THE T&R

BULLETIN

A JOURNAL FOR RADIO EXPERIMENTERS

Vol. 14 No. 12 JUNE 1939 (Copyright) Price 1/6

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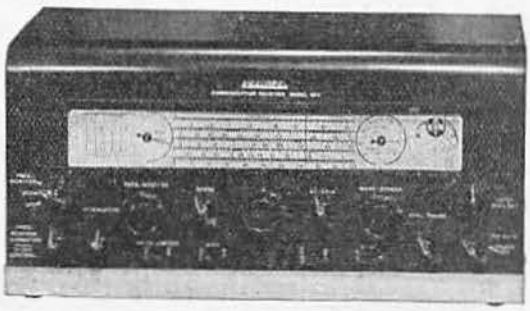

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THE T. & R. BULLETIN

OFFICIAL JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

DEVOTED TO THE SCIENCE AND ADVANCEMENT OF AMATEUR RADIO

Hon. Editor: A. O. MILNE Secretary-Editor: JOHN CLARRICOATS

Advertising Manager: HORACE FREEMAN

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CONTENTS

WHEN AMATEURS FOREGATHER

WE can think of little more exhilarating than to be in the company of a bunch of good amateurs who are indulging in that most entertaining pastime—"ragchewing."

National Field Day, which passed by for the eighth time a week or two ago, provided ample opportunity for the ventilation of pent-up verbal energy, and we have little doubt that many of our younger members benefited exceedingly from the exchange of views.

Amateur Radio, like one other hobby near to our heart—philately—thrives on the dissemination of information. The good fellowship which prevails when radio amateurs and philatelists foregather is something real. Swopping "ham radio" ideas, like swopping stamps, has an appeal which is irresistible.

How frequently it happens that the newcomer to both hobbies springs a surprise on his more learned colleagues who have to pull themselves together sharply to find a solution of the new problem which suddenly confronts them.

In our somewhat hectic existence we have witnessed many such embarrassments, but possibly the most interesting aspect of a "rag-chew" is when acknowledged experts begin to argue.

Occasionally the correspondence columns of our own Journal become the arena for a full-dressed debate on some point of general interest, but unfortunately the days of real technical scraps seem to have passed. How many of our members remember the heated arguments which arose a decade ago between the "driven amplifier" devotees and those who still favoured "locked oscillators"? Do they remember the "modulation war" between the "anode school" and their "poorer" brethren who pinned faith in grid modulation?

We sigh for a return to the old days when each man was prepared to submit his theoretical and practical knowledge to the glare of publicity *via* the correspondence columns of this and other journals.

In our last issue we revived a memory of the "pre-commercial age" when one of our readers put forward his views on Optimum Plate Tank Values. His letter brought to light the well-proved fact that experts often disagree, in fact the more we delve into this specific matter the more we agree with Mr. Rogers' further opinion, expressed privately, that it is time an authoritative article was prepared by the Experimental Section.

Readers need no reminding that Mr. G. W. Slack contributed an invaluable treatise on this very subject as recently as November last, but even his conclusions differ quite appreciably from those put forward by other authorities.

Towards the end of last month we had the pleasure of meeting one of the most prominent amateurs in North America—Mr. E. H. Conklin, Associate Editor of *Radio*. During his all too brief visit to London we heard at first hand a good deal about the very close liaison which exists between the amateur movement in the States and the various official scientific bodies. Somehow we feel that the British amateur is lagging behind in acquiring knowledge of what is being done by such eminent organisations as the National Physical Laboratory and the Radio Research Board, and in the wonderfully equipped laboratories of our leading commercial concerns.

On rare occasions we hear of important papers being read to the learned Societies and occasionally have the opportunity of reading a reprint or a *precis*, but there must be a great deal of invaluable information which passes beyond our scan.

Recent developments in ultra-high frequency communication cannot all (as some may be led to assume from information generally available) be confined to the U.S.A. We would welcome the opportunity of giving the fullest publicity in our Journal to every new aspect of the subject brought forward by British engineers.

* * * * * *

CONVENTION QUESTIONNAIRE

Inserted with this issue is a Questionnaire designed to assist the Council in preparing a Convention programme which will appeal to the majority of members who attend. One question concerns the suggestion to hold a meeting of Experimental Section members. If, as we hope, this comes to fruition, perhaps it will be possible to formulate plans to ensure that more information of definite scientific interest becomes available to the membership generally.

We realise that many of our leading technical members are prevented, under employment agreements, from contributing articles or delivering lectures without authority, but we feel sure that almost every important concern would give its approval provided no "trade secrets" are disclosed.

The vast majority of amateurs, in this country at any rate, are not professionally engaged in radio work, therefore they must be dependent almost entirely on their professional colleagues for news of commercial or laboratory progress. We dare suggest that many manufacturers and scientific bodies would probably benefit by a closer contact with keen amateur experimenters, particularly when it concerns matters relating to propagation and long period observations.

* * * * * *

THE LADIES

The Questionnaire also invites those who expect to attend Convention to give their views as to whether the wives and lady friends of members should be permitted to attend certain functions.

Council feels that such a debatable question should be answered by the membership, and not by themselves.

Wise men!

* * * * * *

A VOLUME ENDS

Our final word this month must be to thank all those who have helped to make Volume 14, which closes with this issue, the biggest ever. In our bookcase at Headquarters stand the previous thirteen volumes, neatly bound. A glance at the shelf will illustrate better than any words can hope to do how our Journal has grown. That first volume produced with such trepidation during 1925-6 finished with a mere 200 pages—Volume 14 runs to nearly 800 pages.

Contributors, no less than advertisers, have made this growth possible. We thank them all, and in doing so assure them of our appreciation for services rendered.

On to Volume 15—and may it be even bigger and better than all its predecessors.

J. C.

The Overseas Five

By J. MACINTOSH, A.M.I.W.T. (VS1AA)

An All-Mains Amateur Receiver, incorporating a separate beat oscillator and a 100 kc. crystal oscillator.

THE average transmitting amateur is usually so occupied with his transmission work that the receiving side is neglected. Frequently, if it can be afforded, a commercial superhet is purchased and there the matter ends. Further interest in receiving is confined to twiddling the knobs.

The receiver to be described is not intended to replace the large expensive superhets but in the writer's opinion it will completely outshine the ordinary " detector and one or two audio stages " and gives a very good account of itself against the smaller types of superhet, at least on C.W.

The idea of using a separate beat oscillator was first brought home to the writer when experimenting with a frequency meter/monitor, but it did not fully materialise until an article appeared in "*QST*" (February, 1936, page 15).

The Circuit

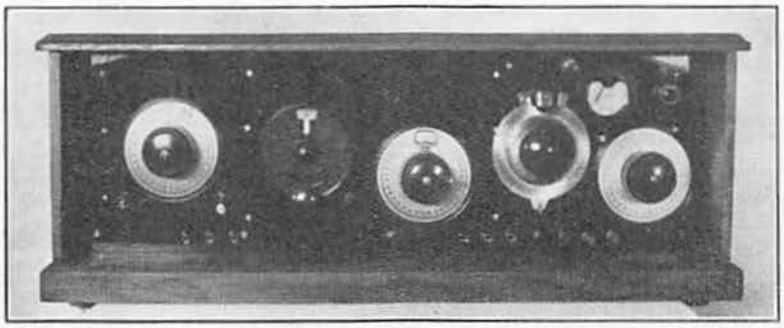
The receiver uses six valves, but as one of them is employed in a 100 kc. quartz crystal oscillator circuit it has no connection with the working of the receiver as such. In designing the instrument, the main points set out to be achieved were :—

(*a*) To use the minimum number of valves consistent with efficiency.
(*b*) A low background noise.
(*c*) Good selectivity coupled with good sensitivity.
(*d*) Good amateur band-spread.
(*e*) Ease of tuning.
(*f*) Ability to tune-in any receivable station between 5 and 100 metres.

Fig. 1 gives the circuit. If efficiency is to be maintained on the high frequencies, low loss components must be used. The most important of these are C, C1, C2, C3, C4, C5 ; valve holders for V1, V2 and V5 ; coil holders for T1, T2 and L1 ; all coil formers and chokes CH1 and CH2. The receiver works very well indeed on 28 Mc. and up to about 36 Mc., which is the approximate limit of the 10 metre transformer. There are no local 56 Mc. stations and therefore it is difficult to say what the results would be on this frequency. On the radio side, every wire should be kept as short as possible and components must be placed so as to enable this to be achieved.

If the reader wishes to economise, he can eliminate V3 and couple V2 to V4 *via* R8, C15 and T3. The receiver was so designed in the first instance and was used for several months with the utmost satisfaction, using telephones for reception. A desire for greater signal strength brought V3 into use, but when using telephones on average signals it was necessary drastically to cut down strength with R12. The reader can take his choice ; if he wants very loud signals then instal V3, if not, cut out this component, together with R9, R10, R11, C16 and C17. If further economy is desired, V6 with its attendant components could be eliminated, but this is not recommended, as the 100 kc. crystal circuit is invaluable when band setting, etc.

Fig. 2 gives the layout of the various components with the chief dimensions. No effort was made to reduce sizes to a minimum, so there is ample scope in this direction for anyone who is so inclined. In the writer's case an existing cabinet was used and this accounts for the rather large size.



Front view of The Overseas Five.

Radio Frequency Stage

This stage employs a 7 pin R.F. Pentode (V1) and the connections to the base of the 6 pin R.F. transformer T1 are so arranged that it is possible to use either tuned or aperiodic coupling in the grid circuit. Reference to Figs. 3 (*a*), (*b*) and (*c*) should make this clear. Fig. 3 (*a*) shows the *holder* connections with the windings drawn in as they appear when the 6 pin former (*Eddystone* type No. 1003) is plugged in position. Fig. 3 (*b*) gives the schematic diagram of the windings, while Fig. 3 (*c*) shows the arrangement when an R.F. choke is used in the grid circuit. This choke can be any good short wave choke wired up to pins 1 and 6 of a former for ease in plugging in, or a suitable component may be constructed by winding 70 or 80 turns of 30 d.s.c. wire on a 6 pin former

and connecting the two ends to pins 1 and 6. Pin 2 on the former must be connected to pin 6. to complete the circuit.

It will be observed that Figs. 3 (*a*) and (*b*) make provision for a cathode regeneration coil, although Fig. 1 does not show this. Although regeneration applied to the R.F. stage brings up signal strength and improves selectivity it increases static and interference, and for these reasons was not incorporated. It also caused some interlocking with the regeneration control on V2 which explains why the cathode coil was disconnected.

In normal operation, V1 is used with a choke in the grid circuit and although there is a definite drop in signal strength as compared with the tuned arrangement, tuning is greatly simplified in that C1 is out of action. No attempt was made to gang C1 with C2, and a band spread condenser has not been fitted to T1. C1 is fitted with a " Utility " 100/1 ratio slow motion dial and this serves to make tuning easy. The tuning of an R.F. stage normally tends to be flat, therefore to improve selectivity the grid connection to V1 is tapped down the grid coil. The coil data is given in the Appendix.

P1 comprises a 50,000 ohm potentiometer with a .1 megohm resistance in parallel. P1 is necessary only when regeneration is required. Normally it is left in its maximum position when no cathode coil is used. Several points should perhaps be explained before finishing with this stage. Ganged tuning was not attempted owing to its additional complexity. With separate tuning and plug-in coils, the layout can be simplified and the efficiency made really high. Regarding tuned and aperiodic aerial coupling, many tests have been made on 28 Mc. and in every case the tuned arrangement, using a suitable transformer as T1, produced louder signals than did the aperiodic coupling. On the lower frequencies the difference was even more marked. It is purely a matter of convenience and in most cases the aperiodic coupling will be found

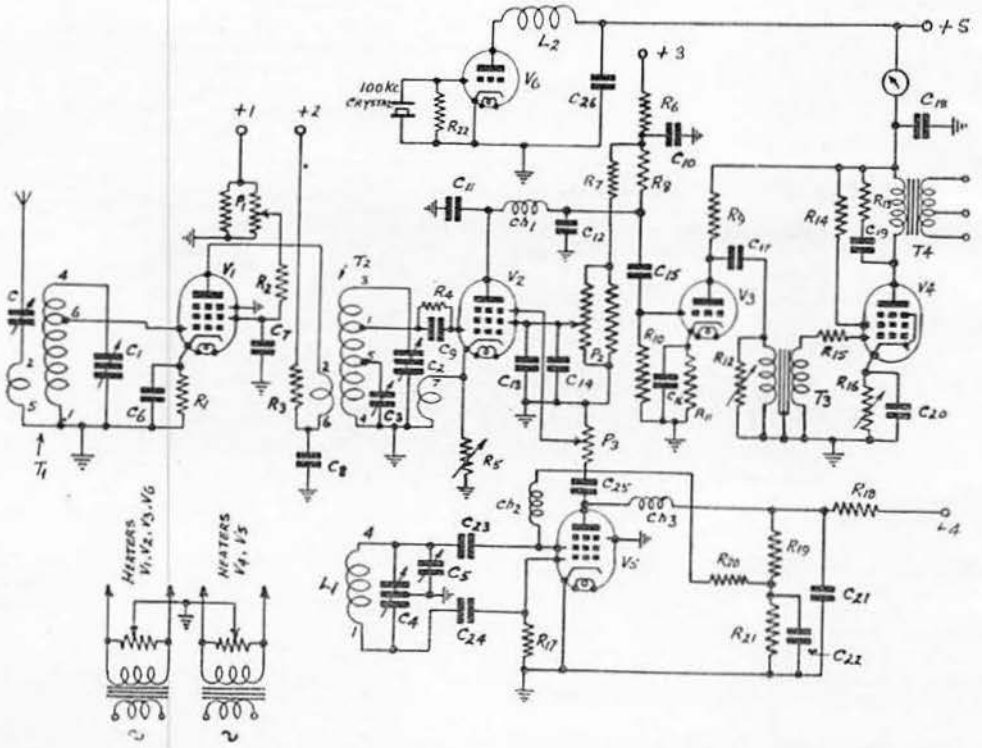


Fig. 1.

Circuit of All-Mains Receiver, incorporating separate beat oscillator and 100 kc. crystal oscillator.

C—Midget Igranic.
C1, C2—.0001 μF Cyldon S.G.
C3—20 μμF Eddystone.
C4—.00015 μF Cyldon S.G.
C5—600 μμF (see text)
C6, 7, 8, 23—.01 μF Mica
C9—.00005 μF Mica.
C10, 14, 21, 22—2 μF.
C11—.0003 μF Mica.
C12, 24—.0001 μF Mica.
C13—.1 μF.
C15, 17—.02 μF Mica.
C16, 20—15 μF Elect.
C18—4 μF.
C19—.005 μF.
C25—.0001 μF.
C26—.25 μF.
P3—50,000 ohms.
R1—500 ohms.
R2, 3, 14, 15, 20—1,000 ohms.
R4—.25 Meg. (see text).
R5—0/20 ohms (see text)
R6—5,000 ohms.
R7—30,000 ohms.
R8—.05 Meg (see text).
R9—.1 Meg.
R10—.5 Meg.
R11 (to suit)—2,000 ohms.
R12—0/10,000 ohms.
R13, 19, 21—.05 Meg.
R16—0/400 ohms.
R17—120,000 ohms.
R18—20,000 ohms.
R22—5 Meg.
CH1, 3—Short-wave chokes.
CH2—All-wave Choke and Short-wave Choke in series.

For P1, P2, T1, T2, T3, T4, L1, L2 and Valves, see text. Usual .01 μF condensers are fitted to heaters of V1, V2 and V5.

to give adequate signal strength with greater ease of tuning. Valves which were found to work well in this stage were the *Osram* VMP 4 G and M.S.P.4 and the *Cossor* MVS/Pen.

Detector Stage

The efficiency or otherwise of this stage will make or mar results. Certain valves function better than others. The *Osram* VMP 4 G and *Cossor* MVS/Pen work very well, but for 56 Mc. work it would undoubtedly be advantageous to use special short-wave valves in both this and the R.F. stage. The transformer T2 (Fig. 4) couples V1 to V2 and although transformer coupling is not so easy to instal as tuned anode or tuned grid coupling, it is at least equally as efficient and, moreover, station settings are constant. Efficient tuned anode or tuned grid coupling requires a variable coupling condenser and different settings of this condenser will affect the readings of C2 and C3. The design of different detector stage transformers is given in the coil table.

The grid condenser C9 must be small in value. The valve used is this receiver is .00005 μF, although higher values will work well but affect the detector tuning on high frequencies. The condenser should be one of small size, wired directly between connection 1 on T2 and the control grid of V2. The grid leak R4 is 250,000 ohms and was the only size which worked really well out of over a dozen other values tested, varying between 100,000 ohms and 5 megohms. A separate coil is used for cathode regeneration and this was found preferable to tapping the secondary of T2. It is easy to rewind such a coil until a suitable size has been obtained, but definitely not so easy to keep altering the tapping points on the secondary.

The electron coupled oscillator type of circuit is used and this is found to be most stable at high frequencies. Variation of high tension voltage does not appreciably affect the tuning, neither does the application of regeneration, both vital points in high frequency work. P2 is a 50,000 ohm carbon track potentiometer with a 100,000 ohm resistance wired in parallel. Such an arrangement, combined with a suitable size of cathode coil, gives almost perfect regeneration over all bands.

The purpose of R5, a variable 20 ohm resistor, needs explanation. With the usual size of cathode coil, regeneration is produced with about 25 volts or less on the screen grid. A slight increase in signal strength is available if we can but apply 50 volts or so to the screen grid. To enable this to be done without regeneration commencing, adjust R5 to a few ohms in value—this adjustment must be found by experiment—and then it will be found possible to increase the potentiometer adjustment to round about 50 volts with the same perfect regeneration. The maximum adjustment on P2 should provide up to 75 or 80 volts positive. Another obvious way to produce this result is to reduce the size of the cathode coil to the absolute minimum, but this

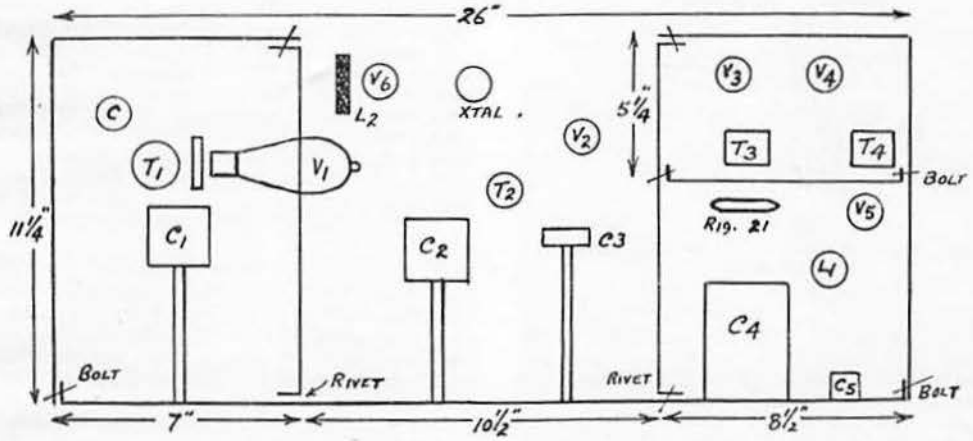


Fig. 2.
Plan of Layout.

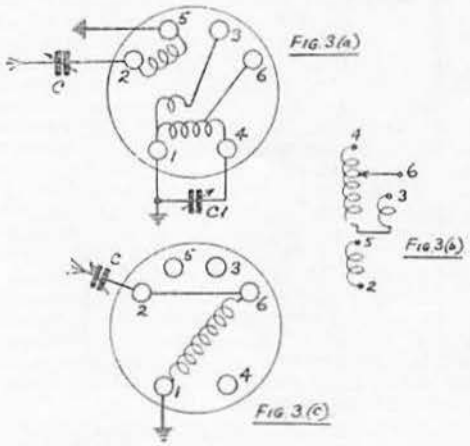


Fig. 3.
(a) Aerial transformer base connections.
(b) Schematic diagram of the windings.
(c) Alternative method using choke coupling.

was found to be somewhat tricky in practice, and regeneration, while obtainable at low capacity values of C2, could not always be induced at high values. The arrangement shown in Fig. 1 works well with different valves and could also be fitted to V1 if desired for regeneration purposes.

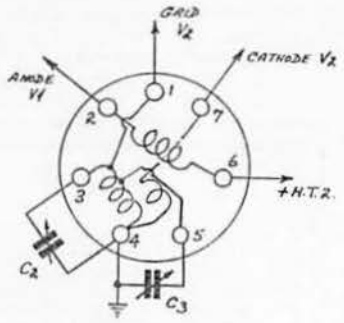


Fig. 4.
Detector stage transformer (7-pin type) base connections.

There is one minor difficulty, variation of R5 slightly affects the readings on C3. In practice, however, this does not matter much because once R5 has been correctly adjusted, this adjustment holds good over the 28, 14, 7 and 3.5 Mc. bands. Too easy regeneration, *i.e.*, with low screen voltages, means too large a cathode coil and *vice versa*. The remedy is obvious and fully worth the time spent on adjustment.

Band-spreading is effected by C3 which is 20 μμF in value. It is first necessary to strike the band required on C2 and then to adjust the tapping to C3 so that this condenser covers the whole of the band required. In Malaya, the 3.5 Mc. band is but very rarely used, therefore more attention was paid to 28, 14 and 7 Mc. If it is desired to cover all bands from 28 to 1.7 Mc. then it would be advisable to make C3 larger in value to enable complete bandspread to be effected on 3.5 and 1.7 Mc. On 3.5 Mc., with C2 set at 32 degrees, C3 tunes 3,500 kc. at 170 degrees, and 3,900 kc. at 33 degrees, with C3 across the whole of the secondary. Obviously, larger coverage of band spread on 3.5 Mc. can be made only by increasing C3, or by increasing the number of turns on the secondary of T2 and decreasing the capacity of C2. If the value of C3 is made greater than 20 μμF, then the tappings on 28, 14 and 7 Mc. will require to be reduced to counterbalance. For example, on 28 Mc., C3 is at present across approximately $1\frac{7}{8}$ turns and with C2 set at 45 degrees, C3 tunes 28,000 kc. at 151 degrees and 29,000 kc. at 22 degrees. Now if C3 is increased to, say, 40 μμF, C2 will require to be reduced a little in capacity to strike the band and C3 will then cover about twice what it did previously—possibly 28,000 to 30,000 kc.

If it is desired to dispense with the grid tap on T2, then a 6 pin former can be used. The connections for such a design are given in Fig. 5, but the coil data given in the Appendix naturally does not hold good. Six pin transformers (*Eddystone* type No. 1003) were made up at first and gave every satisfaction. The seven pin type, however, is preferable on the higher frequencies. C2 is fitted with an *Igranic* " Indigraph " slow-motion dial, and C3 with a " Utility " 100/1 ratio slow motion dial.

First Audio Stage

V2 is coupled to V3 by the resistance capacity method. R8 may be any value between 40,000 and 100,000 ohms. As already explained, V2 may be coupled direct to V4, thereby eliminating V3, an arrangement which will give very good telephone signals. Alternatively, V3 could be made the output valve in place of V4. If economy in high tension current is desirable, this method can be recommended, in which case V3 should be an *Osram* MH4 or MHL4. If the circuit as shown in Fig. 1 is to be retained, then V3 should be a fairly high impedance triode such as the MH4 or the H42, whilst R9 should be of a size suitable for the valve used; 100,000 ohms is a good all round value. No decoupling, other than C18, was found necessary in the anode circuit of this valve. In some designs it might, however, prove necessary.

Output Stage

Little need be said about this stage, which is quite straightforward. Valves found suitable were the *Osram* MPT 4 and *Mazda* AC2/Pen, but for really good loudspeaker quality from broadcasting stations, the writer prefers to use a pair of low-impedance triodes in push-pull. This receiver, using a pentode output, will be found to give quite good quality, with adequate strength. It was primarily designed, however, as a C.W. receiver, and it is as such that it shines.

R12 provides adequate volume control, and is noiseless in operation, since no direct current flows through the primary of T3. Audio frequency transformers tried and found to operate well were *Ferranti* A.F. 5, 6 and 7, and *Varley* " Hypermite." The latter is now in use, as a small size became imperative when V3 was added to the receiver. The A.F. 7 gave the best quality on telephony. T4 may be any suitable output transformer. R13 and C19 is the usual pentode network. A low-impedance power triode would function well in this stage if desired, with a possible gain in quality and less risk of instability.

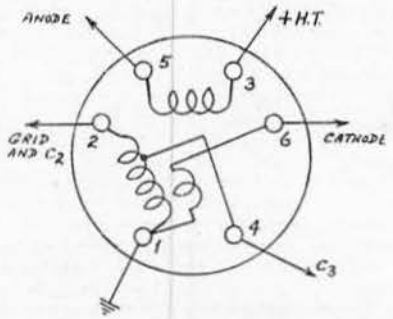


Fig. 5.
Alternative method of detector stage transformer coupling, using 6-pin base.

Beat Oscillator

The object of this circuit is to provide a signal which is made to beat with the incoming signal at the detector valve. The latter valve is not then in an oscillating condition. When a regenerative detector valve is receiving a C.W. station this station is fully in tune at zero beat—i.e., at the silent point, but as no signal is then audible, one must detune slightly to either side of zero beat.

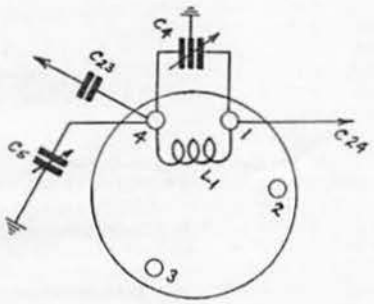


Fig. 6.
Base connections of beat oscillator coil.

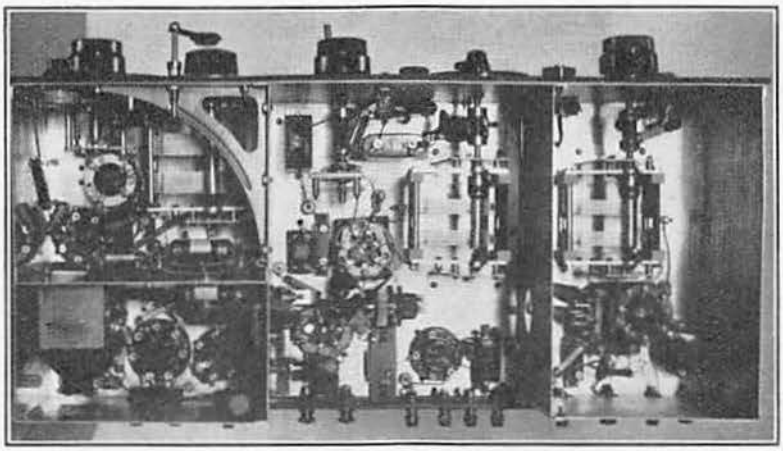
As detuning continues, the signal rises in pitch and gets weaker. It will thus be seen that the ordinary regenerative detector valve is not capable of being fully tuned to an incoming C.W. station. A separate beat oscillator valve (V5) removes this difficulty and also provides several other most desirable features. Selectivity is improved and stability becomes amazingly good. There is less background noise which gives a better signal to noise ratio.

The oscillator can be set to give any desired tone or pitch to the signal without in any way reducing signal strength, and unlike the regenerative detector, it will not "block" on the strongest of signals. Last, but not least, the oscillator can be calibrated to provide a very accurate frequency meter.

These advantages over the ordinary detector valve, sound too good to be true! To achieve them, however, the beat oscillator circuit must be above suspicion. All components—particularly L1, C4, C5, C23 and C24—must be rigidly mounted. Also the circuit must be well screened from the grid circuit of V2, otherwise interlocking may occur. If the oscillator is to be used as a standard frequency meter, a really good precision dial should be fitted to C4, and a good low ratio dial to C5. It was not found necessary completely to enclose the oscillator circuit; the top remaining uncovered. Screening—aluminium in this case—must be rigid; the thicker the better. The coils L1, too, must plug right home into the holder, otherwise different readings will result, due to longer or shorter leads.

The circuit is an electron coupled oscillator of the Colpitt's type and is exactly similar to an E.C.O. circuit used for some time in the transmitter at VS1AA. Bandspread is provided with C5, which is connected across half of C4. Other good oscillators are available, but this particular form of the Colpitts is so easily wired up that it is preferred by the writer. No tap is necessary on L1, which is wound on an *Eddystone* 4-pin former, Type No. 936, connections being made to pins Nos. 1 and 4. See Fig. 6.

The oscillator circuit is actually connected between the control and screen grids of V5, the rotor of the split stator condenser C4 being joined to earth. The dial fitted to C4 is a *National* Type "N" Velvet Vernier, providing accurate adjustment to one-tenth of one degree. The dial on C5 is a "Utility" slow-motion 100/1 ratio, type W.180. The value of C5 is not known, as it is a cut-down version of a *Cyldon* reaction condenser, but it is probably round about 60 $\mu\mu$F. There are several ways of effecting bandspread, but this method struck the writer as being very convenient, and it works excellently. C4 and C5 are both mounted on the front panel, but in the interests of stability they should be rigidly fixed to the baseboard and be controlled by rods running to the front panel. To make the oscillator really stable and insensitive to movements of the tuning dials, the front panel had to be reinforced by several sturdy brackets. It would perhaps be an improvement to fit the oscillator at the rear of the receiver with the audio stages at the front.



Underside view of The Overseas Five.

The oscillator circuit L1, C4 and C5 is always tuned to twice the wavelength (half the frequency) of the incoming signal and not the fundamental. The beat oscillation is injected into the suppressor grid of V2 *via* C25 and P3. The lead from the arm of P3 to the suppresser grid should be screened, and should not run close to the grid circuit of V2. In actual practice it has been found possible to dispense with C25 and P3 as enough coupling exists in the wiring and by virtue of proximity. Absolute and perfect screening is not so easy as it sounds! P3 controls the strength of the signal injected into V2, but there is very little difference between the minimum and the half-way positions. At the maximum position, however, there is a very noticeable difference. P3 is generally set somewhere between minimum and half-way and left there. In this position it works very well on all signals. The R.F. choke CH3 is not essential, and may be replaced by a resistance of 10,000 ohms, or so in value.

It may be found desirable to fit a fixed condenser of about .0001 μF. from the anode of V5 to earth. This condenser was found to improve the regeneration control on V2 when V5 was in action. A further slight improvement can be obtained by the addition of a .00005 μF. condenser from the suppressor grid of V2 direct to earth. Neither of these condensers is shown in Fig. 1.

The operation of the beat oscillator is as follows: When V2 is receiving a station on 28 Mc., V5 is operating on 14 Mc., *i.e.*, on exactly double the wavelength. With V2 on 14 Mc., V5 is on 7 Mc. Now supposing a signal is being tuned in on, say, 14,020 kc. Condenser C3 is correctly adjusted with appropriate regeneration control by P2. Then C5 is tuned until a fairly loud beat note is heard. This is tuned on C5 until zero beat (silent point) is located and P2 adjusted until V2 is just *not* oscillating. The oscillator circuit is now tuned to 7,010 kc. (It is assumed, of course, that C4 and C2 are correctly set for the band.) The desired signal will now be heard and its pitch will be entirely and completely controlled by C5. A slight re-adjustment is generally necessary on C3. V2 may be brought up to the edge of oscillation by adjustment of P2, but this is rarely necessary except on very weak signals. C5 will be found to control the pitch or tone of the C.W. signal, from the lowest to the highest tone desirable, on either side of zero beat. The strength of the signal is not affected by C5, while adjustment of C3 will affect the strength, but not the pitch, of the signal.

The beat oscillator could be set on the fundamental, but this is undesirable, as bad interlocking then occurs between C3 and C5. The second harmonic operates best, although the fourth is often used when receiving on 28 Mc. The beat oscillator is then on 7 Mc. This works very well indeed, and on 28 Mc. there is practically no difference between this and the usual second harmonic.

At certain times of the day the A.C. mains voltage at the writer's station is so unsteady that it is quite impossible to keep a 28 Mc. station in tune when using the regenerative detector only. It is then necessary to "follow" the signals all the time on C3. Switching in the beat oscillator results in a steadiness of signal which is absolutely uncanny. Fading is not overcome, of course, but the pitch of the signal remains rock steady, and this in itself makes reading through QRM much easier. Again, an interfering station can often be tuned to zero beat and the wanted signal read with comparative ease.

It certainly takes a little practice to locate a station quickly on the beat oscillator, but the knack is soon acquired. When going over to the beat oscillator, and after having correctly adjusted C3, C5 and P2, the operator is struck by the quieter background; this is noticeable even when static is heavy. The signal strength appears to drop a little, but this is more than compensated for by the much quieter background.

Several types of valves have been tried in the oscillator, and the most suitable was found to be the *Osram* MSP 4 screened R.F. Pentode. About 50 to 60 volts on the screen are ample, while the anode is run at 130 volts.

100 kc. Quartz Crystal Oscillator

This stage is quite straightforward, as shown in Fig. 1. It provides harmonics at every 100 kc. At 100 kc., 200 kc., 300 kc.—7,000 kc., 7,100 kc.—14,000 kc., 14,100 kc., and so on. L2 is an old *Igranic* No. 300 turn plug-in coil, and the valve V6 may be any suitable triode. Harmonics are clearly audible throughout the 14 Mc. range, but not on 28 Mc. The harmonics get weaker as the frequency increases and *vice versa*, but their strength may be considerably increased by connecting a .0001 μF. condenser to the anode of V6 and running a short piece of wire from this condenser over the top of T2.

To be able to utilise the 100 kc. circuit we must first know the position of at least one marker station or be in possession of a frequency meter. In the latter case, the procedure is easy and should need no explanation. Let us start with the 14 Mc. band. The marker station JNJ operates on a frequency of 13,940 kc., and therefore lies between the 139th and 140th harmonics of the crystal. Tune in JNJ on C2 and C3 so that C3 falls at about 165 degrees on a 180 degree dial. Now slowly increase the frequency (reduce the tuning) with V2 oscillating and the 140th harmonic, *i.e.*, 14,000 kc. will probably be heard at about 145 to 150 degrees on C3. Continue reducing the tuning of C3 and in turn pick up the 141st, 142nd, 143rd and 144th harmonics. This covers the 14 Mc. band. If bandspreading is not correct, adjustments will have to be made to the tapping 5 on T2 (Fig. 4). The bandspread can be made to cover as much or as little of the C3 dial as is desired. About 120 to 130 degrees on a 100/1 ratio slow-motion dial will give all the bandspread necessary on 14 Mc.

Now to adjust the beat oscillator circuit for 14 Mc. Plug in the appropriate coil L1 for 7 Mc. and restore the tuning of V2 to exactly 14,000 kc. with V6 in circuit and V2 oscillating. Set C5 to some high reading, say 145 degrees, and tune C4 until the beat note is located, then set to zero beat. The beat oscillator will now be tuned exactly to 7,000 kc. V2 should be set to the non-oscillating condition, when it will be found possible to beat the oscillator harmonic against the crystal harmonic by slight variation of C5. Note the reading of C5 at zero beat. A check should now be made to ensure that the oscillator *is on* 7,000 *kc.*, and this can easily be done by a simple absorption meter. Set V2 into oscillation and tune C5 a little to either side of zero beat so that the beat is clearly audible. Then loosely couple the absorption meter over L1 and tune its dial until a point is reached where V5 goes out of oscillation and the beat note ceases.

Since an absorption meter only functions on its fundamental, the meter is now tuned exactly to 7,000 kc. Check to see that its tuning does indicate 7,000 kc. If not, the meter will clearly show whether the beat oscillator is set higher or lower in frequency than 7 Mc. If all is correct, reduce the tuning of C5 until the oscillator beats with the 14,100 kc. setting of C3. The oscillator is now tuned to 7,050 kc. Continue the procedure until the entire 14 Mc. band has been covered, taking accurate readings of C5 and the band setting position of C4. This oscillator coil can now be used to give the 7,000 kc. position on the 7 Mc. transformer T2. The crystal will provide a check on this position and furnish the 7,100, 7,200 and 7,300 kc. points. This same oscillator coil will also give the following positions on the 28 Mc. band : 28,000, 28,200, 28,400, 28,600 and 28,800 kc.

If C5 does not give the required bandspread, it can be made to cover a greater frequency range by winding a few more turns on L1. Conversely, a reduction in the number of turns on L1 will result in a higher band setting reading on C4 and less frequency coverage by C5.

Coil Winding Data

The coil winding data for the detector stage appears in the Appendix. Suitable holes should be drilled in the wall of the former to take the ends of the different windings. The secondary should be wound on first, starting from pin 3 and at the end of the former furthest from the pins. Afterwards solder on the wires running to pins 1 and 5. Next wind on the primary winding, starting from pin 2 and winding in the same direction as secondary. The cathode coil should now be wound about $\frac{1}{8}$ in. to $\frac{1}{4}$ in. away from the low potential end of the secondary, starting from pin 7 and again winding in the same direction. Pin 4 has to accommodate the ends of the two windings, but this can easily be accomplished by soldering the earth end of the secondary winding into the pin and the end of the finer cathode winding to the outside of the pin, close to the former. Alternatively, the cathode winding can be soldered to the earth end of the secondary winding just where it disappears inside the former.

