R·S·G·B AMATEUR RADIO

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PASTURES NEW

THE past month has provided abundant evidence that the new 145 Mc/s. band is fast becoming one of our most popular frequency allocations. Prior to opening day on September 1 correspondence to Headquarters, conversations over the air and at meetings gave some clue to the volume of preparatory work that was taking place. Rumours were current of early attempts to improve on the existing world record for two-way communication on 2 metres—whether the optimism was justified time alone will decide. As a matter of interest the present record is reported in QST to be in the neighbourhood of 660 miles—an achievement which has stood to the credit of W3GV and W0WGZ since September 18, 1947. That distance is a little greater than the air line distance between Lands End and John O'Groats which means that it will be impossible for two U.K. stations to exceed the U.S. figure. However as European amateurs will soon be working on 2 metres and knowing of the keeness existing in such countries as Holland and Switzerland there is good reason to think that a new record may soon be established.

Whilst we look forward to long distances being covered, even more important is the fact that the mass movement by hundreds of keen amateurs to the higher frequencies must result in the ultimate accumulation of much new scientific data. The radio amateur is in a unique position inasmuch as he is frequently able to take advantage of a particular set of conditions at a time when research and experimental establishments are either closed down or engaged on other work.

Some cynics may suggest that the war-time and post-war users of frequencies around 145 Mc/s. have solved all the problems. We doubt it. The lower amateur frequencies—notably 28 Mc/s.—have been under critical and constant observation by professional engineers and radio amateurs alike for the past 20 years, but no one can say that we have complete answers to many of the extraordinary effects noticed from time to time on that band.

How much more difficult will it be to predict with any degree of certainty what is likely to happen around 145 Mc/s.

Fortunately, due to improvements in circuit technique and valve design we begin our excursions to this new band under conditions considerably more favourable than those which faced early workers on 28 and 56 Mc/s. The day of the self-existed oscillator and superregenerative receiver has long passed. In their places we find stabilised oscillators and superhet. receivers. The very short wavelengths now available mean that high-gain beam arrays can be constructed and installed even under the most cramped domestic circumstances. The day of the frame aerial may not yet have passed.

Whether entirely new techniques can be developed remains to be seen, but we shall be surprised if, in say 10 years time when we look back at this issue of the BULLETIN, improved methods of generating and receiving V.H.F. signals have not supplanted those in common use to-day. Our guess is that pulse will have come into the picture and that a closer liaison will have been established between the amateur and the meteorologist.

That there will be plenty of new ground to break and fresh pastures to tread goes without saying. As a Society our ambition will be to record each step forward as it occurs and to give credit where credit is due.

And now for some further good news.

As from October 1 next, the band 420–460 Mc/s. will be opened to the amateurs of the U.K. Initially, power must be restricted to 10 watts input for the very good reason that these frequencies are still being used—and will be for some time to come—by stations which may be in aircraft.

Whilst we as a Society regret this power limitation we appreciate, as we feel sure every member will do, that the granting of the facility three months before A.C'y Day (January 1, 1949) is in the nature of a concession. It is now up to us to prove that in spite of the low input power permitted we can yet achieve some measure of success on this band. *Occupancy of all amateur allocations is vitally important.*

The decision of the President (Mr. V. M. Desmond) to award trophies to the first two U.K. members who succeed in establishing two way communication with one another on 420 Mc/s. over a distance of at least 25 miles will no doubt spur on many members to try their hand. We wish them every success.

The Rules governing the award of the Desmond Trophies appear elsewhere in this issue.

J. C.

In this issue

A BAND-SWITCHED EXCITER OR LOW POWER TRANSMITTER

By B. W. ST. LEGER MONTAGUE, G2ANR*

DURING the rush and excitement which followed the announcement of the re-issue of amateur transmitting licences, the writer, like many other amateurs, constructed a simple Tritet-P.A., in order to put a signal on the air as soon as possible. This served very well for a number of months, but the need for greater flexibility soon became apparent. A new exciter was therefore designed, and the following description shows that, whilst basically of conventional design, it includes a number of unusual features.

Design Features

Although complete band-switching is a desirable feature in a unit of this kind, it introduces many complications with regard to layout and stability. For this reason it was decided to effect a compromise by band-switching the first three stages and changing coils in the output stage. This arrangement was also considered desirable from the point of view of efficiency, especially as it was intended to use the unit as a complete 25-watt transmitter, pending the issue of a 150-watt licence.

Circuit Description

The *Mullard* QVO4-7 tetrode was selected as being the most suitable type of valve for the first three stages, the small size and single-ended construction considerably simplifying layout problems. This valve has a good power sensitivity, making it eminently suitable for a circuit where high circuit efficiency is compatible with flexibility.

Various crystal oscillator circuits were tried out, and the one finally selected was the "grid-plate" circuit, comparatively little used in this country, but quite popular in the U.S.A. It is similar in principle to the well-known "Tritet," but differs in that (1) the crystal is returned to earth instead of to cathode, and (2) the cathode circuit is tuned to a lower frequency than that of the crystal. The grid-plate oscillator has all the advantages of the Tritet with regard to low crystal loading, stable operation, etc., with the additional feature that it will give a high output at the fundamental frequency with no risk of over-running the crystal.

The cathode tuning of the oscillator is completely non-critical; it was found that variations over a wide range had negligible effect on power output and crystal current. It was, therefore, found possible to tune this cathode circuit to approximately 3·6 Mc/s. and utilise it as the input circuit for a V.F.O. operating in that band. Thus provision is made for selecting either one of two crystals, or the V.F.O., a co-axial input socket being provided for the latter. When in use with V.F.O. control, the first valve functions as a frequency doubler.

The second and third stages use conventional doubler circuits and are parallel-fed and series-fed respectively. A combination of cathode and grid-leak biasing is used to safeguard the valves if the drive is removed, as would occur in the case of break-in operation by keying the oscillator. The values of the screen dropping resistors are sufficiently high to keep the screen dissipation within its maximum rating even with the anode circuit at resonance and unloaded.

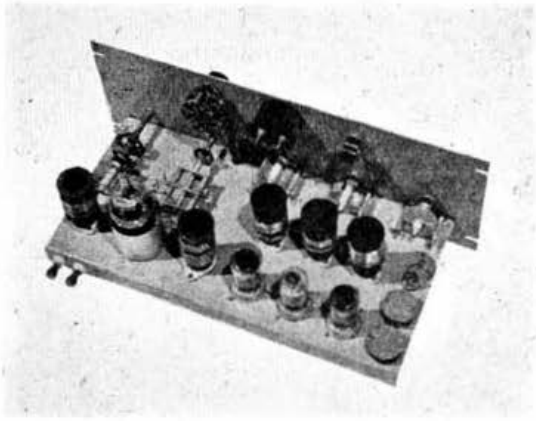


Photo: Mullard Electronic Products, Ltd.
Fig. 1.
View of the 25 watt Band Switched Exciter.

The link windings on each anode coil are fed through screened leads to the band-switch S2. Here, any one of three outputs, at 7, 14, or 28 Mc/s., may be selected for feeding into the link-coupling to the grid of the output valve V4. An additional set of contacts is provided on the band-switch for removing the H.T. from the screens of the valves not in use when 7 or 14 Mc/s. output is required.

The screen-grid of the QVO5-25 output valve is fed through a dropping resistor, R17, from the 500-volt H.T. line. This enables the valve to be anode- and screen-modulated conveniently. In order to preserve the audio-frequency response, the anode is decoupled to the screen instead of to earth, the values of the decoupling condensers C18 and C19 being chosen in a suitable ratio. To prevent the voltage from rising to the full H.T. potential, under cut-off conditions, the screen of the output valve V4 is tied to earth through a 100,000 ohms resistor, R18.

When the unit is used as a complete transmitter, the output valve is fed from a 500–600 volt supply as shown. However, should it be required to use the unit as a driver for a final amplifier, ample output can be obtained with an H.T. of 300 volts, in which case the 500 volt line may be strapped to the 300 volt line.

Keying and Metering

Keying is effected in the H.T. return circuit of the first stage. Generally speaking, a keying filter is not necessary, but if a long keying lead is used it may be desirable to connect a 0·1 μF condenser directly across the key.

The resistors R1-R5 in the anode circuits of each stage serve as shunts for the 0–5 milliameter and are wound with copper wire on a strip of paxolin, the actual length of wire being determined by experiment. Metering is effected by means of a seven-position selector switch. A jack is also provided

* *Mullard Electronic Products, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.*

which enables the meter to be used externally should this be required. The design and action of the switch should be such that there is no chance of H.T. shorts occurring when switching from one range to another. In one position of the switch, the meter is used to measure the H.T. voltage of the final stage, in conjunction with a 200,000 ohm 3-watt resistor R19 in series with the meter. The switch positions are as follows:

METER SWITCH

Position.	Range.	Circuit.
1	5 mA	External jack.
2	50 mA	C.O. anode.
3	50 mA	1st doubler anode.
4	50 mA	2nd doubler anode.
5	10 mA	P.A. grid.
6	125 mA.	P.A. anode.
7	1,000 V.	Main H.T. voltage.

Construction

A view of the chassis is given in Fig. 1. It will be seen that the whole unit is built on a standard steel panel and tray assembly. The tray is made of 16 SWG mild steel and measures 16¾in. wide × 8in. deep × 1in. high. The panel measures 19in. × 7in., and is of 12 SWG steel. The three QVO4–7's fit into standard B9G valve sockets. These require 1⅛in. or 1½in. chassis holes, so that a good circular cutter is a worth-while investment for anyone who contemplates making this unit. In order to economise in panel height, the socket for the QVO5–25 valve is sunk below chassis level and is held in position by 4BA bolts 1½in. long. This necessitates a 1½in. clearance hole in the chassis for the valve base. The lower half of this valve is screened by a 2¼in. dia. shield arrangement. The large panel hole for the meter was cut by the time-honoured method of drilling numerous small holes in a circle and filing out to size, the 12 SWG steel being too much for the circular cutter to hand.

The sockets for the coils L2, L3, L4, and L6, are of the standard 4-pin ceramic type, whilst that for the coil L5 is a 6-pin type. The tuning condensers C2, C3 and C4 are mounted on the front panel, insulation for C4 being provided by an insulating bush. C5 is a midget split stator condenser and is mounted directly on the chassis. The tuning condenser C6 in the final stage is supported by an insulating bracket on the chassis, and is fitted with an insulated coupler and extension spindle.

