

R·S·G·B

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BULLETIN

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN



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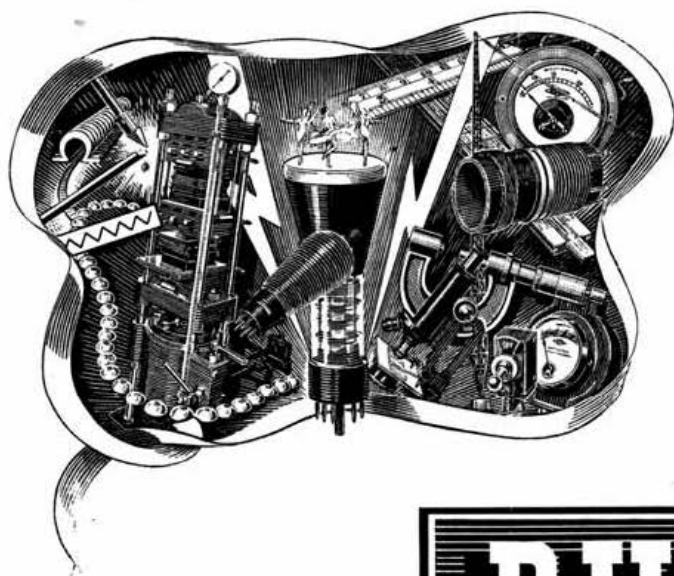
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The
Incorporated Radio Society
of Great Britain.

NEW RUSKIN HOUSE,
LITTLE RUSSELL STREET,
LONDON, W.C.1.

December 15th, 1944.

DEAR SIR (OR MADAM),

I am directed to advise you that, in accordance with the Articles of Association, the EIGHTEENTH ANNUAL GENERAL MEETING of the Society will take place at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2, at 2 p.m. prompt, on Saturday, the 30th day of DECEMBER, 1944.

AGENDA.

1. To approve the Minutes of the Seventeenth Annual General Meeting as published in the January, 1944, issue of the R.S.G.B. BULLETIN.
2. To receive, and if approved, adopt the Honorary Treasurer's Report and the Audited Accounts for the year ended 30th September, 1944.
3. To receive and, if approved, adopt the Council's Annual Report.
4. To announce the names of Officers and Members to serve on Council for the year 1945.
5. To elect an Auditor for the year 1945. The retiring Auditor being eligible offers himself for re-election.
6. To pass a vote of thanks to the President and Council of the Institution of Electrical Engineers.
7. For the purposes of an Annual General Meeting.

Following the meeting Mr. R. H. Hammans (G2IG) will deliver a Lecture entitled "Communication Receiver Measurements and Standards of Performance."

Yours faithfully,

H. A. M. CLARK
Honorary Secretary

REPORT OF THE HONORARY TREASURER

Herewith are copies of the Society's audited accounts for the year ended 30th September, 1944. The following comments may assist Members in their perusal of the Accounts.

INCOME AND EXPENDITURE ACCOUNT

1. This account summarises the Society's financial operations for the year and compares them with those of the preceding year.

2. EXPENDITURE.

- (a) The increase of £246 in the charge for Rent, Rates, &c., reflects the first full year's occupation of the new Headquarters.
- (b) The following factors are responsible for the heavier charge for Travelling and Entertaining :—
 - (i) As Headquarters are now in Central London, there are many more visitors, including, I am glad to say, several from overseas.
 - (ii) More of the Society's Officers attended the Provincial Meetings which have been held.
 - (iii) The fares of four Members of Council who live in the Provinces are included in this figure.
- (c) The growth in membership, together with higher charges for paper and printing, account for an increase of nearly £500 in the net cost of the *R.S.G.B. Bulletin*.

3. INCOME.

- (a) It is satisfactory to record that the subscriptions from Members exceed those for the preceding year by nearly £1,200, and this is the financial result of the rapid growth in membership which has taken place during the past three years.
- (b) The net income from the *Amateur Radio Handbook* and the *Radio Handbook Supplement* shows a decrease of just over £1,100. This large fall in revenue is solely due to paper rationing and delays in printing. At 30th September, 1944, the Society had been awaiting delivery of 45,000 copies of its publications for several months.

4. GENERAL.

After making provision for the taxation arising on the Net Income for the year and placing a further £1,500 to the Post-War Development Fund, the net income for the year is just under £500.

BALANCE SHEET

1. This may be likened to an instantaneous photograph taken at the close of business on 30th September, 1944, and shows all the assets the Society possessed, and what debts it owed, at that time.

2. The Society's assets totalled over £12,000 at the balancing date and—and this is a most important factor—those assets, to the extent of £11,600, were made up of cash and investments.

3. The liabilities at 30th September, 1944 (including that for taxation) amounted to just under £1,000.

4. During the past year the policy of building up the Post-War Development Fund has been pursued, and in addition to the amount of £1,500 taken out of the net income for the year, a further sum of £1,000 has been transferred from the accumulated profits of past years. The Post-War Development Fund now stands at £5,000, and this sum, together with £1,000 in the War Contingencies Fund (which it is hoped will not now be called on) has been separately invested in gilt-edged securities.

5. As may be gathered from the foregoing remarks, the Society's financial position is an extremely strong one and one of which its members may well be proud. Such a strong position permits a reasonable hope that in this case "Post-War Plans" may actually become "Post-War Realities."

PRISONERS OF WAR FUND

During the past year the "Members only" section of this Fund has been completely used up, and the cost of all parcels, whether to Members or Non-Members, has since been borne by the "General Fund."

The position of those members in the hands of the Japanese has been considered and a part of the donations received has been put aside against the time when it will be possible to do something. The sum so put aside is called the "Far East Fund."

We all hope, I am sure, that it will not be necessary to maintain both the present Funds in existence after 30th September, 1945.

THE PILOT OFFICER NORMAN KEITH ADAMS PRIZE FUND.

As full particulars of the origin of this Fund have already been published in the Society's Journal, it is not necessary to enlarge further on them here. I can report, however, that since 30th September, 1944, the cash at Bank of £150 has been invested in 3% Defence Bonds and that the Inland Revenue Authorities have clearly stated that in view of the purposes for which the Fund has been established, no Income Tax will be payable on the interest received from the investments of the Fund. Thus the whole of such interest will be available for prizes, without any deductions.

A. J. H. WATSON, F.S.A.A.,
Honorary Treasurer.

INCORPORATED RADIO SOCIETY OF GREAT BRITAIN
NEW RUSKIN HOUSE, LITTLE RUSSELL STREET, LONDON, W.C.1

BALANCE SHEET as at 30th SEPTEMBER, 1944

1943				1943			
LIABILITIES				ASSETS			
CURRENT LIABILITIES:—				CURRENT ASSETS:—			
Sundry Creditors—				Cash in Hand and at Bank ...			
422	For American Publications	410		2925		5591	
3	" Printing Bulletin	9		Sundry Debtors—			
54	" Current Expenditure accrued			2841	For Sale of Publications	212	
	and owing	52		91	" Advertising	88	
479			471	249	Stock (Publications, &c., at Cost)	300	
						152	
				6106			6043
Reserves—				FIXED ASSETS:—			
2195	For Subscriptions paid in Advance	2817		Investments (at Cost)—			
	" Taxation	1199		1000	£1000 3% Defence Bonds	1000	
	Less Reserve Tax Certificates held	700		2000	£2500 2½% National War Bonds	2500	
1154	" Provincial District Meetings Fund	98	499	Loan—			
100	" Past Presidents' Photographs	50		1000	(To H.M. Treasury, free of Interest and repayable on Demand)	2500	
50			3464			6000	
3499			3935	Furniture and Fixtures—			
RESERVE FUNDS:—				1	(at Cost less Depreciation)	1	
1000	For War Contingencies	1000		4001			6001
2500	" Post-War Development	5000					
3500			6000	Note. —There is a liability (not included in the above figures) of approximately £4200 for Society Publications ordered but not delivered at 30th September, 1944.			
ACCUMULATED FUND:—				10107			12044
2077	Balance 1st October, 1943	2629					
	Less Transfer to Post War Development Fund	1000					
		1629					
	Add Excess of Income over Expenditure for the year as per annexed account	480	2109				
552			8109				
2629							
10107			12044				

E. L. GARDINER, *President*,
A. D. GAY, *Immediate Past President*,

A. J. H. WATSON, *Hon. Treasurer*,
JOHN CLARRICOATS, *General Secretary*.

AUDITOR'S REPORT TO THE MEMBERS

I have audited the Balance Sheet of Incorporated Radio Society of Great Britain, dated 30th September, 1944, as set forth above and have obtained all the information and explanations I have required. In my opinion such Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of the Society's affairs, according to the best of my information and the explanations submitted to me, and as shown by the books of the Society.

JOHN OCKLESHAW, F.C.A.,
*Chartered Accountant,
Honorary Auditor.*

11, Haymarket, S.W.1.
November 14th, 1944.

INCORPORATED RADIO SOCIETY OF GREAT BRITAIN
**INCOME AND EXPENDITURE ACCOUNT for the Year ended
30th SEPTEMBER, 1944**

1942-43				1942-43			
EXPENDITURE				INCOME			
£	£	£	£	£	£	£	£
172	To Rent, Rates, Light, Heat, Water and Cleaning	418		3380	By Subscriptions	4564	
899	" Salaries, Staff Pensions and National Insurance	943			" Income from Sales:—		
22	" Telephone Charges	17		374	Sundry Publications, Society Badges, Books, &c.	488	
191	" Printing and Stationery	222		2436	Amateur Radio Handbook and Supplement	1305	
141	" Postages	181		2810		1793	
52	" Travelling and Entertainment Expenses	144			" Interest Received:—		
34	" Hire of Accommodation for Lectures and Two Council Meetings	51		30	3% Defence Bonds	30	
	" R.S.G.B. Bulletin:—			17	2½% National War Bonds	30	
1816	Printers' Charges, &c.	2385			Tax Reserve Certificates	9	
357	LESS Revenue from Advertising	459				69	
1459		1926					
18	" Legal Charges	53					
24	" Air Raid Precautions	26					
	" Repairs and Replacements	14					
8	" Removal Expenses						
16	" Sundry Expenses	3905					
3036		11					
37	" Depreciation—Furniture and Fixtures	515					
717	" Income Tax on this year's Income	75					
	LESS Excess Profits Tax refund	440					
345	" Excess Profits Tax						
50	" Reserve for Past Presidents' Photographs	1500					
1500	" Reserve for Post-War Development						
	Balance, being excess of Income over Expenditure for the year carried to Accumulated Fund	480					
552		6426					
6237		6237					

PRISONERS OF WAR FUND
RECEIPTS AND PAYMENTS ACCOUNT for the Year ended
30th SEPTEMBER, 1944

RECEIPTS				PAYMENTS			
	Far East £	Members only £	General £		Far East £	Members only £	General £
To Balance at Bank 1st October, 1943		216	238	By Cost of Parcels sent to Prisoners of War during the year, including			
„ Donations			437	Postages and Packing		216	184
„ Transfer from General Account	350			„ Transfer to Far East Fund			350
				„ Balance at Bank at 30th September, 1944	350		141
	350	216	675		350	216	675

E. L. GARDINER, *President.*A. J. H. WATSON, *Hon. Treasurer.*A. D. GAY, *Immediate Past President.*JOHN CLARRICOATS, *General Secretary.*

AUDITOR'S REPORT

I have vouched the Donations shown on the above Account with those published in the Society's Journal and have seen receipted accounts for all parcels sent to Prisoners of War. I have also received from the Bank a Certificate certifying the balance in hand at the 30th September, 1944. In my opinion the above account presents a true and correct record of the Donations received and the payments made by the above Fund, and is in accordance with the books and records of the Society.

JOHN OCKLESHAW, F.C.A.,

*Chartered Accountant,
Honorary Auditor.*

11, Haymarket, S.W.1.
November 14th, 1944.

THE PILOT OFFICER NORMAN KEITH ADAMS PRIZE TRUST FUND
BALANCE SHEET as at 30th SEPTEMBER, 1944

LIABILITIES								ASSETS							
Trust Fund	...	...	...	...	...	...	£150	Cash at Bank	...	...	...	...	...	...	£150
E. L. GARDINER, <i>President.</i>								A. J. H. WATSON, <i>Hon. Treasurer.</i>							
A. D. GAY, <i>Immediate Past President.</i>								JOHN CLARRICOATS, <i>General Secretary.</i>							

AUDITOR'S REPORT

I have audited the Balance Sheet of the Pilot Officer Norman Keith Adams Prize Trust Fund, dated 30th September, 1944, as set forth above and have obtained all the information and explanations I have required. In my opinion such Balance Sheet is properly drawn up so as to exhibit a true and correct account of the state of the Trust Fund, according to the best of my information and the explanations submitted to me, and as shown by the books of the Trust.

JOHN OCKLESHAW, F.C.A.,

*Chartered Accountant,
Honorary Auditor.*

11, Haymarket, S.W.1.
November 14th, 1944.

R.S.G.B. BULLETIN

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DECEMBER, 1944

No. 6

STOCK TAKING

THE last few days of the Old Year are traditionally set aside in business houses for the purpose of taking stock of goods and chattels. Our own Society takes stock annually in December—not of its goods, but of its actions. The current issue contains an account of the manner in which its Directors (the Governing Council) have discharged their duties to the membership since taking office last January. The Annual Report of the Council, as well as the Report of the Honorary Treasurer, should be read and studied carefully by every member, for they provide clear word-pictures of what has been achieved by the Society during the past year.

Resumes of Council Minutes, however carefully they

idea is not new—it was conceived at least 15 years ago—but up to the outbreak of the present war, financial considerations prevented the Council from proceeding beyond the discussion stage. Now, thanks to a greatly improved financial position, no serious difficulties should prevent the Society establishing a station which will compare favourably with Government and commercial experimental stations.

The suggestion has already been made that this Station should take the form of a Memorial to those members of the Society who gave their lives during the war. An excellent suggestion and one which will no doubt meet with much approbation, but two pertinent questions arise. Should the membership be given the opportunity to subscribe *as individuals* to this Memorial or should the full cost be borne by



The President, Council and Headquarters Staff
extend Seasonal Greetings and Best Wishes
for the New Year to Members everywhere

may be prepared, convey only a slight idea of the work which is dealt with at meetings. It is true that the salient features are recorded, but we doubt whether any reader, other than those few who have served in past years, really appreciates the time that is devoted voluntarily to Society business by the Members of the Council. As a case in point, the present Council deliberated, on a recent Saturday afternoon, for more than four hours on the subject of post-war licence policy. Two further hours were devoted to other subjects, of varying importance. Such long sessions are rare but throughout the past year no Council meeting has finished in less time than three hours.

Incidentally a full statement of Council's policy, in regard to post-war licence matters, will shortly be published, meanwhile, we urge patience, for it would be folly to rush into print until some measure of agreement has been reached with the authorities concerned.

The records of recent Council meetings show that careful thought has been given to many other subjects which can be grouped under the now generally accepted term "Post-War Development." Perhaps the project which will have the greatest appeal is the establishment of a Headquarters Station. The

the Society from its Post-War Development Fund? The views of members would be appreciated by the Council.