The winding of the aerial transformers is not difficult, while the oscillator coils are very easy to construct.

Miscellaneous

Earthing points are taken to the nearest part of the chassis, securely bolted terminals being used to make the actual contacts. One-sixteenth aluminium forms the metal chassis (see Fig. 2).

The receiver will work well from any well filtered power unit. A *Ferranti* BEM 1 Unit is in use. A.C. LT could be supplied from one transformer if desired.

WINDING DATA

DETECTOR STAGE COIL (7-PIN) 1½ INS. DIAMETER

Band	Primary Turns	Secondary Turns	Cathode Turns	Band Spread Tap	Grid Tap
3.5 Mc.	18 No. 24 d.c.c. Close wound alongside secondary	32 No. 24 d.c.c. Close wound	3½ No. 24 d.c.c. Wound in between primary and secondary	Across all secondary	No tap
7 Mc.	8 No. 25 d.s.c. interwound with low potential end of secondary	16 No. 20 enamelled, half wound single and half double spacing	2½ No. 25 d.s.c.	4 turns down from grid end	4½ turns down from grid end
14 Mc.	4½ No. 25 d.s.c. interwound with low potential end of secondary	7 No. 18 enamelled, triple spaced	1½ No. 25 d.s.c.	2½ turns down from grid end	2 turns down from grid end
28 Mc.	2½ No. 25 d.s.c. interwound with low potential end of secondary	4 No. 18 enamelled triple spaced	1½ No. 25 d.s.c.	2½ turns down from grid end	1½ turns down from grid end

AERIAL COIL (6-PIN) 1½ INS. DIAMETER

3.5 Mc.	Choke used	—	—	—	—
7 Mc.	6 No. 20 enamelled	16 No. 20 enamelled	—	—	4 turns down
14 Mc.	3 do.	7 do.	—	—	2½ do.
28 Mc.	1 do.	4 No. 18 enamelled	—	—	1½ do.

BEAT OSCILLATOR COIL (4-PIN) 1½ INS. DIAMETER

3.5 Mc.	7 Mc.	14 Mc.	28 Mc.
Not wound	25 turns No. 22 d.c.c. Close wound	9 turns No. 20 enamelled, single spacing	4½ turns No. 16 enamelled, double spacing

NOTES.—The 4 and 6-pin formers are *Eddystone* types and the 7-pin is made by Raymart. Single spacing means wound in each groove, double spacing wound in alternate grooves, and so on. The secondary of the 7 Mc. detector coil is wound single-spaced from the grid end to halfway and then double-spaced to end. This makes the winding of the primary a simple matter. The primary of the aerial coil is wound at the earth end of the secondary, with about ¼ in. space between.

The minimum capacity of C2 can be eliminated on 56 Mc. by winding the secondary winding between pins 4 and 5 (Fig. 4). Bandspread condenser C3 would then tune the whole of the secondary, but the tuning might be unduly sharp. A grid tap could be taken in the usual way.

It should, perhaps, be made clear that the views shown in Figs. 3, 4, 5 and 6 are those of the *holder* when mounted on the baseboard, and not the pins of the formers.

For use in damp tropical countries where humidity is high the following points require careful attention. Fixed condensers should be of mica wherever possible. Fixed resistances must be of good quality. In this respect the *Ferranti* 5-watt plug-in type of resistance is second to none. Valve and coil holders should be of *Ceramic, Mycalex* or other good material. Potentiometers are a bugbear in the tropics. The remedy is to use a good carbon track potentiometer with a good fixed resistance in parallel. Audio transformers and chokes are another difficulty. *Ferranti, Varley* and *R.I.* makes stand up well. Variable condensers should incorporate good insulating material such as Ceramic, etc. Mains transformers must be wound for tropical use. *Rich & Bundy* and *Ferranti* makes are very suitable.

Use of W.42 as Detector Valve

Since writing this article, an *Osram* W. 42 type R.F. Pentode has been fitted as V2. This valve has its control grid connection brought out to the top cap; the input capacity, so important on high frequencies, being thereby reduced. Some little difficulty was at first experienced in obtaining good regeneration, but this was overcome by increasing the grid leak to one megohm. A lower value gave rough regeneration, while values in excess of one megohm gave good regeneration, but tended to create instability on the audio side. The screen voltage required increasing slightly. As a result of fitting this valve, the reading of C2 has to be increased by two degrees for a given frequency on the 28 Mc. band.

Frequency Ranges

The approximate frequency ranges of each of the 7-pin detector stage transformers are as follows :—

3.5 Mc. (62 metres to 140 metres).
7 Mc. (26 metres to 52 metres).
14 Mc. (12.5 metres to 26 metres).
28 Mc. (8.3 metres to 18 metres).

To make overlap more effective, one half turn could be added to the 14 Mc. transformer secondary, while five or six turns could be taken off the 3.5 Mc. secondary. In due course it is hoped to be able to design coils giving complete bandspread on 1.7, 3.5, 7, 14, 28 and a good part of the 56 Mc. band, at the same time covering intermediate wavelengths. If successful, the coil data will be published in this Journal.

The Medway Towns Get Together

The Medway Amateur Transmitter's Society held an old time Hamfest at their Chatham Headquarters on May 10, attended by over 100 enthusiasts from all parts of Kent. Among the clubs represented were the Maidstone Amateur Radio Society, the Sheppey Amateur Radio Club, the Gravesend and District Radio Society, and the Tunbridge Wells Radio Society.

The Main Hall of the building had been set out with small tables and chairs thus giving utmost comfort to those present. On the stage the M.A.T.S. had arrayed, in addition to various types of superhets used by their members, a signal generator of extreme accuracy its in calibration, and an amateur constructed television receiver, to say nothing of the Society's trophies.

The first guest speaker, Mr. R. Hammans, G2IG, spoke of television, dealing with the subject so fully that question time at the conclusion was almost unnecessary. He was followed by Mr. H. A. M. Whyte, G6WY, who discoursed on "Uses and Misuses of the Hambands," a most interesting subject which provided much argument.

Mr. S. A. C. Howell, G5FN (Club Secretary), proposed a vote of thanks to the speakers, after which the company, under the Chairmanship of Mr. G. Jessup, G4HG, adjourned for refreshments.

The catering arrangements which were of the highest order came under the care of Mr. F. E. Howlett, 2AFT.

So ended the second ham evening to be held in Kent this year. It is hoped that other districts will add their support to this scheme, which is tending to keep all the Kentish Groups in good spirits. G5FN

The Stourbridge and District Radio Society

We have been asked to give publicity to the fact that the above Society has been formed. New members will be welcomed at the regular meetings held on the second Wednesday in each month. At the moment the membership consists of 12 fully licensed amateurs, and some 20 A.A. and receiving members. Full details can be obtained from the Honorary Secretary, Mr. D. Rock, G8PR, 4, Linton Road, Old Hill, Staffs., or from the Hon. Treasurer, Mr. C. V. Whittaker, G3UK, 12, Terry Street, Dudley, Worcs.

Golders Green and Hendon Scientific Radio Society

We are advised that at the recent Annual General Meeting of the above Society, the following officers were elected for the year 1939-40.

President	Mr. E. H. Laister.
Hon. Treasurer.	Mr. A. J. Bremner, B.Sc.
Committee.	Messrs. Corfield, Royer, Black, Griffith, Pryor, Maile, Rowler and Sherwood.

Country 56 Mc. meetings will take place on June 18, July 9 and September 10, and to all of these meetings members of the R.S.G.B. are cordially invited. Full details can be obtained from Lt.-Col. H. Ashley Scarlett, D.S.O., 60, Pattison Road, London, N.W.2.

Stray

Mr. F. E. Lane, 2AGZ, would like to get in touch with Birmingham members interested in practising morse. His address is 9, St. James Road, Handsworth, Birmingham 21.

The New Osram KT8 Valve

By S. K. Lewer (G6LJ)

In this contribution the author gives details of the new Osram KT8. Members who have supported our "Buy British" policy will welcome the information that this valve is available at a lower price than its American counterpart. A comprehensive review of the KT8 will appear in our next issue.—*Editor.*

FOR a long time, efforts have been made to convince British manufacturers that a market for amateur transmitting valves does actually exist. A similar enlightenment has been attempted with regard to the market for British short-wave equipment in general. Quite recently, signs of real progress in these directions have appeared and were commented on in the Editorial in the April issue of THE T. & R. BULLETIN.

One of the most recent developments in the production of British valves for British amateurs is the release of the *Osram* KT8. This valve is an entirely satisfactory replacement for the popular American 807. Whenever there has been an occasion in the past to compare a British valve with its American counterpart, in nearly every case there has been justifiable criticism on the ground that the price of the British valve was too high. In the case of the KT8, however, the price has not been brought down only to the level of the American counterpart, but it is actually several shillings cheaper. To the British amateur, it should therefore be quite clear from this that the G.E.C. has now made a definite and praiseworthy step in coming into the amateur market.

In order that the position which the KT8 takes up in the ever-growing range of transmitting valves may be readily understood, it is felt that an account of its development and its characteristics in general terms will be useful and will help the amateur in more fully appreciating what is available to him and in coming to the conclusion, when designing his own apparatus, that he is not sacrificing anything by choosing a British valve.

The KT8 is a beam-tetrode having aligned grids, which results in a very small value of screen current in proportion to anode current. Broadly speaking, the KT8 is an elaborated and improved version of the American 6L6 or its *Osram* counterpart, the KT66. The chief features of superiority are—

(*a*) a maximum voltage rating of 600 volts as compared with 400 volts, and
(*b*) an anode connection at the top of the bulb instead of in the base.

Anode Dissipation

The maximum anode dissipation of the KT8 is 25 watts, which is incidentally the same as the revised rating of the 807. The top anode connection is, of course, a great advantage in the design of high-efficiency amplifiers particularly for the highest frequency bands. The absence of the carbon coating on the inside wall of the bulb also gives improved operation at high radio frequencies. Even at a frequency of about 50 Mc. an anode efficiency of 50 per cent. can be obtained, while the grid drive required to give 27 watts output at this efficiency and frequency is only 5.5 mA. As one would expect, on the lower frequency bands, the maximum efficiency attainable is higher, and no trouble should be experienced in achieving an anode efficiency of 75 per cent. and an output of over 30 watts on the 7 and 14 Mc. bands.

Low Grid Drive

The grid driving power of the 807 is very low, while that of the KT8 is almost equally low. It should be remembered, however, that in these cases where the grid driving power is of the order of one or two watts, no great improvement is effected if the amount of necessary grid driving power is reduced by, say, 50 per cent. On the other hand, it will be found that only a very low power stage is sufficient for driving the KT8 to quite a large output, which is undoubtedly a very attractive feature. In practice, the grid driving power will be greater if the screen voltage is reduced, and therefore if the available grid driving power is limited, careful attention should be paid to the screen voltage. In any case, the amount of drive should be carefully adjusted, since the optimum driving condition is rather critical.

Another point to be observed in the operation of the KT8, and indeed also in other valves of the beam tetrode kind, is that it is dangerous to leave the valve running without a load while the anode circuit is tuned to the bottom of the dip of the anode current. In this condition, the anode current may be as low as 10 per cent. of the full load current, or less than the normal screen current, and when the anode current is as low as this, the current to the screen is much greater than normal and may damage it if the condition is allowed to persist. If the valve is left running without load and with the anode circuit tuned to the dip, it will be found that the anode current will begin to rise after a few seconds, due to emission from the screen, and this may be taken as a danger signal. As soon as the load is applied, the anode current is greater and the screen current is consequently then kept below the maximum safe value.

The Base

Finally, there is an important question which deserves close attention. The KT8 is being supplied with a bakelite base, and the majority of amateurs in this country may be inclined to criticise it on this ground. In the first place, the amateur nowadays tends to reject any form of insulation which is not ceramic or one of the new synthetic resin products, and in particular he considers bakelite to be very bad. When it is realised that the greatest electrical stress in the

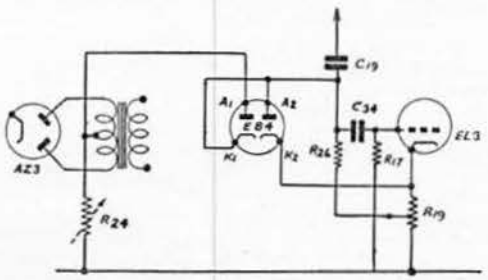
KT8 exists between the anode and the cathode, while the connections to them are separated at a distance of some inches by the glass bulb, it will be seen that the bakelite base can have no effect as far as the output circuit is concerned, and that the same anode efficiency could be expected as if the valve were fitted with a ceramic base. It is true that a little extra grid driving power is actually required to compensate for the losses in the bakelite in the vicinity of the grid and cathode pins in the base, but the extra amount required is negligible in all practical cases.

A ceramic base costs more than a bakelite base, and it is worth reflecting on the thought that the money which bought the valve has paid for a base which may be an unjustified extravagance. Certainly, so far as the KT8 is concerned, there need be no fear that the performance has been sacrified by the use of a bakelite base. For those who remain sceptical, or who wish to have a ceramic base for other reasons, the writer understands that the KT8 will shortly be available with a ceramic base at a small extra charge and will be known as the KT8C.

The Modern Selective Receiver

It is regretted that an error occurred in the diagram of the noise limiting device included as part of the circuit of the Modern Selective Receiver. In Fig. 1, page 577, of the April issue, the diode cathode K2 of the EB4 valve is incorrectly shown as being connected to the earth line. If this connection were to be actually made, the anode A2, instead of receiving a negative bias, would receive no bias at all and would completely short-circuit each alternate cycle of signal voltage.

The diode cathode K2 should be connected direct



Modified noise limiter circuit recommended for use in the Modern Selective Receiver. Note that the diode cathode K2 is connected directly to the cathode of the output valve.

to the cathode of the EL3 output valve, in order to allow of the voltage developed across R19 being applied as negative bias to the diode anode A2.

The diagrams shown on pages 656 and 657 of the May BULLETIN were drawn from the original and the same error crept in. Unfortunately also, due to a publisher's error, the diagram appearing above Fig. 2 should have appeared above Fig. 3 and *vice versa*, although this fact will have been obvious.

To make matters perfectly clear, a fresh diagram of the modified noise limiting circuit has been prepared and is reproduced herewith. Reference was made in the text of the third article to the fact that the output valve is run at reduced ratings. This is due to the inclusion of the series screen resistance R21, not R16 as stated.

The author makes acknowledgment to G6QZ for pointing out the errors.

G5JU

Cosmic Notes

A magnetic storm of average intensity began suddenly just before noon on May 1 and was accompanied by an ionosphere storm on May 2 and 3. This resulted in the critical frequency measured at Washington for the F2 layer at noon on May 3 being only 6,400 kc., while the height of the layer was as great as 660 kms. The magnetic disturbance continued with moderating intensity until midnight, May 3. Sunspot groups had crossed the meridian on April 29 and May 2.

A larger sunspot group was observed with C.M.P. May 5 and two fade-outs reported on May 4 were probably due to this group. A magnetic storm began late on May 5 and continued with varying severity until the early hours of May 9, the chief activity being recorded on the morning of May 7. On this morning high frequency conditions were observed to be extremely poor, while fade-outs were recorded on this day. The N.B.S. at Washington, U.S.A., reported a severe ionosphere storm beginning at about 13.00 G.M.T. on May 6 and continuing until the same hour on May 9. Further fade-outs were reported on May 8 and 9. This storm had finished before the ionosphere measurements were made on May 10 and the F2 layer critical frequency had returned to 10,400 kc. and the layer height to 330 kms.

A magnetically quiet period followed, but further groups of spots crossed the central meridian on May 13 and 14 and an ionosphere storm was reported on May 13 starting at noon and continuing for 22 hours. Another ionosphere storm occurred on May 15 and 16 and the magnetic elements were moderately disturbed on the latter day during the morning hours. The F2 critical frequency on May 17 was 10,700 kc.

A sunspot group with CMP May 19 was followed by a moderate disturbance during the morning of the following day and during the afternoon of May 21. Average sized groups of spots crossed the central meridian on May 23 and 24 and a severe ionosphere storm began at 03.00 G.M.T. on the latter day. Magnetic conditions were rather disturbed from May 22 to 24, the last days for which information is yet available.

G2XC.

Amateur Radio on the Films

From the May issue of *Radio* we learn that a new Hollywood production entitled "Grand Jury Secrets" features amateur radio. From photographs of shots it would seem that a number of genuine QSL cards will figure in the film, thanks to Eugene Kearney (W6PCV), who loaned them to Paramount, together with a few bits of real ham gear. We note, however, from his story that most of the apparatus depicted is of a "prop" nature!

Kearney's story is worth reading, and we imagine the film will also be worth seeing.

Output Stages and Valves

By JOHN H. BATTISON.

THE following notes deal more with the output stage of a receiver than with the actual circuit design preceding the output transformer, although the latter is discussed at the end of the article.

It is generally known that to obtain maximum power output from a source of given impedance it is necessary to work it into an impedance of equal value, but when, as in the case of a valve, waveform has to be considered, the load impedance should be several times the source impedance (Z), so that

$$Z_e = (N)Z_p.$$

$Z_e = (2)Z_p$ in the case of a triode output valve and about

4 Z_p for a pentode,

when Z_e = external impedance

and Z_p = plate impedance.

In the case of a triode, even if the ratio of $Z_p : Z_e$ varies between 0.5 and 4, the power output for a given amount of distortion varies by only a few db, and as the Ra of a triode is usually around 1,000 ohms, it acts as a shunt across the rising output transformer Frequency/Impedance characteristic and smooths out the resonances of the speaker; but with a pentode, when the Ra of the valve may be comparable with the external impedance, distortion is liable to be set up. Actually, the optimum Re of a triode may be increased considerably before distortion becomes apparent.

The pentode is a constant current device and because of this will increase its voltage output as the impedance rises, until maximum output is developed. This gives rise to two important points:—

(1) When the load, i.e., the speech coil, is disconnected from the output transformer, the loading effect of the low-resistance secondary winding is removed and the primary impedance goes up. The volts across it consequently increase and may rise

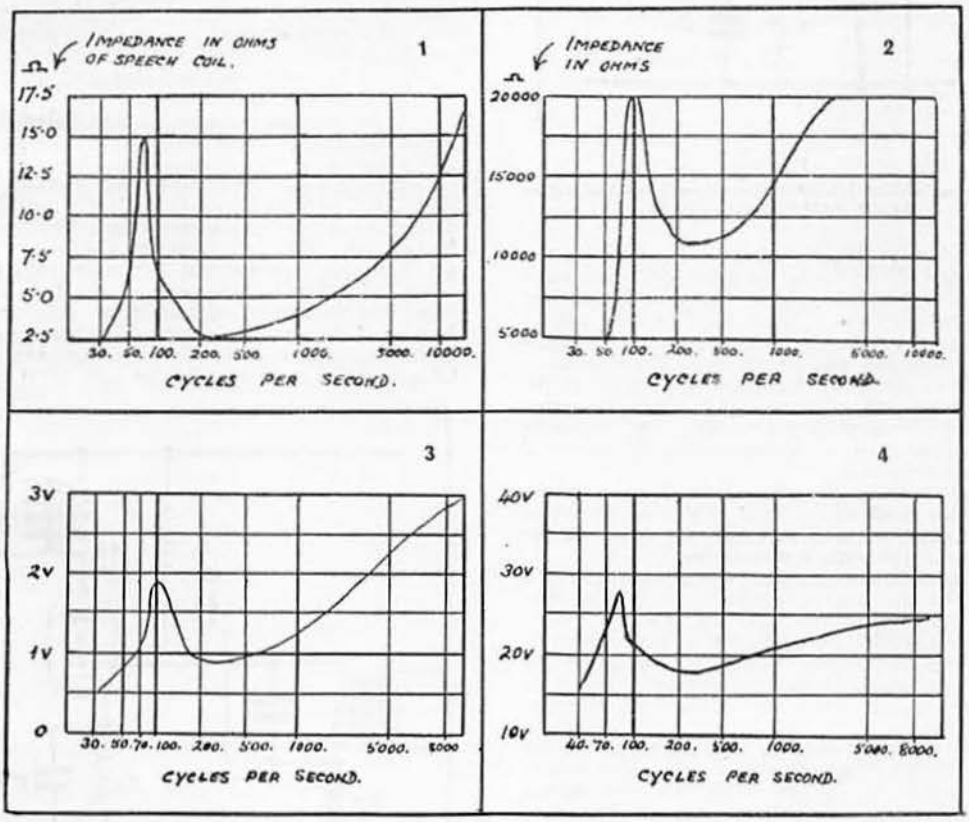


Fig. 1.
Showing impedance of loudspeaker speech coil, D.C. resistance 2 ohms.

Fig. 2.
Showing impedance across primary of transformer for speaker of Fig. 1.

Fig. 3.
Shows rising output as impedance increases when volts are developed across speech coil in Figs. 1 and 2.

Fig. 4.
Showing volts across output transformer primary with speaker connected to secondary. Note bass output greater than top.

to as much as 1,000 v., with the result that breakdown may occur.

(2) There is a good deal of prejudice with regard to the use of a pentode in A.F. amplifiers. The general opinion seems to be that a pentode gives less bass than a triode. If this point is carefully investigated it will be found that the chief cause is insufficient baffle area. (This also applies to triodes and will be mentioned later.) It is well

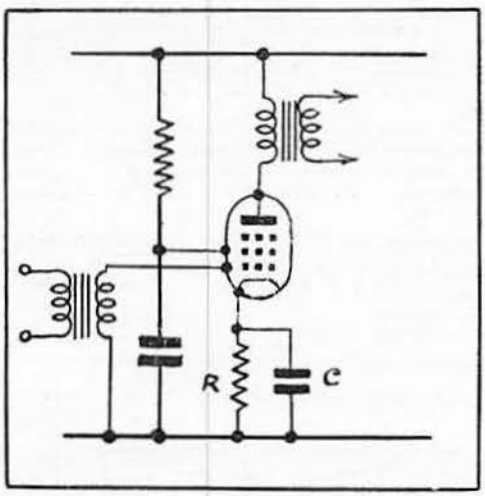


Fig. 5.
The circuit shown is that of the conventional indirectly-heated pentode output stage.

known that as the frequency rises, so does the impedance of the output transformer; thus more volts are developed across the primary as the frequency increases. What most people fail to realise is the fact that there is a definite bass resonance of the speaker at which the impedance rises; this results in increased impedance of the output transformer primary and more volts across the output transformer primary. The following figures taken on a representative speaker will illustrate this point.

As will be seen from Fig. 1 the base resonance impedance is almost as high as the impedance at high frequencies, and this also shows across the primary of the output transformer in Fig. 2.

In Fig. 3 the volts across the speech coil of Fig. 1 are shown, the speaker being fed from an AC/Pen. with a constant voltage input to its grid.

Notice the high voltage at 98 cycles relative to 400 cycles and 10,000 cycles. Fig. 4 shows the voltage developed across the primary of the same transformer and speaker as was used for the other experiments.

From the foregoing one would expect a very large output around 100 cycles, but, owing to the greater amplitude required at low frequency and the relative insensitiveness of the ear, the acoustical output seems less, and actually often is less, than 400 cycles.

The bass resonance is dependent on various mechanical circumstances such as the thickness of the cone and its weight, elasticity of the spider and lightness of the surround. This resonance can be of great value if used properly, but few manufacturers realise this and fit a speaker with a resonance of 120 cycles into a cabinet with a resonance of 300 cycles, making the bass sound very "boomy" and "coloured." The bass resonance is rather flat and bass notes within a few cycles will cause the resonant frequency to be heard. This can be tested by listening to a double bass on a number of sets; the change in a note as the player changes his notes will only be heard on certain sets, on the others no change will be noticed, and only a steady thumping will be apparent.

The Effect of Output Transformer on Bass

The inductance of the output transformer primary or, in fact, any of the inductive inter-valve coupling devices, affects the bass response to a great extent, since the impedance depends on the inductance; a low inductance means a very low impedance and coupling figure at low frequencies. It is here that many cheap transformers and chokes fail, for although usually designed correctly as far as turns matching ratio is concerned, the air gap is made too large and the core too small, both being factors which affect the inductance.

The formula for calculating the approximate primary inductance required for a speaker transformer with no D.C. flowing and for a specified low frequency is given as

$$2\pi FL = Re$$

when F = lowest frequency required to pass
L = inductance for primary
Re = optimum anode load of valve

which assumes a loss of 3 dB at F.

A cheap inter-valve transformer has often unpleasant resonances in the top, since as it has both inductance and self-capacity, there will be a definite resonant frequency—in fact, two resonant frequencies. The first occurs in the bass, due to the coupling capacity and the main inductance, while the other falls between 5 kc. and 10 kc., being due to leakage inductance and self-capacity. In a good transformer, these are arranged to give useful resonances where the speaker output is falling off, i.e., about 70 cycles and 8,000 cycles.

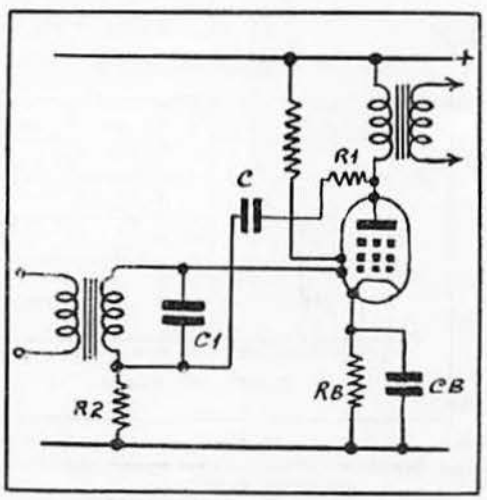


Fig. 6.
The circuit shows negative-feed back applied to a tetrode output stage.

The following remarks on circuit design may be interesting, although they are merely a résumé of what is probably known to most readers.

In the triode output stage, it is current which we wish to pass, and consequently the anode impedance of the output valve is kept as low as possible, which results in low gain but creates a

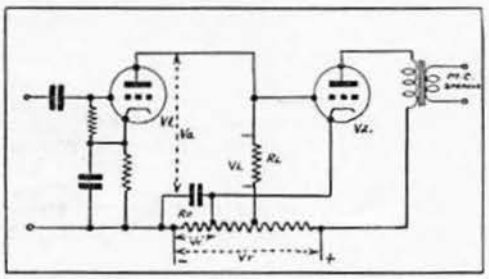


Fig. 7.
Method of obtaining negative bias on grid of output valve. A high-slope valve such as an H.F. pentode can be used as V1.

large shunting effect across the speech coil, thus damping the speaker resonances as explained previously. A practical value of valve impedance is around 1,000 ohms, with a mutual conductance of about 5 Ma/V. and a moderate input voltage requirement.

The Application of Negative Feed-back to the Audio Amplifier.

The system of negative feed-back is one which will probably become widely used in the future, * since in spite of its long name and apparently involved formulæ, it is really very simple to follow and use.

The advantages of negative feed-back are ability to use a tetrode output valve which has a higher sensitivity than a triode for equal output and requires less H.T., while distortion is as low, or lower, than that of a triode. The plate impedance of the output valve(s) can be either increased or decreased according to whether negative or positive feed-back is used, although in output stages it is always used so as to lower the plate impedance. This results in damping the speaker resonances.

*These notes were written before the circuit details were widely published.

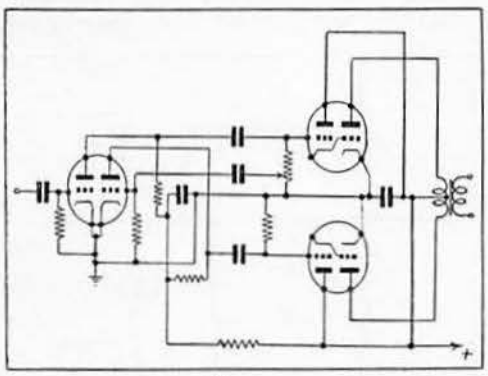


Fig. 8.
Complete circuit using 6B5's and one 6A6 in a direct-coupled push-pull amplifier which will give 20 watts output.

Although most people think of negative feed-back as something to be applied to output stages, there is nothing to prevent the principle being used in preceding stages in an amplifier.

Fig. 5 shows the connections for an indirectly heated output pentode as commonly used.

R is the biasing resister and C the by-pass condenser. The latter prevents common coupling and presents a low impedance to audio frequencies. It has been known for a long time that if C is removed, back coupling will become apparent, but as far as is known it had not been thought of as a commercial or useful proposition until an article concerning the subject appeared in an American publication some time ago.

Now if C is omitted, feed-back will occur because of the common coupling due to R. Since the A.C. component of the anode voltage passes through R and C, the only path for it is a high resistance one via R, which results in an A.C. voltage, Vr being developed across R in opposite phase to the input voltage Vin. Therefore, the actual input to the grid V_1 will be $V_{in}-V_r$

The loss in power output for this arrangement is given by $\frac{R}{R_1}$

when R_b Bias resister

and R_1 = Load resistance + R_b.

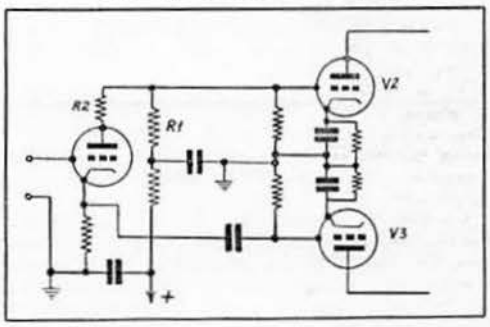


Fig. 9.
Conventional circuit for phase-inversion.

This circuit, although decreasing the distortion by 50 per cent., also decreases the output by 10 per cent. and increases the input required for the original output by 100 per cent.

Fig. 6 shows a typical single valve negative feed-back circuit. The usual valve to use here is a 6L6, although any high slope pentode such as a Pen. A4 or an AC2/Pen. can be used.

It should be noted that negative feed-back cannot be used in a resistance capacity circuit, as the feed-back voltage has to be applied in series with the input to the grid.

For 10 per cent. feed-back, R_2 should be approximately nine times R_1 and C anything from 0.05 μF upwards, 0.1 μF being a usual value. C_1 is only required in cases of oscillation due to the leakage inductance and capacity of the secondary, and may be about .001 μF. C_1 does not affect the top response to any extent, since the impedance of the transformer secondary is low.

Direct-coupled Amplifier

Passing to other unorthodox circuits, we come to the direct-coupled amplifier developed by Loftin and White. In the amplification of very low

frequencies and direct currents (very low frequencies can almost be considered as pulses of D.C.), if the coupling circuit is arranged to have a low impedance at low frequencies, i.e., large value of coupling condensers, the time constant of the circuit will become too large and the circuit will become unstable; therefore, some means of coupling the valves must be found which does not require the use of the usual methods.

If the anode of the first valve is connected directly

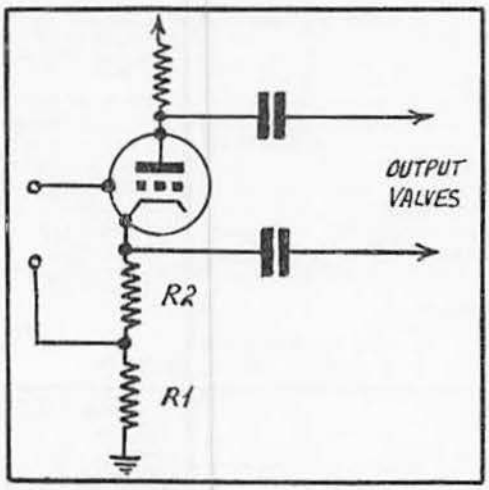


Fig. 10.
Method of using the out-of-phase voltage in the cathode circuit.

to the grid of the output valve, the H.T. voltage will bias the grid very heavily positive. To avoid this, the cathode of the second valve is also raised to a positive voltage to such value that the grid now becomes negative to the cathode by the V_g required (see Fig. 7).

Vc is less than Vb and
Va is less than Vb by V_L
Vc = cathode volts on V_2
Vb = grid bias on $V_2 = V_t - V_c$
Va = anode volts on V_1 less V_L
V_L = volts dropped on R_L load resistance
V_t = total P.D.

This circuit has been altered and brought up to date by the introduction of the 6B5, which consists of two triodes in one envelope, one of which has its grid connected internally to the anode of the other triode. This obviates the necessity for separate biasing and potention dividing resisters, since the cathodes are brought out separately. This arrangement results in high output and efficiency.

Fig. 8 shows a typical modern circuit using 6B5's and a 6A6 for paraphasing valve and driver.

Push-pull Amplifier.

Mention of paraphasing brings us to the push-pull amplifier, which is the oldest known method of increasing the output and securing good quality without loss of efficiency or increase of H.T. Most amateurs know the principles of operation of a push-pull output stage, although for the sake of clearness it may be useful to mention the salient points.

A push-pull amplifier consists of a pair of matched valves (or two or more valves arranged in parallel in pairs), each being supplied with a 180° out-of-phase voltage, so that each in turn amplifies a positive and negative signal, the necessary out-of-phase voltage being supplied by a paraphasing valve in the case of a resistance-coupled amplifier or transformer or choke in a transformer-coupled amplifier. As this method cancels out all even harmonics, valves are designed to provide a large amount of second harmonic. It should be mentioned that it is comparatively easy to construct valves having little third harmonic and a lot of second, or vice versa. In the case of specially designed P.P. valves the even harmonics cancel out, and as there is very little third, the output is quite pure.

Other advantages of push-pull operation are (1) less filtering is required in the power supply, since hum, etc., is amplified equally by each valve and is therefore cancelled out; (2) a smaller output transformer can be used as the steady D.C. from each valve, being in a different direction, is balanced out. This results in the reduction of flux in the output transformer.

The actual power obtainable from a valve for a given input is

$$P = \frac{\mu^2 V_g^2}{9\,Ra}$$

V_g = input volts (peak)
R_a = Anode impedance

when it is matched to the correct load and working under normal conditions.

There are many ways of obtaining the out-of-phase voltage, the best-known method being to use a transformer and earth the centre tap. Another method is to use a centre-tapped choke. In each case, due to the inductance of the winding, the volts at each end of the winding are out of phase.

When using a resistance-coupled amplifier, difficulty is often experienced in obtaining out-of-phase supply without recourse to some form of iron-cored choke. The circuit shown in Fig. 9 provides a solution.

This shows a modern method of phase inversion, although it suffers from the disadvantage that as R_2 and R_1 constitute a voltage divider with values

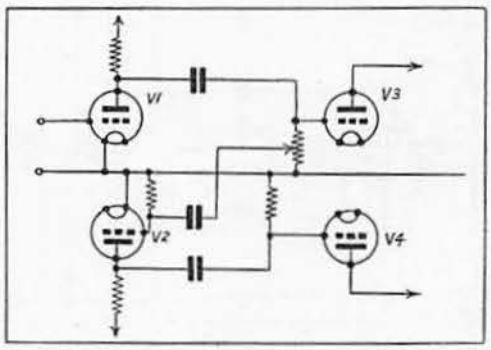


Fig. 11.
Push-pull circuit using variable phasing control.

chosen to have a ratio such that the voltage applied to the grids of the two output valves is equal (and out of phase), the gain provided by V_1 is cancelled in the voltage divider.

Fig. 10 shows a simplification of Fig. 9 and, as before, the ratio of $R_2 : R_1$ is chosen to feed equal voltage to the output stage.

Fig. 11 shows a circuit for input and paraphasing valves. The leak on V_4 is 1 megohm and that of V_3 is made up of .5 megohm fixed + .5 megohm variable. This is adjusted until a signal of, say, 400 cycles applied to the input produces little or no audible tone in a pair of 'phones inserted in the H.T. positive lead, thus indicating that there is no out-of-balance voltage present in the H.T. supply due to the push-pull valves not being 180° out of phase. Actually, this is a very suitable circuit to use since it permits of a variable-phase displacement adjustment.

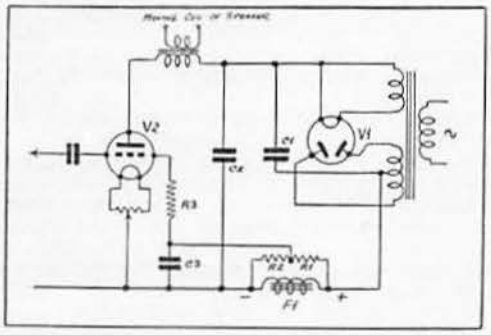


Fig. 12.
Method of obtaining "free" grid-bias by using P-D across the smoothing choke.

Class B and Q.P.P. Stages

From push-pull we naturally come to Class B and Quiescent Push-pull (Q.P.P.) output stages.

Dealing first with the Class B output stage we find that the simple circuit is apparently the same as an ordinary push-pull arrangement, until we examine constants, and here we find that a few differences occur. The first is that very little or usually no bias is applied to the grid of the output valves, which are constructed so that with zero input volts and zero bias the anode current is very low. As soon as a signal is applied, the current increases, and as the input varies so does the anode current; thus the valve only takes current during the actual time that a signal is being amplified and the anode current is proportional to the input voltage. The usual characteristics of a Class B valve are a high impedance and high amplification factor. The system is not really suited to mains operation, as it requires perfect regulation of the H.T. supply which necessitates large chokes and condensers, and a transformer with a low H.T. secondary winding resistance. All this means expense, and with mains equipment it is not necessary to save current as is the case with expensive batteries.