At the extreme left-hand end of the chassis are mounted the crystals, the co-axial socket for the V.F.O. input, and the air-spaced trimmer C1. This trimmer is fixed to the underside of the chassis and a hole is provided in the chassis to facilitate adjustment. Since this trimmer is "live" when the key is up, care should be taken to mount it well clear of the chassis, on insulated spacers. Also mounted beneath the chassis are the band-change and crystal selector switches. The band-change switch is secured directly to the front panel, whilst the crystal selector switch is mounted on a bracket and is operated by an extension spindle. Upon the upper part of the front panel are mounted, in addition to the tuning

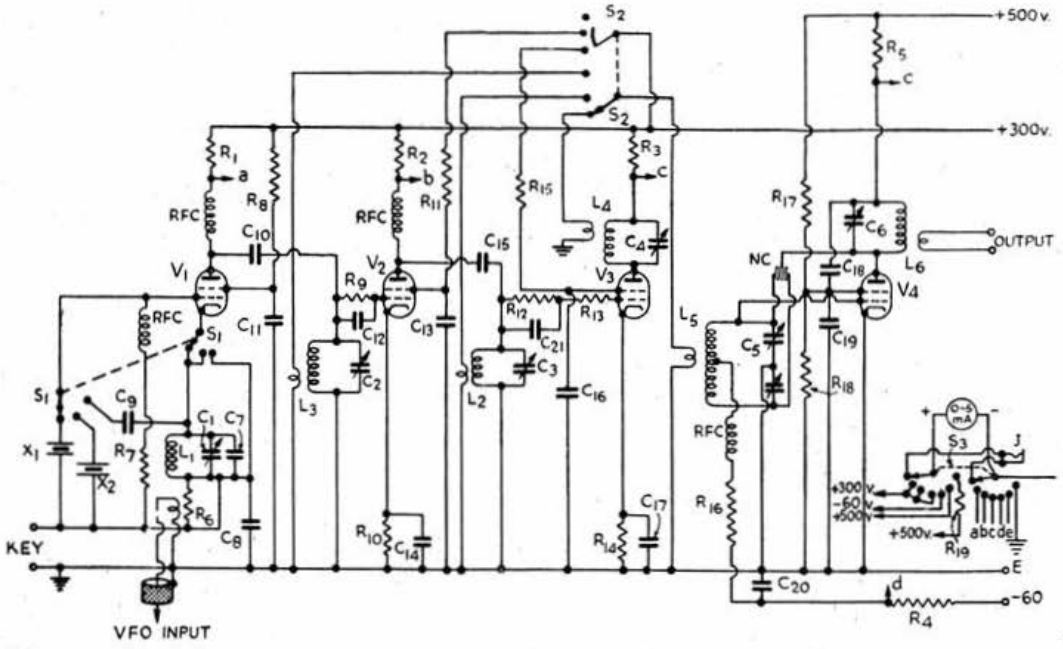


Fig. 2.
Circuit of 25 watt Band-Switched Exciter.

C1	40 pF variable.	C8, 11, 13, 14, 16,	·01 μF.	R10, 14	1,500 ohms 1 watt.
C2, 3	100 pF variable.	C17	·004 μF.	R11, 15	10,000 ohms 1 watt.
C4, 6	60 pF. variable.	C18, 20	·001 μF.	R13	100 ohms ½ watt.
C5	60 + 60 pF Midget Split Stator.	C19	·002 μF.	R16	4,700 ohms 1 watt.
		R1, 2, 3, 4, 5	Meter shunts.	R17	40,000 ohms 10 watts.
C7, 10	100 pF.	R6	220 ohms ½ watt.	R18	100,000 ohms 1 watt.
C9	500 pF.	R7, 9, 12	500,000 ohms ½ watt.	R19	200,000 ohms 3 watts.
C12, 15, 21	330 pF.	R8	47,000 ohms 1 watt.	V1, 2, 3	QVO4-7.
				V4	QVO5-25.

condensers, the milliameter, the meter selector switch and the external circuit jack.

The coils L2–L6 are wound on standard 1½in. diameter formers, and the winding data is given in the table below. The coil L1 in the input circuit is mounted under the chassis next to the trimmer C1, and consists of 30 turns closely wound on a ¾in. diameter former, together with a coupling winding of 8 turns. The total winding occupies a length of ⅜in. The link winding on L5 is wound between the split halves of the main winding.

COIL TABLE.

Band.	7 Mc/s.		14 Mc/s.		28 Mc/s.	
Coil.	Turns.	Turns per in.	Turns.	Turns per in.	Turns.	Turns per in.
L2	15 3½	14	—	—	—	—
L3	—	—	7 3	14	—	—
L4	—	—	—	—	5 2	7
L5	24 8	20	14 4	14	8 3	7
L6	16 6	20	8 4	14	5 2½	7

The two figures in each group represent the number of turns on the main and link windings respectively.

Operation

The tuning-up procedure follows normal practice and requires little explanation. When the unit is set for V.F.O. operation, the V.F.O. is adjusted to some mid-band frequency, after which the trimmer C1 is set to give maximum drive to the valve in the first stage. The remaining stages are then tuned in the usual way. The tuning of the multiplier stages is sufficiently flat to enable almost a whole band to be covered without re-tuning the intermediate stages; all that is required is to bring the anode circuit of the output valve into resonance. Even wider coverages can be obtained by stagger-tuning of the various circuits.

The grid to anode capacitance of the *Mullard* QVO5–25 output valve is of such a low order that neutralisation is not always necessary. However, in the original unit, stray capacitances were sufficient to over-neutralise the valve and it was found necessary to add some additional capacitance in the form of a differential neutralising condenser. The simple construction of this hardly does justice to its academic title. A piece of 16 SWG wire was taken from each stator section of the grid condenser C5. A third piece was mounted on the anode end of the tuning condenser C6. The arrangement can be seen quite clearly in the photograph. Neutralisation was effected by bending the central wire towards one or other of the wires from the grid condenser. The initial adjustments were made with the drive on the output valve, but with no H.T. voltage applied. The changes in grid current which resulted when the anode circuit was tuned through resonance was used as an indication. The final adjustments were made with the H.T. applied. In this case the aim was to obtain a drop in grid current at the resonance point, and a symmetrical current rise on either side. If neutralisation is incomplete, the grid current will rise when the anode circuit is tuned one side of the resonant point, and will fall when it is tuned over the opposite side. For perfect neutralisation, the final adjustments are quite critical and a delicate prodding with a piece of insulating material is all that is necessary. It is generally preferable to neutralise at the highest frequency in use, in which case the setting for the lower frequency bands will be found quite satisfactory.

With the anode of the output valve operating at 500 volts the unit is easily capable of handling inputs of up to 25 watts. The unit may, in fact, be loaded up to 40 watts quite comfortably.

By using the QVO5–25 as a doubler, there is ample output at 58 Mc/s. to drive a 25-watt P.A. There is, in fact, no practical objection to using the unit as a complete 58 Mc/s. transmitter, although the purists might object to the practice of doubling in the final stage.

The Second Annual Amateur Radio Exhibition

The Second Annual Amateur Radio Exhibition to be organised by the Society will open at the Royal Hotel, Woburn Place, London, W.C.1, at 2 p.m. on Wednesday, November 17, 1948.

All stand space has been booked and a total of 26 concerns will be exhibiting—a considerable increase over last year. The official Exhibition Catalogue will be published on October 15 and a copy will be sent free of charge to every member of the Society. Admission to the Exhibition will be by Catalogue. Non-members may purchase a copy at the door (price 1/–) or may obtain one by writing to Headquarters enclosing P.O. for 1s. 3d.

Provincial members who propose spending a few days in town during the Exhibition period are advised to book hotel accommodation in advance at the Royal. The standard bed and breakfast charge is 13s. The Royal has recently been redecorated and its fresh appearance will no doubt please all those who attended last year.

The 1947 Exhibition was visited by nearly 6,000 members. This year it is anticipated that attendances will be considerably greater.

Offers from members willing to undertake duty on the R.S.G.B. stand or to loan equipment for display on the stand, should be made in writing to the General Secretary.

The Exhibition will be opened officially at 2.30 p.m. on November 17 by Dr. R. L. Smith-Rose (Honorary Member), Director of Radio Research, Department of Scientific and Industrial Research, and will close at 9 p.m. On November 18, 19 and 20 the Exhibition will open at 11 a.m. and will close at 9 p.m.

Radio Amateurs' Examination

The following is a summary of the results of the May examination:

	No. of Candidates.	No. of Passes.	No. of Failures.	Percentage of Failures
Home	687	518	169	24·6
Overseas	13	10	3	23·1

Compared with previous examinations the work was generally of a much higher standard both technically and in the manner in which the questions were answered. It was apparent that more adequate preparation had been made for this year's examination.

A copy of the paper and comments on each question will appear in our next issue.

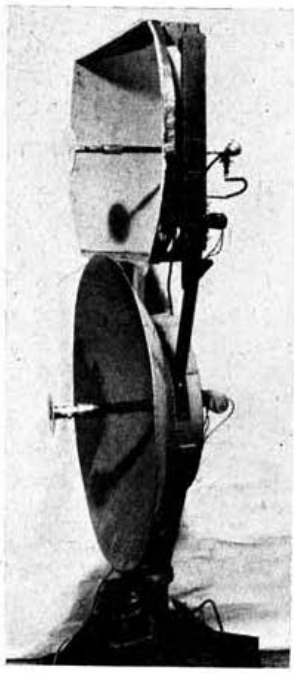
* * *

Classes in Radio Technology will be reopened in Allan Glen's School, 134 Montrose Street, Glasgow, on 28th September. A special Amateur Radio Course is to be included in the syllabus, the fee for which has been fixed at 10/– for a session of 26 weeks.

The classes will be under the general supervision of Mr. R. T. Frost, GM6FT and the instructor will be Mr. W. N. Landles, GM2LQ, as last year.

TWELVE CENTIMETRE EXPERIMENTS

By J. B. RIMMER (GM3AKK) and G. A. RAEBURN (GM2KP)



General view of Twin Parabola assembly.

WITH the return of amateur transmitting licences in 1946 it became apparent to the writers that the more popular bands would become uncomfortably crowded for serious experimentation, and accordingly they concentrated more and more on frequencies above 28 Mc/s. The 58·5 Mc/s. band received attention for some time until local activity faded out. In April, 1947, it was finally agreed that the only remaining V.H.F. allocation *viz.* 2300 to 2450 Mc/s., would be worthy of examination.

Early Experiments

Klystrons being fairly easily obtainable, it was natural that these should be tried-out first. The CV35 (a reflex type with tuning range of 9·7 to 10·1 cm.) was accordingly modified to cover the amateur band, by removing the original Rhumbatron and fitting one slightly larger. The inside diameter of the new Rhumbatron was 6·3 cm. and calibration by means of Lecher wires showed that it resonated at 12·5 cm.

The Klystron CV67 type was also modified from its original range of 8·7 to 9·3 cm., but in some cases an elongated cavity which had been fitted produced a heavy spurious output. Eventually the examination of Klystrons was discontinued as high voltages were required, a fact which handicapped experiments.

Successful Circuits

Whilst the above work was proceeding, Lighthouse tubes were employed in grid separation cavities with a considerable measure of success, but although silver-plating was used, the finger contacts gave a lot of trouble due to intermittent connections. However as this type of tube seemed to offer good possibilities attention turned to Cavity Oscillators of the Re-entrant type in which capacitative plungers replaced the finger contacts in the grid separation circuit.

Present Equipment

Using a 464 Lighthouse tube, a Re-entrant Cavity Oscillator was constructed as shown in Fig. 1. An H.T. supply of 250 volts is used and it is important to note that the plate seal will be damaged by heat if the plate dissipation is taken even slightly over the maximum rating.

To obtain oscillation it is necessary to alter the position of the ¼-wave choke on the plate line so that the grid draws current. Fine adjustment about this point can then be carried out for maximum grid current. The frequency of oscillation depends on whether a 446B or 464A tube is used, variations being noted amongst tubes of the same type. An alteration of 1 mm. in the grid cylinder length will change the frequency—cut to raise, and lengthen to lower the frequency.