The post-war years will bring in their train many other major problems including that of improving the provincial representation on Council. The old cry "London rules the roost" has never, at any time, been true, but we are prepared to agree that it has seldom been found easy to enlarge provincial representation on Council, because very few provincial members have in the past been able to spare the time to make a journey to London once a month.

The professional Societies are in a different category; when a provincial member of such a Society is elected to the governing body, his very election is accepted as a compliment to his Company, whilst his absence to attend meetings in London is regarded as a normal business commitment. In the case of the election of a provincial member to the Council of the R.S.G.B. it is a different story, because most of our provincial members are amateurs, in the true sense, and as such they would find it extremely difficult to persuade their employer that their attendance at Council meetings is a business duty! Provincial members have

(Continued on page 96.)

SQUARE WAVES AND OTHERS

By SIDNEY C. DUNN, B.Sc. (BRS 6348)*

AMATEUR Radio as we knew it in peace-time, involved, for the vast majority, communication by amplitude-modulated carrier sine waves. There seems little doubt that after the war many more amateurs will use the cathode-ray oscillograph as a versatile tool and perhaps even television will come within the province of the home constructor. For many reasons these newer applications of radio demand the use of waveforms other than sinusoidal. The difference in behaviour between these waves and the more "old fashioned" ones is best understood by some concrete examples.

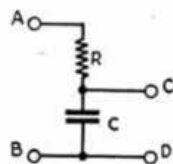


Fig. 1.
Phase retarding circuit.

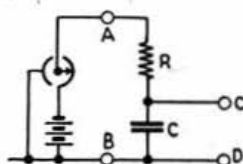


Fig. 2.
Equivalent circuit of square wave generator.

Square Waves

Consider the network shown in Fig. 1. If a sine wave of voltage is impressed across the terminals AB, the output across CD is a sine wave of smaller amplitude retarded in phase by a time depending on the value of RC and the frequency of the wave. If now an alternating voltage of square wave form is impressed on the input terminals, the output across CD is of a very different character. As will be shown later, we cannot compare input and output waves on a basis of amplitude and phase. For an applied square wave the circuit of Fig. 1 may be redrawn as in Fig. 2. On the input side of the network is connected a single-pole switch rotating at the frequency of the square wave. For half a revolution of the switch the point A is connected to a battery whose p.d. is equal to the amplitude of the square wave and for the other half revolution it is connected to B.

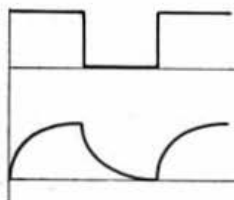


Fig. 3.
Output of RC circuit,
time-constant small.

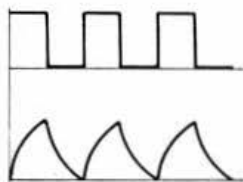


Fig. 4.
Output of RC circuit,
time-constant small.

rise to the steady-state value, the trace shown in Fig. 3 is sufficiently accurate where moderate turning speeds are accurate. If the rate of turning is increased, the "shorted" period will be enforced before the condenser is fully charged, and Fig. 3 will be modified as in Fig. 4. Similarly, Fig. 5 shows the condition when the switch is turning very fast. The problem which now arises is how to describe the action of the network on the wave. We can compare the relative amplitudes readily enough but what of phase? We must seek some description which takes into account the change in shape of the wave. It so happens that there is a mathematical operation which—for certain values of R , C and f at least—describes the foregoing action. This is the operation of "integration."

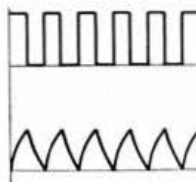


Fig. 5.
Output of RC circuit,
time-constant large.

Integration

In Fig. 6 (A) is a certain curve. Suppose now we measure the area enclosed by (i) the curve, (ii) the X-axis as far as "a" and (iii) the ordinate at "a." Plot this value to scale at the point "a." Repeat for various interval along the X-axis. If a continuous curve is drawn through the plotted points, we have at any point, a measure of the area under the first curve up to that point. This second curve is called the integral curve of curve (A) or curve (A) is said to have been integrated. If now we apply the process to the square wave shown in Fig. 7 we obtain the integrated curve as a triangular wave. This result is the same as obtained electrically by means of the simple RC circuit when the frequency was high enough or, for a fixed frequency, when the product RC was large enough. The essential requirement is that the time-constant RC of the circuit should be large compared with the periodic time of the square wave. When this condition is fulfilled we are justified in describing Fig. 1 as an integrating circuit.

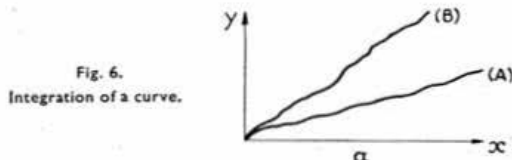


Fig. 6.
Integration of a curve.

Since the wave-shape has changed, the notion of phase has little meaning. The amplitude of the output wave is smaller than the input and in fact most accurate integration only takes place when the output is vanishingly small, when the curvature of the exponential wave is least in evidence. In this condition the voltage across the resistor is practically the same as that across both elements. When the output is taken across the resistor we have the well-known case of an RC coupling between amplifier stages.

It has been shown that when the time-constant is large enough, integration takes place across the condenser. The only voltage we have not considered

When a steady D.C. potential is abruptly connected across a series RC circuit, the voltage across the condenser rises exponentially to the steady-state value. If the voltage is then removed and the ends of the circuit joined, the condenser will discharge through the resistance, and the voltage across the former will fall exponentially. If the switch S were turned round slowly by hand the voltage across the condenser would rise and fall as shown in Fig. 3. It should be noted that although it would theoretically require infinite time for the voltage across the condenser to

is that across the resistor when the time-constant is small. This may be obtained from Fig. 3 by simple subtraction. Since the voltage across the ends of the elements is maintained as a square wave, the voltage across the resistor must be the difference between the square wave and that across the condenser. This wave is shown at (b) in Fig. 8. If the time constant of the circuit is reduced far enough the voltage across the resistor eventually becomes that in (c). The mathematical operation which describes the effect of this circuit is called "differentiation" and the action of the circuit may be expressed as follows.

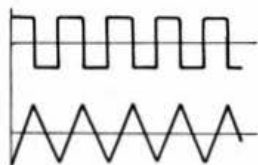


Fig. 7.
Integration of a square wave.

Differentiation

The amplitude of the output of a differentiating circuit is proportional to the rate of change with respect to time of the input voltage. For an ideal square wave, with true vertical risings, this would consist of "spikes" of voltage infinitely high, but since all practical square waves take a small definite time to rise and fall this voltage is finite and the description is accurate.

If we substitute an inductance for the capacitance in the foregoing circuits a similar result is obtained except that what, in the condenser circuit appears across the resistor, appears in the inductive circuit across the coil. The action is never quite so accurate, however, because the impurity (resistance) which exists in a coil forms a greater proportion than that normally found in a condenser.

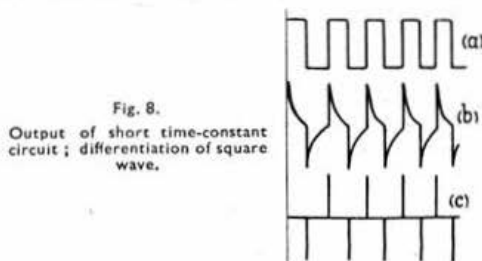


Fig. 8.
Output of short time-constant circuit; differentiation of square wave.

Ringing

If a square wave is impressed across a series RLC circuit, a damped oscillation is produced by each sharp edge which may or may not die out before the arrival of the next edge. By adjusting the value of R a single cycle at the natural frequency of the tuned circuit may be initiated (Fig. 9). In this way it is possible to generate a pulse of extremely short duration. The significance of this statement will be apparent when we come to consider the generation of non-sinusoidal waves. It would be proper, however, to review first the action of these voltages in valve circuits. Unlike sine-wave practice, it is not unusual to apply large amplitudes to the control-grid of a valve so that it is alternately heavily conducting and effectively cut-off. The amplification thus obtained is substantially independent of valve characteristics and the anode voltage simply swings between the full value of H.T. and a point not much above earth.

Another method of controlling anode current is to bias the valve well into cut-off so that only the extreme tip of the firing pulse "switches on" the valve. This

is because pulses are commonly sharper and narrower at their highest points.

Generation of Square Waves and Pulses

In general, non-sinusoidal waves are most useful when they have undergone differentiating processes. Integration is for the most part confined to one application, namely, the generation of linear time-bases, the shape of which will be recognised as the double integration of a pulse waveform. For this reason it is more important that the wavefronts be sharp than that they should have any particular shape. This requirement results in there being two classes of generator corresponding to "self-excited" and "driven" oscillators in sine-wave practice. Since, for a great many uses of these special waveforms the frequency is already fixed by the system to which they are being applied, driven oscillators become the focus of most attention. Again, because sine waves are only useful for triggering generators

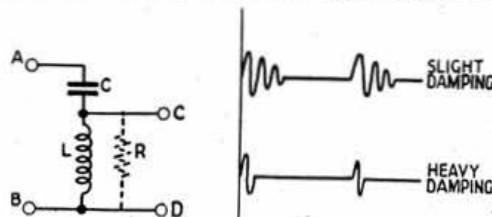


Fig. 9.
Ringing circuit. Waveforms with two values of damping.

when present in a large amplitude (since their slope at zero voltage is proportional to their amplitude) some means must be found of converting a sine wave into a sharp-edged wave of the same frequency. A simple way of doing this is to "clip-off" the negative half-cycles and differentiate the remaining positive ones. These operations are shown in order in Fig. 10. If necessary the last wave may be further differentiated to obtain a sharper pulse. We have seen that the main wave-shaping circuits are those employing R and C (or R and L) and those employing R , L and C . As might be expected, generator circuits also fall into either of these classifications.

RC Type Generator : "The Flip Flop"

In the circuit of Fig. 11, V_2 is biased to cut-off by means of a steady positive potential applied to its cathode via the potentiometer divider R_4 , R_3 ; C_1 being the normal decoupling condenser. In the quiescent state therefore V_1 is conducting heavily and

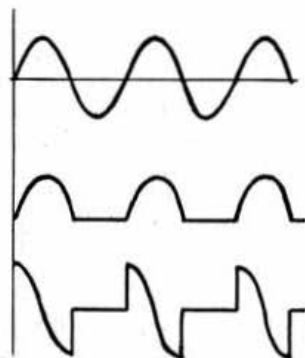


Fig. 10.
Shaping-circuit waveforms for sine waves.

V2 not at all. This means that due to the different voltage drops across the respective anode resistors, the anode voltage of V1 is low and that of V2 high. If now a negative pulse of short duration is applied to the grid of V1 the anode current of V1 falls and the anode voltage consequently rises. This rapid change is applied to the grid of V2 through the RC network where it appears as an amplified positive voltage. The anode current of V2 is then switched on by that

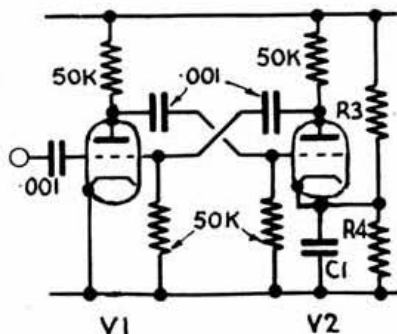


Fig. 11.
Flip-flop circuit.

voltage across R, which exceeds the standing bias, and the resulting voltage-drop across the V2 anode resistance is applied to the grid of V1 to hold it negative, in the same way that the grid of V2 was driven positive. The fact that V1 is cut off means that the conducting path from the anode of V1 down to earth, which normally exists in a conducting valve, is absent. In this condition the equivalent circuit is as shown in Fig. 12. The instant of the cut-off of the valve represents the switching of the H.T. voltage on

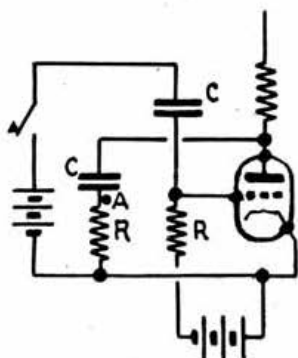


Fig. 12.
Equivalent circuit of flip-flop.

to the grid of V2 via the circuit RC. In the absence of the grid connection the voltage across the grid leak would be that shown dotted in Fig. 13 (c). Flow of grid current through R modifies this curve considerably and in practice it is considerably flattened. Meanwhile the point "A," connected to the grid of V1, after having been driven violently negative by the sudden fall in the anode voltage of V2, is rising exponentially towards zero. When it reaches the cut-off voltage of V1 the latter conducts rapidly by the same cumulative action which cut it off so suddenly and V2 returns to its normal biased state. It will be seen from the oscillograms of Fig. 13 (b) and (d) that firing pulses at the grid of V1 produce square waves at the anode of either valve.

RLC Type Generator : The Blocking Oscillator

Fig. 14 shows a circuit of a normal tuned-grid oscillator with leak bias provided by the network CR. If the time-constant of this network is made large compared with the periodic time of the oscillation, it will not recover in time to render the valve conducting at the end of each cycle, with the result that oscillation may be inhibited for several cycles while the condenser is discharging. With a suitable choice of C and R, and a tight coupling between the coils, the output may consist of a single heavily-damped cycle of oscillation. In this condition the circuit operates as a freely running pulse generator. By taking R to a negative bias voltage and applying a positive pulse across a small resistance inserted at the point "X," the circuit may be driven. It should be noted that the output waveform makes no pretence of being rectangular. What is important, however, is that by making the natural frequency of the tuned circuit high, we can produce at the anode a negative pulse having a very steep wavefront. This pulse when differentiated, may be employed to give a "spike" of voltage of extremely short duration.

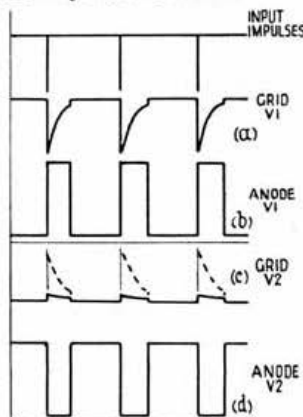


Fig. 13.
"Flip-flop" waveforms.

So far nothing has been said of the uses to which these strange wave-shapes may be put. Two of interest to the amateur will be briefly described.

Electronic Switching

At the beginning of this article use was made of the fact that a square wave could be produced by a steady voltage and a periodically operated switch. The reverse procedure is also of great use. By applying a small square wave to the grid of a valve, the anode voltage may be swung between a low value and the H.T. level, and the valve rendered alternately a low impedance and a high impedance. We are, in effect, employing the valve as a voltage-operated

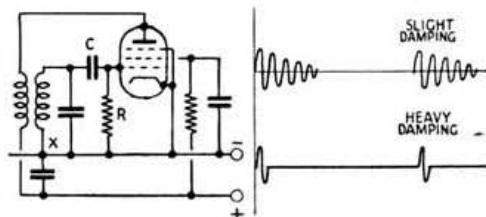


Fig. 14.
Blocking oscillator circuit.
(Continued on page 96.)

AUDIO FREQUENCY OSCILLATORS

By C. W. CRAGG, (2HDU)

PART III

In this concluding article, the writer discusses means for testing an audio oscillator, and describes suitable apparatus for this purpose.