Secondly, the resistance of the secondary of the driver transformer must be low, as the drive valve has to provide power to excite the Class B valves into grid current. Its value, therefore, should not be more than about 400 ohms. This circuit cannot easily be made to give good quality, although the efficiency is high, but there is least distortion at high outputs, as the valves are then working on the straightest part of their curves.

Q.P.P. is very similar to Class B working, the chief difference being in the valves. Although the valves used in Q.P.P. are usually contained in the same envelope, the actual electrode arrangement is different. In Q.P.P. the two sections are pentodes and are biased to twice the "cut-off" point, in order to obtain zero anode current until a signal is applied to the valve.

This circuit, which can be used with any pair of pentodes, has the advantage that lower H.T. can be used than with Class B owing to their greater sensitivity, otherwise the circuits are very similar.

Low-Loading System

The last output stage to be described is the low-loading system. This is a combination of Class A and Class B, and is known as Class A-B.

Useful valves to use here are DA30's, as they are made specially for the purpose. The makers' rating gives them a grid bias of —134v., with a load impedance of 3,400 ohms and an anode resistance of 580 ohms. Two will give in "low-loading" push-pull 44 watts output. "Low-loading" push-pull is a form of Class B, in which the valves are fairly highly biased to keep the anode current low, but as soon as a signal is applied the anode current fluctuates with the signal. For two valves with 100 mA. steady current, it may vary between 100 and 200 mA., or even more.

A special power supply is needed for this circuit, although the writer has found that provided the transformer secondary winding has a low resistance and the rectifier is of low resistance, an ordinary power unit may be used. In practice he uses four full-wave rectifiers connected in parallel, which give very good regulation, and the voltages only vary by about 20 v. below 500 v.

Precautions to take are the same as for all high-power output stages, i.e., 5,000 ohms grid stoppers should be used and the total resistance of the grid return circuit should not exceed 500,000 ohms, since grid current may flow; 100 ohms in the anode lead next to the anodes will often help to stop parasitic oscillation.

Self-biasing with Limited H.T. Supply

The following may be of interest to readers who wish to use self-biasing arrangements with a limited H.T. supply. In the usual way, the bias voltage is deducted from the H.T. supply; consequently when the H.T. is limited to 350 v. unsmoothed, one cannot spare many volts for biasing. Accordingly the drop in volts across the smoothing choke—which may well be the loudspeaker field, as shown in Fig. 12—is utilised to provide the bias for the output valve.

The output from V_1 is smoothed by the reservoir condenser C1. The 2,000-ohm speaker field is in the negative lead, therefore the voltage developed across it is negative with respect to the anode of V_1. This voltage can be tapped off to provide bias for V_2. A potential divider R_1R_2 is connected across F_1, but it should be remembered that as this is in parallel with the choke, it should have as high a resistance as possible, otherwise it will result in decreasing the smoothing. This is because the field impedance is usually about 45,000

(*Continued on page* 764.)

Some 56 Mc. Aerial Designs

IT is possible to make any reasonably good aerial system produce results on the lower amateur frequencies but, on frequencies as high as 56 Mc. it is necessary to pay special attention to the aerial if the maximum efficiency is to be achieved. New designs are constantly being evolved, one or two being discussed in this article. The improved results obtainable from the more complicated types repay the trouble involved in overcoming difficulties attendant on their erection.

A Compact Portable Aerial

The first aerial to be described is a small beam array, principally intended for field work, which, when dismantled, measures only 4 ft. 6 ins. in length, so that it is capable of being carried in a small car. Acknowledgement is made to R. & G. Hook (2CIL) for the details which follow.

The main support for the aerial proper consists of three broom handles, marked " A," " B " and " C " in the accompanying sketch (Fig. 1), joined together by means of 6-in. lengths of brass tube, the overall length (when erected) being adjusted to 10 ft. 6 ins. Each piece of tube is bolted at one end to a broom handle. The centre T piece is formed by making a saw cut to a depth of 1 in. down an 8-in. length of tube, " wings " then being hammered out to closely fit the 6-in. horizontal tube, the whole being securely soldered together. The middle stick " A " passes through the central piece of brass tube and is a tight fit therein.

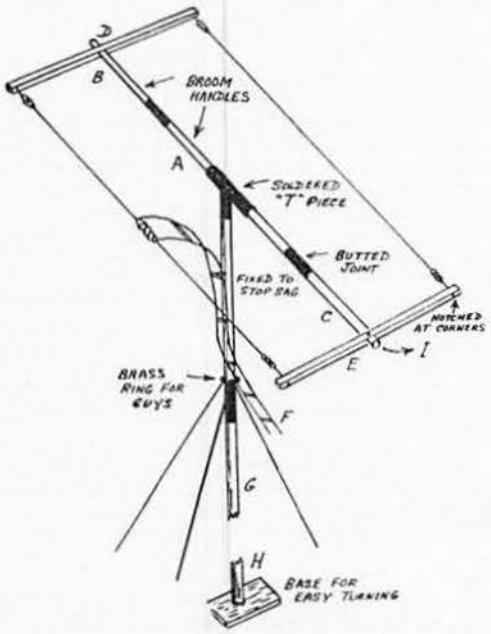


Fig. 1.

A portable 56 Mc. Beam array especially suitable for use in a car.

The end supports, " D " and " E," are made of 4 ft. 6 in. lengths of 1-in. square Columbian pine, suitable notches being cut at the centres to accommodate the central support. Holes ¼ in. in diameter take the fixing bolts.

Bamboo poles were at first used for the mast portion but difficulty was experienced in making sufficiently strong joints. Resort was therefore made to further broom-sticks, joined together in a manner identical to the top section. These have proved perfectly satisfactory.

In order to render attention to the stay wires unnecessary during rotation of the aerial, the scheme shown in the sketch was adopted. The brass ring, to which the guy ropes are fixed, is made an easy fit over the top joint of the pole, allowing the mast to be rotated whilst still being held firm.

A base, whilst not essential, is desirable and can be made from any flat block of wood on hand. If the aerial is to be mounted on a roof, the base should take the form of a stirrup.

After assembling the top section and securing with nuts, bolts and screws, the aerial and reflector should be fitted, care being taken to see that the end spars have a slight tension. The first section of the mast is next fixed and the block holding the feeder (to prevent the top being pulled about), attached to the pole. Finally, the lower sections are fitted and the guy ropes tightened.

If the aerial is to be used in a vertical position, the top section of the mast is removed and the extension piece marked " I " (left for the purpose on the central support) fitted in its place.

The aerial, if for use in the low-frequency part of the band, should consist of an 8 ft. 3 ins. length of 16 S.W.G. enamelled wire. The reflector should be 3 ins. longer and for best results *Pyrex* insulators should be used throughout.

Used for reception, the array has been found to give a definite increase in signal strength and has a further advantage, when employed with unselective super-regenerative receivers, in that its directional properties enable interfering stations to be cut out. It can be easily rotated with one hand to the optimum position, using the other to tune the receiver. It is considered that this aerial system would be equally effective when used for transmission.

Permanent Aerials

Although the designs of aerials which follow are shown vertically in the accompanying sketches, they will be equally effective when erected in a horizontal position, as will be necessary when it is desired to radiate a horizontally polarised wave.

A popular aerial is illustrated in Fig. 2. This is of the conventional dipole type and should be erected as high as possible, both above earth and above surrounding objects. The aerial itself may be of either heavy gauge (10 to 12 S.W.G.) wire, or of tubing (copper, aluminium or duralumin suitably varnished to withstand corrosion). The latter confers little benefit as regards ohmic loss but the

INCORPORATED RADIO SOCIETY OF GREAT BRITAIN

53, VICTORIA STREET, LONDON, S.W.1

CONVENTION, 1939

June 15, 1939.

The Council, anxious to meet the wishes of members, has decided to issue this advanced questionnaire in order to obtain a comprehensive opinion concerning certain matters relating to our Fourteenth Convention arranged to take place during the period September 21-23.

It will assist the Council if only those who hope to attend Convention answer the questions set out below.

1.	Would you support a Theatre or Music Hall visit on Thursday evening, September 21 ? (Price not to exceed 5s.) If " Yes," indicate preference.	(*a*) Theatre (Comedy or Farce) (*b*) ,, (Straight Play) (*c*) Music Hall
2.	Would you support either a Coach Trip around London, or a River Trip, if arranged, on Friday, September 22 ?	Yes No
3.	Are you in favour of allowing wives or lady friends of members to attend :—	
	(*a*) The Conversazione on Friday evening, September 22 ?	Yes No
	(*b*) The Annual Dinner on Saturday evening, September 23 ?	Yes No
4.	Would you prefer that the meeting during the Saturday afternoon be confined to	(*a*) Technical matters ? (*b*) Business matters ? (Strike out one line)
5.	Would you prefer an entertainment to be arranged during the Dinner in lieu of the Draw for Components which is usually held ?	Yes No
6.	If Convention takes place in a good Central London Hotel, would you stay there in preference to going elsewhere ? (Single room 5s. 9d. ; Double room 11s. 6d. ; Breakfast 2s. 6d.)	Yes No
7.	Would you support :—	
	(*a*) The Conversazione ? (Price 2s.)	Yes No
	(*b*) An Experimental Section Meeting during the Saturday morning ?	Yes No
	(*c*) An informal lunch on the Saturday morning ? (Price 2s. 6d.)	Yes No
	(*d*) The Annual Dinner ? (Price 6s. 6d., including service)	Yes No

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The Secretary,

INC. RADIO SOCIETY OF GREAT BRITAIN,

53, VICTORIA STREET,

LONDON, S.W.1.

extra rigidity enables signals to be held more easily. The down-lead may either be weather-proofed flex or one of the commercial low-impedance types now available, the connections being as indicated.

A variation is shown in Fig. 3, the aerial, in this case, being in one complete length of 8 ft., or slightly more. The ends of the feeder are fanned out each side of the centre for a total distance of 6 ins. to 9 ins., to form an impedance match.

Fig. 4 illustrates a somewhat different type, giving, for reception, a high signal-to-noise ratio, and is therefore very suitable for television reception.

To the lower end of the aerial, which, except for the feeder arrangement is similar to those already described, is connected the centre conductor of a screened cable, which should follow the line of the aerial for at least 4 ft. Although the special co-axial cable manufactured under the trade name of *Telconax* will give superior results, preliminary experiments can well be carried out with ordinary 3/.029 lead-covered lighting cable, this having been found fairly satisfactory in practice. The lower half of the aerial is connected to the sheath of the cable at its top end and runs parallel to the cable at a distance of 3 ins. from it. For reception of television, the aerial lengths should be increased to 5 ft. 3 ins..

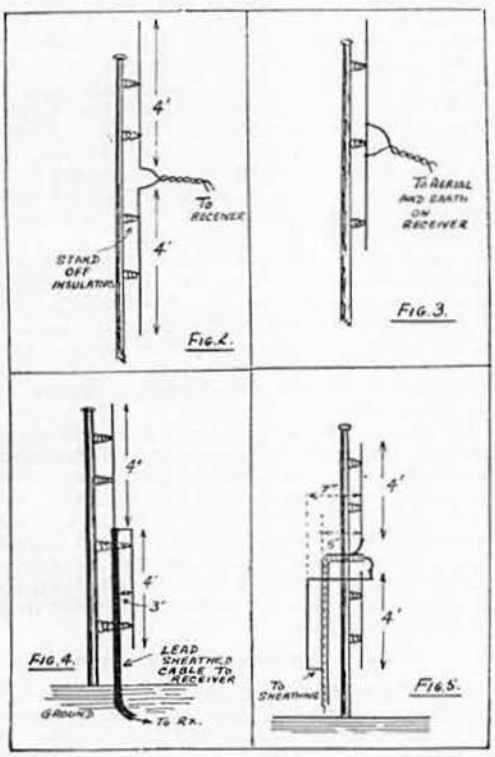


Fig. 2.
A conventional 56 Mc. Dipole.

Fig. 3.
A variation of Fig. 2, in which the ends of the feeders are fanned out each side of the centre to form an impedance match.

Fig. 4.
A type suitable for television reception, giving a high signal to noise ratio.

Fig. 5.
A form of design which uses a length of screened cable as feed to the receiver.

Perhaps the most difficult aerial to erect but, at the same time, the most effective, is the one shown in Fig. 5. This also consists of two 4-ft. lengths situated one above the other. A length of screened cable is brought away at right-angles from the centre where the two aerials meet for a distance of 5 ins., the cable then being led parallel with the lower aerial for a distance of 4 ft. The sheath is connected to the upper aerial and the core to the lower. One inch from the top of the lower aerial a piece of 12 s.w.g. copper wire is attached at right-angles and then bent to run parallel with the lower aerial for 3 ft. 11 ins., at a distance of 7 ins. from it. The wire is again bent at right-angles and connected to the cable sheath.

The cable may be taken off in any direction to the receiver, although it is best to run it as straight as possible.

The systems described, with the exception of the portable one, are all omni-directional. When it is desired to receive from, or transmit to, a particular direction, a reflector consisting of a wire or tube 8 ft. 6 ins. long can be mounted behind the main aerial at a distance of 4 ft. from it. Such a reflector is especially recommended for television reception, as it will increase the signal-to-noise ratio, the dimensions being 11 ft. and 5 ft. respectively.

The writer is indebted to Mr. H. M. Blaber (2BMH) for information concerning the aerials shown in Figs. 2, 3, 4 and 5.

J. N. W.

Trade Notice

Whilst many amateurs employ *Westinghouse* Metal Rectifiers for H.T. supply to transmitters and receivers and for battery charging, it is not perhaps generally realised that there are many more possible applications. These are set out in considerable detail in the Thirteenth Edition of Booklet No. D.P.11, which also gives particulars of the various forms of rectifier now produced. Many of the applications described deserve to be better known amongst those engaged in any branch of the electrical industry. Some of them are of interest to amateurs, one such being the patented "Noregg" system of obtaining a constant D.C. potential despite variations of load and mains voltage.

Other booklets available include "The All-Metal Way to Better Battery Charging"; "Chargers for Electric Vehicles" (D.P.11E) and "Rectifiers for Projector Arcs" (D.P.11G), all of which contain full information on the particular applications indicated by the titles.

Copies of the booklets are available to readers, mentioning this Journal, from *The Westinghouse Brake & Signal Co., Ltd.*, 82, York Way, King's Cross, London, N.1.

The Cathode Ray Tube and its Applications in Television and Oscillography

Part III

By S. West

IN the preceding article in this series a simple C.R. tube set-up was described with which some valuable practical experience could be secured. It is now proposed to describe briefly some of the more general uses of the arrangement in its present form and to follow with circuit details of a linear time base describing the greatly enhanced applications of the unit in its new form. It must be emphasised, however, at this juncture, that the uses of an oscilloscope are legion and, moreover, fresh applications appear almost daily. It is not possible of course to describe all of these applications; therefore the reader is referred to the literature on the subject if a more exhaustive practical application is contemplated. An excellent book, and one which the present writer can recommend, is The Cathode Ray Tube at Work, by John Rider. Unfortunately this book does not deal with present-day methods for securing resonance curves with electronic frequency modulation, but despite this omission is a valuable addition to the bookshelf.

First the fundamentals of the manner in which a pattern is produced must be grasped. Consider the diagram, Fig. 6, which represents a single complete cycle of A.C. which is applied to the horizontal plates of a C.R. tube. At time = 0 secs. the potential is zero, consequently there is no spot deflection. The spot therefore will remain stationary at point *b*. At t=1/200 sec. the potential is maximum in a positive sense and the spot is deflected to point *a* on the C.R. tube's screen. At t=2/200 sec. the potential is once more zero, the spot returning to *b* and so on for t=3/200 sec. and t=4/200 sec. when the spot is deflected to *c* and returns to *b*. If this cycle of events is continued it is apparent that due to the high speed of the changes the spot movement is manifest as a stationary line.

Now consider Fig. 7. The A.C. wave is applied to the deflecting plates as before, but in addition a sawtooth wave is applied to the opposite pair. Now consider what happens. At t=0 secs. there is no deflection in the vertical direction but the deflection in the horizontal sense can be assumed as negative with respect to the zero line of the sawtooth wave; the light spot therefore will assume the position *a*. At t=1/200 sec. the deflection at the vertical plates is maximum, that at the horizontal plates has become more positive however and the spot assumes the position *b*. At t=2/200 sec. the vertical deflection is again zero, whilst the horizontal is still more positive, the spot thus assumes position *c*, and so on for *d* and *e* when the deflection suddenly collapses to the starting-point. Obviously if this collapse is sufficiently rapid in relation to the vertical deflection the spot will travel straight across the screen from *e* to *a*. If this cycle of events is continued, a pattern accurately depicting the original A.C. wave is rendered visible.

This is the fundamental concept of the majority of trace production and, despite its apparent simplicity, it is desirable to grasp thoroughly the cycle of events.

It will, by this time, have occurred to the reader, that if the rate of the horizontal deflection is known accurately, it is a simple matter to assess the rate (frequency) of the wave under investigation. Therefore a C.R. tube has very definite uses as a frequency measuring device.

Similarly as the trace produced at the screen is always a combination of the potentials applied to the deflecting plates, a ready means of computing or comparing the phase relationship between various waveforms is available.

The traces produced in this manner are referred to as Lissajous figures. * Consider two sine waves which are in phase applied to opposite pairs of plates. It will be apparent that the pattern produced will be a straight line. (Fig. 8.) Assume now that there is a phase difference of, say, 30° between the two waves, then it will be seen that the pattern opens into a narrow ellipse (Fig. 9). Similarly for various phase differences the traces depicted in Fig. 10 are produced. The phase relationships for different ellipse eccentricities is readily computed from Fig. 11. If φ is the phase angle, then OD/DE=tanφ from which the angle of lead or lag is readily computed. Alternatively $\tan\varphi^{-1} = 1/\tan\varphi = \cos\varphi$ = power factor. Consideration of the above shows that it is possible to determine resonance and other conditions for various circuits.

There are several ways in which the above patterns can be produced, and it is illuminating to conduct a few simple experiments to ensure that the above is fully grasped. The necessary connections are given by Fig. 12 (*a*), (*b*) and (*c*). The reactance/resistance ratio should be found to equal tanφ. Similarly an element in the circuits of Fig. 12 can be replaced with an amplifier, the phase shift of which for various frequencies it is desired to determine.

Frequency Comparison or Measurement

If two A.C. inputs of different frequency are applied to the deflecting plates, when the frequency of one is accurately known that of the other can be determined with great accuracy, providing their ratio does not exceed about 15/1. Fig. 13 shows the procedure and is self-explanatory. The connections to the tube to secure these figures is straightforward, as shown in Fig 13 (*b*).

Where the ratio of the unknown to the known frequency is high, it is preferable to employ the circuit arrangement of Fig. 14 (*a*). This form of connection will produce the traces shown by Fig. 14 (*b*) and (*c*). The ratio is determined by

* *See "The Low Voltage C.R. Tube," by G. Parr, for a more detailed description.*

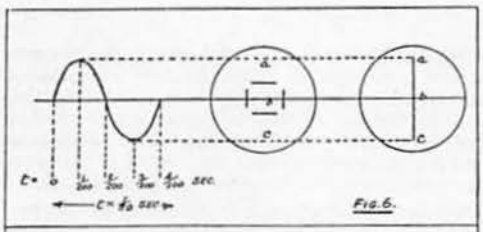


Fig. 6.

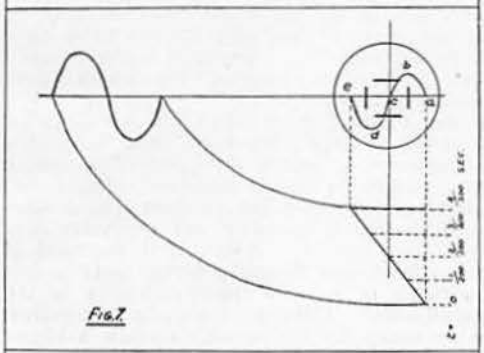


Fig. 7.

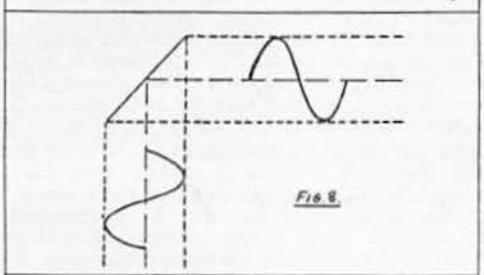


Fig. 8.

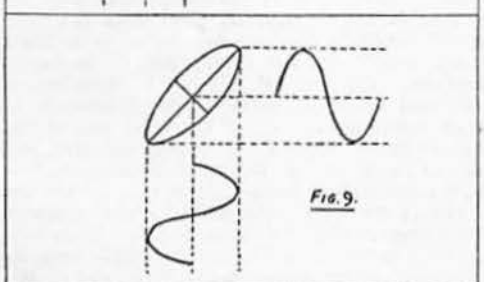


Fig. 9.

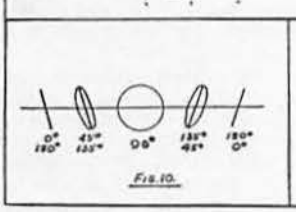


Fig. 10.

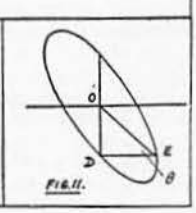


Fig. 11.

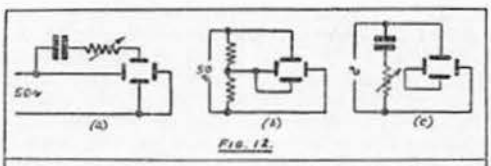


Fig. 12.

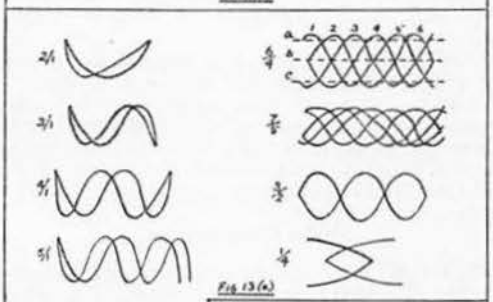


Fig. 13(a).

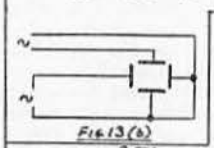


Fig. 13(b).

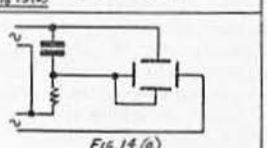
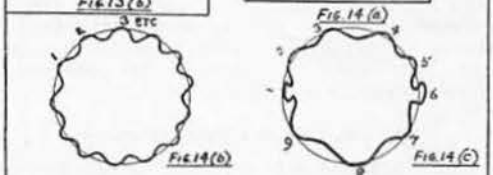


Fig. 14(a).



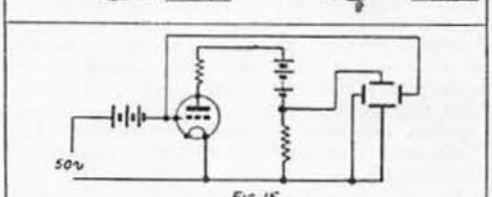


Fig. 15.

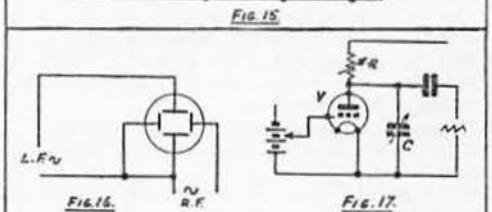


Fig. 16.
Fig. 17.

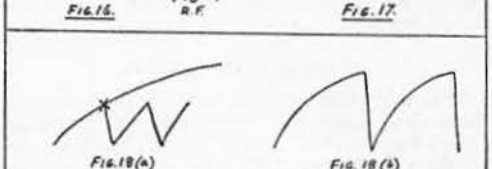


Fig. 18(a).
Fig. 18(b).

Fig. 6. If an A.C. wave is applied to one pair of deflecting plates a stationary line is produced as depicted. Fig. 7 shows analysis of production of simple sine wave trace. Fig. 8. The application of two sine waves in phase, to opposite pairs of plates, produces diagonal trace. Fig. 9. The trace depicted is secured when the two waves have phase difference of approx. 33 degs. Fig. 10. The various patterns obtaining when two A.C. waves having differing phase relationships are applied to the tube. Fig. 11. Method of assessing phase angle for different combinations of L. C. & R. Fig. 12 (a), (b), (c). Connections required to secure Lissajous figures for determination of phase angle, etc. Fig. 13. Typical Lissajous figures. The connections to produce these traces is given by Fig. 13 (b). Fig. 14a. When the ratio of unknown to known frequency is high the above form of connection is preferable. Examples of type of trace produced are given in (b) and (c). Fig. 15. Suitable circuit for rendering visible anode current grid voltage curves of valves. Fig. 16. Simple form of connection for determining modulation percentage of a fixed frequency, fixed amplitude or modulated carrier. Fig. 17. Basic circuit details of conventional gas relay sawtooth oscillator. Fig. 18a. The production of sawtooth oscillation by circuit of Fig. 17 is analysed above. By arranging for the discharge to take place early in the cycle, e.g., at point X linearity is ensured. (b) With incorrect adjustment of negative bias for the gas relay the sawtooth wave will be non-linear as depicted. This will result in crowding of the trace towards one end as is apparent from observing that the rate of potential change is progressively less with time.

counting the teeth in the pattern. A little care is required in order accurately to determine this number, and the only pitfall is the ambiguity created by the slight change in shape, at low ratios, of the teeth at the axis of the pattern. (Fig. 14 (*c*).) Note that due to the reversal of deflection in one half of the pattern, two teeth are deformed, these deformed teeth must be counted once only.

Referring back to Fig 13 (*a*), the simplest manner in which to ascertain the frequency ratios is as follows: Determine the number of horizontal intersections in the pattern, *i.e.*, for the 6/4 pattern there are three intersections, as indicted by the lines *a*, *b* and *c*. Add one and divide this number into the total of peaks that can be counted.

Valve Characteristics

The C.R. tube can be employed for rendering visible the characteristics of valves. A simple means for showing the grid-voltage/anode-current characteristic is indicated by Fig. 15. It is only necessary to provide suitable potentials to the additional electrodes in order to extend this scheme to make it applicable to multi-electrode valves. Both static and dynamic characteristics can be rendered, but as the circuits for the latter tend to become complicated, they will not be described here. The reader is referred to the publications *loc. cit.* for further information.

The C.R. Tube as a Valve Voltmeter

The C.R. tube can be used as a valve voltmeter. As such it is not sensitive, but has the definite advantage that it cannot be damaged by overload, and thus will permit quite high potentials to be measured and compared with safety. The sensitivity can be increased by employing an input amplifier, but care is necessary with the design of this piece of apparatus if the input impedance is to be kept high.

The procedure for the above is obvious; the potential to be measured being applied to the deflecting plates and the degree of deflection noted. It is convenient to calibrate the tube from a source of known voltage.

Generally speaking, where a suitable meter is available for measuring the potentials involved, it should be employed in preference to the C.R. tube. There is no object in using the tube for the mere sake of doing so.

Modulation Measurement

It is a very simple matter to check the percentage modulation where the frequency and amplitude is fixed and has the correct phase. Such is rarely the case, however, with the exception of test signal generators, accordingly only the circuit connections necessary are included, Fig. 16, a description of the principle involved being waived. The problem of determining the percentage of modulation when employing telephony will be dealt with in a later series of articles.

The Linear Time Base

It was stated earlier in the present series that a linear horizontal deflection of the light spot is more suitable in the majority of cases of circuit investigation.

From the foregoing description of the manner in which a pattern is built up, it is seen that a linear trace is secured when the horizontal deflecting potential has a sawtooth wave form. Before giving a recommended circuit and component values it is proposed to deal with some of the more wellknown arrangements of sawtooth oscillators.

Generally speaking, such oscillators fall into two classes, namely, gas triode and hard valve types. It is convenient to deal with the gas triode type first, for the principle of operation is more readily understood; moreover for most work such oscillators are entirely suitable.

In the circuit diagram Fig. 17, V is a gas relay type of valve. Briefly it can be stated that such a valve possesses the important property of presenting infinite resistance across its anode and cathode until the anode potential reaches a certain critical value when ionisation takes place and the valve is a virtual short circuit. This critical potential is largely a function of the grid potential and is in fact proportional to it by a constant known as the "control ratio." If the grid is made more negative, it is necessary for the anode to reach a higher potential to effect ionisation. It is important to note that once the valve ionises, the grid potential has no effect whatever and the discharge is to all intents and purposes complete. That is to say, the valve continues to pass current until the anode potential falls to a very low value.

From the foregoing the operating cycle of the circuit shown in Fig. 17 is readily understood. The condenser C. charges through the resistance R., rendering the anode of the valve V. progressively more positive. At a certain critical potential at the anode the valve V. becomes conductive, its resistance is then extremely low, thus the condenser C, is rapidly discharged. Such a cycle when repeated results in the production of sawtooth oscillations. Fig. 18 (*a*) shows the well-known exponential charging curve of the condenser C. through the resistance R. If the early part of the charge cycle is selected, arranging for the discharge to be effected at the point X the oscillation will be substantially linear. It is easy to arrange that this is the case providing a careful choice is made of negative bias for the gas relay. If the bias is too high in respect to the overall H.T. the oscillation has the form shown in Fig. 8 (*b*), and a little consideration will show that this will result in a crowding of the trace towards one end.

Apart from the above, which in effect does change the operating frequency (because obviously if the discharge point occurs earlier on the charge curve the oscillation frequency is higher) the speed of oscillation is readily controllable. By assigning different values to the charge resistance R. and to the condenser C., it will be seen that the charging rate is altered. The greater the value of CR, the more slowly does the charge cycle occur, so that the frequency of oscillation can be varied by changing the values of any of these items. Generally speaking, however, it is preferable to effect the changes by altering in value the charge resistance and condenser, leaving the bias at an optimum value. This will ensure linearity of sweep at all frequencies within the range of the style of oscillator.

Convenience in Aerial Switching

By J. N. Walker (G5JU)

WHEN an amateur station consists of only one receiver, one transmitter and one aerial, the switching arrangements can be quickly and easily disposed of, but as the station expands it becomes increasingly difficult to make a quick change-over from one piece of apparatus to another, or to a different aerial system. How may stations bristle with crocodile clips, and how few fall in the opposite category?

"Be there a station in the land
With switches neat and true
Which can change from band to band
Without the air turning blue?"

Most readers will have experienced occasions when a quick change-over has been very desirable, not to one but to several aerials, and not only to the transmitter but also to the receiver. If the check can be made instantaneously, a much more accurate comparison will be possible.

Admittedly, it has, in the past, been a difficult matter conveniently to arrange all the switching necessary without resort to innumerable double-pole double-throw switches, but with the advent of the *Wearite* ceramic switch an operator can now make a larger number of changes, all with the movement of one, or at most two, switch knobs. It would not

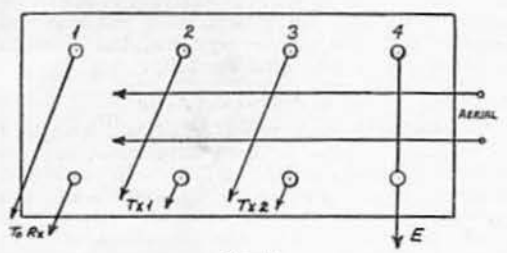


Fig. 1.
Simple arrangement for connecting one aerial to any piece of apparatus.

be wise, especially when working on the higher frequencies, or with low inputs, if such a convenience were obtained at the expense of radio frequency losses, but, as the following brief specification of the switch will show, there is no fear of this occurring.

Description of Switch

The *Wearite* switch, which consists of a stator and a rotor made of Frequentite, is provided with special recesses, into which the tags and contacts tips are firmly riveted. Up to twelve contacts may be fitted, as required, forming a double-pole, six-position switch. Holes are provided in the stator moulding, so that additional wafers can be bolted on, the operating spindle being common to all. Special attention has been paid to the spring tensioning, so that a smooth and definite action is obtained, without trace of backlash, when any normal number of wafers is in use. The result is a very rigid, reliable component.

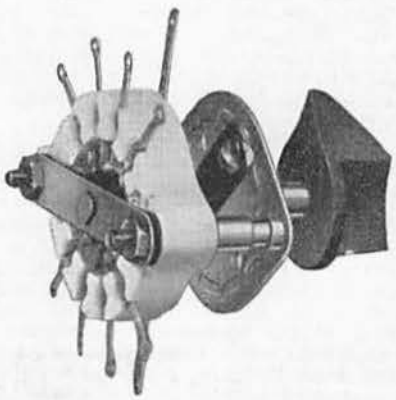
Electrically the employment of Frequentite for the body of the switch makes it suitable for use at high radio frequencies. The capacities existing between the various conductors of the switch are extremely low, being of the order of 1 $\mu\mu$F. between adjacent tags and contacts, and 2 $\mu\mu$F. between these and the frame. The contact resistance is not only low (2 milliohms), but is also consistent, and is, without question, much less than that of a crocodile clip. Breakdown will not occur with 2,000 volts R.M.S. applied between adjacent conductors, and between conductors and frame, whilst modified wafers are available which will stand up to 6,000 volts.

It is evident, therefore, that here is a switch suitable for application to transmitting, television and special apparatus, particularly where high voltages at high frequencies are encountered.

Definite Applications

The number of wafers, and the number of contacts incorporated in each, will naturally depend upon the user's requirements. In regard to the latter, as the price for six positions is the same as for four, it is desirable to specify accordingly, as the full number of positions may be required at a later date. The simplest application is that illustrated in Fig. 1, where the moving contacts (indicated by the lines) are brought out to two long tags. These are connected to the aerial system, which may be of the aerial and earth (or counterpoise) type, or feeders. The first pair of pole contacts will be connected to the receiver, the second to transmitter No. 1, the third to transmitter No. 2, or to the receiver, and so on. One pair may, if desired, be connected to earth, so that the whole aerial system can be independently earthed when not in use.

Fig. 2 gives details of a more versatile switching system, for which two single wafer switches are required. The moving contacts of one switch are connected to the moving contacts of the other. To the fixed contacts of the first switch are connected the various pieces of apparatus on test, and to the fixed contacts of the second switch are connected the different aerial systems. It will be



A Single Section Wearite Ceramic Switch

appreciated that these can be of different types for the same band—for example, two dipoles (one horizontal and one vertical), a long wire aerial, and, possibly, a beam. Alternately, separate aerials, each designed to radiate most effectively on one particular band, may be connected to the contacts. The operator now has all controls at his finger tips and is in a position to make the most of the aerials and apparatus at his disposal, probably without even moving from his chair. If a DX station is heard on one aerial it can be instantaneously brought up to maximum strength by rotating the

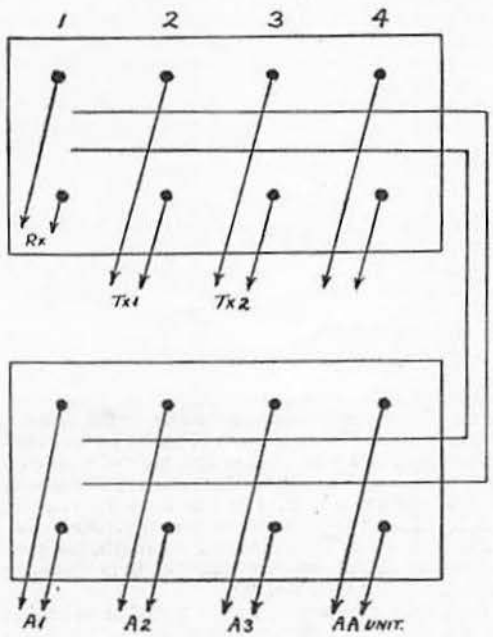


Fig. 2.
Connections as above allow of several aerials being quickly connected to any piece of apparatus, including an Artificial Aerial Unit.

aerial switch and selecting the best, whilst, for transmitting, the aerial known to radiate best in his particular direction can be quickly chosen. Should this information not be known, experiments can be conducted with stations contacted to determine it, without the necessity of requesting the distant operator to wait whilst the changes are made.

A More Complicated Arrangement

Assume that one is chiefly interested in the 28, 14 and 1.7 Mc. bands, and has one transmitter to cover the first two, and a second for the lowest frequency—a desirable and common arrangement, in view of the variation in design necessary. Assume also that three aerial systems are available, those for 28 and 14 Mc. being energised through feeders, and that for 1.7 Mc. being of the aerial and counterpoise type. It will be desirable to connect the receiver to any of the aerials, and, since occasionally the two transmitters may be wanted for use on other frequencies (7 and 3.5 Mc.) it will be useful to be able to connect any aerial to any transmitter. Further, the operator may not wish to touch the aerial switch during a contact, as, for instance, when break-in or duplex systems are in use; therefore, one of the aerials must be connected through to the receiver, no matter which is in use on the transmitter. All this is "a tall order," but it can be accomplished without difficulty with the aid of a three-wafer, six-position switch, the connections being as shown in Fig. 3. Care must be exercised in making the cross connections, but, as the contact tags are very accessible, no difficulty should be experienced. The slight additions of capacity to the feeders, etc., are entirely negligible.

