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JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

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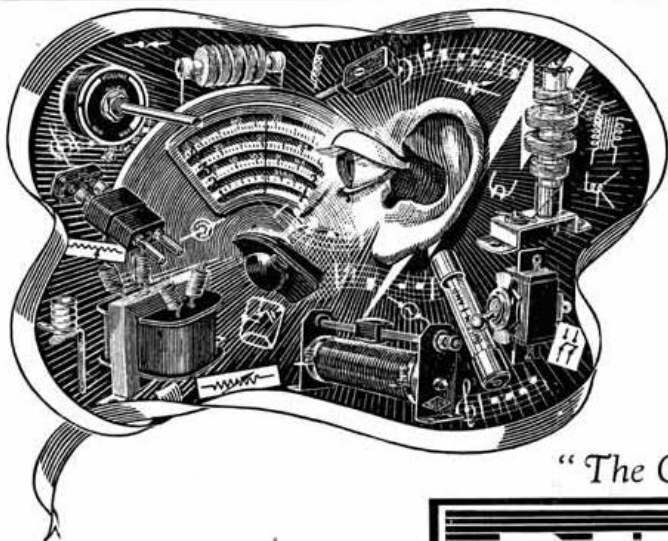
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RECEIVER STANDARDS

IN the last few years of pre-war Amateur Radio a gradual, but nevertheless well-defined, trend was developing in amateur circles towards the factory-built receiver, as the complement to an amateur-built transmitter. It would be interesting to speculate on all the reasons for this, but in pursuance of recent correspondence in this Journal, it is proposed to focus attention upon one probable explanation.

The efficiency of a transmitter, in the broad sense of the term, is very nearly determined by the efficiency in the particular sense—namely output over input. To some extent other factors, such as convenience of operating, enter into the question, but performance is easily measurable with relatively simple apparatus.

To turn to the receiver. Here is a complex piece of equipment at least as essential to the communication link as the transmitter. But, not only is its performance difficult to measure; the very standards of performance are unfamiliar, and the limits of specification figures are debatable. For example, take the matter of signal-to-noise ratio. Noise is the limiting factor to amplification, and is therefore quite as important to reliable communication as the power at the transmitting end. Yet how many amateurs can quote the limiting signal-to-noise ratio of their receivers with as much assurance as they can give the R.F. power into their aërials? Furthermore, how many could judge whether a quoted figure represents good, bad, or indifferent performance?

It is no exaggeration to say that amateur communication demands better receiver performance than any other service. An experienced amateur can judge defects in a receiver, used for amateur communication, more surely and quickly than most; but all he can say is "not selective enough," "too noisy," "too difficult to adjust" and so on. Even if he were able to measure all these factors and quote them in a technical description, his figures would have little meaning except to a limited number of specialists.

Clearly, therefore, we must endeavour to decide on the features which vary from receiver to receiver; how to measure them and distinguish, by means of the measurements, good from bad performance. Only then will amateur receiver design be stimulated by certain knowledge of requirements and by the comparison (in technical articles and advertisements) of performance figures, as progress is claimed.

The problem relating to broadcast receivers has already been resolved by a British Standards Specification, but a very wide gulf separates the

broadcast and communications types, so that figures of performance so derived might be, in some circumstances, misleading or useless. We also lack standard terminology. For instance, how are we to differentiate between drift, due to valves warming-up, and that due to tuned circuit changes; what shall we call that condition which gives ample, but not excessive B.F.O. injection; what terms shall we attach to the various kinds of instability, and so on.

As a nation-wide body of enthusiasts, technicians and operators we appear to have a unique opportunity of initiating discussion and finally reaching decision on all these points, and in so doing we might well set up standards which would prove invaluable to all radio communication interests. There is obvious scope for technical articles—the more provocative of discussion the better, for this subject will inevitably arouse differences of opinion even amongst authorities in the world of receiver design.

THE POST-WAR AMATEUR MARKET

At some not too distant date, if sage and prophet can be relied upon, the good days of Peace will once more be with us. As one quite important section of the radio-purchasing community, it is clearly in our own interests to put forward ideas to the industry which will enable them to cater for our needs. One member, whose letter appears in this issue, suggests that an enterprising company should produce a standard form of chassis. The idea is good and one which we hope will attract the attention of someone with an eye to the future.

Our recent appeal for articles describing wooden fabricated aerial masts met with little response, but the one member who contributed (his article will appear shortly) provided us with an idea. Would it not "pay" some progressive concern to produce wooden sectional masts to a standard specification and in varying heights?

Undoubtedly many members, especially those in the Services, have, during the past five years, made mental note of similar ideas which, if made available to amateurs, would do much to improve the efficiency and appearance of our post-war stations.

May we suggest, therefore, that the columns of this Journal be used to focus attention on any suggestion that may ultimately prove a boon to amateurs in the years to come? We need have no fear that radio manufacturers will let slip the golden opportunities which will be presented to them when amateur radio comes into its own again; but it is our job to tell them what we want.

J. C.

PRESIDENTIAL ADDRESS*

By E. L. GARDINER, B.Sc. (G6GR).

It hardly seems necessary for me to express my deep appreciation of the honour which you have conferred upon me by my election as President of this Society. Amongst some professional circles the Radio Society of Great Britain may not always have been regarded in the past with the same seriousness as other technical associations, mainly perhaps on account of the comparative youth of a large proportion of our membership. Although I have been associated with the radio profession for the whole of my career, and have been active as an amateur for a good deal longer, I have never shared this view, in fact, I have always held, and shall always retain, an intense enthusiasm for Amateur Radio, which I regard not only as amongst the most intriguing and instructive of hobbies, but also as an invaluable training ground for all branches of radio science.

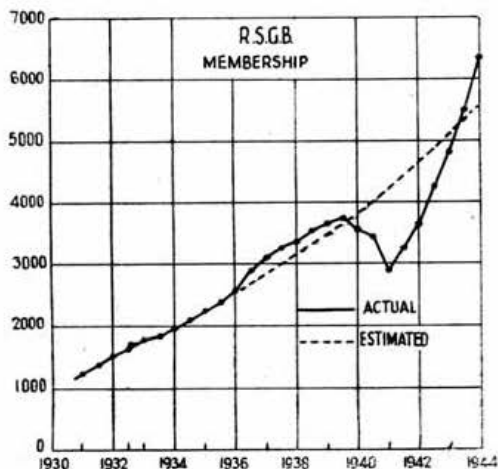


Fig. 1.
Membership Curve of the Society.

War-time Development of the Society

A study of the position in which the Society finds itself at the present time should do much to dispel any misconception regarding the value of our work. The kind of experience which the amateur gains in times of peace is exactly of the type needed to provide a nucleus of skilled personnel in time of war; and I think it is no secret that the many hundreds of our members who flocked to the Colours in 1939 and 1940 were of invaluable assistance in the prompt establishment of a variety of essential technical services. I have every confidence that this fact is appreciated, and that it will make much easier the re-establishment of those rights and privileges which are necessary for the furtherance of the amateur movement, and which it is our purpose to uphold; whilst the Society itself will be felt worthy of increased respect on account of the fine work which its members have achieved. I have little doubt that these facts are reflected also in the gratifying increase in our membership, which has taken place during a period when our normal activities are suspended, and which might have been viewed with apprehension by many members of the Council, as it was at one time by myself.

That membership has increased under the difficult conditions of war seems to me a sure indication of the virility and buoyancy of the amateur, who, working as he does on his own initiative and in furtherance of his own cherished desires, brings to his study of radio a keenness not often met with elsewhere. A man does best that which he wishes to do; and it is just this added keenness which imparts to the amateur movement its extraordinary solidity, and makes me proud to be associated with it, and in a position to contribute at least a little to its future development.

It is interesting to examine the membership curve of the Society shown in Fig. 1. It will be noticed that soon after the outbreak of war, the rate of increase fell off sharply, as might have been expected, since our minds were filled with more vital issues. After a surprisingly short time, however, an upward trend was again resumed, which quickly reached a rate never previously attained, and which shows no sign of saturation to-day. I have tried to estimate by the dotted curve the probable course of events if war had not intervened, and our membership had continued to increase at the peace-time rate; with the interesting result that the estimated figure would have been only about 1,000 short of that actually reached. Although the recent rapid rise has more than compensated for the temporary fall caused by the impact of war, I cannot escape the conclusion in my mind that our present high membership is not, as seems to be feared by some, entirely an abnormal condition arising out of war conditions, but that much of it would have been the normal result of the uninterrupted growth to be expected from a virile Society, thereby indicative of a healthy condition within the amateur community.

It will be seen that the estimated curve is not far from the exponential form, which is typical of "snowball" growth, and which seems to me to lend confirmation to the view that many of our new members join the Society as a result of the recommendation of existing members. This is undoubtedly a desirable state of affairs, and suggests, that, on the whole, members are by no means dissatisfied with the activities and aims of the Society, and have confidence in its ability to represent their interests effectively in the future. It is, of course, not reasonable to expect that every new member will become a fully active amateur when peace returns or that all will remain permanent members of the Society. However, "once an amateur, always an amateur," is a phrase often used in the past, and not without a substantial basis of fact. I think, therefore, that the Society can look forward with complete confidence to a stronger position both numerically and financially in the critical post-war years, than it has ever previously enjoyed; and if I have the good fortune to be in the chair when the first "Test" call of peace-time is radiated, I will do all in my power to see that this opportunity is not wasted.

Post-war Problems

I think you will agree with me that there is too much uncertainty in the air at present for this to be the ideal occasion on which to discuss plans for the future, vital as these undoubtedly are. Planning is a very fashionable occupation to-day, sometimes I fear with an all too flimsy knowledge of the conditions likely to exist when such plans come to fruition. Although your Council and Officers are fully alive to their responsibilities, I want to stress that the conditions

* Delivered at a meeting of the Society held on January 29th, 1944 at the Institution of Electrical Engineers, London.

which will face the amateur movement throughout the world after the war are at present most uncertain, and also that the authorities who may be expected to control these conditions are, in many cases, not yet in existence. Moreover, our own membership is scattered, and those in the Services who might be regarded as particularly entitled to consideration, cannot as a rule be consulted to obtain their views and wishes for the future. Thus, any precipitate action would be unfair to them, and savour of the undemocratic. I hope that I shall have many opportunities in the future of talking to you about these matters which are uppermost in all our minds, but on the present occasion I shall follow the lead given by my distinguished predecessors, Mr. Gay and Mr. Watts, and devote the rest of my address to technical matters which I hope will interest you. I have chosen for my subject a few aspects of receiver development in amateur hands.

* * *

Early Receiver Developments

The pleasure which I derive from becoming your President arises in no small measure from the feeling that I am carrying on to some extent the work of the many well-known, or even famous, men who have held that position in the past. I would like to mention particularly the name of the late Sir Oliver Lodge, for whom I have always felt the highest admiration and esteem, and to whose wonderful ability as a lecturer I have listened many times in the past. To Sir Oliver Lodge may be assigned the credit for launching the selective receiver of to-day, by his historic patent of 1898, entitled "Improvements in Syntonised Telegraphy without live wires," in which he described for the first time "means whereby the frequency of the transmitter and receiver could be varied with ease and certainty." Fig. 2 is a circuit reproduced from this patent, in which the aerial circuit of a transmitter is shown as tuned by an adjustable inductance.

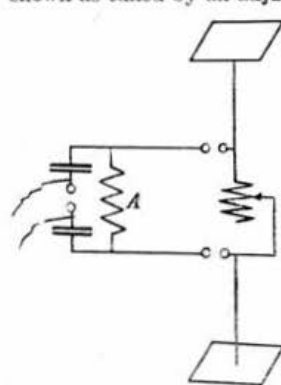


Fig. 2.

Circuit of Sir Oliver Lodge's Patent of 1898.

Early development in receiver design between about the years 1900 and 1914 was dominated by the need for the discovery of an efficient and reliable detector, or rectifier, of high frequency potentials. From the pioneer experiments of Hertz, in which the received waves were detected by the passage of sparks across a short gap, was developed the coherer of Branley and Marconi, by means of which most of the first successful results were obtained.

Since a few personal reminiscences may be excused on the occasion of a presidential address, I would like to recall that my own introduction to radio came about through the lucky presentation to a cadet corps (with which I happened to be associated as a schoolboy) of a small spark transmitter and coherer receiver, of doubtful quality and uncertain wavelength. As it was known that I was interested in electricity, I was asked to make this equipment work, and after much experiment with the transmitter and receiver at opposite ends of a long table, reached the stage at which, when the key was pressed a bell would ring at the receiver. This was thought to be "wireless," and caused unbounded delight, although in

retrospect I am not sure that vibration from the interrupter of the spark coil affecting the coherer through the wood of the table was not largely responsible!

