long distance transmission can be explained by simple ray treatment of an ionosphere consisting of a number of horizontal layers, and complex multiple echoes on these transmissions can often be analysed, but the reception of signals within the skip distance, and with bearings having no relation to great circle routes cannot be explained by such a simple theory. These anomalies are classed as " scattering," since they can be explained by assuming waves to be scattered from a series of isolated ionic clouds. No theory of long distance propagation is complete without taking into account the effects of scattering, for scattering may seriously limit the use of short-wave direction finders and beam aerial systems.

Early Experiments

The main aim was to discover the nature and cause of signals received in the skip zone and also to deal with lateral deviations and angular spread at greater distances. Early evidence of scattering was obtained at Chelmsford in 1927, when it was found that signals from a high-power transmitter on a frequency well above the critical frequency at vertical incidence could be received at all distances up to the extreme range of long-distance transmission, but that within a limited zone there were no signs of direction unless a beam aerial was used for transmission. In this latter case the apparent direction of travel of the waves was the opposite to that in which the beam was projected. This led to the theory that the waves were scattered back from some point or points on the path of the primary beam. The source of scattering seemed to be at or beyond the edge of the skipzone. This was confirmed in 1933, when the aural methods of obtaining bearings were replaced with a cathode-ray tube.

Signals (25 regularly spaced unmodulated C.W. dots per second) were transmitted from Ongar on 19·5 Mc on the South Africa beam. Reception was at Chelmsford, a few kilometres to the east, so that a strong ground wave was received almost at right-angles to the beam. A scattered signal was also received, partly overlapping the ground signal. The scattered signal could be suppressed at a particular setting which gave a maximum for the ground wave, and *vice versa*. The position for suppression indicated a southerly bearing for the scattered signal, showing that the signals were being scattered back from regions " illuminated " by the beam, and from the time delay it was shown that the scattering regions were beyond the skip zone. At the end of 1933, however, short bursts of scattering were noticed almost entirely overlapping the ground dot and corresponding to very small time delays.

* *A précis of a paper read by T. L. Eckersley, B.A., B.Sc., F.R.S., M.I.E.E., before the Wireless Section of the Institution of Electrical Engineers on February 7th, 1940.*

High-power Pulse Experiments

High-power pulse tests were carried out on various frequencies from Ongar and Dorchester, using very narrow pulses (·1 millisec.) synchronised with 50 cycle A.C. mains and radiated by omni-directional aerials. The receivers were at Chelmsford, 19 km. from Ongar and 232 km. from Dorchester. During the first tests the F layer critical frequency was such that no F echoes were obtained, the working frequency being too high. However, an echo pattern was obtained which showed certain general characteristics on all frequencies. The ground signal was followed by a diffuse echo of some milliseconds spread. The echo had a sharp leading edge with a delay, varying from 7 to 15 millisecs. at day, to 30 to 40 at night. The spread of the scattered echo was often very large and made up of numerous individual pulses, each fading at random.

The time delay of the leading edge corresponded to a reflection from a height of 1,500 to 2,000 km., from the ionosphere at vertical incidence, but later experiments showed that these are not reflections from such heights.

In addition to this distant group of scattered signals a number of separate echoes of much shorter delay were obtained.

Short Distance Scattering

Analysis of many observations shows that in spite of irregularities these echoes have a well-marked height distribution. The minimum height is rather sharply defined at 100 km., some echoes at lower heights being associated with irregularities in the E layer. Sporadic echoes occurred mainly on the longer waves in use (7 and 9 Mc) and on magnetically disturbed days. There is also a diurnal variation and the reflected signals appear to consist of a cone of rays with angles of 20° to 30° on either side of the vertical.

Distant Scattered Groups

Using spaced frame aerials it was possible to prove that the distant scattered group did not consist of single vertical rays, while directional aerial experiments confirmed previous experience that the scattered signal was always in reverse direction to that in which the beam was projected. With an omni-directional aerial, scattered signals were received from every horizontal direction. This refers to daytime observations. At night the echoes were stronger, and even when an omni-directional aerial was used showed high directional properties.

During the spring of 1936 the morning hours often gave a critical frequency above the working frequency, thus providing F echoes at normal incidence. Scattered echoes were also present as well as numerous short-distant sporadic scattered echoes. As frequency decreases the equivalent distance of the leading edge decreases and comes to a limit slightly less than twice the F layer equivalent height (2F). This gives an estimation of the source of the scattering.

Measurements of intensity of scattered signals show greater intensity for longer wave stations, but there is a diurnal and seasonal variation. In 1930, on a 32 metre wave, scattered signals were confined to daylight in the winter, while in summer, midday signals were weak and night signals strong.

Interpretation of Results

(a) *Relation of Scattering Distance to Skip Distance.*

As has been pointed out above, the leading edge of the distant scattered group is related to the skip distance and this implies that the scattering sources are below the F layer and primary radiation reaches them after reflection from the F layer, the scattered energy returning by a similar path. In the accompanying skip distance diagram, S is the edge of the skip zone for the transmitter T. If energy is scattered back from irregularities on the ground, such sources must lie beyond S. The delay time increases for sources beyond S, causing a spread of the echo and a sharp leading edge corresponding to S. This minimum delay expressed as an equivalent distance is approximately equal to the skip distance.

The evidence actually points to scattering not at the ground but from ionic clouds somewhere below the apex of the ray path. The scattering source S4 now gives the leading edge and the above general explanation still applies. The effect of using a beam transmitter can also be explained. Only the section between AB and A'B' is illuminated by strong primary radiation. The scattered radiation arises from points such as P and Q and is received at R from a well defined direction.

The explanation holds whether the scattering source is on the ground or in the ionosphere. A comparison of the delay of the leading edge and the skip distance is impossible, as the latter cannot be accurately determined. Nevertheless, if magneto-ionic effects and the curvature of the Earth can be neglected then, corresponding to an equivalent height for a given frequency at vertical incidence, there is a simply-related equivalent path and frequency for oblique transmission to a given distance (Martyn's theorem). Assuming scattering to occur at 100 km. above ground, then there is relatively close agreement between the skip path calculated from this theorem and the observed scattering distance. In these calculations the ordinary ray is considered.

It can be shown mathematically that the equivalent path of the scattering is proportional to frequency and experiments confirm this point.

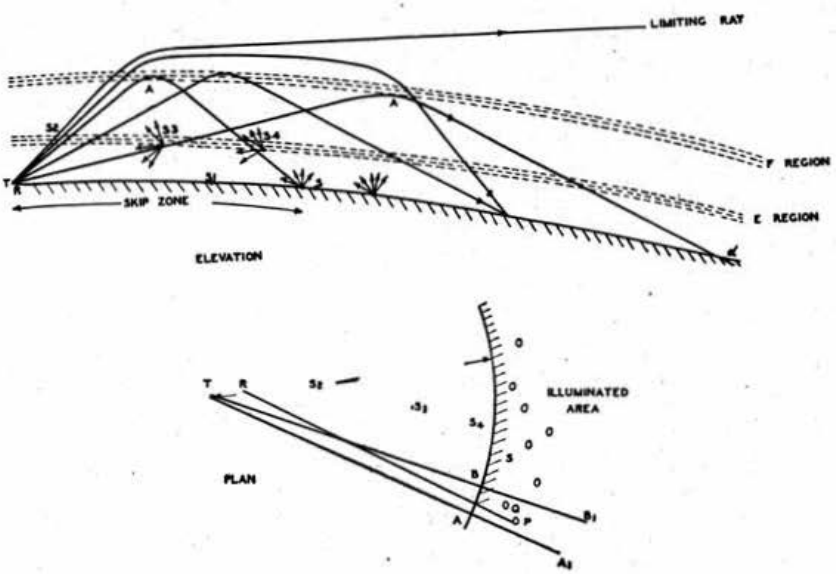
(b) *Comparison of Ground and E-layer Scattering.*

Points such as S2 and S3 may also give rise to scattering when the primary ray is ascending. At S3, owing to the small elevation of the ray and attenuation the direct ray will be very weak. At S2 with higher elevation, echoes can be produced and these are the short sporadic echoes which have been noticed.

When the working frequency is less than the critical frequency it is possible to compare the equivalent height of the distant scattered signal with the F layer equivalent height and from these measurements it is considered that irregularities in the E layer are the most likely source of the scattered signals of both short and long distance types.

(c) *Relative Strengths of Echoes.*

Further evidence is provided by a comparison of the relative strengths of the 2F echoes (*i.e.* those which are twice reflected at the F layer) and the distant scattered group. For example, in a typical case when attenuation in the E layer was low, very strong 2F echoes were obtained, far stronger than the scattered signals. Later, when E layer attenuation had increased the 2F echo was reduced



Skip diagram to illustrate the path of the primary radiation "illuminating" the scattering sources, and the directional reception of the scattered signal at a point R near a beam transmitter at T.

to the same intensity as the scattered signals. If the scattering source was at the ground then both scattered and 2F echoes had to traverse E layer four times and should have been equally affected by the increased attenuation. As this was not so, it is probable the scattered signal had its source high in the E layer and only traversed that layer twice.

(d) *M-type Reflections.*

Evidence is also provided of the patchy nature of the E layer, for if this were not so then M echoes (twice reflected from F layer with intermediate reflection from upper edge of E layer) should always be present when E and F echoes are present. Experimental observations show that this is not the case, an effect which can only be explained by picturing the E layer as an open latticework of scattering centres (high density patches). The distribution of electron density in the scattering clouds may produce M and F, or E and F echoes only.

(e) 1*F Scattered Echoes.*

A further type of scattered echo may be produced by the deviation of the 1F echo as it passes through the scattering layer and so providing a path somewhat longer than the normal 1F echo path. Such scattered echoes have been observed on the 7 Mc transmissions from Ongar.

(f) *Intensity of Scattering.*

Further means of deciding whether scattering sources are on the ground or in the E layer is afforded by the measurement of intensity of scattering and its variation with frequency. If conducting objects comparable in size with the wavelength were responsible, then scattered energy would obey Rayleigh's law and increase as the 4th power of the frequency. In actual practice the intensity decreases rapidly with increasing frequency. This would be expected if ionic E layer clouds are responsible.

Conclusions

Two definite conclusions are reached, (1) that a region of marked ionic irregularity exists in and above the E layer, (2) that the types of scattering observed all originate in this layer.

In the skip zone the scattered signals are all important as no primary radiation will be received, but in long distance transmissions beyond this skip zone the primary radiation will swamp the scattered signals. However, lateral and vertical deviations may be produced by the scattering which may upset the successful working of aerial systems (such as the M.U.S.A.) which are designed to mitigate distortion produced by multiple echoes.

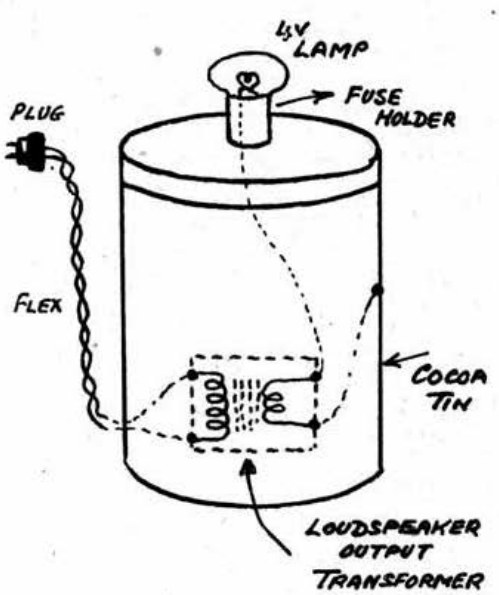
E. J. W.

Bright Ideas

The following idea for utilising an old loudspeaker output transformer may interest some readers.

Night Light

As the output from the particular transformer in question was 7·5 volts at 240 volts 50 cycles input, turns were taken off the secondary until the output registered 4 volts. This was used to light an ordinary 4-volt 0·3-amp. Pea Lamp (1·2 watts) in the manner shown in the accompanying sketch. Estimating an efficiency of 50 per cent. for the transformer, the lamp should run for approximately 400 hours for the cost of 1 kWH. A lamp of this type should find a place in bedrooms, radio shacks, A.R.P. huts, etc.



The cost of production was 1s. 3d. plus the value of the transformer. The lamp, fuse holder, flex and mains plug were obtained from Woolworths, whilst the case was a ½-lb. cocoa tin. To switch the light on or off, the lamp is screwed in or out for half a turn.

Aldis Signalling Lantern

If users of the Aldis Signalling Lantern construct a step-down transformer with an output of 12 volts at 3 amps., the lantern can be operated from this source, thereby obviating the constant charging of the secondary battery normally used. The latter can then be kept as a reserve supply.

BRS2817.

B.B.C. Adapted

R.A.F. pilots have discovered several ways of adapting the B.B.C. announcers' preamble—"Here is the one o'clock news and this is So and So reading it to you." One heavy bomber squadron which has amusing emblems drawn by the padre on most of its aircraft, displays one showing an announcer with the caption :—"Here is a bomb, and this is No. 842 Squadron handing it to you."

Even in the Intelligence room, where crews are interrogated after a raid, the joke is carried on. In the early hours of the morning, the captain of an aircraft back from Berlin, marched brightly up to the interrogating officer's table followed by his crew, and announced in an imposing voice :—"Here is the 3 a.m. line, and this is Flying Officer Jones shooting it."

A FIELD OPERATOR'S 'VADE MECUM'

PART II.

By B. W. F. MAINPRISE, B.Sc.(Eng.), Diploma Electrical Engineering (G5MP).

In Part I, published in our February issue, the author of this series of articles, explained that the information was intended primarily for those members on active service who have occasion to improvise repairs to radio and electrical equipment. The hints given in Part II should prove especially useful to all who are responsible for accumulator maintenance.