Controlling Power Supplies

Between the first example given and the last, it is possible to devise a large number of combinations to suit different cases, which the user can work out for himself. It is interesting, however, to note that, by the addition of an extra wafer, the switching of the power supplies to the receiver and transmitters can be simultaneously controlled with the aerial change-over. It will not be necessary, as a rule, to use the additional wafer as a double-pole switch, therefore each half can be used as a single-pole, thereby increasing the number of connections possible. Assuming that valve filaments are always on, whilst the station is in operation, it becomes possible to arrange for the receiver H.T. voltage to be transferred to the monitor, and the appropriate H.T. transformers in the transmitter power supply to be switched on, when the switch is moved from the receiving to the transmitting position. In general this will only be possible with the simpler systems, but there is ample scope for individual ingenuity.

The Double-Doublet Aerial

The double-doublet type of aerial, which appears to be fairly popular at the present time, consists of two half-wave aerials in line, with feeders of identical type connected to the centres of each half-wave. By changing over the connections of the feeders the aerials can be excited either in phase or out of phase, thereby producing a marked change in the lobes of radiation, or of maximum reception.

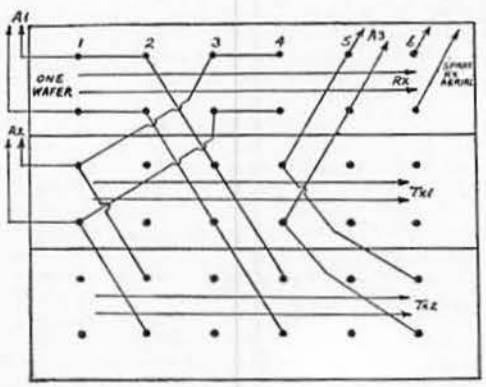


Fig. 3.
An arrangement which gives one knob control of many different combinations.

The change-over can be quickly accomplished by means of two *Wearite* switches, without the introduction of losses, the connections being as shown in Fig. 4. As two or more contacts are available extra aerial systems can, if desired, be connected in addition.

Mounting Suggestions

The switch incorporates a mechanism which, in addition to giving smooth, trouble-free action, makes it practically impossible for it to be set in

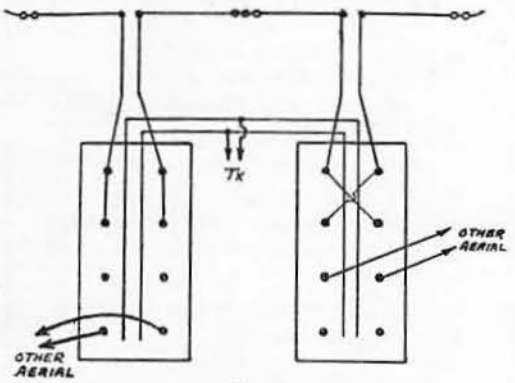


Fig. 4.
Utilising the switch with a double doublet type of aerial.

any but the correct locating position. Advantage should be taken of this fact, and after the switch has been firmly mounted on a panel of ebonite or plywood (or metal, for that matter) a strip of paper showing the numbers of the switch positions should be fitted with clear cellulose adhesive above the knob. In a separate panel above this can be shown the appropriate connections which obtain, according to the position of the knob. This is made clear in Fig. 5, which illustrates possible lettering for panels when the switch is used (*a*) as in Fig. 2 and (*b*) as in Fig. 3.

1	2	3	4
RX	TX1	TX2	E

1	2	3	4
14 Mc. Dipole	28 Mc. Dipole	56 Mc. Dipole	Long Wire

Fig. 5a.
Suggested indicator panels for use in connection with the scheme shown in Fig. 2

	1	2	3	4	5	6
RX	A1	A1	A2	A2	A3	—
TX1	A2	—	A1	A3	—	—
TX2	—	A2	—	A1	—	A3

Fig. 5b.
Suggested indicator panels for use in connection with the scheme shown in Fig. 3:—
A1—14 Mc. dipole, etc.
A2—28 Mc. Dipole, etc.
A3—Marconi, Zepp, etc.

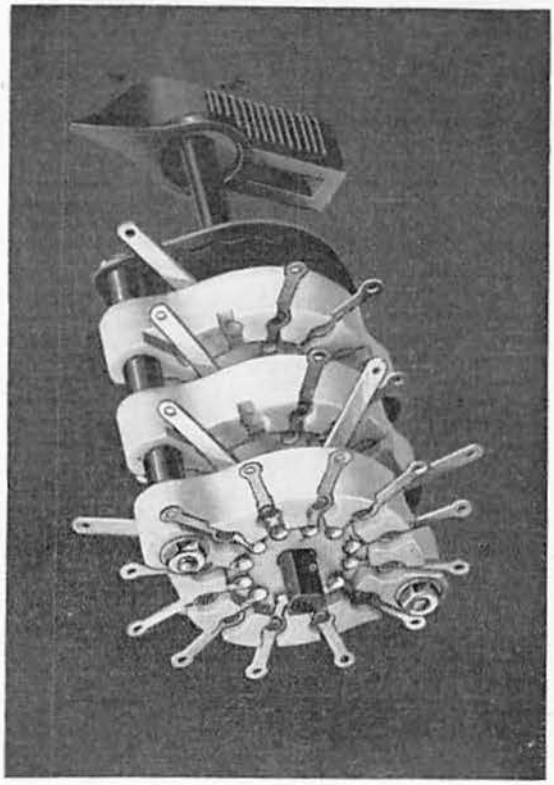
Types of Feeders

For the utmost convenience, and to avoid retuning the transmitter, or readjusting the condensers in Zepp feeders, it is desirable to employ, as far as possible, the same type of feeder throughout. It is immaterial whether this is of the low impedance (50 to 120 ohms), medium impedance (125 to 250 ohms) or high impedance (400 to 600 or more ohms) type. Zepp or Windom feeders may, of course, be used, especially where separate aerials for each band have been erected.

Conclusions

Another benefit arising from the use of this switch is that, where the aerial or feeder leads terminate in crocodile clips, these can be left permanently in position at the correct points on the coil, or, if thought desirable, soldered in place. It will no longer be necessary to ponder over which was the correct turn to connect a clip, when changing from one transmitter to another, or from one frequency to another.

There are many more ways in which the switch may be employed, such as band switching in transmitters, and the writer will be interested to hear, from time to time, of readers' ideas in this respect.



A 3-section Wearite Ceramic Switch

Hints to T. & R. Bulletin Contributors

IT sometimes happens that a member prepares a technical contribution for publication without previously intimating his intention to Headquarters, as a result such an article frequently falls short of requirements in minor respects. This would have been avoided if the author had studied the few hints which have been prepared.

For the benefit of members who may be contemplating the preparation of articles, we have decided to publish the hints, together with a few suggestions regarding photographs.

Preparation of Articles

1.—If possible type your manuscript and use double spacing.

2.—Head your contribution :—

.....Subject.....

By..... (Call sign).

3.—Insert sub-titles where necessary, and if using a typewriter underline : thus Circuit Description. (This informs the printers that the words are to be set in italics). Sub-titles should be placed at the side of the text.

4.—Do not use slang or radioese.

5.—When describing frequency use the terms Mc. (large M small c) and kc. (small k, small c). Use the abbreviations μμF and μF instead of mmf. and mfd. Use the word "aerial" and not "antenna."

6.—When referring to a sketch or diagram, use the term "Fig." in preference to "Diagram" or "Dia."

7.—Draw sketches on separate sheets of paper and write your name at the back of each sheet.

8.—Prepare captions for your sketches and/or photographs on a separate sheet.

9.—Avoid the use of the first person singular. Refer to yourself as "the writer" or "the author."

Photographs

1.—Remember that a photograph is intended to convey information to readers of the article. For this reason a photograph in addition to being sharply defined, must also show clearly the salient features of the piece of apparatus under review.

2.—When photographing a piece of radio apparatus endeavour to take views of the top and underside, or top and interior. Study the article entitled "Photographing Amateur Radio Apparatus" in the November, 1938, issue of this Journal.

3.—It is desirable to submit ¼ plate or 3¼" × 2¼" size photographs in preference to miniatures, unless a very good camera is used for the latter.

4.—Submit prints and not negatives.

5.—Write your name on the back of each print.

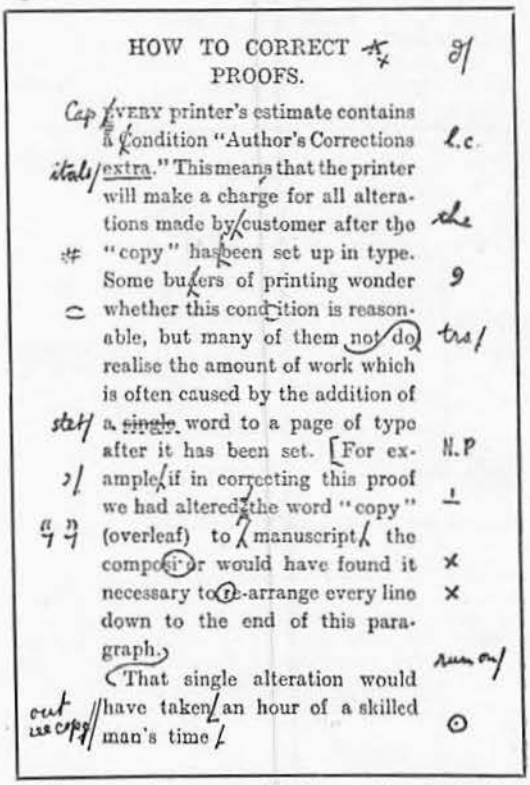
6.—When preparing the caption associated with a photograph cover as much information as possible. Emphasise special features.

7.—Finally, if you are in doubt about any point in connection with photographs of apparatus to be described, write to Headquarters.

Proofs

Except in the case of short articles, the author is always given an opportunity of checking the proofs.

To assist would-be contributors we give below examples of the more commonly used printer's signs.



Whenever time permits the author is invited to check his circuit diagrams or sketches.

Publication

After an article has been accepted and proofs passed, a delay of some months may occur before we are in a position to use it.

Types of Contributions Required

The Secretary-Editor will, at all times, be pleased to consider for publication articles dealing with the theory or practice of Radio Communication. Constructional articles are also welcomed. In the latter case we prefer the contributor where possible to quote actual results obtained. For example, a description of a 25-watt transmitter is enhanced if brief details are given of its performance over a period, together with a description of the aerial systems used.

Strays

Mr. F. Johnstone (BERS276) informs us that he is an operator of the Seletar Amateur Radio Club transmitter VS1AP. His QRA is 41 M.Q., R.A.F. Seletar, Singapore, S.S.

* * *

Mr. W. E. Smith (VQ4WES), will be operating in Uganda on 14 Mc. under the call sign VQ5WES from June to November.

THE HELPING HAND

By J. N. WALKER (G5JU)

Part XXI.—FURTHER METHODS OF ELIMINATING TRANSMITTER INTERFERENCE.

IMPORTANT factors in the elimination of key clicks from a telegraphic transmitter are the choice of the correct type of filter choke and the point in the circuit at which it is placed. The choke may form part of the same circuit as that which includes the resistance/capacitance filter discussed last month, but this will not necessarily be the case.

Before proceeding to give details of suitable types, it will be desirable to explain the function of the choke.

Choke Filter Action

In Fig. 1 is shown a circuit which is intended to represent a valve in an early stage of a transmitter—it may be the oscillator or a following doubler or buffer amplifier. C1 is the smoothing condenser incorporated in the power supply, and the higher its capacity the better.

Assuming, for the moment, that the choke is not present, it will be evident that, on pressing the key, a very sudden rush of current will flow through the valve. Particularly will this be the case if the power supply possesses poor regulation, since, with the key up, the condenser C1 will acquire a potential higher than that appearing across it when a load is present. Whether this surge of current will or will not cause key-clicks in neighbouring receivers will depend on the design of the following circuits but, in the majority of cases, severe interference is almost bound to occur. The resistance/capacitance filter across the key will do nothing to mitigate the effect and it becomes necessary to insert a low-frequency choke in series with the high tension supply, when the overall operating conditions are greatly modified.

When now the key is pressed, the current has first to traverse the choke, which action brings into force the self-inductive properties of the latter. An E.M.F. is produced which acts in the opposite direction to that from the power supply and, in consequence of this opposition, the current is only allowed to build up gradually—no sudden surge can occur. This is all to the good and tends to prevent the production of key-clicks at " make," but there is another side to the picture.

On raising the key, the self-inductance of the choke has the opposite effect, i.e., it produces an E.M.F. in phase with the applied voltage and tries to prevent the current dying away. This action is very undesirable. For one thing, it is the duty of the resistance/capacitance filter, and not the choke, to look after the time lag at " break " whilst, and more important, the induced voltage appearing across the choke is often nearly as great as the normal applied voltage. Since both work in the same direction, the total voltage is very high and current is forced to continue to flow *via* the spark formed at the key contacts. When no resistance filter is present, this spark takes the form of a long, thin, pale blue discharge and, in bad cases, an arc will form which will do much damage to the key contacts. Under such conditions, it is hardly to be expected that the resistance/capacitance filter will be able to remove the spark completely—what happens is that the spark is reduced to a fat, yellow one of much shorter duration.

Whilst there are methods of overcoming the trouble described when almost any type of choke is employed, it can be avoided at the outset by the choice of the correct type.

Choice of Choke

The self-inductance of any given choke depends mainly on two factors—its normal inductance and the rate of change of the current traversing it. Further, the actual inductance depends on the ampere-turns, *i.e.*, on the amount of current flowing and on the number of turns in the winding, as well as on the material of which the core is made. The latter should always be of silicon-iron for the purpose we have in mind.

In transmitting work, we are usually concerned with a comparatively small current (a fraction of an ampere) which normally traverses a choke consisting of several thousand turns of wire.

When such a choke is inserted in a circuit being rapidly keyed, the rate of current change is just about as high as it can be—from zero to maximum and back again from maximum to zero. The self-

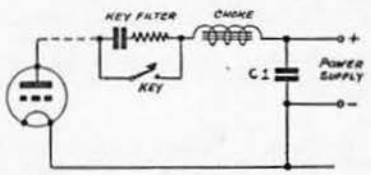


Fig. 1.
The effect of a choke, inserted as shown above, is explained in the text.

inductance of the choke is therefore constantly being brought into play and that at its maximum value, resulting in the creation of high voltages at " break."

The first requirement in a filter choke is that it should be wound with a gauge of wire sufficiently robust to carry the maximum current likely to flow, without overheating or risk of breakdown.

The second requirement is that the insulation, both between the layers of wire and between the winding and the core, should be high, since not only has the normal working voltage to be withstood but also the peaks produced by the action of keying.

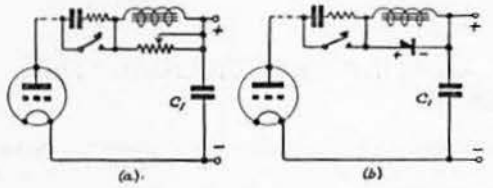


Fig. 2.
Methods of modifying the action of a filter choke by means of (a) a resistance, (b) a metal rectifier.

This factor is modified when precautions to reduce the peak voltages are taken.

In cases where the inductance of a choke is rated at a given current, a value of 10 to 15 henrys should be chosen. The inductance with no current will always be higher and it is desirable that it should not exceed 20 henrys or there is a possibility of too great a lag being introduced, so preventing the signal building up properly.

There are several ways of overcoming the trouble brought about through the self-inductance of the choke generating a peak voltage. One is to employ what is known as a " swinging " choke, the design of which is such that, at high current densities, the core becomes magnetically saturated. This condition results in the inductance falling to a very low value, so that, at the moment of " break," the self-inductance is small and the induced potential is much lower than would otherwise be the case. When using this method, care must be exercised to ensure that the core does actually saturate at the maximum value of current flowing and it is necessary to choose a choke the maximum current rating of which coincides approximately with that in the associated circuit.

As an example, if a choke rated at 100 mA is chosen, it is probable that saturation will not occur until the current flowing reaches a value of at least 80 mA. If the current flowing through the circuit is 50 mA, it will be obvious that the " swinging " effect will not be brought into full play and the inductance of the choke will still be fairly high, so defeating the object of its inclusion.

It is always desirable to employ a swinging choke but, in cases where it is not fully effective or where a constant inductance type of choke has perforce to be used, certain refinements can be introduced.

The first of these is to place across the choke a resistance, preferably variable, as illustrated in Fig. 2 (*a*). Such a resistance, which may be of a value between 50,000 and 100,000 ohms, acts in two ways. Since its resistance is much higher than that of the choke itself, it carries but a small fraction of the current traversing the circuit but its presence reduces the inductance of the choke and enables the latter to be adjusted to a fine degree. Further, it reduces the self-inductance, thereby reducing the surge potential developed at " break," and, finally, it serves to absorb the voltage so developed, at least in part. Since, as previously pointed out, this voltage may be quite high, even with the resistance in position, the surge of current flowing through the resistance may be considerable, and for this reason, a heavy duty component should be used. A suitable type will be found in the *Varley* range.

Finally, we come to a method whereby the undesirable surge may be completely eliminated, without otherwise affecting the action of the choke. As shown in Fig. 2 (*b*) a *Westinghouse* metal rectifier is connected across the choke in such a manner that it is practically non-conducting to the current flowing at " make," but at " break," it acts as a short-circuit and completely absorbs the surge voltage. The resistance/capacitance filter across the key is then solely left to look after matters at " break," which is as it should be.

The manufacturers recommend the type H.T.16 for this class of service, where the current does not exceed 60 mA and the voltage 300—which are the conditions we have been discussing. The rectifier is generously rated and is unlikely to be overloaded however rapidly keying takes place. It is important that no resistance be placed in series with the rectifier or the action will be detrimentally affected.

As regards the resistance of the choke itself, little need be said beyond the recommendation that it be as low as possible, to avoid unnecessary voltage drop across the choke.

The Position of the Choke

The position of the choke will normally be as shown in Fig. 1. Since, so placed it will only allow the energy in the circuit to build up gradually the drive to the next valve and to any further ones following will, in turn, be only gradually applied. The currents in the anode circuits must perforce increase comparatively slowly and no sudden surge of R.F. energy will be delivered to the aerial.

It will be appreciated that by placing the choke in an early stage of the transmitter, a smaller size can be employed, since one may expect both the current and voltage to increase in the later stages.

Where the regulation of the power supply feeding the final stage is poor, it may be advisable to insert an additional choke in series with the high tension lead to the anode of this valve, in order to smooth out any surge which might possibly occur because of the abnormally high voltage appearing under " no load " conditions.

It should be pointed out that the position shown is still correct when screen-grid keying of a pentode or tetrode valve is the system employed. Preferably the feed to the screen should be taken off on the valve side of the choke, assuming a common power supply is used. It would be difficult to obtain a choke suitable for insertion in the lead to the screen, and, in any case, the action would not be nearly so effective.

* * * *

The foregoing remarks cover the field of telegraphic interference and readers acting on the

advice given should experience no difficulty in operating a transmitter on any frequency down to the lowest granted to amateurs, and employing any reasonable power, at any time, without the fact being made evident to near-by receivers and without fear of causing inconvenience (to say the least) to fellow amateurs using the same band.

Interference When Using Telephony

Many of the points previously enumerated will apply when telephony is the system of transmission employed. In particular, loose coupling of the aerial to the transmitter is essential, whilst great care is necessary in making transmitter adjustments. In the first place, such adjustments should always be carried out with the aid of an artificial aerial unit, the load being transferred to the radiating aerial only when the transmitter as a whole is functioning in a proper manner.

In passing, it is well to point out that by loose coupling is intended indirect coupling. The actual degree of coupling should be adjusted so that the correct load is presented to the valve.

The factor mainly responsible for telephony interference is undoubtedly over-modulation and it is only too easy for this to occur without the operator realising the fact.

The average modulation factor employed in broadcast transmitters is quite low—usually of the order of .3 to .4 (30 per cent. to 40 per cent.), the reason being that allowance must be made for the accommodation on the carrier of the audio-frequency peaks, without danger of the modulation exceeding 100 per cent. in depth, even for the briefest periods. Admittedly, this condition has reference to the wide range of volume met with when transmitting music and the average depth of modulation can be increased (as it usually is) when speech only is being transmitted. At the same time, if a transmitter and its associated modulator are adjusted to give a mean modulation depth of 80 per cent. with a given input voltage, it is impossible, with normal speech, to maintain this figure exactly. Certain syllables and tones are bound to be of greater intensity than others and the resulting peaks will result in the depth of modulation exceeding 100 per cent.

There is only one way of maintaining an exact degree of modulation, whether this be 20 per cent. or 80 per cent., and that is to feed into the modulator a voltage of constant amplitude, such as is obtainable from a tone-oscillator. Under any other conditions, the depth of modulation is constantly varying and it is necessary to ensure that the adjustments are such as will prevent it exceeding 100 per cent.

There is a system of telephony transmission, unhappily employed, consciously or unconsciously, by many amateurs at the present day, whereby (assuming anode modulation) the grid of the modulated valve is supplied with far more drive than it actually requires so that, in effect, the carrier expands to take all the audio power supplied from the modulator, irrespective of the mean level of the carrier. It will be realised that the output waveform, under such conditions, is of a very peaky character and the rate of change of aerial current is very great. It is under these conditions that severe interference can be caused to near-by receivers and, since the side-bands produced are much wider than would otherwise be the case, interference is also created over a wide area to others using the same frequency band.

In brief, then, it is first of all necessary to provide a carrier which is of sufficient amplitude to take the available modulation, or, alternatively, to adjust the amount of audio-frequency power being delivered by the modulator to a degree such that over-modulation is avoided.

Matters are at their worst when the radio-frequency amplifier is provided with insufficient grid drive. The carrier is then unable to attain its proper amplitude at modulation peaks and it breaks up, with the result that "squittering" noises, of a nature unpleasant alike to amateurs and to broadcast listeners, are radiated. Under such conditions, interference will be severe, no matter what type of receiver is in use. There is no excuse for its occurrence as there will be many indications that something is radically wrong—the meter reading anode current will show a varying instead of a steady reading, whilst modulation will be in a downward direction.

Modulation Systems

It is not appropriate here to discuss the many possible modulation systems and it is only proposed to touch upon one or two points relative to proper adjustment.

Suppressor grid modulation is deservedly very popular at the present time. The potential applied to the suppressor grid has a considerable effect on the radio-frequency output and, in the first place, it is essential to apply a negative bias of the value specified by the makers as being correct for the particular anode and screen voltages in use. Otherwise, modulation will not be linear and there will again be a tendency for the carrier to break up. In general, only a small audio-frequency power is required to effect full modulation and no benefit accrues from increasing the A.F. input beyond the specified value—rather the reverse, since the valve will be unable to handle properly the increased voltage swing and trouble will ensue.

One is not usually concerned with the amount of grid drive in this particular instance since the valve should previously have been adjusted to give full output under Class C telegraphic conditions, with the suppressor biased positively.

Control Grid Modulation

The remarks made above apply, in the main, to control grid modulation. As a rule, it is difficult

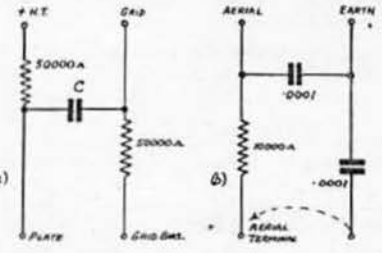


Fig. 3.
Showing how an old inter-valve resistance coupling unit may be altered to act as a low-pass filter, to prevent interference to a broadcast receiver.

to obtain full modulation with this system, because the applied bias has to be increased well beyond the value used for telegraphy and there is a danger of non-linearity being introduced. Again, it is pointless to try and obtain better results by increasing the amount of audio power and the latter should, in all cases, be kept well within reasonable limits.

With both suppressor and control grid modulation, the audio-frequency voltage should be applied across a resistance placed in parallel with the transformer secondary winding, to prevent the development of excessive peaks.

Spurious Oscillations

Another point to watch is that spurious oscillations, of a frequency which may be either higher or lower than those actually being employed in the transmitter, are not being generated in any part of the equipment. Such frequencies, if present, will also be modulated and it may well be that their unwitted radiation may be causing more trouble than the main radiated wave.

When parasitic oscillations are present in the circuits associated with the final valve, the operating conditions of the latter will be altered—excessive grid current may flow, the internal dissipation will increase and the efficiency will drop. These factors will affect the degree of modulation and it is essential that they be eliminated.

Parasitic oscillation in the modulator will also cause trouble. Frequencies beyond the normal audio limits may be present and, since they will produce wide sidebands on the carrier, interference may be caused to local receivers without the reason being obvious.

It is admittedly a difficult matter to detect all the various types of parasitic oscillation which may be present, whilst to go thoroughly into the subject here would occupy more space than is available. It is thought better to defer explanations of methods of detection and cure to a later article, when the subject can be fully discussed from every angle. For the present, the reader is advised, when parasitic oscillation is suspected, to place stopper resistances in valves associated with the audio equipment (other than Class B), values of 5,000 ohms in the grid circuits and 100 ohms in the anode circuits usually effecting a cure. In Class B amplifiers, one cannot insert resistances of high value or the correct functioning will be disturbed. In such cases, the remedy is to place a combination of series resistance and capacity in parallel with the output circuit of the offending valves. Alternatively, radio-frequency chokes, of low resistance, may be substituted.

Oscillation at ultra-high frequencies in the grid or anode circuits of R.F. valves is best eliminated by the insertion of a small choke connected right up against the grid or anode. It is not possible to give concise information regarding a suitable choke, since the frequencies both of normal operation and that of the parasitic will affect its size, but, in general, it can take the form of a few turns of enamelled wire wound on a pencil. Experiment is advisable to ascertain the smallest number of turns which suffice to effect a cure.

Low frequency parasitic oscillation is nearly always due to the incorrect choice or placement of R.F. chokes. Cutting out one not actually essential or the substitution of a different type will cure the trouble in the majority of cases.

The presence of parasitics will also cause trouble with a telegraphic transmitter. It may be impossible to obtain a pure D.C. note, more than one wave will be radiated and clicks will be audible to other operators at odd spots in the band.

Blanketing

Trouble is sometimes experienced through neighbouring receivers (especially old models), being rendered inoperative when energy is radiated from the transmitting aerial. This effect, known as "blanketing," occurs when the amount of R.F. energy reaching one of the receiver valves—usually the detector—is so high as to "block" the valve and render it insensitive. Blanketing is liable to occur with both telegraphy and telephony and is naturally very annoying.

Interference is also probable when a non-variable-mu type of valve is employed in the first R.F. stage of the receiver. In such a case, the R.F. voltage (at the transmitter frequency) reaching the grid of the valve may not be sufficient to cause blanketing but will give rise to cross-modulation and the local telephony will be heard super-imposed upon the broadcast programme.

One remedy for both types of interference is to place a wave-trap close to the aerial terminal of the receiver, tuned to the transmitter frequency, but this will only be effective on one particular band. A low-pass filter of a type suitable for use over a wide range of frequencies is shown in Fig. 3. In days gone by, many manufacturers marketed an intervalve coupling unit, generally built inside a bakelite base. One of these, suitably altered, can be made into a very neat filter device. The connections will be found invariably to follow those set out in Fig. 3 (*a*) and it is a simple matter to effect the substitutions indicated in Fig. 3 (*b*). The values of condenser and resistance shown will give immunity from blanketing and associated troubles in all but the most severe cases. When the cure is not complete, the value of the resistance should be increased to 15,000 or 20,000 ohms.

With most sets, the inclusion of the filter, which should be placed very close to the receiver aerial terminal, will not appreciably affect the performance. To mitigate any falling-off that may possibly occur with old type sets, the value of the resistance should be kept as low as possible, consistent with effective action, or, alternatively, a short wave type of choke may be substituted.

Where the trouble is but slight, a cure can often be effected by the simple expedient of inserting a plain resistance. Providing the owner is agreeable, other methods are to make the receiver more selective by reducing aerial or interstage couplings, etc., and to fit a lower value of grid leak to the detector valve in order to prevent it blocking easily.

Intermediate Frequency Interference

A somewhat rare form of interference, but one which may be experienced at considerable distances, occurs when transmission is taking place on a frequency in harmonic relation with the inter-

(*Continued on page* 764)

Experimental Section

MANAGER, A. M. H. FERGUS (G2ZC).

THE Editorial published in the May issue which referred to the Stockholm C.C.I.R. meeting will, we hope, have been read by all members of the section As a heading " Stockholm 1940 " may not appear to affect us, but for those who read its message seriously, it must surely arouse more than a passing interest.

Certain facts have been placed before us, requirements have been clearly defined, and what amounts to a friendly challenge is laid at our feet.

Naturally our findings will be placed at the service of the Society as a whole, but will they add to the data being sought or shall we have to admit that as a Section we have nothing new to contribute ? That question can only be answered if we determine to work together as a team on the various problems. Group members should study the headings of the problems and then, in conjunction with their G.C.'s and the G.M.'s, set about organising definite lines of investigation.

As mentioned last month in these notes, a movement is on foot to try and obtain co-operation between all the groups studying 56 Mc. problems, which is one way of obtaining a start, the argument being that aerial, transmitter, receiver and propagation studies all enter into the problem of obtaining the best results on any specified frequency. It should be obvious that this arrangement must have beneficial results, but could we not extend it to cover all other amateur bands ?

Those willing to co-operate are asked to communicate with their G.C. who in turn will report to the G.M., after which, if the response justifies it, plans can be made to arrange an inter-group exchange of information.

28 Mc. Tests

G4JZ (ex-2FHA) has sent particulars of summer 28 Mc. tests which he is organising on behalf of the Propagation Group. The tests are open to all amateurs, and a report will appear later in this Journal. British stations will be operating until September 17 on the following days and times :— *Mondays :* 12.30, 13.30, 15.00, 18.00 ; *Tuesdays :* 12.30, 13.30, 15.00, 18.00, 20.00 ; *Wednesdays :* 13.30, 18.30 ; *Thursdays :* 12.30, 13.30, 15.00, 18.00, 22.00 ; *Fridays :* 12.30, 13.30, 15.00, 18.00, 20.00 ; *Saturdays :* 14.00, 16.00, 18.00, 20.00 ; *Sundays :* 10.00, 12.00, 13.30, 15.00, 18.00, 22.00.

Reports should be sent to L. F. Coursey, Christ Church Vicarage, Cheltenham, Glos.

Transmitters

On pages 696-697 in the May issue appeared an interesting letter from G6YR on the subject of *Optimum Plate Tank Values* which was answered by G5QF as well as by an Editorial note. To many, this may read " That's that," but to us it suggests that amateurs, principally interested in Transmitters, should let us have authentic data on their own results. Here we have a problem which should interest everyone.

Convention

It will be noticed that among the questions printed in the Questionnaire sent out with this issue is one which asks whether members will support an Experimental Section meeting. Provided the response is satisfactory, steps will be taken to organise such a meeting during Convention. We believe it is badly needed.

Aerial Group

Group 1 (56 *Mc.*).—A halfwave vertical aerial 2½ to 3 waves high has been giving good results, but feeder losses have been excessive ; further experiments are being made in an endeavour to overcome this defect. A square beam aerial has proved to be a good all-weather system : it has good gain, and great height is not necessary.

Group 4 (56 *Mc. Receiving*).—Experiments, using a long wire, show a gain, when direct as against capacity coupling is used. Tests with a Variometer type of aerial continue, whilst problems regarding the rotation of the Kraus Beam rotating aerial are also being studied. The conclusion reached as a result of experiments with a single wire feeder (off centre-fed on all bands, using 14-gauge enamelled wire for radiator and feeder of the same gauge) is that the feeder length must bear some harmonic relationship to the radiator (namely, 33, 66 or 99 feet) in order to ensure the best compromise in matching. When 18 or 20-gauge wire is used for the feeder, the length appears to be immaterial.

Experiments show that direct coupling to the P.A. is not advisable. At a distance of about 12 miles the second harmonic is one point down on the fundamental and three to four points down on the fourth. A separate LC aerial circuit, link-coupled to the P.A., is recommended, one leg of the link (at the P.A. end) being earthed, with the aerial tapped on to the coil, about two turns in. The aerial circuit is then tuned for maximum aerial current and the P.A. for minimum feed, consistent with the power required, which is of course regulated by the link loading.

G2IM.

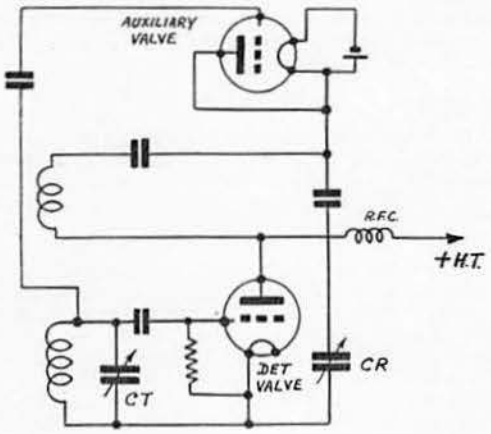
Receiver Group

The T.R.F. sub-group are experimenting with some interesting circuits in connection with reaction and its control. Of special note is a circuit employing a standard detector circuit and in addition a second valve connected so that the grid of this auxiliary valve is attached to the grid circuit of the detector, whilst the plate is connected in the reaction circuit, as in the diagram herewith. It is claimed that this method of maintaining a constant between the grid and reaction circuits of the detector greatly simplifies tuning.

Another circuit which shows promise uses the screen of the detector valve for reaction and the anode for amplification. Although a slight reduction in gain is noticed, it has been found that the improvement in reaction characteristics offsets this disadvantage.

It has been established after experiments on many frequencies that detector circuits employing an impedance in the cathode circuit to obtain reaction are improved beyond all expectations by making that impedance variable and controllable from the panel. If this procedure is adopted, it is very

instructive to experiment with various screen voltages on a screen grid or pentode valve. It will be found that maximum sensitivity is located at a very critical value of screen voltage and when this point has been found the screen control should be



An interesting circuit developed by the Receiver Group in which the maintenance of a constant between grid and reaction circuits of the detector simplifies tuning.

left alone. The final reaction is then controlled by the variable cathode impedance. 56 Mc. receivers have been constructed with a small choke in the cathode. A 50,000-ohm variable resistor is connected across it and is used to control the final reaction. In this way a tapped grid coil is avoided and all leads carrying R.F. can be kept short. Reaction by varying the cathode impedance in this way is exceptionally quiet and no paralleling condenser is necessary.

For those experimenters who are bothered with coupling inefficiency on 56 Mc., here is a method which has proven itself successful: By connecting the aerial or output from an R.F. amplifying stage directly on to the *plate* of the valve, very little damping will be introduced, and yet the coupling is surprisingly efficient. This idea can be introduced with any form of detector, but it works especially well on Split Culpitts and Hartley (single or push-pull) circuits.

G5HF.

Propagation Group

The matter contained in last month's Editorial gives British amateurs further opportunities to prove their usefulness and justify their continued existence. Contributions on the data required should therefore be completed and forwarded as soon as possible.

There is a change in the list of sub-groups published last month. "Magnetic" and "Conditions" are now amalgamated with the title "Magnetism and Conditions," and G2UP continues as G.C.

Aurora contains a note that a sudden rise in atmospheric pressure appears to cause a variation in fading on 14 Mc.

A code for short-wave reporting is being given a trial by the Fading sub-group. It gives full details of radio and meteorological conditions, and can be used as a means of exchanging information over the air.

The graphs produced by the Magnetism and Conditions sub-group show the variation of 14 Mc. conditions at a glance. It is noticed that signals from VK are appearing later in the morning than in 1937, and this seems to coincide with the passing of the sunspot maximum.

The 28 Mc. "A" sub-group believe that 28 Mc. conditions are dependent entirely on solar and magnetic activity, and that local weather and phases of the moon have no effect on this band. The group is studying many subjects, including problems of pre-skip signals, fade-outs and the "hissing" phenomena and effects caused by the sporadic E layer, aurorae, magnetic storms and chromospheric eruptions.

G2XC has prepared a summary of 28 Mc. conditions for the past winter with particular reference to cosmic phenomena. This will shortly appear as a separate article.

The 56 Mc. "B" sub-group notice signs of a 28-day cycle and a period of rapid fading after an increase in the "mush level." Co-operation is still required from 22.00 to 23.00 B.S.T. on Wednesdays, listeners included.

In his presidential address to the Mathematics and Physics Section of the Indian Science Congress, Dr. K. R. Ramanathan dealt with the Earth's Magnetism and the Upper Atmosphere. He stated that progress in ionosphere technique has provided means of locating the approximate level at which a sudden burst of ionisation is caused by the solar eruption. During a radio fade-out, the initial cut-off of reflected waves from the ionosphere is abrupt from all the layers E, F1 and F2, but the waves reflected from the lower layers disappear a little earlier. The reappearance of the signals is distinctly earlier from F2 than from F1, from F1 than from E, and so on. When the signals have reappeared the charge-densities of F2 and F1 show practically no change, while the charge-density of E shows a slight increase. These facts and the rapidity with which normal conditions are restored make it certain that the ionisation, due to the solar flare, takes place in and below the E layer.