A few years later, when the first world war was over and licenses re-issued, my first amateur contacts were made over distances of about a mile, utilising a Ford spark coil at the transmitter, and a copy of the Italian naval mercury-and-carbon coherer as the detector.

Selectivity Improvements

The selectivity of early equipment was limited by the fact that (a) the superheterodyne principle was not known, and (b) without valve amplification it was inadvisable, owing to the loss of energy entailed, to use more than two tuned circuits loosely coupled to each other. One of these was usually the tuned aerial circuit, while the second was directly connected to the detector—thus both were heavily damped.

The coherer gave place in its turn to more reliable detectors, such as the magnetic and the electrolytic, to be followed by the crystal detector invented in 1906 by H. H. C. Dunwoody of Washington. It was with this kind of equipment that the pioneer work was done, by men who were essentially amateurs within the meaning which we attach to the term; and I think it is valuable to remember that many of the same men who brought the radio industry of to-day into existence were also amongst the founders of this Society.

I would now like to illustrate my outline of receiver development by showing you a number of photographs of early stations and equipment, several of which were the means of effecting historic contacts in the hands of Past Presidents of the Society; and of other keen members.

[Here the President showed a number of slides, illustrating amongst others the stations of Mr. Leslie McMichael, including the receiver employed for the first two-way communication from a moving train; Mr. Gerald Marcuse; the late Mr. E. D. Simmonds, including the equipment with which he effected historic first contacts with Australia; the station of Mr. S. K. Lever, our Executive Vice-President, as it was in the early 1920's; and his own station. Comparisons were made between early and modern equipment, and some of the salient features pointed out, whilst the important position so long occupied by the straight receiver in amateur practice was commented upon. Ed.]

The Trend of Future Developments

I would like to devote the remainder of my address to a few comments on amateur receiver practice as it was immediately prior to the present war, and to suggest some directions in which developments seem probable.

Even to-day the straight receiver remains popular, and in addition to providing valuable experience in design and construction for the comparative newcomer it forms a useful second receiver for the advanced operator. Drastic changes in this established favourite do not seem very likely. The principal advances have come about through improved valve design, which is, of course, by no means at a standstill during the war. The modern aligned-grid R.F. pentode has made possible effective amplification up to perhaps 100 Mc/s., and has been used at higher frequencies, whilst its improved input impedance has reduced the inevitable damping of tuned circuits. Together with the very loose coupling which the high-stage gain of such valves makes practicable, a considerably better selectivity is often realised than was usual some years ago. Loose coupling between stages and aerial is a factor necessary for accurate ganging, and

complete wave-change switching and ganging of the tuning controls is now quite a practical proposition in the modern straight receiver. An effective audio filter is a valuable addition to this circuit, and should preferably have a narrow band-pass characteristic for C.W. reception. Some room undoubtedly exists for improvements in the design of this filter.

Ganged Separate Oscillator

The ganged receiver can be much improved by the addition of a feature which is at present seldom seen, namely the built-in and ganged separate heterodyne oscillator. This should be reasonably well screened from the receiver proper, and loosely coupled to the detector grid coil. The receiver dial will be calibrated in terms of this oscillator, which if carefully constructed may have the frequency stability of a wavemeter. Thus, when receiving C.W. the receiver acquires the precision and stability usually associated with the superheterodyne, whilst the pulling, or blocking, effect of strong signals upon an oscillating detector is eliminated. The normal tuned circuits are preferably provided with individual trimmers, and are lined up with reference to the oscillator, when the effects of aerial or reaction coupling upon frequency cease to be important. Well carried out, this system is inferior only to the superheterodyne in respect of its sensitivity to modulated transmissions, and in the tendency of powerful modulated signals to spread over adjacent channels, on account of the lower absolute selectivity.

Improved Dielectrics

In recent years it has gradually come to be realised that the difficulties in obtaining satisfactory detector performance at very high frequencies are not, as was once supposed, due mainly to the valve, but can be traced very largely to the use of dielectrics which may be quite effective at somewhat lower frequencies. Design has been directed to the complete elimination of solid dielectrics in favour of air at all points of high R.F. potential, including the valve base and holder; and to the use of ceramics, polystyrene, and perhaps glass when support is essential, in place of the more usual plastics. In consequence it has been found possible to operate quite ordinary valves up to some hundreds of megacycles; and less difficulty than heretofore may be expected when the higher frequencies again become available for amateur use. In pre-war days the amateur was, with little doubt, the most experienced user of the ultra-high frequencies; whilst the increasing commercial development of these may be expected to have continued subsequently. Our experience of this specialised field, and of its special tools, such as the super-regenerative circuit and many others, is likely to be of more use in the future than was at one time supposed.

Wide-band Frequency Modulation

Just prior to the outbreak of hostilities a great deal was being heard of the potentialities of wide-band frequency modulated transmission, in fact, high fidelity broadcast services utilising this system were in operation in the United States. Frequency modulation is by no means a new idea, but in the past it had generally been regarded in the light of a narrow-band or space-saving system, and in this form had been shown to offer no real advantages over the more conventional amplitude modulated systems. It is interesting, however, to remember that the very early marker and spacer wave form of C.W. transmission was in fact an example of frequency modulation. Taking advantage of modern high frequency methods, Armstrong reversed this conception, showing that if frequency modulation be developed as a wide band

system covering 100 kc/s. or more, it has valuable properties in the improvement of signal-to-noise ratio; and he has worked out a transmitting system which effects a substantial saving in power.

There seems little doubt that frequency modulation in this form offers an excellent field for post-war development by the amateur, who will be particularly attracted by the saving in power at the transmitter, since he is often severely limited in that respect. In the first place the system will not be difficult to incorporate into existing equipment, as a preliminary step to the later development of improved methods. No doubt there are other technical advances of a broadly similar nature which, when the exigencies of war permit them to be disclosed, will open up further fields for amateur investigation.

Signal-To-Noise Ratio

Study of the superheterodyne in recent years has led to a better understanding of signal-to-noise ratio which, with the high gain easily obtainable under present conditions, is a limiting factor in reception. It is now generally agreed that noise is determined almost entirely in the grid circuit of the first stage, that arising later in the receiver being nearly negligible if the general design is sound. This noise can be reduced by two main factors, the first being the valve design which should for example provide for a minimum screen current, since this current has been shown to add materially to noise whilst not contributing directly to amplification; and the second,

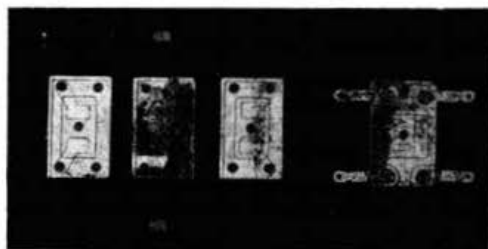


Fig. 3.
Ceramic-mounted I.F. filter crystals.

the Q of the first tuned circuit, which must be the highest obtainable. In this respect many of our early receivers were in advance of those in use more recently, for in the days when the simple straight receiver was the recognised standard, the careful amateur generally took a good deal of trouble to build a highly efficient aerial coil, generally a bulky affair rather similar to the modern transmitting inductance. Later, however, as the high sensitivity of the superheterodyne became commonplace, the idea grew up that the large efficient coil was no longer worth while. Whilst it does not always follow that a compact screened coil is inefficient (and there has been a considerable advance in the design of such coils), nevertheless, recent work clearly shows that the best possible coil is well justified at the input of a receiver, rather than the small affair on a paxolin former, found in many commercial "all-wave" receivers. Outstanding improvements in signal-to-noise ratio have been obtained from sets incorporating a large coil, rather more of the kind generally associated with the transmitter, and having a Q of several hundred.

Crystal Band-Pass Filters and other Improvements

High selectivity is a *sine qua non* of the modern superheterodyne receiver, and in this respect I have often expressed the opinion that the crystal band-pass filter represents the best solution at present available. I have described this technique at some length both

in *THE BULLETIN* and the *Amateur Radio Handbook*, and will not, therefore, enlarge upon it here, beyond pointing out the considerable advances which are well known to have taken place during the war in the mass-production of crystals. As a result of these, we may expect to obtain crystals more easily, more cheaply and in greater variety in the future, and there should not be the same barrier to their general use on grounds of expense. An illustration of a neat ceramic mounting for a pair of filter crystals is illustrated in Fig. 3, whilst complete filter units are available commercially for those who do not wish to build their own.

Full advantage cannot, however, be taken of extreme selectivity unless the receiver is proportionately stable, both as regards its tuning adjustments, and the vital factor of frequency drift. In my experience there is still much room for improvement in this direction. Most commercial designers have realised the importance of a smooth and well designed tuning drive and dial, which forms a striking feature of the typical communication receiver, and makes possible a fine adjustment of frequency, but there are not always equal facilities for the accurate reading of this frequency from the dial, or for its exact maintenance electrically. Improvements in components and dielectric materials assist in this direction, but it is unfortunately true that the requirements of variable tuning with a wide frequency-coverage conflict with those of high stability, and there would seem room for new principles of design directed towards the elimination of temperature drift. A stabilised power supply is of real assistance in this respect, and, even if of the simple Neon-regulated variety, could be introduced with advantage into the more advanced amateur receiver. Its purpose is to prevent supply variations from reacting upon the frequency stability of the frequency-changing system.

The Double-Superheterodyne

One of the most promising lines of attack upon these related problems is found in the double-superheterodyne; at one time only regarded as suitable for the larger commercial point-to-point installations, but which has been developed for amateur use by several members of this Society during the last few years. The principal technical difficulty to be overcome in this system is the production of audible beats on certain frequencies at which harmonics of the two local oscillators coincide, the complete elimination of these calling for more than the usual care in screening, and in circuit decoupling, whilst exercising care that the oscillators have good wave-form and the whole receiver is well designed. Where, however, reception is mainly required over a limited range of frequencies, such as the amateur bands, the problem can be eliminated by the suitable choice of intermediate frequencies; and this has also been done for broadcast reception, where the well-known short-wave converter changes a normal broadcast receiver into a simple form of double-superheterodyne.

Summary of Design Principles

It will perhaps be of interest to summarise the principles on which a receiver for amateur use can be designed. Although the first I.F. will be high, nevertheless at least one tuned R.F. stage is desirable in order to reduce second-channel interference, and provide the best attainable signal-to-noise ratio. As previously mentioned this factor is determined by the first stage and the first tuned circuit. This should be the best obtainable as an amplifier has inherently a lower noise level than a frequency-changer. After an efficient R.F. stage, signals are amplified to a level at which subsequent valve noise should contribute very

little to the total, and on theoretical grounds one stage is quite sufficient to effect this gain when using modern valves; but some may prefer to employ two stages, which need not then be worked at the highest pitch of efficiency. The lining-up problem is considerably eased by this step.

The double-superheterodyne cannot easily be designed as a single dial receiver and it is usual to provide a separate R.F. control for adjusting the signal-frequency circuits. At this point comes the first major decision which must be taken, whether to design the first frequency-changer as the main tuning control (in which case it may be ganged to the R.F. circuits in the usual manner); or whether to treat it as a preset adjustment, and effect fine tuning by variation of the first I.F. amplifier. If the former course be adopted, the receiver becomes very similar to one of conventional design, its only advantage being the use of a high first I.F. in order to reduce second-channel, followed by a low second I.F. to provide selectivity. The second choice offers attractive

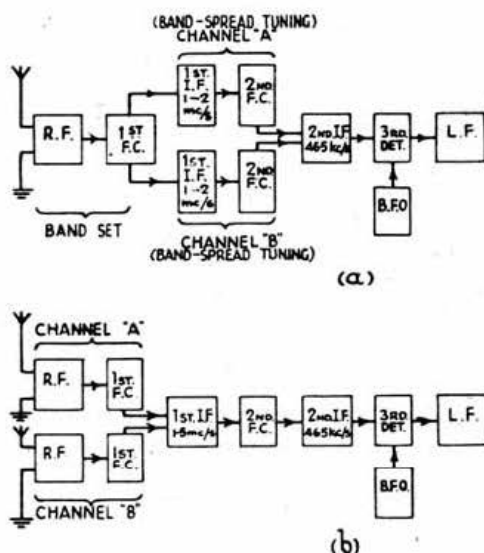


Fig. 4.

- (a) Schematic diagram of double-superheterodyne receiver arranged for simultaneous or alternative reception of two signals of similar frequencies.
(b) Similar receiver arranged for simultaneous or alternative reception of two signals on widely different frequencies.

possibilities in regard to stability, and on these lines the first oscillator will be fixed for each wave-band, either by means of its own carefully calibrated dial (by some form of switching), or in the most advanced example by the selection of crystals which "lock" this oscillator for each band. The latter suggestion would be quite practicable on the amateur bands, and would eliminate at once the chief source of drift in the majority of receivers.