THE three important characteristics of an A.F. oscillator are its output power, frequency, and waveform.

Output

The output may be measured by means of an ordinary rectifier-type voltmeter connected across the correct load resistance. Provided the waveform is good, this type of meter will give correct readings but with varying degrees of distortion the readings will alter. Where the distortion is more than a few per cent. a valve voltmeter is a more reliable indicator. If, however, the waveform is distorted in such a way that the positive half cycles rise to a higher value than the negative half cycles most valve voltmeters will give a misleading result. It is therefore desirable that some idea of the waveform shall be obtained before any attempt is made to measure the output. When a reasonable wave-shape has been obtained (*e.g.* below 3 per cent. distortion) either type of meter may be used satisfactorily. For reading the power in a distorted wave it is necessary to measure the current in the known load resistance by means of a hot-wire or thermo-couple type ammeter. Both these types indicate the R.M.S. value of the current. Moving-iron volt-meters are not suitable for output measurements as they usually draw excessive current and are accurate only on the lower frequencies.

headphones, until they are approximately equal. If both frequencies are fed to the 'phones together the beats may be heard, and adjusted to zero without using a meter.

The most convenient standard of frequency is the 50 c/s. A. C. mains which is sufficiently accurate for most purposes. A tuning fork oscillator of the type shown in Fig. 18 can be made-up quite simply. In this case the waveform is of little consequence as it is only used for its frequency characteristic. There are

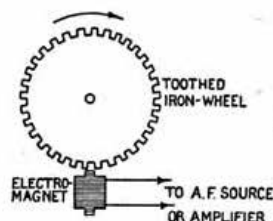


Fig. 19.
Phonoc Wheel for production of a known frequency or for measuring unknown frequency.

numerous mechanical methods of producing known frequencies, one of which is the Phonoc Wheel. A small iron disc with a prearranged number of cogs is arranged as shown in Fig. 19 so that it may be rotated at a known speed by an electric motor or by hand. With either method of rotation a flywheel should be attached to keep the speed more constant. The motion of the cogs near the electromagnet induces a small voltage in the latter and the resultant current will be of a frequency equal to the number of cogs passing the magnet each second. The required number of teeth may be calculated for a given frequency provided the speed of revolution of the wheel is known. Alternatively, if several watts are available, the output from the oscillator on test may be fed to the electromagnet; once the wheel is started it will continue to rotate at a speed governed by the frequency of the applied voltage and by the number of cogs as before. The speed of rotation can be deduced with a stop-watch by counting the revolutions in a known period of time.

If a coil of known inductance is available it may be tuned by a condenser to the frequency it is desired to measure. The frequency can then be calculated, knowing the capacity and inductance. An air-core coil should be used because one with an iron core changes in inductance with voltage and frequency.

Another method, employing resistances and condensers of known values, is to use the Wien bridge. The condensers may be made variable as was shown in Fig. 10 and calibrated directly in terms of frequency. At the frequency at which the bridge is balanced there will be no output, but harmonics will be passed, so that an absolute null point will not be obtained unless the oscillator is entirely free from distortion. The detector may consist of a pair of headphones or a meter, but if more accurate results are required an amplifier may be used before the detector. The degree of accuracy will depend upon the accuracy with which the values of condensers and resistors is known. The stray capacities should, therefore, be kept as low as possible so as not to be comparable with the actual capacities used. If desired, the resistances instead of the condensers may be tuned. This enables larger

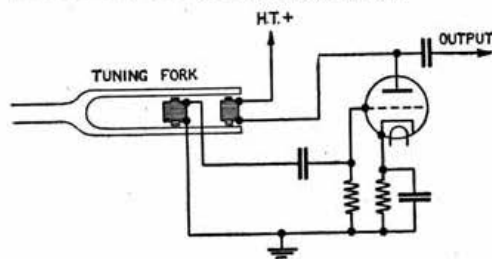


Fig. 18.

Outline of Tuning Fork Oscillator. Valve 6A3, or similar power valve. Electromagnets; bell magnets wound with 32 S.W.G. wire for anode coil and 38 S.W.G. for grid coil.

Frequency

There are two recognised general methods of measuring the frequency of an oscillator. The first is by comparing the frequency with some known standard. The second is to use circuits which are known to tune to given frequencies. The first method (using a cathode-ray oscilloscope) is described in the *Radio Handbook Supplement*. The known frequency is applied to one pair of deflector plates and the unknown frequency to the other pair. When the two frequencies are the same, but 90° out of phase, a circle is seen on the tube, whilst for varying frequency ratios different types of Lissajous figures appear.

If a cathode-ray tube is not available, the two frequencies may be fed to the same meter (approximately the same voltage for each frequency); when they are at approximately the same frequency, beats will be seen on the meter. With this method it is possible for a harmonic of one frequency to beat with the fundamental or a harmonic of the other thus giving a misleading result. To avoid this danger the two frequencies should be adjusted first by ear, using

condensers to be used and minimises errors due to strays. The dial is calibrated directly in frequency by working out the frequency at several points on the rotation of the resistors or condensers, whichever is made variable. During initial calibration it is a good plan to check the calibration by using the mains as a standard of frequency (i.e. measure the oscillator frequency by both methods). The Wien bridge (Fig. 20) is a very convenient method once it is set up. The resistances in the bridge should, of course, be wound non-inductively.

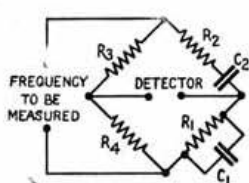


Fig. 20.
Wien Bridge for Frequency Measurement. When $R_1 = R_2$ and $C_1 = C_2$ and $R_3 = 2R_4$,
$$\text{frequency} = \frac{1}{2\pi R_1 C_1}$$

To assist in obtaining a sharper balance a potentiometer may be interposed between R_3 and R_4 and the slider taken to the detector.

Waveform

Distortion in the oscillator output is the most difficult effect for the amateur to measure with any degree of accuracy. The simplest method of obtaining some idea of the waveform is, of course, to examine it on a cathode-ray tube, but in this way it is difficult to see distortion below about 3 per cent. When an actual measurement of the distortion is required a more elaborate set-up is necessary. The usual method is to use a filter of some type which will eliminate the fundamental and pass all other frequencies. The distortion coming from the filter is then compared with the total signal at the input and its percentage of the latter read by means of a calibrated potentiometer. An idea of the layout is given in Fig. 21. The

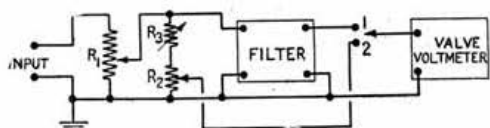


Fig. 21.

Block Diagram of Distortion Meter. R_1 value according to input impedance required. (For average use about 1,000 ohms.) R_2 and R_3 in series should be large compared with R_1 . For a 10 per cent scale $R_2 = 5,000$ ohms. $R_3 = 100,000$ ohms.

potentiometer R_1 is used merely to set the input to a convenient figure. The valve voltmeter need not be calibrated, as it is only used as an indicator and not as a true voltmeter. R_2 is calibrated directly in percentage distortion. To measure distortion a signal is applied to the input with R_1 turned well down and the valve voltmeter switched to Position 1. R_1 is then varied until a convenient reading is obtained on the meter. The filter (to be described later) is tuned for minimum reading—i.e. the fundamental is tuned out— R_1 being increased whenever the reading dips too low. Having tuned the filter as accurately as possible the meter is set to some known point on the scale by means of R_1 and then switched over to Position 2. R_2 is then varied until the same reading as before is indicated. The amount of distortion can then be read on the scale of R_2 .

The method of calibrating R_2 is as follows. Suppose the distortion meter is required to read from zero to 10 per cent. A known voltage (say one volt) at a frequency well removed from that to which the filter is tuned is applied to the input, with the voltmeter in Position 1. Having set R_1 to a given point (a mark may be made on the scale of the voltmeter for convenience in all these readings) the meter is switched

to Position 2. With R_2 at maximum, a voltage input, of ten times the original value (i.e. ten volts) is applied. R_3 is then adjusted until the meter reads the same value as before and is then left fixed. The scale of R_2 is calibrated linearly with its resistance, i.e. at maximum it reads 10 per cent., half way down 5 per cent., and so on. The controls needed are the input control (R_1) the switch for the voltmeter, and the filter tuning controls. R_3 is preset. If more than one range is required, additional positions are added to the switch so that the meter is connected to a different potentiometer for each range. Alternatively, R_3 may be switched to different values and the several scales read on the same potentiometer R_2 . If a range of 0–50 per cent. is wanted, the input in the second part of the calibration is made only twice the first input instead of ten times. For a 25 per cent. scale it would be made four times the input. The only part of the calibration that is likely to cause difficulty is that brought about by the fact that R_2 may not be quite linear. Dial calibration will be linear with resistance, and not with angle of rotation. Values of the potentiometers are not at all critical, but R_2 and R_3 in series should be high compared with the value of R_1 so that the input impedance does not alter too much as R_1 is adjusted. If this precaution is not taken the apparatus under test may be affected, and the varying load may alter the distortion in its output as R_2 is varied.

The Valve Voltmeter

The linearity of the voltmeter scale is of no consequence, and a single reference line is all that is necessary. It is important, however, that the meter reads the same for all frequencies in the range to be measured. In this connection it must be remembered that the harmonics are being read as well, so that if the distortion meter is needed to read up to 8,000 c/s. the voltmeter should have a linear frequency response up to at least the fourth harmonic of this frequency, viz. 32,000 c/s. The sensitivity of the meter will depend upon the input voltages likely to be met with in practice, but it should be capable of reading up to the mark on the scale with an input of about 100 millivolts or less. This means that with 10 volts input to the distortion meter it should be possible to read down to about 1 per cent. distortion. To read lower percentages a more sensitive voltmeter will be required.

As the home constructor may find it rather difficult to obtain high sensitivity with linear frequency response it is suggested that the frequency range be up to about 4,000 c/s.; the meter must, therefore, be linear up to at least 16,000 c/s. As this distortion meter may be used to measure the distortion of any amplifier (with a low distortion A.F. signal generator at the input) its use is not limited to oscillators.

The Filter

The filter is the most difficult part of the meter for the amateur to construct for it must be capable of tuning over a range of frequencies, and giving a high order of attenuation at the fundamental, compared with the harmonics and other spurious frequencies, such as hum. As it is tuned, the attenuation must not vary greatly, otherwise R_3 will need adjustment with frequency. The filter requirement may be made much less stringent by using a number of spot frequencies with a small amount of tuning, rather than by attempting to provide continuous coverage.

Two types of filter will be briefly described. The first, a bridge type, is shown in Fig. 22. This form of filter is hardly suitable for continuous coverage due to the difficulty of tuning the parallel resonant circuit. The bridge is the ordinary Wheatstone type with one arm replaced by the tuned circuit which, at resonance, is purely resistive. To obtain a selective circuit the

L./C. ratio is made high. This will also assist in tuning as a useful frequency swing can then be obtained with an ordinary $\cdot 0005 \mu\text{F}$ tuning condenser. For changing frequency the coil must be tapped, and the variable resistance in the other arm of the bridge changed to a different value. This control may be brought out to the front panel together with the tuning condenser and switch. To obtain a high impedance, a coil with a good Q is preferable. Incidentally, the values of resistance in the bridge

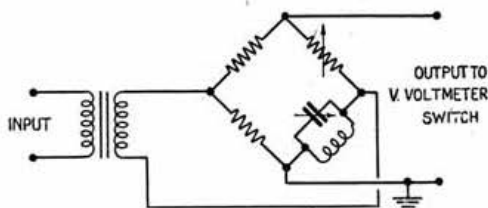


Fig. 22.

Bridge-Type Band-stop Filter. Transformer 1 : 1. Other values see text.

will be affected by this factor. For the most selective operation all three resistances should be of the same value, and the tuned circuit must also have the same value of impedance. Six frequencies will be suitable for most work and the following seems to be a reasonable choice: 200, 400, 800, 1,000, 2,000 and 4,000 c/s.

The second type of filter is shown in Fig. 23. This is a band-stop filter giving maximum attenuation at a frequency $\frac{1}{2\pi\sqrt{LC}}$ and when the resistance R is four times the A.C. resistance of the coil. In practice R usually consists of two variable resistors in series, one (about one tenth the value of the other) to act as a fine control, since adjustment is rather critical especially on low percentages of distortion. The tuning condensers must be of rather a large capacity so that an ordinary $\cdot 0005 \mu\text{F}$ is not sufficient. For instance, if L has an inductance of one Henry, each condenser is about $\cdot 0125 \mu\text{F}$ at 1,000 c/s. Since a variable condenser of this high value is not practicable C may consist of a number of fixed capacities, which can be switched to different values, and a normal 2-gang $\cdot 0005 \mu\text{F}$ used for fine adjustment. Some kind of decade arrangement is most suitable, using two decade switches and the tuning condenser. Suggested values of condensers are given in Fig. 23. A tuning

range of about four to one should be obtained, according to the self capacity of the coil. Fig. 24 conveys an idea of the arrangement. The two sets of condensers are switched together so that they are always the same capacity. Three frequency ranges are shown and these will give a total range of approximately 150–10,000 c/s. The value of R depends upon the coil resistance, but 10,000 ohms for the coarse and 1,000 ohms or less for the fine control will cover most cases. To cover the frequency range quoted above the coil should have an approximate inductance of 20 Henrys tapped at $1\frac{1}{2}$ Henrys and 80 milliHenrys. The latter portion may consist of an air-core section in series with the rest of the coil. The Q of the coil need not be very high for a good frequency response curve; 10 is a suitable figure. The values of capacity suggested for tuning are as follows: switch 'A' starting at contact 1, $\cdot 0003 \mu\text{F}$ and increasing by this amount per contact, i.e. contact 2, $\cdot 0006 \mu\text{F}$, 3, $\cdot 0009 \mu\text{F}$. Switch 'B' starting at contact 1, $\cdot 0025 \mu\text{F}$, increasing by this amount per contact. These two switched condensers and the variable condenser are permanently connected in parallel. Since some of the values of condenser specified are non-standard ($\cdot 0006 \mu\text{F}$, $\cdot 0009 \mu\text{F}$, etc.) they must be made-up from a number of standard values. In order to reduce

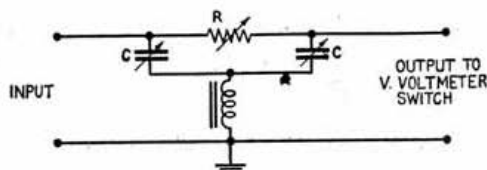


Fig. 23.

Tunable Band-stop Filter. Frequency = $\frac{1}{2\pi\sqrt{LC}}$. R = four times A.C. resistance of coil.

the number of condensers that this arrangement makes necessary, the switches may be designed so that instead of merely switching to each contact in turn, they connect the contacts together (e.g. when on contact 6, all before 6 will be short-circuited together). In this way only one $\cdot 0003 \mu\text{F}$ condenser is required from each contact, and a $\cdot 0025 \mu\text{F}$ in the other switch.