Dr. Ramanathan adds that ionosphere workers in moderate latitudes also have found that during magnetic storms the waves reflected from the F2 region become weaker, the height of this region increases and its electron density decreases.

G8DA.

Transmitter Group

Four sub-groups have been formed and, by the time this notice appears, the Group Centres will have communicated with the members allotted to their groups. Emphasis is placed on the importance of members settling down to some co-ordinated work on the lines recently set out. As the Letter Budget is the only means of maintaining satisfactory contact between the members of any one group, they are urged to contribute to it and to maintain its circulation with the least possible delay.

G5JU.

The Reporting of Signal Strength

A THEORETICAL SURVEY AND SOME SUGGESTIONS

By H. R. Heap* (G5HF).

THAT the present method adopted by amatuers of reporting signal strength is inadequate for experimental work, must be obvious to all who try to derive conclusions from tests carried out "over the air." The "S" unit itself has not been standardised against any scientific unit, and even had it been so standardised, it would be unsatisfactory in most cases, because it is what may be described as a "skilled unit" introducing the human element. Used intelligently by experienced operators it may be given a meaning of value, but for the average amateur this is not the case; in an amateur radio contact one usually has no information as to the intelligence and experience of the operator at the other end.

In order for a signal strength report to be of value, it is essential that the unit used as the basis for the report be standardised, either by a known agreed unit or by direct comparison with some readily accessible standard. At present the "S" unit is given a different value by different experi-

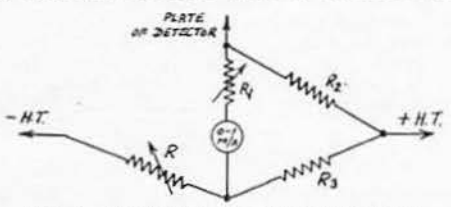


Fig. 1.—Bridge Circuit for Output Meter.

menters, some arranging the "S" steps above S1 in 3 dB or 5 dB stages. Others base the unit on S1 being the weakest signal detectable, or on S9 being the loudest likely signal; some divide the scale into equal steps while others divide it logarithmically.

It is the endeavour of this article to arouse interest in the measuring of field-strength and to mention a system which most amateurs could easily put into practice.

Measuring the Voltage

Our first consideration is to find how to measure the voltage produced at the output terminals of a receiver by an incoming signal which, incidentally, is usually too small to measure directly with simple apparatus. Various types of vacuum-tube voltmeters suitable for such a measurement are described in many text-books and periodicals and so will not be discussed here.

For continual use on a receiver, the second detector may be constructed and calibrated as a voltmeter. In order to obtain a forward reading meter a bridge circuit (Fig. 1) should be coupled to the detector and a reliable 0-1 m/ammeter connected as shown. The values of resistances will vary according to the valves used, but it is a simple matter to determine their best values experimentally by using variable resistors in a preliminary circuit. The resistor R_1 may be inserted if the range of voltage to be measured exceeds that which is readable on the meter. When this value of R_1 has been determined it should be left untouched.

Many modern receivers are fitted with such meters, hence the problem is now to discover a simple method of calibrating the meter off the particular aerial systems in use.

Unit to be Adopted

Seeing that the "S" unit has become well established, it might seem inadvisable to call for a change, but if the unit is to be fixed at a definite value, it will have to bear some given ratio to the scientific unit "microvolts per metre." Therefore it would seem best to drop the "S" strength as a unit and measure directly in the basic unit. For purposes of code transmission, the "S" could be retained as a prefix, the full meaning of S5 being "Your signal strength is 5 microvolts/metre."

This method of reporting would render possible a double or even triple figure such as "S17," but this should not be such a disadvantage when it transforms a meaningless report into something of value. Amateurs whose sole aim is to collect QSL cards would no doubt find this an unnecessary nuisance, but the writer hopes that in the near future many amateurs will turn to the technical development aspect of radio, in which case some new procedure in reporting would become essential.

Scientific Methods of Field Strength Measuring

A detailed description of these methods will be unnecessary as the average amateur would be unable to afford the equipment necessary. Further, he would not have the means available for calibrating it. It is interesting, however, to know the underlying principle of such methods.

Fig. 2 gives the general layout which forms the basis of most systems in common use. The voltage received on a loop aerial is compared with that generated locally, by means of a receiver in which the frequency-changer and/or second detector circuits are calibrated as vacuum-tube voltmeters. In practice complications arise, due to the fact that the locally generated signal is much greater in amplitude than the received signal, and suitable attenuators are required. For the higher frequencies this introduces errors and calls for a special technique. Friis and Bruce have described a method which is claimed to function up to 30 Mc.,

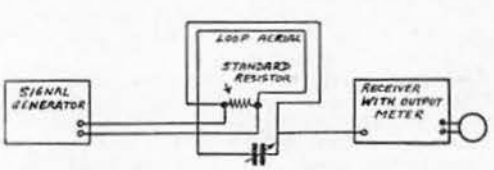


Fig. 2.—Basis of Field Intensity Measuring Methods in common use.

* Receiver Group Manager (E.S.).

but for full details the reader should consult the paper referred to in the bibliography.

It would be impracticable to apply the above method to an amateur receiver, due to the necessity for an accurately calibrated signal generator, attenuator and a sensitive thermocouple voltmeter. With such apparatus an accuracy of 5 per cent. is considered good, and although 15-20 per cent. would be near enough for amateur purposes, even this accuracy would be impossible using makeshift and cheap apparatus.

Using a Standard Transmitting Aerial

A method which could easily be adopted by amateurs uses a coil aerial of known dimensions passing a known current, and this produces a field intensity which can be calculated.

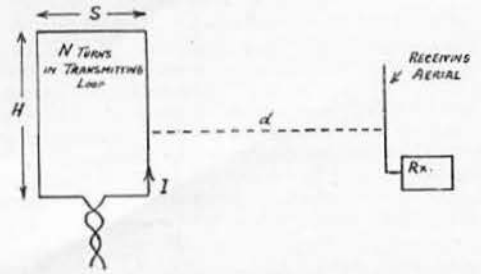


Fig. 3.—Set-up of Standard Transmitting Aerial.

With the second detector of the receiver constructed as a vacuum-tube voltmeter, the transmitting aerial is placed at a known distance from the receiving aerial (say 4 to 5 wavelengths). The plane of the coil aerial must coincide with the direction line of the receiving aerial, and the distance " d " (Fig. 3) should be such that it is at least ten times the length of the receiving aerial. The field intensity produced may be calculated from the formula

$$E = \frac{376.NHI}{\lambda d} \sin \frac{\pi S}{\lambda}$$

where E is the Field Intensity at distance d. microvolts /M.
" N is number of turns in the transmitting coil.
" H is height of transmitting coil in metres.
" I is the current in the transmitting coil.
" λ is wavelength of transmission in metres.
" d is distance between receiving aerial and coil (metres).
" S is width of transmitting coil in metres.

It is essential that the oscillator feeding the transmitting coil be completely screened, to prevent radiation from reaching the receiving aerial direct. The oscillator should be tested with the transmitting coil disconnected and no signal should be detectable on the receiver. For U.H.F. tests the transmitting coil should be raised as high above the ground as possible.

Experiments should be conducted on all sides of the receiving aerial, as local screening will probably make a theoretically omni-directional aerial slightly directional. If the receiving properties of the aerial are worked out in this way, then a correction factor may be deduced for signals from known directions.

This method may be used down to 3 or 4 metres with success.

It is to be hoped that some amateurs will try out this method and report results. At present signal reports given by two amateurs in different parts of the country bear no relation to one another, but if both reports were based on the same standard, valuable information should be obtained from them.

* * *

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Trade Notice

Sheets are now issued by *British Tungsram Radio Works, Ltd.*, 82-84, Theobalds Road, London, W.C.1, giving very full information on the operation of *Tungsram* transmitting valves, audio output valves, rectifiers and barretters.

Within the range will be found a type suitable for almost any amateur application. Special mention may be made of the type OS-12/501, a pentode equivalent to the RK25; and the type OS-40/1250, equivalent to the RK20. Both are suitable for suppressor grid modulation.

The triode valves have recently been redesigned to enable them to withstand higher anode voltages. Of special interest is the type OP-37/600 which, with its high slope of 7 mA/volt, can be relied on to give an outstanding performance.

Many of the audio output valves are designed specifically for Class B operation and types are available to give outputs from a few watts up to several hundred watts. Amongst the many rectifiers listed, one of the most popular is undoubtedly the RG250/1000, which is of the mercury vapour type. Two in a full wave circuit are capable of giving a D.C. output of up to 500 mA at 1,000 volts.

Details of the types mentioned and of the many others available for all classes of service are to be had by readers of this Journal on application to the address given above.

Reports Wanted

G3YY (Brighton, 6), on his 58,760 kc. C.W. transmissions.

G8FL (North Walsham) on his 14,070 and 14,296 kc. telephony transmissions.

W8CIN (New York) on his 28,536 kc. transmissions. Input 250 watts.

W1GSR (Boston, Mass.), on his 7 Mc. telegraphy signals.

Stray

Mr. H. Eliaeson (SM6WL), of Motala, would be pleased to arrange schedules with stations in the Channel Isles and Isle of Man. His frequency is 14,370 or 14,396 kc.

THE MONTH ON THE AIR

A RUNNING COMMENTARY OF RADIO CONDITIONS FOR THE MONTH OF . . . . . MAY, 1939

by H.A.M. WHYTE (G6WY.)

ANOTHER month rolls by and still we record consistent DX conditions, even if a little down on last May. Some may say that conditions were poor, but that which follows the opening paragraph should help to dispel this contention. There is still one very disturbing thought, however, and that is this question of deliberate and accidental off-frequency operation. Some British stations, whose activity has been given prominence on this page, are reported as being the culprits, but we do not need to go on reports, we have our own ears and there is little excuse for a station being 30-40 kc. *outside* the International band limit. The unfortunate part about the whole business is the fact that the off-frequency station invariably raises the elusive DX. We receive complaints about this every month from amateurs whose knowledge of edge-band operation is above suspicion. There is only one thing to do—call the station and tell him, if he ignores you or refuses to believe, there is another remedy—we leave it to you.

Good news comes from Gibraltar. Arthur Nissen, the operator of the Danish ship OXVC, stationed in the harbour, writes to tell us that the full address of ZB2B (14,135) is as follows: Royal Signal Corps, Post Box 201. There is an enthusiastic group attached to the station who operate frequently on 'phone and C.W. It is also reported that ZB2C is only waiting for his licence to arrive.

Slovakia, a country counting instead of Czecho-Slovakia, is active now with OK3DK in Bratislava on 14,330. EV1AB, heard by G5CI last month, is reported by G3PP as being a Russian ship off Aberdeen. KB6ILT, Box 47, Agana, Guam, has caused many kilowatts to be dispersed in the European ether; he is very active on 14,320 or 14,380 giving quick QSOs to all he hears; don't overlook K6PMP in the same Island. CR4MM has apparently improved his receiver as he now works stations on every CQ. A card will reach him c/o Mario Moutinho, Praia, Cape Verde Is., the same town as CR4HT and on the same frequency. G3JR, who has been busy all the month, raises a query about the U8 stations. He mentions U8IR 14,415, 21.15, U8AC 14,350, 21.40, both giving Post Box 51, Chiwa. He wants to know if "Chiwa" is the same as Khiva on British maps, to which we answer "yes." Furthermore, the gazeteer gives this town as being in Uzbek. U8IB, in Tachkent, is also in Uzbek Republic, so we hope they QSL! Other DX at G3JR includes: VQ2GW 14,370, 23.00; U9BC, 14,270, 2.140; XE1LX, 14,045, 02.50; J5DC, 14'430 20.30; CX1CB 14,410 03.00; FB8AA 14,350 19.45; XE1DA 14,405 05.15; VS2AE 14,365 18.05; J3FJ 14,410 20.00; VP7NT 14,405 22.50; PJ5EE 14,415 03.15 (QSL via ARRL); EA7AV 14,330 (J. Portela, Veedor St.15, Cadiz). 3JR also worked EA9RA, who promptly closed down when asked for his full QRA in Ifni, and YA2UR, who faded out. It is interesting to note that several stations have reported PJ5EE, and it is very possible that he will prove genuine, as PJ3CO (worked by G6CL) is with us again on the H.F. end of 14. He is ex-PAOXX, you will remember, and cards should be sent via N.V.I.R. or A.R.R.L.

G8QL has also been very busy and produces as his best: VU2FO, 14,300 19.30, KA1SP 14,410 21.20, CR4HT, and "XXX," who stated his QRA was secret! Another secret station appears to be YY2A reported by SU1AX, who believes he is a country north of Alexandria. G8QL heard YY1DT, probably one and the same. G4AS is showing the world what a G4 can do when he tries—he WAC/WBE on 'phone on May 1, and relies on the "good old formula"—listen and call—don't call aimless "tests," and proved his point by hooking VK5RN, 3BZ, ZS2X, YV1AQ, 4AE, VP6MY, VU2JG, TI2RC, HI7G, CX2CO, ZS6BR, HK3CI, VS7RA, VQ2CM, CE1AM, ZB2B, VP2AD, ZE1JH, 1JZ, and K5AD all on *'phone*.

G8KP is keeping Yorkshire regularly on the map or air, whichever you prefer, with FM8AD 14,300 23,50, CR4HT, XZ2AB, VQ3HJP, VP7NT, VS2AE, OQ5AV, HI6Q, making eight new ones for a total of 102 worked. He also raised XU8MI, KA1FG, 1SP, VQ2HC, 2JC and GX7AX, who claimed to be on a ship. G2ZQ reports active again with KB6ILT, MX3C (old MX2B) 14,375 21.00, K6PMP and the two CR4's. G2DH added two—KB6 and I7AA and YV5AE, which proves that the latter does work Europe sometimes! PJ5EE was also contacted and we all await further news of this station. Other DX at 2DH includes U8IB, CR7BC, CE2AG, J5DC, XU4CV, 6W, VP5PZ and CR4HT. By the way, P4CC is a Dutch ship in the Mediterranean bound for S. America.

G5HH, who reports after a long absence, raised his total to 90 with XE1PE one night when he couldn't sleep! It is interesting to note that he has 83 of these confirmed—a very good percentage. He queries whether certain stations QSL, notably I7AA, UK8AI, FM8AD, LZ1ID. To take these in order, we have a card from I7AA, obtained due to the kind offices of I1IR via I1LD, who is a friend; UK8AI *has* sent cards to G; FM8AD has just sent a batch to R.S.G.B.; LZ1ID can only be

reached now via HB9CE, who appears to send cards on his behalf presumably from a copy of his log. Incidentally, XG5SV is off Singapore according to the last report. G6ZO pushes his 25 watts to far corners of the earth with contacts from FB8AD, KA1SP, CX1CB, PK1MF, and many ZS's. DX heard by 6ZO includes HK2BL 14,410, XU8NR 14,360, CE3BF 14,415 (Box 366, Santiago), J8CD 14,390, PK4KS (working PA's only!), XU6DD 14,370, PJ3GM (what—another ?), LZ1Z 14,250, EARMOC (worked several W's at 22.45), VQ4CHS 14,060 and VQ4JRW for new Kenya stations, TG1L 14,310, sounds a bit suspicious.

Now, here's some more news of VU7BR of interest to all listening stations. From G2YL we learn that VU7BR does not intend to reply to any more reports; he complains of having to pay excess postage on quite a few useless reports and spending whole evenings answering them. It is as well, perhaps, to mention that Empire letters cost 1½d. *for each ½ oz.* This is an old complaint from stations situated in "rare" countries, and one which has our sympathy; but we would like to answer VU7BR and others in a similar position, by suggesting for their serious consideration, that they have a cheap card or slip printed which will just acknowledge the report—no time is then taken by writing out a card, and an envelope, self-addressed, should accompany the report if a reply is required direct. As far as R.S.G.B. BRS members are concerned, it should not be forgotten that they are trying to gain their H.B.E. certificate, which would be *impossible* without the friendly co-operation of amateurs, and we therefore recommend that a printed verification should be sent via the R.S.G.B. to all members; this takes very little time or writing.

G3PM was elated when he raised ZB2B and reports that the C/O is Major R. N. Solly. G8HX is of the opinion that TA1AA is near YR or U5 and recounts the experience of G8GO, who tried for two hours (with an S8 signal) to obtain some information from the "Turk," but was answered with "QRM" each time—apparently TA1AA enjoyed the leg-pulling! G3AH raised J5DC 18.20, XU4CV 14,360 18.25, YI7RF 14,420, who promised to QSL via R.S.G.B., and YV5AE 14,420 22.45. G2LC was ZB2B's third QSO and has since received a card; he heard VP4TO, J2OV, PJ3CO, XE1AA, K6NYD, 6MWF and MX3C. G8IL, using his thin wire roof top aerial has had amazing results with 'phone. The following were worked before breakfast during May: VP1WB, 1BA, VP3LF, HK1AA, 1AG, OA4AI, TI2RC, YV4AE, 1AP, CO's and VK's; sometimes S9 reports were received with *less* than 25 watts. There appears to be no doubt that the leaded roof right under the aerial is acting as a reflector as he can offer no other explanation. One hundred countries have now been raised.

SU1WM wants us to run a monthly list, similar to our "In Search of B.E.R.T.A.," but including all those who have already qualified, giving the total number of Dominions and Colonies confirmed. Your views on this will be appreciated; we think it a good idea. G3YM has been very active with 14 Mc. 'phone and produced QSOs with VS2AK, who operates on 14,040 between 16.00-18.00 G.M.T., PK4HW, VU2FA, 2FQ, PK3WI 14,028, KA1FH 14,158, KA3KK 14,246, VP1BA 14,135, EA7BA 14,022 (Cadiz). He also heard XU8RM 14,282 and XU8IL 14,148. All these contacts were made using a W8JK beam. G2AT queries KA7EC (14,360), but he is quite genuine, and worked PK1TT. He wants to know if G3JR uses ECO to slip up and down the band and suggests that "YA2AB" worked by G8II could possibly be YI2AB.

W6QD informs us via G6LK that *Radio* is running a DX contest during the last week in November for 'phone and C.W. G6LK reports 'phone contacts with the following: ZB2B, KA3KK, ZC6JF 14,150, XU8MC 14,310, K6OJQ, 6OTH, 6NYD, 6JPQ, VP1BA, HR5C, and a part contact with PK6XX. He runs a C.W. schedule with KD6OQZ in Howland I., but does not say whether contact has been established. We also learn that G5ML had the first G contact with PK6XX. G5CI reports 7 Mc. contacts with TA1XR (claiming to be in Istanbul, QSL to Box 12), EV1AB (in Gulf of Bothnia) and he heard ZA2X, OK1JC, and ZC6RL, besides W6. VU2FA continues to put a fine signal through, and cards may be sent to Major Atkinson, Kasauli, Simla Hills, Punjab. VU2JG can be QSL'd as follows: Mr. John Farr, 1st Btn. Devonshire Regt., Connaught Bks, Rawalpindi, Punjab; he is operating about 10,000 feet up with a single 6L6 with 12 watts input.

A list of active Burma stations has been sent by XZ2LZ; these are 2JB, 2LZ, 2AB, 2EZ, 2DX, 2EX, 2AC, 2DP, 2BH, 2DY and 2TM. G2MQ tested a new rotary beam when conditions were "down," but managed to prove its efficiency by working PK4HW, VQ2CM, 2FA, K4EJF and LU. G3DO reports yet another contact with Nevada—W6ATN on 14,160, who is looking for G contacts every morning between 06.00 and 07.30 B.S.T. W7ESK was worked and will be in K7 near the Aleutian Is., between July 7 and August. HB9CE is to take his holiday in Liechtenstein this summer and will give as many contacts as possible for a country never previously represented in amateur radio. Call and dates are not yet known.

BERS195 had his card returned from Cyprus, addressed to ZC4EB, marked "inconnu." He has now heard 172 genuine countries with 140 confirmed, which will answer the question, so often heard, "how many countries is it possible to work?" A card was received from I7AA owing to the fact that BERS195's card went through the usual R.S.G.B. channels and was noticed by I1IT when it arrived in Italy; he at once sent it direct to I7AA with a request that he should answer, as I1IT received his first report from Australia eight years ago from "195." Ham spirit is the same the world over. Unusual signals heard in N. Australia include FX, which was the call of a Brazilian Expedition some years ago, XG5SV (Somerville, Royal Navy, Seletar, Singapore), VK4BF is a new station in Papua on C.W., XU8TW (Box 1360, Shanghai), K6ILT/KD6 in Midway, which must have been before he arrived in Guam, KD6QHX on C.W. Owing to studying, Eric Trebilcock will cease to exist for some time as a listener, but will endeavour to hear a few N.F.D. stations.

W1WV raises a question which should be answered. He asks if cards for BERTA from U.S.A. may be checked by the A.R.R.L.; the answer is "no." All claims must be sent direct to R.S.G.B. from abroad. He should soon be eligible as he has

just worked VK9XX and still lacks some Empire cards. G4FL received a card from VE5AAD for a QSO on March 13, stating that the latter believed it was the first VE5/G4 contact. During May G6WY worked KA1LB, PK1LK, 1TT, CR7AK, VQ4RHL (Box 103, Nairobi), CR4MM, J2NQ, KA7EC, KB6ILT, on C.W., and VS2AL, 2AK, ZE1JS, 1JZ, VU2FA, 2JG, VQ2CM, and ZS's on 'phone.

G4FL went on the air on February 24 and raised the first station he called—ZL2CW, just about as far as he could get! Since that momentous date he has raised VK2, 3, 4, 5, VE, CT2, FA, PY, ZS, CR4, TF, ZB1, CR7 and SU, with a 26 feet high doublet and an 809. Stations heard included XU7CK, J8CA, VQ2BI, VS6AL, and FB8AH. GW3QN worked YA2UR as well, and obtained a full address: Peter Henin, Post Box 22, Kabul—so perhaps he is genuine after all! YI7RF and ZD4AB were also QSOd, the latter obtaining his first GW thereby. G5SO adds mystery to this page by raising YA5XX 14,350, stating he was camped beside a road in Afghanistan, which checks with YA5XX of last year, who returned to U.S.A. Before he returned, however, he did state he would be returning to Asia, but would not operate in Afghanistan but in an equally rare country. On 'phone, 5SO was fortunate in hooking HK4EA, VP1BA, HI3N, TG9BA, VP7NS, XU6W, TI2AC, VP3LF and 3CO and HC1BZ. G5ML, "the mighty voice of the Midlands," reports (for the first time) with OQ5ZZ, KB6ILT, XU8HB, 6N, 8NR, J2NQ, 2MI, KA2OV, 3KK, CR4HT, ZC6HS, FN1C, VP2LB (St. Lucia), and many others of equal DX value!

BRS1679, of Birmingham, reports OQ5ZZ, the Gatti Expedition, while BRS3553, in the same town, heard KA1LV and FB8AH on 'phone. 2AGZ, again in Bromwich, received 12 countries in 16 minutes on May 14. A few unusual calls from BRS3319's log include XE1CQ, CX1AG, VP6LN, CR6AI, CE3CG, HK1AA, VK7CL, HR5C, CE1AS, TI2GC and TA1CC alive again!

Personal

As this is the last time I shall have the pleasure of compiling the DX news under the familiar title, "The Month on the Air," I wish to take the opportunity of thanking all who have made the feature a success. G2MI will carry on, under a new title; it is hoped that everyone will give him the same loyal support as has been accorded to me.

Empire Calls Heard

Eric W. Trebilcock (*BERS*195), *Powell Creek, Australia. April* 1-27, 1939:—

7 *Mc.:* G2pb, 3fq, 3pw, 5lp, 5ns, 8bd, gm6sj, gw5md, 5od.

14 *Mc. 'Phone:* G5bj, 5vm, 6bw, 6wt, gm5nw.

14 *Mc. C.W.:* G2in, 2kg, 2mi, 2nn, 2sy, 2vf, 3fp, 3jr, 3tb, 4aq, 5by, 5dr, 5mq, 5mw, 5oz, 5pj, 6ku, 6pk, 6qr, 6nb, 6td, 8dd, 8fv, 8ii, 8im, 8kp, 8lu, 8oa, 8pl, 8ps, 8mv, 8tc, gm3ua, 4an, 5ir, 6hz, 8hp, gw5od.

J. Haw (*BERS*454), 10 *Mess, H.M.S. Egret, c/o G.P.O. London. At Hadibo Socotra, March* 8-12.

14 Mc. CW: g3ny, 5ns, 6bt, 6gm, 6iz, 6td, 8cl, 8lu.

At Suez and Aden, March 28-31: 14 Mc. CW: 2cl, 2sy, 3qv, 4au, 4cf, 4gn, 5an, 6dt (phone), 5dv, 5ml (phone), 6ti, 6km, 8it, 8sm.

At Suez, April, 7 Mc. CW: g2nj, 3rb, 3rl, 3yt, 6wi, 8ki.

THE 28 Mc. BAND

BY NELLY CORRY (G2YL)

ACTIVITY decreased considerably during May, and this fact, coupled with a definite decline in conditions, made the band exceptionally quiet on most days. Thanks, however, to regular operation on the part of a dozen or so DX stations (among whom must be specially mentioned PK2WL, SU1MW, VU7BR and ZS1AX), there were only a few days when absolutely nothing could be heard.

The solitary representative of the continent of Oceania heard in G was PK2WL, who worked PA0FB on ten days in the period May 1-25. PA0FB also heard PK1VM and PK1VY, but there is no report of VK or ZL signals having been received in Europe.

In Asia, stations active included VS6AO, VU2AN, VU2FO, VU2FS, VU7BR and XZ2JB, but as far as is known the only one of these who was worked by G's during the month was VU7BR. On May 29 VU2AN reported he had heard no signals on the band since April 23, but had been away for two weeks of that time. VU2FO was active on Sundays April 30 to May 21 inclusive, but the only Europeans heard were G6GO, G6QX, D4ORT, ON4PW, SP1DC on April 30, and ON4AU on May 7. Stations worked were FB8AA, VK5IT, VS6AO, VU7BR, W2GWI/MO and XZ2JB, and an S9 signal signing "ZR5T" was logged on May 14. W2GWI/MO, who is active daily around 1445 G.M.T. and has been heard in G during the month, told VU7BR he was in a ship bound for Capetown from Penang. He is due back in New York on June 20, when he will QSL all stations worked. VU7BR was usually active from 1300 G.M.T., and heard European signals on 19 days in the period April 20 to May 20. He found F8CT, G5BM and G6YL the most consistent signals, and says, "Believe it or not, day after day the only signal heard and worked has been G6YL whose flea-power chirps have held up better than any of the other signals." Stations outside Europe, worked by VU7BR included CN8AV, FB8AA, PK1VM, SU1DB, VQ2HC, VU2FO and ZS4AA.

African stations have produced some excellent signals during the month, and SU1MW or ZS1AX, or both, were audible on most days. Others logged were CR7AK, FA3JY, FB8AA, SU1DB, SU1DM, SU1GP, SU1RO, VQ3TOM, ZE1JR, ZE1JZ, ZS4AA, ZS5DF, ZS5T, ZS6EG and ZS6W.

Signals from South America were rarer than in April, but BRS3003 reports LU1DA, LU1DJ, LU4BC, LU5AN, LU8AB, PY2MI, PY3EN, VP3LF and YV1AP, while 2AOU heard VP3CO, and BRS3179 heard PY4BL. The only Central America or West Indies stations reported were K4EZR and VP6YB, and G6YL heard W3EHO/O, a ship in the Gulf of Mexico.

Reception from North America was surprisingly good on April 30, when G2ZV worked W2, 4, 5 and 6, and districts 1 and 8 were also heard. On this day VU7BR heard and called many W 'phones, but without any luck. During May the only W's reported were a W1 heard by G2XC on May 1, a W2 heard by BRS3179 on May 5, and another heard by BRS3003 on May 24. On May 14 skip was unusually long as VU2FO heard W2AOG and VU7BR heard W4DSA.

Activity in Europe is probably lower than usual this year, but conditions must be partly responsible for the fact that only a few signals from F, LA, ON, PA, SP and U were reported during the month.

Many thanks to G2XC, 2ZV, 6YL, 2AOU, BRS3003, BRS3179, PA0FB, VU2AN, VU2FO and VU7BR for their reports which are particularly appreciated at this time of the year.

The 56 Mc. BAND

By J. M. R. SUTTON (GW2NG)

VARIOUS reports are to hand this month showing an increase of activity. It is good to note that new stations using this band do not even contemplate the use of modulated oscillators and relatively unstable transmitters, but make their debut on the higher frequencies with C.C. apparatus. Thus we progress from year to year, and the exponents of stabilised apparatus are reaping the benefits of such apparatus with more consistent and greater distance contacts. These results are enabling investigators of certain theories to provide themselves with more data. There is everything to be said for stabilised transmitters and nothing for the other type, and we are very glad to note that evidence in the shape of reports shows that this has been realised.

British Reports

G2ZV again sends a very full report, which we appreciate in view of the fact that he has been busy playing host to W9BNX and his wife. Schedules with 2OD have been discontinued for three weeks because 2OD has been away. He has, however, been in contact with G5TX (588), 3YY (599), 2MV (579), and also had a Q5 R6 QSO on 'phone with 2MV. He attributes to the warm air on the top of the downs (this causing low level bending) his contact with 2XC on May 6 at 22.30 because the Southdown Hills intervene between their stations. On May 7 it was very hot, and this temperature was maintained during the evening, with very little wind. These climatic conditions appeared to produce good 56 Mc. conditions, and contacts were made with 2MV at 18.30, and again at 21.45. At 23.00 2MV worked 6DH and 6DH was heard at 2ZV at 23.38, a contact resulting at 23.40. On May 8 6DH was heard calling 5UK and saying that he could hear 6PG. There was little activity until May 11-12, when contacts were made with 5TX, 3YY and 5UK, who was a very fine signal. Other stations worked during the month were 8OS, and 6XM, who was heard for the first time this year.

We are glad to hear once again from Miss Hall (G8LY), who has found conditions improving. Her signals have been heard by stations who have not logged them since last September. During the cold weather from April 25 to May 10 there was nothing to report, but a first QSO was made with 5BY on the latter date. Signal strengths were 559, with deep slow QSB to zero. May 13 saw 6XM the loudest signal ever received at 8LY at 589. QSO's were made with 6XM, 2GG, and a report received from 8OS, who had not heard 8LY since September, 1938. 2MV was heard on May 17, while a report was received from 5TX on May 19. Contacts were effected with 5TX, whilst 5MA and 6OH were heard on May 21. 8LY wishes stations would make more use of QRZ, QLH, etc., at the end of a QSO in order to give semi-DX stations a better chance. She finds a great improvement in signal strength by tapping her 10 half-wave W3EDP aerial direct on to the coil in the receiver. 6OO (Basingstoke) has been received at last, but has not yet heard 8LY; 8OS was heard for the first time on May 10, his long-wire V-aerial being in an unsuitable direction for reception of his signals at 8LY.

2ADZ reports not so exciting conditions this month as the weather conditions have been more uniform. The reports cover the period April 27 to May 22. As there are quite detailed reports of the stations heard, only a brief summary can be given here. On April 27 5UK and 2ZV were heard, and these two stations were also heard on April 29 and 30. Fifteen other local stations were heard on April 30, but 5UK was the only semi-DX station heard on May 1. 6DH was heard on May 2, whilst 6DH, 5UK, 6FO and 8OS were logged on May 3. There was a "DX-flutter" on 8OS, and harmonics were also heard on this date. On May 6, 7, 8 and 9 6DH, 8OS and 5UK were heard. May 10 gave 8OS, 5UK and 8LY, while 5BY worked 6FO, the contact not being audible at 2ADZ.

May 13, 15 and 16 gave 6DH, 2UJ, 5UK and 8LY, whilst May 19 was a good day with 5TX, 6DH, 5UK and 8OS. From then until May 22 stations heard were 5TX, 5UK and 6DH. The distances of the stations mentioned are 6FO, 118 miles; 6DH, 72 miles; 5TX, 63 miles; 5UK, 50 miles; 8LY, 45 miles; 2ZV, 40 miles; and 8OS, 30 miles. It can be seen that most of these are out of the ground-wave distance. 2ADZ has some interesting comments and suggestions to make on the R.D. scale suggested by 2AAH in his International Contest log. He also mentions flutter on local signals when an aeroplane is overhead. When the aeroplane is a long way off from the receiving or transmitting station the frequency of the flutter is slow, but this increases to a maximum when the aeroplane is directly overhead. This effect is apparently caused by reflection of the 56 Mc. signals from the metal-work of the aircraft and has also been noticed by 5MA and 2NH.

2AAH is interested in the problem of temperature and 56 Mc. signals. His log for the month of April includes the reception of 2ZV, 5TX, 2OD, 8OS, 2XC, 3YY and some high-speed morse heard at several places in the band on April 25. This is believed to emanate from the RN, Portsmouth, or, less likely, to be caused by E-layer reflection. The maximum RD for this month was 360, on the signals of 2OD.

News of regular schedules comes from G3YY. He is operating on 58,760 kc. most evenings around 22.00 B.S.T. on C.C. C.W., and is also portable on Sundays on the South Downs, using the same apparatus, Tri-tet and FD. He is in regular contact with 2ZV with signals 599x both ways, and has also contacted 2OD and 5CM. He has had reports from 2AAH, 2DDD, 2DCT, 2BIL and BRS1173, and is willing to arrange schedules with anyone who cares to write to him.

Lastly, news from Cheltenham district (forwarded by 5JU) concerns a visit to inspect the very fine gear at 6IH. The respective merits of the *National*

1-10, using Acorns, and the new *Skyrider* 5-10 were checked. The receivers were compared on the same signal, and the 1-10 was used both as a straight and as a super-regenerative. The *Skyrider* won "hands-down." This receiver is as easy to use as, e.g., a *Skyrider* SX17 on the lower frequencies! 8ML is doing some good work with a 6L6g running as a power-doubler, but hopes to have a PA going very soon. He is doing portable work on Painswick Beacon, and hopes to contact the Newport (Mon.) stations. He is active on Wednesdays from 21.30 to 22.30, and on Sundays from noon onwards. His frequency is 56,800 kc., whilst 6IH is on 56,344 kc.

News from all parts raises hopes that activity will be very good on July 9, and we hope that the weather will be kind to the portable stations. May we anticipate a new 56 Mc. record?

Snowdon 56 Mc. Tests from GW6AA

In view of the success of the 56 Mc. transmissions from Snowdon last September, a more ambitious series of tests has been arranged to take place in July, covering the week-end of the R.S.G.B. 56 Mc. Field Day.

All transmissions will be crystal controlled, mainly C.W., and receivers for all types of transmissions will be used, although it is hoped that crystal controlled transmissions will predominate. A small petrol driven generator will be used to solve the problem of supplying light and power for operating the station over a period of several days.

The following aerial systems will be used:

(i) A horizontally polarised fixed directional array, beamed on London.

(ii) A vertically polarised rotatable beam array.

(iii) A wave-and-a-half vertical Franklin Uniform aerial.

(iv) A horizontal half-wave aerial running North-South.

Two days are to be set aside for the erection of the apparatus and aerial systems on the summit, but it should be understood that the success of the tests is largely dependent upon the weather conditions prevailing at the time. Even in summer, winds exceeding gale force are often experienced on the summit of Snowdon, and squalls of rain and hail with terrific wind velocities occur without notice.

The operators will be on the summit from July 5 to July 10, but scheduled transmissions will not commence until 19.00 B.S.T. on Friday, July 7. Automatic C.W. test calls of ten minutes duration will be made at the following times (all B.S.T.):—

Friday, July 7.—19.00, 20.00, 21.00.

Saturday, July 8.—14.00, 16.00, 18.00, 20.00, 22.00.

Sunday, July 9.—10.00, 12.00, 14.00, 16.00, 18.00, 21.00, 22.00.

Reports of stations heard, and other details of general interest concerning the tests, will be given at the following times, telephony being used:—

Friday, 7th.—22.00.

Saturday, 8th.—17.00.

Sunday, 9th.—09.45, 20.00.

Call-signs of distant stations which have been heard, but not contacted, will be given in C.W. after each of these transmissions.

The main object of these tests is to investigate the radiation diagrams of the various aerial systems used, to compare with the theoretical, and with this object in mind, schedules are desired with stations equipped with field strength measuring apparatus (including receivers fitted with S meters, as comparative figures only are required). The aerial system in use at that moment will be given out in each transmission, code groups being used for the C.W. transmissions, and these should be given in all reception reports, where possible. All such reports will be acknowledged, and will be much appreciated.

Schedules with C.W. stations located over 150 miles from Snowden are also desired, those wishing to arrange schedules for these, or any tests they may wish to carry out during the period July 7 to July 9, should write as soon as possible to David S. Mitchell, The Flagstaff, Colwyn Bay, North Wales.