The first I.F. must now be chosen, and if the last suggestion be followed it must be variable over a convenient range such as 1.5 to 2.0 Mc/s., or 2.0 to 3.0 Mc/s. One stage will be ample here, since too much gain leads to the risk of overload at the second frequency changer. In practice the oscillator of the latter is ganged to the two I.F. circuits, the combination forming a very similar assembly to a medium-wave broadcast receiver but working at a somewhat higher frequency. These controls are brought out to the second main dial of the receiver, forming the principal band spread scale, which should,

of course be large and clearly calibrated. The characteristic advantage of the system is now evident since this band spread calibration is independent of the actual frequency being received, however high this may be, and also since the circuits concerned are working at the comparatively low first I.F. of a few megacycles only, they will have the stability and permanence associated with broadcast types of receiver, and may be expected to hold their calibration to within a few kilocycles, indefinitely.

After the second frequency-changer follows a second I.F. amplifier, now operating at a low fixed frequency, for which the 465 kc/s. region is very suitable, since it is convenient for the introduction of crystal filters if desired. The arrangement of this section, and of the final detector and audio circuits which complete the receiver, can follow conventional lines, incorporating any special improvements, such as delayed A.V.C., noise-suppression, or audio filters which the owner favours. Stability of the B.F.O. is, however, important, and should not be inferior to the rest of the equipment. Much can be said for controlling this also by means of

the limits of one amateur band. The R.F. and first frequency-changer remain common, and signals then divide as shown in Fig. 4a the two duplicate first I.F. channels, either or both of which can be switched into use as desired. Following the respective second frequency-changers, the two signals are recombined at 465 kc/s. into the second I.F., detector and L.F. stages, which are common to both.

Arranged in this way it is assumed that the R.F. circuits are broadly enough tuned to accept the two signals, which must, therefore, be of similar frequency; and in practice the R.F. stages would be tuned approximately to the weaker of the two. It is thus excellent for single-band working, but not suitable for comparisons between bands. To meet the latter conditions, the whole of the earlier stages of a receiver may be duplicated, as indicated in Fig. 4b, and it is not, of course, necessary that this should be a double-superheterodyne, the scheme having been applied to the normal superheterodyne by Mr. F. Charman,



Fig. 5.
The Author's Station in 1924.

a crystal, when it will always be correctly set in relation to the I.F. crystal filter, helping in this way to achieve the final aim of a completely stable receiver on which the beat-note of an illusive signal will remain constant for prolonged periods. The advantages generally thought to attach to a variable beat oscillator seem largely illusory, since the audible note can readily be changed within limits by a touch on the band spread dial, should it become tiring to the ear.

A receiver developed on these lines may seem elaborate at first sight, but on consideration it will be seen that many of the stages are individually simple and often operate on fixed frequencies, whilst the efficiency of modern valves enables us to keep the number of stages within limits. A few members have gone further, and have introduced valuable additions, which enable the receiver to be tuned to two transmissions independently. The value of this provision in normal times would be obvious, since it enables both sides of a conversation to be followed, or alternatively can be used to hold a transmission of interest whilst searching elsewhere on the band. It may also be used to compare reception conditions on two frequency bands simultaneously. Moreover, the idea need not necessarily be confined to double-superheterodyne receivers, but is adaptable to simpler equipment.

Duplication of First I.F. Stage

One design of double-superheterodyne receiver on the lines described has been modified by duplicating the first I.F. section; by which it is rendered suitable for alternative reception of two transmissions within



Fig. 6.
G6GR in 1939.

G6CJ, who has described its value in the study of simultaneous propagation conditions on widely differing frequencies.

Conclusion

In this brief survey of receiving developments, I trust that some members have found suggestions which will stimulate fresh inventive work; whilst the "old-timers" may have enjoyed the recollection of earlier days. It will perhaps encourage the younger members who to-day make up an increasing proportion of the Society, to notice that all amateurs, Presidents included, must pass at some time or other through the "young squirt" stage; as is well illustrated by the illustration of Fig. 5 in which the speaker can be recognised operating his station on 160 metre 'phone in about 1924; and which provides an interesting contrast with the same station shown in Fig. 6 as it was in 1939, before the outbreak of war put an end temporarily to some 28 years of continuous and absorbingly interesting amateur activity.

OUR FRONT COVER

THE part that is being played in the war effort by "AVO"

Electrical Testing Instruments is such that it can be truly said that they are actively engaged on the fighting and factory fronts. They are sharing a great responsibility with a proud sense of duty and high confidence in the future. It will be appreciated that, under present circumstances, orders can only be accepted which bear a Government Contract Number and Priority Rating. Enquiries should be addressed to The Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, S.W.1. Telephone: Victoria 3404-8.

THE PILOT OFFICER NORMAN KEITH ADAMS PRIZE

Declaration of Trust Accepted by the Society

DURING the years immediately preceding the present war, many North London experimental radio stations were famed for their efficiency, reliability and courtesy. Few were better known than Station G5NM, owned and operated by a youthful solicitor, Norman Keith Adams, who, in other walks of life also, had endeared himself to those who knew him.

Keith Adams, mindful of the coming call of King and Country, volunteered for service in the Royal Air Force during the summer of 1939 and he was in one of the first contingents of British radio amateurs to arrive in France after the outbreak of hostilities. The nature of his work then, and subsequently, cannot yet be disclosed, but it is known that his pre-war radio experience was soon put to good effect. Keith remained in France until the evacuation, when he returned to England to continue his special radio duties. After a spell in East Anglia and elsewhere, he was posted to Gibraltar, where his ability was recognised by senior Signals Branch officers. Promotion through the ranks came quickly, to be followed by a strong recommendation for a commission.



The late Pilot Officer Norman Keith Adams (G5NM)

At about this time Keith Adams, and others, set about the task of forming a war-time Gibraltar Amateur Radio Society which, for many months, provided a common meeting ground for all amateurs serving on The Rock. Those who knew the operator of G5NM well, were not surprised to learn that he had been appointed Honorary Secretary-Honorary Treasurer of the new Society, for in peace-time he had acquired the gift of organising ability. By this time his promotion to commissioned rank had been approved, and it was as Pilot Officer N. K. Adams that he undertook new and more arduous duties in preparation for the Allied invasion of North Africa.

Sometime on August 21, 1942, Keith Adams set off by flying boat on a special assignment. His work completed the machine turned for base and was within sight of Gibraltar, very early the next morning, when suddenly the giant Sunderland crashed into the sea. And so a young life was lost, a life which, in the course of 26 years, had been devoted to service of the highest order.

The news of his death was received in British Amateur Radio circles with great sadness, for although young in years it was recognised that he had achieved much.

To-day, as the result of a Gift which it has accepted from his parents (Mr. and Mrs. H. F. Adams), the Council announces that his name will be permanently

commemorated by the institution of a special Prize. The Gift will be held by the Society upon certain trusts set out in a Declaration entered into by the Society, the salient features of which are summarised in the following paragraphs.

Whereas Henry Francis Adams and Irene Mabel Adams, of 35 Manor View, Finchley, Middlesex, being desirous of effecting a permanent memorial of their late son Norman Keith Adams (A Pilot Officer in the Royal Air Force, and a former member of the Society call sign G5NM, and who lost his life on active service overseas on August 22, 1942) have handed to the Society the sum of £150 to be held by the Society upon the trusts and subject to the regulations mentioned.

The Deed states that the Trust Fund shall be invested in the name of the Society, and that it shall be kept separately in the Society's books.

The dividends and annual income of the Fund shall be employed in providing a prize to be called *The Pilot Officer Norman Keith Adams Prize*. The Prize shall be open only to Members of the Society, and shall be awarded annually by the Council, to the Author or Joint Authors of the paper or article bearing upon radio science, or the application thereof, or upon subjects relating thereto, which, in the opinion of the Council shall be the most meritorious paper or article published in the R.S.G.B. BULLETIN or other official journal for the time being of the Society during the 12 months ending June 30 in each year, and in the event of two or more papers deemed to be equally meritorious then the Prize shall be divided as equally as possible between the Authors thereof, but no Member who has once been awarded the Prize shall be eligible for a further Prize from the Trust Fund at any time. The first of such Prizes shall be awarded in the year 1945.

No member of the Society serving as a Member of the Council of the Society making the award shall be eligible for a Prize awarded by that Council, and no employee of the Society shall be eligible for a Prize during the period of his employment by the Society.

Provision is made in the Deed to withhold the Prize for any one year if it is considered that no paper or article justifies the award. In such a case the Council may in their discretion either add the amount or value of the Prize to the capital, or award an additional Prize to the second most meritorious paper or article in the following or any subsequent year.

The Prize may be awarded either in whole or in part in money, books or medals or in such other form as Council may at any time determine.

If from any cause the dividends and annual income cannot or shall not be applied for the space of three years for the purposes mentioned in the Deed or if the Society shall be wound up or dissolved (except for the purposes of amalgamation or reconstruction), then the Trust Fund shall be transferred to such other Society or Institution having objects similar to the objects of the Society as the donors of the Trust Fund or the survivor of them shall nominate.

The Schedule attached to the Deed states:

1. The paper or article shall be an original paper or article and any paper or article which is wholly or substantially a reproduction or copy of or extract from a paper article book lecture or address previously

(Continued on page 192)

A RADIO JUBILEE

THE Silver Jubilee Meeting of the Wireless Section of the Institution of Electrical Engineers held in London on May 3, 1944, was an historic event. Those members of the Society who attended either as Members of the Institution or as visitors, heard one of the most entertaining reviews of the progress of radio communication that has ever been given.

Several Past-Presidents of the Wireless Section collaborated in presenting a series of short addresses on various aspects of the development of radio from its earliest days. Col. Sir Stanley Angwin, reigning President of the Institution, explained that the Wireless Section was formed at a very important stage in the history of radio. This was at the beginning of the era of practical radio telephony, when tremendous advances were being made in valve design and circuit technique. He referred to the frequent discussion on the question as to whether radio amateurs or professional radio engineers were responsible for the opening-up of long-distance short-wave communication.

Dr. W. H. Eccles recalled the early equipment in use at the beginning of the century and traced the thread of progress through the succession of spark transmitters, high-frequency alternators, arc generators, Fleming diodes, electrolytic detectors, crystal detectors, and finally to the thermionic valve. In his opinion this device, together with the advent of the heterodyne principle in 1913, revolutionised the whole technique of radio.

Professor G. W. O. Howe with boldness and humour enlarged upon the historical fact that all the earliest developments in radio were made in spite of theory. The reason why the successful bridging of the Atlantic by radio was achieved by Marconi and not by Sir Oliver Lodge was that Lodge was so well versed in theory that he knew it was impossible, whereas Marconi did not know it was impossible and went ahead and did it! Professor Howe also spoke of the reluctance in some quarters, only as short a time as 17 years ago, to believe that the ionosphere actually existed. Experimental practice had again confounded the theoreticians.

Admiral Sir Charles Kennedy-Purvis reviewed the early progress of naval radio communication. Like Professor Howe, he too recalled the lead given by the practical men who disproved the theoretical predictions and the subsequent haste with which the mathematicians revised their calculations and found new answers just to show that they had been right all the time! He referred also to the development of long-distance short-wave radio and said that a debt was owed to two bodies—the amateurs and the Marconi Company, who forged ahead against widespread criticism.

The progress of broadcasting transmitter technique

was outlined by Mr. H. Bishop. Congestion of the wave-channels in the frequency spectrum, the development of high-power valves and Class-B transmitters were singled out as being the three most important problems which the B.B.C. had had to consider. Improvements in recording systems used by the B.B.C. were due largely to the demands of the Empire Broadcasting Service. Much remains to be done, however, in the field of acoustics, especially in studio and microphone design.

The address by Dr. R. L. Smith-Rose, who was delayed in Washington, U.S.A., was recorded by the B.B.C. and re-played at the Meeting. He spoke not of the past, but of the future. The use of high-stability transmitters operating on frequencies of the order of 500 Mc/s. over distances up to 100 miles will in his view relieve the pressure on the lower frequency channels. He foresaw the time when pilotless transport aircraft will cross the Atlantic and other long distances by the aid of radio control. Automatic correcting devices would prevent collisions with other aircraft encountered on the journey.

Dr. Smith-Rose spoke also of the need for applying war-time technique to the improvement in acoustic quality of broadcasting and in the development in television. It was important, too, that legislation should cope effectively with radio interference caused by electrical machines. Micro-waves represented a wide unexplored field for research, and the necessities of the war have brought to light gaps in our experience which can only be filled by a considerable amount of attention and development.

