THE T. & R.

BULLETIN

THE INC. RADIO SOCIETY OF GT. BRITAIN

AND THE BRITISH EMPIRE RADIO UNION

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THE INCORPORATED

RADIO SOCIETY OF GREAT BRITAIN

AND THE

BRITISH EMPIRE RADIO UNION

53, *VICTORIA STREET, LONDON, S.W.I.* ('PHONE: VICTORIA 4412)

PATRON: H.R.H. THE PRINCE OF WALES, K.G.

R.S.G.B. CALENDAR.

Unless otherwise announced, all meetings are held at the Institution of Electrical Engineers, Savoy Place, W.C.2 commencing at 6.15 p.m. Tea is served at 5.30 p.m.

April 20. "*Some New Ideas on Master Oscillators*," by G. W. Thomas, G5YK and H. C. Page, G6PA.

Forthcoming Conventionettes.

May 6. District 5, Bristol.
May 27. District 16, Larkfield.
June 3. District 1, Manchester.
June 17. District 14, Southend.
June 24. District 7, Weybridge.
July 1. District 2, Leeds.
July 15. District 4, Leicester.

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Honorary Editor :—

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Vol. 9

No. 10

CONTENTS.

CONTESTS

EVER since the Society awoke to activity after the Great War, it has been to the forefront in promoting Contests amongst its members, and in this work it has followed the policy of similar organisations, who find that competition is one of the best means of furthering interest in their particular field. In recent years the number of Contests has increased considerably, while the number of entrants has multiplied accordingly. The organisation of such events, the checking of the results, and the many difficulties encountered, has become a task of no small magnitude, and we are sometimes tempted to ask ourselves if we are not arranging too many Contests.

For each Contest a set of rules has to be carefully drawn up by the Awards Committee, who, after considering every detail, pass them to Council for ratification. Here, again, they are "veted" and each rule examined for any loophole which might have been previously overlooked. Finally, in their approved state they have been printed under the assumption that they were straightforward, and that the judging of the Awards would be a comparatively simple matter. Yet what has been the result ? In nearly every case some difficulty has arisen, and more often than not the responsibility for the final judgment has been left to the President, who has again re-read the rules and given his decision upon their literal wording.

It is our view that Contests would be easier to organise if all participants would but exhibit a little more true " ham spirit." Rules are issued with the idea that all who take part will read them and act in accordance with the spirit underlying them. We are, however, bound to confess that this is not always the case, for there appears to be a class of amateur who sets out with a definite intention of finding loopholes, and then proceeds to formulate his plans of operation accordingly. An instance of this will serve to show what we mean. In our recent Low Power Contest, the rules clearly stated that the voltage to be applied to the valve or valves delivering power to the aerial should not exceed 100 volts, in other words, the Contest was organised purely and simply for those interested in QRP work, and who have not the facilities available insofar as unlimited current supply is concerned. Imagine our surprise when we were asked if it would be considered within the rules if a member used relatively high power on his sub-stages, providing the voltage on the final amplifier did not exceed one hundred volts. Had the member given the matter full consideration, he would have realised that the underlying spirit of the Contest would be defeated if his proposed method of operation were adopted. As a result of this enquiry and similar ones from various parts of the country, the Awards Committee must now spend considerable time in devising additional rules to guard against this contingency in future.

(*Continued on page* 348.)

FURTHER NOTES ON DRIVEN AMPLIFIERS

By E. N. Adcock (G2DV).

WITH the idea that much of the lack of efficiency and (what is more important) a large number of the cases of BCL interference are caused by unstable circuit arrangements, the writer has attempted an analysis of the various causes of trouble in multi-stage transmitters that have come to his notice. While it is not suggested that the ground has been completely covered, it is hoped that the beginner may find some assistance in the following paragraphs.

Parasitic Oscillations.

Parasitic oscillations are probably the unsuspected cause of more trouble than any other fault in a transmitter—raw A.C. notes that should be T9, T61D's that refuse to neutralise, transmitters that "go off the deep end" in the middle of a QSO—most of them may be traced to a parasite.

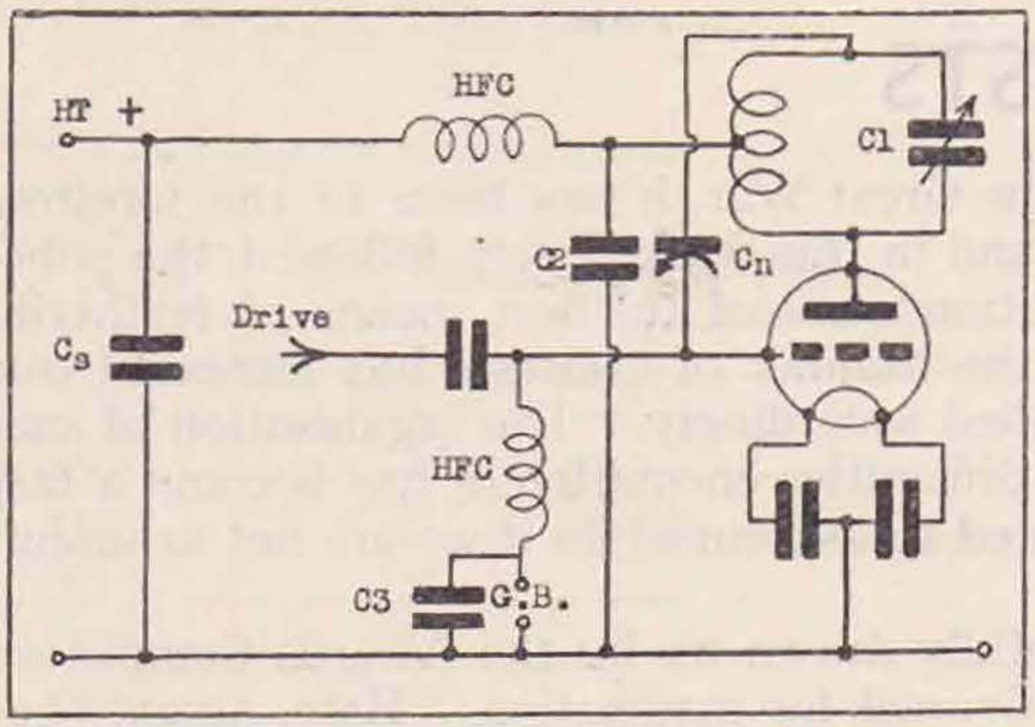


Fig. 1a.

Shows a conventional power amplifier circuit.

In a short-wave transmitter possible parasites fall into three groups :—

(1) Low-frequency parasites.
(2) Parasites near the fundamental.
(3) Ultra high-frequency parasites.

1. *Low Frequency Parasites.*

H.F. chokes are the main cause of the parasites that fall into this category. In Fig. 1A we have a conventional amplifier stage. In Fig. 1B the circuit is re-drawn showing the possibility of the chokes acting with the various capacities and C_s, the final smoothing condenser in the H.T. filter, to form a T.P.T.G. oscillator, and assisted, in this case, by the neutralising condenser increasing the normal plate-grid capacity of the valve. This parasite is also, of course, quite possible with a doubler, and is also the frequent cause of an impure note from a 3.5 mc. crystal oscillator stage. The obvious remedy is to remove the anode choke—it is quite unnecessary, and the by-pass condenser C_2 will tie the nodal point down to base line without any further assistance.

In Fig. 2 we have another possible T.P.T.G. with the grid chokes of two successive stages. Here again the omission of the anode choke will effectively stop this parasite, as the H.T. is parallel fed at its frequency, and relative to the low-frequency oscillation, the anode will be effectively tied down to base line, as the inductance L_1 has insufficient impedance to make an efficient choke at the frequency of the parasite.

2. *Parasites near the Fundamental.*

In capacity-coupled amplifiers, these are caused by imperfect neutralising, the tuned circuit of the preceding stage acting as the grid circuit of the following one. They will be dealt with under "Neutralising."

3. *Ultra High-frequency Parasites.*

The common causes of trouble in this region are long leads to tuning condensers. In Fig. 3 is shown a sample of this type of parasite the writer came up against in a single-ended amplifier. There are dozens of possible variations. Prevention is better than cure. Keep the leads from anodes to tuning condensers down to an absolute minimum—a golden rule in all short-wave work! The use of grid stopper resistances and chokes may effect a cure, but do so at the expense of overall efficiency.

Finding the Parasite.

In the case of any multi-stage transmitter the best mode of procedure is as follows : Remove the crystal from the C.O. stage and apply H.T. to all stages. Take each stage in succession and decrease bias until the valve is dissipating as much anode current as it will safely stand. Run over each stage with a neon. If any parasite is there it will show itself. Procure an absorption wavemeter, or if none is available a few coils (say 2t to 20t) and a .0005 mfd. condenser, and find the approximate frequency of the parasite. Once this is found, the reason for its presence will soon be obvious, and the cure suggest itself.

Neutralising

Neutralising is undoubtedly the most prolific source of trouble in many transmitters. In some cases this is aggravated by the presence of un-

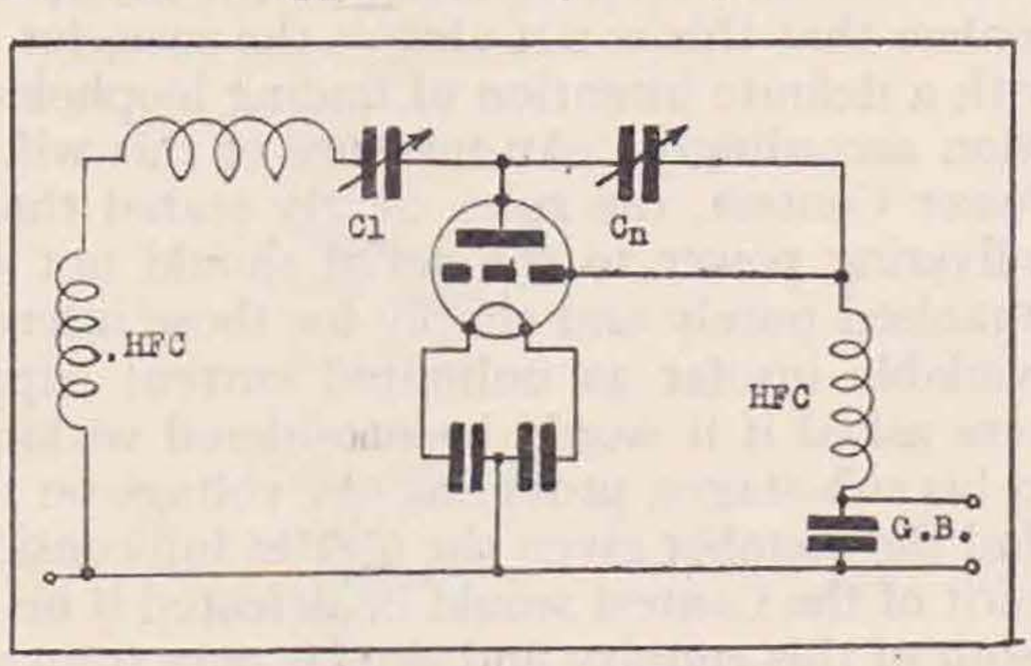


Fig. 1b.

Fig. 1a re-drawn showing possibility of chokes acting with the final smoothing condenser to form a T.P.T.G. oscillator, thus producing a low-frequency parasite.

suspected parasitics, but in the opinion of the writer the single-ended amplifier is inherently unbalanced, and, where there are BCL neighbours, should never be used on frequencies above 3.5 mc.

In Fig. 4 we have the usual arrangement employed in a single-ended amplifier. Anode voltage is fed to the amplifier by centre-tapping coil L_1. When

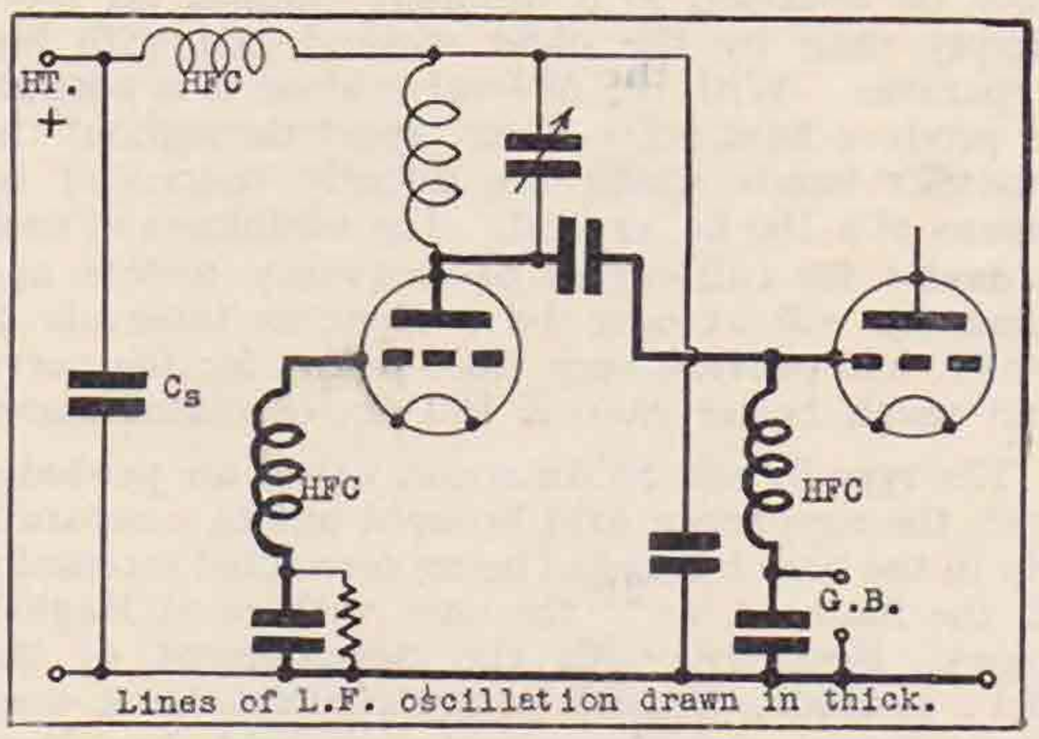


Fig. 2.
Grid Chokes in two successive stages are another source of parasitic oscillations

C_n is adjusted to equal the capacity existing between anode and grid, the circuit is usually said to be neutralised. However, although valve capacity has been neutralised, *no account has been taken of the capacity of components to earth*—a factor not to be disregarded at the frequencies with which we are dealing—the circuit, in fact, is asymmetric. This

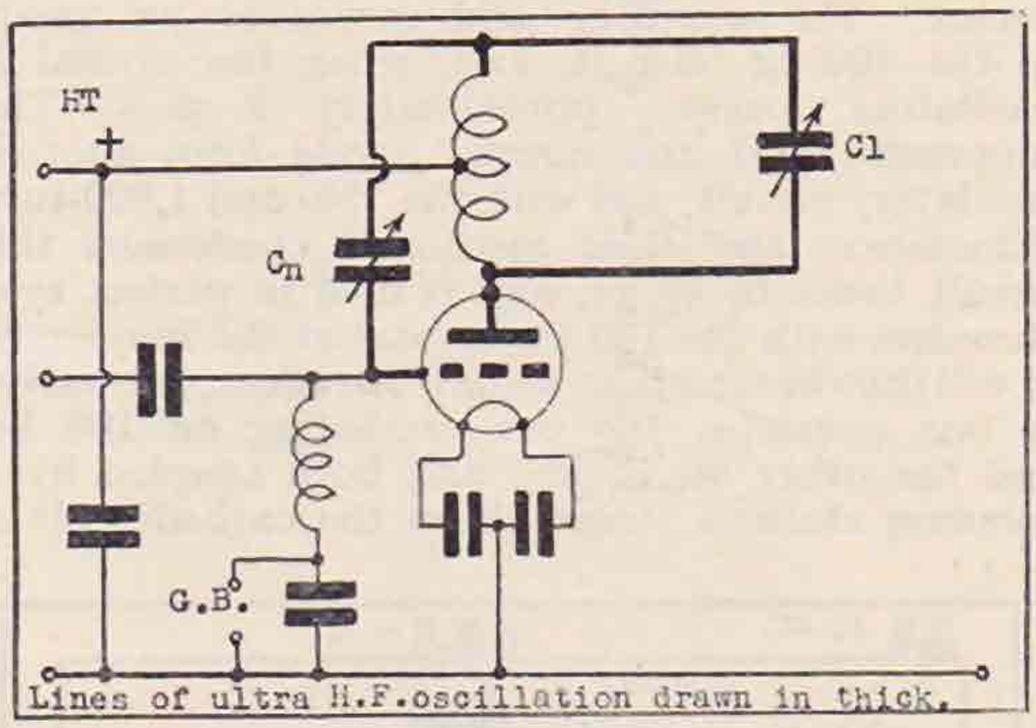


Fig. 3.
Shows how ultra H.F. parasites may be caused by long leads to tuning condensers.

may easily be proved. The negative bias necessary to obtain cut-off of anode current with drive removed is $\frac{1.2\ E_a}{\mu}$ where E_a = voltage applied to anode, and μ is the amplification factor of the valve. With a single-ended amplifier this is never the case if a valve with a mutual conductance of 2 or greater be used, and in actual practice sufficient bias is applied to overcome any feed-balk.

When drive is applied the circuit operates partially as a T.P.T.G. (with the anode circuit of the preceding stage acting as its grid circuit in the case of a capacity-coupled amplifier), the whole being locked on wave by the drive through from the preceding stage. Owing to the use of low-C circuits, the frequency of this T.P.T.G. at the moment of commencement of oscillation may vary somewhat from that of the drive, so that a very

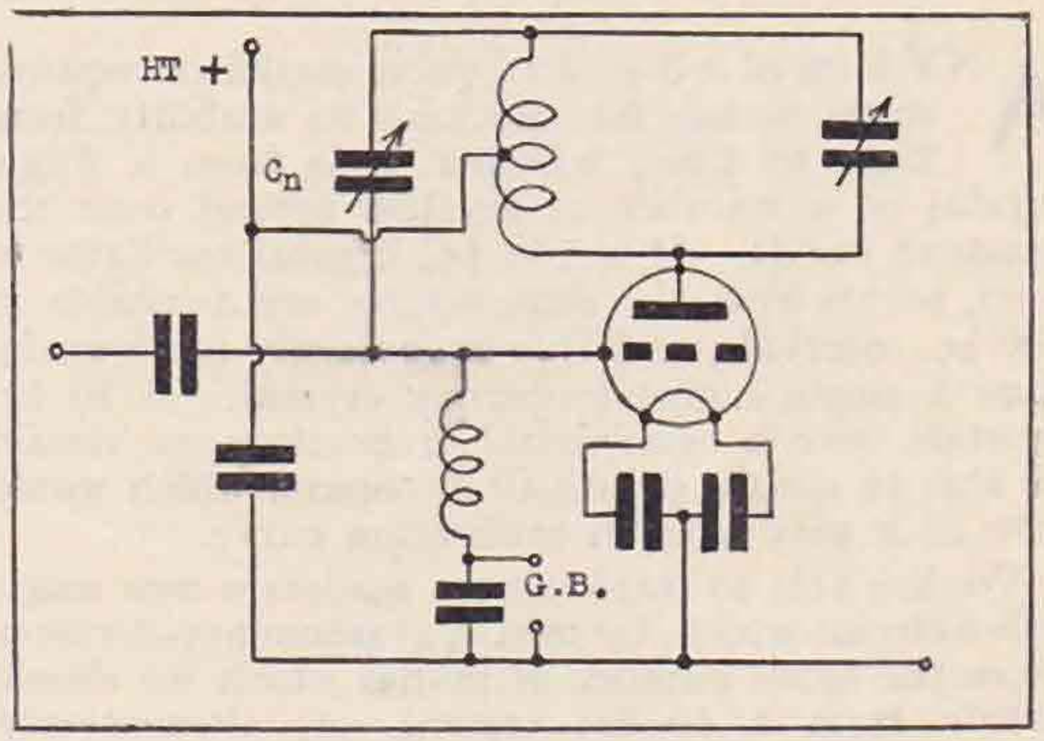


Fig. 4.
Usual arrangement of a single-ended amplifier with centre-tapped anode voltage-fed.

small space of time is taken for the oscillators to come into step. During this time a large number of transients of indeterminate frequency are produced, thus causing the key-clicks audible in a nearby broadcast receiver. Altering the capacity of C_n will increase the percentage of power derived from the T.P.T.G., transients will be stronger, and the key-clicks worse than ever—the usual experience when out of so-called neutralisation.

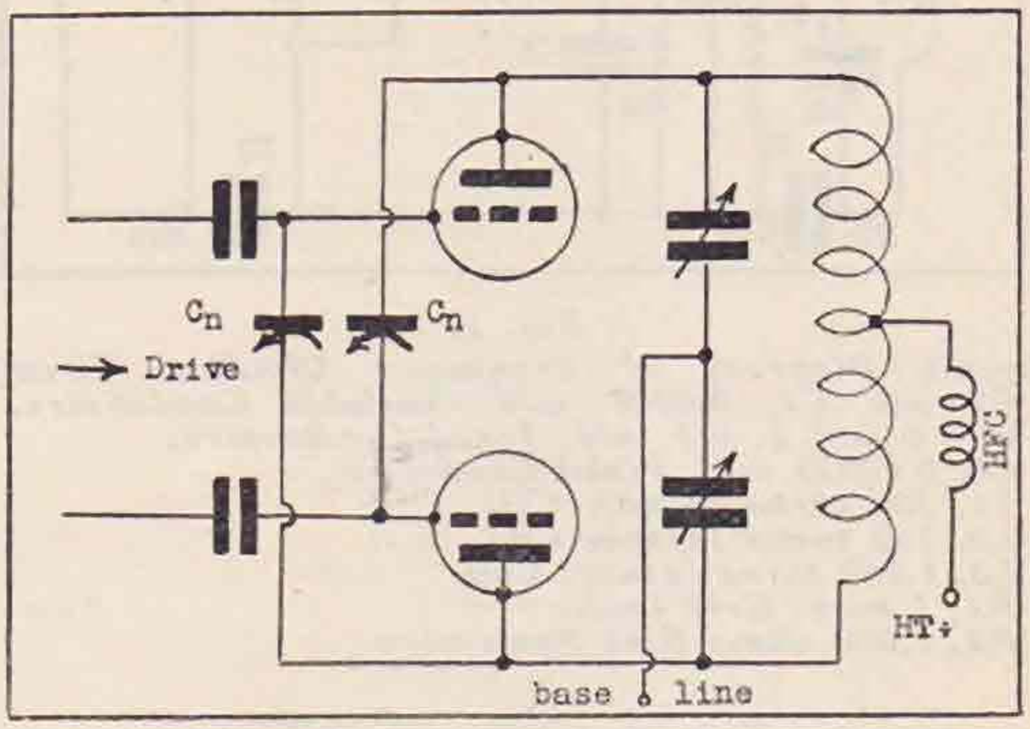


Fig. 5a.
A push-pull circuit showing circuit arrangement.

Consider now the push-pull circuit in Fig. 5a, and the same re-drawn in Fig. 5b. One of the main troubles we come up against in short-wave work is that stray capacities to earth are of such a type that our minds are unable to grasp them. However, if we lay out this circuit symmetrically as the bridge in Fig. 5b, both a perfect voltage balance and symmetry to earth can be obtained. In actual practice the writer found that, on reducing bias until about 100 ma. were passing to the anodes (with drive removed), no trace of RF

(*Concluded on page* 348).

THE H.F. PENTODE AS A FREQUENCY DIVIDER.

By A. D. Gay (G6NF).

(Describing a Crystal-controlled Monitor for calibrating and checking the electron-coupled master oscillator or frequency meter.)

ANY form of self-excited valve oscillator requires some means for checking its stability from time to time, whether it is from a single crystal or a number of crystals spread over the amateur bands. If a 100 kc. crystal oscillator is used, points from the same source are available at 100 kc. intervals, and this is obviously more useful than a single higher-frequency crystal. If 10 kc. crystals were a commercial proposition we should be able to obtain points 10 kc. apart, which would give us a very smooth calibration curve.

We are able to introduce to readers a new single valve circuit which, by means of frequency-division, gives the same number of points which we should obtain from a 10 kc. crystal, or, alternatively, 100 kc. points only. In the *Proceedings of the I.R.E.* for July, 1933, Victor Andrew described a circuit, using type 57 and 58 American valves, for producing oscillations of lower frequency, which

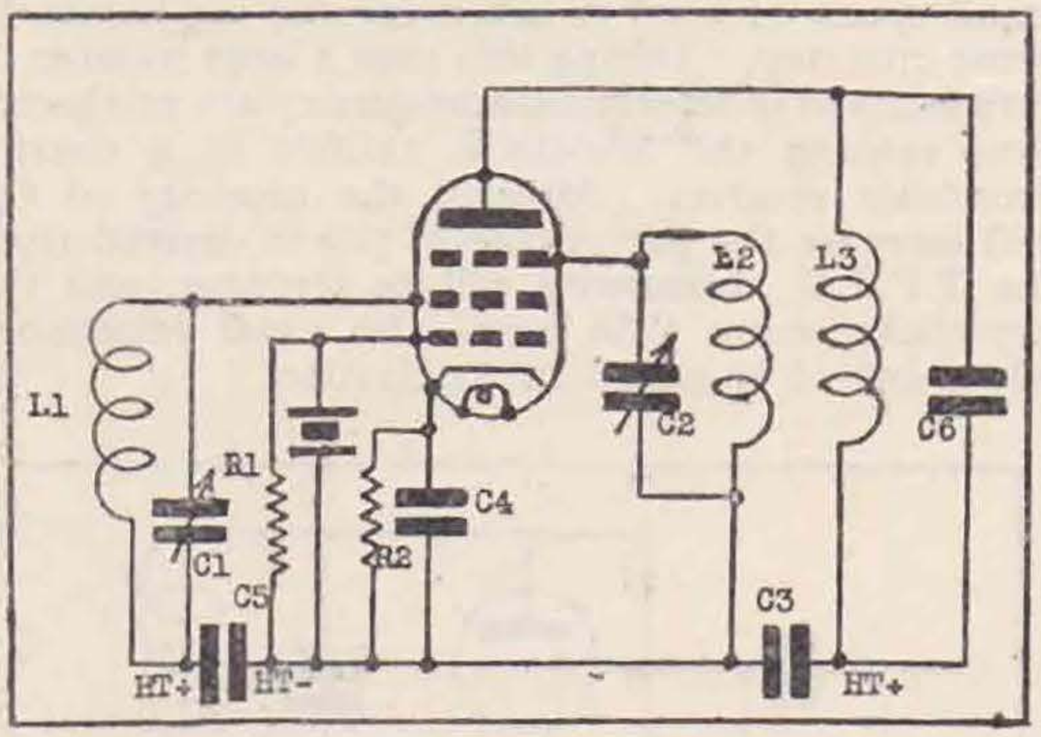


Fig. 1.
Circuit Diagram of Frequency Dividing Circuit.
C1 and C2, 0.0005 mfd. Variable Condensers.
C3, 4 and 5, 0.1 mfd. Fixed Condensers.
C6, 0.00025 mfd. Fixed Condenser.
L1, 300 turns Igranic Coil.
L2, 750 turns Igranic Coil.
L3, 1,000 turns Igranic Coil.
R1, 1 meg. Grid Leak.
R2, 1,000 ohms Bias Resistance.

are directly controlled by a crystal of higher frequency. Most experimenters will be familiar with frequency doubling as a convenient method for obtaining H.F. energy from a low-frequency crystal for the purpose of driving higher frequency P.A. stages. The question of producing H.F. energy of lower frequency than the fundamental source is an entirely different matter, and has to be performed normally with the aid of a relaxation oscillator, which is controlled by means of a proportion of harmonics from the fundamental source in its anode circuit. This type of frequency divider is familiar as the multi-vibrator circuit and divisions of the order of 10 are easily obtainable.

It is the purpose of this article to show how, with the aid of an H.F. pentode, this frequency division may be obtained in a different manner far more simply than by the older method and with less apparatus. With the one valve alone it is possible to produce harmonics 10 kc. apart throughout the amateur bands which are directly controlled by means of a 100 kc. crystal. The usefulness of such a device for calibration of frequency meters and monitors will at once be evident as intervals of 10 kc. will provide very close points for the curve and much better than a 100 kc. oscillator alone.

The type 57 and 58 American valves are pentodes with the suppressor grid brought out to a separate pin in the base instead of being connected internally to the filament, as is the case with most English types. Recently, with the development of the H.F. pentode, English manufacturers have used 7-pin bases and the suppressor grid has been connected to one of these pins; this has enabled the H.F. pentode to be adapted to frequency dividing. The writer has had the opportunity of trying two Mazda AC/S2 pentodes in the circuit shown in the diagram, and they both function extremely well for the purpose.