GW6AA

56 Mc. Annual Field Day

In accordance with the announcement made in the April issue, we publish below a list of those members who have informed us of their intention to operate portable transmitters during the 56 Mc. Field Day event arranged to take place on Sunday, July 9:—

Call Sign.	*Operator.*	*Location.*
G2JB	J. H. Payton	Walton Heath, Surrey.
G2NH	E. A. Dedman	South Downs, near Brighton.
G2QY	G. P. Anderson	High ground in N.W. London.
G2WS	W. A. Scarr	Woldingham, near Caterham, Surrey.
G3CU	J. D. Kingston H. F. Knott D. R. Spearing	Tattenham Corner, Epsom, Surrey.
G5CD	D. N. Corfield	Nr. Amersham, Bucks.
G5MA	N. H. Munday	South Downs, near Storrington.
G6DP	D. E. Palin	Frodsham Hill, Lancs.
G6QZ	A. G. Parker	Wymondham Waterworks at Wicklewood, Norfolk.
G8LY	Miss C. Hall	Farleigh Hill (684 ft.), near Basingstoke, Hants.

The following members have informed us of their intention to operate portable receiving stations:—

Call Sign.	*Operator.*	*Location.*
2ADZ	H. W. Parker	North Downs, near Epsom.
2BIL	G. F. Keen	Devil's Dyke near Brighton (600 ft.)
2BVD	C. R. Beaven	Between Portishead and Bristol.

British Isles Calls Heard

J. Haw (*BERS*454), 10 *Mess, H.M.S. "Egret," c/o G.P.O., London. At Aden, May* 1-7:—

14 *Mc. C.W.:* G2hg, 2og, 2xn ('phone), 3ig, 3rq, 3xf, 4au, 4dn, 4in, 5jx, 5pj. 6gn, 6ux ('phone), 6wt ('phone).

At Djibuti, French Somali Coast, May 9-10:

14 *Mc C.W.:* G3dg, 3jd, 3rn, 4in, 5dq, 5gi, 5mq, 8ip.

At Kamaran, May 12-15:

G3no, 4cf, 5hi, 8pl.

At sea 200 *miles N. of Port Sudan, May* 22:

14 *Mc. C.W.:* G6ku.

7 *Mc. C.W.:* G3ga, 3vv, gm3xb, 8wo.

HEADQUARTERS CALLING

Licence Facilities

Considerable time will be saved if members approach their D.R. or T.R. for advice regarding the extension of licence facilities. Such enquiries should in all cases be *accompanied with a stamp for reply.*

Members are asked to note that the Council can only recommend members for the following facilities.

(a) *An increase in power from* 10 *to* 25 *watts.*—Members must apply to Headquarters for a special form which must be returned in accordance with the instructions given thereon. Applications for this facility can only be considered after a member has been licensed for six months.

(b) *An increase in power to* 50 *watts.*—Members must submit a detailed technical application, *in duplicate,* to their District Representative and must give an assurance that crystal control or some other method of frequency stabilisation will be used. Applications can only be considered after a member has been licensed for twelve months.

(c) *Permission to use the* 3.5 *Mc. Band.*—Members must submit a technical application *via* their District Representative, and must give an assurance that crystal control or some other method of frequency stabilisation will be used. Applications can only be considered after a member has been licensed for twelve months.

The Society cannot obtain special facilities such as Field Day or Portable permits except as from time to time announced in this journal.

Permission to use the 60 Mc. band and all other similar facilities must be applied for by direct application to The Engineer-in-Chief, Radio Section, G.P.O., "Armour House," London, E.C.1.

The Society cannot assist members to obtain either an Artificial Aerial or Radiating Licence, but D.R.'s and T.R.'s will at all times be glad to give private advice.

Notice to Home Members

The G.P.O. advises that in the event of war, members possessing transmitting apparatus should remove all valves and pack them securely into a container.

It is also suggested that an inventory of all transmitting gear be taken. No decision has yet been reached regarding the impounding of amateur transmitters, but if this takes place a receipt should be obtained.

A.R.R.L. Subscriptions

Members are reminded that the Society has an arrangement with the A.R.R.L., whereby subscriptions to that organisation can be accepted at 12s. 6d. per annum. We frequently learn that members, unacquainted with this arrangement, purchase copies of QST from booksellers at a price considerably in excess of the subscription rate mentioned above.

B.E.R.T.A. Claims

We would remind members that we cannot check claims from 1939 B.E.R.U. Contest logs until after the results of the contest have been published. Members will then be in a position to see whether the station concerned has made an entry.

First-Class Operators' Club

Although it has been clearly stated that this Club is not a section of, or in any way connected with, the R.S.G.B., an increasing number of members appear to be under the misapprehension that it has official backing from the Society.

The Council, when the Club was first started, authorised the publication of general notes, but it is now considered that no useful purpose is being served by their continuance.

The Council has, however, agreed to the occasional publication of general notes concerning the actual working of the Club which now has a membership of about 65. The Hon. Secretary is Mr. R. Webster (G5BW), "Steetley Holme," Willingdon Road, Willingdon, Eastbourne.

Mr. C. R. Emary, M.B.E.

In the Honours List, published on June 8, appeared the name of one of our best known members, Mr. C. R. Emary, ex VS6AX and now G5GH. It can now be revealed that Mr. Emary, was attached to H.M. Consulate at Valencia during the recent Spanish Civil War, the Medal of the British Empire having been awarded to him in recognition of radio work carried out whilst in that country.

We offer him, on behalf of all members, our very heartiest congratulations. Mr. Emary is now in Gibraltar on special duties.

R.S.G.B. Slow Morse Practices

Details appear below of the slow Morse practices organised by the Society for those members wishing to learn or improve their code. As usual, test matter will be taken from recent issues of THE T. & R. BULLETIN. The page number and month of the issue will be given at the end of each test, by telephony. A telephony announcement will also be given at the commencement of each test to assist those interested in tuning-in the sending station. It is emphasised that reports will be appreciated and are desired in order to ascertain useful range and numbers utilising the service. If, however, a reply is desired, a stamp should be sent. Will stations in areas not at present served offer their services to Mr. T. A. St. Johnston (G6UT), "Normandale," Little Hallingbury, Essex. (Telephone: Bishop's Stortford 785.)

	B.S.T.	k.c.	Station	Location
Sundays ...	09.00	1,755	G8NF	Manchester
	09.00	1,865	G3LP	Cheltenham
	09.30	1,792	G8AB	Loughton
	10.00	1,800	G8PR	Staffordshire
	10.15	1,920	G6VC	Northfleet
	10.15	1,765	GW3GL	Conway
	12.30	1,758	G6VD	Leicester
Tuesdays ...	22.00	1,934	G3GH	N. Devon
Wednesdays	22.15	1,865	G3LP	Cheltenham
	22.30	1,813	G4AU	Charlton
Thursdays...	21.30	1,765	GW3GL	Conway
	22.00	1,934	G3GH	N. Devon

NEW MEMBERS

HOME CORPORATES

D. CARR (G2XU), 23, Highfield Road, Churchtown, Southport, Lancs.
D. E. GRAY (GM3LG), 55, Viewforth Street, Kirkcaldy, Fife, Scotland.
W. C. FLINTOFF (G3UG), 27, Eden Street, Saltburn-by-the-Sea, Yorks.
F. C. MOORE (G3ZM), 27, Midland Street, Nelson, Lancs.
L. J. PHILPOTT (G4BI), 30, Bradgate Hill, Markfield Road, Groby, Leicester.
W. F. COOPER (G4GN), "Ravenswood," Weston Road, Gloucester.
L. J. GROVES (G4GT), "Berkley," Canewdon View Road, Ashingdon, Essex.
R. MOFFITT (G5KX), 1, Balmoral Drive, Southport, Lancs.
C. S. BROWN (G5QU), 16, Canterbury Road, Redcar, Yorks.
R. W. H. BLOXAM (GM6LS), 15, Corstorphine Hill Road, Edinburgh, 12, Scotland.
J. BARNARD (G8BA), 28, Wheatley Hall Road, Doncaster, Yorks.
C. P'ANSON (G8DQ), 5, St. Clair Drive, Churchtown, Southport, Lancs.
W. D. MANSON (G8PW), 6, Wigsby Avenue, Moston, Manchester, 10, Lancs.
G. H. MEARA (2AGN), 85, Desmond Avenue, Beverley High Road, Hull, Yorks.
J. W. JACK (2AJW), 52, Newlands Road, Grangemouth, Stirlingshire.
T. A. JARDINE (2BMJ), 42, Aldermanhill Road, Dumfries, Scotland.
J. W. R. HILLIER (2BYH), 34, Selbourne Road, Weston-super-Mare, Som.
J. HAMILTON (2CJH), 48, Queen's Road, Preston, Lancs.
L. J. FITZGERALD (2CKJ), 39, Spratt Hall Road, Wanstead, London, E.11.
A. M. BOYCE (2CMR), 34, Carr Avenue, Butterstile Lane, Prestwich, Lancs.
A. E. BERSON (2CUP), 3, Moorlands Road, Camberley, Surrey.
L. FRANK (2FIO), 4, West Albert Park, Liverpool, 17, Lancs.
B. H. BRIGGS (2FJD), 20, Lindley Drive, Gt. Horton, Bradford, Yorks.
J. E. RAND (2FOX), 2, Brunswick Street, St. Paul's, Cheltenham, Glos.
T. ALMOND (2FST), 31, Cann Bridge Street, Higher Walton, Preston, Lancs.
G. H. TALBOT (2FTD), 46, Snaresbrook Drive, Stanmore, Middlesex.
J. E. P. WALFORD (2FVN), Middleton Stoney House, near Bicester, Oxon.
R. J. A. KEMP (2FVP), 29, Capel Street, Calverley, near Leeds, Yorks.
R. T. YOUENS (2HAR), 104, Baldwin's Lane, Croxley Green, Rickmansworth, Herts.
Capt. P. A. O. NORTHEY (BRS3624), The Willows, Datchet, Bucks.
F. DAVY (BRS3625), 9, Chestnut Avenue, Bury, Lancs.
J. N. WEBB (BRS3626), Easemore Farm House, Redditch, Worcs.
W. M. NEWTON (BRS3627), White Lodge, Hollin's Lane, Accrington, Lancs.
H. HARPER (BRS3628), 9, Devizes Road, Swindon, Wilts.
F. C. WATTS (BRS3629), 7, Fifth Avenue, Filton, Bristol 7, Glos.
V. G. MURUGESAN (BRS3630), Marconi College, Chelmsford, Essex.
G. P. VAIDYA (BRS3631), Marconi College, Chelmsford, Essex.
R. S. J. WILLIAMS (BRS3632), 19, Beechdale, Winchmore Hill, London, N.21.
J. GLEDHILL (BRS3633), 41, Deane Road, Fairfield, Liverpool 7, Lancs.
H. S. MARSHALL, M.B.E. (BRS3634), 15, Quarry Rise, Tonbridge, Kent.
D. C. WOODFORD (BRS3635), 21, Burns Avenue, Pitsea, Essex.
H. W. CARE (BRS3636), 9, Section, R.A.O.C., Catterick Camp, Yorks.
W. G. H. CATES (BRS3637), "Wildys," College Gardens, New Malden, Surrey.
T. C. CHARLTON (BRS3638), 39, St. Ronan's Road, Southsea, Hants.
R. A. JEWELL (BRS3639), 13, Augustus Road, Wimbledon, S.W.19, London.
W. M. AITKEN (BRS3640), Flight "A" Squadron, No. 2 Wing, R.A.F., Cranwell, Lincs.
J. O. MATHEWS (BRS3641), 34, Lansdowne Road, Muswell Hill, London, N.10.
A. BAKER (BRS3642), Bank House, Dumfries, Scotland.
D. WATSON (BRS3643), 19, Bedford Road, Firswood, Manchester, 16, Lancs.
A. B. W. WALES (BRS3644), 36, Wright Place, Path-head, Kirkcaldy, Fife.
G. S. BALDOCK (BRS3645), 70, Ardrossan Road, Saltcoats, Ayr.
G. W. B. MILLS (BRS3646), 1, Claude Road, Roath, Cardiff, Glam.
Miss M. ELLES (BRS3647), Totterdown House, Amesbury, Wilts.
R. A. NORRINGTON (Associate), 13, Fulshaw Avenue, Wilmslow, Cheshire.

DOMINION AND FOREIGN

J. E. ROUE (VE1FB), 84, Spring Garden Road, Halifax, N.S., Canada.
K. R. SIVERTSEN (LA8J), Langgaten 46, Sandnes, Norway.
T. LOWREY (BERS470), H.M. Naval Wireless Station, Rinella, Malta.
CAPT. A. J. L. MOONE (BERS471), Headquarters, Meerut District, Dehra Dun, India.

Weston Group

Copies of the very excellent photograph taken at the Weston-super-Mare meeting and reproduced on another page, can be obtained from R. W. Brown and Son, 18, High Street, Weston-super-Mare. Size, 12" × 8" unmounted, 2s. 6d.; size 15" × 10" unmounted, 3s. 6d., post free in each case.

In Search of B.E.R.T.A.

Call.	Dominion Districts.	Colonies.	Total.
G8IL ...	25	14	39
G3BS ...	25	14	39
G6ZO ...	25	14	39
G5OJ ...	25	13	38
G2HX ...	25	13	38
W1WV ...	23	15	38
GM8HA ...	25	11	36
G2UX ...	22	14	36
G8KP ...	23	13	36
ZS6DM ...	21	14	35
G3JR ...	21	13	34
G5ND ...	24	10	34
G3BI ...	24	10	34
VU2AN ...	20	14	34
VU2FO ...	23	11	34
ZS6BT ...	18	15	33
G2GK ...	25	8	33
GM8MQ ...	21	10	31
W1IKT ...	21	9	30
G3DO ...	20	10	30
G2LC ...	24	8	30

Trade Notes

Messrs. Wingrove & Rogers, Ltd., 12, Dartmouth Street, London, S.W.1, have in production a new type of *Polar* condenser. Of the split-stator type, it follows, in general, the lines of the familiar E condenser, the same ceramic base and method of construction being employed. The brass vanes are widely spaced, making the condenser suitable for transmission work with moderately high voltages. Connection is made to the centre portion of the moving vanes *via* a low resistance pigtail.

The nominal capacity is 30 μμF per section, making the overall capacity 15 μμF. Measurement showed the actual capacity to be slightly in excess of these figures, but that is no drawback. The minimum capacity per section was found to be 3 μμF, or 1.5 μμF overall, a commendably low value.

A test was carried out in a ultra-high frequency transmitter with one of the new condensers, which are evidently intended for this class of service. Using an input approaching 50 watts, the performance proved satisfactory in every respect.

The new model, which occupies very little space, can be recommended for service in any type of high frequency apparatus requiring a low-loss, low capacity component. J. N. W.

* * *

The Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2, have recently published a very useful valve reference chart which will prove extremely popular in amateur circles. The chart is in eight sections, each with a differently coloured tab to assist in obtaining a quick reference.

The various sections dealt with are :—

1. Mazda equivalents—BVA types.
2. Battery types.
3. & 4. A.C. Mains types.
5. Universal types.
6. Special types.
7. Earlier types.
8. Base connections.

Sheet 1 gives the Mazda types in red and equivalent types in black.

Sheets 2-7 contain comprehensive technical details of all Mazda valves listed, together with a base connection code which can be checked against Sheet 8. The price of each valve is also listed.

A special stud fitting permits the easy replacement of sheets.

A copy of the Chart can be obtained on application to the address quoted above.

* * *

We have been advised by *Messrs. British Tungsram Radio Works, Ltd.*, that they have now available a range of 1.4 volt battery valves suitable for operation from a single dry cell. These valves are direct equivalents of the American counterparts as manufactured by R.C.A. and Sylvania.

The types are as follows :—

1A7G. Frequency changer of the pentagrid type.
1N5G. R.F. Pentode vari mu.
1H5G. Single diode triode.
1A5G. Low consumption output pentode.
1C5G. Medium " " "

All valves are fitted with an octal base and the filaments are rated at 50 milliamps consumption, except in the case of the 1C5G which consumes 100 milliamps.

D. N. C.

Tungsram Footless Valves

Those who attended the Western Counties P.D.M. early in May, were among the first amateurs in this country to see samples of the new Footless Valves introduced by *British Tungsram*.

Of unique design, especially suited for u.h.f. work, they will, we forecast, enjoy much popularity. The following is a list of code numbers, types and provisional prices :

EF11 and EF12	High Frequency Pentodes	10/6
ECH11	Triode Hexode ...	11/6
EBF11 ...	Double Diode R.F. Pentode	11/6
EL11 and CL11	Output Pentodes ...	10/6
AZ11 and CY11	Rectifiers	9/0
EM11 ...	Magic Eye	8/6

We hope to give a full technical description in our next issue.

The Candler System

For many good technicians, the one stumbling block in the way of obtaining a full licence is the Morse test, which, although not difficult, nevertheless, calls for considerable concentration in the initial stages.

Numerous quick methods of learning the Code have been evolved, but it is doubtful whether any more scientific system has ever been devised than the one introduced by Mr. Walter H. Candler, of Asheville, North Carolina. For years this system has been used in America not only by radio amateurs, but by Commercial and Service students.

During the past few months British amateurs have had their attention drawn to the *Candler System* in a series of informative and original advertisements in this journal, and already we are advised a large number of enrolments have been registered.

The *Candler System* is divided into three Courses : (*a*) Junior, (*b*) Advanced, (*c*) Telegraph Touch-Typewriting.

Each course is available on deferred payments.

An interesting " Book of Facts " which explains the system in some detail is available from the London Representative, Room 55, 121, Kingsway, London, W.C.2.

An Appeal

We have received a request from three Spanish Amateurs, who are at present in a Refugee Camp in France, for old Radio journals published during the last three years so that they might bring themselves up to date with modern developments.

The address is : Florenci Borrell, Campo de Acogimiento, Islote letra K Barracòn No. 12 Aviación, Gurs (Pau-B.P.), France.

Stray

GM8QD thanks his numerous friends for past QSO's, and hopes to meet them all again soon under a ZS call.

NOTES and NEWS from the BRITISH ISLES

DISTRICT REPRESENTATIVES.

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

DISTRICT 2 (North-Eastern).
Yorkshire (West Riding, and part of North Riding).
Mr. L. W. PARRY (G6PY), 13, Huddersfield Road, Barnsley, Yorks.

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

DISTRICT 4 (East Midlands).
(Derby, Leicester, Northants, Notts.)
MR. I. RIDGWAY (G2RI), 90, Romway Road, Leicester.

DISTRICT 5 (Western).
(Wiltshire, Gloucester, Hereford.)
Mr. J. N. WALKER (G5JU), 4, Frenchay Road, Downend, Bristol.

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

DISTRICT 7 (Southern).
(Berkshire, Hampshire, Oxfordshire, Surrey.)
Mr. W. E. RUSSELL (G5WF), "Milestones," Westfield Road Mayford, Woking, Surrey.

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

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

DISTRICT 10 (South Wales and Monmouth).
MR. A. J. FORSYTH (G6FO), 29, Stow Park Avenue, Newport, Mon.

DISTRICT 11 (North Wales).
(Anglesey, Carnarvon, Denbighshire, Flintshire, Merioneth, Montgomery, Radnorshire.)
MR. D. S. MITCHELL (GW6AA), "The Flagstaff," Colwyn Bay, Denbighshire.

DISTRICT 12 (London North and Hertford).
(North London Postal Districts and Hertford, together with the area known as North Middlesex.)
Mr. S. BUCKINGHAM (G5QF), 41, Brunswick Park Road, New Southgate, N.11.

DISTRICT 13 (London South).
MR. J. B. KERSHAW (G2WV), 13, Montpelier Row, Blackheath, S.E.3.

DISTRICT 14 (Eastern)
(East London and Essex.)
MR. T. A. ST. JOHNSTON (G6UT), "Normandale," New Barn Lane, Little Hallingbury, Bishops Stortford.

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

DISTRICT 16 (South-Eastern).
(Kent and Sussex).
Mr. W. H. ALLEN (G2UJ), 32, Earls Road, Tunbridge Wells.

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

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

DISTRICT 19 (Northern).
(Northumberland, Durham, and North Yorks.)
MR. R. J. BRADLEY (G2FO), "High Crest," Yarm Road, Eaglescliffe Co. Durham.

SCOTLAND.
MR. JAMES HUNTER (GM6ZV), Records Office 51, Camphill Avenue, Langside, Glasgow.

NORTHERN IRELAND.
Mr. J. A. SANG (GI6TB), 22, Stranmillis Gardens, Belfast.

NEW MEMBERS ARE CORDIALLY INVITED TO WRITE TO THEIR LOCAL DISTRICT REPRESENTATIVE.

DISTRICT 1 (North-Western)

THE North-Western P.D.M. held on May 21 at Chester (reviewed elsewhere in this issue) was a complete success, and the D.R. would like to record, on behalf of all those who were present, how much the members appreciate the opportunity which this event affords each year of meeting our Secretary (Mr. J. Clarricoats) in the flesh and also to thank him for giving up still another week-end in order to attend this meeting. It is hoped that still more members will demonstrate their appreciation by attending next year's P.D.M., which is to be held in Manchester.

Reports have been received from only two sections this month, but no doubt preparations for N.F.D. have kept the others fully occupied.

Burnley.—G5ZN is on 3.5 Mc. again with a W3EDP aerial, and 8TD is putting a good signal into K6, W7 and all districts of ZS with a single section 8JK beam. Please send reports to the T.R. by the 20th of the month.

Manchester.—Forty-eight members attended the last Manchester meeting to hear a very fine address given by Mr. G. J. Scoles, B.Sc. (Eng.), on "The Continuous Evacuation of Electronic Apparatus," well illustrated by lantern slides. At the conclusion the usual vote of thanks was passed, and Mr. Scoles was requested to express the appreciation of the members to *Metro-Vickers, Ltd.*, for their kindness in arranging for this address.

The transmitter used during N.F.D. was on view at this meeting, and final arrangements were made for this event.

A crystal register is to be prepared, so will all members please send a QSL card to G2OI giving frequencies of all crystals in use and bands being worked? A copy of the register will be sent to all those who contribute information, so please make this effort a success by sending that QSL card now.

56 Mc. activities are as follows: G3BY is working in conjunction with the Ashton Radio Society, and will be operating a portable transmitter on 59,212 kc. at Hartshead Pyke on June 25 from 10.00 to 19.00 B.S.T.; reports or contacts will be much appreciated. 6TL is operating on 56,316 kc. (telephony) every day at 23.00 B.S.T., also Monday, Wednesday and Friday at 21.00 B.S.T. The Friday night group schedule is still in operation from 2200 to 2330, and there is considerable activity after midnight each Saturday. The frequencies in use are as follows: 6TL as above, 6LC on 56,424 kc., 8BI on 56,280 kc., and 2OI on 57,152 kc. These members will be operating their own stations during the GW 56 Mc. Trophy Contest, using C.W. and telephony. Please watch these notes for additional schedules and frequencies.

By the time these comments are in print N.F.D. will be over, and the thanks of all members of this section are directed to those who helped to make it a success. The operation of the station established in this area will be reviewed and discussed at the meeting to be held in July.

DISTRICT 2 (North-Eastern)

The main event of the month was N.F.D. and all who helped in any capacity at the various stations are thanked for their assistance.

Huddersfield.—A dozen members assembled at G5VD on May 11 to discuss N.F.D. arrangements. G2PC and BRS3418 are welcomed as members. 8VF is off the air pending removal to Honley.

Keighley.—The new T.R., who has not, so far, received a single report from the local group, asks that he be kept in touch occasionally with the members in his area. G4DU is active and doing well with 2 watts input and 8UO was surprised recently to have a report on his 1.7 Mc. signals from Germany. Stations known to be active include 3NN, 3UV, 4DU, 4HI, 5VC, 6HF, 6MC and 8UO.

Doncaster.—The local radio society now has a membership of 27, which includes 11 members of the R.S.G.B. Some very interesting talks were given during the month: the first, on Transformers, by 2CLK, was much appreciated. On May 4, G4DP described some of his experiences as a flying-boat operator in the East. The following week, 2CKR and G4DP spoke about accumulators, and apparatus was rigged up showing the formation of plates. On May 18 the club funds benefited from a junk sale, when a large amount of gear changed hands. So far reports to the T.R. have come only from those members who are also members of the Doncaster A.R. Society; we should like to record the activities of the other R.S.G.B. members in the area, so please send along your reports.

DISTRICT 4 (East Midlands).

At the monthly meeting held in Nottingham on May 21, Mr. D. H. Thomas, of the University College, Nottingham, gave one of the most instructive talks we have had in recent times. He chose as his subject "Electrical Musical Instruments."

The transmitter built by G5VU for the 3.5 Mc. N.F.D. station was on view. A "swindle" in aid of N.F.D. expenses gave G2IX an opportunity of proving what a lucky man he is. A junk sale followed.

The meeting was attended by 36 members from all parts of the district.

Mansfield.—At the May meeting, attended by 11 members, it became evident that very much more interest is being shown in 58 Mc. work. It has been decided that, after the meeting on June 18, the monthly arrangements will be suspended until September. 2DPX is now G4DS, 3550 now 2APT, 3432 now 2BRJ. BRS3593 receives a hearty welcome. We understand that G8OT has left the district for service with the R.A.F.

Leicester.—All members are active and a lot of very good work is being done on 1.7 Mc. The recent Trophy Contest was won by the T.R., G6VD, who, in spite of a 5 per cent. handicap, just beat G8CZ by the narrow margin of .15 of a point. The cup, which was presented at Nottingham, will be held for three months. A medallion was also given to the winner.

No reports have been received from Derby, Worksop or Northants; the D.R. will be glad to hear from these towns.

The next District meeting will be held on Sunday, June 25, at the Royal Hotel, Town Hall Square, Leicester.

DISTRICT 5 (Western)

A splendid attendance was recorded at the *Bristol* May meeting, at which Capt. B. Wallich (G6BW) gave a very interesting talk entitled "DX Telephony Experiences." A demonstration followed of records of actual contacts, mainly on 28 Mc., the quality of the reproduction being remarkably good.

Many local stations are taking advantage of the present spell of poor conditions on the higher frequencies to carry out rebuilds. Increasing activity on 1.7 Mc., at all hours of the day and night, is noticeable. All the usual transmitting members are to be heard on one band or another, whilst much building is going on amongst AA and BRS members. In particular, 2FKK has built a battery-operated CO/PA transmitter, which both looks and acts well. G5UH has returned to Bristol.

Many members recently spent an instructive hour or two viewing the sound equipment at the New Palace Cinema. So many availed themselves of this opportunity that it became necessary to arrange parties on three separate evenings.

2FHA, of *Cheltenham*, has received the call of G4JZ. Interest in 56 Mc. is considerable, G5BK, 8LB, 3YZ and 8ML being active on this band. The latter uses both C.W. and telephony on 56,800 kc., and frequently carries out portable experiments. Schedules would be welcome. G8ML has heard G2AU, 5WH and 3QO, all nearly 50 miles distant. Round table contacts take place on 1.7 Mc. with stations in the Midlands.

Activity is normal in other centres. G4GY has moved from Cheltenham to Marlborough, where he will be staying for the next few months. He reports that there are many amateurs in that town, the majority of them being members of the Marlborough Wireless Society, which possesses its own calls, G5MC and 2MS.

DISTRICT 6 (South Western)

The chief item of interest last month was the P.D.M. at Weston, which was well supported by District 6 members.

On page 764 will be found an announcement and rules regarding the Cadell 28 Mc. Challenge Cup, which local members are asked to study very carefully.

By the time these notes appear N.F.D. will be over. Whatever the result, and whatever the weather, the thanks of the District are due to all those who worked so hard to get the gear ready.

Torquay.—Meetings which are now over for this session will probably be started again in October. During the summer several 56 Mc. portable tests will be run; the D.R. would be glad if those interested will write to him for information. Suggestions as to the conduct of these tests will be carefully considered.

Exeter.—There was an attendance of fourteen at a meeting held on May 11. The T.R. reported on the Weston P.D.M. Until September meetings will be held on the second Thursday in each month. Local members please note.

Plymouth.—Nine members were present at the meeting held at G8HF, when transmitter troubles came up for discussion; this once more proved an interesting topic. It was decided to continue to hold meetings throughout the summer; the next is fixed for June 26 at 7.30 p.m. at G8PN, 26, Moor Lane, St. Budeaux.

North Devon.—Although all stations are known to be active, there is little of interest to report. G4CW has been carrying out some QRP tests with success. 3AM, who has built a new modulator, has increased his signal considerably. 6GM has been testing out a new transmitter for N.F.D. 3GH is rebuilding.

DISTRICT 7 (Southern)

A last reminder—the Southern Counties P.D.M. takes place next Sunday, June 18, at the Queen's Hotel, Southsea, assemble at 12.15 p.m. All will be very welcome, so *please* make an effort to attend.

Kingston.—Activity is still at high level, but, as usual, no reports are to hand. The Thames Valley, Kingston, and New Malden Societies recently held a joint meeting at the Albany, Twickenham, at which G6CL was the speaker. The following are active: G2GK, 2NH, 3DZ, 3MF, 3OR, 3VK, 5LC, 5MA, 6PK, 6KP, 8SM, 8TX, 2DLX.

Portsmouth.—Recent meetings have been occupied with N.F.D. arrangements. G2ZR is rebuilding with the help of 2AWC, and is obtaining H.T. supply from vibrator power packs. G2XC had the pleasure of a visit from W9BNZ, and runs 28 Mc. schedules with G2ZV. Best wishes to 2DJY, who temporarily leaves the district due to promotion.

Guildford.—G6NA demonstrated his temperature controlled exciter at the May meeting. The quality and stability were exceedingly good, and the ensuing discussion proved most interesting. G6GS has taken over the post of T.R. for the Guildford and Woking areas, and all local notes should be sent to him. The following are active: G4AP, 5RS, 5WP, 5YA, 6GS, 6LK, 6NA, 6YZ, 8CV, 8IX, 8LT, 8NT, 8UG. The next meeting will be held at the Royal Oak, Stoughton, Guildford, on July 2, at 2.30 p.m.

SOUTH OF ENGLAND PROVINCIAL DISTRICT MEETING

SUNDAY, JUNE 18th, 1939.

at the

QUEEN'S HOTEL, SOUTHSEA

Assemble	12.15 p.m.
Lunch	1.15 p.m.
Meeting	2.30 p.m.
Tea...	4.30 p.m.

Inclusive charge 6/6 if reservations are made before June 10th after that date, 7/6

Reservations, which need not be accompanied by a remittance, to Mr. E. A. Dedman, 75, Woodlands Avenue, Coombe, New Malden, Surrey.

Cambridge Calling.

DISTRICT 8 CONVENTIONETTE

SUNDAY, JULY 2, 1939

Meet at Market Place, Cambridge	10.45	a.m.
Visit to Colleges	11. 0	a.m.
Lunch, University Arms Hotel, Cambridge	1. 0	p.m.
Presentation of Trophies ...	2. 0	p.m.
Group Photograph	2.15	p.m.
River Trip to Clayhithe ...	3. 0	p.m.
Tea at University Arms Hotel ...	5.30	p.m.
Station Visits	6.30	p.m.

Price 7s. inclusive.

Reservations to Mr. S. Granfield (G5BQ), 47, Warren Road, Cambridge, not later than June 25. Please send stamped and addressed envelope for tickets.

Ladies cordially invited.

DISTRICT 8 (Home Counties).

A District Meeting was held at the Waffle Café, Petty Cury, Cambridge, on Wednesday, May 10, 1939, when twenty-two members were present. Business discussed included N.F.D. arrangements, and the Cambridge Conventionette, which takes place on Sunday, July 2.

Mr. E. Peach (G5PC), who is a District Controller, gave a comprehensive survey of the work of the Civilian Wireless Reserve, and answered numerous questions.

Mr. L. W. Jones (G5JO) followed with an interesting discourse on interference problems, and their cures. Special reference was made to third harmonics and Television. A very enjoyable meeting concluded with a demonstration of the Howard 450a receiver, by 3WW.

A hearty welcome was extended to Mr. J. Mustill (XZ2DY), who is home on leave from Burma.

Cambridge stations known to be active are G5JO, 5DQ, 8SY, 5OV, and 5BQ. The first-named, with assistance from 5BQ and 2XV, has constructed a four-element rotary beam, which will be ready for

testing shortly. 5DQ is still doing well on 14 Mc. CW, while 8SY, who has had difficulty in working DX, is finding an 8JK beam a cure for his troubles. 2XV is making a complete rebuild, while 5DR is not yet going from his new QRA.

Peterborough.—G3BK built the 7 Mc. transmitter for N.F.D., and tested it out from 3DY's station. 3WW has invested in an *Eddystone* E.C.R. receiver. 3DY, whose sixty-foot lattice tower is a landmark, is erecting a closely spaced four-element rotary beam. 2NJ, who is on 1.7 and 7 Mc., works from Heacham, Norfolk, at week-ends. He has just had his 4,000th QSO.

Bedford.—G5FO is on 7 Mc., but finds his extensive A.R.P. duties limit his operating times. 3JU is on 1.7 Mc.

power transceivers, and different types of portable radiators for these transmitters.

After an enjoyable tea, coupled with an informal ragchew, members went round the half-dozen local stations. As usual 8MU had some interesting apparatus to demonstrate; his oscilloscope and voice-actuated relay system accounted for a full shack. Thanks are due to the Ipswich T.R., G2AN, for arranging for such a suitable meeting place. It was decided to hold the next meeting on October, the exact date and place to be announced later.

Ipswich.—The chief activity has been in connection with the necessary gear for Field Day. G8MU is experimenting with an extended double Zepp on 14 Mc.; 6TI has now 30 confirmed contacts towards B.E.R.T.A.; 2JD is still seeking elusive 14 Mc.

FORTHCOMING EVENTS

June	16	District 15 (Edgware Section), 7.30 p.m., at G3HT, 4, Gainsborough Gardens, Edgware.
,,	16	District 12 (North London Section), 7.30 p.m., at Orpheum Cinema, Temple Fortune.
,,	18	Provincial District Meeting in Southsea. (See separate announcement.)
,,	21	District 14 (East Essex Section), 8 p.m., at G5VQ, 149, Westbourne Grove, Westcliff-on-Sea.
,,	21	District 15, 7.30 p.m., at G6PR, 38, Alpha Street, Slough, Bucks.
,,	22	District 13, 8 p.m., at Brotherhood Hall, West Norwood.
,,	22	District 12 (Watford Section), 8 p.m., at Carlton Tea Rooms, 77a, Queen's Road.
,,	27	District 14 (East London Section), 7.30 p.m., at G8AB, 35, Priory Road, Loughton.
June	28	Scotland "A" District, 7.30 p.m., in room "A" Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, Glasgow.
,,	30	Northern Ireland District Meeting, 6.45 p.m., at Thompson's Restaurant, Donegall Place, Belfast.
July	2	District 8, Conventionette at Cambridge. (See separate announcement.)
,,	5 *	District 1 (Manchester Section), at Brookes Café, 1, Hilton Street, off Oldham Street, Manchester.
,,	5	S.L.D.R.T.S., 8 p.m., at Brotherhood Hall, West Norwood.
,,	6	District 14 (Colchester Section), 7.30 p.m., at G8PZ. 19-21, Artillery Street, Colchester.
,,	9	Brentwood Radio Society D.F. Field Day.
,,	9	56 Mc. Field Day.
,,	12	District 18 (Hull Section), 7.45 p.m., at Hull Technical College, Park Street.

* *Sale of disused apparatus at this meeting.*

Hunts.—G4AZ (Fenstanton), who is on 7 Mc., is erecting a V beam. 6WA is on 1.7 Mc. occasionally, and 5RL on 3.5 Mc. at week-ends. 2FZQ is inactive owing to the severe illness of Mrs. Holt. We all trust she may have a speedy recovery.

DISTRICT 9 (East Anglia)

The District meeting held at Ipswich on Sunday, May 14, enjoyed the support of members from widely scattered parts of East Anglia. The D.R. took charge of the proceedings, and welcomed G2UJ, the District Representative for District 16, whose chat on the activities and meetings held in his area proved very interesting.

The Norwich 56 Mc. exponent, G6QZ, related some of his recent experiences on this band; and described his results using a W 8 JK beam as compared with other types of arrials. G5QO raised some points concerning ultra-high-frequency low-

DX; 3OJ is rebuilding his transmitter for use on 7 and 14 Mc.; other active stations include 2AN, 3XT, 8AN, 8IS, and 8WI.

Great Yarmouth.—G3RW eagerly awaits delivery of an *Eddystone* E.C.R. receiver. Mr. A. Thompson's A.A. call, which was given incorrectly last month (it should be 2BXJ), has now completed his frequency meter monitor; 2FAO is experimenting with C.O. stages with interesting results; 2BIC, who has moved to a more satisfactory QRA, now has more room for his various aerials; BRS3366, 3468, and 2999 are active.

Norwich.—G8VW reports an increase in membership and activity here appears to be fairly high. G6QZ is on 56 Mc.; 2MN is operating regularly on 1.7 Mc.; whilst 2UT, 6UA and 8VW are hunting DX on 14 Mc.