15. *The accumulator working your equipment has had its case perforated by a splinter, and is leaking. How would you effect a temporary repair?*

I would take some of the black pitch compound sealing an H.T., grid bias, or torch battery, melt it, and run it over and around the leak. The accumulator should be tilted so that the acid will not tend to leak out till the pitch has hardened. Care must be taken when the casing is of celluloid not to bring a flame close up. If the hole is fairly large, then a piece of cardboard should be thoroughly impregnated in the molten pitch to protect it from the acid, and then pressed into place. Failing pitch, chewing gum can be used.

16. *And for a more permanent repair?*

If the container is of glass, there is little else one can do. If it is of celluloid then another piece of celluloid can be coated with amyl acetate or with one of the dissolved celluloid adhesives such as Durofix, and applied over the leak. The surface of the container must be first dried and scraped clean, and the accumulator left tilted for several hours until the patch has hardened. A similar procedure can be adopted for moulded composition containers.

17. *You desire to recharge your accumulators and find a house where the D.C. mains are still intact. What household equipment would you search for to employ as a voltage dropping resistor?*

An electric fire or cooker would probably be the most suitable. For instance one rated at 750 watts per element would provide a current of approximately 3½ amperes on a 220 volt supply and approximately 7 amperes on a 110 volt supply. If not available, I would search for electric irons or immersion heaters. These would probably be rated around 400 watts, but unfortunately they cannot be left in operation for considerable periods without overheating. It would therefore be necessary to open them and expose the element, preferably in a draught. As a last resort, a number of lamps may be switched on (taking black-out precautions where necessary) and the accumulator connected in series with one of the fuses, or one of the switches, to pass the total current.

18. *Your accumulator is rather small for your equipment, necessitating frequent charging. You find another, of somewhat larger ampere-hour rating, but notice a certain amount of sulphate on the plates. What points would you bear in mind when deciding whether to change over or not?*

I would remember that the sulphate has been formed from active material in the plates: that it is useless and cannot be reconverted to active form. Thus the ampere-hour rating of the accumulator has been reduced and cannot be recovered. The accumulator may therefore actually hold a smaller charge than my present one. Further, a sulphated accumulator may very likely show other defects through mistreatment, such as buckled plates, or increased internal resistance and it should be carefully examined before a change is decided upon.

19. *Suppose your accumulator is fairly old, and you notice that its ampere-hour capacity is considerably below the figure stated by the manufacturers. It has been kept free from sulphate. What defects would you look for and attempt to remove?*

Possibly some flakes have broken away from the plates and are permitting an internal discharge, which may be intermittent, depending upon how good or how poor is the unwanted contact. Alternatively the sludge at the bottom of the cells may have reached up to the plates. Both these faults will be shown by the voltage of the defective cell falling while idle. The cells should be thoroughly washed out, refilled with acid and charged. One fault not often considered, is that through rough transit, one or more of the plates may have broken away from the joining lugs and is thus out of action. The break may consist of a barely visible crack, as the separators generally keep the plate from falling out of position, and where possible, the lugs should be carefully examined for this defect which is easily overlooked. In this case, there will be no fall of voltage while the cell stands idle.

20. *You require a resistance of approximately 4 ohms for a filament or battery charging circuit. You are obliged to use the heater element of a stove rated at 200 volts, 600 watts. Suppose the wire length of this is 1 yard. The length to give a resistance of 4 ohms will be 36 × 4 ÷ 67 inches, i.e., 2·2 inches, which is inconveniently short. How else could you cut and connect the resistance wire to give a longer length, though still 4 ohms approximately?*

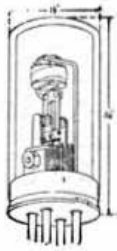
Suppose the wire were cut in half (Fig. 1) and the halves connected in parallel. Each half has a resistance of 33 ohms. In parallel, the effective resistance is 16·5 ohms. This is too large.

Suppose the wire were cut into three equal lengths, and these connected in parallel. Each third has a resistance of 22 ohms; in parallel the effective resistance is 22 ÷ 3, or 7·4 ohms. This is still too large.

Suppose the wire were cut into four lengths, and the four connected in parallel. Each quarter has a resistance of 16·5 ohms; in parallel, the effective resistance is 4·1 ohms, which is sufficiently close. The overall length is 9 in. It will be seen that the resistance rapidly decreases with this method of connecting sections of the wire in parallel. For instance with the wire cut in half, paralleled, the effective resistance is reduced to $1 \div 2^2$ of its original value. With the wire cut in quarters, paralleled, the resistance is down to $1 \div 4^2$ of its original value, and so on.

ELECTRADIX RADIOS

L.T. Battery-operated Home-made VIBRATOR KITS



To obtain H.T. successfully. Supersede H.T. Batteries. The Vibrator converts D.C. to A.C. by vibrating uniformly. Any voltage up to 100 watts obtained by transformers and rectified for radio H.T.

American Vibrators totally enclosed, slightly dented covers. 4-pin non-sync.

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Magnetically tripped Switches that operate instantaneously

We offer, at a reduced price, Circuit Breakers of first-class make, in place of fuses on power circuits. Operate instantly on an overload. Fireproof construction and bakelite or metal cover. Made in single, double, and triple pole. Prices are very low, and **type marked with a star have thermal trip delay.**

SINGLE POLE, HEAVY IRON CASE 250/400 Volt

Illustration shows S.P. with cover removed.

Rating	Type	Price
6 amps.	S 11/1G	11/6
6 ,,	S 11/1Z*	13/6
10 ,,	S 11/1G	16/-
15 ,,	S 11/1G	18/-

4 in. × 5½ in. DOUBLE POLE, IRON CASED

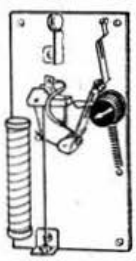
Rating	Type	Price	Rating	Type	Price
1 amp.	S 11/2Z*	18/6	5 amps.	S 11/2Z*	25/6
1½ ,,	S 11/2Z*	19/-	6 ,,	S 11/2Z*	26/-
2 ,,	S 11/2Z*	20/-	6 ,,	S 11/2	23/-
2½ ,,	S 11/2Z*	21/-	10 ,,	S 11/2Z*	32/-
3 ,,	S 11/2Z*	22/-	10 ,,	S 11/2	30/-
4 ,,	S 11/2	22/-	12 ,,	S 11/2Z*	36/-
4 ,,	S 11/2Z*	25/-	15 ,,	S 11/2Z	34/-

TRIPLE POLE, 3 TRIPS Light Iron Case 300/500 Volt

Rating	Type	Price
800 m/a.	S 11/3Z*	25/-
3 amps	S 11/3	21/-
3 ,,	S 11/3Z*	24/-
4 ,,	S 11/3	21/-
6 ,,	S 11/3	32/-
10 ,,	S 11/3	38/-
15 ,,	S 11/3Z*	45/-

TRIPLE POLE, 3 TRIPS Heavy Iron Case 300/500 Volt

Rating	Type	Price
500 m/a.	S 11/3Z*	26/-
800 ,,	S 11/3Z*	27/-
1 ,,	S 11/3Z*	24/-
2 ,,	S 11/3Z	22/-
2 ,,	S 11/3Z*	26/-
3 ,,	S 11/3Z*	28/-
4 ,,	S 11/3	23/-
4 ,,	S 11/3Z*	30/-
6 ,,	S 11/3	36/-



2-AMP. THERMO TIME-LAG CIRCUIT BREAKERS

A SPECIAL DESIGN IN AUTO-SWITCHES with time-lag tripping on 2 to 3 amps. Safety thermo switch with long-break auto overload trip. For back of panel with front indicating knob, compact, 4 in. × 2 in. × ½ in. deep. Any voltage up to 1,000 v. (as illus.) **Only 5/6. Worth a Guinea.**

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S. P. 5 amps., **5/-**

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Genuine **Weston** model 354. Central zero 1 to 15 amps., pol. mag. dead beat. Flush panel, 2½ in. dial, nickel or black. Sale price, **7/6.** Mounted in solid mahog., 3 in. sq., **9/-.** Hoyt CZ mov. coil milliammeters, 25-0-25 m/a. Turner 100 m/a. Various ranges of Switchboard Meters.

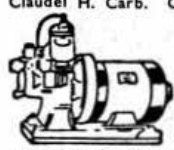
HOT WIRE METERS for Radio or Low-Frequency. ½ amp., 2½ in. dial, front panel, 100 m/a. to ½ amp., **10/-.** 200 m/a. to 1½ amp., **7/6.** 500 m/a. to 2 amps., **7/6.** To 2½ amps., **15/-.** High voltage model in square ebonite case, 1½ amps., **10/-.** Special Sullivan Meters with cut-out switch, **15/-.** High grade magnet damped H.W. Meters. 100 to 500 m/a., 4 in. dial, Marconi type, **25/-.** 200 m/a. to 1½ amps., J. & P., brass case, **27/6.** 2 amp. and 3 amp. ditto, **32/6.** 6 in. and 8 in. H.W. meters to 10 amps., 20 amps. and 50 amps., **40/-.**

LAB. GALVANOMETERS. Vertical Ballistic with mirror on coil, quite new, by Tinsley, **60/-.** Mirror Galvos. in brass case, **90/-** Galvos. by Gambrell Paul and Nalder, **£3/10/-** and **£4** each. Universal Multiplying Galvo. Shunts, **35/-.** Silvertown, Siemens and Fuller horizontal 3½ in. Galvos., **7/6.** Vertical Telegraph type Central Zero Scale, **4/6.** Multiplex Vibrators, **45/-.** Wheatsone Bridges.

METER MOVEMENTS. Full size, moving coil, P.M. for adapting home-made multi-range testers. For 3 in. or 4 in. dials, **5/-**, post **1/-.**

ENGINE SETS

ASTER Single-cyl. W.C. Engine, Bosch Mag., 2½ kW., Set 220 volts. Claudel H. Carb. Coupled 12 amps. compound Dynamo, **£20.**



Horizontal Twin Petrol A.B.C. Engine, fan-cooled, coupled 1¾-kW. D.C. Dynamo, 50/70 volts 25 amps., Mag. Ignition. Cost £190, Sale **£25.**

2¾ kW. **AUSTIN.** 2-cyl. water-cooled Engine, Mag. Ignition and 110 volts 25 amps. Dynamo, **£28. Austin** 3½ kW., 110 volts, **£48.** Switchboards, **£5.**

PELAPONE 500-watt, single-cyl. 2-stroke water-cooled, self oiling Engine, mag. ignition; coupled to 50/70 volts, 10 amps. shunt Dynamo. 1,000 r.p.m., **£17/10/-.**

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A.C. split phase synchronous motors, squirrel cage rotor, ¾ in. dia. Dog clutch drive to reduction gear from 2,000 revs. to 58 r.p.m. Voltage 15 to 20 volt, 50 cycles reversible double shaft, enclosed laminated new. Suit model drive, remote control switching, tuning drive, etc., **8/6.**

MOTOR DRIVES. Morse ½ h.p. Silent Chains, new, 29 in. long, with large and small 1¾ in. sprockets, ratio 4 to 1, for motor drive projector, **8/6.**

GEARS. Skew drive Gear Boxes for Cine. or Boat, ¼ or ½ h.p., **10/-** Ditto on C.1 Pedestal, with flywheel, **15/-.** Small 2 to 1 Gear Boxes ¼ h.p., **4/6.**

100 DRILL STANDS. Massive machined steel drill stands, Wolf type, with rise and fall handle and counter weight, height 32 in. weight 102 lb. Sale **10/-**, carr. fwd.

ELECTRIC GOVERNORS, Centrifugal control, 1,500 r.p.m., brushes, slip rings, **7/6.**

D.C. GENERATORS, shunt wound—110 volts, ½ amp., 15 lbs., **10/6**; 110 volts, 1 amp., **15/-**; 200 volts, ½ amp., **17/6**; 200 volts 1½ amps., **26/-.**

WINDMILL GENERATORS, totally enclosed, ball-bearing, start charging at 300 revs., 6 volts, 10 amps., **£75.**

D.C. MAINS MOTOR GENERATORS. D.C./D.C., 220 volts to 30 volts, 10 amps., **£7/10/-.** M.G. Crompton, D.C./D.C., 100 volts to 17 volts, 6 amps., **£4/7/6**; 200 volts to 16 volts, 5 amps., **£5.** Estro M.G. ditto to 6 volts, ½ amp., **45/-.** Motor generators for all outputs up to 60 amps.

GRINDING MACHINE for Crystals or Lens, oscillating movement, for flex drive, **£3/10/-.**

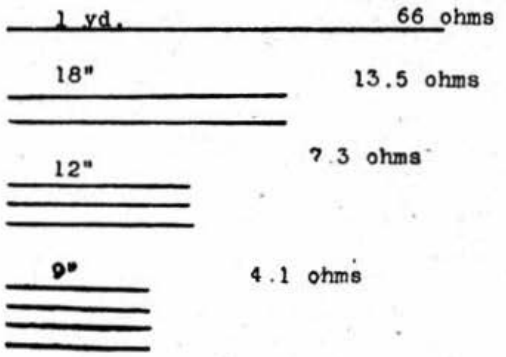
2½d. stamped envelope must be enclosed for Bargain List "T.R." or for replies to enquiries.

ELECTRADIX RADIOS

LONDON'S LARGEST SUPPLIERS OF BARGAINS IN RADIO ELECTRICAL, MECHANICAL & SCIENTIFIC INSTRUMENTS
218, Upper Thames Street, LONDON, E.C.4.
Telephone: Central 4611

21. *What other advantages are there in this method of connection?*

Firstly, the current carrying capacity of the resistor is increased in direct proportion to the number of lengths in parallel. For instance, in the previous example, the resistor will be at red heat when carrying its rated 3 amperes. But with several lengths in parallel, the heating effect will be very considerably reduced, and thus the choice of material for the former on which the resistor is to be wound is much wider.