A consideration of the circuit diagram (Fig. 1) shows the 100 kc. crystal connected between grid and cathode in the usual manner. Bias for the valve is provided by a 1,000-ohm resistance in the cathode lead, which is necessary to stabilise the circuit. The auxiliary grid serves as an anode to the 100 kc. circuit, and, when the crystal is oscillating, passes approximately 3 m/a. The suppressor grid and normal anode form another oscillatory circuit, and with the 750- and 1,000-turn inductances and their associated condensers this circuit tunes to 10 kc. and is held in perfect synchronism with the 100 kc. crystal at the frequency. It will thus be seen that we have, in effect, two valves in one envelope, the one oscillating on 100 kc. and the other on 10 kc., and both coupled by a common electron stream from the cathode. It is

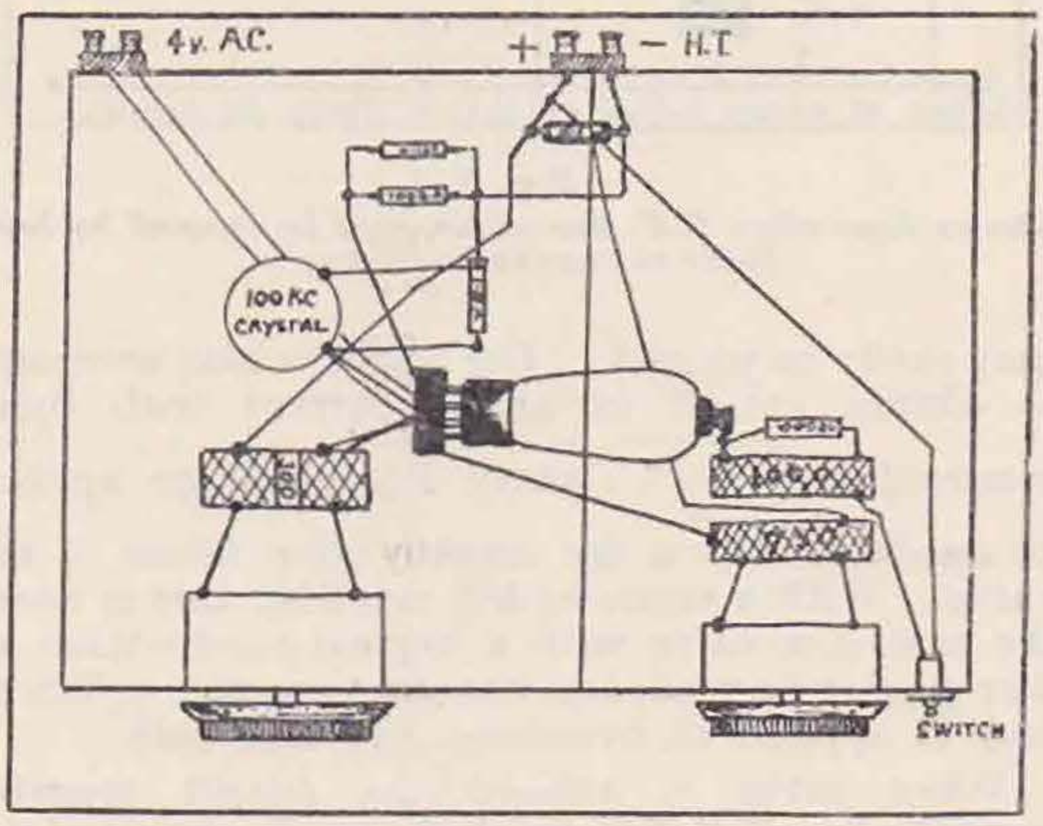


Fig. 2.
Suggested Layout of Frequency Divider.

this electron-coupling which enables the two frequencies to be locked together so easily.

Although the experimental lay-out of the circuit was of the customary bread-board style, with the 100 kc. crystal oscillator on the left, the 10 kc. oscillator on the right, and the valve in between, in considering a permanent lay-out it might be advantageous to screen each half according to the design in Fig. 2. A 0—10 milliamp. meter in series with the H.T. feed to the crystal oscillator will enable a check to be kept upon this circuit and indicate that the crystal is oscillating.

With the H.T. disconnected from the 10 kc. circuit, two harmonics from the 100 kc. crystal oscillator are located on the receiver—for instance, on 7,000 and 7,100 kc. The H.T. to the 10 kc. oscillator is then switched on and the condenser C2 slowly turned until the oscillator locks over a few degrees of the dial. There should then be ten distinct harmonics between the receiver dial positions for 7,000 and 7,100 kc. There will be found other positions for the dial of the 10 kc. oscillator in which a small degree of lock is obtained, but in these positions there will be some odd number of harmonics instead of ten. A length of wire, clipped to the anode coil of the 10 kc. oscillator and laid over the receiver, will provide sufficient coupling to produce R7 harmonics, and a switch should be provided for breaking the H.T. circuit to the 10 kc. oscillator for occasions when harmonics of the 100 kc. crystal are required alone.

A METHOD OF DETERMINING ULTRA-SHORT WAVELENGTHS.

By A. S. Clacy (G6CY).

THE following brief description of the method of determining ultra-short wavelengths employed at G6CY may be of interest to other experimenters, and is put forward on account of its simplicity and because the writer does not recollect having seen the method described eselwhere.

The essential item is a Frequency Meter with an accurate calibration, operating on one of the lower frequency amateur bands. Such a meter has been constructed at G6CY although the calibration has not yet been accurately accomplished, only a rough graph having been prepared. The meter is of the Dynatron type and uses a Hivac SG.210 valve specially selected for this work by the *Hivac Valve Company*. The fundamental range of the Frequency Meter is approximately 1,600 Kc. to 2,050 Kc. To measure short waves the method is as follows :—

(1) Set the S.W. Receiver oscillating at the desired frequency.

(2) Set the Frequency Meter at 0° and slowly move the dial until a harmonic is heard in the receiver.

(3) Note dial reading.

(4) Slowly move dial of Frequency Meter until next harmonic is found and note dial reading.

(5) Repeat to obtain as many readings on Frequency Meter as possible, leaving Receiver untouched throughout the operation and tabulate results as shown below.

These readings were actually secured on one occasion at G6CY, and bearing in mind the fact that the Frequency Meter at present has only a rough calibration the results are considered satisfactory.

F.M. Dial Reading. Degrees.	F.M. Frequency. Kilocycles.	F.M. Wavelength. Meters.	Differences.
27	2015	148.9	
			... 5.3
72	1945	154.2	
			... 5.0
99	1885	159.2	
			... 5.2
119.5	1825	164.4	
			.. 5.1
136	1770	169.5	
			... 5.4
149.5	1715	174.9	
			... 5.3
162	1665	180.2	
			... 6.6
173.5	1615	185.8	

Taking the arithmetical mean of the values in the last column the figure 5.27 meters is arrived at, and this is the wavelength at which the S.W. receiver is oscillating.

The principle of operation is that at each change in frequency of the Frequency Meter the order of the harmonic received increases by 1, thus 5.27 is the 28th harmonic of 148.9 meters (approximately) and the 29th harmonic of 154.2 meters, and so on until finally one is receiving in the receiver the 35th harmonic of the Frequency Meter signal on 185.8 meters.

It may be found at times that one or more of the "differences" recorded in the last column is a multiple of the others, and in this event it clearly indicates that an intermediate harmonic has been missed. This is easy to do as harmonics of this order are very weak in the O-V-1 receiver used. (N.B.—Super regeneration is not employed.)

The views of other members on this method of determining short wavelengths will be welcomed.

STRAYS

Paul Poulsen, OZ2P, has changed his address to Helgesgade, 6, Kongsvang, Aarhus, Denmark.

Dr. E. P. Metcalfe, ex VU2KH, has moved to The University, Mysore, India. His new call is VU7KH.

OSCILLATIONS, WAVES AND WAVE MOTION.

By A. Everett (ZT6U).

In this article, which is reprinted from "Q.T.C.", the South African Radio Relay League monthly journal, with the permission of the Author and the Editor of that journal, we present a comparatively simple explanation of electrical wave motion. This information should prove of particular interest to those new members whose knowledge of first principles may be limited.

WHEN we use the expression "wave" we are apt to think of waves in terms of that which we see at the sea-shore and up to a point such an analogy certainly helps to visualise a wave that can only be detected by its effects. But any motion that is periodic, that is to say any motion that repeats itself at stated internals, may be termed a wave. Among the periodic motions encountered in the practice of our hobby we meet with the oscillations of a valve, sound waves, light waves, carrier waves, modulated waves, to say nothing of the ordinary household alternating current. All these, although vastly different in character, obey the same fundamental laws.

Simple Harmonic Motion.

In order thoroughly to understand the principles underlying wave motion it is necessary to understand what is meant by Simple Harmonic Motion.

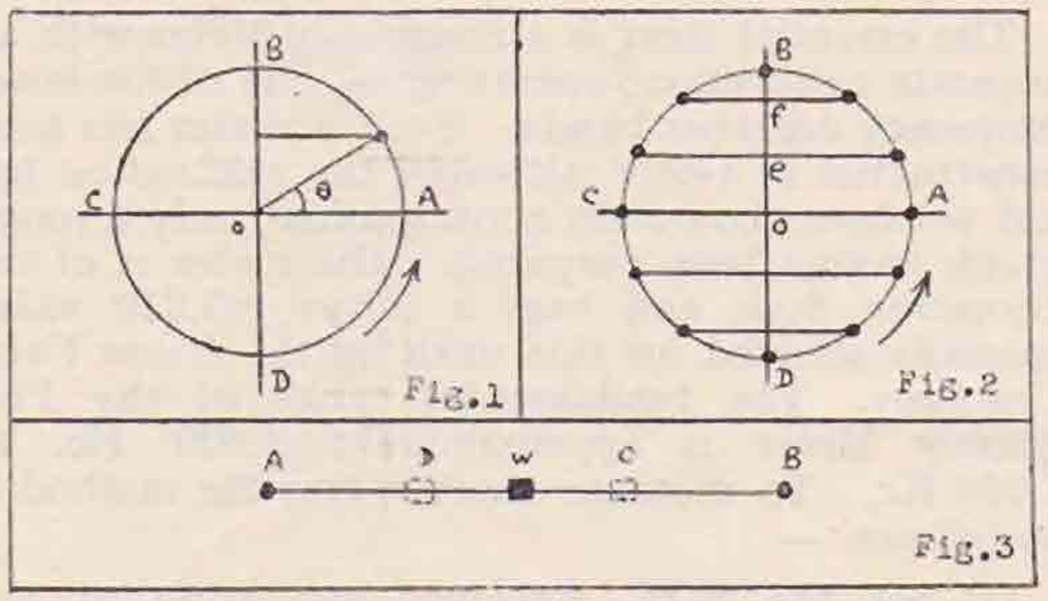
Suppose we have a point Q travelling round a circle ABCD in a counter-clockwise direction with uniform velocity. (Fig. 1.) From the position of Q at any given instant let us draw a perpendicular to DOB the diameter of the circle. Then as Q revolves the point P will move up and down along DOB and the point P is said to have Simple Harmonic Motion. ABCD is termed the "circle of reference," but let it be clearly understood that although we used the point Q moving in a circle to define what is meant by Simple Harmonic Motion, it is still possible for P to move in simple harmonic motion without there being a corresponding point moving in a circle.

If we now take a number of points at equal distances round the circle of reference (Fig. 2) and, as before, drop perpendiculars to the diameter DOB through each point, then as Q is revolving at uniform velocity the point P will traverse the distances Oe, ef and fB in equal times. Considering the point P and assuming it to start moving upwards from O, the velocity gradually decreases as P gets nearer to B, stops, reverses and increases in velocity as it approaches O, then decreases in velocity towards D and so on. The total time taken for P to move from O to B, B to D and D to O is known as the periodic time of the simple harmonic motion and it is defined as the time taken between two consecutive passages of the point P in the same direction through any point in its path. The number of complete passages to and fro in a second is called the frequency. The maximum displacement of the point P from the mid position of its path, that is OD or OB is termed the "amplitude" of this simple harmonic motion and the angle θ swept out by the line OQ from some fixed line in a given time is termed the "phase" of the particle which is executing the simple harmonic motion.

Let ω be the angular velocity of Q expressed in radians per second. (A radian is the angle subtended at the centre of a circle by an arc whose length is equal to the radius of the circle.) Since the circumference of a circle is $2\pi \times$ radius it should be clear that there are 2π radians in a circle. Let T be the periodic time of a simple harmonic motion and f the frequency

$$\text{then } f = \frac{1}{T} = \frac{\omega}{2\pi}$$

We must consider in what manner a force must act on a particle to cause it to perform a simple harmonic motion, Imagine a piece of elastic fixed at one end, the free end being gradually drawn away.



The farther the free end is drawn away, that is the farther the elastic is stretched, the greater the pull required to stretch it. Put in other words, a force is brought into play in stretching the elastic tending to restore the elastic to its normal position that is dependent on the distance the free end is displaced. If, therefore, we have a particle which is so situated that when displaced from its position of rest, a force is called into play which tends to restore that particle to its position of rest and which is proportional to the displacement, then the particle will execute a simple harmonic motion. If "m" is the mass of the particle and "r" the force of restitution

$$\text{then } T = 2\pi\sqrt{\frac{m}{r}} \text{ or } f = \frac{1}{2\pi}\sqrt{\frac{r}{m}}$$

Imagine now our piece of elastic stretched between two points A and B with a weight W at rest attached at the centre. (Fig. 3.) Suppose the weight W to be displaced to the right to a position such as C. The tension in the side AC is increased, tending to restore the weight to its original position. If it is then released, the weight will travel back

towards W, its position of equilibrium, but, owing to the fact that it now has velocity as well as weight, due to its momentum, it will travel beyond its position of rest to D when the tension in BD will tend to bring the weight to its position of rest once again. If there are no frictional or other forces present the weight will continue to vibrate, or oscillate, about its position of rest and will do so with simple harmonic motion. In order that any body may vibrate it must possess both elastic control and inertia.

When studying the characteristics of simple harmonic motion it is convenient to do so by means of graphs. (Fig. 4.)

Assume our point Q to be rotating counter-clockwise with uniform velocity round the circle of reference XY X^1Y^1. Suppose the circumference of the circle to be divided into equal sections, since the rotation is uniform each section will represent equal increments of time. Now draw a graph using time as abscissa and mark off a number of equal intervals corresponding to the number of sections on the circle. Using displacement of the point P as

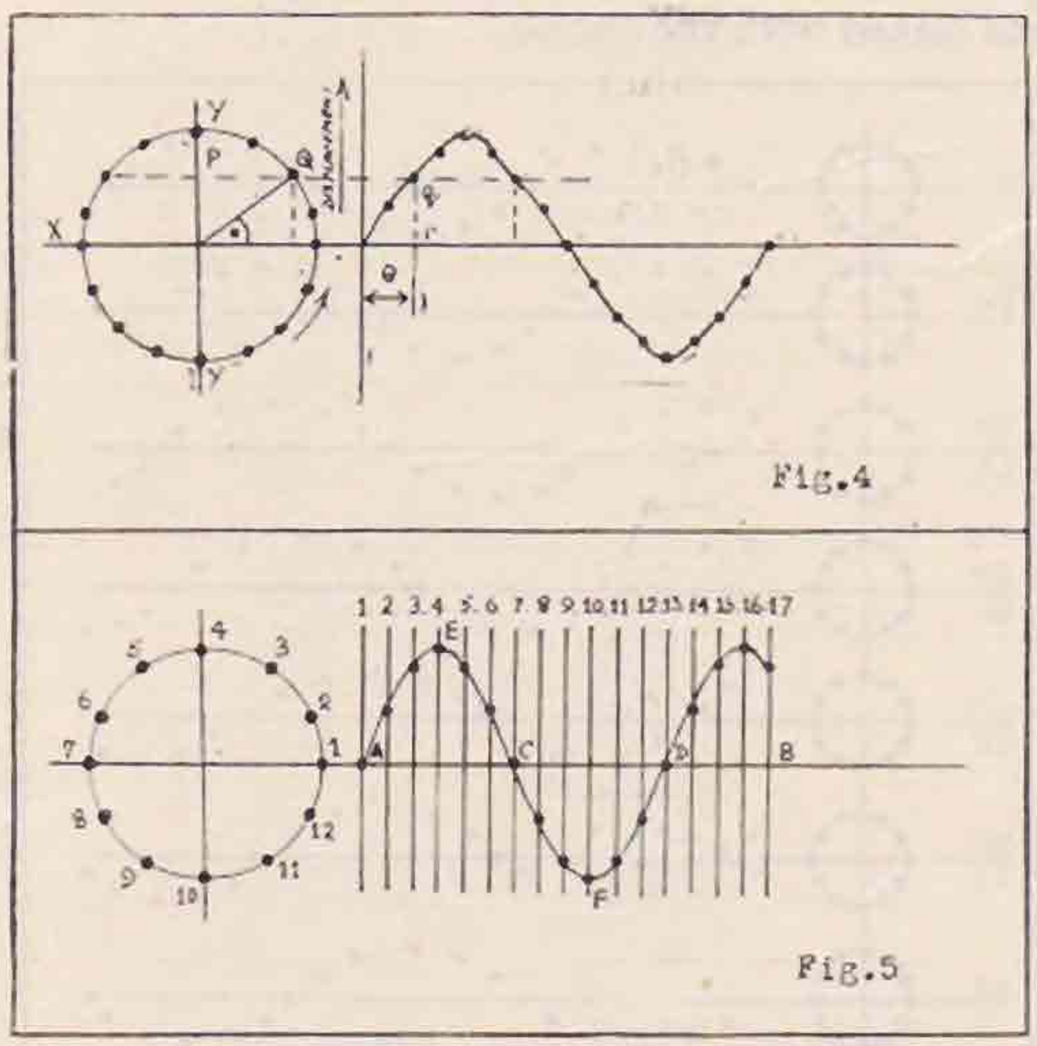


Fig.4

Fig.5

ordinates, at each of the time intervals on the graph mark off a distance equal to the displacement of P for the corresponding position of Q. For instance, the ordinate qr is equal to the displacement of P which is OP when Q has reached the second point of the circle. Now OY is the amplitude of P and OY = OQ. We will call the amplitude a. Also since PQ is parallel to OR, OP = QR and considering triangle QOR.

$$QR = OQ \sin \theta = a \sin \theta$$

Now the point Q has an angular velocity of ω and takes a time " t " to travel from X to Q.

$$\text{therefore } \theta = \omega \times t$$

and the displacement at any instant is

$$= a \sin \omega t$$

$$\text{and since } \omega = 2\pi \times \text{frequency} = 2\pi f$$

the displacement at any instance is

$$a \sin 2\pi ft.$$

The ordinates in our graph are then proportional to the sine of the phase angle of Q at any instant and the graph is known as a sine curve or harmonic curve.

Wave Motion.

Up to the present we have discussed the periodic motion of a particle or body, such as the weight in the centre of the stretched elastic, where the phase of every particle taking part in the motion is the same. Now let us consider the resultant motion when the various particles, comprising a body each execute a simple harmonic motion, the phases of the various motions not being the same for all but related to one another in definite ways.

Suppose we have a number of particles arranged when at rest along a line AB and that these particles all perform simple harmonic motions of equal amplitude and period along lines at right angles to AB. Let the phase of each successive particle, starting at A, differ from that of its predecessor by a constant amount and let us for the sake of simplicity make this phase difference 30°. When particle one is in its mid position, the position of the other particles will be shown in Fig. 5. Since a circle contains 360° and 30° is one-twelfth of this, the displacement of particle two at any moment is equal to the displacement of particle one at one-twelfth of the periodic time, similarly particle three will be displaced by an amount that particle one will be displaced after a time $\frac{2}{12}T$ and so on. A curve drawn through the position of the particles at any given instant will be an harmonic curve. Particle 13 at any moment will be in exactly the same state as particle one, particle 14 as particle two, etc.

Figure 6 shows the positions of particles at successive intervals of $\frac{T}{12}$ for half a complete vibration. It will immediately be apparent that the curve drawn through the particles in each case can be obtained by moving the curve for the preceding arrangement to the left and, hence, as the motion goes on the curve connecting the particles appears to move steadily towards the left.

The distance through which it moves during one complete period of one of the moving particles is termed the " wavelength " of the motion and is the same as the distance between two particles which are moving at every instant in the same direction and are equally displaced on the same side of their midpositions.

The distance AD in Fig. 5 is the wavelength and a point such as E is called a " crest " while a point such as F. the maximum negative displacement is called a " trough." It is important to observe that the translating motion of the wave is not accompanied by the translation of the particles themselves, each particle moves to and fro along its own little path, its mean position during a complete vibration is never altered. A wave is therefore a motion through a medium due to the parts of the medium performing in succession certain periodic motions about their mean positions and in the case referred to, where the particles vibrate at right angles to the direction of propagation of the wave motion, the wave is said to be a " transverse wave." Light waves and electromagnetic waves are transverse waves.

You have all at one time or another put up an aerial and have all experienced the annoyance of

having the halyard jam in the pulley at the top of the mast ; you have all effected the same cure, given the halyard a jerk and seen the freeing movement travel along the halyard to the masthead. But, did you all realise that what you did was simply to impress a simple harmonic motion on the free end of the halyard, so generating a wave that travelled along the halyard to the top ?

Now imagine the halyard to be infinitely long so that there will be no complications due to the fixed end, impress a simple harmonic motion on the free end at right angles to the length of the halyard, and continue this motion. Wave after wave, or what is called a wave train, travels along the halyard at a definite speed, but the particles forming the halyard do not move along the halyard but simply vibrate to and fro at right angles to the direction of propagation of the wave.

It is also possible for the particles performing the simple harmonic motion to do so in the same direction in which the wave moves. When this happens the wave is said to be longitudinal, sound waves being typical of such a movement. Fig. 7 shows what happens. At AB the undisplaced positions of the particles are shown. Let each particle execute a simple harmonic motion in the direction AB and, as before, let the period and amplitude be the same for all and the phase difference 30° or $\frac{T}{12}$. When particle one is passing through its midposition and travelling towards the right, CD represents the positions of the other particles and each successive line shows the positions for each successive $\frac{T}{12}$ of the period of the simple harmonic motion. In this form of wave motion the distance between adjacent particles alters. A point where at any instance the particles are crowded together is called a " condensation " while a point where the distance between particles is a maximum is called a " rarefaction." These points play the same part in longitudinal wave motion as do crests and troughs in a transverse motion.

Propagation.

Consider the mechanical conditions necessary for the execution of a simple harmonic motion, and for the propagation of a wave through any medium. If a particle or body moves in such a way that at all times the sum of its potential and kinetic energies is a constant, it will be moving with simple harmonic motion and to do this as we have seen it must have inertia and some form of elastic control. The potential energy of a body or particle is the energy it obtains by virtue of its position and kinetic energy that which it obtains by virtue of its motion. Referring to Fig. 3 at the position C the body is at rest and is acted upon by the tension in the elastic AC, its energy is wholly potential. At W, after being released, it is travelling with maximum velocity, the elastic pull on either side is equal and has a resultant of zero. Potential energy here is nil and the energy is wholly kinetic. At D where it is again momentarily at rest and acted on by the tension on the elastic BD the energy is wholly potential. At any other point in its travel the total energy of the particle is made up of a certain amount of potential and kinetic energy and it can be shown that this total energy is a constant.

For a wave to be transmitted through any medium it is necessary that :

(1) a small element of the medium when set in motion must possess kinetic energy or, in other words, the medium must possess density ; and

(2) the relative displacement of an element with respect to its surroundings must produce a reaction tending to restore the element to its original position, that is, the medium must possess elasticity.

So far oscillations and wave motion have been discussed in general terms. Now let us apply our general knowledge to the particular problems and conditions met with in radio.

Electro-Magnetic Waves.

When a current i is flowing steadily in a circuit of inductance L a certain amount of energy becomes latent which is set free when the circuit is broken. Among other effects this produces the well-known spark of self-induction when the circuit is broken. The energy stored up is given by the expression

$$\text{energy} = \tfrac{1}{2}Li^2 \text{ ergs}$$

and is analogous to the kinetic energy of a moving particle of mass M moving with a velocity V where the energy is given by

$$\text{energy} = \tfrac{1}{2}MV^2.$$

It is important to note that the energy is not stored up in the electric circuit itself but in the magnetic field linked with the circuit.

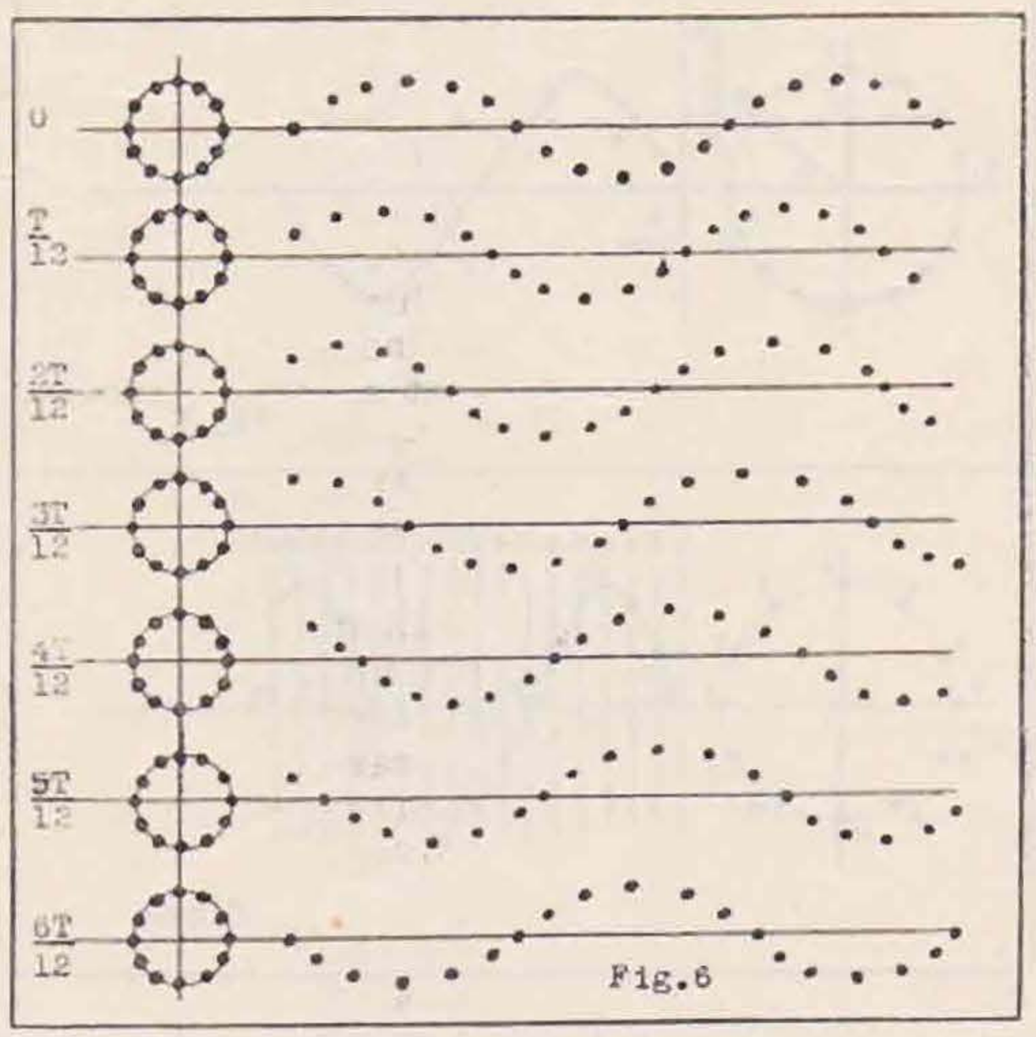


Fig.6

Consider the discharge of a condenser capacity K through a circuit inductance L but in which there is no resistance. Typical of such a circuit would be the coil-condenser arrangement of an absorption wave meter. Suppose the condenser to have a quantity of electricity Q in it at any instant. It can be shown that the fundamental equation governing the discharge is

$$\frac{d^2Q}{dt^2} + \frac{Q}{LK} = 0$$

This is the differential equation which is known to represent an undamped simple harmonic motion whose periodic time is given by

$$T = 2\pi\sqrt{LK}$$

Compare this with the equation given earlier on for a particle mass M moving with simple harmonic motion under a force of restitution R.

$$T = 2\pi\sqrt{\frac{M}{R}}$$

It is easy to give this oscillating discharge a physical interpretation. It is known that the charge on a condenser takes the form of an electrostatic field containing a certain amount of energy stored in the di-electric of the condenser. During discharge this electrostatic field disappears and a magnetic field is produced linked with the inductance. As we are assuming there is no resistance in the circuit, no energy is lost during the transfer and the whole of the energy in the condenser at the instant of discharge becomes stored up in the magnetic field. Then the magnetic field begins to disappear and in so doing sets up an electro motive force producing a current in the same direction as the discharge current which is dying away and thereby prolonged. The condenser begins to charge up again but in the opposite direction to its previous charge. The energy oscillates between the magnetic and electric fields much as the energy of the weight in Fig. 3 changes from potential to kinetic energy. Further, just as air friction will ultimately bring the vibrating weight to rest, so any resistance in the circuit will gradually cause the electric oscillations to die away. This effect is termed damping and damping alters the periodic time T of any simple harmonic motion. If the resistance in the electric circuit is R then instead of the equation $T = 2\pi\sqrt{LK}$ we have $T = \frac{2\pi}{\sqrt{\frac{1}{LK} - \frac{R^2}{4L^2}}}$

Just as a material system must possess both elasticity and inertia so that it may vibrate, so an electric circuit must possess both inductance and capacity before electric oscillations can occur. Elasticity and capacity or rather the reciprocal of capacity, inertia and self-induction represent analagous quantities and just as our mechanical vibrations follow a sine curve so our electric oscillations follow a sine curve and are governed by the same general laws covering simple harmonic motion.