Lowestoft.—We welcome two new Lowestoft members, Mr. H. S. Harper (BRS3623) and Mr.

R. E. Seppings (2FUL). G5QO has been re-erecting his 56 Mc. beam aerial and carrying out propagation tests ; 2CPL is constructing an ultra-high-frequency receiver ; 2CWO is making trolitul insulators.

Beccles and Bungay.—G3RK, who works on 7 Mc., has designed a high quality modulator. We wish 3IN (Saxmundham) a speedy recovery after his recent operation. Other stations known to be active are 3UT, 2APD, 2AFC and 2FFT.

DISTRICT 12 (London North and Hertford)

North London.—The May meeting was mainly devoted to a report from the chief N.F.D. operators, after which five-minute talks were given by various members.

Watford.—There was an attendance of 20 at the May meeting, during which a sale of surplus gear took place. The following are active : G5RW, 5RD, 6GR, 8CK, 3KP, 2HAR, BRS3585, 3583, 3601.

Central Herts.—The recent meetings held at G2SJ and 5ZS were mainly devoted to discussing arrangements for N.F.D. A new member, 2FRU, of Welwyn, has a very efficient station on top of Lockleys School ; an 8JK and a rotatable beam have been erected. G8PM has been transferred to the *Murphy* Radio Laboratory, where he joins 6XN and 6FL. At Hitchin 3VI and 3HM are now at the same QRA, each operating separately. 3SJ, of Letchworth, is now active on 1.7 Mc. phone, as is 3TL, of Stevenage.

DISTRICT 13 (London South).

A very successful junk sale was held at West Norwood on May 25 and we would thank all those who contributed to the success of the evening. News is somewhat scarce this month and no reports of meetings in Woolwich or Wimbledon are available. G2RC and 3TA are both active, the latter having contacted KA ; 2UX, 2JK, 3CU and 5PY are also active. 2ZQ and 3ZJ are busy with C.W.R. activities and find little time for amateur radio.

By the time these notes appear in print N.F.D. 1939 will be a thing of the past and we sincerely hope that those who took part enjoyed themselves. Hearty thanks are due to all who worked so hard to make the event a success.

DISTRICT 14 (Eastern)

District Representative.—T. A. St. Johnston (G6UT), " Normandale," Little Hallingbury, Essex. Tel. : Bishop's Stortford 785.

Town Representatives :—

Brentwood.—G. Turner (G3LA), " Avalon," Crow Green Road, Pilgrims Hatch.

Chelmsford.—R. L. Varney (G5RV), " Arvika," Galleywood Road.

East Essex.—B. C. Leefe (G5XI), 16, Carlton Road, Leigh-on-Sea.

East Essex.—Activities during the past month have mainly been connected with N.F.D. arrangements. At the May meeting, held at G5UK, final plans were made and operating schedules distributed.

The Southend Radio Society held its first D.F. contest of the season in conjunction with other Essex societies. The transmitter built by G2KH for these contests worked extremely well and good reports have been received.

Monthly meetings are to be held outdoors during the summer when weather permits.

G2SO is to be married shortly, and members presented him with a small memento and their best wishes for the future.

East London.—At the May meeting held at G2HR, Highams Park, N.F.D. was the chief topic. Stations G8ABP and G6UTP reported arrangements well in hand. BRS3502 has applied for A.A. permit and G3KZ for a 25 watt permit.

Romford.—At the field day held on April 15, and arranged by the Romford and District Radio Society, the Brentwood car finished six minutes before the Romford contingent. Southend, who entered unofficially, showed they have developed the art of D.F. work to a high degree.

During the month Dr. Bosch, of *Vacuum Science Products, Ltd.*, gave an interesting lecture. The Romford Club transmitter was put to good use at the National Service Rally held at Marylands Aerodrome.

DISTRICT 15 (London West, Middlesex and Buckinghamshire)

Attendance at meetings in Ealing and Hanwell always runs high, but a new level was reached at G6RW when thirty arrived, including Miss Bindeley (BRS3606), who is the first local lady member to attend a meeting.

By the time these notes appear N.F.D. will have passed, and we hope the score will justify the efforts of those who worked to attain success. We should like to thank all responsible for the replacement of the " YK " generator, and would assure them that great use will be made of it.

The Edgware section are holding meetings on the third Friday in each month, to which local members are invited.

The Edgware Short Wave Society now boasts eighteen fully licensed members. New calls include G4KD, 4JD and 4JU. 2BZD has obtained the call G4JT.

West London.—G3UQ reports a pirate who uses the call G4EE, and also that of Mr. Walters, G5CV. G4AR, 6CO and 2DRF report.

Wembley.—G5SR and 6WN are active, while 8PI complaints of local work on 14 Mc. and none on 1.7 Mc. He is quite right. Why do members of this district use 14 Mc. for local contacts and spoil it for those who wish to work DX on C.W. It seems high time that the bands were split to give every one a chance.

Edgware.—BRS2715 has left for South Africa and G6AC for Newfoundland. We wish them *bon voyage*. Active stations are G2SG, 4DN, 5VG,

6ZO, and those reported last month. The E.S.W.S. debate, "C.W. *versus* phone," ended in a draw. It was generally agreed that C.W. and telephony stations should use separate bands.

High Wycombe.—Town meetings are being held each month. Active stations are G2RL, 3MI, 6JK, 8JK, 8VZ, 2AKZ and 2BAO.

Slough.—No reports, but perhaps N.F.D. will wake things up.

Twickenham and Hounslow.—BRS3606 reports.

* * *

See "Forthcoming Events" for dates of District meetings.

DISTRICT 16 (South Eastern)

Ashford.—G2JV is testing a new transmitter with an RK23 final, 2QT is building a three-element beam, whilst 3SL, 6SY and 8RK are busy with aerial experiments.

Bognor.—G2ZV and 2DDD had the pleasure of entertaining Mr. Conklin, Assistant Editor of *Radio*, and his wife during their recent visit to England. They apparently elicited much useful information regarding U.H.F. work generally, and in consequence 2DDD is considering the construction of a concentric lines receiver. The Sussex S.W. & T. Club have arranged a visit to the television transmitter at Alexandra Palace on June 15, while a talk on Television will be given by G6OT a few days previously. 2ZV, who is preparing for the 56 Mc. Field Day, is very active on that band. He recently worked G6DH (110 miles) and G5UK (82 miles).

Brighton and Hove.—G6CY explained and demonstrated his new receiver incorporating the *Evrizone* tuner at the meeting held on May 4. 2BYD is congratulated on receiving the call G4JH. 3YY has contacted ZL on 7 Mc., and will shortly be working portable on 56 Mc. 3WR is experimenting with a *Reinartz* "square" aerial on 14 Mc. For European contacts he finds it equal to his Windom. 8AC is now licensed for 50 watts. Other active stations are: G2RU, 3HP, 3JF, 4JH and 6CY. BRS2134 has returned to Mexico, where he hopes to be on the air soon with an XE call.

Eastbourne.—G3CX reports that most members are rebuilding; G2AO and 5BW being the only stations on the air.

Gravesend.—The local group offer their sincere thanks to G5IL for his generous gift of a rotary converter, which will be used during field days. 2IZ constructed two 40-ft. demountable batten masts for N.F.D. Pressure of business has forced 2BDL to resign the secretaryship of the local Club which he has held since its inception, and the members wish to express their thanks to him for the work he has done to further their interests in the past. 2FUN has been elected in his stead. 6PG and 6VC continue their successful work on 56 Mc. All stations are active. We extend our sympathy to 2IZ on the loss of his father.

Heathfield.—Congratulations to BRS1173, who finished second in the receiving section of the VK/ZL Contest. He sends interesting details of stations heard on 56 Mc. with an 0-V-1. The list includes G6FO, who was heard on both May 11 and 12. 5JZ is experimenting with beam aerials. A 4-section W8JK aerial directed on VK gave consistant R8 reports on phone, a three half-wave current fed type was very indifferent, and at present a close-spaced array is undergoing test. A rotary is contemplated. 5PN is busy with C.W.R., 5PR active on 1.7 Mc., 4GW and 5AQ also report.

Maidstone.—G5XB recently gave a talk on D.F. work, and preparations are being made for a D.F. Field Day on June 18. The Club's 8-valve super designed and built by 5XB is now in use. Active: G5XB, 8UC, 2BXW, 2763, 2834 and 3552.

Medway Towns.—An extremely successful "Ham Evening" was held on May 10 which attracted an attendance of nearly 100—certainly a record for any District 16 event in recent years. A report appears elsewhere in this issue. M.A.T.S. is awaiting a full licence, and has enrolled four new members this month. 2BCH is now G4HG.

Tunbridge Wells.—G5OQ, who has finished an extensive rebuild, now has a most imposing rack more than 6 ft. high, the contents of which work well. 6OB is congratulated on obtaining his W.A.C. and W.B.E. 2UJ is again on the air after a rearrangement of his shack. 4AY, 4DM, 4IB, 5KV, and 6ML are also active. BRS3604 and 3634 are welcomed as new members.

Whitstable.—G4BY and 4FI are on 1.7 Mc., while 5CI is still doing well on 7 Mc., and hopes to be on 56 Mc. shortly.

DISTRICT 17 (Mid-East).

Cranwell.—G8FC is temporarily off the air owing to extensive rebuilding, and 3OI has had to neglect the monthly reports owing to studies. 6LU is still building his 56 Mc. super, so activity at the present moment is somewhat curtailed.

Brigg.—G8AP has dismantled his transmitter in favour of a new QRP rig. Activity at present will be confined to 7 and 3.5 Mc.

Pointon.—G8GI is still using a "V" beam aerial and collecting new countries. He has a sked on 1.7 Mc. with 6TV, and would be pleased to hear from other District 17 stations who would like to join in.

Lincoln.—A very successful meeting was held on Sunday, May 21, at the Queen's Hotel, when all members organising N.F.D. stations were present to discuss progress and final arrangements. It is hoped to arrange visits to other stations in the District during the summer season.

Boston.—Although no reports have been received from this area for some considerable time, it is known that all members are actively engaged for C.W.R. exercises, and that very little time is left for operation on the usual bands.

Grimsby.—All preparations for N.F.D. are complete, and by the time this appears in print it is hoped that the time and energy expended will have been justified. All local members are taking part.

DISTRICT 18 (North and East Yorkshire)

Driffield.—G5CJ, who has come to reside in Driffield from Kendal, is putting out a good 3.5 Mc. phone signal.

Hull.—The attendance at the last Hull meeting was a record, when a talk, given by G6OS on "Thermionic Emission of Valves" was greatly appreciated.

The next meeting will be held at the Hull Technical College, in Park Street, on July 12, at 7.45 p.m. Particulars of this visit have been given previously.

and it is hoped that as many members as possible will avail themselves of the kind invitation extended by Mr. C. T. Holmes (G3CH), who is in charge of the wireless section of the College.

G6OS has reached a total of 108 countries worked, and is awaiting cards to enable him to apply for membership of the exclusive D.X. Century Club.

Scarborough.—In spite of the approaching "close season," attendance at the weekly meetings is very good indeed. Morse practice nights have been arranged for Thursdays. Visitors to the Scarborough Short-Wave Society during May included G8IJ, 8UJ, 2BDG and 2AGH.

G8KU reports having worked 41 SPs in this year's contest. 8BB has a new 56 Mc. transmitter completed, and is carrying out tests with 4DY. The latter is rebuilding his final with an 809 triode.

G3KS has been doing exceptionally well on 14 Mc. phone. Both W.A.C. and W.B.E. were made within five days, aided by an 8JK beam, which can be erected in two different directions. 3AT is residing in Scarborough for the season.

York.—Mr. R. W. Hall (BRS3527) has been granted an A.A. licence.

Scotland

"A" District.—GM5CF, 8LS and 8MJ have taken up appointments in England, and GM8QD has sailed for South Africa. We wish them the best of luck in their new spheres. At the June monthly meeting, which will be the last for the season, a discussion of N.F.D. will take place.

"B" District.—No news, apart from N.F.D.

"C" District.—Mr. J. G. Halley (GM8CF) has resigned his position as D.O. subsequent to his appointment as controller of the local group of C.W.R. We thank him for the excellent work accomplished during his term of office. Mr. R. H. B. Candow (GM5SC) has been elected to succeed him.

"F" District.—The District were pleased to welcome at their last meeting GM5YX, 6JH and 6XI, when GM6RV demonstrated a Peto-Scott 0-V-2 receiver. 2DWY is now GM4JQ. GM5IR, who requires South American for WAC, has been working some good DX in Africa. GM6NX is testing a two-section W8JK beam, which has given him CE for his 105th country. Most stations are believed to be active, although reports are nil.

"G" District.—Miss D. Burns (GM2IA) is welcomed back to the ranks of active amateurs. On invitation, the station was visited by the District, and all were very royally entertained. By the time this appears in print GM6RG will be in U.S.A., but his station is still on the air, the operator being GM5FT. GM3TD has erected two tall masts, all other stations are active.

"H" District.—It is with regret that we see three of our members leave the fold to take up new positions in other parts of the country; we wish them every success and the very best of luck. Meetings are being well attended. Code practice is being well supported by those present, and the members are indebted to GM3NH, 4AN, FK, 6JJ and 8MQ for their services in this respect. At a recent meeting an interesting talk was given on long wire aerials by GM3NH, who used diagrams and a map to illustrate the theory. Extreme interest was evinced in this subject, which seems to show that experimental work in this direction is by no means dead. Meetings will be discontinued until September, but in the event of any special meeting being called members will receive individual notification. Members are asked to notify the D.O. immediately of any changes in QRA and call-signs. He also wishes to thank those who have assisted at meetings, in the operation of the N.F.D. stations, and for the co-operation that has been given by all throughout the season. The following are active: GM3LO, ND, LG, NH, UU, XO, 4AN, FK, GK, 6JJ, 8MQ, KR, KQ. Active on 1.7 Mc. are GM2NQ, 3ND, UU, XO, 4GK and 6JJ.

Northern Ireland

The teams for the four N.F.D. stations had made their arrangements at the time of writing, and they hope to keep the GI score well up to the top of the list again this year.

GI8TS expects to carry out a series of tests on 56 Mc. in July and would appreciate reports. On July 1 it is hoped to establish contact with GM2UU in Stranraer from a portable location at the Gobbins, Co. Antrim. On July 8 the projected site is on Slieve Croob (1,755 ft.) and schedules have been arranged with G8UB in the Lakes, GW6AAP on Snowdon and EI8L on the Wicklow Mountains.

Members are asked not to forget the District meeting on Friday, June 30 at Thompson's Restaurant Donegall Place, Belfast (6.45 for tea at 7 p.m.). Those with gear for sale or exchange should bring it along.

Late 56 Mc. News

Mr. Sherratt, G5TX (Cowes Isle of Wight), reports reception of PAOPN and ON4DJ at 2315 BST on June 8. Signals were S5.

During N.F.D. week-end G6CW and 8JV were consistently heard in London. G6OT (Southgate) contacted the former station on June 7, reporting his phone signals S7.

CALIBRATION SECTION

Crystals and frequency meters of the heterodyne type can be accepted for calibration and these should be sent **direct** to the Calibration Manager:

Mr. A. D. Gay (G6NF),
156, Devonshire Way,
Shirley,
Croydon, Surrey.

Crystals should be enclosed in a small tin and securely packed to avoid loss in transit, whilst frequency meters should be packed in a wooden box or substantial cardboard container.

Return postage for crystals and frequency meters must be enclosed as stamps and not attached to the postal order. The Society cannot accept responsibility for any loss or breakage that might occur in sending apparatus for calibration through the post.

Calibration Fees

Crystals, 1.7, 3.5 and 7 Mc. types... 1s. 6d. each
Crystals, 100 kc. type ... ... 2s. 6d. ,,
Heterodyne frequency meters 5 points within the amateur bands ... 5s.
For each extra point at any desired interval 6d.

The Western Counties Provincial District Meeting

HELD on Sunday, May 7, the Weston Meeting —arranged as a P.D.M. to cover Districts 5, 6 and 10—drew an attendance of no less than 97, which seems to establish this town as a very suitable *venue* for these gatherings. On this occasion we were also honoured by the presence of Mr. Arthur Watts, G6UN, President of the Society, who accompanied Mr. J. Clarricoats (Secretary-Editor) from Headquarters.

The chair was taken by Mr. Austin Forsyth, G6FO, D.R. of No. 10, the District acting as host this year. After luncheon and the group photograph, the business proceedings commenced with a very able and comprehensive review by " Clarry " of current R.S.G.B. affairs and activities; in a dissertation occupying some 70 minutes, he informed the meeting on such matters as licensing, frequency allocation, high power permits, T. & R. Bulletin policy and advertising, the steps being taken to meet a state of emergency, tentative arrangements for Convention, Certificate awards, the QSL Bureau, and an outline of the method by which Council keeps the country representatives in touch with London.

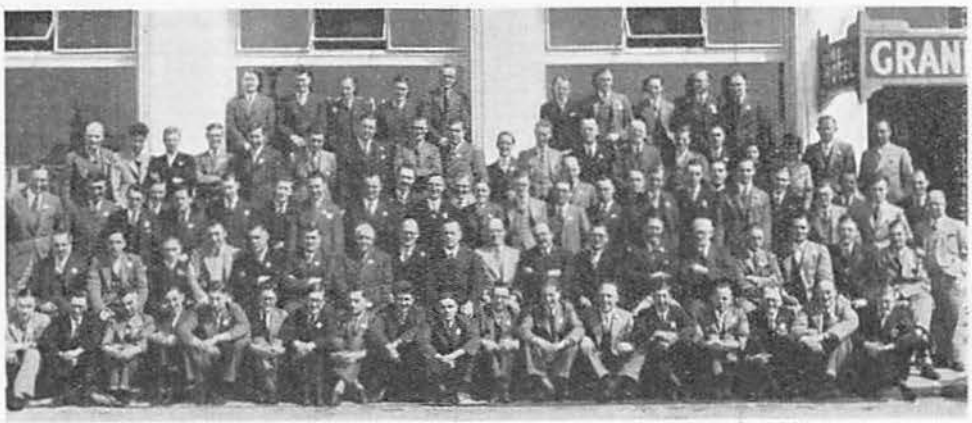
The meeting was then thrown open for general discussion, and members raised points connected with Amateur Radio in defence organisation (G6LQ), alleviating the load on the QSL Bureau (G5LM), the question of a subsidy for T.R.s (2BAR), a licence examination (G6PF), and the system of provincial representation on Council (G2JL). This particular matter—from the contention of G2JL and his supporters that the country is not adequately represented on Council—led to a very free discussion, bringing in the question of D.R. election as opposed to appointment, to which opinions were contributed both for and against by (among others) 8UH, 8DA, 8HI, 5QA, 5JU, 2NG, 2BQB and 2UL.

The President's Address

The President then dealt briefly with all these queries and contentions, explaining that emergency communication in war-time was a matter for the Home Office, that a shortened address for direct delivery of cards by the GPO had already been considered but presented many practical difficulties, that local organisation expenses were best met by a small levy on the members concerned, and that the licence form was now undergoing revision. With reference to the larger matter of provincial representation on Council, Mr. Watts said that it was a problem continually before them in London and that — while Headquarters were anxious to meet the wishes of members in every possible way—it was not easy to devise a system which did not involve long journeys and heavy expense, to say nothing of the difficulty of time for those members of sufficient seniority and standing who might be called upon to serve on Council. Dealing with the suggestion that D.R.s should be *ex officio* members of Council, Mr. Watts characterised this as giving rise to a situation where office would be held without its responsibilities, since Council meetings took place sometimes twice a month and it was inconceivable that all D.R.s would be able to attend even as frequently as two or three times a year.

The President made it clear, however, that it was intended to go into the whole matter again as soon as possible and that for this purpose full note had been taken of the opinions expressed at the meeting. In order to clarify these, a straight vote was called for on the question of whether the system of R.S.G.B. representation should remain unchanged or be altered; 43 members voted for the existing system, 26 against it, and some 25 members abstained from voting.

The business meeting terminated with brief remarks on the progress of their Districts by Mr.



Photo, R. W. Brown & Son

The Western Counties Provincial District Meeting held in Weston-super-Mare on Sunday, May 7, 1939.

J. N. Walker, G5JU, D.R. of No. 5; Mr. W. B. Sydenham, G5SY, D.R. of No. 6; and Mr. Austin Forsyth, G6FO, D.R. of No. 10. As the three representatives concerned with the convening of the meeting, it was most gratifying to them to see contingents from such distant areas as Newbury, Malvern, Cheltenham, Torquay, Winchester and Swansea, as well as Messrs. Edwards, Cox and Wood of *Stratton & Co.*, Birmingham, and the two very welcome overseas visitors, VU2EB and SU2TW Bristol members were present in force, and in addition to those who crossed by steamer from South Wales, a party of 24 came over from Cardiff in three 'planes chartered from *Western Airways*.

The Top Table—G6UN and G6FO chat, whilst G6CL wields the pen

The only regret after a very successful meeting is that, once again, reservations were barely half the attendance; this meant unnecessary crowding, a very awkward situation for the manager of the Grand Central Hotel, and much anxiety on the part of those responsible for the arrangements, particularly as several late-comers had to take their meal away from the main party. All this could have been overcome by a penny postcard in advance? A.F.

The North-Western Provincial District Meeting

IT is again the writer's pleasure to give a brief account of the North-Western P.D.M., which was held on this occasion at the "Bars Hotel," Chester. The D.R. (Mr. J. Noden) is to be congratulated upon the arrangements he made for the benefit of those who were able to attend. Sixty-six members were present.

Owing to the fact that Chester had been selected as the venue of this year's meeting a number of members living in the North Wales area were able to be present, including the District Representative (GW6AA) and Mr. and Mrs. Read (G6US), who came from Oswestry.

Members began to arrive at the hotel about midday and long before 1 p.m. there was a full gathering improving its appetite for lunch. The latter was quite informal and no speeches were permitted. A short interval followed, during which members obtained a breath of air and posed for numerous photographs.

The business of the meeting was then opened by Mr. Noden, who began with a brief review of the year's work from the D.R.'s point of view. He then called upon each of the Town Representatives present in turn to say a few words about the position in their own particular areas. Liverpool, Manchester, Blackburn, Blackpool, Bury, Crewe and Warrington were all represented and the remarks of the T.R.s showed clearly that activity and membership is steadily increasing, particularly in regard to 56 Mc. operation. The question of District Notes was briefly mentioned by the District Scribe and the D.R. then read a message from VU2FO (via 6GL) wishing members a successful meeting.

The D.R. concluded his remarks by referring to the forthcoming National Field Day arrangements and explained that as he had received six applications to operate the four permitted stations he had allotted one station to the Manchester area and one to the Liverpool area, the remaining two being allotted by ballot to two of the other applicants. The frequencies to be used by each station were also allotted by ballot. This announcement led to a very animated discussion as to the procedure to be adopted in the future and in order to allow the meeting to proceed the debate had to be closed!

The most important business of the meeting then commenced, namely, the address by our Secretary, G6CL. The venue of next year's meeting was put to the vote and by a large majority Manchester won the day. Mr. Clarricoats then proceeded to congratulate the Burnley members upon the considerable increase in membership in their area and their support of R.S.G.B., and went on to review the position regarding licences, dealing particularly with the question of authorised frequencies, high power permits and off-frequency working. This was followed by a short outline of technical progress, mention of the forthcoming Conferences at Stockholm and Rome, an appeal to members to buy British-made apparatus, a reference to the BULLETIN and the need for technical articles, examples of the problems arising at Headquarters, and an announcement about Convention; finally he thanked the District Representative and the Town Representatives for their support during the past year.

Owing to the very thorough manner in which G6CL had covered the ground very few questions were asked at the conclusion of his remarks, and 6AA accordingly proposed a hearty vote of thanks, which was duly seconded by 6TW and carried in the usual manner. After a brief reply by 6CL and another short interval for more fresh air an excellent tea was served, and while this was in progress the D.R. supervised the usual raffle to settle the ownership of a number of components.

For some unknown reason there do not appear to be any active stations in or about Chester, and it was, therefore, not possible to arrange station visits. The meeting was accordingly terminated after tea, but it was voted a complete success, and everybody seemed to have had a thoroughly enjoyable day, with the pleasure of renewing personal contact with members from other parts of the district and from District 11.

H. W. S.

Congratulations

We offer heartiest congratulations to Dennis and Eileen Heightman, of G6DH, on the arrival of a Junior Operator. Clive Peter "came to town" at the DX hour of 2 a.m. on May 24.

Letters to the Editor

The Editor does not hold himself responsible for opinions expressed by correspondents

ADVERTISING QUESTIONNAIRE

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—I wish to thank the very large number of members who so kindly furnished me with the particulars requested in the Questionnaire which was included in your March issue. The information they have given will prove of great value and interest to the radio trade, and I am confident that present and prospective advertisers will, on receipt of the details I am correlating, appreciate that it is to their advantage to continue or to commence bringing their products to the notice of readers.

Question 8 produced more than 50 useful suggestions, with a preponderance of opinion in favour of a greater variety of wire-wound resistors and metal chassis being made available. In addition, members suggested that a wide market exists for relays, modulation and Class B transformers, rotary beam aerial kits, light tubing for beam aerials, high voltage split-stator transmitting condensers, and various coils for ultra-short wave work.

Members may be assured that I shall always endeavour to include in the advertising pages of this journal announcements which will be of equal value both to themselves and to our advertisers.—Yours faithfully,

H. FREEMAN,
Advertisement Manager,
R.S.G.B. Publications.

TELEVISION INTERFERENCE

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—With reference to third harmonic interference to television receivers, I should like to state what has been done in my area. We had a number of television receivers working in my road, but none were picking up my transmissions on 14 Mc. Recently, however, a very expensive set was installed on the other side of the road at a distance of 20 yards. After a complaint had been made that I was causing interference, the Post Office engineers asked me to try several types of wave traps, but these were of no use.

Although I have a television set working in my own house with the aerial only 6 ft. away from the transmitting aerial, it does not pick up any interference when using 25 watts on 14070 kc. This seemed to baffle the Post Office engineers, as they did not think it was possible. However, I suggested to the makers of the television set that they should make new I.F. coils, which they were kind enough to do. This cured the trouble immediately, and I am now able to work at any time without causing interference.—Yours faithfully,

H. H. LASSMAN (G2PX).

AC4YN

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—I shall be obliged if you will warn all members to take more than ordinary care in reporting upon the signals of any station signing "AC4YN." Since July, 1938, a station has been persistently using the call-sign of this station with an occasional change to "AC4YR," and there are a number of amateurs in many parts of the world, who are patiently awaiting cards which, of course, will never arrive.

The operator of the bogus station displays an unusual breadth of imagination and is an adept at deception. He advises that all cards are to be sent to Lhasa. Cards for "AC4YR" to be sent via "AC4YN"—the operators of both stations being well acquainted with each other!! His knowledge of Lhasa is unique!! and probably a persistent and curious amateur may discover that he bears the name of "Reg Fox"!!

Apparently, the strain of this deception proved to be too much for him while in contact with VU2FO, and little did he realise, in spite of his assumed knowledge of this station and its location, that the operator of VU2FO is the officer in charge of the official Government station responsible for wireless communication with Lhasa. His exit can well be imagined!

It is indeed disquieting to realise that even among the ranks of amateur operators we have those who will practise fraud, and if by nature they are not criminals, they are certainly cases in urgent need of mental examination.

The reasons for such deception are certainly beyond my understanding, and the result is disconcerting. Reports are invariably accompanied by very friendly letters, photographs and I.R. coupons, and in many cases the pleasure displayed by his victims as a result of working, as they often describe, "such rare DX," is pathetic.

In quite a number of cases I have replied, returning the I.R. coupons, but I give hereunder a list of those stations, the operators of which may be interested to know that "AC4YR" does not exist, and "AC4YN" did not operate on the date reported.

GI5QX, FB8AB, VK3ERS, VK2ADE, ZS6DY, VQ3HJP, ZE1JI, ZS6EU, XE1AM, HB9RDP, OK2SO, OK2OP, W5KC, W9UQT, W9BPU, W6TI, W8KKG, W9QOE, W6BDQ, W6MUR, W6LTM.

I have asked many transmitting and receiving stations to watch for the pirate and to try to get his bearing, and I shall be glad, for the sake of those wishing to contact *my* station, if all amateurs will co-operate. Once his country can be determined, and I have very strong suspicions as a result

of comparing reports, I shall approach the local amateur society with a view to assisting in locating the culprit.

In future, will all amateurs, after working "AC4YN," kindly hold their cards and correspondence until confirmation is received from this station. It will then be understood that no card means a bogus contact. All cards are despatched from Lhasa in sealed envelopes, which on arrival should bear an Indian postage-stamp and the Gyantse post-mark.

Yours sincerely,
R. N. Fox (AC4YN).

British Political Mission,
Lhasa, Gyantse P.O., Tibet, via Calcutta.

AN INTERESTING THEORY

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—As one of your many readers, interested in the possibilities of U.S.W. communication, I am sending an idea which might explain the freak results which have been achieved at these low wavelengths. Though such results have been very rare, I feel that they are, nevertheless, too numerous to be dismissed as freaks, and I am not satisfied with an explanation based on abnormal ionisation.

Normally these waves are not reflected back to earth in the useful manner characteristic of waves of longer length, nor probably are they absorbed or scattered, though they may be refracted, at the various reflecting surfaces. Consequently they travel away from the earth, not excluding even the ground wave which leaves at a tangent.

This has always appeared a drawback, and high angle radiation has been ignored, even though reflection from other bodies must occasionally bring them back to earth. In suggesting that this is the explanation of freak reception on U.S.W., I am not ignoring the immensity of the distance in a return journey even to the moon, and this question of distance will be mentioned later. Normally rays which are reflected back, are too weak to produce any response, due to the limits of sensitivity of our receivers, but when reflection is due to one of our companions in the solar system freak reception should be possible. The reflecting properties of the sun may be problematical, but a surface of volcanic ash such as exists on the moon, might make a god reflector while Venus offers an excellent surface by virtue of the clouds of water vapour by which it is completely surrounded.

As these waves have been called quasi-optical, a reference to light waves will show that the distances are not necessarily excessive. The amount of blue and violet light received from the sun diminishes rapidly with a decrease in its altitude, while the longer waves of red and particularly of infra-red are unaffected. This is caused by the additional score or so of miles necessitated by an oblique passage through our atmosphere. The ninety million miles of free space are insignificant compared with our atmospheric envelope of a few miles.

If then the shorter waves of wireless radiation are subject to the same discrimination, their failure to cover long distances within the limits of the upper reaches of the stratosphere, is explained. DX is only possible by a direct route through the atmosphere taken by rays at high angles to the earth's surface. As the return journey to the moon would only take 2½ seconds, the time lag could escape observation. Even if the moon or the sun were not at its zenith, Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto are also possible suspects, though the margin of error is smaller, due to the small angle they subtend to us.

I have erected a high angle radiator and hope soon to throw a miserable ten watts vertically upwards. Perhaps they will never return, but can anyone prove it without trial ?

I am,
Yours faithfully,
W. H. WALKER, 2DXS.

48, Stacey Road,
Cardiff.

INSULATING MATERIALS FOR THE HIGHER FREQUENCIES

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—Referring to the article on the above subject in the May issue, the power loss of porcelain must be a surprise to many who use this material for zeppelin feeders. It would be interesting to have the experiences of any who have compared results following the substitution of, say, trolitul for this purpose.

Yours truly,
H. BRABROOK (G5ZD)

DX Century Club

From the June issue of *QST* we notice there are now 14 British Isles amateurs listed as members of the DX Century Club. This represents over 10 per cent. of the total certificates awarded to date.

Out of 133 holders, the U.S.A. 2nd District leads with 19, followed by W1 with 18 and W8 with 17. The W6 stations, in spite of their high-power reputation, have but 11 certificates to their credit, a similar number to W3, whilst the very large 9th District only boasts one more. W7AMX is the sole representative for his District, whilst W4 with 6 and W5 with 4 also find difficulty in reaching the century mark.

The European contingent only accounts for 9 certificates, whilst Asia has but two representatives both in Japan. Australia, with 3, and New Zealand with 1, completes the story, except for two VE2's, two SU's and a single South African in ZS2F.

G6WY still leads the world with 144 countries, but W8CRA is running him close with 139.

The British Isles holders of the DX C.C. Certificate are :—G6WY (144), G2ZQ (132), G6RH (127), G5RV (111), G6CL (110), G5BJ (107), G2DH (107), G2TR (106), G5QY (105), G6KP (103), G5BY (103), G6NF (100), G5BD (100), G6MK (100).

56 Mc. Calls Heard

W. A. Scarr (G2WS), Beckenham Grove, Shortlands, Kent. During May, 1939 :—

56-60 *Mc.* : G2aw, 2dp, 2hg, 2lw, 2mr, 2mv, 2nh, 2od, 2rd, 2uj, 3oo, 5by, 5ox, 5rd. 5uk, 6cw, 6oh, 6ot, 6pg, 6wl, 8sk.

BRITISH EMPIRE NEWS AND NOTES

Australia (Queensland)

By VK4GK

With the advent of cooler weather, more time is spent indoors, as a result we hear increased activity on all bands with the exception of 28 Mc., which is definitely falling off. G stations can now be heard and often worked on both 7 and 14 Mc. in the early mornings.

VK4KH, who struck some trouble in getting his new eleven tube Super to work, has now qualified for Phone W.B.E. and is only awaiting one or two cards. 4YL has at last received her card from ZD2H, so is asking for B.E.R.T.A. 4JP will be the next.

VK4GK still maintains his schedules with VE5BI, which has been going for over seven years; are we near to breaking a record?

BERS195 has QSLs from 140 countries and has heard 172. CR4HT, of Cape Verde, and VP2SA are the latest.

Australia (Western)

By VK6WZ

Activity on 56 Mc. has been considerable here in recent months and during the week-end joining April and May (made longer by a public holiday) a comprehensive network was set up by fixed and mobile stations (all using crystal control and powers ranging between 10 and 48 watts,) to learn more of the band's possibilities. VK6BB, 6BW, 6GB, 6GM, 6LW and 6ZX operated in a large "elipse" drawn around the Perth metropolitan-suburban area. 6GB and 6GM, the two most remote stations, made contact over a distance variously reckoned at 47, 50 and even 58 miles. When checks have been made against Lands Department maps the correct figure should be known. Prior to this week-end test the "DX" record in VK6 stood at 20 miles. Further tests are to be arranged with higher power, directive arrays (all work so far done has been on simple vertical dipoles) and stations arranged in a straight line.

Other bands are settling-down into winter conditions. A recent "home QSO day" arranged by the T.D.S. of the W.I.A. brought about 45 stations on to a rather bewildered 7 Mc. band! VK6MW reports occasional activity on 28 Mc.

British West Indies (Eastern Group)

By VP2AT

VP2LC, *St. Lucia*, reports having work VK, ZL, PK, CT and VO, on 'phone. She has now contacted all United States, and awaits the last few cards to claim W.A.S. An Asian contact is needed for her to claim W.A.C. on 'phone. Both 2LB and 2LC entered for the A.R.R.L. Contest, but 2LC complains that the 'phone section is too hard on the throat!

VP4TI, *Trinidad*, has gone to the World's Fair. 4TR, who runs regular skeds with 2AT, is using a 6L6 crystal tri-tet as a modulated oscillator, and is getting fair results on 'phone. VP2GE, *Grenada*, broadcast a ball-to-ball description of the Cork Cup Cricket Tournament on 7 Mc. In *St. Vincent* 2SC is active on C.W., and is running over 100 watts to his P.A. 2SA is active on 'phone.

VP2AD, *Antigua*, is getting good results on 14 Mc. 'phone with his new modulator, and crystal mike. 2AC is still on C.W. on 14 Mc. 2AB is building a high power C.W. rig. 2AT is getting out well on 7 Mc. 'phone, but finds it difficult to raise anyone on 14 Mc.

The amateurs in Antigua met at 2AB's during April to discuss the formation of an amateur radio emergency communication link for the West Indies.

Burma

By XZ2LZ

XZ2EX-2DX worked overtime during the A.R.R.L. DX Contest and their bag of U.S.A. stations was the largest on record in Burma. 2DP is using 14,050 kc. for DX phone work. 2BH is putting out a first-class signal with his new transmitter. 2EM and 2LZ have worked intermittently on phone and C.W. but both have suffered from intense heat.

XZ2DY, who is now in G, hopes to meet many old friends of the ether. 2PB has been inactive since the arrival of his wife.

Channel Islands

By 2AOU

Jersey.—G3GS, who is still waiting for permission to operate on 28 and 56 Mc., is building a new all-British transmitter for four-band use (including 56 Mc.). Reports on his 14,100 and 14,380 kc. transmissions will be appreciated (usual times 22.00 to 23.00 G.M.T. on Saturdays). 2CNC is shortly moving to a new QRA, where he will be on A.C. mains. A welcome is extended to BERS468. 2AOU, as usual, is listening to DX, and is very pleased to have won the VK/ZL Receiving Contest.

Alderney and Guernsey.—We hope these islands have not sunk below the seas, for no reports are to hand.