To tune this filter the range switch is first set to the appropriate position. (In the case under discussion the ranges are approximately 150–600, 600–2,400, 2,400–9,600 c/s.) The coarse resistance control and the higher capacity switch are adjusted for minimum reading, followed by the fine controls. Some inter-

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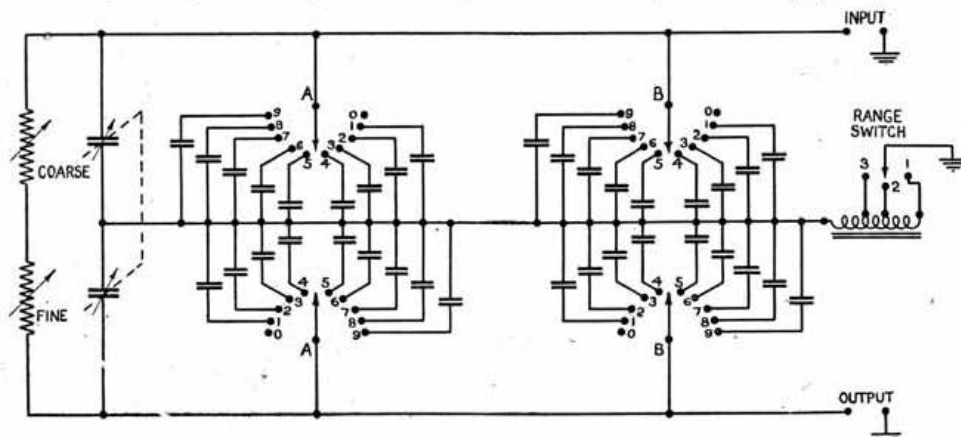


Fig. 24.

Filter Circuit showing Switching. See text for values.

ANNUAL REPORT OF THE COUNCIL

OF THE INCORPORATED RADIO SOCIETY OF GREAT BRITAIN

for the Year ended 30th September, 1944

THE progress reported during past years has been well maintained, notwithstanding the fact that war-time conditions still prevent the revival of full experimental activities.

The growing strength of the Society is reflected by a further substantial increase in membership and by an enhanced financial position which, as pointed out by the Honorary Treasurer in his Report, will enable the Society to bring to fruition its plans for post-war development as soon as practicable after the country returns to peace-time conditions.

Membership

During the year, membership increased by 1,909 (from 5,835 to 7,744), a record in the history of the Society. This figure compares with the increase of 1,355 reported last year, which was itself a record.

An end-of-the-year analysis of the membership register is given below:—

Corporate Members:

Home	7,176
Overseas	359
Life	22
Vice-Presidents	15
Honorary	5

Associates and Junior Associates 167

Included in the Home membership total are many Dominion, Colonial, and Foreign members now on active service in the United Kingdom, while the Overseas membership total includes a number of British Isles members now serving abroad who have no permanent address in Great Britain.

Since 30th September, 1943, the number of Associates has risen from 35 to 167. This increase can be attributed in some measure to the decision of the Council to accept as Junior Associates young persons between the ages of 12 and 17.

It is estimated that at least 70 per cent. of the present Home membership have never held transmitting licences, and this percentage may be expected to increase until such time as licences are again issued. In this connection the Council is of the opinion that some 6,000 to 8,000 members may make application for the re-issue or issue of a transmitting licence as soon as the present restrictions have been removed. This estimate is based on the belief that a very large number of new members, perhaps 4,000 to 5,000, have joined the Society in order to obtain experience which will enable them to extend their radio knowledge by carrying out experiments through the medium of an amateur transmitting station.

Honorary Membership

At its March meeting the Council was happy to confer Honorary Membership upon Mr. Alfred Duncan Gay, G6NF (President 1941-1943), in recognition of his past services to the Society.

Affiliated Societies

During the year the Council granted affiliation to the
Radio Society of Northern Ireland.
Shenstone (A. C. Cosser, Ltd.). Technical Society.
Cambridge University Wireless Society.
Long Row Old Boys' Radio and Television Society
Northern Radio Club (Newcastle-on-Tyne).

The valuable work which is being undertaken by these Societies, and all other affiliated Societies is fully appreciated by the Council.

Technical Lectures

The following is a list of technical lectures given at meetings of the Society held at the Institution of Electrical Engineers, London:—

*October 30, 1943. "Radio and its Relationship to Kindred Sciences," by W. A. Scarr, M.A. (G2WS).

November 27, 1943. "Valve Voltmeters," by E. L. Gardiner, B.Sc. (G6GR).

*December 18, 1943. "Measurements in Radio Experimental Work," by R. L. Smith-Rose, D.Sc., Ph.D., M.I.E.E. (Honorary Member).

February 26, 1944. "Quartz Crystals and their Applications to Amateur Radio Requirements," by E. A. Dedman (G2NH).

March 25, 1944. "Some Less-Common Metals and their Radio Applications," by E. H. Laister (BRS3386).

*April 29, 1944. "Negative Feedback and its Application to Transmitters and Receivers," by H. A. M. Clark, B.Sc. (G6OT).

Mr. E. L. Gardiner's Presidential Address (delivered on 29th January, 1944), in addition to the lectures marked * were published in the Society's Journal.

The Council wishes to record its thanks to those who delivered lectures and to all who contributed to the subsequent discussions. Due to prevailing war conditions no meetings were held at the I.E.E. during the months of May and September.

Society Publications

The standard of technical contributions to the Society's Journal has again been maintained at a high level, and many new contributors have been welcome.

As the result of the decision made last year to discontinue certain non-technical features, it has been possible to devote an average of two extra pages per issue to technical contributions.

The Council, in recording its thanks to all contributors, regrets that, due to the reduction in size of the *Bulletin*, brought about as the result of paper rationing, it has frequently been necessary to spread the publication of full length technical articles over two or more issues. Members are assured that as soon as the paper position improves the size of the Society's Journal will be increased. It is also regretted that on account of paper rationing it has again been necessary to restrict advertising space in the *Bulletin*.

Continued demands for the *Amateur Radio Handbook* and the *Radio Handbook Supplement* made it necessary to order new printings during the year, but as the result of long delays, occasioned by paper shortage and printing difficulties, these printings were quickly exhausted by pre-publication orders within a few weeks of delivery being effected. During the early part of the summer orders were placed for an 11th printing (30,000 copies) of the *Handbook* and a 4th printing (15,000 copies) of the *Supplement*, but deliveries had not commenced up to the close of the financial year. To date 129,500 copies of the *Handbook*, and 75,000 copies of the *Supplement* have been printed and sold.

It has not yet been found possible to begin the preparation of a revised edition of the *Handbook*, but the Council hopes that progress in this connection will be reported next year.

Silent Keys

The Council records with deep regret the names of the following members who have been killed, or have died on Active Service during the year:—

F./Lt. D. A. Ashton ..	BRS4519	R.A.F.
Sgt. F. P. Bramley ..	2FMX	R.A.F.
Air Cmdr. Viscount Carlow	G6XX	R.A.F.
Capt. A. Cattanach ..	GM2TQ	Seaforth
		Highlanders
Cpl. F. E. J. Day ..	BERS521	R.C.A.F.
A.C.2 R. Eales ..	BR55867	R.A.F.
Tel. J. P. Hagerty ..	BR55505	R.N.V.R.
1st Rad. Off. G. Hargreaves	G2FE	M.N.
Major J. Holding ..	G4AS	R. Signals
W./Cmdr. D. L. Ivins ..	BR53509	R.A.F.
Sgt. H. Maxey ..	BR57498	R.A.F.
F./O. R. Millar ..	GM6ND	R.A.F.
Sgt. F. W. Porteous ..	BR55286	R.A.F.
F./O. T. D. Reilly ..	BR55325	R.A.F.
F./Sgt. R. W. Rider ..	G8NX	R.A.F.
Sgt. D. E. Robbins ..	BR56349	R.A.F.
F./Lt. E. S. Sellek ..	BR57389	R.A.F.
P./O. W. O. Simpson ..	BR56000	R.A.F.
L.A.C. J. G. Stokes ..	G8SS	R.A.F.
F./O. R. W. Wheeler ..	BR54220	R.A.F.

Pilot Officer Norman Keith Adams Prize

The Council announced in June that it had accepted a gift of £150 from Mr. and Mrs. H. F. Adams, of Finchley, London, to commemorate permanently the name of their son, the late Pilot Officer N. K. Adams (G5NM), who lost his life on active service in August, 1942. It was also announced that the gift would be held by the Society upon certain conditions set out in a Declaration of Trust entered into by the Society, and that the interest received therefrom would be employed in providing an annual prize to be awarded in accordance with the conditions laid down, to the member who shall have contributed the most meritorious paper to the *R.S.G.B. Bulletin*.

The Council records its sincere thanks to Mr. and Mrs. Adams for their gift.

District Activities

During the Spring, Provincial District Meetings were held in Birmingham, Leicester and Leeds, and all were well supported. A P.D.M. was also held in Croydon and a most successful Dinner and Dance took place in West London at the height of the flying bomb activity.

The Council thanks the organisers of these functions and all others who, in face of growing difficulties of travel, arranged regular local and District meetings. Especial thanks are due to Mr. A. E. Clipstone (G8DZ) who, in his capacity as Deputy Representative for the East Midlands, carried through an ambitious and highly successful programme of meetings and visits.

Members at Cranwell, West Drayton and other Service centres have also contributed to the advancement of the Society's work by arranging meetings.

■ The Council is grateful to Mr. J. N. Smith (GI5QX), Mr. Frank Robb (GI6TK), and Mr. R. Holden (GI5HU) for their efforts in extending hospitality to members serving in Northern Ireland.

It is the intention of the present Council to recommend to the new Council that arrangements be made to organise a Victory Convention in London as soon as possible after hostilities cease. It is also anticipated that Victory Conventions will be held in Scotland and Northern Ireland, and that many Reunions of ex-Service members will be arranged.

Anglo-American Meeting

As the result of negotiations carried out between Headquarters and prominent United States amateurs serving in the London area, a successful meeting of British and American amateurs was arranged at short notice in September. This was held at the Mostyn (American Red Cross) Club, Edgware Road, W.1.

Prisoners of War Fund

Up to June, parcels were sent at monthly intervals to members held prisoner in Germany, but from that month the Government suspended all despatches to German prison camps. The number of appreciative letters received from prisoners in Germany, shows how welcome these parcels have been. The Council trusts that the time is approaching for them to return to their native land.

Council once again expresses its appreciation to Mr. C. H. Lamborne Edwards (G8TL) and his wife for their efforts in continuing to administer the Fund, and to Mr. C. Packe (G3OJ), who has paid for all incidental administrative expenses incurred during the year.

Congratulations

The Council congratulates all members serving with the Armed Forces of the Crown, or in civilian occupations, who have been honoured by H.M. the King. A roll of those so honoured is kept at Headquarters.

Service Members

A record of all members on active service has been maintained by Headquarters since September, 1939. To date approximately 4,500 members have served with the Armed Forces of the Crown—a record which is probably without parallel in any other scientific organisation. The Council extends greetings and best wishes to all Service members and expresses the hope that before the end of 1945, many of them will be back in civilian life.

Post-War Plans

During the past year the Council has given much thought and devoted considerable time to post-war plans, and whilst it is not yet possible to give details of the proposed plans, it can be stated that several meetings have taken place between representatives of the G.P.O. and the Society. A provisional programme, covering the interim period between the time when licences are restored and the effective date for the new conditions which will be agreed upon at the first post-war Radio Communications Convention, will have to be discussed with the G.P.O., and negotiations to this end have been commenced. It is probable that this programme will be based upon the Cairo Convention of 1938, with suitable modifications to cover post-war needs of the Services. Members may rest assured that the Council will spare no effort to obtain the most satisfactory interim conditions.

Negotiations are continuing with the G.P.O. on a variety of other matters in connection with the lifting of the ban on amateur transmissions, and a full statement will be published as soon as agreement has been reached.

The Council has drafted a plan for improved Provincial Representation after the war, but has decided to defer publication until such time as all present District Representatives can meet the Council and offer the benefit of their experience. It can be stated that the plan which has been prepared for the guidance of future Councils, depends for its success upon the full support of every member. If the plan is adopted it will be introduced in two stages extending over a period of from three or five years. The Council desires to make it clear that important changes to the Society's Articles of Association will be necessary before any new method of electing the governing body can be introduced. For this reason alone the Council considers it to be unwise to effect changes whilst the majority of pre-war members are on active service.

Until such time as a clearer conception can be formed of the wishes of members, the Council does not feel justified in preparing

plans for the establishment of a Headquarters station. The location of the actual site, as well as the equipping and manning of the station, are matters which cannot be dealt with at present. If the station is to fulfil the functions visualised by the present Council, it will be necessary to engage the best available talent, and to provide the most up-to-date equipment. Neither qualified personnel nor modern equipment are at present available.

An editorial suggestion, made during the year, that the Society, through its representatives, should sponsor the establishment of Experimental Workshop Centres has been received favourably in many quarters, and it is hoped that the task of carrying the suggestions into effect may be undertaken when Peace returns.

The Council anticipates that the demand for the Society's technical publications will increase considerably after the war. Current demands indicate the need for additional technical literature specially written to assist British radio amateurs in their studies and experiments.

Due to staff difficulties at Headquarters it is not at present possible to offer a Technical Service to members, but it is anticipated that with the establishment of a Society station after the war, this important service will be introduced as a privilege of membership.

Headquarters

The rapid growth in membership, coupled with many wartime difficulties, has thrown a heavy burden upon the reduced Headquarters staff, with the result that it has become increasingly difficult to offer to visitors that hospitality which would be possible under normal conditions.

Prior to the war, when the membership was in the region of 3,500, Headquarters was staffed by the Secretary and four assistants. For the whole of the past year, with a membership approaching and finally passing the 7,000 mark, the steadily increasing work of the Society has been undertaken by the General Secretary, Miss Gadsden and a single junior clerk.

The President and Council wish to take this opportunity of recording their thanks and appreciation of the special effort and considerable additional work which has been undertaken by Mr. Clarricoats and his staff under these exceptional circumstances.

The Council also feels sure that if members are made aware of the prevailing difficulties, they will co-operate even more fully than in the past, by paying subscriptions promptly, by reducing correspondence to a minimum, and by giving prior notice when possible, of an intending visit to Headquarters, particularly if an interview with the Secretary is required. It is of interest to note that during the past year more than 1,500 changes of address were recorded in addition to the registration of some 2,500 new members.

Acknowledgments

The Council records its thanks to all members for their support during the year and especially to those District and Town Representatives who have continued to uphold the traditions of the Society by act and word. Thanks are also tendered to the President and Council of the Institution of Electrical Engineers for again permitting the Society to meet in the Institution.

Council Attendances

The following is a list of Council attendances for the year ended 30th September, 1944:—

	Attendances.	Max. Possible Attendances.
S. K. Lewer, D. N. Corfield,		
W. E. Russell	12	12
E. L. Gardiner	11	12
A. J. H. Watson	10	12
A. D. Gay, H. A. M. Clark ..	9	12
F. G. Hoare*	9	9
A. O. Milne*	8	9
F. Charman, G. R. S. Farnie,		
A. E. Watts	7	12
H. W. Stacey*	6	9
W. H. Matthews†	3	3
E. H. Simmonds,† W. A. Sear†	2	3
G. A. Jessup†	1	3
J. C. H. Hunter†	0	12

* Elected January, 1944.