It has been shown that the magnetic force produced by an electric current (and therefore electric lines) is very similar in form to the force of inertia produced by a body in motion and as the relationship existing between magnetic and electric lines is so similar to that existing between mass and elasticity in a material medium, electromagnetic waves become a possibility.

Electromagnetic waves can be considered as taking place in an all-pervading medium which we term the ether, having permittivity in some way akin to elasticity and permeability in some way akin to density. The laws covering the various phenomena connected with electric and magnetic effects are :—

(1) Electric lines in motion produce magnetic lines.

(2) Magnetic lines in motion produce electric lines.

We are perfectly familiar with these laws as applied to conducting circuits, they are, however perfectly general, for if there is a movement of electric lines in a di-electric, magnetic lines will be produced.

Relationship Between Types of Waves.

And now I regret I must leave you somewhat up in the air, for completely to reconcile electromagnetic waves with waves produced in a material medium involves the answer to the question : " What is Electricity ? " a problem on which scientists throughout the world are still engaged.

As a result of a large number of experiments, the details of which are beyond the scope of this paper, in connection with the relationship between electrostatic and electromagnetic units, it was found that the connecting factor was one of velocity and its numerical value found to be 3×10^3 centimetres per second. Within the limits of experimental error this velocity was found to be that of light in space, which led Clerk-Maxwell to suggest that light itself was an electromagnetic phenomenon. Fitzgerald appears to have first pointed out that the oscillatory discharge of a condenser must set up electromagnetic waves in the surrounding space. Then, using Maxwell's theory as a basis, he inferred that such radiations must be identical with light in all respects save wavelength. When Hertz produced his high-frequency oscillator and also a method of detecting these oscillations, much light was thrown on the subject.

Hertz's oscillator took the form shown in Fig. 8. Two large metal plates are fitted with long metal rods and the ends connected to a spark coil as shown. Capacity is provided by the plates and inductance by the rods. Such an arrangement, if the distance

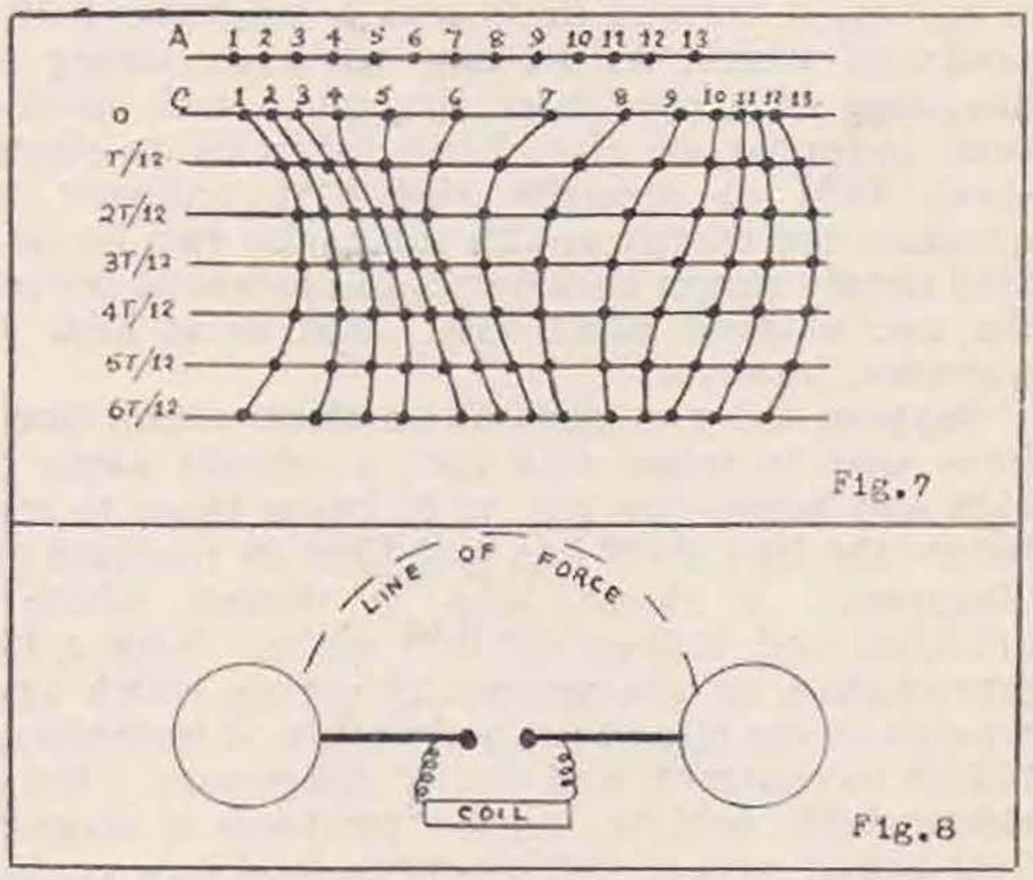


Fig.7

Fig.8

between the plates is small compared to the wavelength forms the simplest of aerials to investigate mathematically and is known as a dipole. The induction coil charges up the plates until a sufficiently high potential is reached to cause sparkover and the spark virtually amounts to suddenly connecting the rods with a low resistance path across which the discharge oscillates at a rate which is independent of the induction coil. It is interesting to consider a numerical example of such an oscillator. Suppose the plates to be 50 cms. in diameter and the rods 50 cms. long .5 cms. diameter.

The capacity of a circular disc in static units is given by $\frac{2R}{\pi}$ where R is the radius, hence each plate has a capacity $\frac{2 \times 25}{\pi} = 16$ static units, and as the two plates are in series the total capacity is $\frac{16}{2} = 8$ units. As the unit of capacity in magnetic units is V^2 times greater than the static unit, the capacity in magnetic units is $\frac{8}{(3 \times 10^{10})^2}$ where V = velocity of light $= 3 \times 10^{10}$ cms/sec.

The inductance L is given by $L = 2l\left\{ \log_e \frac{4l}{d} - 1 \right\}$ where l and d are the length and diameter of the rods. Substituting the values of l and d in our problem the inductance L will be found to be 1,140 units. Using the formula previously mentioned, the periodic time of the discharge

$$T = 2\pi \sqrt{LK}$$

and the frequency

$$f = \frac{1}{T} = \frac{1}{2\pi\sqrt{LK}}$$

and substituting our values of inductance and capacity the frequency f will be found to be 500 million cycles per second.

We can understand such discharges giving rise to wave motion if we remember that in the time taken to charge the plates an electrostatic field has been produced surrounding the plates and extending without limit. When the plates are fully charged these lines will extend in sweeping curves reaching from plate to plate and at the moment immediately preceding the discharge stationary in space. At discharge the ends of these lines move towards each other along the rods, that is to say, a current flows and a magentic field is produced which, as we saw when discussing the discharge of a condenser through a coil, must in turn disappear, its place being taken by an electrostatic field of opposite sign. At ordinary frequencies the energy contained in the two forms of field simply surges backwards and forwards between the two without much loss. Not so at high frequencies, however.

Suppose the two ends of an electrostatic line of force were to move with such a velocity along the rods and across the gap as to cause them to meet before the line itself has had time to contract and disappear. A closed loop is formed which is detached and thrown off into space. Such a loop represents a certain amount of energy which never returns to the circuit ; it is unstable, it immediately begins to contract, and finally disappears. But an electrostatic field in motion produces a magnetic field linked with it. A magnetic field now replaces the static field and is at its maximum at the instant the static loop vanishes. The magnetic field also has nothing to sustain it and must die away only to be replaced by a static field ; if no energy is dissipated the cycle of events continues indefinitely, the result being an electromagnetic wave. We know that even if oscillations occur in a path of no resistance they will not persist indefinitely if radiation occurs and the better the radiation the greater the damping. Circuits in which the plates of the condenser or its equivalent are widely separated so that the lines extend far into space are the best radiators, *e.g.*, the antenna of a transmitter, while those in which the plates are close together are poor radiators, *e.g.*, the tank circuit of a transmitter.

Light Waves.

It is now accepted that light waves are of the same nature as electromagnetic waves but of much higher frequency, that is shorter wavelength. We recently read of Marconi's achievement of two-way communication on a wavelength of 1.5 cms., the shortest wavelength ever used, but compare this with the wavelength of the longest visible light wave which is 1/14,000 of a centimetre !

When we were dealing with the conditions necessary to produce a wave through a material medium we stated that the medium required elasticity and density and that the wave was produced by a simple harmonic motion of the particles constituting the medium each about its midposition. We still have to explain this in connection with electromagnetic waves and to do this I wish to refer to Professor H. Paine's paper entitled " What is Electricity ? " read before the South African Institute of Electrical Engineers.

From the earliest experiments dealing with the elementary phenomena of electrostatics, such as the production of electrification by rubbing, electricity came to be regarded as some kind of a fluid without mass which adhered to some substances called insulators and flowed freely along others called conductors. The discovery of the electric current as something produced by a voltaic cell was a great advance in electrical science, but experiments with currents in wires throw little light on the nature of electricity except to give a general support to the fluid theory. Faraday's laws of electrolysis really tell us a great deal about the nature of electricity, and as a result of Faraday's work electricity should be pictured as something like fine sand rather than as something like water ; and sand, as we know, is a collection of distinct and separate grains. We also know electricity flows easily, like a fluid, but so does fine sand and the finer the sand the more easily it flows.

Cathode Rays.

Towards the end of the last century, from the experiments of Varley, Crookes, and others on the electric discharge in rarified gases and on cathode rays much evidence was accumulated which showed beyond all doubt that cathode rays were a stream of negatively charged particles shot off from the cathode of a vacuum tube with high velocity. Thompson showed that these cathode rays could be deflected by magnetic and electric fields as an electric current in a wire could be deflected. When it was found that the properties of cathode rays were independent of both the residual gas in the tube and the material of the electrodes certain conclusions were drawn :—

(1) Cathode rays are equivalent to a current of electricity.
(2) The particles constituting cathode rays appear to be the constituents of all matter.
(3) The particles themselves consist solely of charges of electricity without the addition of any ordinary uncharged matter.
(4) Electricity itself has the essential properties of matter, *i.e.*, mass and inertia.

These negatively charged particles are termed electrons and in these vacuum tube experiments electricity has been isolated from ordinary matter which usually serves as its carrier and found to consist of small discrete particles or corpuscles. The quantity of electricity which makes up a single electron has been measured and is given as 1.57×10^{-19} coulombs and the mass of an electron has been given as 8.96×10^{-28} grammes.

Later, through experiments with canal rays, the counterpart of the negative electron, called by Rutherford the proton, was detected, resulting in the modern idea that all matter can be resolved ultimately into positive and negative charges of

(*Continued on page* 348.)

AN INEXPENSIVE REISZ-TYPE MICROPHONE

By J. Timbrell, B.Sc., A.C.G.I. (G6OI).

THE microphone described in this article is the final experimental type developed after literally hundreds of tests extending over a period of two years. Nine important desiderata were borne in mind during the course of development work, though it was found that a compromise between them was often necessary. These factors are :

Material for block ; distance between electrodes, size of electrodes, and the material for them ; " window " space ; size of granules ; thickness of granule layer ; material for diaphragm, and finally, the polarising voltage required.

First, the marble block ; this can be rectangular in shape, but the conventional octagon has been chosen to save weight. Fig. 1 gives its dimensions. Owing to the difficulties of making the block, it is suggested that a monumental mason be asked to do the job, and undertake the necessary drilling, too. The face of the block must be flat, and polished.

As shown in the sketch, two parallel channels $\frac{5}{8}$ in. wide, 2 ins. long, and $\frac{5}{16}$ in. deep are cut in the face. They are 3 ins. apart (measured to their outside edges), and are intended to hold the electrodes. At the bottom of these channels half-way along them, holes (X) are drilled right through the marble block wide enough to take a 2 B.A. screwed brass rod. The holes are marked " S " in the sketch, and are $\frac{1}{2}$ in. deep and $\frac{5}{32}$ in. in diameter. They accommodate the screws by which the " window " is held in the block. At (G) is a tapering channel about $\frac{1}{4}$ in. deep at the top of the block. Granules are fed into the microphone through this channel.

The Electrodes.

Two pieces of copper are filed to fit closely into the first-mentioned channels so that their top faces are exactly flush with the face of the block. Tapped into the back of each is a length of 2 B.A. screwed rod, so arranged that when the copper is resting in the channel, the rod projects through the hole in the block. About $\frac{3}{4}$ in. of it should project from the other side (Fig. 2). The front faces of these pieces of copper, after being carefully polished, should be gold-plated. The copper strips are pressed into position, and any gap between them and the side of the channels should be filled with plastic wood. The surface of such filling material should be smoothed off flush with the face of the marble and the gold-plated copper.

Into the holes (S) are then driven No. 8 Rawlplugs which have been well covered with seccotine. The seccotine is allowed to harden, and the tops of the rawlplugs cut off absolutely flush with the marble, a very sharp knife being required for this purpose.

The spacing piece is now cut from $\frac{1}{16}$ in. ebonite or celluloid. The " window " is similarly cut from $\frac{1}{8}$ in. ebonite or metal (Fig. 3). A template for cutting and drilling can be made by taking a pencil rubbing of the block face.

It will be found that to expose all the electrodes to the granules, a " window " space of 2 ins. by 3 ins. is necessary, giving a diaphragm of 6 sq. ins. The screw-holes in the " window " should be countersunk, and the " window " edges chamfered. To the underside of the " window " the diaphragm is fixed with seccotine. Mica of a thickness of .001 in. has been found to be the best type of diaphragm. Failing this, thin rubber sheets (about a millimetre thick) or the thinnest " Kodatrace " are the best substitutes. Rubber when used should be subjected to a slight tension.

When the diaphragm is firmly fixed and dry the " window " and spacer should be screwed down firmly to the marble block, which should have been previously dried by warming. The best size screws will be found to be $\frac{5}{8}$ in. No. 4 steel, with countersunk heads. The edges of the spacer and the " window " may now be trimmed off to the exact outline of the block. Vertical sectional elevations across the microphone at its centre point (Fig. 4) and across one of the electrodes (Fig. 5) are illustrated.

The Granules.

The carbon granules may either be purchased ready prepared, or can be made from arc carbon. In any case, they should not be of uniform size, but should vary between $\frac{1}{50}$ in. and $\frac{1}{100}$ in. in diameter. They can be made as follows :

Grind a rod of arc carbon into a fairly coarse powder, and carefully screen this powder through a $\frac{1}{50}$ in. mesh sieve, rejecting all pieces that will not pass through. Screen them twice, ridding the granules of all fine dust. Dry the selected granules carefully in an oven with the door open, until all

traces of moisture are driven off. Allow the granules to cool, and immediately feed them through the sloping channel (G) into the microphone. Do not attempt to pack the granules, and do not attempt to fill the space completely to the top. When the microphone has taken all the granules it can conveniently hold, close the top of the filling groove with a small, tight-fitting piece of tapering cork.

Terminals can now be fitted to the 2 B.A. rod projecting at the rear. Those used on the earlier

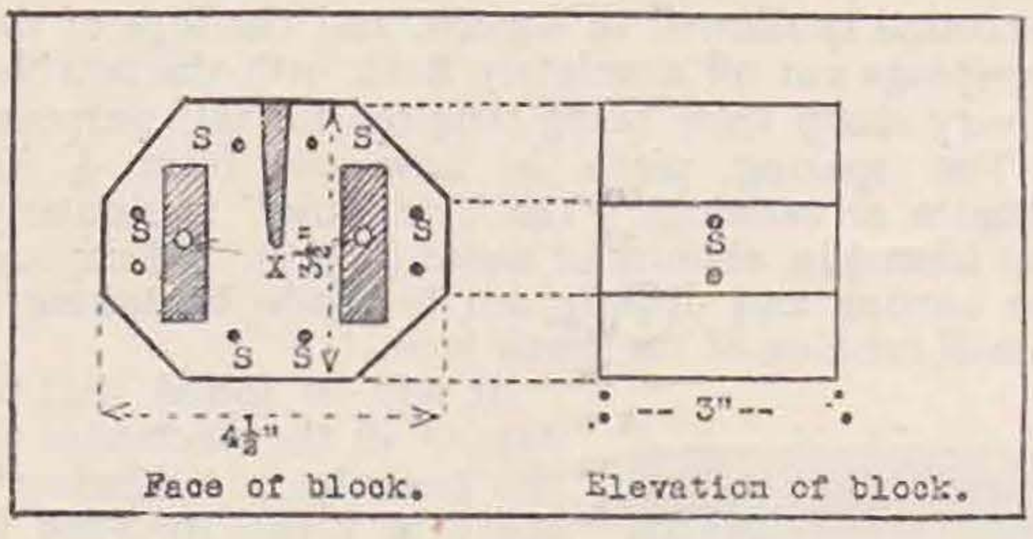


Fig. 1.
Dimensions of Block.

pattern of Exide accumulators are very useful for this purpose.

In the diagram, holes are shown for suspension screws or hooks. The method of suspension is a matter of individual choice. That shown in the photograph consists of a piece of iron strip 1 in. by $\frac{3}{16}$ in., bent into a circle, drilled and then enamelled. Four pieces of steel spring (from Woolworth's) hold the microphone to this frame, which is fixed to the base from an early Amplion speaker.

Such a microphone has been found to be sensitive —yet not inconveniently so—and constant in behaviour. A current of about 12 m.a. should be

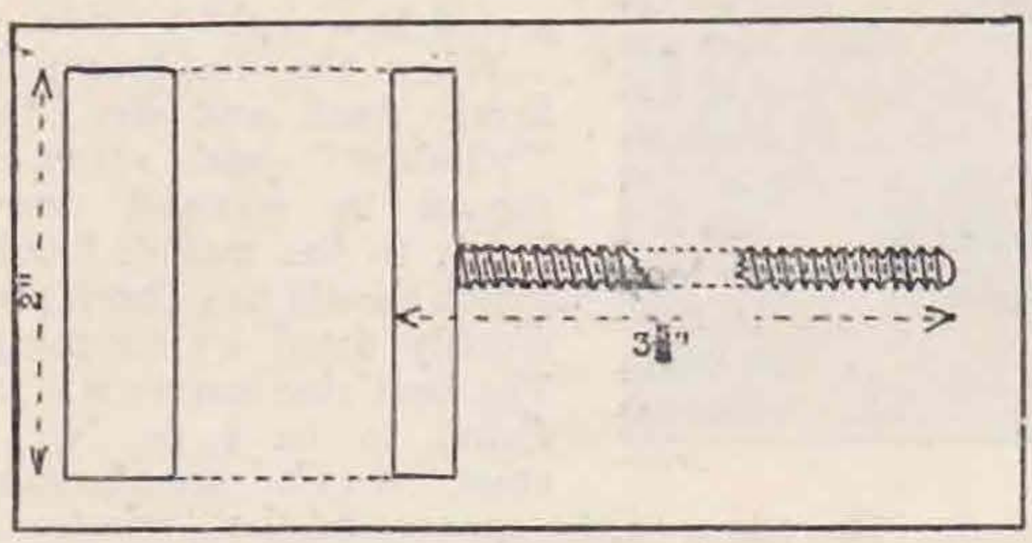


Fig. 2.
Dimensions of Electrodes.

allowed to pass, the applied voltage being from 10 to 20.

To cut the cost of construction, wood (preferably oak or teak) could be used instead of marble, but the grain should be filled with shellac, and the face rubbed smooth. Arc-carbon electrodes, a rubber diaphragm, and three-ply wood for the " window " will also make for economy.

Amplification.

Microphones of the pattern described require at least two stages of high gain, or three of normal gain as amplification before modulation can be attempted.

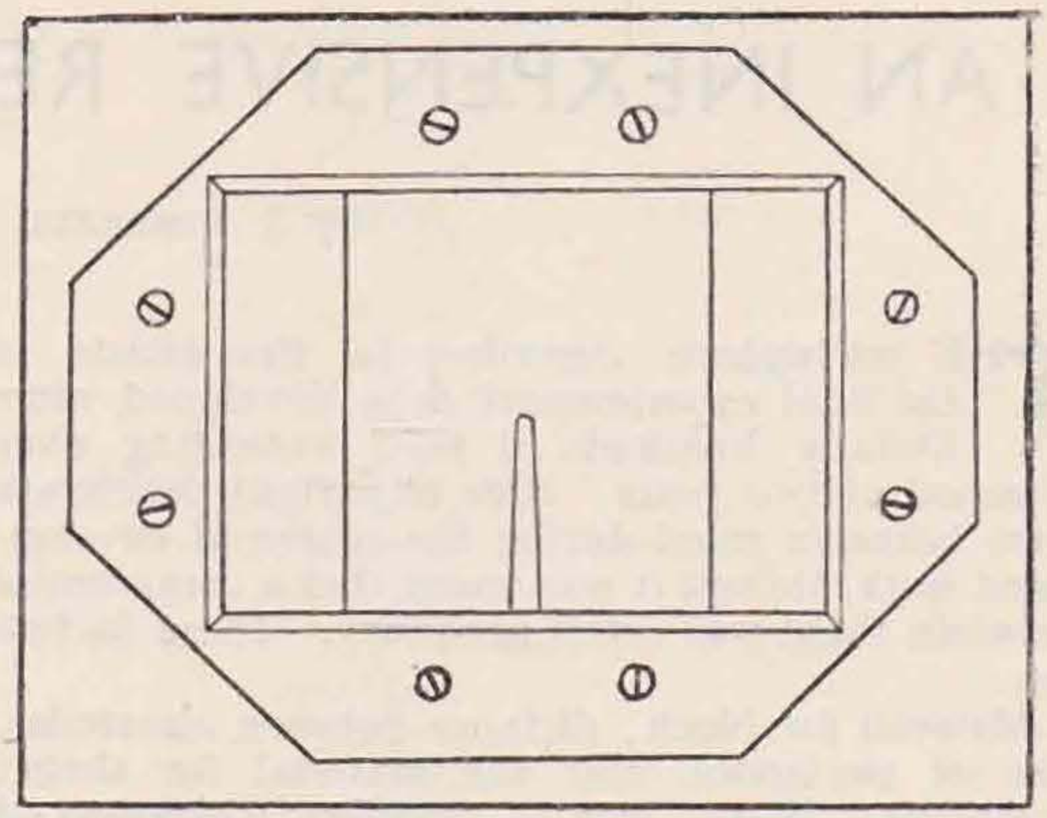


Fig. 3.
Constructional Details of Window.

A successful amplifier used employed an H.F. pentode in the first stage, followed by an output pentode.

The microphone transformer should have a step-up ratio of 30 to 1, or preferably 50 to 1. As the microphone has a comparatively high resistance (about 500 ohms), it will be necessary to arrange for the primary of the transformer to have a high inductance. As it is beyond the capabilities of most amateurs to wind fine wire in perfectly even layers, transformer stampings of a fairly generous size should be used. Assuming Sankey's No. 4 or No. 60 stampings are used and the core is made square in section, the turns that will be required on the primary for various possible D.C. resistances of the microphone are shown in the table below. The calculations have been made on the assumption that the core is made of stalloy, that the current through the primary is about 12-15 m.a., and that the impedance of the transformer matches the microphone at a frequency of 200. As this may allow too generous an amplification of the lower frequencies, it is wise to tap the primary so that fewer turns may be used if necessary.

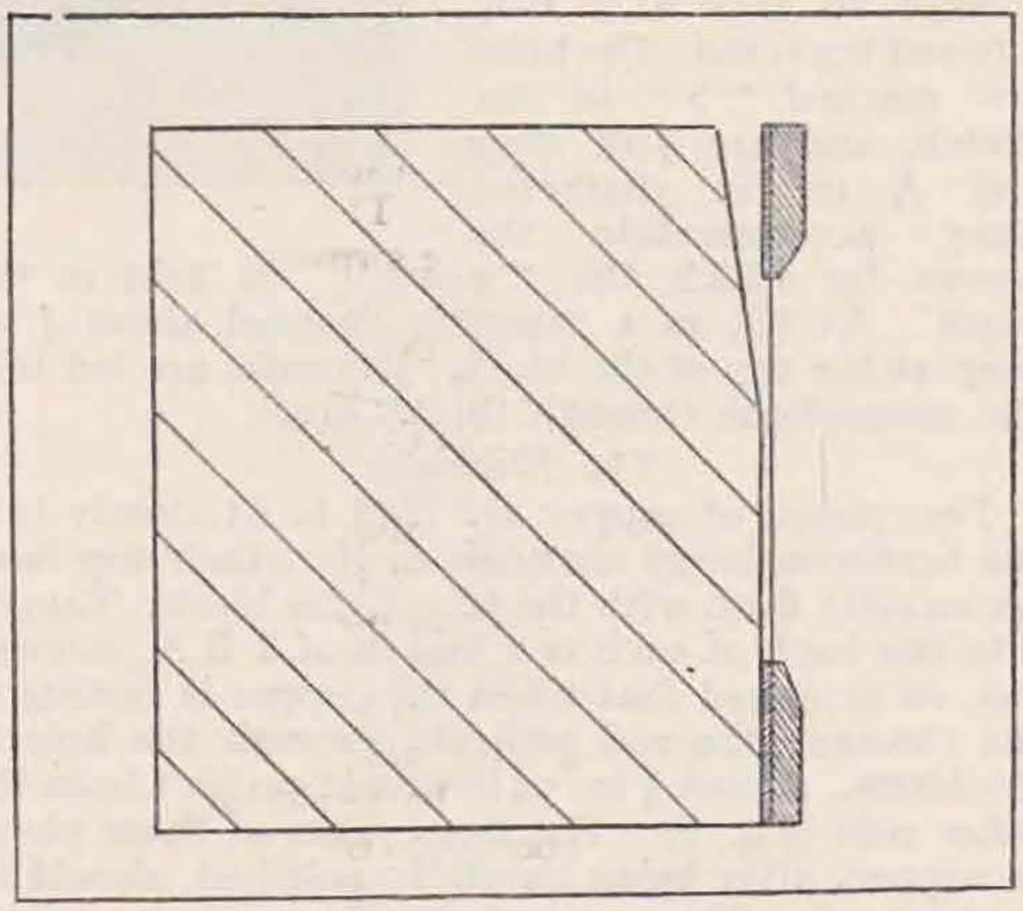


Fig. 4.
Vertical sectional elevation across the Microphone at its centre point

D.C. Resistance of Microphone (Ohms).	Turns on Primary.
300	425
400	490
500	550
600	600
700	650
800	700

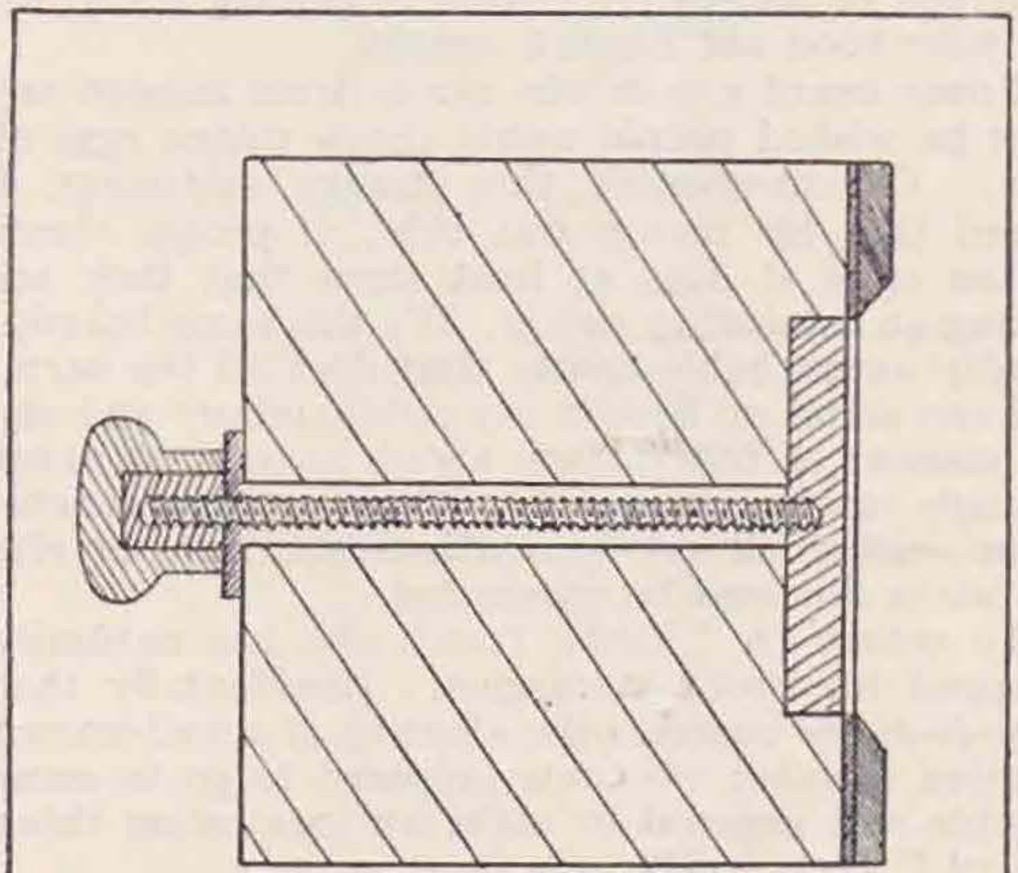


Fig. 5.
Vertical sectional elevation across one of the Electrodes.