Connecting sections of a wire in parallel gives a rapid fall in resistance without the length becoming inconveniently short.

Secondly, if the resistance has to be accurately adjusted, it is clearly easier to adjust an overall length of say 9 in., than to adjust one of say, 2 in. In fact use is made of this in many ammeters with internal shunts. The shunt consists of a heavy strip whose resistance is rather greater than necessary. To reduce the resistance to the correct value, a longer length of lighter conductor is connected in parallel, and this can easily be cut down in length to good accuracy.

22. *Suppose you require an ammeter to check the charging current of your accumulator, or the filament current of a valve. The only instrument available is an ammeter taken from the dashboard of a car, and the scale (which is short) reads 0–20 amps. Would you consider the internal shunt could be reduced, to permit currents around 3 or 5 amps to be read with greater ease?*

No, car ammeters are generally of the cheap moving iron type, in which the whole current is passed through a few turns of heavy gauge wire, wound in a coil to provide the magnetic field in which the moving iron is displaced. They are not shunted, and therefore cannot be readily adapted to read smaller currents than intended.

23. *The terminals of an accumulator which you are given have not been vaselined, and have locked in position. It is not necessary to force them immediately. What could you apply to help loosen them?*

A little ammonia solution is the remedy generally employed. This should be applied to the terminals, but not be allowed to enter the accumulator, as it will partly neutralise the acid. This usually loosens the terminal nuts, which should then be thoroughly cleaned and wiped with a little vaseline.

24. *You find that during transit, acid has been spilled from your accumulator. What would you apply to neutralise the spilt acid so as to prevent further corrosion?*

Soap is probably the handiest article. It should be moistened, and rubbed thoroughly into the battery leads, terminals, woodwork, and all other parts affected by the acid, and left for an hour or so before cleaning off. Ordinary washing soda used in the kitchen is another alternative. It has a quicker action in neutralising the acid than has soap, but it should not be left on articles longer than necessary to ensure complete neutralisation, and should then be thoroughly washed off.

25. *Suppose you need a resistance of about 1·0 ohm, and you make this from a length of copper wire. Would you anticipate any great change of resistance if the wire runs hot?*

Yes, with copper, the resistance will always increase with increase of temperature, and it is not always realised that this increase is relatively large. The temperature coefficient for copper is 0·0043 ohms per Centigrade degree. On paper, this seems very small, but suppose the wire heats from 0 to 100 degrees Centigrade (which is the temperature rise from ice to boiling water, and is not very great, being far below visible heat for a conductor), then a copper wire resistance of 1·0 ohms will increase to 1·43 ohms. If in each case an ammeter in the circuit was set to read 5 amps, then the voltage drop across the cold resistance would be 5 volts, and across the resistance, when heated, over 7 volts, so that effect of the increase in resistance for even a moderate temperature rise is by no means negligible.

* * * *

AUTHOR'S NOTE.—The following difficulties have been met with by the author in practice. Readers are invited to suggest good solutions which, when published, will prove helpful to others in the same predicament.

(*a*) After transit, you find that a soldered joint in your equipment has come adrift. You improvise a rough soldering iron, and there is sufficient solder left round the joint to permit a repair. Unfortunately through lack of flux, you cannot get the solder to flow into the joint, and the longer you persist, the more does the solder become contaminated and forms into blobs. What household substance, likely to be found in the average home, can be used as flux for your purpose? The most likely substances would seem to be floor-wax, or oils, but these mostly seem unsatisfactory. Alternatively, can lubricating oil be used?

(*b*) It is thought that some electricians are able to tell whether a lamp is working off an A.C. or D.C. supply by shaking a pencil or rod rapidly to and fro under the light. With an A.C. supply, a stroboscopic effect gives the pencil a slightly different appearance to that obtained when viewed with D.C. (or presumably, daylight). The author has often been intrigued by this apparently simple test, but so far has been unable to distinguish between the two types of supply. Can any reader state whether the test is possible, and if so, describe carefully the points to look for in the appearance of the pencil?

(*Series to be continued.*)

EXPERIMENTAL SECTION

CONTINUING the notes published last month on the subject of Signal Generators, the next type of arrangement to be considered consists of a single valve oscillator modulated by a second valve. Figs. 1 and 2 show two designs which are simple to construct. It will be seen that these circuits are similar to those used in many frequency meters except that a form of attenuator is added. Circuits of this type should be built up in the style of a frequency meter, stability being the main consideration. It is probable, of course, that many amateurs could modify existing frequency meters to suit the dual purpose. From the point of view of obtaining maximum stability the following general rules should be observed :—

(1) Use valves of high resistance and high mutual conductance. Alternatively a high resistance may be inserted in the plate circuit, but the former method is to be preferred.

(2) Avoid strong oscillations which introduce grid current and harmonic distortion. Grid current may be minimised by means of automatic bias.

(3) Use " high Q " oscillatory circuits.

(4) Use close coupling between coils. This does not mean that a high value of mutual inductance between coils should be realised, for in fact, M should be kept as low as possible, consistent with oscillation. The low value of M should be obtained by means of tight coupling and small regeneration inductance.

(5) Use high-grade insulation throughout.

(6) Avoid overloading the oscillator with the modulating voltage. Modulation to a depth of 30 per cent. is sufficient for most purposes. (For detector distortion tests, 100 per cent. modulation may be needed and even when so deeply modulated the distortion due to the oscillator and frequency modulation should be negligible, but this can only be checked properly on an oscilloscope.)

It will be noticed that Fig. 2 is a circuit of the electron-coupled type, and the following remarks apply specially to this class of circuit. It is very desirable to employ a high-grade S.L.F. condenser together with precision dial and vernier, in the main tuning circuit. It is false economy to fit a cheap dial with its sometimes appalling inaccuracies, but remember a precision component cannot be obtained for a few pence any more than can a precision engineering tool.

In electron-coupled oscillators, the oscillation can be made practically independent of the coupled load if the series output condenser is made small enough. For single valve circuits a compromise has to be adopted between high output and high stability, so the constructor can use a condenser which is only just large enough to give the required

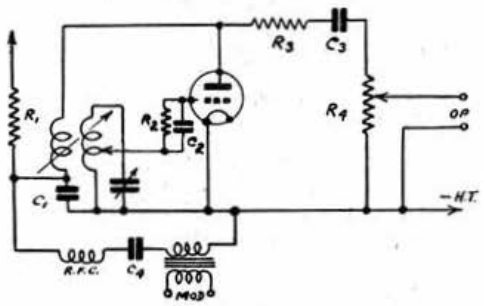


Fig. 1.

R1, 2	50,000 ohms.	C1, 4	·01 μF.
R3, 4	10,000 ,,	C2, 3	·0001 μF.

V1, 6C5 or similar triode.

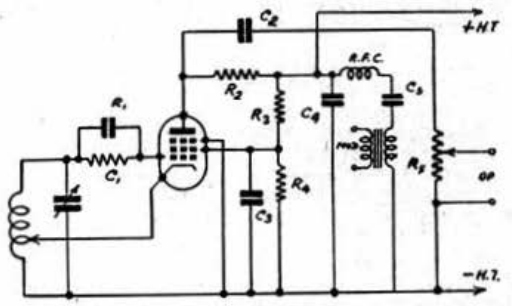


Fig. 2.

R1, 5	50,000 ohms.	C1, 2	·0001 μF.
R2	100,000 ,,	C3, 4	·01 μF.
R3, 4	75,000 ,,	C5	·1 μF.

V1, 6J7 or similar.

output. If good stability and high output are required some form of amplifier will be necessary, but this matter will be dealt with in later notes.

Voltage for the screen grids should be obtained from a potentiometer, so that plate and screen voltages vary together. By this method it is possible to arrange that slight variations in the supply voltage have little or no effect on the frequency of oscillation. (The screen grid is, of course, the anode, from the point of view of the oscillation, in an electron-coupled valve.)

G5HF.

Cosmic Notes

Magnetic Conditions.

December 14 to January 10 inclusive : fairly quiet with mild storms on December 20, 21, 22 and January 6.

Ionosphere Storms

December 18 to January 14 inclusive : moderate storm 02.00–13.00 December 21 and mild storm December 30, otherwise undisturbed conditions.

Critical frequencies and virtual heights, at Washington, average for weeks ending ; midnight F, mid-day E and mid-day F2 respectively :— December 24, 2·7 Mc. 308 km. ; 3·0 Mc. 123 km. ; 8·84 Mc. 248 km. December 31, 2·5 Mc. 298 km. ; 3·03 Mc. 120 km. ; 8·7 Mc. 254 km. January 7, 2·95 Mc. 308 km. ; 3·03 Mc. 128 km ; 9·18 Mc. 258 km. January 14, 3·26 Mc. 291 km. ; 3·04 Mc. 119 km. ; 9·86 Mc. 244 km.

G6DH.

KHAKI AND BLUE

Items for inclusion in this exclusive feature should reach the Secretary-Editor not later than the first day of the month preceding date of publication.

Congratulations to Capt. R. H. B. Candow, R.A.O.C., GM5SC, who has recently been mentioned in despatches for distinguished services in the Field during the period from March to June 1940.

* * *

F./O. G. S. Woollatt, G3ZI, from a station in Cornwall, half confirms a view we have held for some long while, namely, that the R.A.F. *seems* to be liberally sprinkled with Society members. "Seems" seems inadequate—"is" seems more accurate! THE BULL, he tells us, is an "open sesame" to many ham friendships; whilst at his own station he often finds A.C.H.'s surreptitiously peeping inside its covers! We are inclined to agree with G3ZI that when this affair is over the R.S.G.B. should be "a heck of a Society." G. S. W. sends 73 to all old friends. His full address is available from Headquarters.

* * *

Cpl. A. M. Boyce (2CMR), R.A.F., extends his greetings to the "Second Earlies" and expresses the hope that those from the old Manchester Centre C.W.R. who travelled down to "Tumuli" on the night of Friday, October 6, 1939, will soon be able to meet again for a yarn.

* * *

A.C.1 F. Smith 2DDX, who is at an R.A.F. outstation in Surrey would like to hear from G6BP, and 8VZ. Letters should be sent *via* 23, Richards Street, Cathays, Cardiff.

* * *

Tel. J. A. T. Bousfield, 2FQQ, who has been serving in the R.N.V.(W.) R. since the outbreak of war is now on H.M.T.*Saon*. He has visited many places during the last few months and was one of those recently entertained by the GI hams. He sends special greetings to all members of S.L.D.R.T.S.

* * *

A.C.2 John Huggon, G3HJ, who is officially listed on R.A.F. records as "Clerk-Special Duties" is engaged on interesting work near Liverpool. Since joining up in September he has met G8NM (spotted by his badge at the reception station before changing from civies), 4BJ, 4LH and 2DYF. He sends greetings to all old friends who can reach him via "Ballachree," Dunmail Drive, Carlisle, his home address.

* * *

L. Grugeon, BRS3332, whose home address is Dallen, Chiseldon, Wilts, is now in training as an observer in the F.A.A. He would like to get in touch with other members in the same service.

* * *

C. E. Brooks, BRS3811, who is now a W.O. in the R.A.F. sends 73 to G5LC and all E.M.I. employees serving in H.M. Forces.

* * *

We learn with regret that Mr. D. J. Shaw, GM3RL, after serving as a Radio Officer in the Merchant Navy for 12 months, was seriously wounded when a dive bombing attack was made on his ship. Besides losing his left eye, he received other serious injuries which are likely to keep him in hospital nntil the end of next month. Members in the Stirlingshire area may like to visit, or write to him c/o GM6ZV. On behalf of his many friends, we wish him a speedy recovery.

* * *

Mr. F. Tillotson, G6XT, who is now an R.A.F. instructor at No. 2 S.S., would like to meet fellow amateurs in or out of the Service. His temporary address is c/o Mrs. Currey, 26, Avenue Road, Swindon.

* * *

A.C.2 F. G. H. Jones, GW3CF, who recently joined the R.A.F., had a series of pleasant surprises on his first day in the Service. At the gate of the depot he met G8CJ. Later, whilst still in "civies" and wearing his Society badge, he was identified by W2JGH, who has come over to join the R.A.F. His third contact was with 2HHR. Not bad for one day!

* * *

One of our new members, A.C.2 Surman, BRS 4045, who is now stationed near London after a spell at No. 1 S.S., sends 73 to G4PX and GW3QB. Whilst at the school he met many amateurs, including G3CD, 3HT and 3LH.

* * *

Friends of Tel. "Bill" Hamer, G3WT, will be interested to hear that he is now serving on H.M.S. *Geranium*. He sends greetings to all old friends in Liverpool.

* * *

A great event is reported from Jubbulpore, India, where our old friend L./Sgt. Tom Arnold, VU2AN, has had the pleasure of meeting a real live amateur, in the person of Sig. Greenaway, G4CN! Three years had elapsed since the last ham came to visit VU2AN, so the recent contact must have been a red letter event in his life. Since Tom left England

F./O. G. S. Woollatt, G3ZI, now at an R.A.F. station in the South-west of England.

several years ago, he has only met three other amateurs—VU2BA, VU2AU and XZ2JB.

He sends 73 to all old friends and is delighted that the BULLETIN is carrying on.

* * *

Congrats to R. A. Butterworth, G8BI, who, after serving in the ranks of the R.A.F., has been commissioned, with the rank of Pilot Officer (Technical Branch). He wishes to be remembered to his friends in the Manchester area and especially to those who were pre-war 56 Mc. enthusiasts. He is attached to a coastal station in Hants.

Sgm. W. Morris, 2BZK, who is somewhere in England with L.A.C. A. R. Richardson, 2CXT, now in the Middle East.

A.C.2 J. Payton, G2JB, having completed the Radio Mechanics course has now been posted to the South Coast in a spot which will blow off any cobwebs accumulated during study at the school. He and G8IX asked to be posted together and the R.A.F. obligingly responded.