† Retired December, 1943.

‡ Absent abroad on Service duties.

There were 12 ordinary Council meetings during the year.

The Eighteenth

ANNUAL GENERAL MEETING OF THE SOCIETY

will be held at the

INSTITUTION OF ELECTRICAL ENGINEERS, SAVOY PLACE, VICTORIA EMBANKMENT, LONDON

on Saturday, December 30th, 1944, at 2 p.m. prompt

FOLLOWED BY A LECTURE ENTITLED "COMMUNICATION RECEIVER MEASUREMENTS AND STANDARDS OF PERFORMANCE," BY MR. R. H. HAMMANS (G2IG)

Letters to the Editor

Negative Feedback

DEAR SIR.—I should like to express my appreciation of Mr. H. A. M. Clark's most informative paper on "The Application of Negative Feedback" published in the July, August and September issues.

In deriving his fundamental equations, the author has used the symbol μ for voltage gain within the feedback loop. As a consequence, there is confusion between voltage gain and amplification factor (the conventional μ) leading to incorrect expressions for the change in effective output impedance with voltage and current feedback.

The correct equations are:

Gain reduction factor = $1 - \beta A$ where A = voltage gain; reduction in apparent output impedance = $1 - \beta \mu$ for voltage feedback where μ = amplification factor.

The author uses μ (signifying voltage gain) in each case and also in the expression for the increase in effective output impedance with current feedback.

In calculating the change in output impedance with feedback, it is the ratio of change in output anode volts to the change of input grid volts producing the same change in anode current, i.e. the amplification factor (conventional μ) with which we are concerned and not the ratio of volts developed across the output load to input grid volts, i.e. voltage gain (A , author's μ). In practice, using pentodes, μ may be 20 or 30 times A .

When voltage feedback is applied over more than one stage, the effective output impedance may conveniently be written

$$R'_o = \frac{r_A}{1 - \beta \mu A} = \frac{1}{\beta \mu G M} \quad (\text{approx.})$$

where r_A = anode impedance, μF = amplification factor of output valve, A = voltage gain of penultimate stage or stages and $G M$ = mutual conductance of output valve.

It is immediately apparent that by feeding back over more than one stage, very low effective output impedances are possible, far lower even than can be obtained with a cathode follower ($\beta = 1$, $A \rho = 1$). This point does not appear to be generally appreciated.

Yours faithfully,
H. J. R. LETTS, B.A. (Cantab.) GSIL.

DEAR SIR.—I must thank Mr. Letts for pointing out the incorrect analysis leading to equations (11) and (12) of Part I of my article (July issue).

With your permission, I would like to take this opportunity of correcting the paragraph on the effect of negative feedback on output impedance. Although I agree that the use of the symbol μ for a quantity other than the amplification factor of a valve might have been avoided with advantage, in order to be consistent with the already published articles, I have not adopted this meaning in what follows, in which i , V , R and R_o have the same meanings as previously, and,

μ = Amplification factor of output valve.

μ_1 = actual voltage amplification of circuit from input terminals to grid of output valve.

v_o = signal voltage at grid of output valve.

The equation $i = \frac{V + \mu V}{R_o}$ on page 4 is, of course, incorrect and should read,

$$i = \frac{V - \mu_o v_o}{R_o}$$

$$\therefore V = i R_o + \mu_o v_o$$

Considering first the case of Fig. 2 (a),

$$v_o = \mu_1 \beta V$$

$$\text{where } \beta = \frac{r_1}{r_1 + r_2}$$

$$\therefore V = i R_o + \mu_o \mu_1 \beta V$$

$$\therefore R'_o = \frac{V}{i} = \frac{R_o}{1 - \mu_o \mu_1 \beta}$$

(agreeing with the expression in Mr. Lett's letter).

If the feedback is negative this becomes,

$$R'_o = \frac{R_o}{1 + \mu_o \mu_1 \beta} \quad \dots \dots \dots (11)$$

In the case of Fig. 2 (b)

$$v_o = -\mu_1 i r_o$$

$$\therefore V = i R_o - i \mu_o \mu_1 r_o$$

$$\therefore R'_o = \frac{V}{i} = R_o (1 - \mu_o \mu_1 \frac{r_o}{R_o})$$

If the feedback is negative this becomes

$$R'_o = R_o (1 + \mu_o \mu_1 \frac{r_o}{R_o}) \quad \dots \dots \dots (12)$$

When both current and voltage negative feedback are used, as in Fig. 2 (c)

$$R'_o = R_o (1 + \mu_o \mu_1 \frac{r_o}{R_o}) \frac{1}{(1 + \mu_o \mu_1 \beta)}$$

$$\text{Hence for } R'_o = R_o \frac{r_o}{R_o} = \frac{r_1}{r_1 + r_2}$$

Under these conditions the reduction in gain will be,

$$1 + \mu \left(\frac{r_o}{R_o} + \frac{r_1}{r_1 + r_2} \right)$$

It has been assumed that r_o is much smaller than R and R_o , and $(r_1 + r_2)$ is much greater than R and R_o .

The use of feedback over more than one stage in order to obtain a very low output impedance was referred to on page 38 of Part III in the original article.

Yours faithfully,

H. A. M. CLARK (G6OT).

Post War Licences

DEAR SIR.—Your August editorial and recent letters in THE BULLETIN on licensing prompt me to give my views. First I would criticise points made by some of your correspondents.

(1) G2VV's demand for 'phone to be restricted to U.H.F. is, I think, a very selfish one which voices sentiments too often expressed by a noisy section who want the air to themselves for the purpose of C.W.

(2) I cannot agree to G8VN's demand that a degree should be an essential qualification for a high power permit. There are many brilliant amateurs whose radio is a hobby but who are quite capable of handling high power and making good use of it for the benefit of science.

Now may I give my own views?

- (1) Retain the A.A. permit as before.
- (2) Telephony and telegraphy on all bands.
- (3) First year's licence to be C.W. only on all bands.
- (4) Traffic handling on a restricted basis to be allowed (C.W. only). This would help to keep up the Morse standard as well as the operating standard by introducing messages other than the set Q code form so often used pre-war.
- (5) A licensed operator to be allowed to operate a station other than his own in conformity with the regulations governing his own licence.
- (6) Portable operation to be allowed on the lines of U.S.A. licences.
- (7) Proof of activity to be submitted with application for renewal of licence.
- (8) Morse test 15 w.p.m. to be passed annually.
- (9) Aerial length to be unlimited.
- (10) Two technical examinations to be instituted. The first to qualify for an A.A., and after six months, a full licence up to 25 watts. The second to qualify for full and unrestricted use of all bands with a power up to 500 watts.
- (11) Power to be restricted to 25 watts for the first year. Thereafter free use of power up to 500 watts after the passing of a technical examination.

In my opinion the pre-war power restrictions were absurd, because it was impossible to enforce them to any great extent. I feel that we should have as little restriction as possible but, as all will agree, QRM must be kept down. This can be helped in several ways and my only reason for suggesting restrictions is to ensure that high power and 'phone are not used by inexperienced operators. Short-range working should be restricted to 1.7, 3.5, 5.6 Mc/s. and higher frequency bands. The R.S.G.B., through its Journal, should be able to do much to ensure that members observe certain rules of courtesy. Cross town chats on a DX band should be stopped.

I see that the Council and the G.P.O. are working out some points for discussion. In this connection I think that members should insist that the Council keep them informed as to what they propose and also that all matters discussed between the G.P.O. and the Council or its Committees should be published in THE BULLETIN regularly. The Council is an elected body and as such should keep us informed as to its plans and work in order that we may support it or guide it. Any proposals that the G.P.O. make must not be kept a dark secret by the Council. This does not mean that I wish to criticise the Council in any way, as a matter of fact I have the greatest admiration for those who have kept the flag flying under very difficult conditions.

Yours faithfully,

J. CRITCHLEY GRAHAM (GM3TR).

[The Council will publish a full statement immediately decisions have been reached. At the present time the authorities require these matters to be kept confidential.—Ed.]

Can You Help?

Lt.-Col. J. S. Nanier, BRS754, Meadows, Colehill, Wimbome, Dorset, will be pleased to correspond on technical matters with any member.

Mr. A. Eades (Junior Associate) 5/135 Runcorn Road, Birmingham, 12, is attempting to construct a radio controlled boat, and seeks information on suitable valves, selectors, relays and sequence control mechanism.

BRITISH ISLES NOTES AND NEWS

CLOSING DATE FOR JANUARY ISSUE
IS DECEMBER 30th. REPORTS SHOULD
BE POSTED TO REACH D.R.'s AND
SCRIBES BY DECEMBER 25.

DISTRICT 1 (North Western)

D.R.: H. W. Stacey (G6CX), "Sandless," Edisbury Road, West Kirby, Cheshire. Hoylake 337.

BEST wishes to all members, at home and overseas, for Christmas, 1944, and the New Year; may 1945 bring Victory and the restoration of transmitting facilities for amateurs both old and new.

Liverpool and District.—The few meetings held during 1944 have received excellent support. The D.R. hopes to be able to secure a new venue for next year's meetings and to publish in the January issue the date of each meeting to be held in 1945 with details of the papers to be given at the first, second and third meetings respectively.

Manchester.—Can some member with or without time to spare undertake to furnish a few notes of general interest month by month?

F/Lt. J. D. Morris (2DRR) reports that he is at present near Maidstone and wishes to be remembered to G4HK, 41B, 2BK0 and BR5/Bowes. G6CX.

DISTRICT 2 (North Eastern)

D.R.: C. A. Sharp (G6KU), 50 Moore Avenue, Wibsey, Bradford. Scribe: H. Beadle, 13 Chandos Street, Keighley, Yorks.

A hearty welcome is extended to the 31 new members in the District listed in the latest Supplement. They are invited to make themselves known to the D.R. or Scribe.

Bradford.—2FJD is now employed in radio research for M.A.P. and has prepared a number of articles for THE BULLETIN. He sends best wishes to his friends. 4CL attended the Anglo-American hamfest and also discovered a good junk shop in London. 3HA reports that 8RY is now in Italy. News of 3KB and 3KF would be appreciated.

Harrogate.—2DRA, a Tannoy engineer working on a R.C.A.F. station, is building the Kit Bag Receiver as described in the Handbook. He would be pleased to attend meetings held in Leeds.

Leeds.—2317 reports that his aerial masts were brought down by a recent gale but he continues to get excellent results on 12 ft. of wire. He has given up hopes of getting the local members together. 4349, who met SUS and a number of VE and ZL amateurs at his camp, was recently on leave and visited 5UD.

Keighley.—W.O. Taylor, who has been with the R.A.F. Sigs. for over eight years hopes to be of assistance to the local movement after the war. He is building a record-player with a pair of MHL's driving a KT41. Any further dope OM? 8UO was pleased to receive a visit from 5834 of District 13.

Huddersfield.—4976 is interested in the recent discussion in THE BULLETIN on post-war licence conditions and hopes to see his views aired in print. He would like to hear from 2AND. One or two meetings have recently been held at 5VD's which included talks on the C.R.O. by 2RD and Frequency Modulation by SRF. Those present included 2KI, 2RD, 3YI, 5MI, 8CK, 8JI, 8PP, SRF, GMSMQ, 2CQI and 7356. 5VD has given the Signals section of the local H.G. an introduction to Amateur Radio and it is hoped to form a group with a station. As a start it was decided to order 12 copies of the Handbook. Congratulations to W./C. Best, 5QN, who was recently awarded the M.C. for bravery on D-Day.

Sheffield.—Unfortunately it is a little too early to include in these notes a report of the meeting arranged for November 29, but up to the time of writing there are hopes of a good attendance. 4709, who has recently returned from abroad, expects to attend the meetings when on leave. 6PJ, in an air letter to 2LT, reports that he hopes to be back in G next year and says that 8IJ has now moved to Delhi.

The D.R. and Scribe join in sending Seasonal Greetings to District 2 members wherever they may be.

G5UO.

DISTRICT 3 (West Midlands)

D.R.: V. M. Desmond (G5VM), "The Chestnuts," Hanley Castle, Worcester. Scribe: E. J. Wilson (2FDR), Westbourne Road, Olton, Birmingham.

Birmingham.—A meeting of M.A.R.S. was held on November 21 at the Chamber of Commerce, New Street, when Mr. W. Rigg, A.M.I.Mech.E., A.M.Inst. Fuel, lectured on Heating by Radio Frequency Current. Twenty-nine members and visitors were present.

The District Scribe sends seasonal greetings to all members of District 3.

2FDR.

Coventry.—It is hoped to announce very shortly the date of a meeting to be held in Coventry. Those interested should forward their names and addresses to G5GR, 40 Medina Road, Coventry.

The T.R. sends his Christmas greetings to all members.

G5GR.

Rugby.—Six members attended the November meeting when Mr. J. J. Grant gave an interesting talk on home-made test gear. G8FM.

DISTRICT 4 (East Midlands)

Deputy D.R.: Albert E. Clipstone (G8DZ), 14 Epperstone Road, West Bridgford, Notts.

Derby.—G8SI, who reports fit is experimenting with a "Baby Alarm"! 2CVV called whilst on leave and talked things over with G6XM, who is one of the District 4 group at No. 2 R.M.S. A successful Morse class is being run at the school for those with ideas for after the war. The next meeting will be held at G2OU, 43 Kenilworth Avenue, Derby, on December 31 at 11 a.m.

G2OU.

Leicester.—An enthusiastic audience viewed the R.S.G.B. N.F.D. films at G3BU last month. This attraction brought an 80 per cent. turnout of available local members. Our thanks go to Mrs. Newton for the operating and the loan of other films. A welcome visit was paid to us by 2AYY and 2HMI now working in the county. The T.R. regrets that last month's notes were forwarded too late for publication.

5605.

Nottingham.—G6CW was unable to deliver his talk at the November meeting through being called away. We hope he will be able to oblige at some later date. In his absence a lively discussion took place on the virtues of high and low power. This was led by W8TBD, who is now a regular visitor to our meetings. During the discussion post-war licence conditions were considered and the view expressed that R.S.G.B. should endeavour to obtain additional facilities for us. It was also hoped that facilities for portable work would be made easier than in the past. British transmitter designs were criticised by W8TBD, who said that both space and input power were wasted; he offered helpful suggestions for improvement.

G8DZ has received letters from BR86427 (with the B.L.A.), G3SS and G3MG. The latter has visited Hollywood and the Warner Bros. studios where he saw the "shooting" of "This is the Army." He has also met W7FWR, with whom he had a contact in the good old days, and to his surprise he found that she was an XYL and a Granny at that!

When he was leaving they presented him with a microphone in appreciation of their feelings of friendship towards the G's.

We in District 4 wish fellow members a very Merry Xmas and a brighter New Year.

G8DZ.

DISTRICT 6 (South Western)

D.R.: W. B. Sydenham, B.Sc. (G5SY), Sherrington, Cleveland Road, Torquay. Torquay 2097.

Taunton.—Members met at the Y.M.C.A. on November 12 to "peep into the past" with a film show of Field Days, etc. This was thoroughly enjoyed. The show was made possible through the kindness of G4OM. Letters were also read from members, one of great interest being from G3VA. Those present included G3KX, 4OM, 5AK, 5GT, 6LY and 2DRW. The T.R. was unable to attend owing to other engagements.