The secondary should be wound with fine wire. For the No. 60 stampings use No.45 s.w.g. enamelled and for the No. 4 stampings use No. 42 s.w.g. It is then possible to accommodate the turns for a 50 : 1 step-up quite easily. A very efficient transformer has been constructed, using the stampings and bobbin taken from an old small mains transformer. These may be purchased for a few pence.

The trouble taken in carefully matching the microphone to transformer will be well repaid in the results obtained.

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fuses in each of the supply leads are a desirable precaution against accident. The choke and key thump filter are fitted on the switchboard, so that the leads going up to the valve-holder sockets have the power ready for use. The self-excited transmitter is keyed in the H.T.+ and the CO PA type in the PA, or when the CO FD PA is used in the FD.

Voltage drop is the most serious difficulty when dry batteries are used as power supply, and this can only be overcome by the use of a high value grid leak as mentioned earlier. For the amateur with no mains supply available, the bugbear of power looms large, but this need cause no undue worry, for even with dry batteries and a small 2 volt power valve, a good deal of interesting work can be achieved, and perhaps, after all, low power is the best for experimental work, as then there is no question of brute force !

THE CASE FOR LOW POWER

By R. Parsons, G6RP.

A YEAR'S apprenticeship with a BRS number was sufficient to convince the writer of the interest in amateur radio. On obtaining a full licence economy in space was the main consideration, and this was brought about by the construction of a special table 3 ft. long with a top at the ordinary operating level, and a small shelf over it to take clock, coils, wavemeter, etc., and three shelves below.

The top shelf houses a self-excited transmitter for c.w. and local telephony work on 3.5, 7 and 14 mc. The second accommodates a CO PA for use on 7 mc. and the bottom the batteries for the transmitters. The top shelf also supports the key and switchboard ; as no mains are available all power is taken from 2 volt accumulators and dry batteries of varying vintage.

Wide search has been made for good 2 volt low power valves, but with little success, as ordinary super-power valves have an extravagant current consumption, whilst the LF types will not dissipate sufficient power. The PM2 and P215 types seem to be the most satisfactory ; these have an impedance of between 5,000 and 10,000 ohms, and when using 200-300 volts on the plate, inputs up to 8 watts can be obtained, although the usual power at G6RP does not exceed 5 watts.

The crystal outfit is quite reliable for 7 mc. work and uses an old H.F. valve as CO and a new high Mu power valve as PA. As a result of experiments with dry batteries the only satisfactory cure for a chirpy note seems to lie in the use of as high a value of grid leak as possible. The inclusion of an aerial ammeter is definitely unsatisfactory when low power is used, signal strength invariably being reported poorer when in use.

The accurate tuning of circuits is essential, and this can only be achieved by means of a milliammeter inserted in the H.T. negative lead. Tuning with a bulb and loop is difficult with low power, but this method can be made more reliable if a 60 ma. fuse bulb is used instead of the ordinary flash lamp type. Neons can very rarely be made to strike. Tuning is usually affected in a rough fashion with the loop and bulb, and finally finished off by means of the milliammeter, but the various indications in tuning must be known in order to obtain maximum efficiency.

Each transmitter is fitted with leads ending in an old valve base, a standard arrangement preventing the risk of short circuits. The power supply is brought up to a valve holder fitted on a piece of ebonite and mounted on the top shelf, and by this method it is possible to change from one transmitter to another, with the minimum amount of trouble and apparatus. Each valve socket provides LT+ LT—, HT+1, HT+2, and HT—with LT—. If an extra lead is required it si a simple matter to mount another valve base ro single socket and plug.

The switchboard is arranged to give two values of H.T. for the P.A., one being used for tuning and preliminary work, and the other for normal transmissions. A single pole double throw switch facilitates the above operation, whilst switches and

(*Continued in previous column.*)

"SOLILOQUIES FROM THE SHACK."

By Uncle Tom.

(Switching off his receiver violently with his left foot, the bad-tempered old man rushes with a wild scream to his typewriter.)

WRITING for an august journal like the T. & R. Bulletin is not all honey, children. No, not by a long way. For one thing, one has to keep the party clean. There are so many things that I *could* say, now, in a way that would knock them into certain people's ivory skulls, that I have to say in a more polite and less effective manner. 'S a pity—but luckily, hams are notoriously pure-minded people, and possibly they will take the hints after all.

Next to this vexed subject of receivers, I think the pet bee in my headgear is concerned with the operation of transmitters. The one thing that is good about the average ham is his transmitter; but does he know how to handle it? NO! Does he know anything about receivers? NO!! (Witness the fact that hams in this country are *buying commercial receivers* for use in their stations.) That seems almost like an Æsop's fable, but it's perfectly true.

But to come back to operation. We seem to have had a bad outbreak of vibrophobia again. Why all these nasty, jerky little test (or "teht") calls, instead of something nice and solid? Everyone that possesses a bug seems to have a craze for making the dots too short and too fast. Listen to one of the Yanks who sends like that, and compare him with one who doesn't, and you will possibly see that you aren't improving your chance of being copied at a distance by all these finnicky little blibs and blahs.

Just before sitting down to write this, I was working a man who *does* know how to operate. (He will probably recognise himself if he reads this.) He doesn't send fast, as a rule, but he gets through more real "chat" in half an hour than most of the people who do. Also, to my knowledge, he owns a bug, but very seldom uses it.

If *you*, dear reader, have a bug key, and feel that you can't handle it like the professionals do, then, for the love of Mike, don't let the darn thing loose until you've had some practice with it.

Do you remember my suggestion, last month, that we should dispense with QSO's and send each other cards instead? Well, a friend of mine has gone one better. He says "Leave out the call-signs from the cards. Then there won't be any name or address necessary either, and you can just send blank cards, particulars to be filled in at the other end. Narrow that down a bit, and you needn't even send them—the other man can buy them at the local stationer's."

There's amateur radio brought down to its simplest terms—go and buy some postcards, paint pretty call-signs on them, and stick them upon the wall.

I have had a bitter complaint from my fellow-scribe, by name "Little Tom." For two months he has run a little section called "Technical Topics," in which he set interesting problems to be solved by readers of the Bull. He even offered a prize for the reader who sent in the best solutions to the first twelve of them.

As the first two didn't bring in one single solution or acknowledgment of any kind, he has very properly let out a bad, bad word and pinched the prize himself. I hope you're all happy to think that you've missed the chance of getting a T.61 D. by your good old English apathy.

I once heard a man who ran a street mission say that he wished people would throw rotten eggs at him. On questioning this strange sentiment, I found that his reason was this: If people throw rotten eggs, it does at least show that they are taking an interest in things. It's this same beastly, deadly untouchable *apathy* that does all the harm.

I can stand up here in my public pillory and say all manner of rude things about hams, and never a single rotten egg arrives. There are two conclusions—either all my accusations are true, or else no one is the least bit interested.

To return to "Little Tom"—he has naturally dropped his series in disgust. (Incidentally that *nom-de-plume* conceals the identity of a well-known London member who was prepared to go to some trouble and expense to make an interesting thing out of "Technical Topics.")

Don't write in now and say you want them to go on. It's too late—finished.

Now let's talk of more pleasant things. For instance, "Have you ever heard a ham talking? Well, I have. Have you ever heard his sigs squawking? Well, I have. Have you ever had a Yank greet you, with "Ur sigs R9?" It's so divine, but right off the line. Have you ever heard an F spitching? Well, I have. Have you ever felt your fist itching? Well, I have. And when I get a hefty hammer right in my hand, and the blighter says Appelle-Appelle—well the ham that was talking and the F that was spitching and the Yank that says "R9" will GO TO—

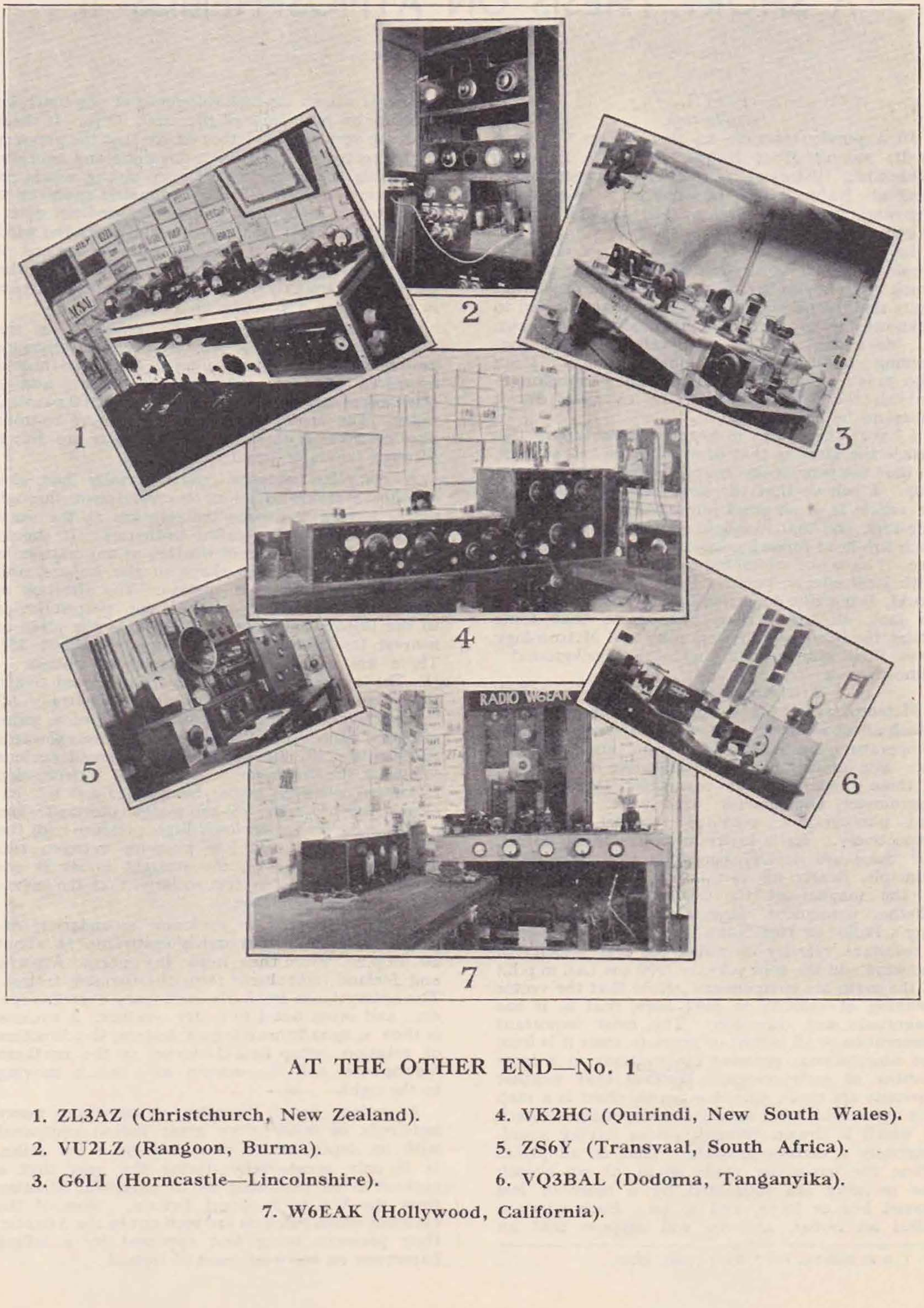
And have you ever heard of the ham up in Sydenham, whose sigs were not there 'cos he'd hidden 'em. When asked why he tarried, he said, "Well, I'm married," and, of course, that's all there was to it.

Incidentally, can anyone provide a good rhyme for "Blackheath"?

The only one I know about Birmingham concerns a young lady who on the piano used to Stirmingham until a neighbour took up the Dirmingham.

And should you ask "Why this unwonted levity?" I can only reply that I'm so jolly well fed up with trying to educate hams by talking seriously to them that I've given it up as a bad job.

SEND A "GUIDE"
WHEN YOU Q.S.L.
A DX STATION.



AT THE OTHER END—No. 1

1. ZL3AZ (Christchurch, New Zealand).
2. VU2LZ (Rangoon, Burma).
3. G6LI (Horncastle—Lincolnshire).
4. VK2HC (Quirindi, New South Wales).
5. ZS6Y (Transvaal, South Africa).
6. VQ3BAL (Dodoma, Tanganyika).
7. W6EAK (Hollywood, California).

"A SHORT THESIS ON ATMOSPHERICS—II."

By Maurice Gibson.

Part I.

Introduction.

In a previous article on this subject * I have dealt, among other things, with the following subheads: Historical; Directional Investigation; General Nature of Atmospherics; Wave-form Investigation; Elimination, and possible causes of atmospherics.

In this present article I intend to examine the whole subject from a rather different angle without much reference to my previous work, in order that there shall be no bias of any kind. I am pleased to acknowledge my grateful indebtedness to Lieut. R. Macmillan, R.N.R., for valuable data concerning conditions in the North Atlantic; I am also much indebted to him for his permission to publish the same, and for the carefully drawn diagrams he has sent me.

I have taken pains to keep the structure of this article the same as that of my first on this subject, so that the present one may be read as a continuation. I believe that the structure and balance of an article is of as great importance as its literary qualities, and that it should serve as its own index, each sub-head following logically from the previous one. I have not attempted to deal in any way fully with local effects, because these vary all over the world, being due to a number of different causes. In fact, all the various phenomena that come under the headings Physiography and Meteorology have their influence on the local "background" atmospherics.

A Few Notes on Meteorology.

Meteorology is the study of all the influences which affect weather, such as atmospheric pressure, temperature, humidity, wind, rain, and sunshine, etc. For quantitative and qualitative observations of these phenomena, the barometer, thermometer, hygrometer, anemometer, wind vane, rain gauge, and photographic sunshine recorder are used respectively. Each instrument has many forms, but these are usually based on much the same principle, nearly all can be made self-recording, in the manner of the barograph. All winds, whether permanent, seasonal or variable, follow Buy's Ballot or Humbolt's law, that is, they have a resultant velocity of which the real velocity of the wind and the spin velocity (900 cos Lat. m.p.h.) of the earth are components. Note that the vector meaning of velocity is used here, that is, it has magnitude and direction. The most important observation of all is that of pressure, since it is from the simultaneous pressure observations at a large number of meteorological stations that weather forecasts are made up. A synoptic chart is a map of a region which has upon it a series of curves, each of which is drawn through places having simultaneously a certain pressure. That is, all places where the barometer reads 30 in. at six o'clock one morning are connected by a more or less curved line or locus, and so on. Each curve is called an isobar, and we will suppose that an isobar is drawn for each difference of one-tenth in. pressure on both sides of the mean 30 in. If these lines are very close together we see that the pressure varies very quickly between one place and another, indicating the formation of very strong winds, in this case we say that the barometric gradient is very steep. Hence the barometric gradient determines the velocity of the wind, and since the wind flows from regions of high pressure to regions of low pressure, we can determine the direction of the wind by examination of the direction of decrease in pressure on a synoptic chart.

We may define barometric gradient as the difference of barometric pressure per given distance between two adjacent isobars. The distance is measured at right angles to the isobars, and is often expressed in millibars per degree of 60 nautical miles. The analogy between isobars and contour lines on maps is obvious since the latter are drawn through points of equal elevation.

A complete synoptic chart usually has also another separate series of curves drawn through places having the same temperature at the same time, these lines are called isotherms. It should be noted that the kind of weather at any particular time is related to the shape of the isobars, and that they are always in motion. The direction of the wind is neither parallel nor perpendicular to the isobar, but is inclined towards the place of nearest low pressure at an angle of about 35°. There are several standard types of isobars:—(1) The cyclone, or low, consists of closed ovals, the pressure being less towards the centre; (2) the anticyclone, or high, consists also of a series of closed curves, but the pressure increases towards the centre; (3) the secondary is a small cyclone following the larger one; (4) the "V" depression is formed when an isobar bends into a "V," enclosing low pressure; (5) the wedge is formed when a V-shaped isobar encloses high pressure; (6) the Col is the region of low pressure between two anticyclones; and (7) the straight isobar is one which belongs to a system so large that the curvature is not appreciable.

In this climate the cyclones, secondaries, depressions, and wedges move eastwards at about 20 m.p.h., especially from the north Atlantic and Iceland, and these form the variable factors. The anticyclones are fairly stationary over Europe, etc., and often bring fine, dry weather. A cyclone is then a spirally moving air system, the direction of rotation being anti-clockwise in the northern hemisphere, and the system as a whole moving to the right.

A cyclone has a diameter of sometimes many hundreds of miles, very great indeed compared with its depth, which may only be a few miles. It is only occasionally during the year that a cyclone is so persistent as to cross the Atlantic, from the U.S.A. to Great Britain. Most of the cyclones which reach us are born out in the Atlantic, their presence being first apparent by a falling barometer on the west coast of Ireland.

* T. & R. Bulletin, Vol. 7, No. 11 (May, 1932).

Weather forecasting is always much more difficult on an island than on a continent, and it is easy to see why in the particular case of the British Isles it must always be a very uncertain business, owing to the fact that the climate is varyingly influenced by systems formed over a vast ocean, and by the reflex action of these on the continental systems.

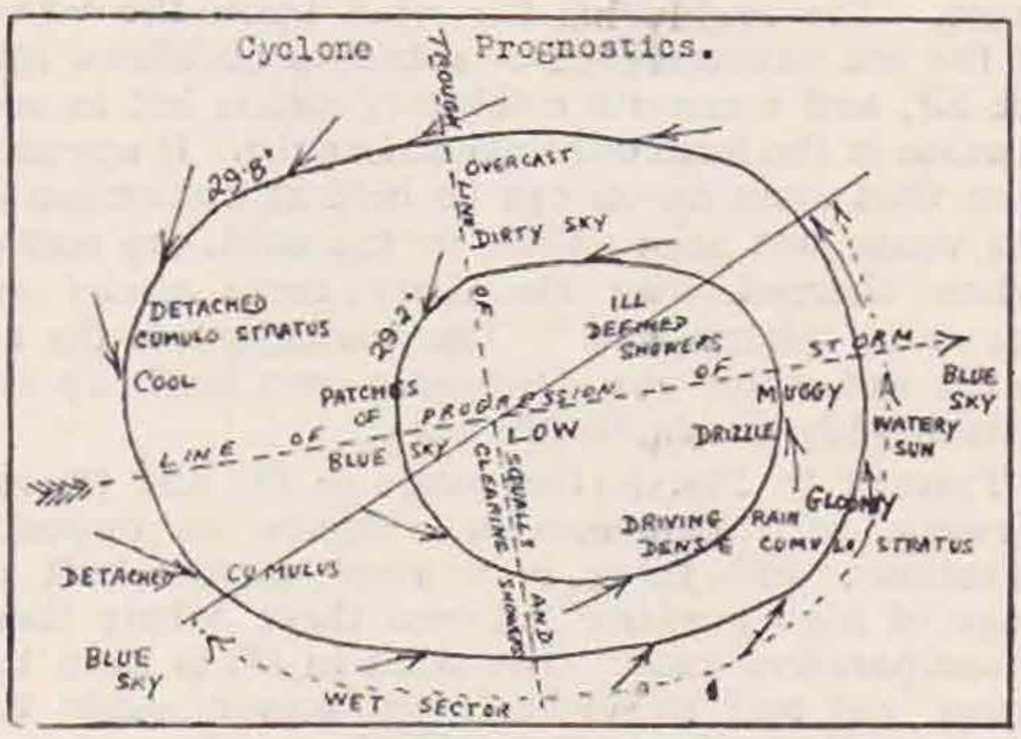


Fig. 1.

Cyclones and Anticyclones in the North Atlantic.

Fig. 1 shows a typical cyclone prognostic, the wind directions (anticlockwise, inwards) being shown by the arrows along the isobars. The usual two forces come into play here, the velocity towards the centre and the spin velocity eastwards. The cyclone may travel as much as 300 miles eastwards during the day. The wet sector is the term given to the area of greatest humidity.

Apart from the weather descriptions at various points on the isobars, some cloud descriptions are given which, perhaps, require some definition. The cirrus is a light fleecy cloud at high elevation, stratus is formed by layers of low, dense, horizontal cloud, nimbus is a rain-cloud, and cumulus is a dense convex heap with flattened base. Cumulo-stratus, etc., are of course, mixed types. The clearing shower is a short, heavy fall of rain which often occurs just after the trough of the cyclone passes.

Fig. 2 shows a typical anticyclone prognostic; the wind directions are shown by arrows as before, and some indication is given of cloud and weather conditions. Note that the average weather is much better than in the cyclone, especially in summer. Owing to the heavier atmosphere in the anticyclone, its bodily movement over the surface of the earth is much slower than that of a cyclone. The centre of an anticyclone may cover a very large area with comparatively constant pressure, and usually has a very shallow gradient round its edges causing light winds. Anticyclones when standing in the path of the faster-moving cyclones tend to deflect them. As a rule the cyclones are forced to slide around the anticyclones, but this deflection depends upon the respective sizes and intensities of the two systems.

Fig. 3 is reproduced from a chart of the North Atlantic and shows a typical chain of cyclones and anticyclones. The different systems are numbered as follows:—(1) A small low over the Gulf of St. Lawrence; (2) a large high over the Western Atlantic; (3) a depression of moderate intensity; (4) a low with a long trough extending south; (5) a moderate high over south-west Ireland; (6) a small depression over eastern England; and (7) a very large high, stationary over northern Europe. The manner in which cyclone (1) at the American end of the chain influences conditions over Europe is reminiscent of a compression wave, or (1) may be described as the "engine" and (7) as the "buffer."

The sequence of events is as follows:—(1) moving east bumps into (2), which being heavier than (1) resists, but is eventually pushed eastwards; (2) then bumps into (3) which in turn compresses (4), helping to form the trough; (4) then compresses the heavier (5) which resists for a time and eventually gives way and finally nips (6) against the "buffer." Where each system bumps the other the isobars are moved closer together, increasing the barometric gradient and consequently the wind velocity at these points.

Turning again to (1) we see that the wind circulates about this system in an anticlockwise direction, while at (2) it moves in a clockwise direction. At the point of contact both winds are moving in the same direction and consequently there is very little wind against wind friction. Wind-earth friction may be considerable on account of the increased velocity of the wind due to the isobars being moved closer together.

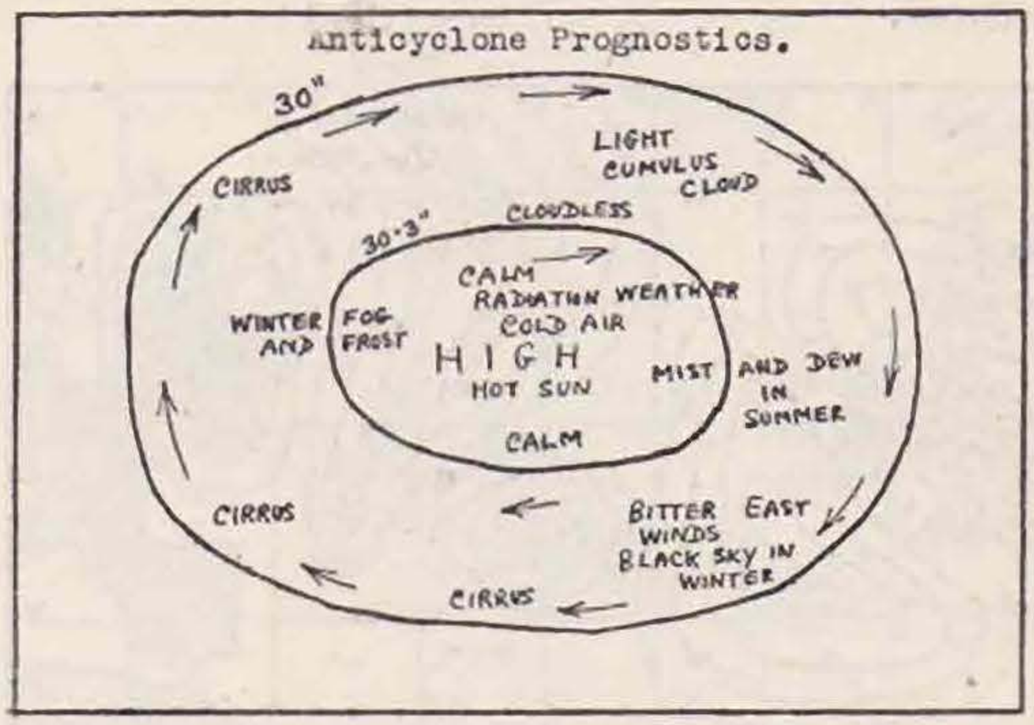


Fig. 2.

It appears that static discharges can sometimes be heard at this point, but they are not very acute. At the point of contact of (2) and (3) the case is similar, except that the winds both move in the reverse direction. In the case of (3) and (4) the conditions are somewhat different. The winds in both cases are moving in an anti-clockwise direction, so that at the point of contact the winds are moving in opposite directions. The isobars are pushed closer together, and there is a narrow ridge of high pressure separating the two systems. There is considerable wind-wind friction, owing to the increased barometric gradient. Lieut. Macmillan reports that he has always noticed that static discharges are most pronounced at this point. He also points out that an observer in the trough of (4) would find the signals of the B.B.C. stations very weak, owing to the steepness of the barometric gradient, and that an observer in the middle of (2) would find the signal strength of the U.S. stations good because the barometric gradient

is very gradual. I think the reason is increased dispersion and attenuation in (4) due to the greater electrical instability of the atmosphere caused by the steeper barometric gradient.

Part 2.

Nucleation.

It is recognised that the essential condition for aqueous vapour to separate out in the form of rain-drops is the presence of an ultra microscopic dust particle, which acts as a condensation nucleus. It is evident that the probability of rain in the near future depends not only on the hygrometric state or humidity of the atmosphere, but also on the nucleation, that is, the number of dust particles per cubic centimetre. It was of great importance to devise some method by which the nucleation could be determined. One of the first devices, called a dust counter, is due to Aitken, in which by means of repeated expansions, aqueous vapour is allowed to condense on the particles present in a measured volume of the given air. The particles are rendered visible by the drops of moisture so formed, and these fall on slabs of polished black glass having fine squares ruled on them where they may be counted. The method, although slow, is very much more accurate than might be supposed owing to the fact that the number of drops which separate out at each expansion can be more or less controlled, and so accuracy in the counting is assured.

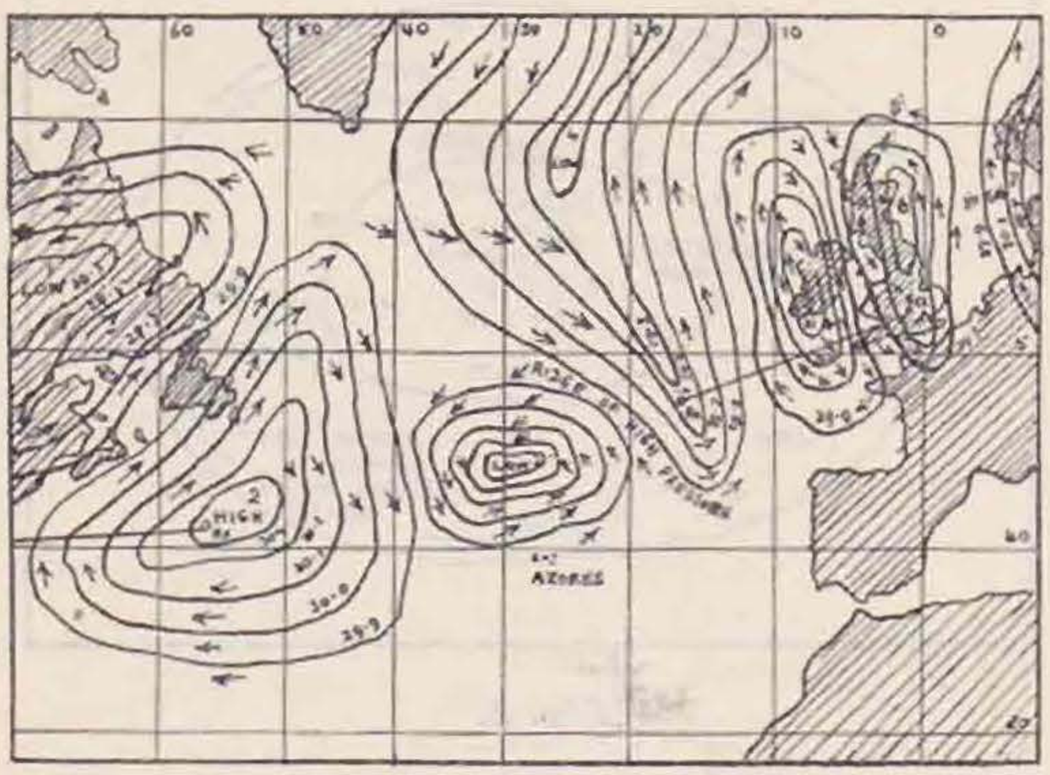


Fig. 3.