Recorded messages of greeting from Sir Ambrose Fleming, inventor of the diode rectifier valve, who is now 95, and from Mr. H. M. Turner, President of the American I.E.E., were re-played together with a record of a speech made in 1935 by the late Senator Marconi, and dealing with his famous original Transatlantic transmission—an experiment which cost £50,000 to prepare and which had been declared futile.

In proposing a vote of thanks to the speakers, Professor C. L. Fortescue spoke of the part which experimental practice had played in correcting the theoreticians and suggested that this was not confined to radio engineering.

The R.S.G.B. was represented officially at the Meeting by Mr. E. L. Gardiner, G6GR (President), who was one of the honoured guests.

Not only the Society members present, but also many of the 300 professionals who attended, must have carried away with them a vivid impression of the courageous enterprise shown by the pioneers and of the importance of the experimental approach to a problem which has been clearly written in so many pages of the history of radio. S.K.L.

WWV Schedules

Apropos the letter from W. N. Craig, GM6JJ, published in our last issue (Page 171) it is regretted that due to a printer's error, part of the telephony announcement was omitted.

The correct version is as follows:—

Telephony announcement made every hour and half-hour.

"This is radio station WWV of the National Bureau of Standards, Washington, D.C., broadcasting standard frequencies and standard time intervals. Radio carrier frequencies of 5 and 10 megacycles are broadcast continuously. In addition, 15 megacycles is broadcast in the daytime and 2½ megacycles at night. These radio frequencies are modulated by frequencies of 440 cycles per second, 4,000 cycles per second and a pulse once each second except the 59th second of each minute. The 440 cycle-tone is the standard musical pitch A above middle C. The tones are interrupted precisely on the hour and each five minutes thereafter. They are resumed after a time interval of precisely one minute. This voice announcement is repeated on the hour and half-hour. This is Station WWV."

The words omitted from the previous announcement are set in italics.

LONDON MEETINGS, 1944-1945

Friday Evenings?

Saturday Afternoons?

WHICH DO YOU PREFER?

SEE ANNOUNCEMENT ON PAGE 191

KHAKI and BLUE

Another Cairo Occasion

WE are indebted to Capt. Ken Ellis, G5KW, ex-SU5KW, and L.A.C. N. D. Glass, 2FFM, for sending details of the meeting held at The Bystander, Cairo, on May 5 last.

The morning meeting was attended by some 35 amateurs who quickly split into small groups to discuss topics of mutual interest. The evening sessions, which commenced at 8 p.m., was supported by an attendance of 57 which included the following:—G3AP, NZ, PX, TG, GM3LG, G4CG, LV, 5DN, NU, SI, WZ, 8KW, 2DKX, DOS, FFM, BRS3261, 3856, 4362, 4649, 6175, 7262, SU1AX, CR, MS, WM, 5KW, VE3AAA, 3ET, W1GPR, 20A, MEO, 3HJE, SGGY, NFQ, OPJ, SUF, 9CGT, EPO, GZS, LGS, OEF, PLX, SCB, WKY.



Festive board, The Bystander, Cairo, May 5, 1944.
Capt. Ken Ellis, G5KW (SU5KW), third from left.

During the meeting Mr. Reda, SU1CR, and L.A.C. Glass, 2FFM, were appointed to act as area representatives for Cairo and Alexandria respectively. A collection, amounting to £4 5s. 0d., was taken for the R.S.G.B. Prisoners of War Fund, and several non-members of the Society filled in an application for membership.

Capt. Ellis states in his report that meetings of the Cairo Amateur Radio Club are to be held on the first Saturday in each month. Notification of the programme will be sent to all who

attended the May meeting. Those who were not present should write to Mr. Reda, Box 600, Cairo. American amateurs are invited to contact Major Posten, W20A, Sig. Corps Det., C, H.Q., U.S.A., F.I.M.E., A.P.O. 787, U.S. Armed Forces.

The next Cairo Convention will be held on November 24th, when it is hoped that the attendance will reach the 100 mark. South African, New Zealand and Australian amateurs are cordially invited to support this and other meetings. The fact that representatives from all three countries were absent on May 5 was regretted by those present.

The photographs illustrating this account were taken by a photographer obtained by Capt. Ellis. Copies have already been sent to all who left their address, those who require additional copies should write to G5KW, c/o Mr. Reda, Box 600, Cairo.

The arrangements for the meeting were again in the capable hands of Messrs. W. E. Marsh, SU1WM, and Alex Hochstein, SU1AX.

Tailpiece

Who was the G with much DX to his credit who, noticing the India General Service ribbon on Major Nepean's (ex AC4YN-G5DN) tunic, said, "I see you must have been in the North West Frontier Area at some time or other, old man!"

● Cpl. J. Cairns, G3UC, R. Sigs, S.T.C.(B.) Mhow, India, would like to hear from G3WP, 5QO, SUB, SWC and 3766, and other old friends. His Service number is 3708152.

● News of the "Batchelor Gang" is to hand from Sgt W. Air, 2FWX, who writes from a R. Signals site near Swindon. Ron Dabbs, G2RD, Bill Bartholomew, G8CK and Tom Huggins, G8JI, are with him, whilst G2KI, G8MQ and 2CQI are in the country. An intensive constructional programme has been undertaken, with the result that most of the "Batchelors" will be "ready for anything" when the "all clear" is sounded. 2FWX seeks information regarding high quality 3 watt amplifiers and the construction of a phonograph oscillator (whatever that may be) using 1½ volt battery valves and low H.T. supply volts. It is required for use in a portable gramophone.

The "Batchelors" send greetings to all old friends.

● Sgt. Harry Colford, 2CVA, R.A.F., reports meeting F./Sgt. Leese, G3UP, in North Africa. He would like to see some more articles dealing with post-war planning for the amateur station.

● From L.A.C. Desmond Alimundo, G4HK, who is still in India, we learn that A.C.2 Stanley Saddington, 2FXQ, of Birmingham, was captured in Burma after the fall of Singapore, and is now a prisoner of war in Thailand.

● BRS4842, writing from India, still hopes to come across a fellow member and comments on the high price of components.



GROUP PHOTOGRAPH TAKEN DURING THE CAIRO MEETING, MAY, 1944.

- After serving for 2½ years in Malta and elsewhere, Cpl. J. Rose R.A.F., **BRSS164**, is now back in England and stationed within a few miles of his home. He will be pleased to hear from old friends who should write c/o 16 North Bridge Street, Sunderland.
- Lt.-Col. R. Postill, **G8NO**, who is now at Catterick, wishes to be remembered to **G2UJ**, **5KV**, **50Q**, **60B** and all other Tonbridge and Tunbridge Wells members. **SNO** hopes to meet the resident ham population at 150 O.C.T.U.
- Mr. J. S. Nicholson, **VU2JP**, Kadalapara Estate, Mudis P.O. via Pollachi, S. India, extends hospitality to any member serving in his part of India. "Nick" wishes to be remembered to all old friends.

Instructors Wanted

The Holborn Squadron, Women's Junior Air Corps, require the services of Morse and Radio Theory instructors. Members in the London area willing to devote one or two evenings a week to this work, are invited to communicate with the Adjutant, W.J.A.C., Hebrand Road Schools, Holborn, W.C.1.

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

DONATIONS.—The General Secretary acknowledges with thanks, on behalf of Council, receipt of donations from:—E. C. Fisher, 3762, 18s. 6d.; W. Hewitt, 4172, 4s. 6d.; District 4 per **G8DZ**, £2; B. Lindley, 6707, 7s. 6d.; H. Mackay, 5029, 8s.; F. E. Herzog, **G2UM**, 5s.; A. H. Magraw, **2BVA**, 5s.; J. E. Farnell, 3817, 5s.; R. S. Jackson, **G6JN**, 5s.; J. Cairns, **G3UC**, 5s.; J. D. Cairns, **2FDV**, 5s.; F. J. Wilson, 10s.; Cairo Meeting per **SUISG**, £9; H. E. Bennett, **G8PF**, 5s.; H. G. Lapworth, 5043, 5s.; T. J. S. Cole, **G3YU**, £1 5s.; L. Sinfield, 3s.; District 2 P.D.M., £4 6s. 3d.; D. Upton, 3106, 5s.; W. G. Taylor, **2AGX**, 5s.; District 12 Meeting, £1 6s.; A. L. Stevenson, 6976, 5s.; R. Postill, **G8NO**, £1 1s.; R. Sunter, **G3DH**, £1; D. Bennett, 7169, 5s.; District 13 per **G3ST**, £1 10s. 9d.; P. Zeld, **2HAG**, 10s.; T. Gates, 2s. 6d.; Anon 13s. Receipts to date, **£1250 2s. 10d.** Expenditure to date, **£731 6s. 1d.** Balance in hand as at May 31st, 1944. (European Fund) **£248 16s. 9d.** (Far-East Fund) **£270 0s. 0d.**

NEXT OF KIN.—Mr. C. H. L. Edwards, **G8TL**, "Speedways," St. Bartholomews Lane, Sudbury, Suffolk, invites next-of-kin to inform him of any special books, music or tobacco that may be required by members held captive in Germany.

KIT BAGS AND SUIT CASES.—During May kitbags and suitcases were sent to those members who have become prisoners of war since last summer, and to those who, due to their transfer from Italy to Germany, lost the original despatches.

Note-paper Donated for Prisoners of War Fund

As the result of a gift to the Society made by Mr. J. E. de Leeuw, **2BDX**, Headquarters have available a supply of good quality note-paper bearing the R.S.G.B. emblem which will be sold to members, and the proceeds credited to the R.S.G.B. Prisoners of War Fund. It is suggested that D.R.s and others organising meetings may like to apply for a small quantity for sale by auction.

The paper is available in packets of 100 sheets and offers from individual members will be welcomed by the General Secretary. (The sum of £1 6s. 0d. was realised at the May District 12 meeting from a raffle for three packets of this note-paper.)

News from the Kreigies

● L./Cpl. Ken Smith, **G3RB**, writing under date of March 1 from Stammlager VIIA, Germany, asks that his greetings be conveyed to **G3II**, **6ZN**, **8KP**, **8WP** and all other members in Wakefield who know him. He is fit and well after experiencing many adventures since leaving PG54 in Italy. Apparently he did not receive many of the parcels sent to him last year from the R.S.G.B. P.O.W. Fund.

● Those who remember old De Fone will be glad to hear that, according to one prisoner of war member he is getting it in the neck these days!

● We learn from Mrs. Richardson that her son has been promoted to the rank of Corporal. His full address is Cpl. A. R. Richardson, P.O.W. 24437, Stalag Luft III, Germany.

● Mrs. Marshall informs us that her son, Sig. F. E. Marshall, **G2XQ**, has received the kit bag and attache case sent by the Society last year. **G2XQ** extends thanks to all who have made it possible for him to receive parcels from the R.S.G.B. P.O.W. Fund.

● Trooper Norman Druce, **BRS2600**, now at Lager XVIII, Germany, has received his kit bag safely via next of kin. He writes, "not only does it provide a receptacle for what kit I have, but in the event of a move, one bag is a sight easier than a dozen cardboard boxes." Spirits are high in his camp.

● Old friends of Cecil Page, **G6PA**, one time head of the R.S.G.B. Experimental Section, will be interested to hear that he has recently been promoted to the rank of Wing Commander. "Pip Ack" is now occupying a base wallah's chair with the M.A.A.F. He has met W./C. Ian Orr-Ewing, **G5OG**, and Ft./Lt. Ted Laker, **G6LK**, the latter during a trip to the M.E. from which he returned much poorer!

Book Review

ELEMENTS OF RADIO. By Abraham and William Marcus. Edited by Ralph E. Horton. Published in Great Britain by George Allen & Unwin, Ltd. In two volumes bound together. 699 pp., 504 diagrams. Price 27s. 6d.

We read on the dust cover of this new book that:—"Many years' experience of teaching radio have convinced the authors that instruction must begin, not with a mass of laws and principles, but with the explanation of the radio receiver." With that thought in mind the authors have attempted, very successfully, to present the elements of radio in a new and novel manner. Those who have grappled with the problem of teaching basic principles to a class of trainees will know only too well that "a mass of laws and principles" fogs and confuses, whereas interest is instantly aroused if some practical demonstration of a principle can be arranged.

The present book introduces several interesting teaching devices. Problems are set as questions at the beginning of each chapter. Paragraphs are numbered and introduced by black-figure captions. A glossary (very useful) appears at the end of each chapter. A set of questions and answers accompanies each chapter and a complete programme of class-room demonstrations is provided at the end of the text. Tables of data are grouped in the Appendix. The drawings are large and more than usually profuse. The programme of demonstrations is comprehensive and varied in scope, but the majority of such demonstrations will require the use of a class-room and the resources of a technical laboratory. The line diagrams are among the finest produced in any technical publication to date. Clear, neatly drawn and informative they will go a very long way towards helping the reader to assimilate the text.