Malaya and Borneo

By VS1AA

VS3AD reports the pirating of his call on 14 Mc., on which band he has never operated. 2AL has had interesting and unusual contacts with VP5 and 6. He also reports having worked VS2AR on 14 Mc. at the short range of about 50 miles. Newcomers to the amateur ranks in Malaya are VS1AP of Singapore and 2AD of Kuala Lumpur. VS1AI has just left for England on transfer. Our best wishes go with you, O.M.

Malta

By ZB1E

It is regretted that, owing to a delay in the post, last month's notes reached Headquarters too late for inclusion in the May issue. These notes therefore cover the two months' period.

The first week in April saw an improvement in conditions on all bands, and, with the exception of occasional static of the crash type which has now given place to the more persistent "frying" static,

this amelioration has been maintained during most of the evenings through to the present time of writing (end of May). BERS453 reports that the 28 Mc. band was open for odd periods during April and some W 'phones were heard at good strength.

On the 14 Mc. band ZB1L is awaiting a South American contact for WAC on 'phone, while 1E has worked W6 and 7, HC1, CM2, CE3, HH3, PY, LU, VP2, VP5, VP9, KA7, KB6 and YV5 (C.W. or 'phone). ZB1X has become the possessor of a "Sky Champion" receiver, while 1S is getting out fairly well with 9 watts input on 14 Mc. BRS981 is held up in his experiments on the 56 Mc. receiver owing to a poor location, where at present signals come in even with the tuning coils out of circuit!

The Burma Amateur Radio Society

The Burma Amateur Radio Society was inaugurated on September 11, 1938, with the following three main objects:—

(1) To encourage the study of Radiotelegraphy and Telephony from the amateur point of view.

(2) To from a body of trained operators which will be available for establishing communication in an emergency and assisting the Police or Military with men and apparatus should this assistance be required.

(3) To safeguard the interest of Amateurs and their privileges in Burma under the International Agreements for the time being in force.

Membership is confined to Amateurs holding Burma Transmitting Licences while Associate Membership is open to those interested in Amateur Telegraphy and Telephony. The following are the list of officers and active members of the Society:—XZ2BH, U. Kyaw Min, I.C.S. (President); XZ2LZ, E. J. Dunkley (Honorary Secretary); XZ2EZ, Khin Mg Bo (Honorary Treasurer); XZ2EX, E. H. Smith; XZ2DX, D. Clamp; XZ2DY, J. Mustill; XZ2AC, Mg Hla Aung; XZ2DP, H. Kamen; XZ2PB, Major Bennett; XZ2EM, R. M. Hall.

Affiliation to the R.S.G.B. has already been granted and an application has been made for affiliation to the I.A.R.U.

A register of operating frequencies is maintained by the Society and every member is advised to consult this register before purchasing new crystals quencies.

The revision of Licensing Conditions was taken up by the Society with the Director-General of Posts and Telegraphs, and the following principal alterations have been agreed upon.

(1) The Director-General of Posts and Telegraphs recognises the B.A.R.S. as the official society representing Amateurs in Burma.

(2) The frequency of an Amateur licensed transmitter shall be controlled by a quartz crystal during the first two years of the operator's licensed experience. No electron coupled or master oscillator will be used during that period. If subsequently such is installed, it will not be used unless there is available a frequency standard by which it can be calibrated or checked before each transmission period.

(3) After five years experience an Amateur may be permitted to use an output power up to 120 watts at the special discretion of the Director-General of Posts and Telegraphs.

(4) Amateurs for the first two years of licensed practice may only use type A1 waves (viz. CW telegraphy) and operation is confined in the 14 Mc. band to one fixed frequency in the spectrum 14,250-14,440 kc.

(5) When applying for renewal of an Amateur Transmitting Licence, the applicant will be required to produce his log book to show evidence of activity during the licensed period.

In connection with revision (4), the Society has generally accepted the principle that on 14 Mc. frequencies from 14,000 to 14,250 are reserved for telephony and 14,250 to 14,400 for C.W. telegraphy.

After discussion with the Commissioner of Police it was decided to offer the organised services of the B.A.R.S. for the establishment of emergency wireless communication in the event of a breakdown of normal communication services. A scheme is now under preparation and each Amateur will be advised of full details.

HAM's in Trouble

We offer our apologies to the two London HAM's—Clark and Whyte—for the printer's error perpetrated in our last issue. In the account of the North London Dinner it was recorded that Mr. and Mrs. H. A. M. *Clark*, G4WY, were among the guests present. This should have read Mr. and Mrs. H. A. M. *Whyte*, G6WY.

Mr. H. A. M. Clark, G6OT, was present (as a District 12 member), as mentioned later in the article.

LAURIE WRAIGHT (G6OC)

We regret to announce the sudden death on Monday, May 22, of Mr. J. L. (Laurie) Wraight, G6OC, at the King Edward Memorial Hospital, Ealing.

Although not a very active amateur, owing to business activities, he held a first-class P.M.G. licence, and had travelled extensively as a ship's operator. Forsaking the sea for a position with *The Gramophone Co.*, Hayes, Middlesex, he later entered the Air Ministry Directorate, as a Radio Inspector. He was well known in District 15, and to members of the Thames Valley Club, as an intelligent radio engineer, ever willing to give whatever help his very limited time allowed. He was buried at South Ealing on May 26, and there were floral tributes from his many radio friends. Mr. Wraight was 30 years of age.

We extend our deepest sympathies to his widow, small daughter, and parents.

G5LC.

Contemporary Literature

By L. FRYER (GM2FR)

FIVE-METRE CRYSTAL CONTROL. Kenneth Jowers. *Television and Short Wave World.*

The article describes a simple two-valve 5-metre transmitter which gave good results in the last R.S.G.B. Ultra-short Wave Field Day.

The circuit uses an 802 in a tri-tet oscillator circuit controlled by a Bliley 10-metre crystal. The 802 provides an output of 2½ watts at 5 metres, which is just sufficient to drive a British valve, the ESW-20, as a straight final amplifier.

The transmitter less power pack, is built on a steel chassis 12 ins. × 8½ ins. × 4 ins., the carrier power on 5 metres being round about 8 watts.

* * *

GRID-BIAS POWER PACKS. N. M. Patterson (W4EG). *Q.S.T.*, September, 1938.

An analysis of the operation of grid-bias power packs and some practical points in their design, the author suggests some rules to follow in order to obtain desired results.

* * *

A PORTABLE OSCILLOSCOPE. *Television and Short Wave World.* October, 1938.

The article describes a small oscilloscope using an Osram type 4051 Tube.

The instrument is designed on commercial lines and is built in two units, the oscilloscope itself in one and the mains unit in the other thus making the mains unit available for other experimental work. The units are sufficiently compact to be carried in a small suit-case and would form a useful addition to the experimenter's test bench.

* * *

CARRIER TYPE REMOTE CONTROL. L. C. Waller. *Television and Short Wave World.* October, 1938.

This article is written by an American engineer and is extracted from the American publication, *Radio Retailing*, of Albany, N.Y. It deals with the uses of new cold cathode valve OA4-G, which is now available in this country, the article is of particular interest to amateur transmitters.

* * *

SOME DIFERENT TELEVISION AERIALS. S. West. *Television and Short Wave World*, October, 1938.

The author discusses some efficient designs of compact and portable types of aerials. The article though primarily for television experimenters will be of interest to 56 Mc. enthusiasts.

* * *

A LOW-POWER EMERGENCY PHONE TRANSMITTER. D. L. Warner (W9IBC). *Radio and Television.* January, 1939.

A description of a simple phone transmitter using a straightforward circuit, an 89 crystal oscillator driving a 6A6 radio frequency amplifier which has its two triode sections connected in parallel. The unit will deliver about 20 watts of modulated carrier to the aerial.

The speech section is equally simple, an 89 acting as speech amplifier, driving a single 6A6 as a class B modulator, this arrangement providing an adequate supply of audio power to modulate fully the radio frequency stage at any input power up to about thirty watts.

* * *

C.W. SUPER FOR THE DX MAN. Leigh Norton (W6CEM). *Radio*, January, 1939.

A description of a receiver designed solely for C.W. reception. While dispensing with many of the "frills" of commercial receivers, it stresses selectivity and sensitivity. The valve lay-out is, Radio frequency amplifier 6U7g, Mixer 6K8, Radio frequency oscillator 6F6, I.F. amplifiers two 6K7s, Power detector 6C5, Beat frequency oscillator 6F6, Output 6F6, and Noise limiter 6H6.

Plug-in coils are used, and all power connections are brought to a six-prong socket at the rear of the set, the power supply being 250 volts at 100 mA, and 6.3 volts at 4 amperes.

* * *

THE CO-AXIAL VERTICAL RADIATOR. John J. Long (W8ABX). *QST.* January, 1939.

This article is a description of the new Western Electric aerial developed for u.h.f. police work, and gives the results obtained by some amateurs when using home-made aerials of this type on 56.6 Mc.

* * *

THE QUADIRECTIONAL RHOMBIC. Dave Evans (W4DGZ/6). *Radio.* April, 1939.

The chief objection to the rhombic aerial as ordinarily used is its size and inability to work several directions.

The "Quadirectional rhombic" described by the author has neither of these disadvantages and can be used to cover the four points of the compass on 28, 14 and 7 Mc.

* * *

TRANSMISSION LINES AS CIRCUIT ELEMENTS. E. H. Conklin (W9BNX). *Radio.* April, 1939.

This article clearly and comprehensively covers the subject of optimum ratios of conductor diameter to spacing for best operation, and also deals with the problem of tuning a shortened line over a given frequency range.

* * *

SIMPLICITY AT 56 Mc. Frank C. South (W3AIR). *Radio.* April, 1939.

A description of a transmitter using a 6L6g harmonic crystal oscillator using a low-drift 7 Mc. crystal, exciting a second 6L6g doubler at 14 Mc. which feeds an 807 doubler to 56 Mc., all three stages being capacity coupled by 0.0001 mica condensers. The 807 is link coupled to a push-pull 808 final amplifier which has an input of 250 to 300 watts for 'phone and 450 watts for C.W. use.

* * *

EXPLORING BELOW ONE METER. J. P. Tynes (W6GPY) and J. W. Babcock (W6ZA). *QST*, May, 1939.

A brief description of the equipment used and the results obtained during tests on 325 Mc. over a path of approximately five miles.

The transmitter uses a pair of HK-24s in parallel as oscillators, the modulator being any unit having an output of 15 or 20 watts audio power, the

transmitter being supplied with approximately 650 volts H.T.

The receiver is a super-regenerative using a 955, followed by a transformer coupled 37 with a R.C. coupled 42 as output.

* * *

A THREE-ELEMENT ROTARY BEAM FOR £16.61. Albert J. Meyer (W7GBY). *QST*, May, 1939.

An interesting description of a 14 Mc. three-element rotary beam array which has stood the test of heavy winds. The most expensive item is the ⅜-in. hardened copper tubing used for the aerial elements.

* * *

A RIG FOR THE LEAN PURSE. Adolfo Dominguez, Jnr. (CM2AD). *QST*, May, 1939.

The author describes a simple transmitter using a 6L6g as regenerative oscillator capacity coupled to an 89 anode neutralised amplifier.

The set is designed for 7 and 14 Mc. work, a double-pole double-throw switch changing the aerial feeder, etc.

Any well-filtered power supply delivering 750 volts at 200 mA. can be used, and any modulator capable of supplying 25 watts of audio-frequency power may be used to modulate the amplifier for phone work.

The transmitter (except for power supply) is built on a wooden chassis 17 ins. long, 12 ins. wide and 4 ins. deep, all parts except valves, coils, crystal and aerial switch being mounted underneath.

The keying system is a combination of oscillator cathode and amplifier grid-blocking, giving clean keying and allowing break-in operation.

* * *

PRE-SELECTION POINTERS. Dana A. Griffin (W2AOE). *QST*, May, 1939.

A discussion on pre-selection is followed by a description of a one-valve pre-selector using a 954 acorn valve, the value of which has been proved by use in a number of amateur stations.

* * *

BUILDING RELIABILITY INTO THE PORTABLE RIG. W. K. Thomas (W8QAN). *QST*, May, 1939.

The author describes a transmitter using a type 89 operating as either a tri-tet or electron-coupled oscillator, followed by a type 807 amplifier.

The power supply uses an 83V in the oscillator supply, an 80 in the bias supply, and a pair of 866 Jr's for the amplifier supply.

The two units are built on metal chassis with "Presdwood" panels and housed in hinged-lid steel cabinets 7 ins. high, 7½ ins. deep and 14 ins. wide, the combined weight of the two sections being 57 lbs. With 50 watts input to the final, the A.C. load is 202 watts.

* * *

A COMPACT AND ECONOMICAL 500-WATT ALL-BAND TRANSMITTER. "Chuck" Jones (W6GNR). *QST*, May, 1939.

The author describes what he believes to be the ultimate in simplicity and economy. A straight 6L6 crystal oscillator is used working on the fundamental crystal frequency with no regeneration.

The amplifier using a type HK254 is simplified by the use of inductive neutralisation, a single-section tank condenser and capacity coupling to the oscillator. The article is well illustrated, and includes notes on the operation of the set.

INPUT RESISTANCE OF R.F. RECEIVING TUBES. George Grammer (W1DF). *QST*, May, 1939.

An interesting discussion on how various types of valves affect the circuit gain and selectivity at high frequencies. The article is illustrated by curves.

* * *

A SIMPLE 5-, 10- AND 20-METRE CONVERTOR FOR HOME AND CAR. Wells Chapin (W9DUD). *QST*, May, 1939.

The author describes a convertor using a type 37 as oscillator valve in a split-coil Hartley circuit, and a type 36 as mixer. The unit is built into a steel cabinet 6"×6"×6", all components being mounted on the front panel of the cabinet. While designed primarily for use with an automobile receiver, the unit can be used for phone and C.W., and is capable of either A.C. or D.C. operation, and is giving a good performance on the 5-metre band with a NC101X.

* * *

HOW TO LAY OUT A METAL CHASSIS. Don H. Mix. (W1TS). *QST*, May, 1939.

This article explains why *QST* does not publish scale drawings, and explains how anyone with a few tools can make a painless job of chassis construction. The methods described are those used in *QST*'s own workshop.

* * *

VOLUME COMPRESSION SIMPLIFIED. W. C. Lamb, Junr. (W6OGC). *QST*, May, 1939.

A description of a neat speech amplifier-compressor, the entire unit including power supply being built on a single 8"×12"×2½" chassis.

The first two stages are a 6SK7 and a 6SJ7, both pentode connected. They are followed by a 6C5, which provides a 500-ohm output, thus allowing the speech unit to be placed on the operating table. A 6H6 is used in the compression circuit and a type 80 in the power supply.

* * *

IMPROVED CONVERTOR DESIGN. Ray L. Dawley (W6DHG) and Leigh Norton (W6CEM). *Radio*, May, 1939.

A discussion of recent improvements and innovations in the design and construction of u.h.f. convertors which may be used both for mobile and fixed-station work. The results of various experiments are given, followed by descriptions of a three-valve convertor using a type 1852 as mixer, 6C5 as oscillator and a VR-150-30 as regulator for the screen voltage of the 1852, and a four-valve convertor using the same valves with an additional 6SK7 as radio-frequency amplifier.

* * *

A 100-WATT TRANSMITTER WITH FOUR-STAGE BANDSWITCHING EXCITER. George W. Shuart (W2AMN). *Radio*, May, 1939.

A description of a bandswitching transmitter using separate 6L6 doubler stages with fixed-tune anode circuits for each band, meter switching in all stages, and a 100-watt beam power final amplifier stage.

The set uses four 6L6s and either an RCA 814 or an RK 47.

* * *

CONSTRUCTION OF PLYWOOD RADIO TOWERS. Millard P. Koopman. *Radio*, May, 1939.

A description of a self-supporting 60-ft. tower the uprights of which are solid wood, the use of waterproof plywood being confined to the cross-

bracing, the advantage of the plywood cross-braces being the fact that they can be nailed into position.

* * *

MULTI-WIRE DOUBLET ANTENNAS. John D. Kraus (W8JK). *Radio*, May, 1939.

The purpose of this article is to describe a system in which the aerial is so constructed that the value of the resistance at the feed point is suitable for the direct connection of an open-wire line such as the 600-ohm type, thus eliminating Stubs, Q-sections and delta matching arrangements. Constructional data is given.

OUTPUT STAGES—(*Continued from page* 719)

ohms, and if the potential divider has a low resistance, it will tend to reduce the smoothing impedance. Useful valves are R_1 100,000 ohms and R_2 30,000 ohms. This will give about 30V negative bias at B which biases V_2 in the usual way via 100,000 ohms resister. A condenser of 50 μF should be connected, as shown for decoupling. The P-D across F_1 is approximately 100 volts at 50 mA.

HELPING HAND—(*Continued from page* 734)

mediate frequency employed in a superhet receiver. For instance, where the I.F. is 460 kc., crystal frequencies lying between 1,832 and 1,848 kc. will be liable to cause a heterodyne beat varying 2,000 cycles each side of zero point, according to the actual frequency. The interference is not likely to be severe but the steady, if weak, heterodyne produced can be very annoying, as it will be present no matter to which station the set is tuned.

The cure is to fit a wave-trap in the aerial circuit of the receiver or to use a crystal of a different frequency.

Harmonic Interference

The subject of interference caused by the radiation of harmonics of the main wave has been ably dealt with in an article published in the November, 1937, issue of this Journal and readers desirous of eliminating this type of interference are referred thereto.

The Cadell 28 Mc. Trophy

In remembrance of an enjoyable holiday spent in District 6 some two years ago, Mr. Cadell, VU2EB, has kindly offered to that District for annual competition a silver trophy which will be known as the Cadell 28 Mc. Trophy.

The D.R., on behalf of all members in his District, records his thanks to the donor.

The Rules governing the award of the Trophy follow :—

1. The Cup shall be competed for annually by District 6 members of the R.S.G.B. Each period shall be from January 1 to December 31, except in 1939, when the period shall be from June 1 to December 31.

2. The Cup shall be presented to the station making the greatest number of contacts on 28 Mc., with not more than one contact to count for each station worked, and subject to a percentage reduction of points according to licensed power as follows :—

Licensed power 500 watts, 25 per cent. of contacts counted.
Licensed power 250 watts, 40 per cent. of contacts counted.
Licensed power 100 watts, 60 per cent. of contacts counted.
Licensed power 50 watts, 75 per cent. of contacts counted.
Licensed power 25 watts, 90 per cent. of contacts counted.
Licensed power 10 watts, 100 per cent. of contacts counted.

3. The winner shall hold the Cup for one year and shall be responsible for its safety.

The Cadell 28 Mc. Challenge Trophy

4. Entrants will be required to sign a guarantee that their licensed power was not exceeded during any of the contacts.

5. Claims shall be forwarded to the D.R. prior to March 1 of the following year.

6. A Checking Committee comprising three A.A. members shall be set up each year.

7. The D.R. shall arrange for secret listening to be carried out whilst check logs will be obtained from selected non-transmitting members.

W. B. S.

QRA Section

Manager: H. A M. WHYTE (G6WY)

When sending in a new, or changed address members are requested to print their names and addresses in block letters, as frequently signatures and names of streets are illegible. This necessitates reprinting the corrected address in the next issue of the BULLETIN.

New QRA's

G2BB.—D. P. L. MAY, 223, Thornton Road, Thornton Heath, Surrey.
G2HX.—L. O. ROGERS, 133, Allison Road, Brislington, Bristol, 4.
G2MU.—E. J. BAVLISS, 30, School Lane, Kenilworth, Warwickshire.
G2SO.—M. GEDDES, "Pen Cuckoo," Linksway, Belfairs, Leigh-on-Sea, Essex.
GW2UH.—E. A. HAYWARD, 6, Kenfig Road, Gabalfa, Cardiff, S. Wales.
G3BU.—H. G. SMITH, 15, Abbeymead Road, Abbey Lane, Leicester.
G3CT.—Capt. E. H. COX, R.A., c/o Lloyds Bank Ltd., Cox & King's Branch, 6, Pall Mall, London.
G3DN.—J. B. LONGRIDGE, Rathlin, Mobberley, Chcs.
G3HS.—D. T. BOFFIN, c/o No. 5, Park Close, Didcot, Berks. Also at Lindsey House, Coxwell Street, Faringdon, Berks.
G3OA.—H. G. COTTIS, 2, St. Mary's Cottages, Hart Road, Thundersley, Essex.
G3VY.—K. MOODY, 96, Churchdale Road, Frecheville, Sheffield.
G3WD.—A. J. WARD, 90, Other Road, Redditch, Warwickshire.
G3WH.—J. P. EDWARDS, 3, Autumn Crescent, Horsforth, Leeds. Yorks.
GM3XO.—J. R. MACPHERSON, 41, Balgarvie Crescent, Cupar, Fife.
G3XX.—C. S. FROST, The Lowlands, Oldfield Lane, Stainforth, Doncaster.
G3YT.—L. D. TOGHILL, 64, York Road, Montpelier, Bristol, 6.
G3ZV.—J. BANNER, 46, Crescent Road, Bromley, Kent.
G4BY.—R. JENNINGS, "Ours," Clare Road, Tankerton, Whitstable, Kent.
G4DV.—E. GANT, The Rookery, Leasingham, Sleaford, Lincs.
G4DX.—R. JACKSON, 2, Milford Grove, Stockport, Chcs.
G4FD.—J. IRWIN, 85, Stansfeld Street, Blackburn, Lancs.
G4FH.—E. G. WALSH, 21, Old Bath Road, Cheltenham, Glos.
G4FO.—GEO. E. COCKROFT, 18, Harborough Road, Oadby, near Leicester.
GM4FT.—W. C. LEES, 6, West Claremont Street, Edinburgh.
G4GD.—N. G. V. ANSLOW, 35, Gilpin Avenue, East Sheen, London, S.W.14.
G4HF.—D. DEVEEN, 21, Powis Square, London, W.11.
G4HK.—D. ALIMUNDO, 10, Clarence Road, Chorlton-cum-Hardy, Lancs.
G4HP.—H. C. DOHERTY, "Little Shortbridge," Uckfield, Sussex.
G4HW.—R. C. WILKINSON (Sergeant), No. 3 (F) Squadron, R.A.F., Biggin Hill, Westerham, Kent.
G4IA.—S. BAYLISS, 210a, St. Georges Road, Bolton, Lancs.
G4IO.—L. E. TUCKER, 68, Borrowdale Avenue, Belmont Park, Harrow, Middlesex.
G4IV.—E. T. CARTER, The Bungalow, Boscombe Road, Amesbury, Wilts.
G4JG.—J. H. GURR, 7, Beltinge Road, Herne Bay, Kent.
G4JH.—W. V. WILLIAMS, "Myrtle Glen," Wembley Avenue, Lancing, Sussex.
G4JN.—F. E. WOOD, 8, Ferndale Avenue, Woodswoor Lane, Davenport, Stockport.
GM4JQ.—B. B. FULTON, 3, Anderson Street, Bonnybridge, Stirlingshire.
G4JT.—D. A. W. CLARK, 21, Fitzgeorge Avenue, Kensington, London, W.14.
G4KD.—P. A. THOROGOOD, 35, Gibbs Green, Edgware, Middlesex.
G4RW.—R. A. WILSON, "Kineton," 28, Monks Avenue, New Barnet, Herts.
G5AL.—A. B. MAY, Light Oaks, 72, North Road, Glossop, Derbyshire.
G5AQ.—L. A. CARTER, No. 1 Flat, Co-operative Stores, Heathfield, Sussex.
G5CX.—C. R. PILL, 16, Queen Alexandra Road, Bedford, Beds.
G5DR.—H. W. SCOTT, 20, Mill Road, Cambridge.
G5LH.—R. MITCHELL, c/o Mrs. Fox, Spinkwell House, Jenkin Road, Horbury, Yorks.
G5LR.—W. P. CARGILL, 197, Badmington Road, Downend, Bristol.
G5RT.—R. W. J. BREWER, 166, Nettleham Road, Lincoln.
GM5UT.—E. F. FOWLER, Roadside Cottage, Birse-by-Aboyne, Aberdeenshire.
GW5YB.—R. ASHTON, 80, Penrhos Road, Bangor, Caernarvonshire.
G6UR.—(ex ZB1R).—HEDLEY PUNCH, "Tokio," 43, Cambridge Road, Brockhurst, Gosport, Hants.
G6JB.—J. C. PAYNE, St. Leonards, Salcombe, S. Devon.
G6LM.—R. A. HISCOCKS, 22, Woodstock Gardens, Melksham, Wilts.
G6PB.—G. BALL, 320, Stanhope Road, South Shields, Co. Durham.
G6SS.—G. C. KINGSBURY, 105a, Festing Grove, Southsea, Hants.
G8GB.—J. F. SALISBURY, 12, Coniston Avenue, Coombe Dingle, Bristol, 9.
G8GN.—R. W. ARNOTT, The Garth, Mon.
G8MJ.—J. A. SEY, c/o G. Sey, 59, Andover Road, Twickenham, Middlesex.
G8OT.—A. S. TRIPP, c/o Mrs. Sheppard, 9, St. Peter's Hill, Stamford, Lincs.
G8QX.—K. HOPKINSON, Daisy Bank, Killamarsh, near Sheffield.
G8RN.—R. BARRON, 20, Exford Road, London, S.E.12.
G8RW.—R. W. STANDLEY, c/o Mrs. Laxton, Westcliffe Road, Ruskington, Sleaford, Lincs.
G8VF.—A. A. H. MOSS, "Sandbeds," Honley, Huddersfield, Yorks.
2AGK.—T. PARTON, 115, Brockhurst Road, Ward End, Birmingham, 8.
2ATB.—MISS DENISE BULLOUGH, 35, Heys Walk, Cheam, Surrey.
2ATW.—D. C. AMBLER, 17, Ovenden Road Terrace, Lee Mount, Halifax.
2AZX.—P. SEYMOUR (Sergeant), "Corisande," Fordes Lane, Cliff's End, Ramsgate, Kent.
2BAY.—R. AMEY, 45, Forton Road, Gosport, Hants.
2BBP.—P. ELMS, Fairhaven, Perry Street, Wendover, Aylesbury, Bucks.
2BGP.—D. C. PARKER, c/o 54, Swiss Avenue, Chelmsford, Essex.
2BPJ.—P. H. WADE, 8, Ancaster Crescent, West Park, Leeds, 6.
2CCB.—J. G. A. BLACKBURN, 15-17, National Avenue, Bricknell Avenue, Hull, E. Yorks.
2CFV.—C. D. METCALF, "Chelthurst," Hempnall, Norwich, Norfolk.
2CHY.—F. GORDON HOLLOWAY, "Welwyn House," Brook House Road, Walsall, Staffs.
2CQU.—R. H. BAILEY, 167, Wolverhampton Road, Cannock, Staffs.
2CTC.—S. R. COOKE, 99, Talbot Avenue, Leeds, 7.
2CUL.—H. C. BAILEY, 88, Falcondale Road, Westbury-on-Trym, Bristol.
2CVD.—E. A. LEVER, 9, Davenant Road, Oxford.
2CYN.—M. O. HELY, 5, Carlaw Road, Prenton, Birkenhead, Chcs.
2DJY.—G. H. LAWNE, 160, Dean Road, South Shields, Co. Durham.
2DNX.—H. G. TOOTHILL, 23, Whirlowdale Crescent, Millhouses, Sheffield, 7.
2DTD.—L. W. LIMB, "Moelfre," Wymondley Road, Hitchin, Herts.
2FFC.—W. S. WILSON, c/o Martin, The Hawthorns, Great Wristland, Watchet, Som.
2FQO.—W. ANDERSON, c/o Mrs. Lawson, Parkhill, Newburgh, Fife.
2HBG.—D. BARLOW, 13, Astley Close, Braunstone, Leicester.
Cancelled.—G2DZ, G5SL, 2ABD, 2ABK, 2AKT, 2AMX, 2AWJ, 2BDZ, 2BOS, 2BQF, 2BYD, 2BYX, 2BZV, 2CCA, 2CGO, 2CHK, 2CIG, 2CKK, 2CTV, 2DFK, 2DFO, 2DIV, 2DJL, 2DLY, 2DMV, 2DNL, 2DPT, 2DWY, 2DXG, 2FBZ, 2FKM.

Ham Holidays

We hear from the D.A.S.D. that they are again arranging for exchange holidays between German and British amateurs. As they have a list of their members anxious to visit England they will be glad to hear from R.S.G.B. members interested in the scheme. Enquiries should be addressed to: The Exchange Manager, Foreign Department, D.A.S.D., Berlin-Dahlem, Cecilienalle 4.

Mr. Francis Kovacs, a Hungarian amateur, of Budapest v. Balvany Ucca 5 Azam, Hungary, wishes to spend a holiday during July or August in this country and would be glad to receive letters from interested members. He also asks for information concerning courses of short wave radio lectures in London. Will those with any details please communicate with him direct?

Social Cablegrams

We thank all those who were kind enough to send us greetings on the occasion of the introduction of Social Cablegrams at the reduced rate. Among the messages was one from our British West Indies representative, Mr. A. Tibbits (VP2AT), on behalf of local members.

INDEX TO DISPLAYED ADVERTISEMENTS

EXCHANGE AND MART

(Continued from Back Cover)

TROPHY 8 COMMUNICATION RECEIVER in perfect condition. Practically new, sell for £8 or offers.—Details, (Ex-2DMM) J. ATCHESON, 15, Merrick Gardens, Glasgow, S.W.1.

WANTED.—Champion or similar for cash. Good condition and must be reasonable.—Write 54, Ridgeway Drive, Bromley, Kent.

WITHOUT DOUBT—"HAM-AID" QSL CARDS are best for colour and design. Samples from G6XT, TILLOTSON BROTHERS, Commercial Street, Morley, Yorks.

Patent and Trade Mark Agents

GEE & CO. (H. T. P. Gee, Mem. R.S.G.B., etc.), 51-52, Chancery Lane, London, W.C.2 (Two doors from Govt. Patent Office). Phone: HOLborn 4547 (2 lines). Estd. 1905. Handbook free.

KING'S PATENT AGENCY, LTD.—B. T. King, A.M.I.E. (2BKT), Mem.R.S.G.B., Regd. Patent Agent, etc., Wardrobe Chambers, 146a, Queen Victoria Street, London, E.C.4. Handbook and Consultations on Patents and Trade Marks free.—Phone: City 6161. Fifty years' references.

EXCHANGE AND MART.

RATES.

Members' private advertisements 1d. per word, minimum 1s. 6d, maximum 10/-. Trade advertisements 2d. per word, minimum 3s. First line, if desired, will be printed in capitals. One inch Semi-Display, 10s. per insertion. Terms: Cash with Order. All copy and payments to be sent direct to Advertising Manager, Parrs, 121, Kingsway, London, W.C.2, not later than the 30th of the month for the following month's issue.

BARGAINS.—Westinghouse Metal Rectifier, Type L.T.4 (11 v. A.C., 6 v. D.C. at 1 amp.), and Heayberd Transformer for above, tapped 7.5 v., 9 v., 11 v., both for 15s.; T.C.C. Electrolytic 2,000 mfd. 12 v. peak, 5s.; Rola 8 in. M.C. Speaker, 6 ohms, with Transformer, 7s. 6d.; 2 v. Valves, Mazda, 2s. each; Triotron, 1s. 3d. each; 4 v. Valves, Triotron, 9d. each. Valve Holders, W.B., 4-pin sprung, 4d. each; Telsen 4 and 5-pin, 2d. each; Dubilier Mica Fixed Condensers, 3d. each; L.F. Transformers, 1s. each; Telsen H.F. Chokes, 3d. each; Varley Bi-Duplex Wire-wound Resisters with holders, 6d. each, etc. Write for list.—HALL, 11, The Inlands, Daventry, Northants.

COMPLETE TRANSMITTER AND RECEIVER for sale. Three stage Rack and Panel TX (RF-60), 10-60 watts, fone, C.W. High Fidelity Speech Amplifier. Twin Power Packs. D104 Xtal Mike. Coils 160, 40, 20. Black Crackle finish, provision for two meters. RME69 Receiver.—Particulars, Box 104, "PARRS," 121, Kingsway, London, W.C.2.

COVENTRY.—Any Ham take fellow Ham as Paying Guest for August-September?—Write G2JK, 36, Montana Road, London, S.W.17.

FOR SALE. NEED CASH.—5 KenRad 6L6G's; little used, 3s. 6d. each. 1 type 19 unused, 3s., 2 type 10's, 1s. 3d. each; 50-watt bases for same, 9d. each; 1 Osram 2-amp. Barretter, 4s.; 1 L.T. L.F. Choke-Pass Amps., 5s.; 1 Block Condensers, Ferranti, 20 mfd. (4 mfd. and 8×2 mfd.), 7s. 6d.; 1 Garrard Double-spring Gram Motor, complete, 7s. 6d.; 160 metre Xtal holder, solid brass, 5s.; block of 2 L.F. Chokes, pass 100 mills. each, 3s. 6d.; 2 Pick-up Heads, 2s. 6d. each: I.R.F. Ammeter, 0—.5 amps., 5s.; R.I. and B.T.H. Transformers, 1s. 6d. Various others, 9d.; Various Multi-Ration Output Transformers, 1s. 6d.; 1 W6 Westector, 3s.; 1 Combined H.T. and L.T. Smoothing Choke, hefty job, 5s. Post extra.—Write at "Wunst" to GM3OM/GM5IR, 52, Upper Bridge Street, Stirling.

FOR SALE.—Sky Buddy, late 1938, £7. Ferranti Meters, 0-1 Ma., 20s., 0-50 Ma., 18s. 6d., 0-500 volts, 18s. 6d., 0-220 volts, 8s. 6d.—G6GD, Bowdon School, Altrincham, Cheshire.

G5KT.—Outstanding QSL's. Trial order will convince you cannot do better. Samples. State AA, G, BRS., SWL.—33, Howard Road, Westbury Park, Bristol, 6.

G3DI.—COLOSSAL SALE of 14 gauge H.D. offered now 3s. 6d. per 100 ft. Xtals, Holders, Switches, Formers, Valves, etc., always in stock. Carriage, 6d. Hamrad Agents.—BENN RADIO, Rugby 2342.

G6DS.—Known the world over for quality. QSL Cards and Log Books. Send for samples. —QRA, 14, Lambley Avenue, Mapperley, Nottingham.

HOLIDAYS.—Why not spend them on small homely Devonshire Farm?—Write G6GM, Featherlands, Holsworthy, Devon.

JUNE BARGAINS.—TROPHY AC3, Black Crackle, Band Spread. Send receive coils for 10, 20, 40, 160, £2 10s. Batt. TRF Det. Pen. Indigraph Dials, £1 5s. 6A6 CW/Fone Black steel case, Jacks for CW/Mic Brooks Xtal Indigraph Dial, £1 5s. 350-0-350 Pack, complete, 15s. 450-0-450 Parmeko, 7.5, 5.40, 14s. 4 v. 3-amp., 5s. Exide H.T.+L.T. Charger, 2 meters, cheap, £1 10s. G.E.C. Home Broadcaster, 7s. 6d. Offers, Ferranti A.C./D.C. Test Set, cost £5 15s.—G5AC, 93, Mount Road, South Sunderland.

NATIONAL 1-10 RECEIVER, complete, carefully used and perfect condition, less Power Pack, £9 10s. Peak Pre-selector in new condition, £3 10s.—MANSELL, Holyrood Terrace, Malvern.

OLDTIMER-G6MN for 1st Grade Clear Type QSL's and Log Books. Send for Samples. G, AA, BRS.—G6MN, Worksop.

OSCILLOSCOPE RCO G5NI, £3 10s., D.B. 20, perfect, £9.—G5MV, 40, North Marine Road, Scarborough.

PHILIPS' 10 RED "E" VALVE Five Waveband de Luxe Superheterodynes. Specially designed and constructed to give the best possible Short-wave reception. Continuous coverage 4½—580M. World-wide range. Suitable Convertor Units available giving A.C. performance on D.C. mains, 110 volts upwards. Write for full details and special Amateur nett price. Strictly limited quantity available.—G6QJ, 49, Clifton Road, Liverpool, 6.

PHILCO CAR RADIO, beautiful tone, 6-volt supply. First cheque for £5 secures. Real bargain. Would consider exchange for Communication Receiver or Avometer.—Box 103, "PARRS," 121, Kingsway, W.C.2.

QSL's.—250, 4s. 6d. 1,000, 9s. Post free Samples gratis. State whether BRS, AA.—G. ATKINSON BROS., Printers, Elland.

SALE.—Moving Coil Microphone, excellent condition. Bargain, 12s.—G8DT, 22, Leckhampton Road, Cheltenham.

SINGLE SIGNAL SUPER, 6 valve, £8. 600v. Power Pack, weighs 41 lbs., 70s. Complete Ham Shack for sale. Surplus gear.—G4JI, 41, Willoughby Road, Boston, Lincs.

SUPER SKYRIDER, 1938, SX16, very little used, and guaranteed perfect; owner getting Standard H.R.O., £27 10s. or nearest. Also Corona Portable Typewriter, in first-class order, 75s.—2FKM, 223, Thornton Road, Thornton Heath. THO 1974.

(Continued on previous page)

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