On mountain tops the nucleation may be only a few hundreds per c.c., while in cities it is many thousands per c.c. The smallest degree of nucleation is said to obtain in parts of the Highlands of Scotland, where 16 per c.c. has been recorded. The atmospheric dust which causes rain and mist in open country is largely volcanic and stellar in origin, and is also formed by the disintegration of sand particles in desert regions, due to repeated expansion and contraction. Near towns, however, there is a good deal of smoke and soot present, and the rain is consequently not as clean as in the country, the presence of soot also causes the formation of dense dirty fogs in the place of the white mists of open country.

Some important observations were made by the members of the International Ice Patrol during their research work on the Great Banks of Newfoundland recently. They took samples of the atmosphere during varying meteorological conditions, and measured the degree of nucleation by the Barus Corona method. They found that the nucleation of the atmosphere under normal conditions was from 500 to 3,000 per c.c., but in the wet sector of a depression the nucleation rose to as much as 50,000 per c.c. It was suggested that this increase in nucleation is due to the following cause. The impact of the wind upon the waves of the sea causes drops of spray to be blown into the air, and a minute residue of salt is left in suspension in the form of solutional nuclei. It appears, then that more nuclei can be held in suspension in the warm wet sector than in the cold, dry sector. When charged with electricity these nuclei are known as " large ions." The nucleation of the air in the wet sector of a depression over land can rise considerably above 50,000 per c.c.

Turning to Fig. 3, the winds in (3) and (4) are blowing with considerable velocity in opposite directions, and there is a very narrow belt or ridge of high pressure between them, where there is comparative calm. The wind in (3) is from the warm, wet and much-nucleated sector, while the wind in (4) is from the cold, dry and much less nucleated sector. Lieut. Macmillan suggests that the warm wind with its nuclei is charged by friction, and that electrical discharge takes place at the point of contact owing to the cold, dry air being at a lower potential, since there are fewer nuclei to be charged.

Background and Drift Atmospherics.

Atmospherics may be conveniently divided into " background " and " drift " atmospherics. The first may be subdivided into (1) those due to meteorological effects, including those due to the cyclone and anticyclone systems described above, these are, of course, to a large extent variable ; (2) those that form the " mush " in various localities : these are fairly constant, but are prone to some seasonal variation ; and (3) those due to purely local conditions, such as configuration of land, etc. Drift atmospherics are nearly always of much greater intensity, and are in some respects less variable : these seem to be largely caused by extra terrestrial influences such as the sun, cosmic rays, etc. The drift, since the greater part of the effects follow the sun, is very much in evidence in comparison with background atmospherics, which seem almost static. The relative intensity of the background and drift types is of great interest, but cannot, of course, be estimated with any degree of accuracy without careful measurement of their respective field strengths. As a rough guess, I should say that in southern Morocco the relative strengths are of the order of 1 to 10,000, sometimes, perhaps, of the order of 1 to 100,000. I have sometimes noticed that the background dies away almost completely except for a slight mush, and the drift type comes in surges of violent prolonged discharges. I believe that the atmospherics met with in this country in summer are largely of the background type, owing to the greater nucleation and greater instability in pressure conditions.

I do not think we get much of the drift type in this country, at any rate not to interfere materially with communication, although communication to, or through, the drift belt would, of course, be

affected. I think the difference in conditions may be stated thus: In England, we have in summer small intensity background atmospherics very intermittent, and in Morocco full strength background atmospherics, fairly constant, with the drift atmospherics, say, 50,000 times as intense superimposed.

The Synthesis of a Non-Directional Electro-Magnetic Wave.

In my endeavour to examine the whole question from a different angle, and above all not to be influenced by previous theories, I have now reached rather deep water. I can, in the circumstances, only make a few suggestions, and it is up to those who possess the requisite mathematical and physical knowledge to determine whether my suggestions are possible or impossible, that is if they should so desire. Now there is, no doubt, that the most troublesome and intense of all the atmospheric disturbances is caused by a non-directional damped electro-magnetic wave on a wavelength of about 20,000 metres. Such an electro-magnetic wave, when separated from its harmonics, would consist of two components—one magnetic and one electrical. My suggestion is that the electrical component is formed by the condenser action of the earth and the ionized conducting shell called the Heaviside layer. I contend that the Heaviside layer, which we may take as representing the insulated plate of a condenser, is charged by extra terrestrial sources, and acts after the manner of a condenser with high resistance leaks, in other words, it breaks down in a sort of brush discharge. The constant changing of the degree of ionization with the shelved effect of the Heaviside layer, would, I think, account for the variations in intensity and duration observed. I think the many leakage paths could be explained by the ionization and nucleation of the atmosphere itself. I conceive the magnetic component to be formed in some way by the horizontal component of the earth's magnetic field.

I cannot put forward any hypothesis that definitely links my suggested electrostatic field

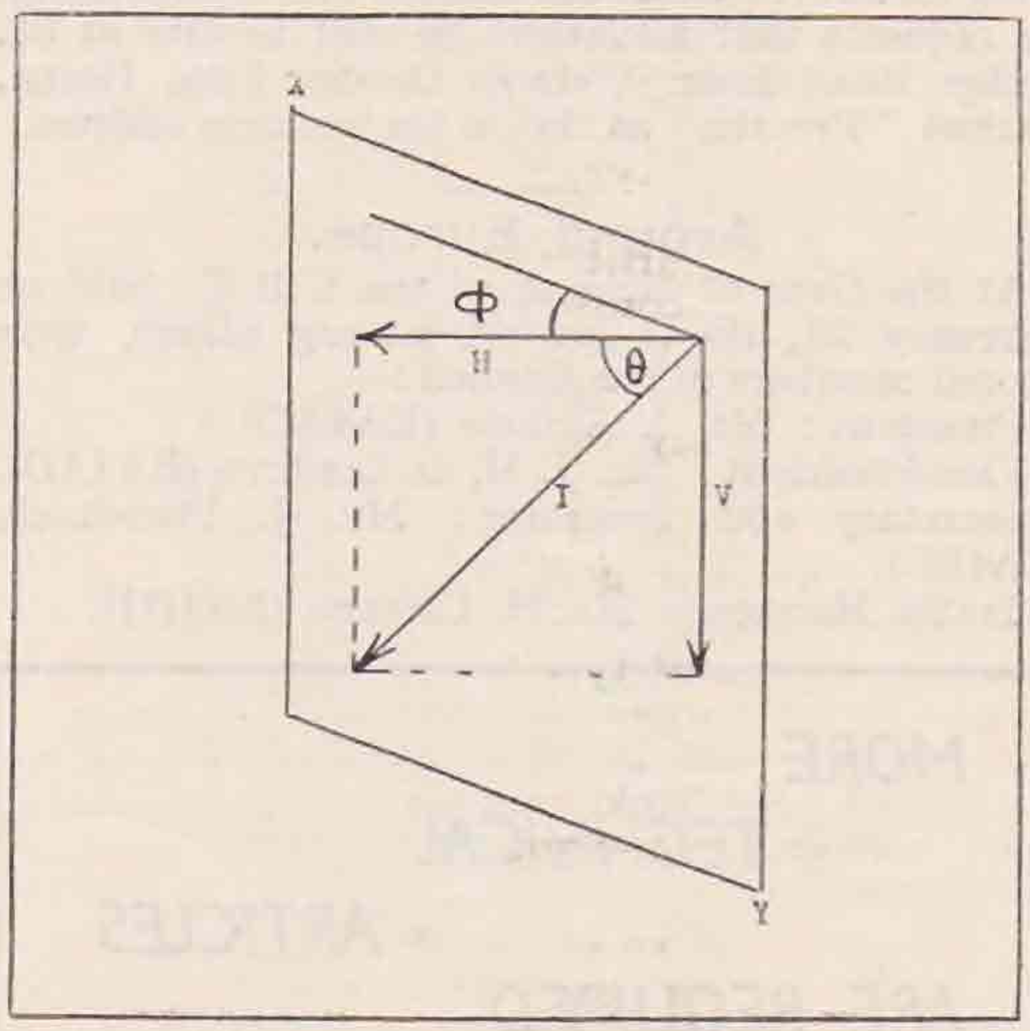


Fig. 4.

to the earth's magnetic component, but we do know that in the normal electro-magnetic wave the magnetic component is horizontal, and the electrical component vertical. Let us suppose for a moment that my hypothesis by some lucky chance is correct, then it is evident that the most intense, and the nearest approximation to a true electro-magnetic wave, would occur where the value of the horizontal component of the earth's field was greatest.

Continuing the argument still further, we would expect that in places where the component was weak that the atmospherics would be largely mush, and would decrease to a minimum at the magnetic poles, where the horizontal component vanishes. It would not, of course, decrease to zero, because here you would still be receiving distant atmospheric disturbances. We would also expect that the drift belt, that is the belt round the earth where the drift atmospherics are worst, would roughly coincide with the places which have a maximum value of the horizontal component of the earth's magnetic field. It is to this theme that I am devoting Section (8) of this article; first, however, the magnetic elements require some definition.

PART 3.

A Few Notes on Terrestrial Magnetism.

The earth's magnetism and the factors which cause it have been the subject of much specualtion. A very rough approximation to the conditions can be obtained by imagining a large bar magnet to be situated at the earth's core, its axis coinciding with the axis of rotation of the earth, and its south pole pointing to the north polar region. Many theories have been put forward in an attempt to explain the irregularities of the magnetic map by the hypothesis that there are innumerable small magnets at the earth's core. None of these theories, however, give an adequate explanation of the observed irregularities, and they are now believed to be due partly to internal, and partly to external causes.

The magnetic field not only undergoes small irregular variations at every place, but there is a continual periodic change which repeats itself daily, called the daily variation. There are also annual variations and superimposed the secular variation which is of large amount and follows a cycle of about 1,000 years. The daily variations are probably due to the electric condition of the Heaviside layer, and secular variation presumably to some slow, periodic magnetic variation in the interior of the earth. The daily variation also undergoes an 11-year cycle of change allied to the frequency of occurrence of sunspots. Magnetic storms are observed by the suspended magnetic needles over a large part of the world being violently affected at the same time. It has been noticed that the sudden appearance of an unusually large sunspot is often accompanied by such storms, and also that there is often a magnificent display of aurora borealis at the time.

A magnetised needle does not point geographical north and south, but sets in the direction of the magnetic poles; the inclination of the magnetic meridian to the geographical meridian is called the magnetic declination φ. Also the north pole of a magnetised needle dips downwards in the north-

ern hemisphere, showing that the resultant field I is not horizontal. By means of a dip circle the inclination of the resultant field from the horizontal may be measured, this is called the magnetic dip θ. The resultant field may be decomposed into its horizontal component H and its vertical component V. φ, θ, I, H, and V are called the magnetic elements. In the diagram, Fig. 4, the plane XY contains the geographical meridian, and at an angle φ to it is the plane containing the magnetic meridian, and the magnetic elements, I, H, V, and θ. Now we see that $V/H = tan\theta$, and $I^2 = V^2 + H^2$, which gives the relationship connecting the magnetic elements.

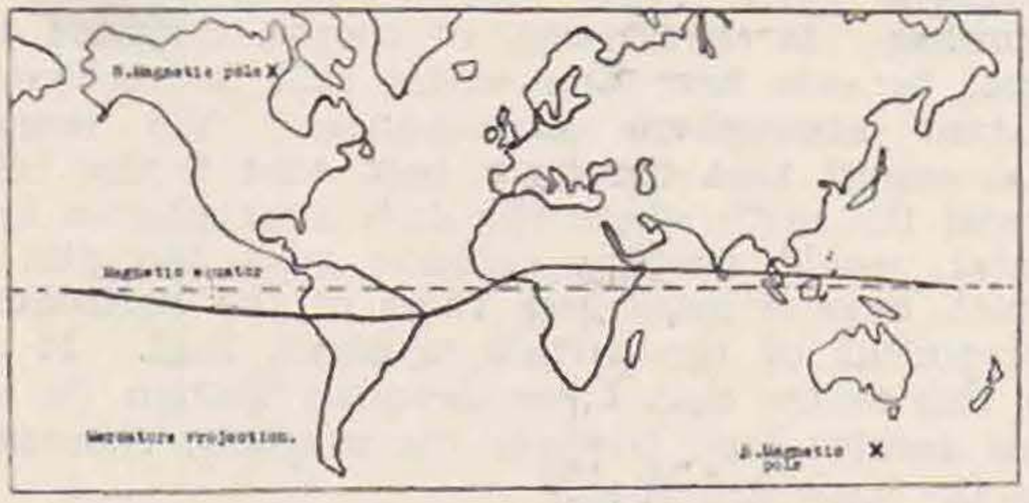


Fig. 5.

The Drift Belt and H. Max.

If we take a map of the world, or better still, a globe, and trace the belt between the parallels of latitude 35° N. and 15° N., we shall cover an area remarkable for the intensity of its atmospherics. Let us for the moment consider only the northern hemisphere ; the belt covers North Africa, most of the Sahara, Egypt, and the Sudan, Arabia, most of India, Burma, Siam, and a portion of Southern China. Across the Pacific we get Mexico and Central America, the Gulf of Mexico, and a large part of the Caribbean Sea. The value of H is about .18 in England, and turning to Kaye and Laby's Physical and Chemical constants, we find that the greatest values given are Cairo, .3003 ; Bombay, .3687 ; Calcutta, .3740 ; and Hong Kong, .3716. The next highest values given are : Honolulu, .2897 ; Sydney, .2680 ; and California, .2525. Now all the first four are within the belt, as also are Honolulu and part of California. Sydney is about 35° S. latitude, but I will not attempt to deal with the southern hemisphere now, owing to lack of data.

It is a curious coincidence, to say the least of it, that the zone of high horizontal intensity appears to coincide with the zone of worst atmospherics. Having examined some definite high values of H, we will now turn to Fig. 5, this shows the line taken by the magnetic equator round the world, and it is on this line that the greatest values of the horizontal component occur. Note that the magnetic equator does not follow the geographical equator, but bends south across South America and north across Africa and Asia. We can then say that the magnetic equator covers a total of some 20° of latitude in the equatorial belt, while fairly high values of H will be found within 35° N. latitude and, say, 35° S. latitude. As far as the northern hemisphere is concerned we have shown that 35° N. latitude does include most of the localities of greatest intensity of atmospherics; farther than that it is not possible to go with the present data.

The West Indies seem to be a region of remarkable intensity, and are, of course, included in the above limits of latitude. A few facts have come to my knowledge about conditions in Trinidad that seem to bear out the usual drift belt phenomena. It seems that there the intensity is very severe all the year round, the 300-500 metres U.S. broadcasting stations come in badly owing to the interference; the short-wave British broadcasts, however, come in well, as does Caracas, although the latter is, of course, a comparatively short distance away.

Co-Operation Required by G5OQ.

Mr. E. F. Baker (G5OQ), of Tunbridge Wells, seeks co-operation with members interested in very low-power transmissions on 1.7, 3.5 and 7 mc. Recently Mr. Baker succeeded in working G6ND (Stirling, Scotland), 300 miles distant, with only 5 volts H.T. from a grid battery to a CO on 7,125 kc. He has also contacted G6TF (Alloa, Scotland) with 10 volts H.T. to a P.P.C.O. These QSO's represent 30,000 miles per watt !

Strays.

Mr. E. A. Parsons (G2PS) advises us that his call is being misused by an unauthorised person.

BRS1357 is willing to co-operate with any station at week-ends on 1.7, 3.5, 7 and 14 mc. bands.

Mr. Brian Christian (G5XD) reports that his call is being pirated. It is believed that the offender is living within the London District ; any information as to his whereabouts will be welcomed by the rightful owner of the call.

G5UM informs us that correspondence is still being forwarded to his old address in North London. He requests that all letters be sent to him at 68, Bridge Road East, Welwyn Garden City, Herts., marked " Private," as this is his business address.

Around Europe.

At the General Meeting of the U.R.E., held on February 25, the following, among others, were elected members of the Council :—

President : Mr. A. Uriarte (EA4AD).
Vice-President : Mr. J. M. de Cordova (EA4AO).
Secretary and Treasurer : Mr. J. Planchuelo (EA4BC).
Traffic Manager : Mr. H. Castano (EA4BJ).

MORE TECHNICAL ARTICLES ARE REQUIRED

HIC ET UBIQUE.

Arrangements for Loyal Relay—New District Arrangements—New Publications—National Field Day—Week-endCruise to Holland

Arrangements for Loyal Relay

In accordance with our usual procedure, full details of the arrangements for receiving messages of Loyal Greeting to our Patron, H.R.H. the Prince of Wales' birthday, have been circulated to our E.L.S. and B.E.R.U. representatives. With the knowledge that other members are interested in these plans, we are publishing the arrangements so that every member may, if he so wishes, endeavour to take a part in this popular annual event.

The British E.L.S. will stand by for incoming messages between June 10 and 22, with special concentration during the week-end, June 16 and 17. All DX bands will be used by the relaying stations.

Messages will commence "B.E.R.U., de," followed by the name of the Society or Group initiating the message. Stations overseas will call "Test B.E.R.U. de . . .," and all messages received in Great Britain should be sent without delay to the President, Mr. A. E. Watts (G6UN), 58, Woodside Avenue, Highgate, London, N.6, or telephoned to Mountview 3970.

BRS members can render a useful service by checking incoming messages.

Overseas members in isolated territories who have no official B.E.R.U. representative may originate a message, either from themselves, or from a Government official on the spot.

New District Arrangements.

Consequent upon the resignation as D.R. of Mr. F. L. Stollery (G5QV), Council have decided to make changes in connection with District arrangements in the Eastern counties. As from April 15, District 9 will consist of the counties of Norfolk and Suffolk, with Mr. H. W. Sadler (G2XS), Redways, Wootton Road, Gaywood, King's Lynn, as D.R. This district will be known as East Anglia.

From the same date, the county of Essex and the East London District, No. 14, will merge; with Mr. T. A. St. Johnston (G6UT), 28, Douglas Road, Chingford, E.4, as D.R. This District will be known as Eastern.

Our appreciations are recorded to Mr. Stollery for his assistance in the past.

T. & R. Bulletin Articles.

Members submitting articles for publication are requested to double space them, as this greatly facilitates the work of sub-editing (where necessary), and also assists our printers. Manuscripts, in addition to being double-spaced, should, wherever possible, be typewritten on one side of the paper only.

All correspondence or matter intended for publication should be addressed to The Editor, T. & R. Bulletin, R.S.G.B., 53, Victoria Street, S.W.1.

New Publications.

Members are invited to apply to Headquarters for a free supply of a new publicity leaflet which sets out briefly the privileges of membership. It is hoped that good use will be made of these leaflets, especially by members who have occasion to acknowledge reports from non-members.

The rules of the new R.E.S. have also been reproduced in leaflet form, and are available free of charge.

In response to requests, we again draw attention to our handbook, *A Guide to Amateur Radio*, copies of which are still available from Headquarters at a price of 7½d., post free.

Arrangements are well in hand for the production of a revised second edition, which will be published during August. Suggestions for improving this edition will be welcomed by the Secretary.

Sectional Committees.

Council have appointed the following gentlemen to serve on sectional committees during the year 1934 :—

Editorial : Messrs. H. Bevan Swift (Hon. Editor), Charman (G6CJ), Hum (G5UM) and Milne (G2MI).

Q.S.L. : Messrs. J. D. Chisholm (Manager), Curnow (G6CW), Dedman (G2NH), Weale (BRS 300).

Awards : Messrs. St. Johnston (Chairman), Buckingham (G5QF), Milne (G2MI), Price (G6HP), Wilkins (G6WN).

R.E.S. : Messrs. H. C. Page (Manager), E. A. Dedman (G2NH).

Messrs. A. D. Gay (G6NF) and M. Pilpel (G6PP) continue as Managers of the Calibration and Q.R.A. Sections.

R.E.S. Section.

We are asked by Mr. H. C. Page, manager of the new Research and Experimental Section, to mention that all ex-members of Contact Bureau are required to fill in an application form for R.E.S. Certain members of the old C.B. seem to be under the impression that they will be automatically transferred to R.E.S., but this is not the case.

R.S.G.B. Calibration Service.

The Radio Section, G.P.O., has advised our Calibration Manager of the result of their check on his March standard frequency transmissions :

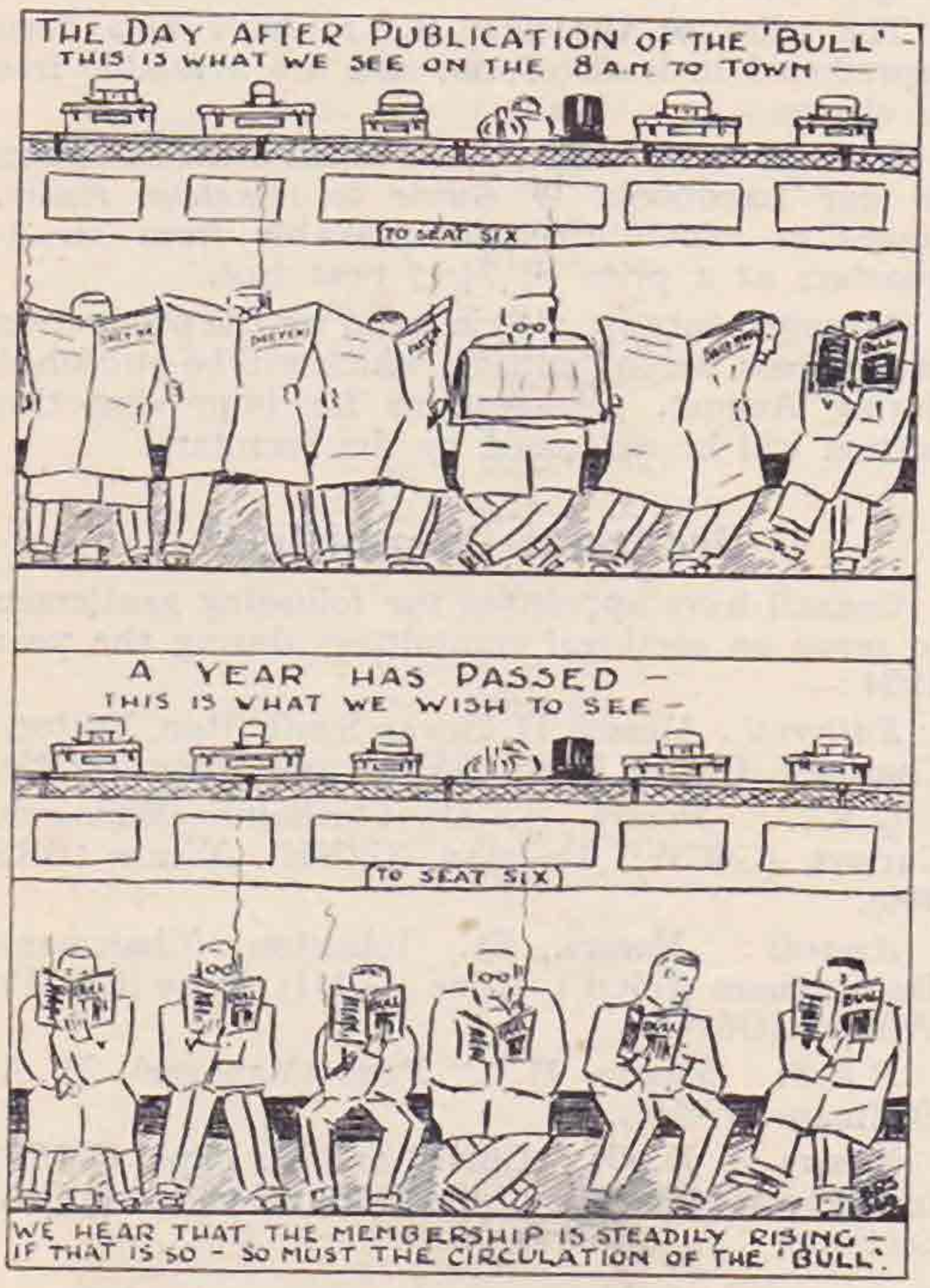
0933 G.M.T.	...	3525.02 kc.
0943 G.M.T.	...	3625.05 kc.
0953 G.M.T.	...	3725.06 kc.

National Field Day.

The suggestion has been made that each District should attempt to take a short cinematograph record of the work done at their stations during N.F.D. These could then be pieced together and the whole made into an interesting film for exhibition at Convention.

It is recommended that 16 mm. film be used and that one 50-foot length be submitted from each station. We understand that cameras can be hired from Pathescope dealers at a cost of about 5s. per week-end. No technical skill is required in operating these cameras, providing a few simple instructions are adhered to.

D.R.'s who intend adopting this suggestion are requested to advise Headquarters in advance.



"Think Amateur Radio—Talk Amateur Radio."

Week-end Cruise to Holland.

Arrangements are being made for a week-end cruise to take place during the period June 29 to July 2. It is the intention of the organiser (Mr. M. Buckwell) to arrange visits to several well-known Dutch stations. The itinerary is as follows:

Friday, June 29.—Depart London, 8.15 p.m.; depart Harwich, 11 p.m.

Saturday, June 30.—Arrive Amsterdam, 1 p.m.

Sunday, July 1.—Depart Amsterdam, 7.30 a.m.; arrive Hook of Holland, 1.30 p.m.; depart Hook of Holland, 11 p.m.

Monday, July 2.—Arrive Harwich, 6 a.m.; arrive London, 8 a.m.

A visit to The Hague will be made by special train from the Hook of Holland.

The fare from London, 3rd class rail and 1st class steamer, *including meals on board*, will be £3 12s. 6d *No passports will be required.* All members interested in this trip are asked to communicate with Mr. M. B. Buckwell, G5UK, 114, Tankerville Drive, Leigh-on-Sea, Essex.

CALIBRATION SECTION FEES.

CRYSTALS, 1s. 6d. *each; FREQUENCY METERS*, 2s. 6d. *for five points, plus* 6d. *for each additional point. These prices do not cover cost of return postage, which must in all cases be remitted as a* separate amount.

Crystals and frequency meters should be sent for calibration, at owner's risk, to Mr. A. D. Gay, 49, Thornlaw Road, West Norwood, London, S.E.27.

Canadian Amateurs Render Assistance to Public Services.

We learn from *The Sky-Wire*, an ambitious little publication issued by the Quebec Division of A.R.R.L., that during the past few months three Quebec amateurs have rendered valuable assistance to the general public. First, Mr. Rowan (VE2GO) contacted a rescue plane piloted by VE2IC, and handled important traffic for the Canadian Airways; then Doctor J. P. Landry (VE2BA), of Mont-Joli, sent news of a snowbound train to the Canadian National Railways. Shortly afterwards two pages of medical instructions were sent by radio to VE2HQ via VE2DQ.

It is incidents such as these that raise the status of the amateur in the esteem of the public, and we reiterate the views expressed by the Editor of *The Sky-Wire*, "they should not pass unnoticed."

Another W.B.E. Telephony Certificate Awarded.

Mr. J. Mahieu, the well-known Belgian amateur who operates under the call ON4AU, has the distinction of being the first foreign member of the Society to win our special Telephony W.B.E. certificate. Mr. Mahieu has also been awarded the I.A.R.U. W.A.C. certificate for telephony and telegraphy, and as he already held our W.B.E. for telegraphy work, he becomes the second amateur in the world to qualify for the Quadruple Blue Riband of Amateur Radio. Congrats, ON4AU.

R.C.C. Two-Band Contest.

Mr. R. A. Fereday advises us that the R.C.C. two-band contest will take place on April 21 and 22. The change in dates was made to avoid clashing with the A.R.R.L. Contest.

Danish International Tests.

The first Danish International DX Contest will take place during the period 00.01 G.M.T., April 21, to 24.00 G.M.T., April 30. Code groups containing a cypher and four characters, will be used by each Danish station, and this group must be mentioned when confirming the QSO by QSL.

Full details can be obtained from Headquarters, or direct from OZ4H (President, E.D.R.).

A 56 MC. Transceiver.

Mr. E. Hare, the author of the above article, which was published in our last issue, advises us that a connection between the junction of R5 and the Westector to the junction of R6 and R4 was omitted.

Without this connection the Westector has no load resistance.

— ? —

Did you spot the error on the Front Cover of our last issue? And the mistake in the Contents Bill?

No Prizes Now!!

More ZI's Heard on 3.5 mc.

Mr. G. C. Allen (BRS250) reports hearing ZL1DL and ZL2MW at 05.50 G.M.T., April 1, whilst Mr. R. A. Bartlett (G6RB) has also heard ZL stations recently on this band about the same time. We shall be pleased to have details of any established contacts with such stations.

Calibration Section.

Manager : A. D. Gay (G6NF).

Approximately 50 certificates in respect of crystals have been issued by this Section since its inauguration. The majority of these crystals have been sent by post for calibration, and only in two instances has any loss been sustained. In both cases losses could have been obviated had the consignees paid more attention to packing. In one instance the crystal was contained in a small cardboard box, well packed with cotton wool, but the box had burst its flimsy envelope, the latter being delivered minus its contents. In the other the crystal was sent between a thin piece of cardboard stuck together with stamp-paper and loose in an envelope. This may have been mistaken for a coin by the postal authorities, who probably tried to see if it would bend. Anyway, the crystal was cracked in half when it arrived! In order to avoid further losses of this kind, crystals should be despatched in a small tin or cardboard box either wrapped in brown paper or packed in a strong envelope.