The Chapter arrangement fits in to the authors' plan perfectly. Simple wave motion theory prefaces a description of a simple radio receiving set. The operation of an Aerial-Earth system is followed by an account of (a) the Tuner, (b) the Reproducible, and (c) the Detector. An explanation of Wave-form, and the principles of the Aerial Coupler precede three chapters dealing with Electron Flow in (a) the aerial-earth system; (b) the tuning circuit; and (c) the crystal detector and phones. Valves are dealt with in four chapters, followed by descriptions of battery eliminators, loud speakers and R.F. amplifiers. A lengthy chapter is devoted to an explanation of the principles of the super-heterodyne receiver. Volume I closes with an account of valve types and direction finders.

Volume II opens with a chapter (No. 29) dealing with Direct Current and the nature of Electricity and Magnetism. Motors and Measuring Instruments are fully covered in the next chapter. Chapters 31-34 are devoted to Alternating Current Theory, Inductance, Reactance and Impedance, Capacitance and Resonant Circuits.

The Electromagnetic Wave and Radio Transmitter Aerials are covered in the next two chapters. Chapters 37-39 deal with Valve Characteristics, Amplifiers and Oscillators, thus paving the way for a full exposition of the operation of Continuous-wave and Modulated transmitters. The Cathode Ray tube is neatly and effectively treated in a lengthy final chapter. Demonstrations and Appendices complete this most absorbing book.

Space does not permit a detailed account being given of the technical standard reached by the authors, but from a critical reading of many chapters we are of the opinion that they have produced, most zealously, a treatise which will quickly take its place in the vanguard of text books devoted to the teaching of the elements of radio. J. C.

Silent Key

It is with deep regret that we record the death on active service of Flying Officer Ronald W. Wheeler, **BRS4220**, of Dagenham, Essex. F.O. Wheeler who was a fighter pilot did not return from a sweep last September, and his death has now been presumed. Our sympathies are extended to his brother-in-law, Mr. Harry Daly, **G2VZ**, and his other relatives.

Leeds P.D.M. Photograph

Mr. P. B. Jackson, **G3WQ**, "The Rose & Crown," New Street, Selby, Yorks, will be pleased to supply prints of a photograph taken at the Leeds P.D.M. to those members who send him a stamped addressed envelope and 2d. in stamps.

Side Slips

The captions beneath Figs. 2 and 3 illustrating Mr. Simmons' article, "A Utility Valve Voltmeter," published in our last issue, were reversed. The screen and suppressor grids of V1 in the circuit diagram (Fig. 1) should have been shown connected to the anode.

Interested in Stamp Collecting?

Amateur Radio and Stamp Collecting have much in common. If you are interested in both hobbies why not join the R.S.G.B. Stamp Club? Full details from Mr. Arthur O. Milne, **G2MI**, 29 Kechill Gardens, Hayes, Bromley, Kent. Monthly distribution of packets.

YORKSHIRE STILL BATTING

THERE was an attendance of 44 at the third war-time District 2 P.D.M. held at the Hotel Metropole, Leeds on Sunday, May 14. Headquarters was represented by Mr. E. L. Gardiner, G6GR (President) and Mr. A. O. Milne, G2MI (Honorary Editor) who deputised for Mr. J. Clarricoats, G6CL (General Secretary). The latter was prevented from attending due to a sudden attack of summer 'flu. A letter sent by G6CL, which unfortunately arrived too late to be read at the meeting, ran as follows: "Greetings to you all and may the 'Ham Spirit' continue to increase in the County of Broad Acres. I shall be with you all in spirit this afternoon. Happy Meeting, Clarry."

Mr. C. A. Sharp, G6KU (District Representative) opened the proceedings by introducing the President, who gave a brief resume of the activities of the Society and made reference to the proposed Headquarters station. The Honorary Editor followed, and remarked that he was lucky to have with him Mr. Clarricoats' famous "black book," but not his black hat! Mr. Milne gave more details of the proposed Headquarters station and said it was hoped to provide members with a regular service of accurate reports, calibrations etc. He mentioned that the present Headquarters was considerably understaffed and asked members to appreciate this fact when paying visits. He went on to discuss

THE BULL and the standard of its contents and appealed for technical articles. The increased membership of the Society was referred to. Members were reassured that the Society continued to work in close liaison with the G.P.O. on all matters concerning post-war regulations. He spoke of "Public Relations" stressing the need for every member to do his utmost to bring Amateur Radio to the public view, and went on to explain how this could be done. Reference was made to the good work being done by the Society's P.O.W. fund. An appeal for support made later resulted in the sum of £4 6s. 3d. being donated.

Tea and biscuits were then served and photographs taken, after which the meeting was declared open for questions. During this period appreciation was shown Mr. J. Clarricoats for carrying on the Society's business from his own home for nearly four years prior to the acquisition of the new premises. (Thank you —G6CL.)

Among those present was Tom Arnold, VU2AN, who mentioned that this was the first P.D.M. he had been able to attend since 1935.

The following is a complete list of those members who attended: G2BM, LT, MI, MQ, VC, G3GN, MK, PD, WQ, G4CL, G6BX, GR, HF, KU, G8TF, CO, 2ALL, BSB, DUX, FIM, HDU, HHV, BRS1151, 2317, 4157, 4224, 6201, 6592, 6730, 6733, 6806, 6087, 7412, 7506, 7558, 7657, 7726, 7794, 7832 and VU2AN.



LEEDS P.D.M., MAY 14, 1944.
Mr. E. L. Gardiner, G6GR (President), Mr. A. O. Milne, G2MI (Hon. Editor), and Mr. C. A. Sharp, G6KU (Representative No. 2 District), are seated in centre of front row with Mr. H. Beadle, G8UO (District 2 Scribe), on extreme left.

New Books

A MANUAL FOR THE WAR EMERGENCY RADIO SERVICE. By George Hart, Acting Communications Manager, A.R.R.L., West Hartford, Conn., U.S.A. Price 1s. Obtainable through R.S.G.B. Delivery about three months.

Home members interested in the United States W.E.R.S. will find this booklet of great interest. The author, who has been closely associated with the practical operation of the Service, makes some observations in his Introduction, which will no doubt strike a chord in the memories of all R.S.G.B. members who, in the years before the war, felt strongly that the British amateur should be given an opportunity of applying both his knowledge and his equipment to Civil Defence purposes.

Mr. Hart writes:—

"British experience indicated that telephone lines frequently become cut off or overloaded during an air raid, and that the messenger service, while invaluable, was slow and cumbersome compared to telephone communication, especially where comparatively long distances were involved. The obvious answer was supplementary radio-communication facilities, but such facilities were not available in Britain because the equipment to establish them was not to be had, and there was not enough skilled personnel available to build, instal and operate radio units."

"Our O.C.D. (Office of Civilian Defence) immediately took cognisance of the fact that, whereas Britain had no radio equipment available for civilian defence, we had the equipment of almost 60,000 amateur stations lying idle, and that while Britain had only limited skilled radio personnel, we had thousands of radio amateurs anxiously awaiting an opportunity to contribute their specialised skill to some worthy war purpose."

One day, perhaps, we shall be told why the British Government declined to allow us to use our equipment for Civil Defence purposes. Meanwhile, we recommend all pre-war British amateurs to study George Hart's *Manual for the War Emergency Radio Service* if for no other reason than that it will show them what might have been done here if we had been given the same chances.

We trust that the W.E.R.S. may never be called upon to function under battle conditions, but if that should happen we have little doubt that the operators concerned, will live up to the best traditions of the Amateur service. J.C.

THE RADIO AMATEUR'S HANDBOOK. Twenty-first edition, 1944. By the H.Q. Staff of the A.R.R.L. Price 10s. 6d. Obtainable through R.S.G.B. Single copies only. Delivery about three months. Cash with order.

The theory portion of the handbook has been considerably expanded and revised, and the section on valves has been increased by about 60 per cent. As a result of the use of the handbook as a training manual, it has been found desirable to expand the treatment of certain principles and to include additional fundamental topics.

A new chapter on "Carrier-Current Communication" appears. This has been an outlet for American experimenters who, like British amateurs, have war-time restrictions on normal radio communication.

A considerable amount of re-arrangement of the text and illustrations has taken place, new valve types are added to the most comprehensive data tables, and a supplementary cross-index by type numbers facilitates locating valves whose classifications are unknown.

The very considerable expansion of this edition has been obtained (about 20 per cent greater type area), without an appreciable increase in weight of paper, by using a larger page format and slightly lighter paper.

This is not a mere book: it is a tradition.

T.P.A.

Another Ramp!

Cpl. J. Cairns, G3UC, writing from Mhow, India, states that the following advertisement appeared recently in an Indian national newspaper:

"For Sale.—Hulliafter Receiving Set. Nine Valves, Electric Bandsread, B.F.O., A.C. 110-220 Volts, 1,200 Rps."

1 Rupee = 1s. 6d.
1,200 Rupees = £90
£90 = 1 Ramp

Electrical Guitars

Apropos the letter from Mr. D. W. Aldous, BRS1006, published in our last issue, we are informed by the writer that the reference to *Practical Wireless* should have read *Practical Mechanics*.

Wanted

Mr. Peter Bradley, G8KZ, 348 Portobello Road, London, W.10, is anxious to obtain a copy of the April, 1939, issue of QST. Can you help?

Side Slip

An error occurred in the last paragraph of the article "The Load Line" which appeared in the April issue of THE BULLETIN. In the fifth line of the paragraph the words "output of" should be "input to."

BRITISH ISLES NOTES AND NEWS

DISTRICT 1 (North Western)

D.R.: H. W. Stacey (G6CX), "Sandreas," Eddisbury Road, West Kirby, Cheshire. Hoylelake 337.

Ashton-under-Lyne.—A well supported meeting was held at 2FXW, Hadfield, on Sunday, May 21. Members afterwards visited the local Cinema. Thanks are due to Mrs. Moore and 2FXW for the welcome extended, also to 2AJP for the photographs taken during the afternoon. G5AL, BR5560, 6889 and 8145 were enrolled as members of the Ashton-under-Lyne Radio Society. The next meeting will be held at the home of 2HAP, Estate Office, Lakes Road, Dukinfield, on Sunday, June 25. Meet 2.15 p.m. outside the Angel Inn. All members located in the District are invited to attend this meeting. (via G5PX.)

Bolton.—A recent letter from 2FPI brings the news that Bolton's "Early Bird" is now convalescing after an attack of diphtheria. 2ABT, senior member of the Bolton Radio Society (Father's Club) recently became No. 1 member of the Grandfather's section!

A welcome is extended to new members, Kendrick, 7803 and Dewhurst, 7653, who recently attended their first meeting. 5883, a Service member stationed nearby, called on the T.R., who was unfortunately out at the time, but an early contact is anticipated. Miss Joan Claricoats, BR5688, is now in the town on a course. The next local meeting will be held on July 16, at 2.30 at 2DVQ. (via 2DVQ.)

P.D.M. Postponed

DUE to prevailing conditions the D.R., after consulting the President and other officers, has decided to postpone the P.D.M. which had been provisionally arranged to take place in Liverpool on July 8. He feels sure that local members will appreciate the reasons which have made a postponement desirable.

Subject to conditions permitting, arrangements will be made to hold a meeting later in the year, notice of which will be given in a future issue of this Journal.

Liverpool.—The May meeting was well attended, 26 members, including several from far afield, being present. Mr. R. A. Spears (G8AZ) delivered an excellent and most interesting paper on the subject of "Quartz Crystals" and the questions which were afterwards put to him indicated that his address had aroused serious thought. It is hoped that it will be possible to publish the paper in THE BULLETIN in due course, with some amplification of that portion relative to crystal control on the ultra-high frequencies. The D.R. has offers of other interesting papers. The date of the next meeting will be published next month. Contributions for the P.O.W. Fund amounted in all to £1.

G6CX.

DISTRICT 2 (North Eastern)

D.R.: C. A. Sharp (G6KU), 316 Poplar Grove, Gt. Horton, Bradford. Bfd. 10772. Scribe: H. Beadle (G8UO), 13 Chandos Street, Keighley.

A full report of the P.D.M. held in Leeds on May 14 appears elsewhere in this issue.

Huddersfield.—G8KV is in Italy with the Signals. STM, who now holds the rank of Warrant Officer, was recently married. (Congrats. O.M.). S./Ldr. Best, 5QN, is reported in the local Press to have twice been mentioned in dispatches. As the last two meetings called by 5VD were poorly attended further meetings are to be held over until the summer.