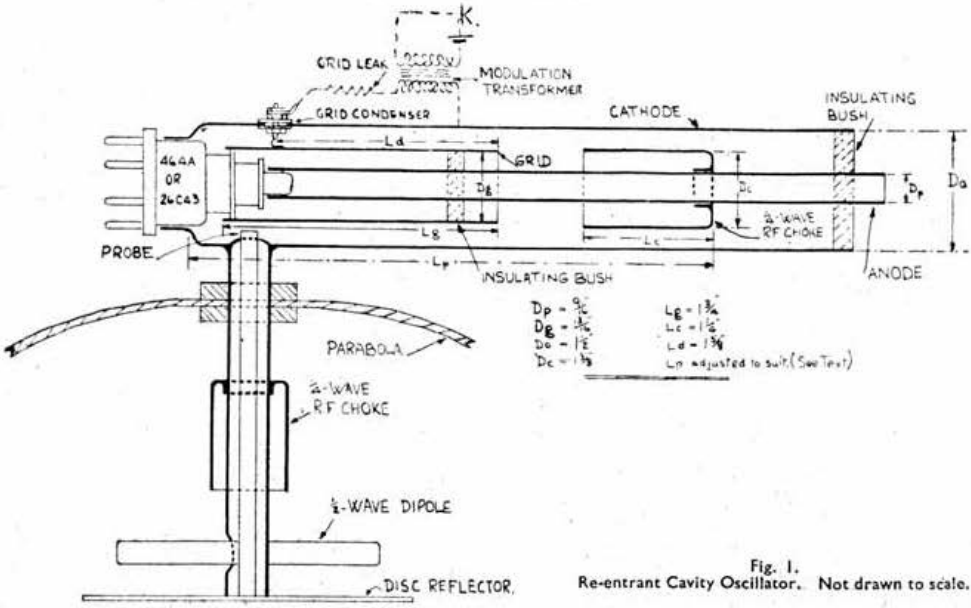


Fig. 1.
Re-entrant Cavity Oscillator. Not drawn to scale.

Modulation, which is a mixture of A.M. and F.M., is obtained by means of a transformer in series with the grid leak, with the addition of a microphone and battery as indicated in the sketch. No further amplification is required.

The oscillator described above is fitted into one of the transmitters, whilst another has a similar circuit tuned 50 Mc/s. higher in frequency.

Both receivers employ a 1N21 contact rectifier as crystal-mixer, into which is injected the signal from a local oscillator comprising a 446B Lighthouse tube fitted in a Re-entrant Cavity Oscillator circuit as described above. The mixed signal is fed into a suitable tunable I.F. followed by normal 2nd detector and output stages. The general arrangement of the crystal-mixer, etc., is shown in Fig. 2.

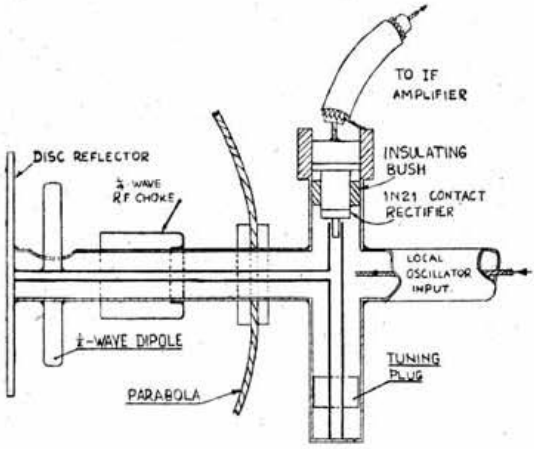
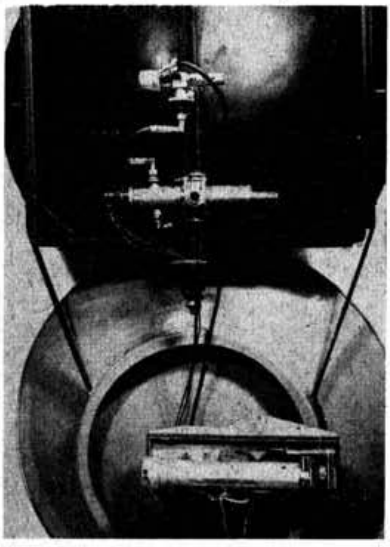


Fig. 2.
Crystal Mixer with Re-entrant Cavity Local Oscillator, using Type 446 Disc Seal Triode. Not drawn to scale.

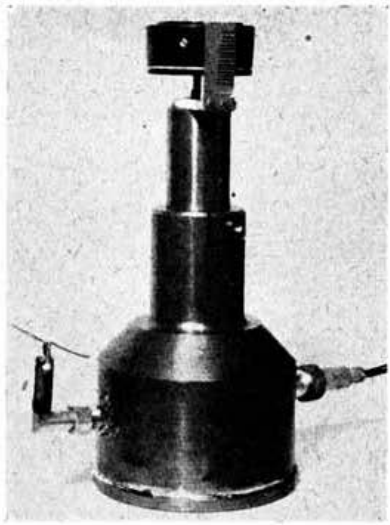
The transmitters and receivers are mounted on the back of the parabolas as indicated in the sketches and photographs. A Re-entrant Cavity type wavemeter, as illustrated, is used for frequency checking.

Results

Consistent two-way phone contacts over a distance of 1,400 ft. at R5, S9 have taken place—the first on July 20, 1948. Longer distance duplex has not been possible as one of the receivers is rather insensitive, but one-way contacts at R5, S9 have been made up to a distance of $4\frac{3}{4}$ miles.



A rear view of the transmitter and receiver. Reading from top to bottom, Crystal Mixer, Local Oscillator and Transmitting Oscillator.



Re-entrant Cavity Wavemeter, range 1,000 to 2,500 Mc/s.

Conclusions

The 12 cm. band offers great possibilities for original and interesting experimentation. It is preferable that at least one of the stations in a pair should be portable due to line-of-sight range being required. Unless turning and general metal working can be easily carried out, it is difficult to construct the various parts required in the Cavity Oscillators, but ingenuity can assist in overcoming these difficulties.

Acknowledgements

Acknowledgement is made to the following Scottish amateurs: GM3AR, 3CAR, 2DPW, 4JO and 2FZT for providing operating assistance, transport, batteries, inter-comm., etc., and to John Keith of *Messrs. G. & J. Weir, Ltd.*, for the photographs.

Bibliography

Klystrons and Microwave Triodes (Radiation Laboratory Series No. 7).

Electronics Engineering Manual, Vol. 5.

A. M. Gurewitsch (Proc. I.R.E., Vol. 35, page 462, 1947).

Principles of Radar (Massachusetts Inst. of Technology).

Electronics, March 1948—"Wavemeter Design for 2 to 75 cm."

Wireless Engineer, May 1946, page 126—"Re-entrant Wavemeters."

OUR FRONT COVER

THIS is a crystal-controlled, 2-metre transmitter designed by Mr. E. H. Dedman (G2NH). The oscillator is an EF50 in tritet, controlled by an 8-Mc/s. crystal. The output frequency of this stage is then trebled in the first QVO4/7, and fed to the second QVO4/7 which acts as a doubler to drive the Push-Pull R.F. Power Tetrode QVO7/40 as the power amplifier. Full technical details of the transmitter were given in the August issue.

THE DESIGN AND CONSTRUCTION OF A MULTI-RANGE TESTMETER

By G. BRIDDON (BRS 4427)

THE testmeter described in this article is a 10,000 ohms per volt instrument providing facilities for the following measurements :—

D.C. voltages—15 ranges from 100 mV. to 5,000 v.
Direct current—15 ranges from 100 μA to 5 A.
A.C. voltages—3 ranges from 10 v. to 1,000 v.
Resistances—3 ranges covering resistance values from 0·1 Ω to 1 MΩ.
Power output—2 ranges matching 3 Ω and 15 Ω speech-coils, and giving readings to 30 w. and 6 w. respectively.

Circuit Description

The complete circuit diagram is shown in Fig. 1, and separate descriptions of each section follow.

(1) *The Primary Meter.*—The central meter around which the testmeter is built is a moving-coil instrument with a full-scale deflection of 100 μA., so that the completed testmeter has an effective resistance of 10,000 ohms per volt (with exceptions to be explained later). The internal resistance of the meter is 700 Ω.

(2) *D.C. Voltage Measurements.*—The required value of series resistance R_s to provide a given range of voltage, can be calculated from the formula :—

$$R_s = \frac{V_r}{I_m} - R_m$$

where V_r is the required voltage range, I_m is the current which produces full-scale deflection of the meter, and R_m is the meter internal resistance.

The ranges selected were 100 mV., 1 v., 10 v., 100 v., and 1,000 v. so that the required values of series resistance, are strictly, 300 Ω, 9,300 Ω, 99,300 Ω, 999,300 Ω, and 9,999,300 Ω. In practice, of course, the round-figure values 0·1 MΩ, 1 MΩ, and 10 MΩ, are used in the last three cases, the error so introduced being less than 1 per cent. for the 0·1 MΩ resistor, and correspondingly less for the higher values.

By means of the simple device now to be described, each of the five "basic ranges" can be multiplied twice or five times at will, *i.e.* with the selector switch S1 at, say, "1 v." the meter can be so operated that full-scale deflection (F.S.D.) is effected by 1 v., by 2 v., or by 5 v.

(3) *The Multiplier Switch.*—Consider the circuit of Fig. 2A. With the values shown in the diagram, the meter will read full-scale. Now break the circuit at the points X, remove the meter, and insert in its place the arrangement of Fig. 2B. The effective resistance between the points X is still equal to the meter internal resistance (700 Ω in this case), so that the operating conditions of the outside circuit are unaffected, but it will now be seen that only half the total current passes through the meter. Hence the meter reading will fall to half-scale, or (what is the same thing) twice the voltage must now be applied across the test prods to produce F.S.D. Thus the meter range has been doubled.

Similarly, the arrangement of Fig. 2C, when inserted between the points X, will multiply the "basic range" five times.

By the use of this switch, practically all D.C. voltage readings (and, as will shortly be seen, D.C. readings) can be brought into the top half of the meter scale, where the "reading accuracy" is greatest. (An error of one-tenth of a division when the meter is reading, say, 5 divisions on a 100-division scale, represents 2 per cent., but the same error at 50 divisions would represent only 0·2 per cent.)

It will, however, be realised that with the multiplier switch at X2 the effective resistance of the instrument is only 5,000 ohms per volt, and for the X5 position it falls to 2,000 ohms per volt. Consequently, when it is essential that the testmeter be used as a 10,000 ohms per volt instrument, the switch should be set to X1 and only the basic ranges employed.

In the circuit diagram (Fig. 1) the multiplier switch is S3. Sections (*a*) and (*b*) perform the actual switching, and the purpose of section (*c*) will be seen later.

(4) *Direct Current Measurements.*—The simple arrangement shown in Fig. 3A which is often used to provide the different direct current ranges in a testmeter, suffers from two drawbacks. Firstly, should the range-switch fail to make contact, all the current under test passes through the meter, possibly with disastrous results ; secondly, a high-resistance contact at the switch (even though it be as low as, say, 0·1 Ω) will render the meter reading inaccurate, especially on the high-current ranges where the value of the parallel resistor is only a small fraction of an ohm.