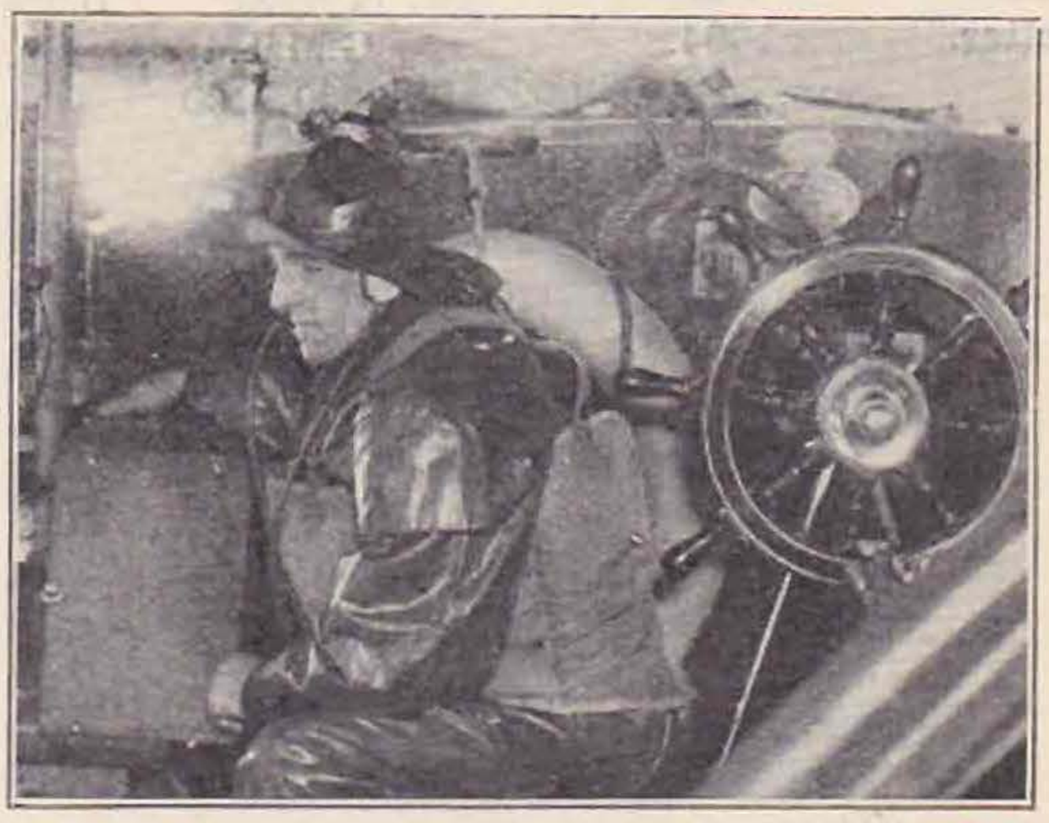
QSL Section.

Manager : J. D. Chisholm (G2CX).

Anyone looking through the batches of cards addressed to foreign stations cannot fail to notice the very high percentage of listeners' reports which are included in these parcels. Whilst this is undoubtedly a sign of healthy activity amongst the BRS fraternity, it also gives cause for a certain amount of not entirely pleasant reflection. When one considers that there have been occasions when *over* 50 *per cent.* of the cards for W have been listeners' reports it certainly seems that something is wrong with the system of reporting.

Nobody who has been through the gamut of Radio experience himself will begrudge the BRS a card, but it is quite evident from a casual glance through the pigeon-holes at HQ that the majority of cards will not be of the slightest use to the amateur to whom they are addressed—a man who is constantly working England from the States is not going to be a bit interested to know that when working Birmingham he was heard in Manchester, and can hardly be blamed for consigning the card to the W.P.B. More discrimination must obviously be used when reporting, otherwise the present low percentage of BRS cards answered will fall still further. In the past the loudest and most consistent DX stations have always received the overwhelming majority of reports when plainly the reverse should be the case. As an illustration of the way not to go about it, I can mention two instances during the last month when listeners have sent in bundles of 300 cards at one time together with a complaint that the last eruption produced only half a dozen or so replies! The remedy is too obvious to require comment.

The Section is ready to receive twice the present number of BRS cards, but for your own sakes try using the old English method of good workmanship rather than mass production.



[Photograph by courtesy of "Folkestone Herald."

Mr. Woodman, Honorary Secretary, Hythe Lifeboat, operating the short-wave receiving gear designed by Kent radio amateurs. The full story of their assistance to the lifeboat service appeared in our last issue.

R.S.G.B. Slow Morse Practice

Slow Morse sending for the April-May period has been arranged as set out below. In order to assist members utilising this service, the page and issue of the BULLETIN from which the test matter is taken will be given—where possible by telephony at the end of each test. Reports may be sent to the transmitting stations or to the organiser. These reports are helpful in ascertaining area covered by the individual stations. Additional stations are requested to assist, and offers should be sent to Mr. T. A. St. Johnston (G6UT), 28, Douglas Road, Chingford, E.4.

SCHEDULE OF TRANSMISSIONS.

Date, 1934.	G.M.T.	Frequency.	Station.
April 21	Sat., 1500	7119 kcs.	G2CY
,, 22	Sun., 0930 B.S.T.	1854 kcs.	G6FJ
,, 22	Sun., 1000	1828.3 kcs.	G2II
,, 28	Sat., 1500	7119 kcs.	G2CY
,, 29	Sun., 0930	1854 kcs.	G6FJ
,, 29	Sun., 1000	1828.3 kcs.	G2II
May 5	Sat., 1500	7119 kcs.	G2CY
,, 6	Sun., 1000	1828.3 kcs.	G2II
,, 12	Sat., 1500	7119 kcs.	G2CY
,, 13	Sun., 1000	1828.3 kcs.	G2II

R.S.G.B. Reception Tests.

Dates and periods for the April-May Tests are set out below, and new participants are referred to page 84 of the September, 1933, issue of the BULLETIN, where an explanation as to how logs are to be filled in is given. B.R.S. and A.A. members will find these tests of great assistance, and transmitting members are able to obtain reports on the signals from various parts of the country, and from Holland. At the conclusion of the tests, logs should be sent to Mr. T. A. St. Johnston (G6UT), 28, Douglas Road, Chingford, E.4, when all logs and letters will be circulated in budget form to those participating.

SERIES 27.

Test Letter.	Date 1934.			Period G.M.T.	Band Mc.
A	Sun.,	April	22	0000-0100 B.S.T.	14
B	Sun.,	,,	22	1030-1130	56
C	Sun.,	,,	22	2230-2330	28
D	Thur.,	,,	26	2000-2100	7
E	Sun.,	,,	29	0930-1030	1.7
F	Sun.,	,,	29	1100-1200	3.5
G	Wed.,	May	2	2100-2200	14
H	Sun.,	,,	6	0700-0800	7
I	Sun.,	,,	6	0900-1000	28
J	Sun.,	,,	6	1100-1200	56
K	Sun.,	,,	6	1900-2000	3.5
L	Sun.,	,,	6	2230-2330	1.7
M	Wed.,	,,	9	2130-2230	3.5
N	Thur.,	,,	10	2130-2230	28
O	Sun.,	,,	13	0000-0100	1.7
P	Sun.,	,,	13	0730-0830	14
Q	Sun.,	,,	13	1130-1230	56
R	Sun.,	,,	13	2200-2300	7

Empire Calls Heard.

The following points should be kept in mind by all transmitting members sending lists of Calls Heard.

1.—Calls of stations *worked* should be omitted.

2.—Calls should be in strict numerical order.

3.—The frequency and dates of observation should be specified.

4.—The arrangement should follow the lines of the lists published below.

5.—Unusual calls *only* should be reported.

6.—The strength and tone should be inserted in code form, i.e. a signal which was QSA 5 R5 T9 should be recorded as (559).

7.—Finally a QSL is always more useful than a printed report, for often many of the stations reported are operated by non-members who do not see this Journal.

ZS1H (Rondebosch, Cape Town), February, 1934 :—
7 *mc.*, G2tk, 2hg, 2sd, 5vr, vu2dx, 2jb, 2lz, vs7gt, 6ae, 6af, 6ag, su1ec, yi7rk, zd2c, vq4lma, 4kta, 3bal, v8ab, vk3gq, 5my, ve1bv.

14 *mc.* : G2bm, 2yl, 2ma, 2vr, 5ml, 5wy, 5lc, 5wp, 5fv, 6vp, 6xq, 6ds, 6xm, 6yl, 6nd, 6rv, vk2jx, 2er, 3ex, 3wl, 4rv, 4wa, 4el, 7jb, zl1cc, 2gn, 4bq, vu2lz, 2jp, 2bm, 2fx, su2ga, 6kr, vpu2, vq3bal, 4cro, 4kta, v8af, ab, ac, xzc6ff, ve1dq, (fone) ve1dr, 1ea, 1ep, 1do, 1ci, 2fr, 2ax, 2bd, 2fq, 2dw, 3bw (fone), 3hf, 3ij, 3wa, vo8j, vp5pz.

G. B. Wild (BERS59), at Gebeit, Red Sea Hills, Sudan, during February :—

7 mc. : g2bm, gq, hx, in, mr, nm, on, rq, sd, tk, wd, zo, g5bd, bj, ch, cp, cv, fb, fn, fy, li, ml, nf, rv, wp, vm, g6cl, cm, cw, ds, hw, ki, li, qb, rh, rv, sh, ui, vk, vp, wc, xx, vq4cre, kta, lma, vq2lq, vu2bl, fy, fx, yu7uu, zu6e.

14 mc. : g2bm, dm, hg, kb, oa, xv, zq, g5bd, ch, ml, uf, g6as, cl, nd, nj, qx, rh, rs, vq4crh, crs, vs3ac, ze1jf, zd2c, zs1b, h, zs3d, zs5a.

W. D. Lockerby (BERS38), Aden, Arabia, during February :—

ei5f, 5j, 8b, g2dc, hx, ig, nm, mi, oa, tk, ul, vr, yl, g5cx, fb, fv, hc, gi, mi, ml, ni, nw, lc, pl, vo, sv, uy, xb, 6cj, cm, cw, ds, gv, ik, kq, mo, pk, rb, vk, vp, ui, xm, xq, sulsg, 2bc, 2np, 6kr, 1sp, velbv, 2bd, vs7gj, vk2hw, 2oc, 2xu, 3cw, 3gp, 3sq, 4gk, 5gw, vp5pz, vu2am, 2bl, 2dz, 2cd, 2jb, 2jt, 2lz, 2mr, vq3bal, 4crh, 4kta, yi5gl, 7rk, zd2a, zl3gn, zs2a, zt5q, 5r, 6n, zu6e, 5wz.

REPORTS WANTED

G2PL (Cambridge), on his 7010, 7120, 7175, 14240 and 14350 kcs. transmissions.

G6WA (St. Ives), on 7 and 14 mc. transmissions. Input 7 watts.

ON4AU (Peruwelz), on his 21.26 and 10.63 metre telephony transmissions.

G5RL (St. Ives), on his 7174 and 14348 kc. transmissions.

W5SP (Forest Park, Ill.), on his 3955 kc. telephony transmissions between 1830 and 1930 CST.

QRA Section.

Manager: M. W. Pilpel (G6PP).

NEW QRA's.

G2AZ.—L. Grech, 93, Harrison Road, Edinburgh, Scotland.
G2PL.—P. Pennell, Litchet House, Gilbert Road, Cambridge.
G5BI.—V. J. Bartlett, 15, Parkville, Tredegar, Monmouthshire.
G5CW.—E. S. Wilson, 20, Singleton Scarp, London, N.12.
G5FA.—J. A. Farrer, 80, Wesley Avenue, London, N.W.10.
G5GC.—G. A. H. Eckles, 57, Sutton Road, Beverley High Road, Hull, Yorkshire.
G5IZ.—W. S. Brook, "Patridene," South Grove, Broughton, Preston, Lancashire.
G5LJ.—L. Jones, 24, Whitworth Road, London, S.E.25.
G5RL.—B. Rowell, 14, Market Hill, St. Ives, Huntingdon.
G6AI.—F. A. Holmes, "Fairview," Green Lane, St. Peter's, Broadstairs, Kent.
G6JT.—J. T. Shrouder, Granville Park, Aughton, near Ormskirk, Lancashire.
G6KP.—A. J. Perkins, 12, Birch Grove, Welling, Kent.
G6RS.—R. K. Sheargold, 97, Manor Lane, Sunbury-on-Thames, Middlesex.
G6WA.—C. Whaley, 5, Ramsey Road, St. Ives, Huntingdon.
G6WK.—W. J. Wicks, 23, Beechwood Avenue, Park Farm, Hayes, Middlesex.
G6WR.—W. H. Robertson, 8, York Terrace, Sunnyhill, Whitehaven, Cumberland.
G6YT.—W. S. Turpin, 64, Hartington Road, Stockton-on-Tees, Co. Durham.
2ABM.—E. Eggleton, 1, Plantation Road, Oxford.
2ACG.—L/Cpl. L. Hill, Att. 2nd Div. Signals, Mons Barracks, Aldershot, Hampshire.
2ALA.—P. G. Hester, 19, Southern Road, Thame, Oxford.
2ARA.—D. A. Murray, 137, East Trinity Road, Edinburgh, Scotland.
2ASP.—J. Paine, 38, Alpha Street, Slough, Buckinghamshire.
2ATX.—R. Healey, 37, Broomhill Road, Bulwell, Nottingham.
2AUI.—L. J. Rose, 42, Harpes Road, Sunnymeade, Oxford.
2AVK.—W. H. Waiting, 3, Alderville Road, Walton, Liverpool, 4.
2AVL.—E. Ingleton, "The Haven," Chalk, near Gravesend, Kent.
2AVR.—C. S. Lewis, 52, Barrow Lane, Hessle, E. Yorkshire.
2AXW.—C. A. Butler, 4, Hemdean Road, Caversham, Reading, Berkshire.
2BJG.—W. C. Meachem, 21, Harwood Street, New Bradwell, Bletchley, Buckinghamshire.
2BXG.—T. H. Hall, 59, Tresham Street, Kettering, Northampton
The following are cancelled :—2AAA, 2ATK, 2BAU.

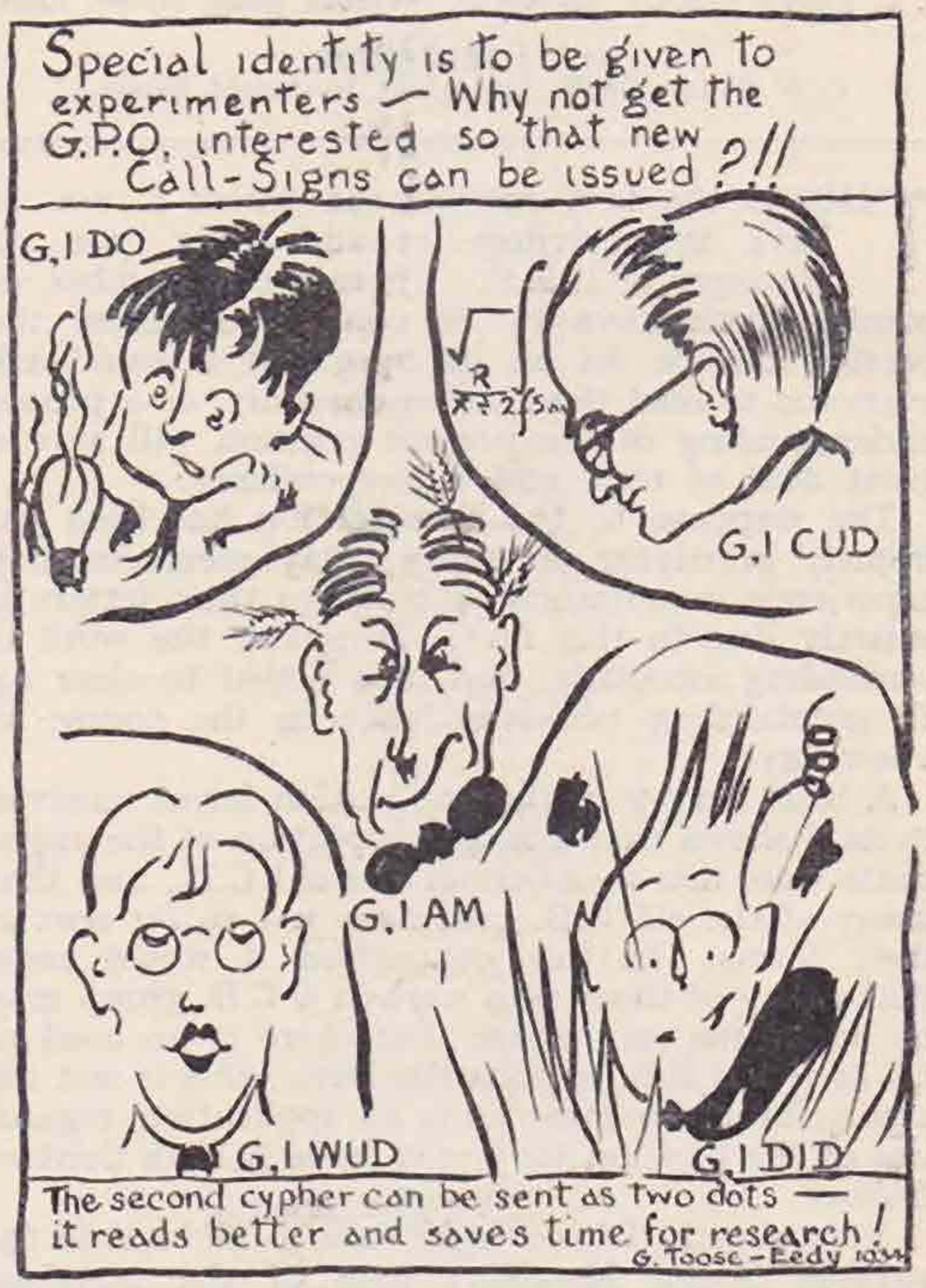
NEW MEMBERS.

HOME CORPORATES.

W. H. Moffatt (G2CM), 33, Charter Street, Gillingham, Kent.
J. Scholefield (G2TR), 2, Balmoral Road, St. Annes-on-Sea, Lanse.
H. W. Daly (G2VZ), 73, Castleton Road, Goodmayes, Essex.
J. K. Wilkie (G5SF), 659, Royal Liver Building, Liverpool.
W. C. Birchall (G5VZ), 72, Park Avenue, Northfleet, Kent.
G. A. Bryan (2AFV), 150, Littleover Lane, Derby.
P. A. Achurch (2AGZ), 95, Victoria Drive, Eastbourne, Sussex.
R. W. Arnott (2AJL), Oakdene, Redbrook Road, Monmouth.
A. Robinson (2ASG), Wellington Street, Morley, near Leeds.
A. C. Hoile (2AVC), 62, Bower Street, Maidstone, Kent.
W. H. Derry (2BOI), 19, Albion Road, Dalston, E.8.
P. Gasper (BRS1368), 78, St. Michaels Road, Aldershot, Hants.
H. W. Eagland (BRS1369), 2, Lord Street, Slaithwaite, Yorks.
J. C. Young (BRS1370), 33, Sandgate Road, Shirley, Birmingham.
D. M. Adams (BRS1371), 36, Redcliffe Square, Earls Court, S.W.10.
R. C. Harrison (BRS1372), 15, Standard Hill, Coalville, near Leicester.
J. Sumner (BRS1373), 51, Sandringham Road, Waterloo, Liverpool, 22.
J. Wilson (BRS1374), Ardenlea, Newmains, Lanarkshire.
W. R. Kerr (BRS1375), 6, Eastleigh Drive, Belfast, N.I.
O. W. H. Ovens (BRS1376), 163, Fishponds Road, Bristol, 5.
H. J. Sullivan (BRS1377), 33, Pelly Road, Plaistow, E.13.
H. Tinnion (BRS1378), 40, Haig Avenue, Bransty, Whitehaven, Cumberland.
W. D. Ingle (BRS1379), 3, Montpelier Terrace, Edinburgh.
B. E. Nichols (BRS1380), The Gardens, Aldenham Cottage, Letchmore Heath, Watford, Herts.
J. H. Mitchell (BRS1381), 8, Graham Road, Rugby.
J. Gripton (BRS1382), 309, High Street, West Bromwich, Staffs.
F. J. R. Taylor (BRS1383), 11, Kingswell Road, Ensbury Park, Bournemouth.
N. A. Preece (BRS1384), 28, Richmond Road, Wolverhampton, Staffs.
C. F. Woodward (BRS1385), 77, Darlington Street, Wolverhampton, Staffs.
J. Field (BRS1386), 43, Gipton Wood Place, Leeds, 8.
J. F. S. Williams, M.A. (BRS1387), 16, Dunstall Road, Wimbledon, S.W.19.
J. R. Cond (BRS1388), Carisbrooke, Radnor Road, Twickenham, Middlesex.
R. S. Robinson (BRS1389), 23, Clifton Road, Flixton, Manchester.
R. W. Charnock (BRS1390), 61, Liverpool Road, Burscough Bridge, Lancs.
D. Campbell (BRS1391), 49, Highcroft Avenue, Kings Park, Glasgow.
D. Mackie (BRS1392), 13, Leslie Street, Glasgow, S.1.
J. R. Wilkins (BRS1393), 30, College Road, Bristol, 8.
R. F. Hewson (BRS1394), 16, Wootton Road, Abingdon-on-Thames, Berks.
R. Worrall (BRS1395), 5, Greenhill Avenue, Liverpool, 18.
J. B. Morgan (BRS1396), 21, Killoch Drive, Glasgow, W.3.
R. M. Kerr (BRS1397), 224, Glencroft Road, Glasgow.
B. R. Edwards (BRS1398), 82, Coolinge Road, Folkestone, Kent.

DOMINION AND FOREIGN.

G. de Buren (HB9AW), Chateau de Denens, sur Morges, Switzerland.
S. E. James (SU1SJ), 20, Rue Missalla, Alexandria, Egypt.
R. Lachet (SU1SK), 11, Rue Chakour Pasha, Koubbeh Gardens, Cairo.



W. P. C. Andrew (VE3WA), 1337, Dougall Avenue, Windsor Ontario, Canada.
R. M. Vickary (VK4RV), P.O. Box 48, Cunnamulla, Queensland, Australia.
R. D. Elliott (VJ5RD), 34, Grange Road, Lower Mitcham, South Australia.
W. P. Campbell (VS7CE/VS7WR), Headquarters, Ceylon Engineers, Galle Buck, Colombo, Ceylon.
C. C. Anderson (W6FFP), 931, Orange Avenue, Fresno, California, U.S.A.
R. T. Stanton (ZL3AZ), 17, Martin Avenue, Beckenham, Christchurch, New Zealand.
L. C. Hunter (ZL3BJ), 62, Colombo Street, Christchurch, New Zealand.
S. Hudson (ZL4FO), 30, Tweed Street, Roslyn, Dunedin, New Zealand.
R. S. Woodford (ZS3D), Box 10, Omaruru, S.W. Africa.
J. H. Pienaar (ZS6P), 51, Grove Road, Orange Grove, Johannesburg.
G. R. Fletcher (BERS220), 6, Mess, H.M.S. *Sandhurst*, c/o G.P.O.
N. E. Philip (BERS221), P.O. Box 10,-Port Elizabeth, S. Africa.
F. Walton (BERS222), No. 70 (BT) Squadron, R.A.F., Hinaidi, Iraq.
F. C. Bailey (BERS223), at Pitchill, Salford Priors, Evesham, Worcs.
S. E. Jacobs (SARS1D), 35, Herte Street, Stellenbosch, S. Africa.
D. C. Hall, 30, Rue Thiers, Colombes, Seine, France.

RESEARCH AND EXPERIMENTAL SECTION

MANAGER:

H. C. Page (G6PA), Plumford Farm, Ospringe, near Faversham, Kent.

GROUP MANAGERS:

No. 1: 1.7 and 3.5 MC. WORK
J. B. Hum (G5UM), 68, Bridge Road East, Welwyn Garden City, Herts.

No. 2: 56 MC. WORK
E. A. Dedman (G2NH), 63a, Kingston Road, New Malden, Surrey.

No. 3: ARTIFICIAL AERIALS
J. K. Todd (G2KV), 12, St. John's Road, Cambridge; and Orchard Place, Wannock, Polegate, Sussex.

No. 4: ATMOSPHERE AND FADING
J. C. Elmer (G2GD), Aethelmar, Seabrook Road, Hythe, Kent.

No. 5: TELEVISION
C. W. Sands (G5JZ), Springfield, Heathfield, Sussex.

No. 6: CONTEMPORARY LITERATURE
R. A. Fereday (PAOFY), Reinkenstr, 40, The Hague, Holland.

No. 7: RECEIVER DESIGN
E. N. Adcock (G2DV), 31, Churchill Road, Little Bromwich, Birmingham.

No. 8: TRANSMITTER DESIGN
A. E. Livesey (G6LI), Stourton Hall, Horncastle, Lincs.

No. 9: AERIAL DESIGN
F. Charman (G6CJ), The Cottage, Park Way, Hillingdon, Middlesex.

No. 10: VALVE RESEARCH
D. N. Corfield (G5CD), 10, Holders Hill Gardens, Hendon, N.W.4.

No. 11: 28 MC. WORK
(Manager to be appointed.)

THIS is the first occasion on which I am to have the privilege of addressing you as Manager of R.E.S. There are a number of points which have to be considered before the Section can be set on its feet, and I would ask everyone to read these notes carefully, as a proper understanding of the present position will save a great deal of time and correspondence.

The response to the new Section has been extremely gratifying, and any delay members may experience in obtaining a reply to their letters is entirely due to this fact. However, the work is proceeding smoothly, and it is hoped to clear up all outstanding correspondence in the course of a few days.

A brief survey of the application forms received to date shows that a large proportion of the applicants were non-members of the old C.B., and that many of the old C.B. men have not so far sent in their forms. In this connection it would seem that many of those who were in a C.B. group may be under the impression that there is no need to fill in the R.E.S. application form; this is not the case. Everyone must fill in an application, regardless of the position they may have held in Contact Bureau.

Very shortly I hope to be able to forward to the various Group Managers lists of the members interested in the Groups to be formed under their control, and in passing I would ask you to bear with me if your names and initials do not appear correctly on the G.M.'s lists. Unfortunately I was never trained as a dispensing chemist, and in consequence my ability to decipher peculiar signatures is not abnormal!

There are several points I would like to make clear with regard to the different sections. Firstly, there seems to be some misunderstanding as to the exact purpose of the Contemporary Literature Section. Its chief reason for existence is to translate technical articles published in foreign magazines. Members of the Group must be able to read at least one foreign language, and be prepared to take magazines in that language as they are published, and forward a précis of anything of particular interest to the different sections of R.E.S. There does not seem to be any marked keenness for membership of this Section, and more members are earnestly needed. Will those members who have volunteered for the Group please let me know the languages they can read?

From the application forms already to hand it appears that a number of members are interested in 28 mc. work, and would like a Group or Groups to be started. The reason why no such section was suggested in the last Bulletin was because the 28 mc. section of C.B. did not appear to have produced anything of merit for some time, and it was felt that perhaps a short period of complete rest would be advisable. However, there appears to be a demand for such a Group, as it is thought that in the course of a year or so the band may become useful again. We are quite prepared to start a 28 mc. Group again, but I feel that a word of warning to intending applicants may not be out of place. In the past there has been a great deal too much stress laid on the DX side of 28 mc. While DX has its merits, and is certainly useful, R.E.S. does not exist for the regular recording of such results. What is desired is data of a more scientific nature, such as transmitter design, and receiver design, to say nothing of aerials. Therefore, if you are only interested in the DX side of the question, there is very little point in joining a 28 mc. Group.

Will those who are interested in the experimental side of this work please forward their application forms at once? Those who have already sent in forms for another section, but did not state 28 mc., are asked to write in to that effect.

Now for a word to the Individual Members. There has been quite a large entry for this section, but for the moment I must ask everyone to have patience and allow me time to set the Groups on their feet. I hope eventually to publish a list of the names and addresses of all members, and the subjects they are interested in, so that they may correspond with one another. In the meantime these members are invited to get into touch with the G.M. of the Group studying the subject in which they are interested.

For the benefit of both Group and individual members I am publishing a list of the Group Managers at present appointed, so that those who wish to get in touch with them may do so without delay. I would remind all R.E.S. members that

(*Continued on page* 348.)

TRADE NOTICES.

The New Westector.

A new Westector, Type "WX," is now available and should find an immediate use in circuits where the original Westector, Type "W," could not be used owing to the frequency limitation. It will be remembered that the Type "W" Westector is suitable up to 200 kcs. For radio purposes their use was practically confined to the 2nd detector stage in super-het. receivers where the intermediate frequency was sufficiently low. The new type are suitable for frequencies up to 1,500 kcs., thus bringing them into the range of broadcast frequencies, and intermediate frequencies in some short-wave super-het. receivers.

The May, 1933, BULLETIN published a short description of *The Westector Phone Monitor*. This was an entirely original use for the Westector, and was tested in operation up to 14,000 kcs., considerably above the makers' rated figure. The new type Westector certainly works very well in such a Monitor, and on the low-frequency bands it is just about on the limit of its rating.