General.—G4MC is now in Wales. SJD (Chief R./O., M.N.) is still on the high seas. 5834 has recently built a portable from spare parts with excellent results.

There are six letter budgets held up in the District. Get them moving please. G8UO.

DISTRICT 3 (West Midlands)

D.R.: F. M. Desmond (G5VM), "The Chestnuts," Hanley Castle, Worcester. Scribe: E. J. Wilson (2FDR), 48 Westbourne Road, Olton, Birmingham.

Birmingham.—At a meeting of M.A.R.S., held on May 15 at the Chamber of Commerce, New Street, Mr. C. Naylor Strong, G2RQ, the President, delivered a most interesting lecture on the Transmission of the Human Voice.

Mr. G. Brown was in the chair, and 49 members and visitors were present. The Chairman, in welcoming members and visitors to the new Headquarters, offered a special word of welcome to Mr. E. L. Gardiner, G6GR, and Mr. J. Claricoats, G6CL, President and General Secretary respectively of R.S.G.B., who had travelled from London especially for the meeting. At the conclusion of the lecture, Mr. Gardiner proposed a vote of thanks to the lecturer which was supported by Mr. Claricoats. The next meeting will be held on Tuesday, July 18, at 6.30 prompt.

Coventry.—The address of the T.R. (Mr. Gardiner), is 40 Medina Road, Coventry, not Meriden Road as published last month.

G2LU has been located in the Azores. 5QN is with the R.A.F. in the Middle East and 6DC with the same service in India. 2YS and 8MK are with the Signals in the Mediterranean. 2DK has started a radio repair service. 5GR is on the air most Sunday mornings with a Home Guard Signals Company.

A letter has been received from Pte. G. L. Clarke, BR54499, at present stationed in Scotland. He is in the best of health and wishes to be remembered to his friends. 2FDR.

DISTRICT 4 (East Midlands)

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

Derby.—It is hoped to arrange a works visit during July in collaboration with the Nottingham section. Members interested in this project are asked to get in touch with the T.R., G2OU, 43 Kenilworth Avenue, Derby.

Leicester.—A "talkie" show was the highlight at the May meeting held at G3BU. The films shown were arranged and projected by Mrs. Newton. "Popeye" was well received by G6VD. A hearty welcome is extended to BR57661, 7684, 7704 and 7725. BR55605.

Mansfield.—The highly successful visit to the Whiteley Electrical Radio Co., Ltd., is dealt with more fully in the Nottingham notes. It was a pleasure to see so many members from this area present and it is hoped that their interest will continue. BR57171.

Nottingham.—The 63 members and friends who visited the works of Whiteley Electrical Radio Co., Ltd., on May 21, had a grand time. The parties were shown round by members of the technical staff headed by Messrs. Lakin and James. The attendance was the largest recorded for many years. After the meeting an excellent tea was arranged by the T.R. (BR57171). We were especially pleased to see G6MN and G8IQ after a period of absence from meetings.

The June meeting will be held at the University College, Highfields, Nottingham. GSDZ.

DISTRICT 5 (Western)

D.R.: R. A. Bartlett (G6RB), 31 King's Drive, Bishopston, Bristol. Bristol 46960.

Bristol.—The May meeting, unfortunately, had to be cancelled owing to unforeseen circumstances. As many notices as possible were sent out but to the few who turned up and were disappointed, please accept our sincere apologies. The next meeting will be held on June 25.

Bath.—A welcome letter comes from G2IW, apologising for the lack of local news but pointing out that it is a case of "there isn't any"! G8JQ and 8DX are home occasionally on leave, whilst 6BW passed through recently. He sends 73 to all in the District.

Swindon.—G8CK, now stationed in the area, sends a very interesting report. He recently organised a meeting at Highworth when an attendance of 14 was recorded. He is prepared to arrange further meetings, if local members are interested. His address is 2588989, Cpl. Bartholomew, Aux Units Signals, c/o G.P.O., Highworth, Swindon. He has the offer of a hall and can guarantee that 2RD, SJI and 2FWX will attend, and possibly 2QV, 2KI, and 8MQ. G3JO, who sends his usual report, has been in hospital, but is now fit. (Glad to hear it O.M.). 3NC is still stationed on the S.E. coast. 5254, who reports from Lancashire, is now C.Q.M.S. (Foreman of Sigs.). He has met no amateurs recently. G6RB.

DISTRICT 6 (South Western)

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

Torquay.—We are pleased to record the return on leave, after several years in "furrin parts," of F./Lt. Leslie Mays, 2CWR, who was T.R. for Torquay before he joined up. Looking very fit, he tells us that he met our old friend, VU2EB, during the early days of the war. It is hoped to hold a meeting shortly.

Exeter.—G2AT, 3MU, 2GK, 5QA, 5SY, 5WY, 2CWR, BR51879, 2627, 5750, two new members, L. King, E. Cameron, and one visitor, VE4AAO, were present at a successful meeting held at the Y.M.C.A. on Saturday, May 13th. An animated discussion took place on two points, the first being that before anyone can become a member of R.S.G.B. there should be some sort of "fence" to jump, this to ensure that the fact that a man belongs to the Society is in itself something to be very proud of. In other words, the present method of entry is far too easy. The second point was that post-war transmitting licences should only be issued to persons who had taken an examination, both written and oral—and the Morse test as well, of course. It was suggested that the G.P.O. could hold examinations quarterly or even half-yearly at various centres, and transmitting tickets would be issued only to persons who had qualified for them. An excellent tea was followed by G2AT's radio quiz. The side captained by G5SY was supposed to have beaten that under G5QA, but as the Exeter T.R. pointed out, this was purely a courteous gesture, and not because the Exeter mob didn't know the answers!



TECHNICAL ARTICLES
are still wanted

The next meeting takes place on Saturday, July 22.

North Devon.—After one or two false starts G3AM has at last arrived home from the M.E., sun-tanned and looking very fit. As might be expected he has taken every opportunity of "seeing the sights," and we can all look forward to hearing some interesting reminiscences when we get together again. G5SY.

DISTRICT 7 (Southern)

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

Bournemouth.—2HAG is welcomed home from Oklahoma complete with "wings" and a commission. It has been suggested that local meetings be started. Will those interested send a card to 2HNO at 45 Parkwood Road, Boscombe? (via 2HNO.)

Croydon.—G4NI has built a pre-selector which is selecting very well. 8141 is now in the Blackburn area where he hopes to meet local members. 5332 has changed QRA and in so doing discovered some forgotten gear. See "Forthcoming Events" for details of the next meeting. (via G2DP.)

Coulsdon.—BRS4458 has been sitting for H.G. exams. 5AN has been "holiday-making at home." We hope to see a strong force of local members at the P.D.M. in Croydon on June 17. (via 3003.)

Reading.—G2IT, 2YI, 3DW, 5IV, 6SY, 8KJ, 2BTY, 2BYZ, 2DIO, 4573, 5795 and 7578 were among those present at the May meeting when 2BYZ had some very interesting equipment on show including a power output meter, signal generator, test meter

Forthcoming Events

- June 24 District 7 (Reading Section), 6.30 p.m., at The Comrades' Club (First floor), 42 Oxford Street, Reading. Lecture on V.H.F. Equipment by F. A. Ruddle, 2DIO.
- June 24 District 15. Dinner and Dance at the Park Royal Hotel, Western Avenue, Hanger Hill, Ealing, W.5. Dinner 7 p.m.
- June 25 District 4 (Leicester Section), 2.30 p.m., at 52 Regent Road, Leicester.
- June 25 District 4 (Nottingham Section), 2.30 p.m., University College, Highfields, Nottingham.
- June 25 District 5. 3 p.m., at 17 Colston Avenue, Bristol.
- June 25 Scotland "A" District. 3 p.m., in Royal Technical College, George Street, Glasgow. Enter by Montrose Street.
- July 2 District 14. 7 p.m., at G6LB, 167 Galleywood Road, Chelmsford.
- July 2 District 14. 3 p.m., at G2HR, 25 Clivedon Road, Highams Park, E.4.
- July 2 Districts 7 and 13. Combined Meeting, 3 p.m., Y.M.C.A., North End, West Croydon.
- July 9 District 7 (Southampton Section). 3 p.m., at Pirelli General Sports Club, Lodge Road, Southampton.

and an electro-viol. The latter is a combination of violin with two pick-ups. He also displayed a charger which was later auctioned "midst a deal of hilarity. The junk sale resulted in the treasurer, G2YI, collecting £12s. 6d. for the R.S.G.B. P.O.W. Fund. 3DW was the winner of a raffle for a 955 Acorn kindly donated by 2BYZ.

Under "Forthcoming Events" will be found details of the next meeting at which Mr. Ruddle, 2DIO, will give a talk on V.H.F. equipment. All local members past and present are cordially invited to attend. (via BRS4573.)

Southampton.—The first meeting held in the area for a number of years took place last month at the Pirelli General Sports Club, Lodge Road, Southampton. Among those present were 3QW, 5LH, 8QW, 2HCD, 6910, 6943 and 7183. The second meeting, for which a display of U.H.F. receivers was planned, took place on June 11. Future meetings will be held on the second Sunday of each month at the Pirelli General Sports Club. (via G8QW.) G5WP.

DISTRICT 9 (East Anglia)

D.R.: H. W. Sadler (G2XS), The Warren Farm, South Woolton, King's Lynn, Norfolk. Castle Rising 233.

BRS Gates recently spent an interesting evening with 2MN, who has been in Liverpool, where he managed to attend a local meeting. Lt. D. W. Dunnett, R.A., writing from C.M.F., has noticed the claim in THE BULL, by 2CMJ to be the first amateur to set foot on Europe's mainland and wonders if he did not beat him by a short head as he arrived just after the assault troops. G. Haylock, 2DHV, and J. D. Baker, 3766, both with C.M.F., are in touch with each other by correspondence. The former sends 73 to 6TI and 5JF. The latter, who managed to attend the last Cairo meeting is looking forward to the next NFD. He sends 73 to all old friends. D. T. Boffin, 3HS, who has just moved into the District, has 2CQJ with him. He has also contacted 5QG—good going in this rather dead (at the moment) area. G2XS.

DISTRICT 11 (North Wales)

Deputy D.R.: C. Spillane (BRS1060), "Woodside," Meliden Road, Prestatyn.

Bryan Savill, ZL2RI, after a spell in the M.E. is now back in ZL. He sends 73 to all old friends in District 11 and elsewhere. Cpl. Fletcher, R.A., BRS6728, late R.Sigs., also wishes to be remembered to local members. He would like to make contacts in the Canterbury area. 7520, having completed his course at a local Radio College, expects to move to Swindon. 7529 and 7581, also on the same course, are joining the R.A.F.

G2GZ has met GW3CF and had correspondence with GW6AA who hopes to resume in the post-war period. 6900, a Radar Mech. in the R.A.F. is now at a station in Dorset, where G8IP is a W./O. 3044 writes from Scotland to say that G8JM is still in Malta.

5520 has joined a ship as 1st Radio Officer. The description he gave of his shack suggests a luxury trip! Letters sent to BRS5660 have been returned. Can anyone help to locate him. BRS1060.

DISTRICT 12 (London North and Herts)

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

North London.—As District 12 wishes to give the maximum support to District 15 who are holding a dinner and dance on June 24, no North London meeting will be held this month. The May tea-party held at the Mulberry Restaurant proved a success except that numbers were down, only 18 including four ladies attending. This was probably due to the rather short notice which was given. We were pleased to have with us Harold Wilkins, G6WN, and his wife, Ken Freeman, 2ADL, Major Higson GW2PH, and Tom Vickery, G5VY, the latter looking well after his long illness. A raffle for notepaper donated to the Society by Mr. de Leeuw yielded 26s. for the P.O.W. Fund. The D.R. acknowledges the receipt of letters from 2CVO, BRS7823 and 7793. Don't forget to look at the "congrats" column!

St. Albans.—Congratulations to 2CNC, who has been granted a commission in the Home Guard. The T.R. has been pleased to receive letters from BRS4177, 4017 and 4659. G5QF.

DISTRICT 13 (London South)

A.R. (South Eastern and Central), S. E. Langley (G3ST), 62 Dumbarton Road, S.W.2.

South Eastern and Central.—At the May meeting, which was attended by G2DP, 2HP, 3ST, 4NI, 5BT, 5PY, 5XH, 8RN, 2FWA, 2HHD, BRS1545, 3003, 3894, 4434, 4584, 4814, 5317, 7943 and W. Mitchell R.A.F., G5BT continued his talk on the oscilloscope in great detail, giving the circuits of the tube and associated units with values and capacities entirely from memory—no mean achievement. A working demonstration followed, during which several defects were shown up in 4NI's oscillator. We are all grateful to 5BT for giving us such a useful and instructive talk on apparatus that will be so valuable to Amateur Radio in the days to come.