The "universal-shunt" circuit of Fig. 3B overcomes both these difficulties by placing the range-switch outside the meter-and-shunt circuit. (Actually, although a universal-shunt arrangement is used in this testmeter, the circuit employed does not take full advantage of the system.) The actual values of the resistors needed for the sections of the shunt are more difficult to calculate, since with the range-switch at, say, C the actual shunt is the portion CDE, whilst the portion CBA is in series with the meter in the opposite arm of the parallel circuit.

In the present case, where each current range is exactly ten times the previous range, it can be shown that, with a meter of 700 Ω internal resistance, the sections of the shunt must have values of 70 Ω, 7 Ω, 0·7 Ω, and 0·078 Ω, respectively. This gives ranges of 1 mA., 10 mA., 100 mA., and 1 A. The 100 μA. range is, of course, obtained with the shunt disconnected.

The multiplier switch is also operative on the D.C. ranges, subject to the limitations already described in connection with D.C. voltage measurements, so that 15 ranges of current measurement are available.

D.C. measurements are taken with S2 at "D.C." or "D.C. voltage" as appropriate, the desired range being selected by range-switch S1, in conjunction with multiplier switch S3.

The remaining facilities are selected by switch S2, with switch S1 set for "Ohms" or "A.C. voltage," as necessary.

(5) *A.C. Voltage Measurements.*—A.C. voltage ranges are obtained by inserting a bridge rectifier between the A.C. input and the meter. *Westinghouse* instrument-rectifiers are not made as a single unit for use with meters of less than 250 μA. F.S.D., and the firm recommends the use of four type WX–1 Westectors, connected in a bridge circuit for use with a 100 μA. meter. As with D.C. voltage measurements, series resistors are employed, (in the rectifier input circuit), to provide different voltage ranges, and it

can be shown that, for sinusoidal waveforms, the required value of series resistor for a particular range is, in general, equal to 1/1·11 of the resistor used on the corresponding D.C. voltage range.

Here the selected ranges are 10 v., 100 v. and 1,000 v., so that for the last two cases the required series resistors are respectively 0·9 MΩ and 9 MΩ.

On the 10 v. range, however, the 1/1·11 rule is modified by the fact that the series resistor is not sufficiently large to "swamp" the impedance of the rectifier. This resistor is, therefore, best adjusted by trial and error, but a value of 81,500 to 83,000 ohms is normal. Moreover, as the rectifier impedance is not constant, but varies according to the current passing through it, the scale on the 10 v. range is not uniform, and a special scale should, therefore, be provided by calibration against another testmeter.

With the multiplier switch at X2 or X5, the meter can only read F.S.D. if the rectifier supplies twice or five times its rated current. Over-running of the rectifier is not advisable, and accordingly section S3 (c) of the multiplier switch breaks the circuit if the switch is set to X2 or X5 when S2 is set for A.C. voltage readings.

(6) *Resistance Measurements.*—The "High" ohms range employs the circuit shown in Fig. 4; the "Medium" and "Low" ranges are identical except that the 10 mA. and 1A current shunts, respectively, are connected across the meter to divide the readings by 100 and by 10,000, and the limiting resistor is correspondingly reduced.

The advantage of connecting the zero-adjuster *across* the meter instead of in the more usual series position, is that the one control serves for all ranges. Its value must, however, be kept very high to maintain accuracy on those ranges where a current shunt

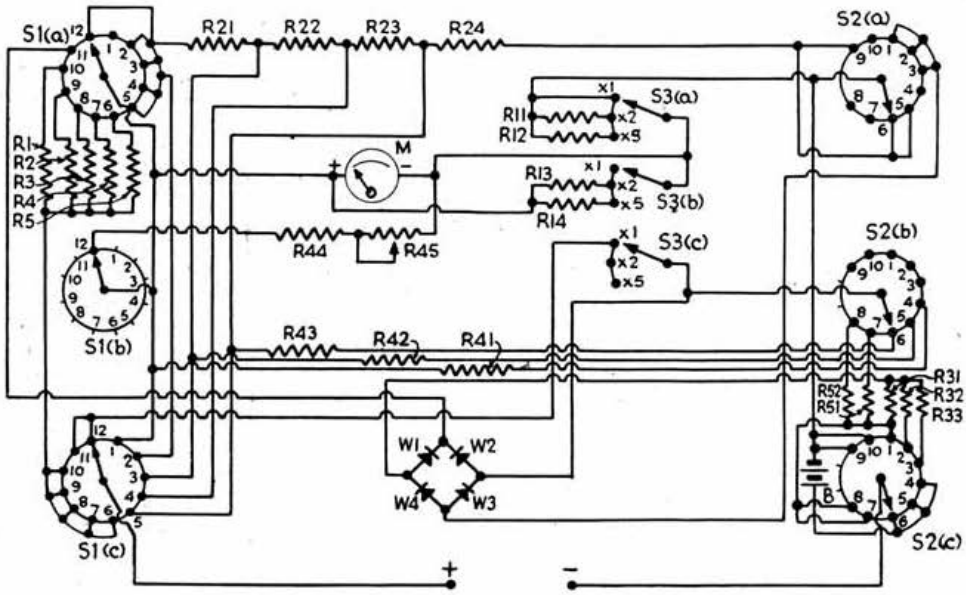


Fig. 1.
The circuit diagram of the complete testmeter. (The component numbers shown in Figs. 2 to 4 correspond to those in this diagram.)

Switch Positions (S1)		
Position		Range
1	...	100 μA. D.C.
2	...	1 mA. D.C.
3	...	10 mA. D.C.
4	...	100 mA. D.C.
5	...	1A. D.C.
6	...	100 mV. D.C.
7	...	1 v. D.C.
8	...	10 v. D.C.
9	...	100 v. D.C.
10	...	1,000 v. D.C.
11	...	A.C. volts.
12	...	Ohms.

Components		
M	100 μA, 700Ω meter.	
B	3 v. dry battery.	
W1–4	Westectors type WX–1.	
D.C. Voltage Resistors.		
R1	300Ω, ½ w.	
R2	9,300Ω, ½ w.	
R3	100,000Ω, ½ w.	
R4	1 MΩ, ½ w.	
R5	10 MΩ, 5 w.	
Multiplier Circuit Resistors.		
R11	350Ω, ½ w.	
R12	560Ω, ½ w.	
R13	700Ω, ½ w.	
R14	175Ω, ½ w.	
Direct Current Resistors.		
R21	70Ω, ½ w.	
R22	7Ω, ½ w.	
R23	0·7Ω, ½ w.	
R24	0·078Ω, 3 w.	
A.C. Voltage Resistors.		
R31	82,800Ω, ½ w.	
R32	900,000Ω, ½ w.	
R33	9 MΩ, 5 w.	
Ohms Range Resistors.		
R41	28,000Ω, ½ w.	
R42	280Ω, ½ w.	
R43	2·8Ω, 3 w.	
R44	10,000Ω, ½ w.	
R45	250,000Ω, ½ w.	
Output Resistors.		
R51	15Ω, 7 w.	
R52	3 Ω(see text).	

Switch Positions (S2).		
Position		Range
1	...	10 v. A.C.
2	...	100 v. A.C.
3	...	1,000 v. A.C.
4	...	High ohms.
5	...	Medium ohms.
6	...	Low ohms.
7	...	Output (15Ω).
8	...	Output (3Ω).
9	...	D.C.
10	...	D.C. volts.

is in circuit (R44 ensures a minimum resistance of 10,000 ohms) and this in turn means that the range of battery voltage for which a zero adjustment is possible is somewhat limited. The component values specified will allow zero adjustment for battery voltages between 3·1 v. and 2·85 v., but below this the battery must be discarded for meter work.

The resistance measurements possible, allowing for the useless " crowded " portions at each end of the scale, are 1,000 Ω to 1MΩ (" High "), 10 Ω to 10,000 Ω (" Medium "), and 0·1 Ω to 100 Ω (" Low "). The scale is best calibrated for the " Medium " range, " High " and " Low " readings being obtained by multiplying or dividing by 100.

The battery must be capable of supplying 1 amp. on the " Low " range, and if No. 8 size batteries are to be used, two should be connected in parallel and the circuit completed for short periods only.

Section S3(*c*) of the multiplier switch operates on ohms ranges as on A.C. voltage ranges, to break the circuit when the multiplier switch is set to X2 or X5.

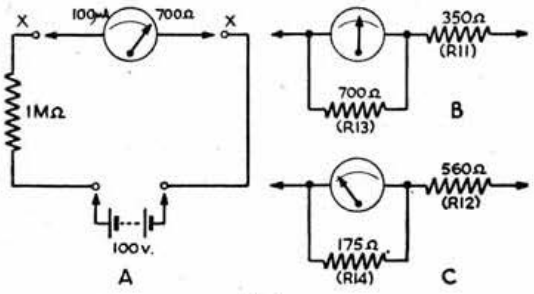


Fig. 2.
The principle of the multiplier switch.

(7) *Power Output.*—Two positions are provided to enable the testmeter to be connected across the secondary winding of the output transformer of a receiver for direct measurement of the power output. On these positions, the test-prods are connected across a 3-ohm or a 15-ohm resistor, so that the matching is maintained when the instrument is connected in place of a 3-ohm or 15-ohm speech-coil. The voltage developed across the resistor is then measured on the 10 v. A.C. range of the meter. Once the 10 v. A.C. range has been calibrated, the readings for the " Output (15 Ω) " range can be calculated from the formula

$$W = \frac{V2}{R}$$

and the scale calibrated directly. It will be found that the maximum reading is over 6 watts, and R51 should, therefore, be capable of dissipating this amount of power. No special scale is needed for the " Output (3 Ω) " range as the necessary values can be obtained by multiplying the readings on the 15 Ω range by five. R52 should accordingly be capable of dissipating about 35 watts, if the full range is to be used; this point is, however, discussed later.

Construction

(1) *Scales.*—The 0–100 scale already provided on the meter will serve for the basic ranges on all D.C. measurements and for the two highest A.C. voltage ranges. Two extra sets of figures reading 0–250, and 0–500 may be added to this scale if desired, for use with the X2 and X5 positions of the multiplier switch. Three additional scales will be needed, for use on the 10 v. A.C. range, the resistance ranges and the output ranges respectively. The first of these can be directly calibrated from another test meter, the second should be calibrated directly by Ohm's law, and the third can be calibrated from the 10 v. A.C. range once this has been inserted.

(2) *Switches.*—A difficulty which may be encountered is that of obtaining suitable switches for the range-selectors. Single-pole, 12-way *Yaxley* switches, particularly of more than one bank, are not very plentiful, and although the component locators, wafers, spacers, etc., are obtainable as separate items, the assembly of a complete multiple switch by this means is inclined to be rather expensive. Much can be done, however, by improvisation with a few old switches. A 2-pole, 6-way switch can be converted into a 1-pole, 12-way type by (i) removing the " stops " to allow 360-degree rotation, (ii) removing and replacing one of the contact strips to operate " 180 degrees out of phase " with the other, and (iii) linking the two " pole " terminals to form one pole.