G3KI and G5CC are also at their station and it is thought there may be other amateurs in the locality, enquiries are now going forward.

* * *

Direct news has at last been received from Capt. E. Shackleton, G6SN, Royal Signals, who, it will be remembered, was taken prisoner in France last year. Writing under date of November 21 he confirms that he was wounded in the left leg, but the wound has now healed. He sends kind regards to his friends and would like to receive letters from all who care to write. His address is Capt. E. Shackleton, 15591, Lager-Bezeichnung Oflag XVIIA, Germany.

According to information recently published in the *Daily Mail*, Oflag XVIIA is located at Dollershein, near Vienna.

* * *

Cpl. A. V. C. Whatley, BRS3790 of Potters Bar, tells us that he is now in Southern Rhodesia in connection with the Empire Flying Training Scheme. He hopes to meet some resident ZE's, and maybe a few G's, whilst abroad. He sends 73 to old friends in District 12.

* * *

Cpl. J. W. Russell, G2ZR, who is now at an R.A.F. station on the Hampshire coast sends greetings to all members of the old S.H.R.T.S. and asks that the following should communicate with him: G2XC, 3LO, 6YK, 8CN and 8JB. He would also like to hear from G5UI. His home address is The Elms, Newchurch, Isle of Wight.

* * *

Len Hanneson, VE4FN, on a recent visit to G with the R.C.A.F. had the opportunity of meeting several amateurs including 2CVA (who is an A.C.1 not an A.C.2 as recently reported), G6IF, 2FV, 2KH, 3UP, 6IF, 8OR and 8PR.

* * *

Sgt. T. Wimbush (ex-G6HP, SU2TW, ZC6XX, etc.), who is now in Canada, with the R.A.F., would like to hear from old friends *via* his home address, 11 Grange Road, Bishopsworth, near Bristol.

* * *

Congratulations to Larry Richards, G3YM, and Garry Appleby, G8ZD, who we hear have received commissions as 2nd/Lts. in the Royal Signals after passing through an O.C.T.U. course. The former is now "somewhere in England," but all communications will reach him if sent *via* his home address "The Cricketers Inn," Epsom Common.

* * *

Apologies and congrats to Noel Simmons. In our last issue we recorded his rank as L.A.C. We now learn that he was "elevated to the peerage" some weeks ago and now holds a commission as Pilot Officer. He is associated with G2HK (also now a P./O.), G2WN and 3CW, the latter are on the civilian staff of the R.A.F. Noel sends his greetings to G3YM and 8ZD.

* * *

L.A.C. D. Alimundo, G4HK, who is at No. 3 *Radio* School on a special signals course, would like to meet any hams who are in the neighbourhood. No. 3 R.S. should not be confused with No. 3 S.S.

* * *

James Ross, GM6ZP, who is a civilian instructor at No. 1 Radio School, tells us that he has just had a "flock" of VE's through his hands! One lad who had sat perplexed for two days through long discussions on British valves, suddenly stood up with the light of discovery in his eyes and exclaimed "say, sir, you mean toobs, don't you!"

* * *

Congrats to Cpl. Frank Wyer, G8RY, of Wolverhampton, who was married last month. He sends 73 to all those who were associated with him on a special works course in Coventry.

* * *

A.C.2 N. Horrocks who is now serving as a Radio Mechanic in the Isle of Wight, has met many amateurs including G3JR, 5IJ and 8PN during his six months R.A.F. service. He sends 73 to his friends.

* * *

Old friends of Lt. Roger Hawkey, R.N.V.R., G5ZG, will be glad to know that he is fit and well after a long spell of "anti-sub." duty.

* * *

Lt. Bill "Brigden, G6WU, also in the R.N.V.R., reports from Great Yarmouth. He too has had a hectic time, but is full of beans and looks forward to a continuation of the old ZG–LL–WU–TY–CL rag-chews!

* * *

A.C.1 Reg. Farr, G8IJ, who recently made the R.M. grade without further training, reports that

L.A.C. C. Henley, VE3ADD, and A.C.1 L. C. Carden, G8HY, are at his station in Norfolk.

* * *

Cpl. Jack Millie, GM8MQ, Royal Signals, wishes to thank all amateurs who have extended hospitality to him whilst stationed in different parts of the country. His special greetings are sent to G5DW and his wife, of Nottingham, G5LW, of Banham, G2MN, of Norwich, and all old friends in Scottish "H" District.

CANADA'S HAMS COME TO THE MOTHERLAND

Through the courtesy of GM6WD we are privileged to publish this unique photograph, taken on the arrival of a recent Royal Canadian Air force contingent. They are all radio amateurs and their calls reading from left to right are VE4NT, 5BI, 2JT, 3BP, 1HK, 3ZA, 3ADR, 3WP, 4BU and 3WN.

From Cpl. "Early Bird" Stevens, 2BVN, comes a fragment of news about the "Maginot Midgets." 2BVN is near Maidenhead, 8GG is at No. 1 S.S. 5OI is believed to be in the neighbourhood of Aden, 5BR is on the high seas. 2FNY is hitting the key in GI, 2FCG is near Sheerness, 2BZQ is in Cornwall, whilst 2BM, 8HB and 2BQC are somewhere near London. 2BVN and 2FCG are among many who have expressed appreciation of last month's Editorial.

A Saturday in Salisbury

ABOUT twenty amateurs gathered on March 1 in the lounge of the County Hotel, Salisbury. The meeting, which was entirely informal in character, proved very successful, all those present, whether in uniform or "civvies" welcoming the opportunity to have a chat on amateur radio topics and, in several instances, to renew old acquaintance.

It was a matter of great disappointment that "Clarry" (G6CL) was unable to be present, as was his original intention. A number of others who were expected did not turn up but it is realised that circumstances beyond one s control often arise under the prevailing difficult conditions.

Of some interest was the fact that the D.R. (G6RB) of District 5 was present, as also was the T.R. for Swindon. Many other towns were represented and several members had travelled considerable distances, the record going to F./O. Woods (late of *Eddystone*).

G5JU gave a short talk on the purpose of the meeting, following this with a brief description of some communication apparatus which was on exhibition. G6GZ voiced an appreciation of the value of radio amateurs in the technical branches of the Services, whilst G6FY (ex PAOFY) gave some reminiscences of life in "PA."

It was decided to hold another meeting, at the same time and venue, on Saturday, April 19. This date is well ahead and all amateurs within a reasonable radius are asked to take particular note of it. More support from No. 2 Signals School would

(*Continued on page* 308.)

This further interesting photograph, also received from GM6WD, portrays nine more VE amateurs who have recently arrived in England for training with the R.C.A.F. Included in the group are: VE1ER, 3AXK, 4AMT, 4OS, 3BBF, 3AAS, 4RX, 5GH and 3AWE.

ON ACTIVE SERVICE

EIGHTEENTH LIST

WE publish below our eighteenth 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 March 1, 1941.

Rank and Name	Regiment or Branch	Pre-war Call or B.R.S.
A.C.2 H. P. Arnfield ...	R.A.F. ...	G3LX
A.C.2 J. B. Atcheson ...	,, ...	2DDM
P./O. L. A. Ballingall ...	,, ...	4057
A.C.2 F. A. Beane ...	,, ...	2CUB
2nd Lt. I. D. Brotherton	Middlesex Regt.	2BDV
Cpl. N. H. Brundle ...	R.A.F. ...	2CPL
Sgt. G. Bull, M.M. ...	,, ...	2AYP
Cpl. H. J. Devenish-Burrell	,, ...	4066
Pte. D. Egan	The Buffs ...	2FPC
Cadet R. S. Evans ...	O.C.T.U. ...	3873
A.C.2 S. F. Farley ...	R.A.F. ...	3220
Gunner D. G. Farquharson	R.A. ...	G3MF
A.C.2 C. R. Greenland ...	R.A.F. ...	G4HD
Naval Airman L. Grugeon	R.N. ...	3332
L.A.C. J. Herculson ...	R.A.F. ...	4068
A.C.2 N. Horrocks ...	,, ...	2CUZ
L.A.C. B. Houston ...	,, ...	3531
L.A.C. H. G. Hughes ...	,, ...	G4CG
A.C.2 H. H. Hallums ...	,, ...	G3RN
Pay Lieut. A. B. Hume	R.I.N.V.R.	BERS 487
A.C.2 F. Hunt	R.A.F. ...	4058
O./Tel. R. Jones ...	R.N. ...	GW3JI
A.C.2 A. T. Knight ...	R.A.F. ...	4067
A.C.2 C. T. Malkin ...	,, ...	G5IV
L.A.C. H. C. Manley ...	,, ...	4053
P./O. S. P. Mason ...	,, ...	G6IX
L.A.C. H. Mee	,, ...	G5MY
Cpl. T. L. Peterson ...	,, ...	G6VG
A.C.1 F. S. G. Rose ...	,, ...	2DRT
A.C.2 S. W. Saddington*	,, ...	2FXQ
Lt. Col. H. Ashley Scarlett D.S.O.	King's Own Royal Reg.	1085
L.A.C. P. G. Skane ...	R.A.F. ...	4059
Cpl. R. W. Standley ...	,, ...	G8RW
2nd Lt. R. W. Stephens	R.W.A.F.F.	ZD2G
A.C.2 D. F. Sullivan ...	R.A.F. ...	2FCJ
Lt. F. S. Sutcliffe ...	R.A.O.C. ...	4064
L./Naval Airman, W. W. Taber	F.A.A. ...	G3GU
A.C.2 C. A. Taylor ...	R.A.F. ...	4056
Cpl. C. E. Teesdale ...	,, ...	2BUV
F./O. R. V. Watts ...	,, ...	484
Sq./Ldr. T. Wilson ...	,, ...	4060
A.C.2 C. Wilson ...	,, ...	4008
Cpl. J. S. Worthington	,, ...	4062
L.A.C. A. R. Yates ...	,, ...	G3LB

* Non member.

73.

G2IJ (Ness Road, Lydd, Kent), to G2DP, 2XV, 3GH, 3SH, 4AR, 5JO, 5BQ, 6FS, 8KZ, W1JFG, 2IXY, 4DSY, and all District 15 members.

* * *

G2JB (R.A.F.), to G2GB, 2DP, 2UX, 2VV, 2YL, 2ZZ, 3TG, 5OX, 5PY, 5WG, 2CIL, 2FQQ.

* * *

G2KH (92 Chairborough Road, High Wycombe), to G2GU, 2LC, 2SO, 2UK, 2YN, 3BS, 5RV, 5VQ, 5XI, 6AB, 6CT, BRS1295.

* * *

G3DT (Orkneys), to G2ZQ, 5DJ, 5FA, 5QF, 6LL, 6OT, 6UN, 6WU, 6WY, 8NY.

* * *

G3GS (100 Fullers Way, Hook Rise, Surbiton, Surrey), to G2FX, 3BN, 3FT, 3IS, 3LT, 3SI, 3NA, 3XY, 6KB, 8VN, GW3KY, SU1AF.

* * *

G3UC (R.A.), to G3AC, 3BC, 3KO, 3RB, 3WP, 3ZO, 4BG, 4NC, 5QO, 5ZT, GI5ZY, G6VX,

* * *

G3YY (1A Dover Road, Brighton, 6, Sussex), to G2HV, 2RD, GW2UH, G2ZV, GW3VL, G4HI, 4IT, GM6WD, GI6YM, G8IT, 2CIA, and W8JFC.

* * *

G5JZ ("Corona," Heathfield), to G2AO, 2AX, 2CF, 2QV, 2UJ, 3YY, 5OQ, 6GZ, 8CP, VK4EL, VK6JE, ZL2OU.

* * *

G5ZG (R.N.V.R.), to G3PX, 5AR, 5RV, 6LB, 6LL, 6TX, 6WU, 8JV, W2IXY, W2IKV.

G6HP (R.A.F., ex SU2TW, ZC6XX, G2TW), to G2MI, 5SR, 6AX, 6BW, 6LL, 6NF, 6QA, 6UN, 6VK, 6WY, GM2UL, 2UU.

* * *

G8BI (R.A.F.), to G2RA, 5CJ, 5TP and 8BK.

* * *

G8KW (R.C. of S. Egypt), to G2QY, 3GX, 4RW, 5FA, 6PI, 6LL, 6WU, 8DR, 8NV, 8TY and GM8KR.

* * *

G8QL (H.M.T. "Ettrick," c/o G.P.O., London), to G2AT, 2SH, 3BI, 5QA, 5QI.

* * *

G8RW (67 Redcar Lane, Redcar, Yorks), to G2FO, 3LS, 3UG, 5QU, 5XT, 8CL, 8GI, 8TG, 8UO.

* * *

2AYH (Carlisle), to GM2MP, G3HJ, GM3OL, G4PZ, GI5UW, GI5ZY, G6JZ, 6WR, GI8GK, 8MI, G8RZ, 2AUM.

* * *

2DDD (Anslyn, Mill Road, Angmering, Sussex), to G2OD, 2XC, 2YL, 2ZV, 5CM, 6CW, 6DH, 6OT, 8LY, 8OS, W9BNX, W9SLG. and all other 56 Mc. friends,

* * *

BRS3003 (Coulsdon, Surrey), to G2CR, 2XC, 5LB, 5JR, VU2AN, 2AU, 2BIL, and all old 28 Mc. friends.

* * *

ZD2H/G2QN (Kano, N. Nigeria), to G2HW, 2TM, 4KT, 6BH, 6MY, 8JA, and the Blackburn Gang, ST6KR, ZD2KM, ZD4AB.

THE MONTH "OFF" THE AIR—February, 1941

By ARTHUR O. MILNE (G2MI)

Notes and News

THE increase in the number of letters received this month is most gratifying, so great, in fact, that we can't afford space to say more than "Thanks fellers."