2HHD kindly presented a pipe for sale on behalf of the P.O.W. Fund which realised 19s. With the usual collection, a total of £1 10s. 9d. was realised.

Jim Sparrow, BRS5317, who looks well in R.A.F. blue, asks if anyone has a copy of "UHF Technique" to lend him for a short time? We were glad to meet P./O. J. F. Lewis, R.A.F., after a long absence.

Lt. Bdr. Shersby, G2GZ, reports by letter that although he is busy giving signals instruction in the R.A., he finds time to do useful work for the R.S.G.B. in District 11 during the absence of the D.R. who is away on duty.

Last minute reminder: don't forget the P.D.M. on June 17 as advertised in last month's issue. G3ST.

DISTRICT FIFTEEN

DINNER AND DANCE

to be held on

SATURDAY, JUNE 24th, 1944

at the

PARK ROYAL HOTEL, Western Avenue,
Hanger Hill - EALING - LONDON, W.5

RECEPTION 6 p.m. DINNER 7 p.m.

INCLUSIVE CHARGE 8/6

Reservations should be made by telephone to the D.R.
(MR H. V. WILKINS, G6WN) BYRON 3369.

TIME IS SHORT

BOOK NOW

DISTRICT 14 (Eastern)

Scribe: L. J. Fuller (G6LB), 167 Galleywood Road, Chelmsford, Essex. Chelmsford 3929.

Romford.—The May meeting took the form of a discussion on Aerial Systems, and the establishment of a post-war workshop for the testing of members' apparatus. G3FT is again abroad.

Chingford.—As the last meeting was poorly attended, the T.R. feels that there may be many new members in the District who are shy of "breaking the ice." He hopes there will be a record attendance at the meeting fixed for July 2. It would be a great help if those intending to be present would "phone Larkwood 2933 in advance. For details of this meeting see "Forthcoming Events." G6LB.

DISTRICT 15 (London West, Middlesex and Buckinghamshire)

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

Those who have not yet booked for the District Dinner and Dance are urged to telephone the D.R. immediately—they may still be in time.

Six members attended the last West London meeting, while 6398, of Plymouth, and 2ADL were present at High Wycombe where they met 4781, 5666 and 7714. 4781 has been in contact with W7IKF. 61F and 5666 report active.

4AR sends congrats. by Air-Mail to 6CF and regards to 3XI and 3UQ. 2KI, now in South Wales, sends 73 to SKZ and old friends. He hears from 2NN, 2GK and 2LA who is apparently in Sheffield. 8136 writes as a new member in the Forces.

Mr. and Mrs. 6CJ would like to thank all those who contributed towards their wedding present which is being reserved against the time when they can establish their own home.

The D.R., Mrs. 6WN and 2ADL attended the District 12 tea party last month. G6WN.

DISTRICT 17 (Mid East)

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

As it is hoped to hold a meeting in Louth shortly, Service members in the area are asked to write to the D.R. for details. BR81060 (Dep. D.R. District 11) who suggested the meeting, threatens to cycle 32 + 32 miles to visit G5BD! His only contact so far is 4882. The ex-D.R., G2UK, sends news from Newmarket, where he is now stationed. (We didn't think he was rough enough to be a Vet, will probably do better as a tipster!) 2BUV has just completed a course at a station in Essex where his Signals Officer is G3XB. G3UF is also there. 2HBN is expected home (Boston) shortly after three years in Iraq. G2CR a former District 17 member, is in Italy. 2DR2 is still in Surrey where he has met G4MS and 7854. 6270 has utilised his receiver and an alarm clock to wake the camp at 0630. We seem to remember a similar "test DX" stunt! G5BD.

DISTRICT 18 (East Yorkshire)

District Scribe: S. Davidson (G6SO), 10 Sidney Street, Scarborough.

Hull.—G3PL reports visits from 6895, 4590 and 7618. He is still anxious to start regular meetings providing members will support them.

Whitby.—Sgt. H. Mills, 5796, reporting by air mail from Iceland, where he is now serving in the R.A.F. as a W.O.M., mentions meeting Bob Holden and Ken Winsor of Hull during his membership of the North-West of Ireland Amateur Radio Society. His efforts to form a radio club in Iceland have so far proved unsuccessful.

A welcome is extended to all new members of District 18. G6SO.

Northern Ireland

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

Belfast.—Congrats to Frank Robb, G16TK and his wife on the safe arrival of a new YL—Francis Rosina Cecilia. Also to Mr. Martin, G13SG and his wife on the birth of a junior op. A welcome is extended to new member Mr. J. Johnston, 7939, and to E19F of Dublin, now temporary resident in this area.

P. A. Turner, 6111, has been invalided from the R.A.F. and is again attending meetings at G16YM. D. Rutherford, 2ARS (ex VU2BA) of Newtonards, is still going strong in India. Good luck O.M. W8VUH paid a visit to G15HU during a recent short leave. Ron Jenks, 2DYZ, now in Bristol, sends best wishes to his GI friends. As the result of a meeting with G16TK, the husband of Beatrice Holman, W1KTG, became a recent visitor to G16YM. Frank and Beatrice were in QSO frequently before the war. Walter Caughey, 2DYZ, reports via G15HU, that he is keeping fit and still receiving R.S.G.B. parcels.

G15UW is still busy putting the finishing touches to his modulated oscillator and will soon be making a start on his oscilloscope, a 6 in. diameter E42-B6 will be used in this job.

We were glad to meet the 'Derry T.R. during one of his rare visits to Belfast. He and the D.R. paid a visit to G15HU where matters of Society interest were discussed. 2DHB was accompanied by Mr. Dan Gallagher; 7308. A visit was also made to G16TK.

As practical construction classes are now commencing at G16YML, the Committee would be pleased to receive surplus apparatus which may be lying about the shack. Any offers? G15QX.

Scotland

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

"A" District.—The May meeting was attended by about 20 members, which was satisfactory considering the counter-attractions of the local "Salute the Soldier" campaign celebrations nearby. After being duly proposed by Mr. Mackenzie and seconded by Mr. McMichael, the Committee to assist the D.O. was re-elected for six months. This Committee have been endeavouring to arrange meetings of interest to members generally and also to compile a register of members at present resident in Central West Scotland. At short notice Mr. Ian Jamieson started a discussion by asking the question "What is a Communication Receiver?" This was answered by one "old-timer" who remarked: "A communications receiver is one where the signal walks out of the speaker in its bare feet"! Visitors of different Services continue to pass through Glasgow but their visits do not always coincide with meetings. Ian McDermid visited 3AR during the month while W7HIA and W8AIE visited 6MD. We were glad to welcome at the meeting GMSMJ after a long absence. Congrats to 2HHX on the arrival of a junior op. Roderick Anthony. GMSCH is welcomed back to membership.

"B" District.—Mr. A. G. Anderson, BR85857, 87 Braemar Place, Aberdeen, and his friend 6107, are anxious to convene a meeting to discuss the possibilities of holding regular gatherings in Aberdeen. Members still resident in the town are asked to contact Mr. Anderson. GM6ZV.

Correspondence**Universal Chassis Suggested**

DEAR SIR,—Referring to the letter of Mr. W. E. Beck in the December, 1943, BULLETIN, I note that he suggests the Society should bring our requirements to the notice of the British Manufacturer. It has occurred to me that a demand exists for a "universal chassis," which could be used time and time again for experimental work. This could be of similar shape to an ordinary chassis with the exception that it would have no top, the "walls" ending in a horizontal flange about 1 in. wide. This flange could be drilled, with equidistant holes, and tapped 6 B.A., enabling the user to build up his chassis by means of interchangeable metal (or trolitul) strips to his own requirements. Changing the layout would often only involve "reshuffling" the arrangement of these strips or plates and any discarded ones could often be used in another circuit, at a later date. This should give the flexibility of the baseboard layout combined with the advantages of the chassis. I feel sure that a product on these lines would find a ready sale among members and experimenters generally, to whom its economy will appeal.

Yours faithfully,

T. N. LLOYD (G3SL).

Public Relations

SIR,—With reference to your editorial in the May issue, and the examples you quote of publicity given to the amateur, may I suggest that prominent advertisers in the BULLETIN and other radio publications be invited to follow the lead of the R.C.A., and Hammarlund Companies in the boost they give the "Ham" in the March issue of *Radio News*.

For example, R.C.A., head their full page advert. with:—
What's cooking for post-war? More small tubes... lighter rigs, the kind amateurs did so much to develop.

The Hammarlund Company head their advert. with:—
Who said the "Ham" is finished?

This is followed with a very fine article as to why amateur radio must continue. The final paragraph I quote in full.

The entire radio industry knows well, and appreciates the many contributions "Hams" have made for the advancement of high frequency radio communications, and surely they too can be counted on to assist the "Ham" in regaining his privileges when the right time comes.

Yours faithfully,

S. RIESSEN (G5SR).

Can you Help?

Mr. C. R. Plant, G5CP, 33 Manley Road, Sale, Manchester, wishes to borrow a technical leaflet and diagram of the National NC45. Can you help?

COUNCIL 1944

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ERNEST LETT GARDINER, B.Sc., G6GR.

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

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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, GW5FI, F. Hoare, G2DP, Wing-Com. J. Hunter, G2ZQ, W. E. Russell, G5WP, H. W. Stacey, G6CX.

General Secretary: John Clarricoats, G6CL.

April Council Meeting

Resume of the Minutes of a Meeting of the Council of the Incorporated Radio Society of Great Britain held at New Ruskin House, Little Russell Street, on Monday, April 24th, 1944, at 6 p.m.

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

1. The Chairman, on behalf of Council, congratulated G. R. Scott Farnie, GW5FI, on his promotion to the rank of Group Captain.

2. It was unanimously resolved to elect 195 Corporate Members (153 proposed by Corporate Members, 42 supported by references) and 18 Associates.

3. The Monthly Balance Sheet and Statement of Account was presented and adopted.

4. The Secretary recommended Council to give consideration to a suggestion that steps be taken to set aside a sum of money from the R.S.G.B. Prisoners of War Fund to provide amenities for members known to be in Japanese hands. Council expressed its desire to follow up the suggestion and appointed Messrs. Watson and Stacey to collaborate with the Secretary in the preparation of recommendations for the early consideration of Council.

5. The President reported, with deep regret, that Air Commodore Viscount Carlou, G6XX (Hon. Treasurer, 1939) had been killed on active service. The President stated that he had offered the condolences of Council to Lady Carlou in her grievous loss.

6. An offer made by Mr. De Leeuw, 2BDX, to donate to the Society 2,000 sheets of notepaper, die-stamped with the R.S.G.B. emblem, was gratefully accepted, as was the donor's suggestion that the paper be sold to members and the proceeds credited to the R.S.G.B. Prisoners of War Fund. The Secretary was instructed to arrange for supplies to be made available for sale (preferably by auction) at forthcoming P.D.M.'s and London District Meetings.

7. It was reported that Mr. Leslie McMichael (Founder Member) had kindly offered to provide copies of historical photographs for slides for inclusion in the collection being prepared by the President.

8. In connection with the suggestion made at the previous meeting that the Council should arrange a meeting with representatives of the radio trade, members of Council agreed to furnish the Secretary with (a) lists of radio firms which they consider may be willing to co-operate with the Society in developing the post-war amateur market; and (b) lists of components, etc., which they consider should be made available after the war to British amateurs.

9. The Adams Trust Deed was signed by the President, Immediate Past President and General Secretary, and sealed with the Common Seal of the Society. The Council recorded its thanks to Mr. Stacey for the invaluable assistance he had rendered to the Society in the preparation of the Trust Deed.

10. Mr. Watts reported upon his recent meeting with Colonel Sir Stanley Angwin (Engineer-in-Chief, G.P.O.) who had assured him that no committees had yet been set up by the G.P.O. to discuss post-war amateur radio licensing matters. Mr. Watts expressed the view that the Council should, at an early date, ask for direct representation on any Government Committee established to deal with amateur radio matters. Council agreed that the suggestion should be brought forward by the Liaison Committee at its next meeting with the G.P.O. The Liaison Committee was also instructed to enquire from the G.P.O. whether pre-war call signs issued to members who have been killed on active service could remain unallocated after the war.

11. It was reported that the City and Guilds Institute had expressed willingness to set special examinations for certain classes of experimenters who wish to apply for transmitting licences after the war. The Council recorded its thanks to Mr.

W. A. Scarr, M.A. (G2WS) for his co-operation and help in conducting preliminary negotiations with C.G.I. representatives.