Sections (*a*) and (*c*) of switches S1 and S2 can be manufactured in this way, and the (*b*) sections present no difficulty. Provided two old switches with reasonably long locator shafts are available, the appropriate sets of three wafers can be mounted on each, the necessary threaded rod and spacer tubes being manufactured as required. Stops may be fitted to restrict the rotation of S2 to 10 positions if this is desired, or the two blank positions may be left free for the addition of further ranges at a later date.

Both the range-selector switches in the writer's instrument were made in this way and have given trouble-free service.

(3) *Resistors.*—Considerations of space preclude any discussion of calibration methods in the present article, but the following points, which relate mainly to the wattage dissipation of the various resistors, may be of assistance.

With the multiplier switch at X5, the current flowing at F.S.D. of the meter is five times that which flows at F.S.D. on the " basic range." The wattage calculations for the various swamp and

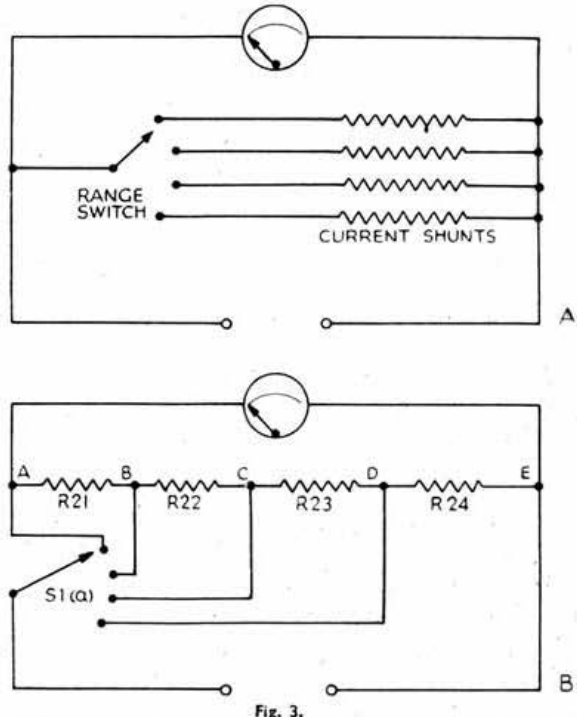


Fig. 3.
The simple shunt and the universal shunt methods of obtaining different ranges of current readings.

shunt resistors must be made by reference to this five-times current, and on this basis R5, for example, may be required to dissipate as much as 2·5 watts. To avoid changes in resistance value through overheating, a generous safety margin should be allowed, and it will be seen that R5 is actually rated at 5 watts. It may well consist of five series-connected 2 MΩ, 1 w. resistors, one of which is carefully adjusted to make the total resistance of the combination 10 mΩ. Similar remarks apply to R33.

Of the D.C. resistors, only R24 requires a high wattage rating. As most of these resistors, however, will presumably be made by the careful adjustment of suitable lengths of resistance wire, the necessary *wattage* will automatically be allowed for by ensuring that the resistance wire used is capable of carrying the appropriate *current* (5 amps. in the case of R24). The high current rating and low resistance value are, of course, most satisfactorily achieved by connecting a number of suitable lengths of resistance wire in parallel, rather than by using one strand alone. R42 and R51 can be similarly dealt with.

At first sight R52 presents a tough problem, for if measurements approaching the maximum reading of about 30 watts are to be available, this resistor must be able to carry about 3·5 amps. Fortunately, such a high rating is scarcely necessary in actual practice. The "Output (3 Ω)" range is used more because of its convenience for connection in place of a 3 Ω load than for taking readings as high as 30 watts. It is unlikely that with a 3-ohm load, power measurements above, say, 8 or 10 watts will require to be measured, and if this limitation is accepted, R52 need only be rated accordingly.

(4) *Assembly.*—The arrangement employed in the original testmeter is shown in Fig. 5, although the components and controls can be arranged to suit individual taste. All components, other than the internal batteries are mounted on the meter panel, and the connections to the batteries are automatically made by two spring clips when the assembly is inserted in its case. Mounting is as rigid as possible, and connections are made with 18 S.W.G. wire, except for the few leads which may be called upon to carry 5 amps. for which 16 S.W.G. wire is preferable. Resistors are mounted on tag-boards, although there is no objection (except on the score of appearance) to their being supported in the wiring. The completed testmeter is housed in a stained and polished wooden case, which also provides a compartment for test-prods and leads.

Operation and Precautions

The two selector-switches are seen to be interdependent. Each has two positions ("A.C. volts" and "Ohms" on S1; "D.C." and "D.C. volts" on S2) which merely serve to bring the other switch into operation. Thus, to measure the voltage output of the 350–0–350 v. secondary of a receiver mains transformer, S1 is set to "A.C. volts" and S2 to "1,000 volts A.C."

The action of the multiplier switch has already been explained.

On the "Low" ohms range, connection should be completed for short periods only in view of the high current drain on the battery. Moreover, owing to the internal resistance of the battery itself, the accuracy of the lowest readings on this range is likely to fall off.

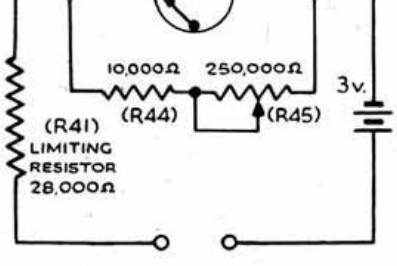


Fig. 4.
The basic circuit for resistance measurements.

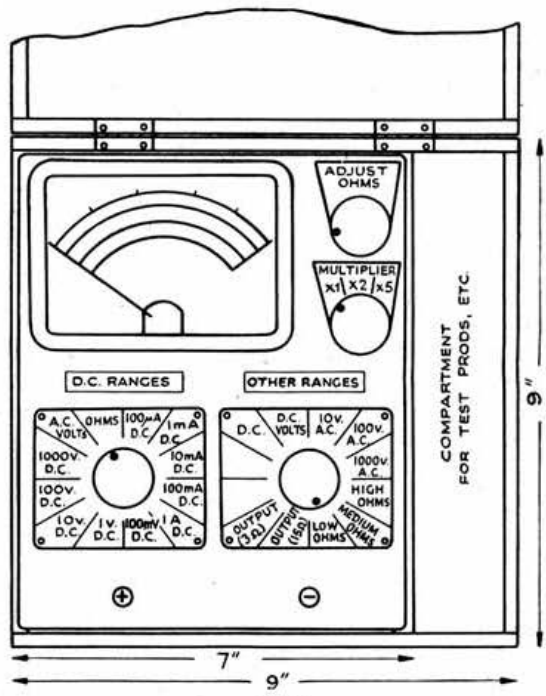


Fig. 5.
The lay-out of the completed testmeter.

When taking output measurements it should be remembered that the scale is only accurate for reasonably sinusoidal wave-forms. Furthermore, the power indicated by the meter is being dissipated as heat within the meter case by R51 or R52, and for this reason it is as well not to leave the meter running continuously on high output readings.

The inclusion of a safety fuse or cut-out (not shown in Fig. 1) is left to personal choice. In the absence of such a device, however, the importance of ensuring correct switch settings, and connecting the prods *only* to the intended points in the circuit under test need hardly be emphasised. In any event, the "safety-tactic" of returning the selector-switch to the "1,000 v." position after each test is worth cultivating.

Headquarters Station—GBIRS

The many reports already received at H.Q. by telephone, telegraph and mail indicate that the transmissions from GBIRS are being consistently received throughout the country. The tone and keying characteristics have been favourably commented upon and the value of the service not only as a frequency marker but as a check on propagation conditions is generally recognised. A typical report, signed by 12 members of the City of Belfast Y.M.C.A. Radio Club, comments, "We were all pleased to hear our H.Q. station."

A GRID-DIP OSCILLATOR

By G. P. ANDERSON (G2QY)

A PIECE of apparatus that should find a place amongst the equipment at every amateur station but rarely does, is the Grid-dip Oscillator, a simple version of which is described below.

The principle of the Grid-dip Oscillator depends upon the variation in the grid current produced by loading the plate circuit of an oscillating valve. The effect of such loading will be a maximum when the oscillator is working at the resonant frequency of the load. Thus the resonant frequency of any circuit may be found by coupling it to an oscillator, and varying the frequency of the latter until the "absorption" by the load circuit is a maximum, indicated by a reduction in the oscillator grid current. By this means the resonant frequency of aerial systems as well as coil-condenser circuits may be measured.

The model described was designed for use inside the station, and it was decided to make it occupy as little space as possible, hence the use of the 6AK5. Almost any type of triode (or pentode strapped as a triode) can be used, and the unit made to be self-contained, with its own battery supplies, as a very low H.T. supply is sufficient. As considered here, the oscillator requires external H.T. and L.T. supplies, and is arranged to utilise an external 0–2 mA (or better) meter.

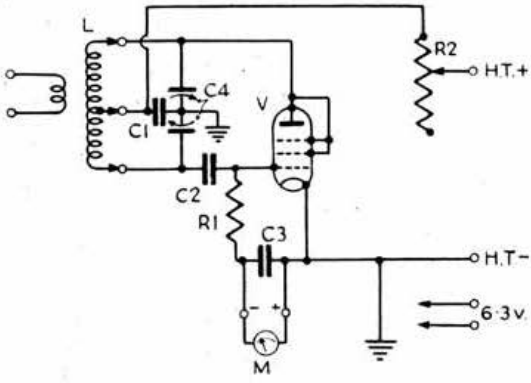


Fig. 1.
Circuit of Grid-Dip Oscillator.

C1, 2, 3	·001 μF. C4 50 + 50 pF variable.
R1	4,700 ohms ½ watt.
R2	100,000 ohms potentiometer.
L	3·5 Mc/s., 60T. 1½ in. diameter, 28 enamelled.
	7 Mc/s., 34T, 1½ in. " 24 "
	14 Mc/s., 14T, 1½ in. " 24 "
	28 Mc/s., 6T, 1½ in. " 24 "
	58 Mc/s., 4T, ¾ in. " 18 "

Circuit

The circuit is shown in Fig. 1, and requires little comment. In the construction, the usual rules should be observed—short leads, etc.—and component values do not appear to be critical. The tuning condenser may be made up of a midget 100 pF variable of the double-bearing type, the stator plates being divided into two banks containing an equal number of plates; careful application of a small hacksaw makes easy work of this job.

Construction

The unit is mounted on the inside of a shallow chassis, arranged to form the lid of a box, so that when assembled the coil is the only component outside.

Any type of centre-tapped coil may be used, those employed being home-made. For frequencies up to 30 Mc/s., the coils are wound on 1½" diameter paxolin tube, while those for the higher ranges are self-supporting and wound with 18 SWG tinned copper wire. The coil socket consists of a valveholder of the kind used for the EA50 type of valve, fixed to the outside of the box by means of two 4 BA bolts, with their heads inside the chassis, and long enough to allow ¼" of bolt to extend beyond the face of the securing nuts.

The low frequency coils are secured to similar holders, short lengths of 18 SWG tinned copper wire being inserted through the holes intended for the valve pins, bent over and soldered to the tags on the side on which the coil is mounted, the other ends extending ¼" below the holder. Slight filing of these ends to form a point will assist with the insertion of the coil in the socket on the oscillator, the ends of the 4 BA bolts serving as guides. Thread may be used to secure the coil to the base. The coils for ranges above 30 Mc/s. are wound with 18 SWG wire, the ends of which are bent to spacing to suit the socket; alternatively a similar method of construction to that described for the low frequency coils could be used.