GW3QN has seen GW3JI off to an unknown destination. We wish him the best of luck when he reaches it. QN also mentions with gratitude the spontaneous offer by an American amateur to look after his family for the duration. Quite a number of these instances of real "Ham spirit" have come to our notice recently.

G5JR reports reception of east coast W phones on the 4 Mc. band as late as 10 a.m. and G6QN records some outstanding PY's on 14 Mc., many of them between 11.30 and 12.30 B.S.T., the best being PY7VB (phone), 4AP, 7AG and 3CA. On February 20, at 21.00 G.M.T., 5CE was S8 on an otherwise empty band. EP1Q is a new "phoney," whilst YT7TJ, YU7AY, LZ1AA, CT1JS and EA1BB have been heard on 7 Mc. Regarding G3QN's recent remarks, 6QN says he is of the opinion that certain German amateurs are trying to compromise the Americans by working fake D–W contacts. Witness the recent antics of D4ARR. On an empty band he called, "W9—W9—BK." After a short pause to give the impression that he had received a reply, he rapped out a R.S.T. at about 25 w.p.m. saying, "Here running 400 watts to 4 stages and HRO. RX." Before the "W" could have given a report, the German called, "W2—" pause—then, "Sorry O.M. QRM then!" An HRO and an empty band! Well, what do you think, chums? What's the little game? Are the Germans trying to discredit American amateurs in the eyes of F.C.C.?

G3QD confirms the slump on 28 Mc. and the good condition on 7 Mc. His bag of "queer birds" includes F3RA, CT1JU, F3ZA, EA1BA, EDV1O and EI8S, OK3PR, and OK3NZ, whilst numerous D's continue to demonstrate that personal freedom so characteristic of the totalitarian regimes! And how!

G3YY has also had some luck on 7 Mc. His bag covers quite a galaxy of "rare" calls: CSL3, EA4BA, HB9F, K4SH (may be genuine), LA5A, LY2BZ, OK3DT, OK3IZ, OK3OR, OK3VJ, OS1AH, OZ2H, TA7T, TO1C, many U's, YU7GD and two HA6R's. Yes, both on together, one working another HA, and the other calling CQ! He also remarks that W's are fairly plentiful on the high-frequency end of 7 Mc. after 21.00 G.M.T.

Don Rabbage, BRS3607, who shortly joins the R.A.F., expects this will be his last report for some time. He reports hearing K4DSE, K4GTM, K4EZR (YL op.), HK4HP, KA7FS, NY4AD, W6BOD and W5HDK (phone), this last heard on an otherwise empty band.

By the way, BRS3766 asks us to correct the misprint in last month's notes; the fade-out to which he referred was from 17 Mc., not 1·7 Mc.

We are glad to know that Charlie Miller, VK2ADE, is now out of hospital and will soon be fit for duty.

BRS1151 has nothing of interest to report, but is hoping to meet G5YV, who is in his district.

BRS3593 says the 60 metre South American broadcasting stations come in very well these days, and that W's are plentiful on 3·5 Mc. VP3BG, on the 49-metre band, is another good signal. By the way, Batavia, on 15·48 metres, is local programme quality around 12.00 G.M.T. BRS191's only news is the arrival of another 500-lb. bomb about 300 ft. from his QRA!

2DVA

Denis Bradley, of the above call, writes such an interesting letter we have given him a sub-head to himself. He begins his letter by saying that he is one of the original R.A.T.S., but is now far from home, and engaged on the manufacture of certain chemicals for export to Germany. He mentions in a postscript that these are delivered in specially designed metal containers, and that his firm has a first-rate express service run by the gentlemen of the R.A.F.!

He has heard D4BUF on telephony and remarks on the increase of doubtful calls, citing the latest, OK4LUV, at 596, who sends with his left foot! He goes on to tell of an amusing experience which

PROBLEM PICTURE No. 3

Now then you B.E.R.U. Contest enthusiasts who is the lady? If you cannot guess turn to Page 308.

he had recently. Passing through Widnes, Lancs., he noticed an R.S.G.B. plaque on the car in front, and promptly punched out TEST on the hooter. Unfortunately, the Ham ahead did not hear it, but a police car following behind did ! The lads in blue wanted to know the meaning of the mysterious signals, but allowed him to proceed after an explanation. Moral : Flash your headlights in future !

The R.A.T.S. are now scattered far and wide. 8PP is in the R.C. of S. somewhere in England. 8PL, also in R.C. of S., is training. 2DKD is in the R.A.F., whilst G5KA was heard of some time ago in the Middle East.

" Much has been written about the fragility of crystals, says 2DVA. Well, I once had a 7 Mc. crystal which gave me some trouble with irregular oscillation, so I returned it to the manufacturers in the North of England. A few days afterwards I received a letter acknowledging receipt of the packing, but where was the crystal ? It had evidently slipped out in the post during transit. An application was duly made to the Post Office, who, of course, doubted if they could do much about it. Anyhow, about a week later the crystal turned up with a note to say it had been found in a mailbag at Manchester ! What is more, it still oscillated as before. Why it was never reduced to fragments is a complete mystery.

News from Nigeria

Two letters have come from ZD2H, who is now in Kano, Northern Nigeria. He reports LU9VA, K5AY and K6QNX on 7 Mc., and during December W1, 2, 3, 4, 8 and 9 on 3·5 Mc., W1AW being the best, with W4BPD a good second. Many phones were heard, including W3EWW and W3FQP, both at S6. He comments on the American habit of signing rapidly, which prevents definite identification at a distance. He says the 3·5 Mc. traffic channels provide good morse practice, but do these guys ever sign ? (QST please copy !) A few unidentified carriers have been heard on 1·7 Mc., but nothing definite.

ZD2H reminds those who contacted him that he QSL'd everyone, but will send a duplicate to those who did not receive his card.

Receivers for the Forces

BRS3425 continues his good work and has provided two more receivers for the R.A.F. One of these has gone to G5YA, whose plea for a receiver appeared in this journal a short time ago. In his " spare time " 3425 is on special constabulary duty at Divisional Headquarters, and is also taking the Candler course.

Donations for this very good cause are still accepted by G2MI.

News from the Services

P./O. Brabrook, writing from No. 1 Signals School, makes some kind remarks about this feature which are much appreciated, but says it hardly seems the same without the monthly list of DX worked by his old friend G3JR, who we hear is now in the Isle of Wight.

G8QR, an instructor at No. 2 S.S., R.A.F., mentions a recent phone QSO between K4EZI and a YL operator in New Mexico, and wonders what the two operators would have said had they been able to see the little group of lads, clad only in their R.A.F. undies, sitting up in bed listening to them ! He draws attention to the remarkable influx of Canadian amateurs. Recently in the N.A.A.F.I. canteen he heard a number of T7 accents, so whistled " Test VE " and was nearly mobbed by about 50 Canadians ! OK2HY has also passed that way recently, and tells a grim tale of his native land. His brother spent a fortnight behind barbed wire for being in possession of an old pump-handle key, and another fellow was shot for under-cover operating. 8QR sends a list of European calls heard, which includes F3ZA, YL2FR and an old friend, U2NE. He recommends the R.A.F. to fellow-members and strongly advises them to join as radio mechanics if they want an interesting and useful job. He will be pleased to meet any amateurs who find themselves at the school, and is at home at Hut W61. The name is R. F. C. Brake.

The W4's Think Aloud

In conclusion, we make no apology for quoting from a copy of *Arc*, kindly forwarded by G6CL. This magazine is published by the North Carolina boys, with W4FSE as editor. They are evidently a live-wire crowd with a strong " Help for Britain " complex !

To quote from " An analysis of the opinions of twenty representative amateurs on current world events," these are some of the suggestions :

" 1. Exterminate all members of a ' bund ' and Fascist members. Plough them under if the farmer does not object too strenuously.

" 2. Give the Nazis, who are cloaking dark deeds with their offices, their passports, 15c. and a swift kick in the pants as the ' all ashore ' sounds.

" 3. Instantly slap a complete embargo upon all trade with Japan. Give all possible aid to China. Have ready our naval forces to blockade all Japanese trade in the event of an attack by them on us. Do likewise should they move against Dutch E. Indies or Singapore. Strike a plan with the Dutch and Great Britain for joint use by them and us of ports and bases in the Orient," etc., etc.

Remember, these are Americans who say this.

A quotation from their Editorial sums up the general feeling. " Are we so decadent that we allow sabotage, passive resistance, disloyalty and espionage to flourish unabashed, merely resting content only to label these sinister crimes with the absurd designation of ' activities of the fifth column ' instead of the true appellation of treachery ? There are many ways we can help Britain without ever loading a troopship. One is to weed out the traitors." The writer goes on to ask : " What has all this to do with Amateur Radio ? Plenty. Are there any amateurs, functioning as amateurs, in the wake of this Axis juggernaut ? One can draw a moral from that. Amateur radio is the very quintessence of liberty. Overlords do not believe in liberty, except that liberty which permits licence for themselves. If we in America do not bestir ourselves towards the end that democracy shall prevail, how can we expect a voice in the decisions which allocate future liberties ? In other words, if the G's win there will come a time when there will be G's and V's on the air. If not—— ? "

And so till next month. 73.

The 28 Mc. Band

By NELLY CORRY (G2YL)

ON several days during the end of January and beginning of February conditions were unexpectedly good, but after February 7 there was a decided slump and the band showed very few signs of life.

Amateur activity was as usual confined almost entirely to the North American continent, but BRS3003 again reported reception of PY7VB on one occasion, *i.e.* 16.18 G.M.T., January 30. LSA2/LSA is apparently no longer audible on 31·5 Mc. but the 27·5 Mc. signal was logged on January 27, 28, February 1, 3, 4 and 13. Other commercial harmonics included ITY (Asmara, Eritrea), ODD and ODE (no connection with a certain comedian), OPZ and seven different Russians.

G2RC and BRS3893 logged two Porto Rico stations, *viz.*, K4GIG (February 5 and 6), and K4GTH(?) (February 6), but were disappointed in not being able to hear KB4HBX, who was working W's on January 30. According to Herb Becker's DX article in the current issue of *Radio*, this is W6PSP operating at St. Thomas, Virgin Islands.

U.S.A. amateurs were heard on January 28, 30, February 1, 2, 3, 4, 5, 7 and 9, and included a number from Western districts, though on most days East Coast stations predominated. The following list of calls heard by G2RC and BRS3893 may be of interest to readers across the pond, as it shows some of the DX audible on January 30, and February 2 to 7 inclusive. The number after each call denotes the date on which the station in question was logged. W5GBS (3), 5KGB (30), 6AII (5), 6DAE (7), 6FYR (2), 6GM (2), 6RJH (4), 6SIF (4), 6TBK (2), 7FTO (2), 9ALF (30), 9CBJ (30), 9EEU (30) and 9HBE (30). On February 5 around 17.00 G.M.T., conditions were exceptionally good and WJBR, WQIE and three other Police transmissions above 30 Mc. were heard.

Reports from G2RC, BRS3003, BRS3685 and BRS3893 are acknowledged with many thanks.

The Ultra-High Frequencies

By CONSTANCE HALL (G8LY)

ADHERING to our promise to "appear" quarterly—here we are! You want U.H.F. news, we want U.H.F. news; even if we cannot get it, isn't it fine to be alive to want it?

Miss B. Dunn, G6YL, tells us that all reports sent *via* her station to CS3VA (Azores) have reached their destination. It will be remembered that CS3VA was heard in Great Britain during 1939 on 56 Mc. The station used a horizontal diamond aerial (beamed on England) terminated by a 600 ohms. resistor and fed by a parallel wire 600 ohms line. Aerial power was about 250 watts. The operator returns thanks to all who sent reports.

400 Mc. and Above

Apropos our remarks in the December, 1940, BULLETIN regarding amateur DX on 400 Mc., a contributor reminds us that as far back as 1932 Marconi established a link between Rome and Sardinia (168 miles), using a wavelength of 57 cms. The transmitter was elevated to 2,460 ft. and the receiver to 1,115 ft.

During 1934 Trevor and George of R.C.A. worked on 73 cms. (411 Mc.), using 5 watts input and a V aerial giving a power gain of 20 db. Later experiments, made with 30 watts input, saw telephonic communication established over a distance of 113 miles. Further tests with a terminated rhombic mounted in an aeroplane produced signals up to a distance of 172 miles, using tone modulation.

U.S.A. Activities

QST and *Radio* continue to devote much space to the activities of those enthusiasts whose one aim seems to be to cover longer and longer distances on various bands in the U.H.F. spectrum. Relay work and reliable links are the order of the day. The latter should prove of much value in an emergency. Some operators who find their code speed a trifle rusty are hastily making amends. The 400 Mc. band has enabled W2KDB with 1·3 watts and W2TY with 4 watts input to establish what amounts to a "private wire" over a distance of 2¾ miles. Signals are reported steady S9 using 955 super regen. detectors.

Thanks

We are indebted to W1HDQ and N9BNX for again sending much interesting news. Both ask to have their kind regards passed to the G fraternity, whose motto is "Higher and Higher."

In spite of the absence of monthly notes the writer has been gratified to receive many letters from old friends. The following are thanked for helping us to maintain the last amateur U.H.F. link in Europe:—G3YY, 6YL, 8OS, 2BIL, 2AXP, BRS1151, 2817 and A.N.Other. Our greetings go especially to 2AXP and 2BIL, both now in DX lands.

Please let us have *your* U.H.F. news by May 25, as the next notes will appear in June.

BRITISH ISLES NOTES AND NEWS

District Representatives and Deputies.

DISTRICT 1 (North-Western). (*Cheshire, Cumberland, Lancashire, Westmorland.*) MR. H. W. STACEY (G6CX), "Sandleas," Edissbury 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.*) MR. L. RIDGWAY (G2RI), 90 Romway 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," 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), "High Crest," Yarm Road, Eaglescliffe, Co. Durham.