Exeter.—A meeting took place at the Y.M.C.A. on Saturday, November 25. There was an attendance of 16 and although there was no set programme, many interesting points came up for discussion. G2AT brought along his calibrated frequency meter and gave a short talk on its construction and use. G3MU also displayed some 60 cm. gear which aroused much interest. Those present included G2AT, 2GK, 3MU, 5QA, 5WY, 2BZQ, 2CAA, BR8171, 2027, 6597, 8123, 8319 and 8732.

The next meeting will be on January 6, 1945, at 2.30 p.m., in the Y.M.C.A.

The D.R. sends to all members of District 6, wherever they may be, and to the President, Council and General Secretary, Good Wishes for Xmas and the sincere wish that Peace will be restored in the New Year.

G5SY.

DISTRICT 7 (Southern)

D.R.: W. E. Russell (G5WP), "Milestones," Mayford, Woking, Surrey. Woking 1589.

Bournemouth.—Fourteen members attended the meeting held on November 25 at which John Kay, BR83789, described his new 60 watt amplifier. Next meeting, 2HNO, 45 Parkwood Road, December 30, 3 p.m. Messrs. Spooner, 2NS, and Wax will describe and demonstrate a most interesting break-in apparatus.

(via 2HNO).

Croydon.—G2RD, while on leave reported that four G's, two A.s, and four BRs are with him at present. 2FWA visited a dentist recently and discovered him to be G6GB—matters other than dental were discussed! VE4AOP visited 2DP at his place of business and a most enjoyable chat ensued. 4AOP has now transferred to District 18. 4584, having been busy on "fly-bomb" repairs, has had to miss recent Croydon meetings. 4NI is on the mend again after having had a badly poisoned finger. 8417 has some ideas for an underground shack (50 feet below is the latest project). 6894's receiver benefited from the suggestions made at the meeting. See "Forthcoming Events" for details of the next meeting.

(via G2DP).

Conisdon.—G3IG has arrived safely in Ceylon. 4458 is taking a code course in readiness for post-war days. 3003 has been listening to U.S. medium wave broadcast recently. A welcome is extended

to new members 8274, 8417 and 8591. Seasonal greetings to all members in the District. (via 3003.)

Reading.—Due to the fact that THE BULL. now goes to press a few days earlier it will not be possible to record the previous month's meeting. Monthly meetings are usually held at The Palmer Hall, West Street, Reading, on the last Saturday in the month at 6.30 p.m., but details may be secured from the T.R., R. Nash, 9 Holybrook Road, Reading.

As the October meeting saw the best attendance to date, it was decided to move to a larger room in the same building. Sgt. Muddell, 2AOV, delivered a very interesting lecture and demonstration on Home Recording. Some of the recordings brought back memories of pre-war days. J. Weaver brought along his amplifier and V. Lancashire the record reproducer. GSKJ put in an appearance. (Congrats on the wedding OM.)

Southampton.—At the meeting held on October 29, which was well attended, the topic for discussion was Post-War plans. On October 25 several members attended a lecture at the University College on High Frequency Heating which is one of the newest processes employed in the plastic industry. The lecture was very ably given by Mr. G. Dring, M.A., B.Sc. Our thanks are conveyed to the Institute of Plastic Industries for a most interesting and instructive evening.

Details of future meetings from the T.R., G8QW, 17 Colmore Gardens, Totton. (via G8QW.)

The D.R. extends his best wishes to all members of District 7 whether at home or abroad and once again records the pious hope that next year will see us united again on the air.

G5WP.

Forthcoming Events

- Dec. 17 District 3 (Rugby), 3 p.m. at The Percival Guildhouse. Display of R.S.G.B. Films.
- Dec. 17 District 4 (Leicester), 2.30 p.m. at BR55605, 202 Gwendolen Road, Leicester.
- Dec. 17 Scotland "A", 3 p.m. in the Royal Technical College, George Street, Glasgow.
- Dec. 30 Annual General Meeting, 2 p.m. at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2, followed by a Lecture by Mr. R. H. Hammons, G2IG, entitled "Communication Receiver Measurements and Standards of Performance."
- Jan. 6 District 6 (Exeter), 2.30 p.m. in the Y.M.C.A.
- Jan. 7 District 7 and 13 (combined meeting) 3 p.m. at Y.M.C.A., Croydon.
- Jan. 14 Scotland "C" District, in Room 4, 7 Airlie Place, Dundee.
- Jan. 16 Midland Amateur Radio Society, 6.30 p.m. at the Chamber of Commerce, New Street, Birmingham. General Meeting. Mr. Yeats will deliver a lecture entitled "The Modern Automatic Telephone Exchange."

DISTRICT 8 (Home Counties)

Deputy D.R.: L. W. Jones, 16 Leys Road, Cambridge. Tel.: Cambridge 3406.

Although no reports were received last month the writer was pleased to notice from the November BULLETIN that the District now has several new members. This opportunity is taken of extending to them a warm welcome. Happy Christmas and a Prosperous New Year to everybody. G5JO.

DISTRICT 10 (South Wales & Monmouthshire)

Deputy D.R.: H. H. Phillips (GW4KQ), 80 Cottrell Road, Roath Park, Cardiff. Cardiff 4512 during business hours.

A hearty welcome is extended to those members who have joined since these notes last appeared and from whom the D.D.R. would be pleased to receive news.

Pembrokeshire.—An inquiry comes from ZB2B, stationed near Haverfordwest as to meetings in the Milford Haven or Pembrokeshire area. His address may be obtained from the D.D.R.

Cardiff.—Regular meetings continue at monthly intervals, fairly good attendances being recorded at those held in recent months. Activity and interest in Post-war development is still in the forefront of topics discussed. Any member wishing to have dates of future meetings is requested to drop a card to the D.D.R. as at present, meetings are being held in advance of BULLETIN publication dates.

Swansea.—Still nothing to report. Will anyone interested in meetings contact the D.D.R. who is endeavouring to formulate some activity in this area?

The attention of members is drawn to the change in address and telephone number of the D.D.R., who may be reached during business hours as above.

Seasonal greetings and good wishes to all members.

GW4KQ.

DISTRICT 11 (North Wales)

Deputy D.R.: C. Spillane (BR51060), "Woodside," Meliden Road, Prestatyn.

2FUD of Caernarvon, a Radio Officer in the M.N., in the course

of a long letter gives his views on post-war co-operation. He has knowledge of only four other members in his area, two of whom (BR57529 and 8761) he has met recently. He sends 73 to G3HC, 8JD and 2DWC. 2FUD has seen much action during the war and lost his ship in the Salerno operation. BR55837 landed in France on June 8 and was mixed up with the Caen battle. He seeks news of 4782 and other local members. 5520 still voyaging around the Indian Ocean, recently received a batch of long overdue mail. GW4CK, 2HIY and 2DAH expect to be on leave shortly. BR51060 and 2HIY visited G5BD last month and enjoyed the hospitality extended to them. 9032 and 9034 are on the same station in District 17 as 1060.

The writer sends seasonal greetings to all old friends.

BR51060.

DISTRICT 12 (London North and Herts)

D.R.: S. Buckingham (G5QF), 41 Brunswick Park Road, New Southgate, N.11. Enterprise 3112.

North London.—The November meeting held at 2DHF, was attended by G5QF, 2DWC, 1174, 3386, 4240, 8075 and 8286. The discussion on frequency stability was continued after which 2DHF uncased his frequency meter for inspection.

We offer congratulations to Miss Joan Claricoots, BR56888, on her engagement to Mr. Peter Matthews, BR57654, of Leicester, also to our very active T.R. for St. Albans, upon being elected a P.A.S.I.

Owing to the festive season there will be no meetings in December.

St. Albans.—The T.R. was pleased to receive an airgraph from BR57910 in Egypt which is being answered here as requested. The letters "O.M." stand for "Old Man," as you guessed, and this is the customary greeting between radio amateurs everywhere. Harpenden looked much the same as usual when we were there a few days ago, except that a few street lamps are now permitted! G5QF, 8FJ, 2CNC and 4477 have visited the T.R. It is planned to hold a P.D.M. in St. Albans some time during March or April, but so far suitable accommodation has not been found. Suggestions will be welcome.

The D.R. and T.R. take this opportunity of wishing all members at home and abroad the compliments of the season and 73 for the New Year. G5QF.

DISTRICT 13 (London South)

A.R. (South Eastern and Central), S. E. Lanley (G3ST), 19, Elm Gardens, Mitcham, Surrey (Temporary Address). A.R. (South Western) E. H. Simmonds (G8QH), 17, Roedean Crescent, Roehampton, S.W.15.

South Western Area.—Congrats to A.C. 1 E. G. Allen, BR51677, who has just announced his engagement to Miss Aileen Watson, of Harrogate. We understand that Mr. Allen has ascertained that the lady of his choice will, within reason, tolerate his continued participation in Amateur Radio! G8QH.

South Eastern and Central Areas.—The November meeting was supported by G2DP, 2HP, 2UA, 2VB, 3ST, 3SU, 2FPK, BR51545 3003, 4324, 6894, 7943, 8906, and G. E. Conway. We were also honoured by a visit from VK3EJ.

A good attendance is expected at the special meeting to be held at the home of BR54324, 3 Englewood Road, Clapham South, at 3 p.m. on December 17, when the "Ann" Cup will be awarded. The judges will be G2VB, 2HHD and BR53003. It is hoped to make this a real hamfest, as we shall not be pressed for time. The QRA is very accessible. Furthermore refreshments will be varied!

At this time of the year our thoughts will be with our many absent friends. How much we wish they could be with us. We extend to them wherever they may be, the compliments of the season and wish them good luck and a speedy return. New members are cordially invited to attend the Croydon meetings. G3ST.

DISTRICT 14 (Eastern)

Scribe: L. J. Fuller (G6LB), 14 High Street, Walton-on-Naze, Essex.

Chelmsford.—The November meeting held at G6ZC, was attended by six members, including two visitors, G4PY and Ft./Lt. Biderman, SP3DF. The latter gave some interesting details of pre-war Amateur Radio conditions in Poland. Congrats to old-timer G2SA on his promotion to Captain in the Home Guard.

Walton-on-Naze.—The Scribe has received letters from G5RV and G2YL, and has again met G2KT. He has also received a visit from a Blackburn member, Mr. Fairhurst, who is stationed in the Walton district. G6LB.

DISTRICT 15 (London West, Middlesex and Buckinghamshire)

D.R.: H. V. Wilkins (G6WN), 539 Oldfield Lane, Sudbury Hill, Greenford, Middlesex. Byron 3369.

West London.—The November meeting was well attended and discussion centered around District Post-War planning; the findings will be put before the next full District meeting. Our President, Mr. Gardiner, hopes to attend the January meeting and to join in the discussion.

It was with deep regret that we learned of the death of Mrs. Scott-Hey, wife of G2FV. We send heartfelt sympathies to 2FV in his sad bereavement. Also with regret we hear that Flying

Officer Norman Young (G8VM), well known to members of this District, has been reported missing from operations while serving in North Africa.

From India comes news of 8IH and 8FA. The former wishes to be remembered to all old friends but says that during the passing of years he has forgotten their names and calls. "FA", who sends an R.A.F. Christmas Greeting Card to the District, looks forward to getting home early next year. Another old-timer, 2BY, has written to the D.R. He is now residing in Cheltenham and is re-joining the Society.

Aylesbury.—Mr. Freer's nomination for Council was rendered void because it was "singled" by someone whose membership had lapsed. This is something that should never happen, of course, and we can only hope that it will not occur again. (Sorry 4781.—D.R.) BR84781 in his report sends news that 7714 is "swatting" for his final City and Guilds. 4781 has had a visit from 5423 while on leave from the R.A.F.

General.—Lt. Cooper, 4IH, has, we believe, gone to a more sunny clime. The D.R. recently visited 6VP, who sends 73 to all and says he is still willing to receive a visitor occasionally.

When compiling last month's notes mention of our other three serving members of Council was omitted. They are the President, Mr. E. L. Gardiner, G6GR, the Acting Vice-President, Mr. S. K. Lewer, G6LJ and our old friend Mr. "Dud" Charman, G6CJ, of Field Day fame. They are all well-known to the older members, but not perhaps to those who have joined recently.

Due to the proximity of Christmas there will be no meeting in late December. For next date see January "Forthcoming Events."

The D.R. sends Christmas and New Year Greetings to all.
G6WN.

DISTRICT 16 (South Eastern)

Deputy D.R.: W. A. Scarr, M.A. (G2WS), 8 Beckenham Grove, Shortlands, Bromley, Kent. Beckenham 1131.

The Deputy D.R. would like to take this opportunity of wishing all District members a Happy Christmas and all the best for 1945.

Correspondence has been more scanty than ever of late, but this is the time for new resolutions and to begin with, the Deputy D.R. is able to report that Eddy Trowell (2HKU) of 27 Unity Street, Sheerness, has agreed to become District Scribe. Will members please back him up by sending notes of either individual or group activities to him each month?

BR84658, whose home is in Worthing, has sent an interesting letter from C.M.F. He looks forward to meeting many District members as soon as he gets back. G2VA, 3GW, 2HKU and 7928 have managed to meet at 2VA's house and were reminded of old times with the Sheppey Amateur Radio Club. 2NK, who writes from St. Mary Cray is anxious to hear from old friends. His address is 59 Amherst Drive. 2FYD, writing from Chatham, reminds some of us of the days of the Medway Amateur Transmitters' Society.

Will all members of District 16 please drop a line to 2HKU or the Deputy D.R. before the New Year in order that the District may have a really worthy contribution for the January BULLETIN?
G2WS.

DISTRICT 17 (Mid East)

D.R.: A. C. Simons (G5BD), Admiralty Road, Mablethorpe. Tel.: 69.

After serving for four years in the Middle East, W. O. Hutson, G6GH, of Boston, is now home and stationed in Warwickshire. Welcome back Geoff old man. 4657 (Corporal Royal Marines), of Grimsby, has met G3BB. 5960 (R.A.F.) is now in Northern Ireland and hopes to attend meetings at G16YM. The D.R. was pleased to meet BR81060 and 2HIY recently. G3OS has received news from 8094 in India and 5933, who is now in the R.A.F. He and 3WB are holding the "home front."
G5BD.

DISTRICT 19 (North-Eastern)

D.R.: R. J. Bradley (G2FO), 36 Raby Road, Stockton-on-Tees. Newcastle.—The T.R. reports that the Northern Radio Club celebrated its first birthday by announcing that its membership had reached 40. It is hoped that this figure will be considerably increased during the coming year. BR84546, having returned to his native GI wishes to thank all members for the friendliness and hospitality shown to him during his stay in Newcastle.

Darlington.—2HMK has recently acquired a new shack and after a hectic time with paint and varnish is now busy installing his gear. He received a visit from BR86904 while the latter was on leave and would welcome visits from other members who find themselves in Darlington.

Middlesbrough.—BR87413 reports that he is now in the Royal Navy and is engaged on an extensive radio course.

The D.R. recently received a letter from ZB1AA, who points out that he hails from N. W. Durham and is, therefore, a member of District 19, although all his radio activity took place in ZB1. He sends 73 to all old friends.