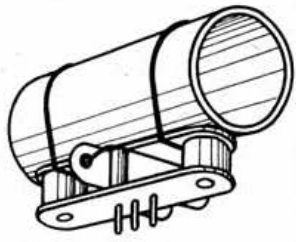


Fig. 2.
Coil Construction.

Operation

In operation, after power has been applied, the grid current is adjusted to a convenient value by means of the variable resistor R2. The circuit to be measured is then coupled to the oscillator coil, either by bringing the two circuits into proximity, or by means of a link coupling. The oscillator tuning is varied until a decrease is observed in the reading on the meter; coupling should be only sufficiently tight to produce a clear indication on the meter. Any method of measuring the frequency may be adopted; in the writer's case it is done by tuning in the oscillator signal on a calibrated communication receiver, but rough calibration could be made for each coil. "Pulling" of the oscillator frequency by the circuit under test, however, precludes accurate scale calibration, and measurement of the frequency on a receiver should, of course, for the same reason be made with the circuit under observation maintained in position.

Applications

The unit described has many obvious uses, such as for aligning tuned circuits in transmitters and receivers. It is also of particular value in checking the tuning of aerial systems. For example, if the coupling coil connected (through feeders) to a dipole is placed near the oscillator coil, a pronounced and quite sharp dip in the grid current meter reading will be seen as the oscillator is tuned through the resonant frequency of the aerial, and the effect on the frequency of varying the height and position of the aerial may be readily observed; it is, incidentally, most enlightening! Similar measurements have been made on the writer's three-element 60 Mc/s. beam aerial, and very accurate readings have been obtained. Although no experiments have so far been carried out, it should be possible to find the resonant frequencies of guy wires (and even of drain-pipes!) by means of a portable version of this useful piece of apparatus.

THE B.E.R.U. CONTESTS, 1948

FROM a casual listen around the H.F. bands during the first or third weekends of April last it was obvious that a major contest was in progress—G5WP sums it up in the word "brawl!" With complete freedom from last year's fuel restrictions and a spell of good DX conditions on the 14 Mc/s. band, hundreds of operators took the opportunity of raising the rarer DX stations which appear "out of the blue" on these occasions, only to hibernate again until the next major event. This becomes only too obvious when the small number of British entrants is noted—most stations were more interested in claiming new countries than points in the B.E.R.U. Contest. The number of entrants never was a criterion of the success of a radio transmitting contest—especially is this so in this year's event. It is known that close on 400 British Isles stations were actively participating.

Conditions on 28 Mc/s. showed signs of deterioration after the winter spell; nevertheless, many of the rarer stations were there to be "queued" for. One entrant, after vainly calling VQ3HGE for two hours—during which time the latter worked nearly 30 British stations—was rewarded at last and was well satisfied to hear him announce he was now QRT on that band, immediately after ending the contact. The 7 Mc/s. and even 3·5 Mc/s. bands were also utilized and many good DX contacts were made, especially on 7 Mc/s., but few British entrants appear to have made full use of these bands. The scoring system this year made multi-band operation well worth-while, and most of the leading stations operated on at least three bands.

Suggestions and Criticisms

Numerous entrants took the opportunity of offering helpful suggestions, which will be carefully borne in mind in framing the rules for future events. There were many, too, who had certain criticisms to make. The scoring system and analysis sheet came in for a good deal of comment and it was suggested that their complexity tended to discourage many intending entrants from submitting logs. V.F.O.'s came in for some scathing remarks. I1ADW (in QSO with a W4) was heard to send the following: "The G's have some sort of a contest on and are making an awful rumpus with their V.F.O.'s and punk A.C. notes." It does seem from the numerous complaints that quite a bit of unsportsmanlike activity did in fact take place, including the sending of CQ on the frequency of a rare DX station after a QSO with him had been completed—sweeping the band with the P.A. switched on, and bad notes generally. Again the question is raised "Can't something be done about it?" The only answer seems to be in the hands of the operators themselves—don't reply to stations calling on your frequency, and announce this fact when sending CQ.

Publicity

It is pleasing to note the response to the wider publicity this year, particularly from Canada. Some areas still complain of lack of early information, but we hope this difficulty will in time be overcome. Paper restrictions are, as usual, to blame.

Disqualifications

Although the attention of entrants was clearly drawn to certain important rules, a number of logs were withdrawn for the following technical infringements of rules: entries posted after closing date, no analysis sheet, no signed declaration, and (in one case) the declared use of power in excess of that permitted in the event. A list of these stations, together with their claimed scores, appears on page 68.

SENIOR B.E.R.U. CONTEST WINNER, 1948.

David H. Duff, VK2EO, Hornsby, New South Wales, winner of the 1948 Senior B.E.R.U. Contest. VK2EO was the leading Australian station in the 1947 B.E.R.U. and 1947 A.R.R.L. DX Contests, and the winner of the 1947 VK Contest—a remarkable post-war record. His equipment consists of a four-stage V.F.O. exciter (837–12SK7–12SK7–837) coax.-coupled to a 100 watt band-switched transmitter with an 813 power amplifier. A Bendix Wavemeter and R.C.A.88 receiver complete the picture. In between contests VK2EO has been preparing for 144 Mc/s. operation.

The Senior Section

Mr. D. H. Duff (VK2EO) of Hornsby, N.S.W., with 2,947 points, is to be congratulated on winning the Senior event. He is a well-known entrant in most international contests and has, in fact, now obtained wins in six major events in a row—truly a remarkable record. He obtained the highest VK score in the 1947 B.E.R.U. Contest. VK2EO had 357 contacts with 25 of the 30 possible prefix zones. These included 23 contacts on 7 Mc/s. with no less than 11 zones.

Second place is occupied by another well-known Australian station—Mr. G. F. Cole, VK2DI, of Miranda, N.S.W., who with 2,854 points made 315 contacts with 26 zones, including 20 stations in 7 zones on 7 Mc/s.

Mr. W. E. Russell (G5WP), of Woking, Surrey, with 2,809 points is placed third, and is also the leading British entrant. He certainly deserves all credit as he was most unfortunate in 1947, when he obtained the highest British score, but was deprived of placing by the ruling rendering the event null and void to British entrants owing to fuel restrictions. He was one of the few British entrants who made use of all the DX bands with success. G5WP worked 7 stations in 4 zones on 3·5 Mc/s. and 22 stations in 8 zones on 7 Mc/s., which together with those worked on 14 and 28 Mc/s., gave him a total of 261 contacts with 22 zones.

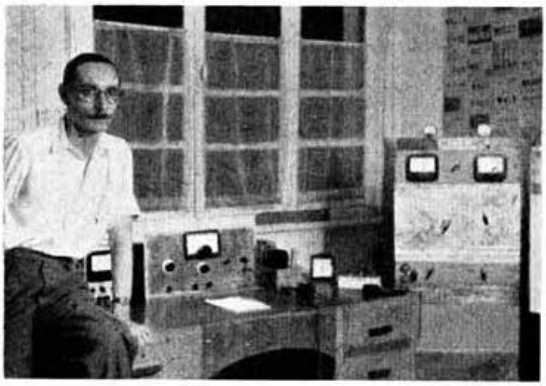
The Junior Section

This year the Junior event was run concurrently with the Senior, thus giving low-power stations an

opportunity to work the higher power stations taking part in the other event. In 1947, Junior entrants found that many of the higher power stations were no longer active after taking part in their section, and had more difficulty in finding stations to work.

The Junior event was won by Mr. R. G. Cracknell, ZE2JV, of Plumtree, Southern Rhodesia, who obtained 1,709 points, and made 200 contacts with 21 zones, including 18 contacts on 7 Mc/s. with 6 zones. Congratulations—a fine score!

Mr. E. J. Lake (VK4EL) of Brisbane, puts Australia on the map again by obtaining 1,602 points and thus taking second place. He had 152 contacts on the 14 and 28 Mc/s. bands, and was using his normal 90 watt transmitter with the reduced power supply of 330 volts.



A B.E.R.U. CONTEST COMPETITOR

Although G. R. Chiffey, G3ZJ, was in Asmara, Eritrea, for little more than a year, he contacted well over one hundred countries besides giving countless amateurs a chance to work a rare country. As MI3ZJ he provided British stations with one of the most sought-after and consistent of the 1948 B.E.R.U. signals from his lofty 8,000 feet-up location.

Third place goes to Mr. C. C. Newman, VS9AN, of Aden, with 1,379 points and 252 contacts, 161 of which were with the British Isles. Mr. Newman had a transformer breakdown and was in trouble later with a hastily-built E.C.O.

Placings—Senior Section

Pn.	Call Sign	Pts.	Pn.	Call Sign	Pts.	Pn.	Call Sign	Pts.
*1	VK2EO	2,914	32	VK3CN	1,502	63	G5RP	757
2	VK2DI	2,854	33	VQ4KTH	1,460	64	VE6MZ	755
*3	G5WP	2,809	34	G6XL	1,429	65	GM3WO	734
4	VQ3HJP	2,777	35	G4AR	1,424	66	VE3ADV	722
*5	G6CJ	2,768	36	G2DC	1,394	67	VK2MT	705
6	G6RH	2,764	37	G6RC	1,364	68	VE2OL	700
*7	ZL1MB	2,286	38	G5HZ	1,352	69	G2BQC	697
8	ZL2FA	2,210	39	VK2GW	1,278	70	VE1RP	694
9	G6GN	2,096	40	ZS6BT	1,258	71	G5W1	692
10	G5DQ	2,041	*41	VE1CU	1,209	72	G2HAO	675
*11	ZS6CT	2,015	42	VK2QL	1,203	73	ZE1JO	650
12	MD5KW	2,002	43	G6BQ	1,142	74	GW8UH	636
13	VK3XK	1,972	44	ZL1DA	1,136	75	VE1IM	631
14	G5MY	1,966	45	G3AH	1,081	76	G2LC	593
15	G3BI	1,965	46	VK4RF	1,045	77	VE5AT	573
16	G6LX	1,934	47	VP6AT	1,040	78	G2AJB	561
17	MI3ZJ	1,919	48	VE1EK	972	79	VE3QB	548
18	G2VD	1,813	49	VE1HG	924	80	VQ8AD	544
19	G3AZ	1,806	50	VK3UM	917	81	VE1NE	526
20	G6RB	1,729	*51	VE2BV	913	82	VQ8AF	486
*21	VE3KE	1,676	52	VE1EA	887	83	ZS5HC	454
22	G8PB	1,668	53	VK5DQ	867	84	VS9AF	447
23	ZS5U	1,659	54	G3UI	855	85	VE3AFY	407
24	G4CP	1,655	55	ZL3AZ	828	86	VK3ZC	402
25	VK4RC	1,609	56	G6CL	816	87	VO1D	382
*26	VK6PJ	1,608	57	G5CW	801	88	VQ2GW	340
27	G8IL	1,559	58	VE3VN	799	89	G5WA	280
28	G8WF	1,556	59	G5MR	797	90	G6WN	252
29	VK2RA	1,551	60	VP4TO	778	91	G3SB	249
30	G2DM	1,521	61	VK5LD	776	92	G3AW	235
31	VK6RF	1,504	62	G6KP	773	93	G6NK	175