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

NORTHERN IRELAND. *To be appointed.*

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

DISTRICT 1 (North Western)

THE D.R. would like to thank those members, and especially the Blackburn Group, who have written to congratulate him on his appointment. He hopes to meet them all in person in the not-too-distant future—possibly at the Blackpool meeting. Details of this meeting are published elsewhere in this issue and as this will be open to civilians and is intended to take the place of the North Western P.D.M., it is hoped that every available member will do his best to attend. Meetings are few and far between these days and the opportunity of getting together should not be missed.

G3DC, who is now serving in the Merchant Navy as a radio officer, inquires whether the Manchester meetings are now held. What about it, Manchester ? 3DC would be glad to hear from any member who cares to write, and asks that letters be sent to his home address: 127 Eccles New Road, Salford 5.

G8GG sends interesting news from No. 1 S.S., R.A.F. Since returning from France he has visited many parts of the country and has spent much time in the London area. He has visited 4KG, 6WN and 6XD, and would like to thank them for their hospitality. During a short period in Middlesex he renewed acquaintance with 6FZ and 2MB of Liverpool and 6YR of Southport. He would like to hear from old friends. Letters should be sent to 25 Abbey Road, Blackpool.

Bolton.—Finding Bolton conspicuous by its absence from these pages, 2BTO and 2DVQ have appointed themselves unofficial scribes "for the duration," and hope Boltonians will give their support. (Reports to 32 Bromwich Street, please. 2FPI (Early Bird) is now L.A.C., and when last heard from was en route for "somewhere in the Middle East"; 2CKC, 2CQL, and 2BDA are also in light blue; 2ABT is at present a gunner in the

R.A., and studying hard ; 4HL is also on the high seas ; 3AC represents yet another blue, that of "Law and Order." This completes Bolton's roster of "Khaki and Blue" but the Civil Defence Services are represented by 3CJ (A.F.S.) and 2ABF (Rescue Squad).

The scribes, after several unsuccessful attempts at enlisting, are now spending long hours at their receivers in search of DX. They tender their apologies to all whose activities been have not reported, but the omissions, if any, are due to lack of information. They send their best wishes to 6PO of Coventry (who, it is hoped, has recovered from the ill effects of the blitz), and to all serving amateurs from the Bolton area.

Blackburn.—Thanks are accorded to our retiring D.R., G6TW, for his efforts on our behalf in the past, especially at N.F.D. and at the annual District Meetings. Blackburn members wish him the very best of luck and hope to hear him on the air again soon.

G4CJ (R.C. of S.) and 6BH have been on leave ; 3VV is home after a spell in the Tank Corps, having been discharged on medical grounds ; 2HW, 2TM and 8JA are busy with receivers ; 6WH writes very cheery letters.

The D.R. would be glad to hear from members in towns not represented in these notes, who will offer to furnish monthly reports. G6CX.

DISTRICT 2 (North Eastern)

Sheffield.—G8RX has joined the R.A.F. 2LT is busy with A.R.P. 3RZ and 3MY are both going ahead with their medical studies and building new receivers in their spare time. 3MY is also listening on the U.H.F. Have the local "Old Timers" lost all interest in these notes ?

Wakefield.—G3RB (R.C.S.) and 8KP (R.A.F.) have been home on leave. 6ZN and 6WJ are busy on war work.

Keighley.—G8UO was pleased to receive visits from 6ZN and 6MC. No reports of activities have been received.

Barnsley.—An attempt was made last month to put Barnsley back on the map, but no further reports have been received. What about it ? Please send notes to G2LT.

Halifax.—G3UF, now serving with the Navy, has kindly forwarded some notes on the present activities of the Halifax amateurs. 3ZK, who was T.R. before the war, is a radio mechanic in the R.A.F. BRS3994, welcomed as a new member, is also in the Navy. 3UI and 4DB are together as signallers in the R.A. 8SJ and 8CB are still in the locality. The local society was forced to close down owing to the dispersal of its membership, but the spirit remains.

The D.R. was pleased to have a visit from G6BR recently, when much talk of old times and things to come ensued.

Come on the other towns ! Leeds, Bradford, Hull, York, Huddersfield, and the rest, let's hear from you. G2MI.

DISTRICT 3 (West Midlands)

The D.R. has been pleased to appoint Mr. Eric Wilson, 2FDR, 48 Westbourne Road, Olton, Birmingham, as his scribe. All items for inclusion in these notes should in future be sent direct to Mr. Wilson, to reach him by the 25th of the month.

Our grateful thanks are extended to G3HB, 5CX and 5GR, who also offered to help in connection with the preparation of notes. We trust they will see that 2FDR is kept supplied with local news.

G5VM.

DISTRICT 4 (East Midlands)

Only one T.R. has reported this month, so again we must emphasise that these notes cannot be representative without up-to-date information from relevant sources. It's up to all of you ! We hear that a bomb landed about 20 yards from the shack used by BRS3761, but beyond throwing everything into a confused heap no damage was done, and it all works ! G6IM excelled himself in writing a long and interesting letter about the *mentionable* things he has done since joining the R.A.F. As far as can be judged, they won't be able to *kick* him out after the war ; he enjoys the life immensely. 2HBG is in the Sudan swatting flies.

Leicester.—We are pleased to hear from G5MY after a long spell of waiting and to know he is safe and well. In a recent letter to 3BU he reports his latest QRA is within sight of that commercial QRM nightmare of all 1·7 Mc. hams located in northern GM. While on the subject of letter writing, just a word to our other Leicester members serving in H.M. Forces. Please try to find time to write to us at home o.m.'s. It's a long time since we heard from G2XD, 5GN, 3AN, 4BJ, 2BAP and 2FNW, so what about it ? The following are still active on the Home Front, G2IX, 2RI, 3BU, 8CZ, 5UQ, 6VD (not forgetting the N.F.D. cook, 2BLR), most of

whom spend quite a lot of time on the receiver. It is rumoured, however, that the urge to press a key again is still there ! Queer ! ! !

One last note. It may be that with so many unsettled QRA's the most certain method to QSP your message is through these columns. Try it ! The D.R.'s address is 90 Romway Road, Leicester, 'phone 24295. G2RI.

DISTRICT 5 (Western)

It has been gratifying to receive reports from Bath, Cheltenham, Gloucester and Stroud. The D.R. thanks all who have responded to the appeal for news. Please keep it up.

Bath.—G4GD from District 13 offers to stir up interest in his area. Welcome, O.M., and many thanks for your offer. We hope to hear from you regularly.

Cheltenham.—Reports have been received from G8DT, 8ML and 4JZ. Most of the locals are keeping in touch with one another through the medium of informal meetings held at the QRA of G8DT on Friday evenings. These meetings are usually attended by G5BM, 5BK, 8ML, 8LB and 2FMT, whilst local amateurs on active service, including G8DA, 3YZ, 3LZ and 2FOX, pay a visit when on leave. G5BM has designed a 56 Mc. superhet, 2FMT has a Skybuddy, 8ML has built an 1851-6K8 56 Mc. converter which works very well, 4JZ listens occasionally but finds his SX24 not too good for H.F. work.

Gloucester.—G3PZ, who is on R.A.F. work, would like to get in touch with members living in the neighbourhood of Gloucester. He expects to be in the locality for some months.

Stroud.—G4AB reports that the Stroud Radio Club has been disbanded owing to lack of support. 5HC is too busy for ham radio, 5ZK living at Ebley is welcomed to the district. 5SR was another visitor recently. 2DWH, at Bristol University, listens occasionally. 2FRG is believed to be in the R.A.F. BRS3383 (Dursley) would like to meet local members.

Bristol.—No local meetings are being held at present, but it is hoped to restart them shortly.

The D.R. appeals to all amateurs who come to live in, or may be passing through, Bristol or other towns in the District, to make themselves known if time and opportunity permits. Numerous interesting contacts can be had in this way. This appeal applies to either service or civilian members.

G6RB

DISTRICT 6 (South Western)

The D.R. thanks those members who have written to him in response to the appeal made last month. May we now extend the appeal to the general membership ? If you are doing any experimental work, or have any item of news likely to be of interest, do not fail to write to your T.R. in time for publication.

Taunton.—The T.R. writes that those left in the area are carrying on as best they can and are maintaining their interest. He would like to hear from as many of the members as possible.

Plymouth.—G3TX and 2CJB are now together, and the latter, as well as BRS3182, is engaged in receiver building. 3TX has built a L.F. oscillator working from 25 cycles to 10 kilocycles.

2FKO reports the arrival of a daughter. Congratulations !

8HF has arrived in VP4 with lots of gear.

Torquay.—The D.R. continues to devote what spare time he can find to various experiments. There is nothing actually new to report this month, but the receiver is still occupying his attention. 2ACU has been having a glorious clean up of the junk boxes, etc., with the result that the war effort has benefited considerably in scrap. We don't doubt it ! He has also constructed a gadget or two to reinforce the efforts of the early morning alarm clock ! He hopes to carry out some tests on valve characteristics by means of a valve tester he is designing, and which will be more elaborate than the usual commercial kind. G5SY.

DISTRICT 7 (Southern)

Bournemouth.—A welcome is extended to two Midland amateurs discovered doing war work in the town. G3UN of Stourbridge and 2DMW of West Bromwich. 4MY having built a new receiver, 2XP landed the job of calibrating it. 2HNO, the T.R., appeals to all amateurs in the town to get in touch with him at 45 Parkwood Road. He suspects there are quite a few " in hiding ' since several local addresses have appeared in New Members' lists recently. (By 2HNO.)

Croydon.—2ANR, now a Radio Mechanic, is reported to be " vacationing " in ZB1. 8TB continues to dabble with the ultra-highs. 2KU is on work of national importance at a very fashionable holiday resort. 2CRD, who has nearly completed the construction of his superhet, recently had the pleasure of meeting one of the CWR " Early Birds " in the person of 2BQC whilst in the Midlands. BRS3179 has been doing night operating at a telephone exchange. 3003 remains faithful to the 28 Mc. band. 2DP has been on the sick list. 4AA has received a letter from 3VN, who finds the lack of radio in TF a bit irksome. 8LU and 4NI are still in the neighbourhood. 5XH is reputed to have left his shop for another job. 2FWA, in reply to the Editor's comment last month, states that his wavemeter is definitely a freq. meter !

(By 2FWA and BRS3003.)

Guildford.—G6LK reports from the Isle of Man that all is well and that DX is quite good ! 8IX seems to be enjoying his stay by the briny, in the company of 2JB, 3GZ, 3KI, 4NO, 5CC, 8GC, and 8KS. Congratulations to 8UG on passing his exam. ; he is now working near Croydon. 6GS has been sent to the wilds of Scotland for change of air. 5YA kicked in with a very interesting letter ; the DR thought they had been towing " our Andrew " behind a target-towing plane but found he had mis-read the letter ! 3VB, who is expecting to leave this area, recently had a visit from 2VB. 2FWB, after going on the sick list whilst in Guildford, has returned to the healthier climate of Berkshire. 8LT returned for a few days' leave from the north, where he seems to have had an exciting time on blitz nights. 5RS keeps the receiver warmed up and expects to lend a hand with the A.T.C. 5WP, despondent after 'flu, was cheered by visits from 8HA and 8LT.

G5WP.

Oxford.—G8PX, who is assisting the local A.T.C. Squadron, has recently constructed a frequency meter and 100 kc. bar, as well as several code practice audio oscillators, and a cathode ray oscillograph. In his "spare time" he has rebuilt his Skyrider! 5LO listens frequently on the ham bands, 2ALG is engaged on receiver construction. 4AB, 4FH and 8SF are at the University, reading medicine and science. The O.U.R.C. has been disbanded, but several enthusiastic ex-members continue listening schedules. One "die hard" has logged 75 countries on phone since the "great close down" in September, 1939. 2FJM has left Oxford and is now on Government work. G4AB asks whether any members are now at Cambridge University.
(By G4AB.)

Reading.—This month we welcome Mr. Ruddle, 2DIO, to membership. 6WO, 6GT, 2YB, 2HAX, and 5HH met recently at the latter's QRA, and indulged in a pleasant rag chew. All combine in sending 73 to 5AO and others from Reading who are serving. 2HAX, who is in the "Ack Acks," spent a short time in France. 2FJM is on Government work. 5HH would be pleased to know what the rest of the locals are doing. (By G5HH.)

Kingston and New Malden.—The TR was recently entertained by 3JG and treated to some good reproduction from his quality amplifier. 3OR is busy with the A.F.S. and installing PA gear in the village. 2AJD (R.A.O.C.), now a Radio Mechanic, is somewhere in the Sunny South. BRS2921, home after an absence of two months, finds conditions poor on 28 Mc. BRS3637 is busy on police radio. A hearty welcome is extended to 3UY, a blind enthusiast, who has come to the New Malden area. 3MF, now in the Gunners, expects to be training for some months before he is allowed to demonstrate his skill to Jerry. G8HA and sometime GM8HA was recently home on leave and made a number of local visits. (By G2GK.)

Southampton and Winchester.—Mr. L. G. Stoodley, G8DM, 23 Cheriton Road, Winchester, has offered to send notes from Southampton and Winchester. The group in the latter town has been increased by the addition of several Southampton members, and now includes G2KC, 2PS, 2XX and 8QW. G8QW is anxious to arrange local meetings.

DISTRICT 8 (Home Counties)

Last month we appealed for someone to take over the good work started by G2NJ, in reporting activities from the Peterborough area. An immediate response was forthcoming from G3WW, of March, who will act as scribe for this part of the district for the time being. Others acting in a similar capacity are G5OV (Hunts.), BRS3585 (Shefford, Beds.), and G5RL (St. Ives) now in the R.A.F., but a regular gleaner of news for District Notes. Again, many thanks for the assistance rendered.

Cambridge.—As we write, 5DQ is home on leave from the Royal Corps of Signals, and looking very fit. 2XV has become a gramo-record fan, and is trying out pick-ups. 5JO, 8SY and 5PC are doing overtime on work of national importance. There is no news of other members this month. Will 2DT and 3CY please report?