12. It was reported that the President, Immediate Past President and General Secretary represented Council at the recent successful Birmingham Provincial District Meeting.

It was reported that District meetings had been arranged to take place in Croydon on June 17 and Park Royal on June 24.

The meeting closed at 9.15 p.m.

London Meetings, 1944-5

The Council is anxious to discover whether London members are in favour of meetings at the Institution of Electrical Engineers being held, as hitherto, on Saturday afternoons, or on Friday evenings.

Members resident in the London area are asked to send a postcard to the General Secretary, by not later than June 24th, 1944, stating their preference.

The words "Saturday afternoon" or "Friday evening," in addition to the member's name and address will be sufficient.

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.

Technical Publications

The attention of members is directed to the fact that no facilities exist at Headquarters for obtaining technical publications other than the American publications listed below. Considerable inconvenience is caused by members who send cheques and postal orders for other publishers' books when forwarding either their subscription or an order for American publications.

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. 6d.
"A Course in Radio Fundamentals" (A.R.R.L.)	3s. 6d.
"The Radio Handbook" (Editors and Engineers Los Angeles)	12s. 6d.

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.

Subscriptions to "Radio"

Until further notice no further subscriptions to the American monthly publication *Radio* can be accepted by the Society.

The Amateur Radio Handbook

The tenth printing (22,500 copies) of the Society's Handbook is now on sale price 4s. post free. Cloth bound copies are also available, price 6s. 6d. Headquarters will be pleased to allow trade terms on orders for 12 or more copies.

Cash Sales Department

The following items are now in stock at Headquarters:—
Members' Notepaper (new style), 100 sheets .. 3s. 6d.
Car Plaque of Emblem .. 3s. 6d.

The above items will be sent post free to any address in Great Britain on receipt of remittance. Orders for Eire are despatched via the Censorship authorities.

Headquarters Address

A considerable amount of official Society correspondence is still being delivered to the General Secretary's private address. This, in spite of frequent requests for all R.S.G.B. correspondence to be sent to New Ruskin House, 28/30 Little Russell Street, London, W.C.1.

Those who act as sponsors to applicants for membership are kindly requested to record the above address on the application form, if the latter bears the temporary war-time address of the Society, viz. 16 Ashridge Gardens, Palmers Green, London, N.13.

When communicating with Headquarters the Society's name must *always* preface the address. Embarrassment and delays are often caused because letters intended for the Society are opened by one of the other firms operating from New Ruskin House.

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ARE URGED TO MENTION THIS JOURNAL
WHEN WRITING TO ADVERTISERS.

THE PILOT OFFICER NORMAN KEITH ADAMS PRIZE

—(continued from page 183)

published (whether in the Society's official journal or otherwise) shall be ineligible for a Prize save that a paper address or lecture first published by delivery at any gathering of members of the Society and subsequently reproduced in the Society's official journal shall be deemed an original paper or article and eligible for a Prize if so reproduced within twelve months of such first publication.

2. In determining the merit of a paper or article regard shall be had not only to the literary style form length and subject matter of such paper or article and to the scientific knowledge or information conveyed by the Author or joint Authors thereof but also to the value of its contribution to the general advancement of the science and practice of Amateur Radio and a paper or article shall be eligible for a Prize whether it be technical or non-technical.

Members will note that articles or papers published in the Volume commencing July, 1944, will become eligible for the "Pilot Officer Norman Keith Adams Prize."

Congrats

- To Mr. Donald W. Aldous, **BRS1006** of Torquay, whose wife presented him with a son—Dirke Wayne—on May 13, 1944.
- To the North London "twins" Andrew Boa (**G5BO-SU5BO**) and Eric Woodhouse (**ex G2SX**) who have taken junior operators on to the strength. Miss Louise Ruth Boa and Miss Ann Woodhouse are keeping their mothers busy whilst Andrew operates an Eastern Telegraph Co. station in Port Sudan, and Eric continues to impart knowledge to R.A.F. trainees.
- To Mr. and Mrs. "Bill" Winsford, of Hertford, who have recently introduced additional QRM into the **G4DC** household. Janet Mary arrived safely on May 11. "Bill" wishes to notify his many friends that "all stages function according to the book."
- To R. Postill, Royal Signals, **G8NO**, on his promotion to Lt.-Colonel.
- To Capt. and Mrs. Stan O'Hagan, **G2CR**, now the proud parents of a daughter—Eileen Patricia. Stan is an Army doctor serving in Italy.
- To Cpl. B. S. Hancock, **BRS4897**, who has been mentioned in despatches for outstanding work with the R.A.F. during the North African campaign.

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.

Advertisers and buyers are reminded that under Defence Regulations 1939, Statutory Rules and Orders 1940, Number 1639, a permit (T 99 G) must be obtained before sale or purchase of certain electrical and wireless apparatus, particularly such valves and apparatus as are applicable to wireless transmission.

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

AMATEUR in Forces must sell first-class components. Oil Dubblers: two 4μF 2,000v, 20s. each. One 5μF 1,500v, four 0.1μF 3,000v, one 1μF 1,500v, two 25μF 2,500v; all 10s. each. Six 1meg. pots with switch, 5s. each. Six 0.0005 variable, 2s. 6d. each. Two Celestion 6-in. with tx, 26s. each. One M.E. Gramplan 10-in. 15 ohms speech; one R. & A.P.M. with multi tx; one G.E.C. 10-in. P.M. with tx, all rigid chassis, 60s. each. Four American 6-in. with tx, 26s. each. Two four-valve A.C./D.C. receivers, new midget, £11 each. Mains transformer Bryce 500-0-500, four four-valve heater windings, 200mA H.T., £5, new. One C.R. Tube 10-in. Electrostatic, £8. Transformer for C.R.T. 3,000-3,000 etc., £3 10s. Two U17's, 15s. each. Two gas-filled relays, 20s. each. 4v N43, 25s. Wanted: A.F. modulated all-wave Signal Generator and auto record changer and crystal pick-up.—Write Box 356, PARRS, 121 Kingsway, London, W.C.2.

EDDYSTONE 1V (chassis), SG.DET.LF.PEN., with specified 2v valves, coils covering 12-200 metres. Perfect condition, £10.—G2XV, 89 Perve Road, Cambridge.

EXCHANGE.—Valves X30, 1223, 25Z6G, also 5 metre Transceiver components, new, for 8 μF Electrolytic condensers.—Inquiries, BRS4437, 11 Edward Street, May Bank, Newcastle, Staffs.

MONOMARK service.—Permanent London address. Letters redirected. Confidential. 5s. p.a. Royal patronage. Key tag 9d.—Write BM/MONO7A, W.C.1.

R.S.G.B. BULLETINS.—1931 to date, 1s. 6d. each. Minimum four issues. Inquiries, S.A.E.—BM/XBX, London, W.C.1.

SALE.—All new. British and American valves, including Acorns, also a few electrolytics. Stamp for particulars.—Box 375, PARRS, 121 Kingsway, London, W.C.2.

SALE.—National H.R.O. Senior, as new, complete with 2½ volt tubes, four sets of coils covering range 1.7Mc/s. to 30Mc/s. No speaker or power pack. 1938 model. Absolutely perfect condition. Cost £90. What offers?—SHERRATT, G5TZ, G5TX, 82 High St., Newport, I. of W. Telephone: Newport 2504.

SALE.—National NCS1X 10 valve communications receiver, 5 bands, £28.—EBURNE, 55 Honiton Road, Coventry.

SALE.—Signaliser and instructions. Transformers 500-0-500 250 ma 6-3v, 4A 6-3v, 2A 5v, 3A, 250v 120ma 4v 3A. Three 10-in. Rola speakers, new. Vibrator pack 2v input, 150v 60ma output. 350v 80ma 4v 3A power pack. Rotary transformer B.T.H., 12v input, 1,000v 30ma output. Generator 1,200v 100ma output. Motor Generator, 12v input, 220v 40ma output with smoothing S.W. Converter 200-250v mains. Valves including 5Z3, 6K8, 6B5 and 25L6GT. Others new and second hand. Send inquiries for other components.—Offers to F. R. JOYCE, Thornthorpe House, Newhall, Burton-on-Trent, S.A.E.

SALE.—Two racks suitable for transmitters, approximately 5 ft. x 2 ft. x 1 ft., safety switch doors and panels, crackle black finish, on wheels, £5 each or nearest offer. Two other steel cabinets suitable for similar equipment, approximately 2 ft. x 3 ft. x 1 ft., £2 10s. 0d. each.—L. W. JONES, 16 Leys Road, Cambridge.

SKY BUDDY or similar receiver wanted: working condition or otherwise.—Details and price to ULPI, 24 Burns Street, Nottingham.

SPECIAL Portable T.R.F. battery receiver. Similar construction to Oxford University Arctic Expedition set, by G6US. Beautifully made and aluminium screened, in strong case, £15.—BM/GAA, London, W.C.1.

S/W Battery Receiver, octal coils, aluminium chassis, ceramic holders, gray steel cabinet "All World 2," 75s.—15 Belgrave Close, Chelmsford, Essex.

TUBULAR Condensers 1,000v test, -1, 9d. each; -05, -01, 7d. each; -004, -002, -001, 5d. each. Dabiller Mica Condensers, -0001, -00015, -0002, 5d. each; -001, -002, 6d. each. Ceramic Condensers, 4,000 μF, 1,600 μF, 6d. each.

-01 Mica, 1s. each. Two μF Mansbridge 600v wkg, 4½ x 1½, 2s. 9d. each. Telsen S.M. Disc Drives with escutcheon, 2s. each. Celestion P.M. 6½ in. Speakers with trans, 2, 6d. 8 in. less trans, 21s. 6d.—CHARLES BRITAIN RADIO (K. H. EDE), "Eureka", Surrey Gardens, Eppingham, Surrey.

VALVES.—EZ2, EF6, 76, 84/624, 6C5, 6J5, 6G5, 6Q7, 6K7, 6K8, new, ss. 6d. each. Resistors, 1/3, 1/2, 1 watt assorted, 100 for 12s. 6d. 5mA type meter rectifier, 10s. 6d. 5mA M.C. meter, 27s. 6d. Ekco Eliminator type K18, with charger. Complete set of Eddystone 6-pin coils. Offers.—Box 374, PARRS, 121 Kingsway, London, W.C.2.

VISITING VK interested in purchasing good ham gear, also portable, preferably midget pocket type, any condition.—Write P.O. GILDER, R.A.A.F., Base P.O., Kingsway, London, W.C.2.

WANTED by serving member.—8: 16μF. 500v. electrolytic also 4 ft. telescopic aerial. State prices.—BRS6940, Ivy Farm House, Kensing, Kent.

WANTED.—Communication receiver, preferably Sky Buddy, Sky Chief or Sky Champion. Must be suitable for immediate operation.—Price to WELLS, 13 Springfield Rd., Swindon, Wilts.

WANTED.—DB20 in perfect order. Write stating age, period of use and price required.—Box 365, PARRS, 121 Kingsway, London, W.C.2.

WANTED.—Disk recording motor and turntable (12-inch), complete with traverse and cutting head.—Offers to F. GREEN, G3OS, 24 Woods Terrace, Gainsborough.

WANTED.—H.B.O. or RE 70-RX. Must be in first-class order. Speaker not required.—Provost T. W. READSHAW, G6MUU, Hollywood, Esbank Road, Bonnyrigg, Midlothian.

WANTED.—Simpsons electric turntable in good condition.—Particulars to MR. J. PAGE, 70 Castle Drive, Penrith, Cumberland.

WANTED.—Television, March, 1937. QST's, January 1930, August, 1931, October, 1933.—SIMMONDS, G3AD, Croft Farm, West Charlton, Kingsbridge, Devon.

WANTED urgently. Two Lissen Hi-Q 5-pin valve-holders.—Offers to 2HAB, 9 Weymouth Street, Apsley, Hemel Hempstead, Herts.

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PATENTS AND TRADE MARKS

KING'S Patent Agency Ltd. (B.T. King, G5TA, Mem. R.S.G.B., Reg. Pat. Agent), 146a Queen Victoria Street, London, E.C.4, Handbook and Advice on Patents and Trade Marks free. Phone: City 6161. 50 years' refs.

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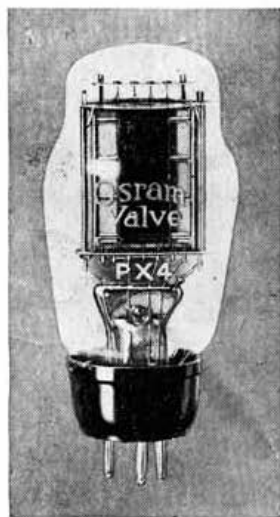
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