Finally the D.R. would like to take this opportunity of wishing all members at home and overseas, a Merry Xmas and a happier New Year.
G2FO.

Northern Ireland

D.R.: J. N. Smith (G15QX), 19 Hawthornden Drive, Belmont, Belfast, N. Ireland. Telephone: Belfast 63323.

A General Meeting of the R.S.N.I., whose affiliation to R.S.G.B. has given much pleasure, will be held in the Y.M.C.A. on

Wednesday, January 3, 1945. All R.S.G.B. members are cordially invited to attend.

Recent visitors to the Club Room at the Y.M.C.A. were W3JAK and G6QF (an old friend of the Club). W8VUH, G6QF and BR88127 were made welcome at the T.R.'s home. The practical end at G16YM is going strong with the construction of an amplifier for Club use, the younger members showing a keen interest in the proceedings.

The D.R. and T.R. wish all Members a Happy Christmas and a Right Good New Year.
G15QX.

Scotland

Scottish Records Officer: J. Hunter (GM6ZV), 51 Camphill Avenue, Glasgow, S.1. Langside 237.

"A" District.—The R.S.G.B. P.O.W. Fund was the richer by 10s. as the result of a junk sale held at the November meeting. £2 was sent to the same Fund after the October meeting. GM6MD started a discussion on post-war conditions which aroused considerable interest. Due to holidays, the December meeting will take place on the 17th.

"B" District.—At the November meeting some R.S.G.B. films were shown. A welcome is extended to BR88521.

"C" District.—Mr. Laird concluded his talks on R.F. oscillators at the November meeting when the "Transistor" was dealt with. Members are reminded that the District hold regular meetings on the second Sunday of every month in Room 4, 7 Airlie Place, Dundee. Notice of meetings appears in the local press on the previous day.

"H" District.—Welcome to new members R. Brown, BR88361 and F. Stewart, BR88524. Will BR87376, K. McLean of Cupar, please send his full address to D.O. (A. W. Lawson, Makora, Kinghorn) as there is another member in Cupar desirous of a contact. GM6JJ reports meeting GM5DK. SMQ, reporting from Huddersfield, attended a meeting at G5VD, where he made new friends, among them G8RF. G8MKQ was home recently but is again afloat. J. Shepherd of Dunfermline is now in the R.A.F.; old-timers may be interested to know that in pre-war days he had all continents verified on a one valver.

Congrats to GM3NH on being elected D.O. of "C".

Good wishes for Christmas and the New Year are extended to all members with sincere hopes that during the coming year members at present away will return to their homes.
GM6ZV.

Please QSL!

Major Ken Ellis, SU5KW, informs us that he has been responsible for the installation of medium wave broadcast stations which are now operating from the Suez Canal Zone, Palestine and Syria. A fourth is being installed in Basra. The call signs and frequencies of these stations are as follows:—

JCPA (1391.4 kc/s.), JCLA (1009.8 kc/s.), JCFA (790 kc/s.). Major Ellis does not indicate the stations to which these frequencies and calls are assigned, but possibly JCPA is the call of the Palestine station. The Basra station will use the call JCFC.

JCKW (Palestine) is also working on 7145 kc/s. and a Forces Broadcasting Service operates from Cairo on 7220 kc/s. Major Ellis would appreciate reports on the reception of these stations. He promises to QSL 100 per cent.!

News of Belgian Amateurs

Sgt. Fred Vost, G2DF, now with the R.A.F. in Belgium, sends the good news that Paul de Neck, ON4UU (President of Reseau Belge) and John Mahieu, ON4AU, are both safe and well. Sgt. Vost writes "They were delighted to hear that the R.S.G.B. has kept going during the war, and they send greetings to all who remember them. During our meeting photos were brought out of their visits to your old H.Q.s at 53 Victoria Street. Meetings have restarted in Brussels and some 20 Belgian amateurs are giving them their support." Sgt. Vost was unable to contact M. Verstrepen, ON4AA, as he is busy with the Canadians.

Sgt. Les Coupland, 2BQC, reports attending a meeting in Belgium when ON4KB, 4KX, 4HX, 4PA, 4PO, 4CK and 4FDM were present. ON4PA ("Papa") showed him photographs taken during his last visit to the home of G2YL.

Another well-known G reports attending a meeting (probably in Brussels) when ON4UU, 4BK, 4RY, 4TA, 4UX, 4UL, 4AU, 4BZ, 4ZV and 4AV were present, whilst Fit./Lt. R. W. Standley, G8RW (15 H.M.U.) has met ON4EJ, 4FLO, 4AV, 4BK, 4VK, 4OI, 4RY and 4JMA.

Mr. W. Crossland, G5CI, informs us, on the authority of a friend in the R.A.F., that M. A. Royaut, ON4KM, of Brussels, is now serving in the Intelligence Branch of the State Police. He came through the German occupation without mishap and hopes soon to revive contacts with his British Isles friends.

We know that many hundreds of members will join with us in offering congratulations to our Belgian friends on their liberation from Nazi oppression and will share our hope that the time is not too far distant when we shall again be able to stage further Anglo-Belgian reunions on the lines of those held in London and Brussels before the war.

News from the Kreigies

● Old friends of Lt.-Col. Tom Whimster, G8UJ, will be relieved to hear that he is in fairly good health, despite the fact that he has been held captive by the Japs since the early part of 1942. He is located in Kushing Camp, Borneo. Mr. Whimster, senior, who sends the above good news is now living at 42 Tolmers Road, Cuffley, Herts.

HEADQUARTERS CALLING

COUNCIL 1944

President:

ERNEST LETT GARDINER, B.Sc., G6GR.

Executive Vice-President: S. K. Lewer, B.Sc., G6LJ.

Honorary Secretary: H. A. M. Clark, B.Sc., G6OT.

Honorary Treasurer: A. J. H. Watson, A.S.A.A., G2YD.

Honorary Editor: Arthur O. Milne, G2MI.

Immediate Past President: A. D. Gay, G6NF.

Members: F. Charman, G6CJ, D. N. Corfield, D.L.C.(Hons.), G5CD, Group Capt. G. R. Scott Farnie, GWSFI, F. Hoare, G2DP, Wing-Com. J. Hunter, G2ZQ, W. E. Russell, G5WP, H. W. Stacey, G6CX.

G.P.O. Liaison Officer: A. E. Watts, G6UN.

General Secretary: John Clarricoats, G6CL.

October Council Meeting

Resume of the Minutes of a Meeting of the Council held at 2.15 p.m., Saturday, October 21, 1944, at New Ruskin House, Little Russell Street, London, W.C.1.

Present.—Messrs. E. L. Gardiner (President), S. K. Lewer, H. A. M. Clark, A. J. H. Watson, A. O. Milne, A. E. Watts, F. Charman, D. N. Corfield, W. E. Russell, and J. Clarricoats (General Secretary).

Apologies were received from Messrs. A. D. Gay, F. G. Hoare, and W. H. Stacey.

(1) It was unanimously resolved to elect 141 Corporate Members (110 proposed by Corporate Members, 31 supported by References), 8 Associates and 6 Junior Associates. It was reported that the membership total as at September 30, 1944, was 7,744, representing an increase of 1,909 since September 30, 1943, and a record in the history of the Society.

(2) With further reference to the question of the disposal of surplus Government radio equipment and valves, it was reported that a meeting had taken place between the Secretary and the authorities. Arrangements were being made to furnish them with a list of those items of Service equipment (including valves) which it is believed will find a ready sale among members, if offered at reasonable prices.

The Department concerned has given an assurance that it is the intention of the Government to avoid a repetition of the arrangements made after the last war whereby second-hand dealers purchased bulk quantities of surplus equipment, and resold at large profits. They have already discussed the question of disposal with representatives of the Radio Industry, who are anxious to avoid surplus material finding its way on to the second-hand market through dealers.

The Secretary also suggested to the Department concerned that members of post-war Service Reserves (similar to the pre-war R.A.F., C.W.R.) should be issued with surplus standard Service equipment for official exercises. He further suggested that A.T.C. and other pre-Service training units should be provided with obsolescent surplus radio equipment for training purposes.

(3) In connection with current reprintings, the Secretary reported that 9,000 copies of the *Handbook* and 3,500 copies of the *Supplement* had been ordered to date. Delivery of the 11th printing of the *Handbook* was promised for November 15 and the 4th printing of the *Supplement* for November 29.

(4) Four hours were devoted to a full examination of licence policy and a list of points was prepared for submission to the G.P.O.

(5) The Technical Committee was instructed to prepare a report covering all matters relating to technical examinations with a view to submitting recommendations to the G.P.O. at an early date. The Committee was also requested to consider technical matters relating to the re-issue of licences.

(6) The monthly statement of account and balance sheet was presented and adopted.

(7) It was resolved to suspend the monthly transfer of £20 per month from the R.S.G.B. (European) Prisoners of War Fund to the Far East Fund.

(8) It was reported that H.M. Inspector of Taxes had agreed that no tax would be payable on the income from the Pilot Officer Norman Keith Adams Trust Fund. It was resolved to purchase 3 per cent. War Bonds to the value of £150.

(9) It was reported that, due to staff difficulties, the I.E.E. are no longer in a position to permit ordinary meetings of the Society to be held in the Institution on Saturday afternoons. In view of the uncertainty of conditions in London at present, it was agreed to defer a decision in regard to the holding of evening meetings, until after the A.G.M. fixed for December 30.

(10) It was agreed that in the event of a Ballot for Council becoming necessary, the Council would appoint scrutineers at the November meeting. This course would be necessary in view

of the decision not to hold an ordinary meeting prior to the A.G.M. Due to the lateness of the hour, it was decided to defer discussion on four agenda items until the next meeting. The meeting closed at 8.15 p.m.

R.S.G.B. Prisoners of War Fund

DONATIONS.—The General Secretary acknowledges with thanks, on behalf of Council, receipt of donations from:—District 7 and 13, per G2VB, £1 10s.; Scotland "A" District, per G6MZV, £2; W. Gray, GW4NK, £1; W. J. Thompson, G2MR, 11s. 9d.; P. Knife, 4687, 7s. 6d.; W. N. Craig, G6MJJ, £2 2s. 6d.; K. J. Dearson, 7479, 1s. 6d.; A. Hine, 4438, £1 1s.; R. N. Lawson, G5ZK, 10s.; W. J. Purnell, 8946, 10s.; G. Openshaw, 2BTO, 10s. 6d.; W. Clegg, 3600, 12s.; P.W.T.O. and staff H.M. Dockyard, Devonport (per ON4FT), £2 5s.; D. Clift, 8205, 5s.; H. C. Turner, G5OJ, £1; G. Spence, G6MRZ, 5s.; P. C. W. Green, 3753, 17s. 6d.; T. Brackenbury, G8BB, 2s. 6d.; Taunton Group, per G5AK, £1 12s. 6d.; W. Jones, GW6OK, 3s.; G. H. Towsey, 2FYD, 15s.; G. W. Horton, 7250, 5s.; A. W. French, 6838, £1; A. Baldwin, 8595, £1; A. Howland, 6164, 9s. 6d.; F. W. Welsh, 8847, £1 1s.; E. Shields, 3462, 5s.; R.A.F. (W.D.), per C. Ranft, £1 1s. Total receipts to date, £1,401 1s. 6d. Total expenditure to date, £ 67 12s. Balance in hand as at 30th November, 1944: European Fund, £163 12s. 3d.; Far East Fund, £3 10s.

Your Best Christmas Present

will be a donation to

The R.S.G.B.

Prisoners of War Fund

Changes of Address

Members who change their permanent address are asked to note that at least one month must elapse before the change can become effective for BULLETIN despatch purposes.

The Society cannot, under existing conditions, send the BULLETIN direct to a Service address. Members on Active Service should arrange for re-direction from their home address. Provided re-direction is effected promptly, no additional postage is required.

American Publications

The Society is in a position to accept orders for the following publications which are ordered individually from America:

"QST" (Official monthly publication of The American Radio Relay League). By subscription, per annum	17s. 6d.
"The Radio Amateur's Handbook" (A.R.R.L.)	10s. 6d.
"The Radio Amateur's Handbook"—Special Defence Edition (A.R.R.L.)	8s. 6d.
"The Antenna Handbook" (A.R.R.L.)	4s. 0d.
"A Course in Radio Fundamentals" (A.R.R.L.)	3s. 6d.
"The Radio Handbook" (Editors and Engineers Los Angeles)	12s. 0d.
"Radio" (Monthly publication of Radio Ltd.) per annum	21s. 0d.

Orders must be accompanied by a remittance made payable to the Society and rates and prices are subject to alteration without previous notice. Delivery can be expected in about 12 weeks from date of order. Service Addresses must not be used. Single copies of text books only may be ordered.

Members who change their address during the currency of a subscription to QST or Radio should advise the publishers direct.

STAFF VACANCIES AT R.S.G.B. HEADQUARTERS

OPENINGS EXIST AT R.S.G.B. HEADQUARTERS FOR TWO YOUNG GIRLS (14-17½ YEARS) FOR GENERAL CLERICAL DUTIES. GOOD PROSPECTS, AND CONGENIAL CONDITIONS.

APPLICATIONS SHOULD BE MADE IN WRITING TO THE GENERAL SECRETARY, R.S.G.B., NEW RUSKIN HOUSE, LITTLE RUSSELL ST., LONDON, W.C.1.

EXCHANGE & MART-ADVERTISEMENT RATES

MEMBERS' private advertisements 2d. per word, minimum 3s. TRADE advertisements 4d. per word, minimum 6s. Box Numbers: 6 words, plus 1s. TERMS: Cash with order. All copy and payments to be sent direct to Advertisement Managers, Parris Advertising Ltd., 121 Kingsway, London, W.C.2, by the 30th of the month for following month's issue.

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

CATHODE Ray Oscilloscope—new, complete with X and Y Amplifiers, and Time Base in panelled steel cabinet. Prepared but not wired for second stage Y Amplifier. All necessary switching and usual controls, latest 21 in. Cossor Tube and Gas Relay—£25 (the cost of the components).—SIMMONS, G3SV, Pyrgo Park, Havering, Romford, Essex.

COMMUNICATION receiver wanted. National NC200, Hallcrafters SX28, Super Pro, or other equally good receiver.—BARTON, Olychyn, Stonehouse, Glos.

CONSTRUCTORS Data Sheets, by L. Ormond Sparks, provide full constructional details and fine blueprints of Tested and Guaranteed Designs. Data Sheets for:—"The L.O.2" Super S.W. double pentode receiver for DX work; (Battery). Two-Valve Amplifier (Battery). 3½ watt A.C. Amplifier. Transverse Current, Microphone. A.C. Trickle Charger. All 2s. 6d. each. Electric Guitar Units, 5s. Electronic one-string Fiddle, 3s. 6d.—L. ORMOND SPARKS, (R.), The Constructors—Consultant, 9 Phoenix Road, Brockley, London, S.E.4.

"E.D.C." Rotary Converter 24 D.C.—220 A.C. Valve Charger 110 A.C. to charge 4v and 120v accumulators. Offer.—HILL, Robin Hood, Nr. Battle, Sussex.

FOR SALE.—Ediswan 10" electrostatic C.R. tube and transformer, 10hrs. use; or exchange for communication receiver or Avo Model 7; cash adjustment.—HCCX, 354 Middleton Road, Chadderton, Lancs.