Peterborough.—Who said the ham spirit of helpfulness was dead? It may be war-time, but as soon as last month's BULL. appeared, with a request from 3WW for some dope concerning the R.M.E.70, three offers were on the way. The required information was forthcoming from 5SA. 3WW finds a DB20 behaves perfectly with his R.M.E.70. 3BK has been passing the time by re-wiring an old broadcast receiver. 2NJ, who writes, at long last, from somewhere in England, appears to be having a good time. He sends 73 to all in No. 8, and reports meeting 5IL, 6LX, 8NA and others.

St. Ives.—G5RL has moved to the South of England, and hopes soon to be wearing his "Sparks" badge. He reports that 6WA is in Kent, and that 8ST has gone East.

Beds.—2CFV, of Norwich, is now in this area. 2FFG has been promoted to L.A.C. and was recently home on leave. 2DPQ "mourns the loss" of 8KP and his wife, who have moved to the Salisbury area after making many firm friends during their sojourn in Beds. (What about that proposed visit, Bill? G5BQ) The call 2RCD, in last month's issue, should have read 2CRD.

Good luck to all No. 8 members, wherever you are, and please let's hear from you. G5BQ.

DISTRICT 10 (South Wales and Monmouthshire)

It is regretted that no notes have appeared recently, but this is due entirely to the fact that no news has been forwarded to the Scribe. It is hoped, however, to arrange a meeting in Cardiff within the next few weeks. In this connection the writer would ask all interested to communicate with him and suggest a suitable date or day in the week. G8PW is welcomed to Cardiff. Other members in the town are active in several directions, many new pieces of gear having been constructed.

G5FN will be glad to hear from service members located in the District. His address is 90 Coleridge Avenue, Penarth, Glam. G5FN.

DISTRICT 11 (North Wales)

Regular meetings continue to be held in Prestatyn to which Service members are frequent visitors. BRS4023 (brother of G2SO) and 2HCZ, a new member from Bangor, were heartily welcomed on a recent occasion.

It is hoped to hold a Sunday meeting towards the end of March, full details of which can be obtained from BRS1060, Woodside, Meliden Road, Prestatyn.
G6US.

DISTRICT 12 (London North and Hertford)

North London.—A very successful meeting was held on February 23 at G6CL, fifteen members being present, including G2IJ (Lydd), G6GL (West Kirby, Wirral) and 2CDB (home on leave from the R.A.F.) who is stationed with G3GX. The high spot of the meeting was the arrival of G2RX (now for ever to be known as Rasputin Xanthopè) with a neatly trimmed beard! It was suggested that he was getting ready to monopolise QSO's with YL operators when we get back on the air!

We welcome the following new members to the district—BRS4021, 4032 and 2BAB.

Letters have been received from G3DT, 3NR, 5QF, 6WU, 8CK, 2CNC, 2DTD and BRS3712—all of whom send their 73 to district members, wherever they may be. G3DT claims to have found

an ideal site in the Orkneys for an N.F.D. station, but bemoans the fact that it is necessary to take his accumulator several miles to be charged. G6WU, still stationed on the East Coast when ashore, seems to have been having some exciting times. BRS3712, now in GM, is getting some great ideas from the gear he is handling.

Watford.—G8CK (R.C. of S.) has been busy with exams. but still finds time to have personal QSO's with 3OJ. 3NR sent postcards to seventeen member in that area but only three replies rewarded his efforts. He is having trouble with tuning a V.H.F. convertor (3–1 meters) which uses telescopic lines, and would like to get in touch with anyone working on similar lines. 2HAR has constructed a 3-valve straight receiver, which he claims puts his commercial job in the shade. He is now a Platoon Commander in the H.G.

BRS3493, studying at an electrical engineering college in Devon, is to build the EF8 low-noise receiver described in the BULLETIN a few months ago. He is also working on a battery signal generator. 4BF, now an observer in the R.A.F., has built a 3-in. oscilloscope and hopes to add a time base in the near future. 2DFS is to build a modulator during his periods of leave.

St. Albans.—2CNC, who is trying to get the locals together, recently met G2CY, also of that town. 2DTD (Hitchin) has purchased a *Howard* 438 receiver and is very pleased with its performance.

The next North London meeting will be held at G8TY (phone ENT. 3219), 92 Arlington Road, Southgate, at 3 p.m. on Sunday, March 30. Nearest Tube Station—Southgate. At the February meeting a " whip round " for cigarettes resulted in a nice little parcel being sent to our D.R., G5QF, who is still at Ware Park Sanatorium. G5FA.

DISTRICT 13 (London South)

Central Area.—The meeting held at G8TN on February 23 was attended by G2GZ, 2DP, 3ST, 4DC, 8TN, 2FWA, 2HHD and BRS3724.

Conversation was mainly centred around a discussion on the likely conditions of Amateur Radio after the war.

District 14 keeps going with local meetings. Here are a few of the regulars from left to right:— 2HHD, G8TN, BRS3724, G2DR, G3ST & 2FWA.

G2DP brought along the latest American handbooks which proved most interesting, especially when compared with old radio books produced by 8TN. These included the Society's combined Call and Log book of 1928 vintage.

The next meeting will be held at G2VB, 35 Grangecliff Gardens, S.E.19 (top of South Norwood Hill, 49 or 68 'bus), at 11 a.m., March 23. G8TN.

DISTRICT 14 (Eastern)

The writer would like to express his appreciations to Council for having appointed him D.R. and would assure them of his earnest intentions to carry out his duties to the best of his ability.

Mr. St. Johnston, G6UT, the retiring D.R., has set us a splendid example over a number of years and on behalf of all District members we send him our cordial thanks for all he has done in the past.

Chelmsford.—G6LB has a new hobby—that of luring unsuspecting amateurs to his QRA to demonstrate image rejection on his Howard 430 with built-on preselector! 8PB, who seems to get bigger every time we see him, is kept busy these days. 2SA sports Sergeant's stripes in the H.G. and whilst away on a course of instruction in southern England met VE4AOJ, operator of an R.C.A.F. Mobile W/T station. 5CA has done some listening, but apart from W's on 3·5 and 7 has nothing to report. 5RV has been busy calibrating multi-range test meters and " swotting "! We are glad to welcome Mr. H. R. Heap, G5HF, of Manchester and Mr. B. M. Selby, G4LV, to our midst, whilst congratulations are sent to G5UK, now a Ft./Lt. 5RV conveys greetings and thanks to VU7BR, whose magnificent Christmas card was received some weeks ago. The following were present at the February meeting—G5RV, 5UK, 6LB, 8PB BRS3650 and Mr. Goodchild.

Forthcoming Events

Mar. 30 Scotland " A " District, 2.45 p.m., Y.M.C.A. Club, 100 Bothwell Street, Glasgow. Visit to inspect apparatus used for transmission of pictures by wire after meeting. All members welcome.

„ 30 District 12, 2.30 p.m., at G8TY, 92 Arlington Road, Southgate, N.14

Brentwood.—G3JW reports that 4AK is an air gunner attached to our now famous and much-sunk aircraft carrier! 3MV is an R.A.F. W./Op. stationed at Cairo. Will other local members please drop a line to 3JW at 92 Queens Road, Brentwood?

Southend.—We are pleased to see that G2YI of Rayleigh has rejoined the Society and that our old friend 2KT is still active. The following members have not been seen or heard of for some considerable time:—3NP (Pitsea), 3TS, 8RT and 2CMF (Laindon). Would they please write to 2SO, who is anxious to keep the area together? 2SO has had personal QSO's with 4LV (R.A.F.), VE4FN (R.C.A.F.) and 2YI (G.P.O.). G5RV.

DISTRICT 15 (London West, Middlesex and Buckinghamshire)

Those attending the February meeting held at G3UQ included G3AD (in the uniform of a Pilot Officer), 6RW, 8KZ, BRS1545 and BRS3318.

Letters have been received from G8IH, 6CO (who is now in the north) and 2FCJ (who sends 73 to 5ZA, 6RC, 6XP and the rest of his friends in the District). From BRS1357 (R.A.F.) comes a letter saying he has been forced by bombs to come into our district. He enjoys the meetings arranged at his camp and says he knows several T.V.A.R.T.S. members. G2QY reports a meeting of the Edgware Society, when Pilot Officers G3HT and 4KD were home on leave. VE5ZM was there too, as was 2IM. 6VP spends lonely days and nights on his A.R.P. job but has comfortable quarters for the week-ends. G3UQ has again consented to the next meeting being held at his QRA on March 29. G6WN.

DISTRICT 16 (South Eastern)

The only report to hand is from G3YY, the T.R. for Brighton. The writer again appeals to the other T.R.'s and individual members, wherever they may be, to write occasionally. The notes sent in at Christmas-time were read with great interest, so please make a similar effort for the April issue ?

G3YY has been listening on 7 and 56 Mc., and reports much activity on the former band. 4MH is concentrating particularly on 14 Mc. 3YY would like to hear from 3JF. 2CMH has been on leave.

It is extremely difficult to arrange meetings just now, but with better weather ahead there seems no reason why local gatherings should not take place. Will any member who is interested please write to G2WS ? G2WS.

DISTRICT 18 (North and East Yorkshire)

Driffield.—A letter from G2KO brings news concerning local members ; 6UJ is inundated with jobs in the repair section of his business, BRS566 on active service, has found time to build a short-wave battery receiver, 3DW has left for Canada to train young pilots, 5CJ has also left the town. 2KO himself has so many duties that he almost works the clock round !

Hull.—G6OS has almost completed a frequency meter built on the lines of the one described by G6LL, but with the addition of a vibrator circuit, the scarcity of components however, caused him many fruitless journeys to local stores. 4RX (R.A.F.) has left the district for duty overseas ; we wish him luck. A passing comment by an A.R.P. warden revealed 2AJV (late of Grimsby), living a few doors from 8UL. We are glad to welcome Mr. F. W. Ellis (BRS4043) into the Society, and also 2CGL (R.A.F.), who has rejoined after a break of a year. *Via* G8UL.

Scarborough.—Our warmest congrats. to Tel. P. B. Briscombe, G8KU, R.N.V.W.R., and Miss P. P. Fowler, BRS3484, whose recent marriage was announced. We wish them much happiness.

G6TG, now in GM, wishes to be remembered to his many friends in No. 18. No news is to hand from 2CP, 6CP and 6SO, but we learn that 2TK and 8BB have left the town. 2DDD is rebuilding his receiver.

The D.R. regrets the absence of news from Bridlington, Thirsk and Whitby, and appeals again for scribes to report local activities. Under existing circumstances it is impossible to keep members in the Services fully *au fait* with District happenings. G5MV.

Scotland

All members will regret to hear that Mr. D. J. Shaw, GM3RL, has sustained serious injuries through the bombing of the ship on which he was serving as Radio Officer. He will be in hospital for some time yet and will appreciate hearing from any of his friends; his address may be obtained from GM6ZV. We are glad, however, to be able to report that he is making good progress.

"A" District.—At the February meeting, which incidentally was poorly attended, the design of poster for display in canteens throughout the city of Glasgow was discussed. After the next meeting (to be held on March 30) a visit will be paid to a newspaper office, at the invitation of GM6WD. Those attending will see the apparatus used in the transmission of pictures by wire, so we hope the support will be good.

F./O. W. Craig, GM6JJ, writes to say that he has had a long letter from L.A.C. Phil Hardie (GM6JH of Linlithgow), who is a Radio Mechanic at an R.A.F. station in Scotland—actually the one commanded by G2IC (*vide* February BULL.). GM6NX also a Radio Mechanic and 2UU are in the neighbourhood and have some pleasant times together. GM6RV is believed to be close at hand but has not yet been contacted. Phil is anxious to meet GM5YX, who is requested to drop a line to him *via* 6JJ. GM6ZV.

Northern Ireland

Recent visitors to GI included G3BN, 3RF, 6AB, GM8CN, 2FHF and 2FRN. GW3CR (whose son is also in the R.A.F.), 6KS and BRS3856 have left for other destinations. We hope 6KS will remember to visit G2MI whilst at Harrogate. EI3G (Irish Signals) was in Belfast recently with an Army rugger team.

Letters have been received from 2COF (who sends 73 to all old friends) and VK3IR. The latter reports that VK2KS, 3UH and 4CJ are all well.

Friends of 2DZG (now a prisoner of war) who wish to write to him should address their letters to Sig. W. E. Caughly, Number 5333, Stalag XXI-B, Germany.

The first of a new series of technical talks at the Y.M.C.A. Radio Club was given by GI5UW, well supported by GM3TR. Measuring instruments in general and the design of a meter for measuring the impedance of transmission lines in particular, were discussed. Further talks are to be given fortnightly.

GI6TK, on behalf of many other GI's, sends best wishes and congrats. to Tom Arnold, VU2AN, on his recent promotion. GI5TK is now an instructor at a well-known radio college in Belfast. News from GI3JP, 3ZX, 5TK, 6WG, 8LF, 8UW and 8WD would be appreciated. Via GI6TK.

Letter to the Editor

LOOKING AHEAD

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—I believe that most amateurs will agree that it is not too early to make plans against the time when we shall resume our pre-war activities. I believe therefore that we should decide on some of the lines which we feel amateur radio should then follow.

Before the war the greatest emphasis was placed on experimental work, and operating was generally regarded as a means of testing apparatus developed on the bench. This in particular was the view of the licensing authorities. Those of us who have experience of signals in the services, have found that, generally speaking, there is less scope for experimental work there, and that one of the greatest needs is for highly trained operators and instructors, and for N.C.O.'s capable of taking charge of them. Amateurs are excellent wireless mechanics, with little need for training, but require considerable tuition before they are of use as operators in the Services. This I think is mainly due to the fact that few amateurs have experience of handling actual messages, and that many of us (including myself) used to use bugs or send fast without doing much copying. Our proficiency was therefore sufficient for our own needs, but one requires considerable training before being able to handle messages at 20 w.p.m. or so. Procedure is also a difficulty but requires less practice.