Details of Leading Entrants

Station.	Transmitter.	Input Power (watts)	Aerial Systems.	Receiver.
VK2EO	V.F.O. and crystal controlled.	100	28 Mc/s.—4-element rotary. 14 and 7 Mc/s. — 67 ft. Zepp.	AR88
VK2DI	V.F.O. / crystal switched exciter—813 final.	100	7 Mc/s. — Full - wave Zepp. 14 Mc/s.—Rotary dipole. 28 Mc/s.—Rotary 2 half - waves in phase.	12 valve, home built.
G5WP	E.C.O. / crystal switched exciter — P/P 35 T's in final.	90/150	3.5 and 7 Mc/s.—136 ft. "VS1AA" windom, 14 Mc/s — Rotary single section compact "W8JK." 28 Mc/s.—as for 14 Mc/s., but 2-section.	National H.R.O.
ZE2JV	6V6 CO-6L6-6L6 (ECO on 28 Mc/s.) P/P 807's in final.	25	End - fed Zepp (N-S). 66 ft. centre-fed Zepp (E-W). 3-element close-spaced rotary on 28 Mc/s.	No details.
VK4EL	V.F.O. 805 final (14 Mc/s.). 808 final (28 Mc/s.).	23	33 ft. vertical, centre-fed.	Home-built superhet with convertor.
VS9AN	E.C.O. / crystal 807 final.	15/25	14 Mc/s. — Half - wave Windom. 28 Mc/s. — Full - wave Windom and half - wave rotary dipole.	AR88 L.F.
BRS15024	—	—	—	2-v-2 with R.F. regeneration.
BRS1535	—	—	—	Modified H.R.O.

Placings—Junior Sections

Pn.	Call Sign	Pts.	Pn.	Call Sign	Pts.	Pn.	Call Sign	Pts.
*1	ZE2JV	1,709	8	VK3NC	910	15	VQ4FCA	560
*2	VK4EL	1,602	9	VS6AE	843	16	VP1AA	464
*3	VS9AN	1,379	10	VE5QZ	811	17	MD5AK	440
4	ZB1Q	1,372	11	VP8AD	692	18	G2FJD	382
5	VK5RX	1,122	12	ZS5BW	622	19	GM4FK	344
6	VK4TY	1,069	*13	G3DCU	593	20	VS6BC	337
7	VU2JP	1,043		VK4XJ	593			

The Receiving Section

Although the entry was somewhat disappointing, at least it was a slight improvement on last year. Apart from a criticism of the scoring system, it was pointed out that transmitting entrants make it very difficult for the receiving stations when using break-in and not signing—even at the end of a QSO.

(*Continued on page* 68)

TELEVISION INTERFERENCE AND THE VIEWER

By JAMES N. ROE (G2VV)

IN facing the problems of television interference amateurs must consider, not only the technical difficulties involved, but also the social aspect in dealing with the TVV (television viewer). Co-operation, in preceding years, with the BCL has called for a general *esprit de corps*, and now we have to start all over again, knowing that the answers will not be quite so easy as before.

Unfortunately, there exists in the minds of the public a feeling that their "right" in listening to broadcast—and viewing television—programmes, takes precedence over the licensed amateur's "right" to operate his transmitting station.

Much has already been done by individual amateurs and radio clubs to dispel this erroneous attitude but the fact remains that an all-out collective effort should be made to educate the radio, and television, public to the fact that the amateur has *equal* rights. How is this to be done ?

One effective way of reaching the public is by the general exhibition of a film. The writer has in mind something similar to "The Highway Code" and a number of such films made by "The Crown Film Unit." The film could, without doubt, be produced by amateurs themselves but the difficulties involved in arranging for its exhibition throughout the country might preclude such an ambitious effort.

Possibly, a more practicable method would be the publication of a carefully worded, plain language, announcement in local newspapers all over the country or, perhaps in the first instance, within the present television service area. Such an announcement—advising the public that they can expect assistance from the amateur, where his transmitter is known to be causing interference to their reception—might be prepared by the R.S.G.B. Television Sub-Committee. Copies would then be circulated to Regional Representatives who, in turn, would approach their local press for co-operation. Editors of community newspapers are usually quite willing to give their support to such movements.

We have recently had an example of just how much co-operation can be attained in a direct public appeal. Anyone who has read the reports on the R.I.C. campaign against car ignition interference must have been impressed by the results so far achieved.

An extension of television transmitting hours in the future is absolutely certain. Coupled with this will be the ever expanding service area. All in the future it is true but bringing with it the biggest interference problem ever to confront the amateur fraternity.

We have the opportunity now—in these early stages of television expansion—to bring the proper facts before the viewing public. Let us see to it that "the man in the street" learns to accept the amateur as a knowledgeable friend who—far from wishing to mar his radio and television entertainment—is willing to co-operate should his transmitter cause any interference.

What can *you* do as an individual amateur ?

If you know of a television receiver in your vicinity call and make yourself known to the owner. Ask if your transmitter is causing trouble to his programmes. Don't wait for your neighbour to complain. True, he might not realise for a while that your transmitter is the cause of his picture turning upside down, or disappearing altogether, but—he is bound to find out sooner or later. Unless you have taken very elaborate precautions (and perhaps even if you have !) you can be sure that your transmitter is causing interference to a nearby television receiver.

By using this approach you are starting off along the right path with your viewing neighbour and, far from "sticking your neck out," he will appreciate and respect your attitude. One does, of course, meet a difficult individual now and again. Such people are to be found in all walks of life. A viewer complaining of interference from your transmissions but refusing to allow you to see his receiver or carry out tests should be reported to the authorities. However, in the majority of cases, mutual understandings will leave everyone happier.

Thanks to the complexity of present-day electronic developments the radio amateur must be a master in the art of diplomacy !

In conclusion—a word of warning. The absence of a television aerial on a house is *not* an indication that the occupiers do not possess a television receiver. In the London area there are many viewers using indoor aerials so—beware !

Citizen's Radio Service

In the United States active preparations continue for the utilisation of the 460–470 Mc/s. band recently allocated by the Federal Communications Commission for the "Citizen's Radio Service." Already certificates of "type approval" have been granted to manufacturers of suitable transceivers and it is believed that the F.C.C. will make the actual issuing of station licences to private citizens a very simple matter. No Morse or technical examinations are envisaged. The service will permit the use of these frequencies for short distance communication, radio signalling (including facsimile) and remote control of objects.

Power is expected to vary from 50 watts, for fixed crystal controlled transmitters, to between 10 and 50 milliwatts for mobile hand sets. Unstabilised transmitters will be confined to frequencies near the centre of the band. Manufacturers anticipate a normal range of from ½ to 7 miles for mobile operation. First models weigh approximately 2¼lb. including batteries.

The 420 Mc/s. Band—Official Statement

Holders of Amateur Wireless Station Licences issued by the Postmaster General are hereby authorised to use, as from October 1, 1948, telegraphy and telephony on any frequency between 420 and 460 Mc/s., with power not exceeding 10 watts, subject to the general conditions of their licences and subject to no interference being caused with the working of other services.

The Station Behind the Call

G6KU*

THOSE who cannot devote a separate room to radio will no doubt have pondered the pros and cons of the outdoor "shack" against possible indoor schemes.

Due to a growing family, this was the position of Charlie Sharp, G6KU, Representative for the North-Eastern Region. Having decided against the outdoor site on account of its many disadvantages, a highly satisfactory compromise has been effected by housing the complete station in a large bookcase-bureau which occupies a corner of the dining room, between window and fireplace. The unit, which harmonises with the furnishing scheme, is quite unobtrusive when closed and though not lending itself to much experimental work, is very flexible in operation and can be used on a choice of several bands at a moment's notice. A prime advantage is that the gear is kept in good condition due to being in a warm room.

Layout of Station

The bottom shelf of the bureau houses six chassis with input and output sockets at the front and a thick bunch of wires, taped up, connect to mains, control panel and transmitters. The plug and socket method enables any unit to be removed for examination in a very few minutes. These chassis contain the 1,000 volt supply with 866 rectifiers and choke input; 600 volts for drivers or medium power and 350 volts for crystal oscillators or first stages in transmitters. Also included are 350 volts H.T. for speech amplifiers and modulator, a mains operated grid bias supply (with valve separators for preventing interaction between stages having widely different grid currents), a source of low voltage for operating keying and other relays and the usual bleeder resistances, key click filters, etc.

On the shelf above, at the left, is the family broadcast receiver with controls brought through the door. The speaker fret is in a corresponding position on the right hand door. Although not a superhet, the family can listen in comfort to the programmes without interference, while the O.M., using phones, works DX with 150 watts or uses 10 watts of fully modulated phone on 1·7 Mc/s. The right hand section of this shelf contains the speech amplifier and modulator, comprising a 6J7—6C5 and P.P. 807s and this is fed from a home-built transverse current microphone. All the above gear can be locked up to prevent danger to anyone.

Operating Position

The hinged flap of the bureau makes a substantial and convenient operating desk and when lowered discloses the H.R.O. receiver on the left while to the right is the control panel and home-made "bug" key.

This panel provides for the switching of mains to all gear, the changing over of plate and screen voltages to each of the three transmitters, the monitoring of all valve currents and voltages and carries the input plugs for key and microphone. The meters, which can be switched into circuit as required, read, from left to right, anode currents of P.A., buffer, driver and modulator respectively. Lastly, a voltmeter to 1,500 with rotary switch and coloured identification dots is available for all anode and screen voltages. The control panel is illuminated by concealed lights.

Auxiliary Equipment

Access to the top (former bookcase) compartment of four shelves is by means of a pair of glass panelled doors. The lowest shelf holds at the left the mains supply for the frequency standard and the loudspeaker for local phone work. Next comes an interesting piece of gear built completely from surplus M.O.S. components. On the one chassis is a 500 kc/s. bar oscillator followed by two multi-vibrators on 50 kc/s. and 10 kc/s., any one of which can be switched on as needed and having a tuned output for the band required. On the same chassis is a Franklin V.F.O. with two EF 50s as oscillators followed by two untuned EF 50 buffer amplifiers and a tuned 6V6 output with stabilised voltage supply. The Franklin coil can be switched from 300 metres to 80 metres fundamental and the output stage is tuned by switched coils, feeding R.F. to a co-axial plug on either 1·7, 3·5, 7 or 14 Mc/s. for driving purposes. At the extreme right is a filament transformer, which by means of a six pole change-over switch behind, gives voltages of 5, 6·3, 7·5, 10 and 12·6 for the various valves in the transmitters.

The Transmitters

The first of these transmitters is on the shelf above, on a long chassis, and uses in the first stage a 6L6 as doubler, being fed by co-axial link from the V.F.O. The buffer is an 807, driving a pair of 35T's in push-pull to 150 watts on 14 Mc/s., the output being taken by co-axial cable to an aerial tuning unit on the top shelf.

The transmitter on the shelf next to the top is similar to the one described but has a single 211 valve as P.A. and operates on 3·5 Mc/s., also being link-coupled to another aerial tuning unit on the top shelf.

The right hand section of the top shelf houses the 1·7 Mc/s. transmitter which consists of a neutralised

*56 Moore Avenue, Wibsey, Bradford, Yorks.