There is no doubt that the "WX" Type will find a very ready use in adapting ordinary broadcast receivers of the non-"super" variety to A.V.C. without the use of separate or multi-purpose valves.

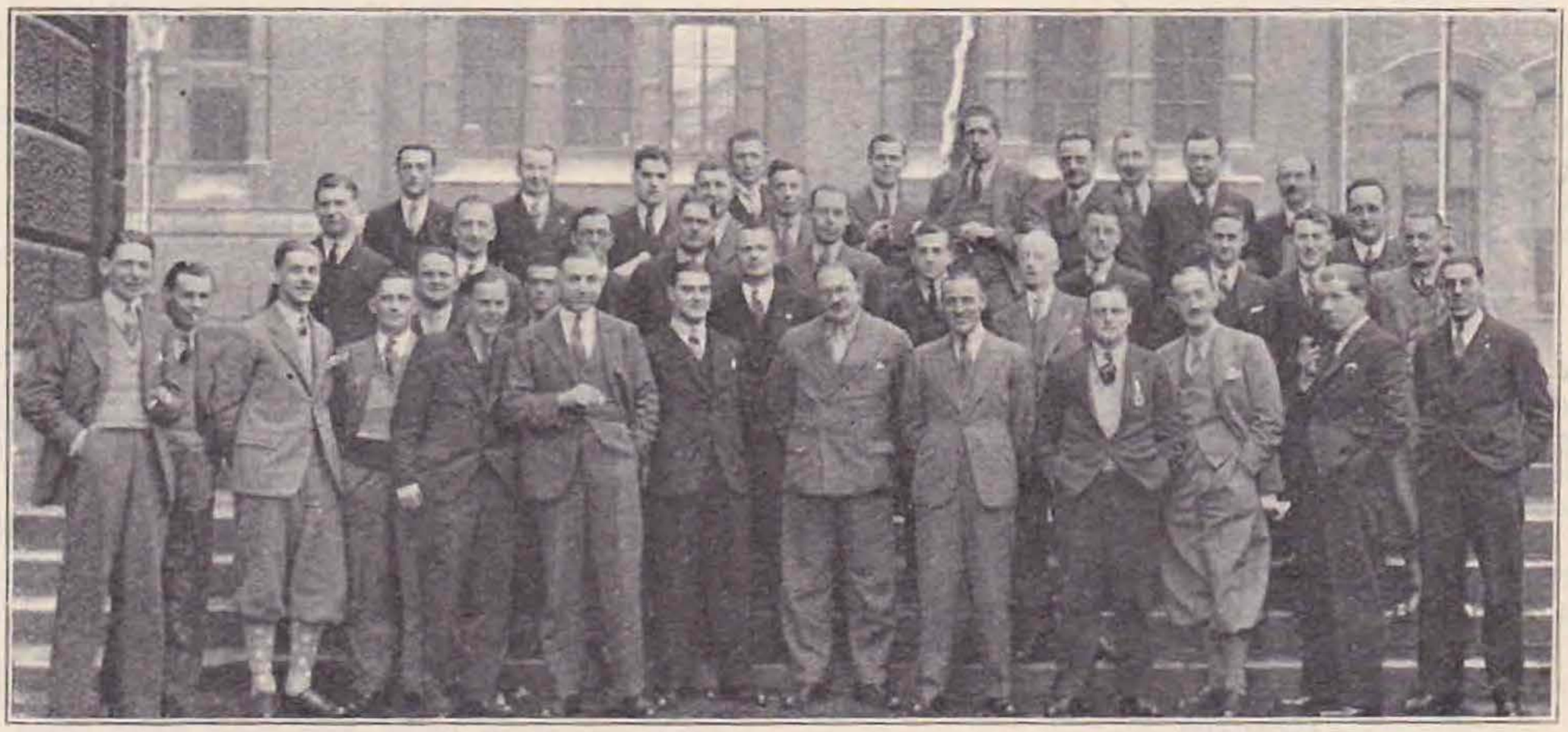
At present only the WX6 is available and is a single-wave rectifier corresponding to the W6. It is rated at a maximum input voltage of 36, passing 0.1 mas. Very complete operating details are supplied with the Westector, and for further information regarding A.V.C. or similar circuits, *The All-Metal Way*, 1934, will be found very useful. The price of the WX6 is 7s. 6d.

Components constructed from materials possessing low power factors are of increasing importance to the radio amateur working on ultra high frequencies, and in the Special S.W. Valve-holder Type 949 recently marketed by *Messrs. Strattons*, an example of the care taken to ensure this feature is prominent. The base and stand-off legs are made of Frequentite which has a power factor of less than 0.1 per cent. compared with Porcelain (7½ to 15 per cent.) and Synthetic Resins (3 to 11 per cent.). Almost as good as Fused Quartz, this material can be relied upon for all high-frequency work. The loss factor is also very low, being of the order of 0.4 against Porcelain (5.2 to 105) and Synthetic Resins (12 to 55).

The model examined was designed for use with four pin type valves, arranged for baseboard assembly and 3-hole fixing. The sockets are made from channelled brass heavily nickel-plated, and connection can be effected by soldering or by means of screw and nut.

Coils for Wireless Receivers.

It has been claimed that wireless receivers giving better performance in a smaller space can be designed by the use of high-frequency coils of small size made with cores of specially prepared magnetic materials, on account of the facility in screening and the more effective coupling between different coil-windings these coils afford. The published information regarding the performance of the magnetic material used in such coils is critically surveyed in a report issued by the Department of Scientific and Industrial Research (Radio Research Special Report, No. 14, Magnetic Materials at Radio Frequencies. A critical survey of present knowledge, published by H.M. Stationery Office. Price 6d.).



[*Photo by Webb Radio*

DISTRICT 3 OPEN THE CONVENTIONETTE SEASON AT BIRMINGHAM, WITH A GOOD ATTENDANCE

Front row, left to right. E. N. Adcock, G2DV (Holder BERU Receiving Trophy) G2AK, G6LI (D.R. No. 17 District), G2OA G5VH, G6JQ (D.R. No. 4 District) G6LL, G6CL, G5VM (D.R. No. 3 District), G5BJ (C.R. for Warwick), G5NJ (C.R. for Staffs), G5NI and G6CJ. Dr. Marston G2PD (District Commander, R.N.W.A.R.), between G6LL and G6CL, Mr. F. W Miles, G5ML, between G5NI and G6CJ.

Empire B.E.R.U. News.

B.E.R.U. REPRESENTATIVES.

Australia.—H. R. Carter (VK2HC), Yarraman North Station, via Quirindi, N.S.W.

Bahamas, Bermuda and the Eastern Part of the West Indies.—P. H. B. Trasler, (VP4TA) No. 2 Mess, Pointe à Pierre, Trinidad, B.W.I.

Burma.—W. G. F. Wedderspoon (VU2JB), Government High School, Akyab, Burma.

Canada.—C. S. Taylor (VE1BV), Stewiacke, Nova Scotia; R. Prissick (VE2CX), 27, Bellevue Avenue, Westmount, Montreal, P.Q.; S. B. Trainer (VE3GT), 4, Shorncliffe Ave., Toronto, 5, Ont.; A. E. Howard (VE4CJ), 2401, 25th St. West, Calgary, Alberta; and A. L. Cusden, (VE5HJ), 1465, 17th Avenue, New Westminster, British Columbia.

Ceylon and South India.—G. H. Jolliffe (VS7GJ), Frocester, Govinna, Ceylon.

Channel Islands.—Capt. A. M. Houston Fergus (G2ZC), La Cotte, La Moye, St. Brelades, Jersey.

Egypt, Sudan and Transjordania.—Lt. E. S. Cole (SU1EC), Haking House, Abbassia, Cairo, Egypt.

Hong Kong.—A. P. Rosario (VS6AN), P.O. Box 391, Hong Kong.

Iraq.—M. Goodinson (YI5KM), "A" Bungalow, 203 Squadron, R.A.F., Basra.

Irish Free State.—Col. M. J. C. Dennis (E12B), Fortgranite, Baltinglass, Co. Wicklow.

Jamaica, British Honduras, Turks Island and Cayman Island.—C. M. Lyons, (VP5MK), P.O. Box 36, 12, Port Royal Street, Kingston.

Kenya, Uganda and Tanganyika.—R. O. Davidson (VQ4CRL), P.O. Box 31, Nairobi.

Malaya.—T. G. Laver (VS3AC), Government Electrical Power Station, Johore Bharu, Johore.

Malta.—H. G. Cunningham (BERS.161), H.M.S. "Royal Sovereign," c/o G.P.O., London.

Newfoundland.—E. S. Holden (VO8H), Box 650, St. John's, Newfoundland.

New Zealand.—C. W. Parton (ZL3CP), 69, Hackthorne Road, Cashmere Hills, Christchurch.

Nigeria.—Capt. G. C. Wilmot (ZD2A), Depot Nigeria Regt., Zaria, Nigeria.

North and South Rhodesia.—J. W. Mavis (ZE1JE), P.O. Box 160, Umtali, South Rhodesia.

North India.—2nd Lt. T. H. Beaumont (VU2FP) 1st Batt. Beds & Herts Regt. Jhansi, India.

South Africa.—W. H. Heathcote (ZT6X), 3, North Avenue, Bezuidenhout Valley, Johannesburg.

Canada (First District).

By VE1BV, via G6YL.

A number of VE1 amateurs took part in A.R.R.L. tests, and a very good time was reported by all. VE1DQ had contact with YI2FK, and is now W.A.C. Mr. MacKasey, VE1DE has been elected President of the Halifax Radio Club. A large number of VE1's are working on 3.9 mc. fone, and will welcome reports on their transmissions.

Canada (Second District).

By VE2CX.

The new amateur licences for Canadian amateurs in general follow similar lines to those previously in vogue. Two important changes, however, should be mentioned. First, telephony operation on 1.7 mc. is now restricted to those using modern apparatus with at least one stage of buffer amplification between oscillator and final amplifier. Second, the 28 and 56 mc. bands may be used for portable work, but only within the Province for which the licence is granted.

Ceylon.

By VS7GJ.

Conditions during the Contests were erratic, but the amazing number of stations calling "Test B.E.R.U." was an indication of the popularity of the endurance test!

A monthly letter budget is now in operation under the control of VU2JP. VS7HT has been reported working on 3.5 mc., but as this call is not issued, a pirate is suspected. Take out a licence O.M. and play the game. VU2FY and 7JW report, the latter is on his way to G on leave.

Egypt.

By SU1EC via G2DC and G5US.

The SU membership has increased in the last year to considerable dimensions. On February 27 a good percentage of the Alexandria amateurs visited Cairo, and a small meeting was held. On the 28th they foregathered again, and went the round of the military wireless stations at Polygon, SU1EC, and the wireless section of the 216 Squadron R.A.F. From there on to SU6HL's QRA, where divers matters amateur were discussed. Main matters proposed and passed were the resuscitation of the Letter Budget and participation in the National Field Day in June. For the latter, SU1WEM, SU1CH and SU1SJ have agreed to reconnoitre a good location at Agomie near Alexandria, the main essentials being two good palm trees. It is hoped that all Cairo amateurs will be able to travel to Alexandria for this event. As the sands and bathing are perfect it should be a pleasant week-end. Those present at the meeting were SU1SG, 1SJ, 1AQ, 1AB, 1CH, 1MM, 1WEM, 2NP, 3AB, 5NK,

6HL and OE1FH, who is visiting Cairo. Earlier in the week OE3AH visited SU1EC in Cairo and SU1SG in Alexandria. SU1CH installed a QRP fone station on a boat plying between Alexandria and Constantinople, successful two-way tests were carried out throughout the whole voyage on 7 mc. with SU1SG, the call sign was SU1TON. Conditions throughout the month were good on 14 mc., VK's are disappearing and W stations coming in well; QRN is gradually increasing.

Malta.

By BERS161.

Owing to the Fleet being away from Malta, and pressure of work at the R.A.F. base, all stations were QRT during March, but great activity is anticipated shortly. VP3C and 3H will have completed their new QRO station by the end of April; 3J, 3F and 3X are building 56 mc. gear.

The question of licences is still being decided by the Government, but recent letters promise an early decision.

Northern India.

By VU2BM.

Considerable activity is reported this month. VU2RE worked Italian 1MD, using 6 watts, and is interested in Group 4 of R.E.S. VU2DX has been QSO 26 countries in recent months, whilst on the reception side BERS74 reports hearing over 60 G's during the contests.

Northern and Southern Rhodesia.

By ZE1JE.

The eagerly awaited 1934 B.E.R.U. Contest has come and gone, with very disappointing results as far as the ZE1 participants are concerned. During the whole period conditions were so bad on both 14 mc. and 7 mc. that it was practically impossible to QRX for replies to our "Test Beru" calls.

Mr. I. de B. C. Fynn (ZE1JH) is leaving for England in April, and is looking forward to his visit to R.S.G.B. Headquarters, probably in May.

Mr. B. M. Orr (ex VQ2XD) is now domiciled in Southern Rhodesia; his QRA is c/o The British South Africa Company, Salisbury. He reports having managed to W.A.C. with an input of 5 watts before leaving Northern Rhodesia.

ZE1JF is temporarily off the air pending arrival of new mains and filament transformers from England. He hopes to resume operations at an early date with increased power. He has now received his W.A.C. certificate.

ZE1JJ, although active, has again failed to report.

CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents. All correspondence must be accompanied by the writer's name and address, though not necessarily for publication.

T9 REPORTS WITH SELF-EXCITED CIRCUITS.

To the Editor of T. & R. Bulletin

Dear Sir,—I was interested in reading G6FU's article on "Unorthodox Crystal Control," as I myself when in VQ5 was blessed with no volts—not even gas mains! But in my case I had no crystal for insertion anywhere. On the other hand, I obtained T9 reports on 14 mc. (not often dropping to T8) simply by working a high "C" circuit a good deal off resonance—and in using a Windom aerial. I contravened the idea that a Windom allows of no toleration in such respect (minute care was taken, however, in siting accurately the actual tapping point of feeder to antenna).

By moving away from resonance and thereby sacrificing strength a purity of tone was attained instead. Incidentally, although only using 6 watts I could obtain an R4 report in G.

This is not to advocate self-excited rigs as against C.O., but merely as a testimony that with the former a tone *can* be improved to a C.C. note if one cares to make the sacrifice—which to us as QRP is truly self-discipline! and Lent is a good time to exercise it!

Yours, etc.,
A. B. Trewin (G2AT),
(ex-VQ5NTB).

WILL THE PENDULUM SWING?

Dear Sir,—In view of the prophecy that the sun spot 11-year cycle controls radio conditions (and it certainly points that way), the writer suggests that a pendulum-like effect will shortly take place, and that during the next year or two the 3.5 mc. band will once again be best for DX. In view of past experience this seems feasible.

At the present time 7 mc. has taken the place of 14 mc. as the best universal band; in fact it is producing conditions almost identical with those experienced on 14 mc. some four or five years ago. To-day 14 mc. contributes "local" Americans and little else.

During 1923-4 the 3.5 mc. band was teeming with DX, and during those halycon days, VK's and ZL's were received at signal strengths far in excess of those noted in later years on 7 and 14 mc. In view of this it would seem that the year 1934 may repeat the conditions of 1923, and the writer prophesies that a good time is in store for those who have remained faithful in their interest to 3.5 mc.

Yours faithfully,
C. A. Simons,
G5BD.

THE PENDULUM HAS SWUNG!

Dear Sir,—It may interest you to know that Mr. S. Schofield, ZL2CS, of French Pass, New Zealand, reports that he received my 3.5 mc. signals at 04.05 N.Z.T. on December 19, 1933. Signals were QSA2 R3 on a three-valve receiver.

Yours faithfully,
J. W. Riddiough (G5SZ).

NOTES and NEWS from the BRITISH ISLES

DISTRICT REPRESENTATIVES.

DISTRICT 1 (North-Western).
(Cumberland, Westmorland, Cheshire, Lancashire.)
MR. J. NODEN (G6TW), Fern Villa, Coppice Road, Willaston, near Nantwich, Cheshire.

DISTRICT 2 (North-Eastern).
Yorkshire (West Riding, and part of North Riding), Durham, and Northumberland (Middlesborough is in this district.)
MR. L. W PARRY (G6PY), 13, Huddersfield Road, Barnsley, Yorks

DISTRICT 3 (West Midlands).
(Warwick, Worcester, Staffordshire, Shropshire.)
MR. V. M. DESMOND (G5VM), 199, Russell Road, Moseley, Birmingham.

DISTRICT 4 (East Midlands).
(Derby, Leicester, Northants, Notts.)
MR. W. W. STORER (G6JQ), 28, Blanklyn Avenue, Leicester.

DISTRICT 5 (Western).
(Hereford, Oxford, Wiltshire, Gloucester.)
MR. W. B. WEBER (G6QW), 2, Balmoral Road, St. Andrews, Bristol.

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

DISTRICT 7 (Southern).
(Berkshire, Hampshire, Surrey.)
Mr. E. A. DEDMAN (G2NH), 63a, Kingston Rd., New Malden, Surrey.

DISTRICT 8 (Home Counties).
(Beds., Bucks., Cambs., Herts. and Hunts.)
Mr. G. FEATHERBY (G5FB), 30 Lindsey Road, Bishops Stortford Herts.

DISTRICT 9 (East Anglia).
(Norfolk and Suffolk.)
MR. H. W. SADLER (G2XS), Redways, Wcotton Road, Gaywood, King's Lynn, Norfolk.

DISTRICT 10 (South Wales and Monmouth).
MR. D. Low (G5WU), "Nantissa," Westbourne Road Penarth, Glamorgan.

DISTRICT 11 (North Wales).
(Anglesey, Carnarvon, Denbighshire, Flintshire, Merioneth, Montgomery, Radnorshire.)
Mr. T. Vaughan Williams (G6IW), "Malincourt," Grosvenor Ave., Rhyl, Flintshire.

DISTRICT 12 (London North).
Mr. S. BUCKINGHAM (G5QF), 19, Oakleigh Road, Whetstone, N.20.

DISTRICT 13 (London South).
MR. H. D. PRICE (G6HP) 12, Hillcrest Road, Sydenham, S.E.26

DISTRICT 14 (Eastern)
(East London and Essex.)
MR. T. A. ST. JOHNSTON (G6UT), 28, Douglas Road, Chingford, E.4.

DISTRICT 15 (London West and Middlesex).
MR. H. V. WILKINS (G6WN), 81, Studland Road, Hanwell, W.7.

DISTRICT 16 (South-Eastern).
(Kent and Sussex).
MR. A. O. MILNE (G2MI), "Southcot," Larkfield, Kent.

DISTRICT 17 (Mid-East).
(Lincolnshire and Rutland.)
MR. A. E. LIVESEY (G6LI), Stourton Hall, Horncastle, Lincs.

DISTRICT 18 (East Yorkshire).
(East Riding and part of North Riding.)
MR. T. WOODCOCK (G6OO), 8, George Street, Bridlington.

SCOTLAND.
MR. J. WYLLIE (G5YG), 31, Lubnaig Road, Newlands, Glasgow.

NORTHERN IRELAND.
MR. W. GRAHAM (GI5GV), 5 Ratcliffe Street, Donegal Pass, Belfast

DISTRICT 1 (North-Western).

MEMBERS reading these notes must feel very satisfied with the manner in which the C.R.'s are handling the work in their two areas. Keep an eye open for coming events, and do not hesitate to offer your assistance to those responsible for their organisation, your interest will at least give them encouragement.

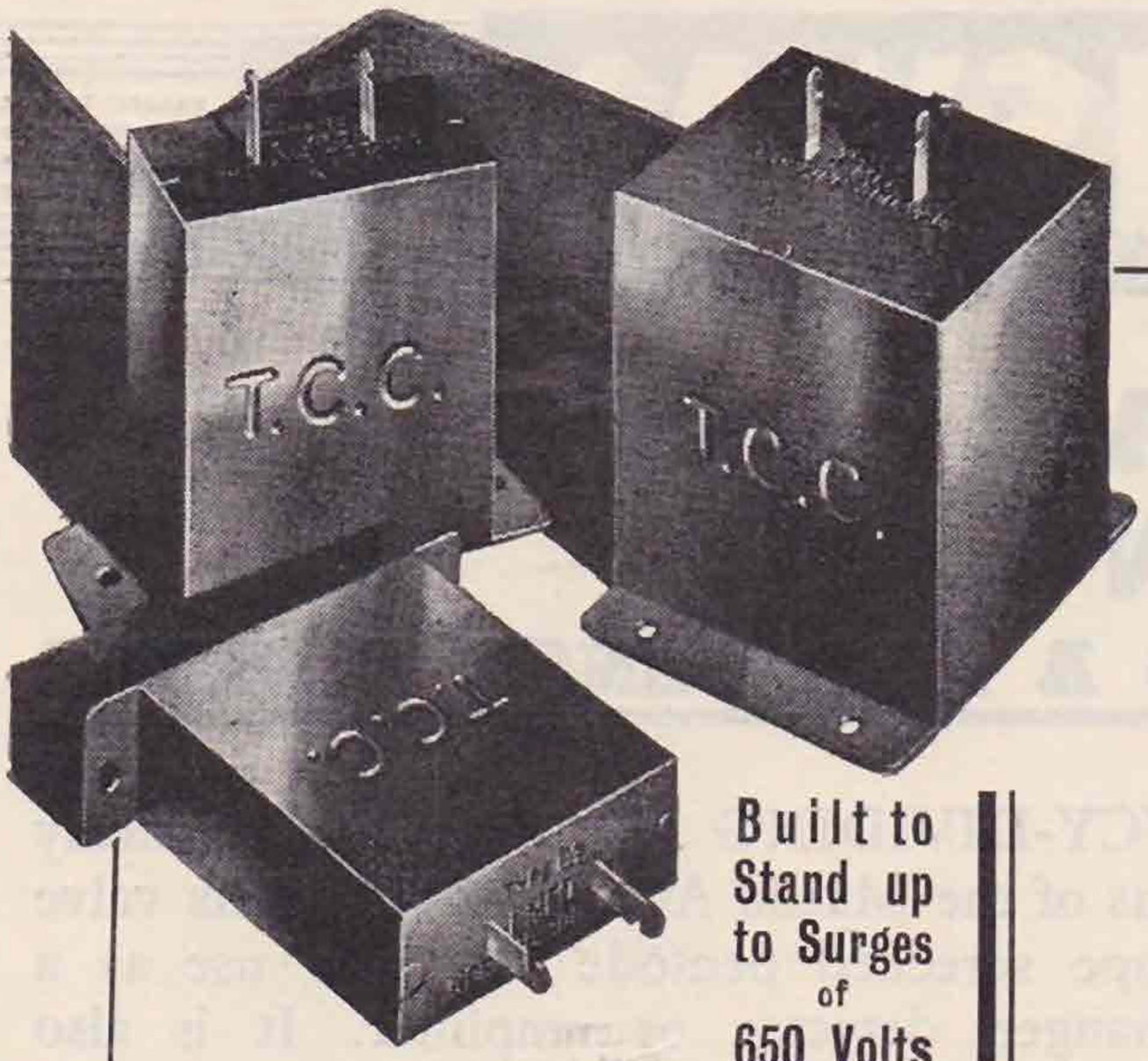
At the next meeting of the Manchester section, to be held on May 2, the D.R. will deliver a talk on ultra high frequency work, and he hopes on this occasion to make the acquaintance of many new members. G6QA will also talk on "Ribbon Microphones."

G6CX reports that the capacity of the meeting place was again severely taxed at the March meeting of the Liverpool section, and mentions that considerable support was given by a group of members from the North Wales district. At this meeting final details for N.F.D. were discussed, and plans made for the supplying of the necessary gear. Arrangements were made for holding a 56 mc. field day on July 22, in conjunction with District 11. It is hoped to achieve some long-distance work on this occasion. Stations will be established in North Wales and in Liverpool for communication on 1.7 mc., and it is hoped later in the day to link up these points on 56 mc. Transmissions will commence from about 1000 G.M.T., and will continue until dusk. B.R.S. members in and around the two districts are asked to co-operate in this important event.

Practically all members in the area report active, and there is considerable interest being shown in 1.7 mc. work. G5RY has been allotted to Mr. R. W. Wright, ex 2AWV, whilst Mr. W. H. Waiting, ex BRS1354, becomes 2AVK. A crystal register is in course of preparation, and the C.R. will appreciate a card from each member specifying the frequencies of the crystals in his possession.

G2OA, C.R. for East Lancs and East Cheshire, reports that 19 members attended the March Manchester meeting, when it was arranged for a small committee to take in hand the selection of a suitable site for N.F.D. This section will organise the work of the "A" station. A discussion took place regarding arrangements for the Annual Conventionette.

Slow Morse Tests for the benefit of B.R.S. and A.A. men will be carried out by G2OI every Sunday morning from 0030 to 0045 G.M.T. (or B.S.T.) on 1820 kc. (These practices, in accordance with a ruling from the Post Office, must be arranged in conjunction with Mr. T. A. St. Johnston, G6UT. —ED.)



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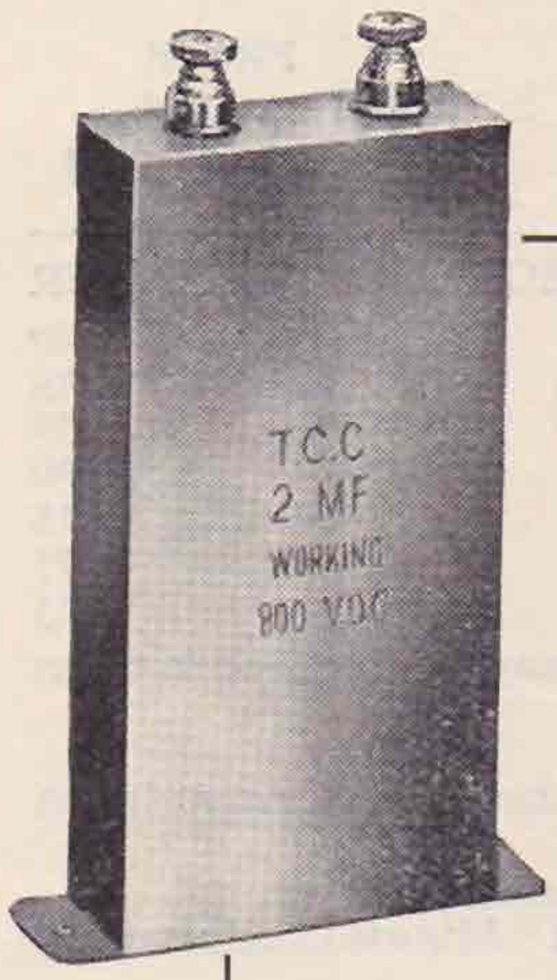
The TYPE 141

This condenser has a working voltage of 2,500 peak value and is tested to 5,000v. D.C. 1 mfd. as shown, price 28/-, 2 mfd. and 4 mfd. at 50/- and 97/6 respectively.



The TYPE 101

Here is illustrated a 2 mfd. condenser for maximum voltage of 800 peak, and is tested to 1,500v. D.C. Price 9/-, other values from .01 at 4/6 to 10 mfd. at 47/6.

...*and the* EXPERTS AGREE

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At a future meeting, G5YD will explain the working of the Cathode Ray Tube.

G2RA, 2OI, and 5YD have been carrying out triplex telephony tests on 1.7 mc., the latter is working on a dual detector circuit employing a Class B valve.

The following report active : 2ACP, 2AZT, 2BGK, 2BF, 2HL, 2HM, 2OI, 2RA, 2WQ, 5CH, 5MB, 5OZ, 5YM, 5WR, 5XM, 5YD, 5ZN, 5ZT, 6AX, 6GV, 6QA, 6ZU, BRS1114, 1212, 1270, and 1360.

DISTRICT CALENDAR
April/May, 1934.

April 18. District 5. At Talbot Inn, Gloucester, at 7.30 p.m.

April 20. District 2. Sheffield Section, at G6PY, 13, Huddersfield Road, Barnsley, at 7.30 p.m.

April 24. District 12, at The Ark Café, Temple Fortune, at 7.30 p.m.

April 24. District 14. East London Section, at G6UT, 28, Douglas Road, Chingford, at 7.30 p.m.

April 25. District 14. Essex Section, at G2LZ, Stilemans, Wickford, at 7.30 p.m.

April 25. District 15. At G2UV, 143, Abbott's Drive, Wembley, at 7.30 p.m.

April 28-29. District 14. Field Day, at Rookwood Hall, Abbess Roothing.

May 2. District 1. Manchester Section, at Brook's Café, Hilton Street, Manchester, at 7 p.m. Talks by G6TW and G6QA.

May 3. District 5. At Full Moon Hotel, Bristol, at 7.30 p.m.

May 4. District 13, South London and District Transmitters Society, W. Norwood Brotherhood Hall, at 7.30 p.m.

May 6. District 7. At Hand and Spear Hotel, Weybridge, at 2.30 p.m.

May 6. District 2. Newcastle Section meeting.

***May 6.** District 5. Conventionette at Grand Hotel, Broad Street, Bristol. Tickets, 5s., from G6QW. 12 noon, assemble; 1 p.m., luncheon; 3 p.m., business meeting; 4.30 p.m., tea; 5 p.m., station visits.