In view of the foregoing, I do feel that we should ask for permission, when we are again licensed, to handle third party messages, on roughly the same basis as in the U.S.A., in order that we may justify ourselves as operators as well as experimenters.

I should like to see point to point schedules within Britain, capable of giving a home service to the public with a maximum delay of say twelve hours, and, in addition, the revival of Empire Link Stations for disposal of traffic within the Empire. Also facilities for traffic handling to the U.S.A. should be easily arranged, in view of the increasing spirit of co-operation between the two countries. Much of the *Bull* notes and news could be passed by these means, as was done some years ago, with the consequent saving of time delay.

I feel sure that the authorities would consider suggestions formulated on these lines with favour, even if only because they would provide a valuable reserve of operators. I feel convinced that many more amateurs would participate in operating activities, such as message handling, than would attain equal proficiency or have as much interest in organisations such as the old C.W.R.

The views of readers would be interesting.

Yours faithfully,

J. H. EMMERSON (G8HA).

We shall be pleased to publish views from members providing they are brief and to the point!—ED.

G6UB de 2FUX

Mr. F. W. Fletcher, 2FUX, 75 Uxbridge Road, Ealing, W 5, is anxious to contact Mr. S. W. A. Butters, G6UB. Letters sent to addresses at Eastbourne and Bristol have not been answered.

Silent Keys

It is with regret we have to report the death, at the early age of 20, of Alisdhair Hendry Elrick Scott, B.Sc., G8QF.

Educated at Highgate School, Mr. Scott passed later to London University (City and Guilds College), where he specialised in Communications and Radio Engineering. He graduated in July last year, taking his Science Degree with honours.

He was later selected by the Marconi Company for a course of instruction at Chelmsford, but after a few months was compelled, through illness, to resign. He died five months later in Scotland.

G8QF had been a Society member for four years and had operated from his home in Highgate for about two years prior to the war. He was also a member of the Institution of Electrical Engineers.

We extend to his parents and relatives our deepest condolences.

* * * *

We also have to record that Mr. A. G. Balmer, 2BVI, of Berwick, has been reported missing since September last, when his ship —the s.s. *Cymbeline*—was sunk by enemy action. Mr. Balmer was serving as 1st Radio Officer. We offer our sincere sympathies to his sister and her family.

G6CL.

* * *

It is with great regret that we have to announce the death on February 25 of one of our best liked and most respected members, G6QZ, known to all in District 9 as "Billy Parker."

Mr. Parker was one of the Society's most staunch supporters in the Norwich area, and one had only to visit his station to realise how keen he was on experimental work, especially in connection with V.H.F. His health had never been too good, however, and the extra work due to the war no doubt brought a great strain.

The writer, on behalf of all who knew him, offers very sincere sympathy to his relatives

G2XS.

Can You Help ?

Mr. C. T. Fairchild, G3YY, 1A Dover Road, Brighton, 6, having obtained an old type Phillips vibrator unit, would like to hear from any member who can furnish him with the correct connections. The unit carries the number 28891460–916, and is marked B11 underneath. There are no voltage designations on the vibrator.

Have You a Spare 6R?

Dr. Brian Christian, G5XD, 8 Woodkind Hey, Bebington, Cheshire, is in urgent need of an Eddystone 6R (red spot) coil. Can anyone help ?

HEADQUARTERS CALLING

Registered Address

As from March 1, 1941, the Registered Office of the Society was changed to 115 High Holborn, London, W.C.1.

The business of the Society will, as hitherto, be carried on from Temporary Headquarters, 16 Ashridge Gardens, London, N.13.

B.B.C. Transmissions within the 7-7.2 Mc. Band

The Council has taken note that two frequencies within the amateur allocation, 7–7·2 Mc., have been, or are about to be, used by the B.B.C. for overseas transmissions.

Enquiries are being made.

The Amateur Radio Handbook

We have been officially advised by the Chief Officer, Permit Branch, Ministry of Information, that *The Amateur Radio Handbook* may not be sent to prisoners of war in Germany.

This ruling was obtained after two of our members, who are prisoners, had asked us to despatch a copy to them.

South London Representation

Council announces that arrangements have been made to appoint three Area Representatives for District 13, in lieu of a new D.R.

The following members have been invited and have accepted office :—

South Eastern Area.—Mr. L. H. Shersby, G2GZ, 41 Reverdy Road, Bermondsey, S.E.1.

South Central Area.—Mr. L. Sanderson, G8TN, 104 Croxted Road, West Dulwich, S.E.21.

South Western Area.—Mr. E. H. Simmonds, G8QH, 17 Roedean Crescent, Roehampton, S.W.15.

It is understood that Mr. Sanderson will act as Scribe for the District and that an announcement will appear in the April issue regarding the territory covered by each of the three areas.

It is hoped that as a result of this new arrangement regular meetings will be held in the South Eastern and South Western areas of the District.

American Publications

We propose publishing a note in this column each month regarding arrival or non-arrival at Headquarters of *QST* and *Radio*. This should assist those members who periodically write, if delivery is delayed, to enquire whether a certain issue has reached England.

To bring the position up to date we give the following summary :

QST.—February issue received February 26.

Radio.—February issue received February 27.

QST.—September and December, 1940, issues not received.

Radio.—December, 1940, issue not received.

Up to the time of going to press we had received confirmation that orders for QST and A.R.R.L. Handbooks despatched from Headquarters up to December 2, 1940, had been received safely at Hartford. Similar information from *Radio Ltd.*, showed receipt of orders despatched from Headquarters up to December 3, 1940.

We would again remind members that a period of at least eight weeks must be expected to elapse between the sending of an order to Headquarters and receipt of the books required.

No stocks of American publications are maintained at Headquarters.

New Members

HOME CORPORATES

D. J. SHAW (GM3RI,), 44 St. Swithin Street, Aberdeen.
G. WOOLDRIDGE (G3UN), "The Limes," South Road, Stourbridge.
C. D. S. WINTLE (G4GG), "The Lilacs," Reed Vale, Teignmouth.
R. T. DEALEY (G6DT), 34 East Sheen Avenue, S.W.14.
T. L. PETERSON (G6VG), 4 Belle Vue Crescent, Tyne Dock, South Shields.
H. TURNER (G6ZT), c/o "Braemar," Bransty Road, Whitehaven, Cumberland.
E. W. GREENHALGH (2AGV), 3 Victoria Terrace, Bramley Road, Snodland, Kent.
J. A. ROUSE (2AHL), 3 Betchworth Avenue, Erleigh, Berks.
W. BROCKBANK (2ARW), 156 Greystone Road, Carlisle, Cumb.
G. R. SANDERSON (2AYK), 73 Queen's Drive, West Derby, Liverpool, 13.
G. BULL (2AYP), Allanbay Cottage, Binfield, Bracknell, Berks.
R. C. HARRIS (2BAB), 1 Queen's Drive, Finsbury Park, N.4.
I. D. BROTHERTON (2BDV), 17 Gloucester Road, Hampton, Mddx.
J. FLETCHER (2BJF), 40 Southfield Road, Gloucester.
C. W. PETTIFAR (2DPQ), 84 Clifton Road, Shefford, Beds.
C. E. TEESDALE (2BUV), 23 Queen Street, Boston, Lincs.
F. A. BEANE (2CUB), Ridgewell, Halstead, Essex.
F. A. RUDDLE (2DIO), "Porth," Northumberland Avenue, Reading, Berks.
W. S. SYKES (2DJS), 36 Southmere Road, Gt. Horton, Bradford
F. S. G. ROSE (2DRT), "Allendene," Pinchbeck Road, nr. Spalding, Lincs.
D. B. EGAN (2FPC), 35 Aberdeen Road, Edmonton, N.18.
H. W. HEATH, M.P.S. (2HHD), 85 Bedford Hill, Balham, S.W.12.
A. RENSHAW (2HOG), 131 Vine Street, Abbey Hey, Gorton, Manchester, 18.
F. ELLIOTT (BRS4051), 36 Queen Mary Road, Sheffield, 2.
F. G. HAYNES (BRS4052), "Sonoma," Chester Road, Streetly, Birmingham.
H. C. MANLEY (BRS4053), 8 Walpole Road, Twickenham, Middx.
D. J. MAIN (BRS4054), 14 Budoch Drive, Goodmayes, Essex.
G. K. E. INMAN (BRS4055), 150 Springfield Road, Sheffield.
C. A. TAYLOR (BRS4056), 86 Rennets Wood Road, Eltham, S.E.9.
L. A. BALLINGALL (BRS4057), 278a High Street, Uxbridge, Middx.
F. HUNT (BRS4058), 284 Grimsby Road, Cleethorpes, Lincs.
P. G. SKANE (BRS4059), 115 Eden Park Avenue, Beckenham, Kent.
S./LDR. T. WILSON (BRS4060), 5 Drayton Park Avenue, West Drayton, Middlesex.
E. A. SPEAKMAN (BRS4061), 21 Duncan Drive, Greasby, Upton, Wirral.
J. S. WORTHINGTON (BRS4062), 10 Shelton Road, Wallasey. Cheshire.
J. H. O. CANNELL (BRS4063), 95 London Road, Morden, Surrey,
F. S. SUTCLIFFE (BRS4064), 18 Park Road, Guiseley, nr. Leeds.
F. PYGRAM (BRS4065), 26 Sandhurst Place, Leeds, 8.
H. J. DEVENISH-BURRELL (BRS4066), 76 Clockhouse Lane, Romford, Essex.
A. T. KNIGHT (BRS4067), "Dunromin," Pine Road, Chandlers Ford, Hants.
J. HERCULSON (BRS4068), 26 Marchmont Crescent, Edinburgh, 9.
I. GOODALL (BRS4069), 5 Burghlee Terrace, Loanhead, Midlothian.
B. F. STEWART (BRS4070), "Highlands," Kingswood Way, Selsdon, Surrey.
H. C. MURFITT (BRS4071), c/o 47 Kirkleys Avenue, Spondon, nr. Derby.
J. H. CRUDGINGTON (BRS4072), 88 Morris Avenue, Wyken, Coventry.
I. J. WOOD (BRS4073), "Reydon," Coldharbour Lane, Bushey, Herts.
A. I. P. ANDERSON (BRS4074), 24 Millway, Mill Hill, N.W.7.
S. B. LAYTON (BRS4075), 288 Ripple Road, Barking, Essex.
W. WALKER (BRS4076), 24 Laverack Street, Handsworth, Sheffield, 9.
R. WOLSTENHOLME (BRS4077), 20 Wesley Street, Westhoughton, nr. Bolton.
R. S. DERBYSHIRE (BRS4078), 29 Barnfield Crescent, Sale, Manchester.
O. G. SHAW (VE3FG), Apt. 39 Spruce Courts, 330 Sumach Street, Toronto, Ont., Canada.

MATHEMATICS FOR THE RADIO AMATEUR—

(*Continued from page* 282).

—ve) give a +ve sign in the product; unlike signs (one +ve, one —ve) give a —ve sign in the product.

(*d*) $(-4) \div (-2) = +2$; $(+4) \div (+2) = +2$; $(-4) \div (+2) = -2$; $(+4) \div (-2) = -2$

Which gives for dividing, the same rule as for multiplying, *i.e.* like signs give +, unlike signs give —.

The reader should practise the above rules with examples, in simple numbers, which he constructs for himself.

Solutions to Problems set in Part IV

11. (*a*) **8000 m.**, (*b*) **2400 m.**, (*c*) **4·8 m.**; 12. **54·54 m.**; 13. **7389 kc.**; 14. (*a*) **129**, (*b*) **450**. Both products are in the form $\mu H \times \mu\mu F$; 15. **1593 kc.**; 16. **22·5 $\mu\mu$F.**

(*To be continued next month.*)

A SATURDAY IN SALISBURY—

(*Contd. from page* 294)

also be appreciated—on this occasion only one member (G8DI) came from that usually prolific centre of Hamdom." G6CL intends, it is understood, making a special effort to be present and we may possibly be honoured by a visit from our new President.

So please mark the date—APRIL 19—the Saturday after Easter, and help to make the next meeting the war-time equivalent of a peace-time Conventionette. J. N. W.

Ham Hospitality

The following members have kindly offered to extend "Ham Hospitality."

Blackpool, Lancs.—P. Roberts (2COR), 65 Mosson Lane, Norbreck. (Phone: Cleveleys 2197.)

Carshalton, Surrey.—S. Kember (G6KM), 71 Shirley Avenue (evenings or week ends).

Edinburgh.—J. Wilson (GM6XI), 52 Macdowall Road, Edinburgh 9. (Phone: Edinburgh 42153.)

Knutsford, Ches.—G. W. Pryor (G3YX), The Lodge, Booth Hall.

Leeds.—H. Beaumont (G5YV), 8 Ashfield Avenue, Morley.

March, Cambs.—R. F. G. Thurlow (G3WW), Cotswold House, St. Peter's Road. (Phone: March 2128.)

Northern Nigeria.—A. Tomlinson (ZD2H-G2QN), Posts and Telegraphs, Kano. (Phone: City 61.)

Trade Note

Mr. H. W. Stewart, G2CY, has joined the staff of Antiference Ltd., Plender Place, Camden Town, in the capacity of Works Manager, after an association with Webbs Radio for 11 years.

Problem Picture No. 3

Yes, it's Madeline McKenzie, VK4YL—but she's grown up! Five years ago, at the age of 13, she was the youngest licenced amateur operator in the British Empire. At 18 she is just as keen as in the days when her call was one of the most outstanding on the DX bands. Her father, VK4GK, shared with Madeline many B.E.R.U. Contest triumphs.

EXCHANGE AND MART.

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