FOR SALE.—National P.W.D. Dial, Eddystone coils, valves and components. S.A.E. for list.—BR5087, 14 Edwina Close, Bitterne, Southampton.

FOR SALE.—Two sets of 4-pin Raymarts coils. 11-180 metres, 15s.—HREKS, 2A Hawthorn Avenue, Gainsborough, Lincs.

FOR SALE.—Two RCA acorn pentodes, 50s. each. One 955 triode, 40s. Several American metal valves. S.A.E. for list. Avonmhor D.C. £3 10s.—COPER, Bayville, Chichester Road, Southbourne, Emsworth, Hants.

FROM ATOMS TO STARS by Martin Davidson, D.Sc., F.R.A.S., is an important new book on the popular subject of atomic physics and astronomy. Written primarily for the amateur scientist and the intelligent layman. The most recent discoveries and theories are lucidly explained with a sprinkling of mathematics for those who like figures as well as facts and reasoning as well as conclusions. Fully illustrated.—Order at once from HUTCHINSON SCIENTIFIC & TECHNICAL PUBLICATIONS, 47 Princes Gate, London, S.W.7. Price 15s.

HALLICRAFTERS Super-Skydrier SX11 needs trimming: £28. G5NT Oscilloscope, 5s. Purchaser must collect.—GSPX, 1 Lovelace Road Oxford.

MALLOY 6v. 4-pin UX Vibrator, new 15s., also 5-pin UX base, 15s. Quantity of crystals, various between 2,000 and 4,000 Kcs., £1 each, 8 amp Key, £1, another requires assembly, 10s., Mullard EF50.6 at 12s. 6d. each. Moving coil mike, D.C. Res 50 ohm, £2. Transformer to suit, 8s. 6d. Larynx type mike, 30s. the pair complete with cord and plug. Good quality carbon type mike, new and unused with transformer, 12s. 6d. Mike transformer, 5s. Quantity used condensers tubular, 350v., mostly -1 µF. 3s. doz. Some s.h. but sound High Voltage condensers up to 5,000v., various Low voltage to 200 µF. 4 diam silver plated copper tube in 3" coils at 9d. per turn up to 30". Quantity of coils, tuning condensers 1 and 2-gang, 5mA Westinghouse rectifier, meter type, 15s. Quantity of other goods, stamp for particulars. Cannot give complete list so please state approximate requirements.—H. ENGLISH, The Maltings, Rayleigh Road, Hutton, Brentwood, Essex.

MONOMARK service.—Permanent London address. Letters redirected. Confidential. 5s. p.a. Royal patronage. Key tag 9d.—Write BM/MON07A, W.C.1.

RADIO. We require two men with good technical knowledge for positions as Salesmen in our showrooms. Also two juniors and boys. Good opportunities; permanency.—Write in first instance stating age, experience and salary required to "HRS." Berry's (Short-Wave) Ltd., 25 High Holborn, London, W.C.1.

R.C.A. 6A6G. 1851 matchmaker 50 watt modulation transformer. Ferranti multirange milliammeter 0-7½, 30, 150. Offers invited.—KAY, 24 Watcombe Road, Bournemouth.

ROTARY Converter 240v D.C. to 220v A.C. 120 watt, as new £15.—BR54473, 55 Brocking Way, Heston, Middlesex.

SALE.—3" R.C.O. Oscilloscope £6. Eddystone 2-v. battery S.W. receiver in aluminium cabinet, provision for H.F. stage in screened compartment. £4. Callers only after 6.30 p.m.—Elmer, 307 Hood House, Dolphin Square, S.W.1. Victoria 3800. Extn Hood 307.

SALE.—Woden fl. trans 200-230v. 6-3v 3a. Most components for "Everman 4" and 1940 Air Hawk 9. S.A.E.—G. D. HATHORN, Chelmsford, Ponteland, Newcastle-on-Tyne.

SALE.—Few -1 µF 6,000v oil impregnated condensers: -1 µF 3,000v paper condensers, unused, 10s. each. Selenium rectifiers 180v 40mA, suitable for instruments, eliminators, etc., 5s. each.—BYRNE, 146 Stamford Street, Brooks's Bar, Manchester, 16.

SALE.—3 Hoyt Meters 50, 100, 150mA, 12s. 6d. each. Weston 0-1mA, 45s. New met. rect. for same, 15s. 3 Weston meters 50, 100, 200mA, 30s. each. Parmeko Trans 625-0-625 at 300mA, 7-5v 4a 4v 6a, 70s.; another 500-0-500 at 250mA, 50s. 500-0-500 at 500mA, 80s.; another 500-0-500 at 300mA, twice; 4v 5a twice, 90s. All 230/240 pri. 3 Philco 1v, new 5s. each; 1 RCA 210 boxed, 15s. 2 Mazda mer vap rec valves U150/1100 and holders. Offers. New Brush Rectifier D104 Mike and stand, never used: 4 gns. Muirhead precision dial for freq. meter, 50s.—G3HZ, 57 Briarlands Avenue, Sale, Cheshire.

SALE.—Parmeko recorder, comprising cutting head, tracking gear and motor; precision built, £52 or part exchange H.R.O.—Box 485, PARRS, 121 Kingsway, London, W.C.2.

SALE.—Signal Generator, Taylor 65A, £17. G.12 P.M. Speaker, £6. Meters, transformers, many components—mostly new. Stamped envelope for particulars.—Box 488, PARRS, 121 Kingsway, London, W.C.2.

SELL.—National NC81X communication receiver, one owner, condition as new, no speaker. £30 or offer. S.A.E. reply.—G3FN, 19 Stradbroke Road, Sheffield, 9.

SHORTWAVE Receiver "All-World Battery 2," grey steel cabinet, 65s. Bakers 10" P.M. quality speaker, push-pull transformer, 60s.—BR53757, 15 Belgrave Close, Chelmsford, Essex.

WANTED.—A 12A7 valve.—2MI, 29 Kechill Gardens, Hayes, Bromley, Kent.

WANTED.—Communications receiver. Hallcrafters Sky Champion or similar type. 250 volts A.C. supply. State price and details.—GOSLING, Kingston-on-Soar, Nottingham.

WANTED.—Rola G12 or similar type speaker.—B.M.—NBWP, London, W.C.1.

WANTED.—Hallcrafters SX32, SX28, SX25 or SX17. Good cash price given.—SHEPPARD, 6 Verulam Avenue, Walthamstow, London, E.17.

WANTED urgently.—electrolytics small or large quantities.—G4MB, 20 Bromfield Road, Bexleyheath, Kent.

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KHAKI and BLUE

● L.A.C. N. Woodnutt, BR53594, of 78 Southamption Road, Fareham, Hants, and now with the R.A.F. in the C.M. area, sends seasonal greetings to all old friends. He would appreciate a letter from any who have the time to write.

● L.A.C. N. D. Glass, 2FFM, reports that a further meeting of amateurs located in and near Alexandria took place in October. Among those present were SULAX, IMS, IHT, 1DX and G2CP. 2FFM advises that G3HM (now in Italy) and 3TA are awaiting home postings, whilst 2FRM is back in England. G3ZY was contacted recently.

● "Early Birds" will be interested to hear that Sq./Ldr. L. Ballingall is now at R.A.F. Yundum with the West African Forces. He inquires whether W./O. Baker, now with B.L.A. is the one-time Cpl. Baker who was with him and whom he last saw in a dug-out in a London park? Sq./Ldr. Ballingall will be glad to hear from any ex C.W.R. member who cares to write. He has been in West Africa for 12 months, passing the first eight months in Dakar.

● Old Cranwellians will be interested to hear that Flt./Lt. R. W. Standley, G8 W, is "enjoying one long continuous N.F.D. with the B.L.A." Since crossing the Channel he has visited Bayeaux, Caen, St. Lo, Rouen, Amiens and most of the battlefields of the last war. He is now in Belgium where the welcome has been terrific—feted, showered with fruit and wines and kisses from the Y.Ls. (Lucky man. We got no such luxuries in Belgium during the last war!—Ed.)

● W./O. C. F. Barnard, G8AC, home from Malta, sends greetings to all old friends of the Brighton and District Radio Society days and seeks news of G6CY, G2RU, G3WR, G6GS and G5AO. He has rejoined F./Lt. Frank Incheley, G3AG, of the old Fitting Party days of 1939. His address is c/o 90 Coombe Road, Brighton, 7.

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THE demand for "AVO" Electrical Testing instruments for H.M. Forces is now such that we regret we can no longer accept orders for ordinary Trade or private purposes. Orders already accepted will be despatched as soon as possible. Orders from Government Contractors or Essential Works can be accepted, but they must bear a Contract Number and Priority Rating, and even these orders will necessarily be subject to delayed delivery.

We take this opportunity of expressing to the Electrical and Radio Trades our appreciation of their co-operation and patience during the considerable and unavoidable delays that have occurred in executing their orders. We feel confident that our customers will appreciate that we, in common with other manufacturers, are prompted by the universal desire to assist towards a speedy and satisfactory termination of hostilities. The Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, S.W.1

EDITORIAL—(continued from page 81)

accepted office in the past, but invariably pressure of private business has made it necessary for them to miss many of the meetings.

Attention has been directed here to but three of the problems which have exercised the minds of the members chosen a year ago to direct and govern the Society. Those same problems, and others like them, will be further considered by the new Council when it takes office in January—which reminds us to mention that it is the duty of every Corporate member, resident in the United Kingdom, to exercise his right to vote in the forthcoming Council Election.

J. C.

SQUARE WAVES—(continued from page 84)

relay switch, which mechanical device it might easily replace. This would be particularly true if very high rates of switching were required. An article devoted to this topic will appear in a later issue of THE BULLETIN.

Frequency Calibration

In order to appreciate certain of the applications of square waves it is necessary to refer to Fourier Analysis. Fourier's important concept was that any arbitrary recurrent wave-shape could be synthesised by adding together sine waves of different frequency and phase displacement. The actual process by which the different amplitudes and phases are evaluated is known as Fourier's Analysis. When a square wave-shape is analysed it is found to consist of a sine wave of the same frequency as the original wave and an infinite number of harmonics of the same wave. That is to say a 10 kc/s. square wave consists of the sum of a series of sine waves at 10 kc/s., 20 kc/s., 30 kc/s., etc. Here then is an oscillator which generates not merely one frequency but a whole band of frequencies. By locking a 100 kc/s. crystal to a square wave generator we can obtain "marker points" throughout the spectrum of a receiver. By similarly driving a 10 kc/s. generator it is possible to calibrate accurately a tuning control in terms of frequency. Combining this calibration with an efficient bandspread system we can expand an amateur band over the whole width of the tuning dial and know the frequency accurately at any point. Further, by selecting the small voltage giving rise to a 10 kc/s. marker and amplifying it we can drive a transmitter.

A great many of the uses to which square and other waves may be put would require a circumstantial account of circuits outside the scope of this article. It is to be hoped, however, that amateurs will acquaint themselves with these wave-forms and become adept in the technique they demand.

AUDIO FREQUENCY OSCILLATORS—

(continued from page 87)

locking of the resistance and capacity controls will be experienced as the filter is brought into tune, so that the two fine controls must be adjusted together until no further reduction in the voltmeter reading is possible. With very low figures of distortion the tuning will become sharper. After a little practice the procedure of tuning becomes much easier than at first appears, all the controls being adjusted for minimum reading on the meter.

American Medium Wave B.C. Stations

Mr. A. G. Dunn, G3PL, 79 Hayton Grove, Hull, Yorks, is anxious to obtain, on loan, an up-to-date list of U.S. and Canadian medium wave broadcast stations.

City of Belfast Y.M.C.A. Radio Club

Apropos the report of the City of Belfast Y.M.C.A. Radio Club, published last month, we are informed by Mr. Frank Robb, G16TK (Hon. Secretary) that the Club was formed in January, 1923, therefore the meeting referred to in the report was the 21st A.G.M. and not the 10th. The Club was granted the call-sign G16YM in 1926 in which year it became affiliated to the R.S.G.B.

We look forward to attending the Silver Jubilee Meeting of the Club in 1948.

Anglo-U.S. Meetings

We have been asked by the Hon. Secretary, Belfast Y.M.C.A. Radio Club, to point out that the 1st Anglo-American hamfest of the war took place at the Belfast Y.M.C.A. on November 4th, 1942, when 72 amateurs signed the register. Of these, 56 held pre-war calls. Seven other meetings were held at the Y.M.C.A. and at one 29 U.S. amateurs, representing the nine call-sign districts, were present.

In referring to the meeting held at the Mostyn (American Red Cross) Club, London, on September 23, 1944, as the first Anglo-U.S. Hamfest, we had in mind the fact that it was the first in which Headquarters participated.

The splendid efforts made by the City of Belfast Y.M.C.A. Radio Club are fully appreciated by the Council and are referred to in their Annual Report.

Congrats

● To W/Cmdr. Norman Best, G5QN, of Coventry, who has been awarded the Military Cross and mentioned in despatches for gallantry on the Normandy beaches on "D" Day.

● To F/O J. M. Gillespie, BR56147, and his wife on the arrival of a son—James Logan—on September 24.

● To Mr. J. Ward, G4JJ, of Barnsley, whose wife has presented him with twins.

● To G3RP, who was recently married in London.

● To A.B. H. W. Houston, BR58423, who was recently Mentioned in Despatches for distinguished service whilst on convoy escort duty. A.B. Houston is a Submarine Detector Operator.

Silent Keys

We record, with deep regret the names of the following members who have been killed or have died on active service:—

Flying Officer C. W. Davies, R.A.F., BR57663.

Sergeant H. Dunningham, R.A.F., BR57291.

L.A.C. H. H. Hallums, R.A.F., G3RN.

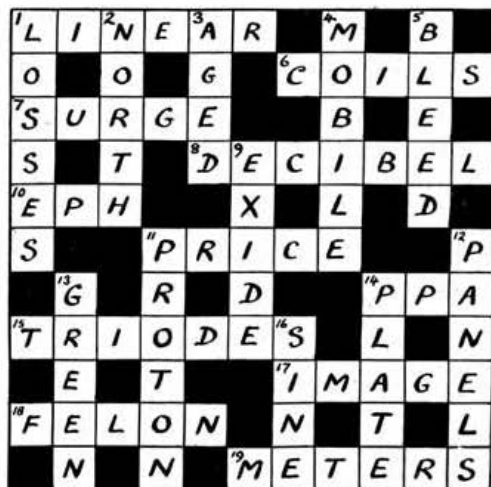
Flying Officer H. W. Hoskins, R.A.F., BR55585

Major G. Twiss, 8th Gurkha Rifles, VU2KK.

We also record, with deep regret, the passing of Lord Craigynile (Life Member), Mr. H. Jackson, BR53679, of Hallaton, Leicester, and Mr. A. J. Ogilvie, BR57807, of Bexley Heath, Kent.

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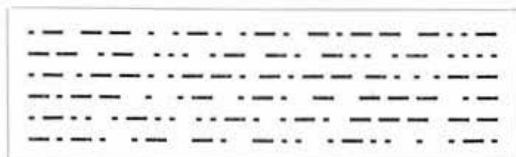
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