May 6. District 18. Informal gathering at Bellevue Hotel, Scarborough, at 3.30 p.m. Tickets, 2s. 6d., from G6OO.

May 6. District 7. At Hand and Spear Hotel, Weybridge, at 2.30 p.m.

May 9. District 5. At Talbot Inn, Gloucester, at 7.30 p.m.

* The Secretary will represent Headquarters at this meeting.

DISTRICT 2 (North-Eastern).

The Sheffield Group met at G5HK on March 21. Owing to the closing down of the Angel Hotel, a new meeting place for this group has to be found. The April meeting will be held at G6PY on the 20th inst. Sheffield and District members wishing to attend are requested to advise G5HK, who is arranging transport.

The Bradford Group are asked to communicate with Mr. C. A. Sharp, G6KU, 316, Poplar Grove, Great Horton, who is desirous of providing all interested with the dates of local meetings and field days. From this area BRS1151 reports that when his aerial (which is an indoor type 16 ft. 8 in. long) is in the magnetic N-S direction, reception on 14 mc. is much improved, and 28 mc. is possible, When the aerial was due N. and S., 28 mc. reception was nil.

At the next Middlesbrough Group meeting, to be held at the Royal Hotel on the 20th inst., a schedule of lectures will be prepared. At the March meeting much interest was shown in R.E.S.

DISTRICT 3 (West Midlands).

It is regretted that the Staffordshire report for March went astray, due to a postal error which did not come to light until late in the month.

The District Conventionette was attended by 45 members and friends during which a very interesting and comprehensive report was given by Mr. J. Clarricoats, G6CL (Secretary), who also answered many questions on various matters. After tea a circular tour of stations took place, stations visited being G5NI, 5VM, 6XQ, 2PD, and 5BJ. Thanks are extended to all who attended, and also to those who undertook the various odd jobs. Active stations are G6NJ, 5YY, 5BJ, 5NI, 6XQ, 2WD, 6KI, 5TL, 2AK, 6AS, 6DL, 5ML.

An interesting report is to hand from BRS1066, who states that he heard W1DBM on 1.7 mc. at 0630 G.M.T., March 18. He is now carrying out some special observations on commercial interference for Headquarters.

DISTRICT 4 (East Midlands).

G2SD reports that most of the members in Derbyshire are active and welcomes 2AFV, who is only thirteen years of age. Can any younger member boast an A.A. licence? (Congrats, YM.—Ed.) G5HT and 2SD are planning an extensive 56 mc. campaign; they hope to carry out tests between moving cars, and also with an aeroplane.

G5VH reports the usual activity from his county and mentions that the Leicester Amateur Radio Society are to hold a field day during May for the purpose of testing direction-finding apparatus. Several members from this county spent an enjoyable day at the Birmingham Conventionette.

G5YF reports excellent progress from Northants, and states that the Kettering Society showed a balance of over £31 at their annual general meeting on March 26. The membership of the Society is now over 80, and a short-wave group is being formed. In conjunction with the B.T.H. Radio Society, the Kettering Society intend to organise a field day in the near future.

G2IO reports that 15 members attended the Notts County meeting on March 24; these meetings will be held on the second Saturday in each month throughout the year. Plans have been made to organise a 28 mc. field day on the second Saturday in May, which will be the first event of its kind held in the district.

As field days appear to be holding a great attraction, the D.R. would be interested to hear from members likely to support a 56 mc. event, as it should be possible to link up the whole district with suitable gear erected on high spots.

DISTRICT 5 (Western).

Arrangements have been made for the Annual Conventionette to take place on Sunday, May 6, at the Grand Hotel, Broad Street, Bristol. Members will assemble at mid-day and lunch will be served at 1 p.m. The inclusive charge will be 5s., and in order that the necessary catering arrangements may be made, all members who propose attending are asked to advise Mr. W. B. Weber (G6QW), at 2, Balmoral Road, St. Andrews, Bristol, before May 1. This District is well known for its fine Conventionettes, and this year will be no exception. Members from other Districts are specially invited and are assured of a hearty welcome.

The Bristol Section held their usual monthly meeting during March, when Mr. W. A. Andrews, B.Sc., A.I.C. (G5FS) gave a most interesting lecture on "The Story of Matter," illustrated by many instructive experiments. Congratulations to G5JU, who has now qualified for his W.B.E., W.A.C.

STANDARD FREQUENCY TRANSMISSIONS.

SUNDAY, APRIL 29th, from G6NF London.

0930 *BST.*	3525 *KC.*
0940 *BST.*	3625 *KC.*
0950 *BST.*	3725 *KC.*

Accuracy within 0.01 per cent.

The Gloucester Section members, from reception of calls heard over the air, are mostly active, but no report has been received this month.

The Wiltshire members still continue to keep their Letter Budget up to its high standard and the Budget is supported by most of the active members.

The Oxfordshire Section members all reported active and many are preparing for 56 mc. tests in the near future.

New calls are: 2ALA ex BRS1230 and 2ABM ex BRS1140.

DISTRICT 6 (South Western).

The letter budget continues to be well supported, contributions being well up to standard, and as at present constituted, it is practically impossible to accommodate a larger number of contributors in the two-monthly circuit. Those who do not contribute at present, and would like to do so, are asked to send a card to the D.R. Any suggestions from District members or from others will be welcomed. Most members are active, though there is an evident falling off in 14 mc. work. The other bands, however, are all receiving attention with 3.5 mc. phone occupying the time of a number of members. Various types of modulation systems are in use with grid circuit modulation and choke control of the sub-amplifier being prime favourites. The 56 mc. experiments between G5GD and 5SY continue, and seem to have shown up the superiority of the super-regenerative receiver over the super-het for this band.

In view of the fact that the membership in the District seem to be roughly concentrated around Taunton, Exeter, Plymouth, and Truro, the D.R. would like to receive comments regarding the question of holding monthly meetings of these groups at members' homes.

The D.R. commends for serious consideration the new "R.E.S." project, and urges all who consider their amateur radio as an experimental subject to send in their application without delay. This is the sort of thing that has been badly needed. G5SY has had no challenges yet to his two hours' W.A.C. record. (See "Scotland"!—Ed.)

DISTRICT 7 (Southern).

The March meeting at Weybridge again attracted a large attendance. The D.R. gave a talk on short-wave superhetrodyne receivers, and most members present took part in the ensuing discussion. This was followed by a discussion on R.E.S., and, judging by the enthusiastic reception accorded, this project should be well supported by No. 7.

Arrangements have now been completed both for National Field Day and the Conventionette. For N.F.D. two stations are to be run, one in charge of G2NH at last year's site, Mr. Jones' Farm, High Street, Walton-on-the-Hill, and the other in charge of G6GZ at Farnham. Members who will be able to operate these stations are asked to send their names to their C.R. as soon as possible.

Conventionette has been fixed for June 24 at the Hand and Spear Hotel, Weybridge, Surrey. Fuller details will be given in next month's notes, but in the meantime the D.R. will be pleased to hear from all who hope to attend, in order that some idea as to the probable attendance can be given to the caterers.

The letter budget this month contained much of interest, including a detailed report of the 56 mc. activities in the Southsea area.

The May meeting will be held at the Hand and Spear Hotel, adjoining Weybridge Station, on May 6, at 2.30 p.m.

DISTRICT 8 (Home Counties).

Once again all C.R.'s report, a fact which needs no further comment.

The D.R. was pleased to meet several members of this District at the March meeting at the I.E.E., and hopes that more members will avail themselves of these interesting evenings.

Our two A.A. stalwarts at St. Ives have now blossomed out with full tickets, and we wish them all the best. There will probably be a spot of QRM for them in the future, as the D.R. understands that VU2AB is expected home shortly, and he hopes to be on the air from St. Ives with a G call sign.

The usual stations are all active.

DISTRICT 10 (South Wales and Momouth)

Although there are very few reports to hand this month, it is a pleasure to record the fact that our monthly meetings are supported by everyone within reach of Newport.

Other than the Conventionette, which will have been held prior to publication of these Notes, the item of most importance, and fully discussed at the meeting, is the National Field Day.

Two stations will be put in the field : " A " under G5WU and " B " under G2XX.

Station " A " will be situated on Leckwith Hill, Cardiff ; Station " B " on a site outside Newport.

Will those members who have not already intimated their desire to join one of the camps, please get in touch with the owners of either of the above call signs ?

It is of interest to record that G5WU has had further successful contacts with U.S.A. stations under Group 10*A*, 1.75 mc. Tests, working W1DBM and W1CHV on March 3, and W1DBM and W1BR on March 17.

Just a reminder : please remember the conscientious efforts of your C.R.s ; they deserve your support, so pass along the reports O.M.s.

DISTRICT 11 (North Wales).

Seven members (G2II, 5FU, 6IW, BRS1060, 1156, 12711, and 1303) paid a visit to the District 1 meeting held at Liverpool on March 21, when definite arrangements were made for a 1.7 and 56 mc. Field Day to be held on July 22. The two Districts are to co-operate on this occasion, and further details will be available later.

G5FU is building a 56 mc. transmitter for this event, which should be on the air by the time these notes are published. BRS1156 and 1211 on March 25 took a 56 mc. receiver to the top of Prestatyn Mountain and were successful in hearing R2 fone from G5MQ of Liverpool.

Members of the district are now at work preparing the gear for their N.F.D. " A " station.

We welcome 2BUN, BRS 1325 and 1366 as new members.

Sunday, March 18, was notable for the fact that at G6IW's QRA a record meeting was held, ten members being present. These meetings are held every Sunday evening at the above address, and as N.F.D. is only two months away, will all members please try to attend ?

DISTRICT 12 (London, North).

Abundant proof of interest in District matters was forthcoming at the March meeting, attended by some 25 members. In the absence of the D.R., G6CL officiated, and introduced Dr. G. Bloomfield (G5MG) and Mr. D. N. Corfield (G5CD) to deliver short talks on their recent 56 mc. experiments. Considerable interest was shown by all present, and without doubt No. 12 will again come to the fore in summer time activities on this band. A suggestion by G6CL that a permanent 56 mc. circuit be installed between his station and that of G5MG will, it is hoped, lead to interesting results. The possibility of using a pair of circular hoop aerials arranged 180° apart was also discussed, as was the suggestion to employ old-fashioned crystals for detecting purposes. G5CD described an aerial arrangement erected in the loft of his house which permits the changing of its direction at will. Details of a new superhet he has under construction were given. G5MG mentioned that his experiments with G5VY had in the main been directed towards obtaining reliable *house to house* communications, rather than an attempt to establish long distant contacts. Both speakers were of the opinion that no real DX could be achieved with super regenerative receivers ; a forecast that ultra short waves may eventually be used for rural telephony work by P.O. subscribers, was made by G6CL. He considered that it may be possible one day to " dial " a frequency in the same way that an ordinary exchange line is " dialled."

Following the technical discussion, a business meeting took place, during which several important matters were settled.

As from April 1, the old form of book letter budget was put into operation, it being considered that the previous method was unsatisfactory. Arrangements have been made for local groups of members to hand the budget to one another, thereby saving circulation time. Members who were not present at the March meeting, and who wish to contribute, are requested to advise the D.R.

To meet the wishes of certain transmitting members arrangements have been made to hold a District " evening on the air " each month. These " meetings " will commence at 9 p.m. local time on the first Friday in each month. The 7 mc. band will be used.

A rehearsal for N.F.D. will take place on Sunday, May 13, at 10.30 G.M.T., when G6WU will operate his " B " station gear from the Orange Tree, Totteridge. All members will be welcomed.

The April meeting will be held on 24th inst., at the Ark Café, Temple Fortune, at 7.30 p.m., when Mr. A. T. Mathews (G5AM) will give a talk on cathode ray oscillograph work. Following this a sale of *good* apparatus will take place, 25 per cent. of the proceeds being handed over for N.F.D. expenses. Thanks are extended to Mr. Pidsley (2ALZ), who donated two hot-wire ammeters at the March meeting. The proceeds of a subsequent " raffle " to decide their new owners were handed to the District Treasurer (G6FI) for N.F.D. expenses.

Arrangements have been completed for the rewinding of the District M.L. convertor donated by Mr. Radford (G2IM). Contributions to offset the cost of this work will be welcomed from *all* members.

Congratulations are offered to Mr. E. S. Wilson (BRS956), who is now G5CW.

DISTRICT 13 (London, South).

Owing to pressure of work the D.R. has been off the air recently, and as no one has reported, he has been out of touch with district activities.

The annual general meeting of the South London D.T.S. was held on March 2, and was followed by a talk by G2NH on single signal supers.

Will any member having spare radio parts please send them along to G6HP as he is trying to collect some gear for the Radio Society of the Royal Normal College for the Blind in Upper Norwood ?

South London D.T.S. meetings are held on the first Thursday in each month at the Brotherhood mall, West Norwood, commencing at 8 p.m. All Hembers are welcome.

DISTRICT 14 (Eastern).

Elsewhere in this issue will be found a notice regarding the merging of the London East District with the rest of Essex. The re-arranged District will be known as District 14 (Eastern). In order to enable members to get together, it is hoped to hold meetings in various parts of Essex. March meetings were held at G6IF and G6UT, and the attendance in each instance was 12; at the latter meeting 2APS displayed films showing the manufacture of valves. Meetings for April have been arranged as follows:—

Tuesday, 7.30 p.m., April 24, at G6UT, 28, Douglas Road, Chingford.

Wednesday, 8.15 p.m., April 25, at G2LZ, "Stilemans," Wickford.

Another Field Day has been arranged for April 28-29, and the venue will be "Rookwood Hall," Abbess Roothing. Will those intending to be present notify the D.R., so that provisioning can be made? The following have reported to G5UK during March: G2DQ, 2KT, 2LZ, 2SA, 2WG, 2YI, 5VQ, 6CT, 6IF, 2BWP.

Arrangements have been made for G6UT to operate the "A" and G6CT the "B" station during N.F.D. Full details next month.

DISTRICT 15 (London, West and Middlesex).

At the March meeting, which was attended by 17 members, discussion took place regarding National Field Day. Arrangements have been made for the "A" station to be operated by G2UV and G6WN, whilst the "B" station will be under the control of G6YK and G6CJ. Members who have not yet replied to the D.R.'s circular letter regarding N.F.D. arrangements are requested to do so immediately. In the event of any member not having received this communication, he should get in touch with G6WN.

The date and time for the April District meeting will be found in the District Calendar.

Only one report arrived for the March Letter Budget. Need more be said?

DISTRICT 16 (South-Eastern).

Six members were present at the last meeting of North Kent amateurs, held at G5OJ on March 17. Tentative arrangements have been made for the group to hold their own little contest, which will probably take place on April 21 and 22. The next meeting will be at G5LB, 45, Monivea Road, Beckenham, and all visitors will be welcomed.

Tunbridge Wells held their first local meeting on April 1 at G5OQ, who is to be congratulated on getting them together so well.

Folkestone are active as usual, and G6XB's station is looking more commercial than ever, so if you hear anything that sounds like a twin brother of RPK, you will know that it is he!! G2IC has at last worked VU2FY, having kept a sked at 20.00 G.M.T. every Saturday since the beginning of December.

We are glad to report that G5MP is now on the mend and wish him a speedy recovery.

G6AI, 6RQ, 6QC and 2MI were active during the 1.7 mc. test; 6RQ has had a report from South Australia on his 7 mc. signals when using 9 watts. 2AVC is a new member in Maidstone, who has only to pass the Morse test for his full licence.

Activity is also considerable in Gravesend, and it is hoped that all local members will pull together and become a really lively section of the Society.

Conventionette is drawing nearer. May we remind you that it is to be held at Larkfield on May 27? Tickets, which are 4s. inclusive, may be obtained from the D.R. As many as possible are requested to purchase their tickets prior to the actual day.

Larkfield Road House is on the main road, four and a half miles the London side of Maidstone, and is very clearly labelled.

There is no report from Sussex this month although G2AO, 2CF, 2KV and 5JZ are heard active.

Mr. T. Woodcock (G6OO), our D.R. for East Yorkshire, in action.

DISTRICT 18 (East Yorkshire).

The Bridlington Short Wave Club is now being formed. G5FV is experimenting with centimetre waves, and 2AMM is engaged with television.

NORTHERN IRELAND.

A letter from Mr. W. J. Thompson, who was lately BRS1179, has just reached the D.R. W.J.T. has changed his abode to Hong Kong, and it is possible that in the near future a new call bearing the prefix of that country will be heard; in any event he has our best wishes for his future success.

We have to record two new call signs this month—Mr. Milliken (ex 2ABT) is now GI5JN, and Mr. Adams (ex 2AYA) GI5AJ. The former was omitted from the list of operators for station A arranged for forthcoming N.F.D.

GI6TK took part in the recent low power contest. GI5QX, 6WG, 6YW, 5MZ, 5UR, 5JN, 5HV and 2SP are all active.

GI6WG comments on SU1EC's letter in the January BULLETIN, and states he has been signing off with "... and 73, etc," which covers a multitude of sins. He also reports that some "spitch" merchant has been using his call, and would very much like to locate the culprit.

SCOTLAND.

Preparations for the Field Day in June are now under consideration. "A" District has fixed station "A" call as G5DK, and station "B" as G2MA, while in "D" District, the calls will be G6MF and G6FN for stations "A" and "B" respectively. The station calls for "B" and "C" Districts are not yet announced.

Owing to a severe illness, Mr. Kyle (G6WL) has been obliged to give up radio, and has been abroad to recuperate. We take this opportunity of extending the good wishes of all our members to Mr. Kyle for a speedy return to his normal good health.

During the past month there has been a gratifying influx of new members, eight in "A," and two each in "C" and "D" Districts.

Mr. Maxwell, BRS1200, of Musselburgh, has been allotted the call G2RQ. Three BRS members have received "A.A." permits from the G.P.O. The new calls are 2AHD, Mr. Imrie (BRS535); 2BXX, Mr. Adams (BRS1261); and 2ARA, Mr. Murray (BRS 1306).

Recently, on 14 mc., G2MA succeeded in working all continents in 1 hour 40 minutes. This is believed to be a record.

(G6QB claims the record with 55 minutes.—Ed.)

The QRP Contest in March was supported by G5HL, G5ZX and G6IZ.

In the Junior B.E.R.U. Contest, G6IZ scored 143 points, which is a good total, taking into consideration the apparent lack of support from certain parts of the Empire.

It is with regret we learn that G6JX has resigned from the Society. However, this is only temporary, and it is to be hoped that we shall soon have him in our ranks again.

"B" District are preparing for 56 mc., and hope to break all records this summer. G6ZX, of Clarkston, has already resumed transmission, but has not received any reports so far.

The apparent stagnation in "C" District has been the cause of considerable worry at Scottish Headquarters of late. Ultimately it was found necessary to make a personal appeal to each of the members in the District possessing transmitting permits. The response has been very gratifying, there being evidenced a general desire to bring life into the district. It is quite evident from the letters received that the devitalised state of the district has irked many of the members, but it rather looks as if everyone had waited for some one else to make the first move.

The first move, we are glad to say, is now an accomplished fact; and we are very pleased to announce that Mr. Allan (G5NW), 34, Forthill Road, Broughty Ferry, has undertaken to organise the activities of the district during 1934. We are gratified at other offers received, and will take advantage of them as occasion arises. The matter was very urgent, however, and as Mr. Allan was prompt to respond to our appeal, we were very pleased indeed to accept his offer without further delay. More will be heard of the district next month, but meantime Mr. Allan is busy with the arrangements for National Field Day. We would earnestly appeal to *all* the members to give Mr. Allan their loyal support, as his task is, at best, not an easy one, and can be rendered impossible if he does not get the backing from the members to which he is entitled.

Unorthodox Crystal Control at G6FU.

With reference to the above subject, Mr. J. H. Cant (G6FU) advises us that observations have been made on the behaviour of his single-valve c.c. transmitter, details of which appeared in the February issue of The Bulletin. Particular attention was paid to a study of the three "dips" noticed in the plate current meter when adjusting the transmitter, it having been found that under prolonged operating conditions the wave had a slight tendency to creep from one "dip" position to another.

Experiments made to trace the origin of these "dips" definitely established the fact that they were due to spurious subsidiary frequencies slightly off the true crystal fundamental. A new crystal made from a piece of specially selected quartz has been cut and carefully ground, and it is now found that the frequency remains dead constant. It is hoped to carry out some tests using mains supply in the near future.

The author of the original article desires to thank those members who have written to him in connection with the subject.

EDITORIAL—(*Continued from page* 311).

In amateur Contests everything depends upon the integrity of the entrant, whose log sheet has to be accepted as sole proof of his accomplishments, for no effective scheme of checking his statements has yet been found possible. In other words, we have to rely upon the honesty of the contestant throughout. Once we lose faith in this, the day of Contests will be at an end.

These comments are not written with the idea of blaming our members in any way whatsoever, but rather to illustrate the difficulties which are encountered by those responsible for the organisation of our Contests. Considering the matter from all angles, we think it will be agreed that their task is not as simple as some would have us believe.

OSCILLATIONS—(*Continued from page* 320).

electricity, protons and electrons. All matter is made up of molecules which in turn are made up of atoms. Normally an atom is electrically neutral and consists of an equal number of protons and electrons. The number of protons in an atom is given by the atomic weight of the element. All protons are gathered together to form a central nucleus with which about half the electrons are intimately associated and which cannot be separated under ordinary methods of attack. The remaining electrons are distributed round this nucleus of protons and electrons and are not so difficult to remove. It is the disrupting of this central nucleus that has been termed " splitting the atom." In the case of conductors these outside electrons are easily removed ; in the case of insulators, considerable force is required to cause them to leave. It is when we have electrons in motion that we obtain an electric current.

Conclusions.

We should now be in a position to complete our analogy between waves in a material system and electromagnetic waves in ether, so let us take stock of the position. We may regard the ether as an all-pervading medium having properties analgous to elasticity and density. We know that the energy oscillating between an electromagnetic and electrostatic field is analogous to the energy of a moving particle changing from kinetic energy to potential energy, and that the mathematical relationship covering these interchanges of energy are generally the same. We also know that if the particles constituting a material medium having density and elasticity perform simple harmonic motions in a given time phase that a wave will be transmitted through the medium. We are able to picture electricity as a collection of tiny particles of electricity in the same way that a spadeful of sand is a collection of tiny particles of sand. It should, therefore, not be difficult to visualise an electromagnetic wave through the ether as a wave produced by the motion of electrons in the same way as a wave through a material medium is produced by the motion of the particles constituting the medium.

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" Short Wave Wireless Communication." Ladner and Stoner.
" What is Electricity? " H. H. Payne.

R.E.S.—(*Continued from page* 336).

in some cases G.M.'s are themselves busy with the formation of as many as five Groups, and therefore they must not be disappointed if they do not get a reply by return post.

Providing nothing unforeseen occurs, membership certificates should be issued during the coming month. The new R.E.S. badge, button-hole or tie-pin type, is now available from H.Q., price 1s. 6d. This badge and the certificate will be light blue in colour.

I shall be very glad to receive suggestions for the improvement of the Section at all times.

All application forms must be addressed to me, c/o 53, Victoria Street, but my address for all other correspondence is : H. C. Page, Plumford Farm, Ospringe, Faversham, Kent.

DRIVEN AMPLIFIERS—

(*Continued from page* 313).

could be found in the anode circuit at any setting of the tuning condenser.

In commercial high-power practice other considerations enter, such as long leads (due to the size of the apparatus) whose reactance is sufficient

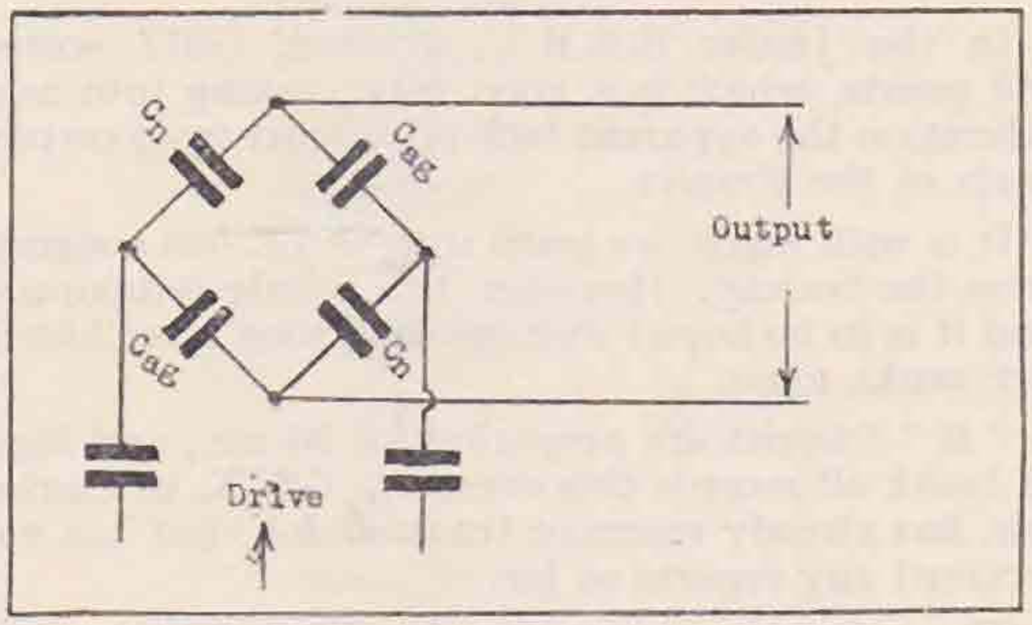

Fig. 5b
Shows Fig. 5a redrawn in bridge network form. Perfect voltage balance and symmetry are claimed for this arrangement.

to upset the bridge balance, necessitating the use of series condensers to cancel this effect. Also the power factor of the condensers forming the bridge must be taken into account, but in amateur practice such considerations may be neglected.

Ham Parodies.

No. 2.

(*With apologies to the writer of the well-known song.*)

He was a very handsome brasspounder,
She was a very ardent YL,
He used to QSO her each Sunday at ten,
They used to rag-chew and chatter for hours and hours and then,
He visited the Annual Convention,
She came to that Convention as well,
Now they both use the self-same transmitter, because
He was a very handsome brasspounder, he was.

" PIPS."

EXCHANGE AND MART.

RATES.

Private members' advertisements 1d. per word, minimum 1s. 6d. Trade advertisements 2d. per word, minimum 3s., cash wih order. First line, if desired, will be printed in capitals. Copy to reach 53, Victoria Street, or the Advertising Manager, Parrs, 121, Kingsway, W.C.2. not later than the 1st of the month preceding date of publication.

AMERICAN SHORT-WAVE RECEIVER.—Four valves in three aluminium units interchangeable coils, all ranges; has very fine tone L.F. amplifier. £5, inclusive, spare set valves in original cartons. Brown's speaker, good accumulator, and spare Varley output transformer. Receiver modern design. Advertiser giving up wireless, having no space.—SEXTON, Grand Pump Room Hotel, Bath.

EDGCUMBE ELECTROSTATIC VOLTMETERS, 500-2000 volts, 15s.; Hot Wire Ammeters, ½ amp., 2s. Plus postage. For sale or exchange.—2.ALZ, 9, Sharpleshall Street, Regent's Park, N.W.1.

EXTENSION RODS cut and drilled to order, (complete with two brass collars), 2d. per inch. Binocular H.F. Chokes, 20-2,000 metres, 2s.—G6WQ, 10, Aberdour Road, Goodmayes.

G6VP.—'PHONES, TRANSFORMERS REWOUND. Brown's "A" a speciality; any resistance; 24-hour service. Lowest terms in the trade.

G6DS. For neat and snappy QSL Cards, Log Books and Pads. Send for samples. QRA, "Inglenook," Orlando Drive, Carlton, Nottingham.

GUARANTEED CRYSTALS, any frequency, 3.5 and 1.7 mc. bands, strong oscillators, perfectly finished, 7s. 6d. Dustproof plug-in holders, take 1-in. dia. crystals, snips at 3s. 6d. Special holders to order.—G6WQ.

THREE TRANSMITTERS.—One 1.7 mc. C.O.P.A., one 7 mc. C.O.P.A., and one 1.7 mc. T.P.T.G. Complete with valves, meters, crystals, etc., and two short-wave receivers, all in perfect condition. Also pounds' worth of spare Transmitter and Receiver Components, Cabinets, Valves, Chokes, Coils, etc. Accept £15 or near offer. The whole lot.—G5VS, 14, Kilworth Avenue, Southend-on-Sea.

WANTED.—1000-0-1000 volts 150 ma. Transformer with 220 volts primary; 4 volts 6-amp. Transformer with 220 volts primary; 1 mfd. Condensers, 1,500 volts working; 2 mfd. Condensers, 1,500 volts working; .0003 Condensers, 2,500 volts working; .002 Condensers, 2,500 volts working. FOR SALE: Ferranti Portable A.C. Voltmeter, .220, 25, and 8-volt readings, £3. Cost over £5, little used. Ferranti Projecting Type Milliammeter, reading 150 ma. Nearly new, £1. Also quantity of Inductances, H.F. Chokes, Resistances, Condensers, etc. Prices on application.—G2IN, 28, Denmark Road, Southport, Lancs.

Patents and Trade Marks.

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