OPERATING NOTES

AMATEUR operators examining the new list of Q signals approved at Atlantic City last year have already noticed a number of new abbreviations that should prove extremely useful. For example, **QSN ?** meaning "Did you hear me on .... kc/s. ?" should come in handy on many occasions. So should **QTX** "I will keep my station open for further communication with you until further notice (*or* until .... hours)." Both are ideal for testing—particularly on the V.H.F. bands.

For the benefit of those members who have not yet seen the full list, a selection of the new signals is given below :—

QRE ? *What is your estimated time of arrival at .... (place) ?*
QRE *My estimated time of arrival at .... is .... hours.*
QRF ? *Are you returning to .... (place) ?*
QRF *I am returning to .... (place).*
QSN ? *Did you hear me on .... kc/s. ?*
QSN *I did hear you on .... kc/s.*
QTS ? *Will you send your call sign for .... minute(s) so that your frequency may be measured.*
QTS *I will send my call sign for .... minute(s) so that my frequency may be measured.*
QTU ? *What are the hours during which your station is open ?*
QTU *My station is open from .... to .... hours.*
QTV ? *Shall I stand guard for you on the frequency of .... kc/s. (from .... to .... hours) ?*
QTV *Stand guard for me on the frequency of .... kc/s. (from .... to .... hours).*
QTX ? *Will you keep your station open for further communication with me until further notice* (or *until .... hours*).
QTX *I will keep my station open for further communication with you until further notice* (or *until .... hours*).

* * *

Break-in operation has been dealt with more adequately than in previous lists. **QSK** is retained for "Can you hear me between your signals ?" and the reply "I can hear you between my signals," but there is now also **QSI** to say "I have been unable to break-in on your transmission." Very useful !

A certain amount of confusion exists as to the correct use of **QSY, QSU** and **QSW.** For instance **QSY ?** is all too often used to ask "Can you change frequency ?" whereas it really means "Shall I change frequency ?" The exact wording of these three abbreviations is well worth studying :—

QSU ? *Shall I send or reply on this frequency* (or *on .... kc/s.*) (*with emissions of class ....*) *?*
QSU *Send or reply on this frequency* (or *on .... kc/s.*) (*with emissions of class ....*).
QSW ? *Will you send on this frequency* (or *on .... kc/s.*) (*with emissions of class ....*) *?*
QSW *I am going to send on this frequency* (or *on .... kc/s.*) (*with emissions of class ....*).
QSY ? *Shall I change to transmission on another frequency ?*
QSY *Change to transmission on another frequency* (or *on .... kc/s.*).

* * *

Old timers who still use the abbreviation **QSC** to mean "Your signals have faded right out" are in for a surprise. Under the Atlantic City regulations this abbreviation will soon mean "I am a cargo vessel" !

* * *

Radio REF offers the following advice to operators :—

On C.W.—

1. Do not send faster than you can copy.
2. Never send more than five CQ's without giving your call-sign.
3. Do not reply to directional CQ's if they are not addressed to you.

On 'Phone—

1. Pay attention to the quality of your transmissions.
2. Avoid long discussions.
3. Keep your conversation to subjects of a technical nature.

* * *

Perhaps Shakespeare had been listening on 14 Mc/s. before he wrote "Tush, tush ! Fear boys with bugs."—*Taming of the Shrew.*

THE STATION BEHIND THE CALL

(*Contd. from page 67*)

1626 driver with 1625 output and aerial tuning unit-whilst to the left are the aerial tuners for the transmitters previously mentioned. Grid current meters can be plugged into jacks on the front of each transmitter chassis and the co-axial input sockets are in a similar place to the right.

Transmitters for three bands are thus available ready tuned but other ranges may be obtained by coil changing. A comfortable and convenient station can be operated in this way and both local telephony and DX C.W. is indulged in, W.A.C., W.B.E., W.A.S. having been obtained and over 100 countries worked.

Aerial Systems

The aerial is a Zepp. with 122 ft. top and 16 ft. feeders which is also used as an end-on voltage fed single wire and with the addition of a 136 ft. counterpoise for the 1·7 Mc/s. band. Other ancillary gear which has been constructed and is brought out for use as required includes a 10 valve crystal superhet receiver, frequency meter, monitors and C.R.O.

B.E.R.U. CONTEST (*Contd. from page 65*)

Placings—Receiving Section

Pn.	Call Sign	Pts.	Pn.	Call Sign	Pts.
*1	BRS15024	3,006	4	BERS195	2,142
2	BRS1535	2,772	5	BRS250	2,058
3	BRS1914	2,547			

* *Prefix zone certificate winners.*

Disqualifications (*Claimed Scores shewn*)

Inaccuracies in log.—ZS2A, 5,038.

No signed declaration or analysis.—VE3BBR, 1,333 ; ZS6HM, 179 ; VE8NX, 75.

No signed declaration.—VE1KN, 1,084 ; VK3RJ, 684.

No analysis.—GW3ZV, 2,387 ; G4MU, 1,109 ; VE3AKG, 912 ; VK5FM, 807 ; VO3X, 701 ; G8KU, 657 ; AP4A, 443 ; VK2VN, 392 ; VK3JA, 294 ; VK3PL, 170.

No analysis and late entry.—VE2WW, 2,611 ; EI5F, 480 ; VE6IZ, 204.

Use of power in excess of 150 watts.—VE1PQ, 692.

Late entries.—G2EC, 2,701 ; G2QT, 1,448 ; VE1BV, 1,272 ; G5FA, 983 ; VE3AGX, 620 ; VE3ANO, 563 ; VE3DU, 166 ; VE6AB, 131.

Check Logs

Non-entry logs received from the following were useful for checking purposes :

AP5B, G2AO, 2MI, 2HOX, 3COJ, 4HJ, 4JZ, 5MI, 5ND, 5TL, 6AH, 6BB, 6HD, 6XS, GI5TK, GM3AVO, 3CIX, GW4CX, 5SL, VE1AQ, 1QZ, 2RL, 3AAW, 3ACS, 3BWY, 3DT, 4EO, VK2DG, 3XB, 5AJ, 5BY, 5KO, 5JD, 6WT, VQ4MHA, VS6AJ, 6AL, 6AW, ZB1AI, ZL1CH, 1HY, 3GR, 4HS, ZS1BM, 6BJ 6BW, 6EW and 6JT.

The President's Trophies

NOW that frequencies within the band 420–460 Mc/s. are about to be released it is anticipated that a number of members will be anxious to compete for the Desmond Trophies. As announced in the February, 1948, BULLETIN, trophies will be awarded to the two members who first succeed in establishing contact with one another over a distance of at least 25 miles on frequencies in the 420–460 Mc/s. range.

The following rules, approved by the President, will be used to judge the award.

(1) The contact must take place between fixed land stations situated within the United Kingdom of Great Britain and Northern Ireland.

(2) A minimum distance of 25 miles accurately calculated by means of an Ordnance Survey Map (or Maps) must be covered before a claim is lodged.

(3) Contact must be maintained for not less than 15 minutes and readability reports not lower than R3 exchanged.

(4) The exact time (GMT) of contact must be recorded on each claim form.

(5) Claimants must be fully licensed Corporate Members of the R.S.G.B., and each side of the contact must be witnessed by one other Corporate Member who will be required to certify that the rules have been observed.

(6). Claimants must certify in writing that their licensed power was not exceeded.

(7). A description of the equipment used for both receiving and transmitting must accompany each claim.

Service Stations

It is apparent from correspondence that not all amateurs realise that certain of the amateur bands are in fact shared by International agreement with other fixed and mobile services. Thus, for example, Government stations have a perfect right—indeed a prior right—to use the 160 and 80 metre bands.

The attention of the Service Ministries however has been drawn to reports that Service stations, using amateur procedure, have been indulging in private conversations with amateurs. The Service authorities have taken note of these reports and are arranging for their monitoring stations to cover more closely all the amateur bands so that should future offences occur they will be intercepted.

If called by a Service station, *other than under condition* 12 *of the Amateur Licence*, amateurs should note particulars of frequency, call sign, time, date and place, and forward these to the Engineer-in-Chief, Radio Branch (WM/13) G.P.O., Brent Buildings, North Circular Road, London, N.W.2.

Radio Sounding Balloons

From time to time the Society receives complaints from members that radio sounding balloons are operating in the 28–30 Mc/s. amateur band. In recent months complaints have been few in number but we have reason to believe that interference from these balloons is still being experienced in certain parts of the country.

Members who are in a position to furnish Headquarters with information concerning this source of interference are asked to state time, date and frequencies. It would help if an indication could also be given of the regularity or otherwise of the interference.

The Cairo Conference regulations assigned the band 27·5 to 28 Mc/s. for this service.

CQ Holland

FROM the moment that the party of West Country amateurs, who, with their wives and friends, recently spent two weeks in Holland, met PA0XE at Haarlem it was obvious that the local amateurs were bent on showing what Dutch hospitality can really mean. PA0XE brought a message of welcome from the President of V.E.R.O.N., and, being attached to the Dutch railways, was able to assist the party on many occasions. The Hotel Schiller in Amsterdam was soon established as Headquarters but thanks to the programme arranged by the Dutch amateurs the party travelled far and wide through the "Land of the Windmills." Visits were paid to the AVRO Broadcasting Station at Hilversum, the Airport at Schipol, the Lopic transmitters and the Phillips' Valve factories at Eindhoven as well as to many amateur shacks. It was noted that practically all amateur equipment is home constructed and reflects great credit upon the owners' ability to overcome local shortages of radio supplies. But perhaps their enthusiasm and ingenuity is a direct link with their war-time activities in the various underground movements.

Gathering of British and Dutch Radio Amateurs and friends at a party in Amsterdam on August 4, 1948.

Time was also found to visit many historic places, including The Hague, Arnhem, Nijmegen, Alkmaar —famed for its cheese—while the ladies of the party were especially interested in the traditional costumes seen at Volendam and Marken. With the final goodbyes, after a party given as a mark of appreciation to the PA0 amateurs, it was felt that many friendships had been cemented by personal contact and that memories of a most pleasant holiday will be maintained for a long time to come by Amateur Radio.

Mr. Harold Andrews, G5DV, organiser of the party, is already making enquiries for a similar trip next year—possibly to Denmark.

Tot ziens en bedankt voor alles.

Band Planning

An important circular on the subject of Band Planning has recently been issued to R.Rs., C.Rs. and T.Rs. Members interested in this subject who have not attended a group meeting since mid-August are urged to contact their T.R. and obtain details from him of the information contained in the circular. The circular invites replies to several questions on band planning. Act *at once*—a week later than this is *too late*.

Members Subscriptions

Some members and some representatives have asked for information regarding the Society's financial affairs in view of the statement made by the Honorary Treasurer that steps were being taken to enable the Society to increase if necessary the subscription rates.

It is thought that a very full and fair view of the Society's affairs will be obtained from the following :

1. Audited Annual Accounts to September 30, 1946, and Honorary Treasurer's Report thereon published in the December, 1946, issue of the BULLETIN.
2. Audited Annual Accounts to September 30, 1947, and Honorary Treasurer's Report thereon published in December, 1947, BULLETIN.
3. Report of 1947 Annual General Meeting published in January, 1948, BULLETIN.

During the past few months some letters from members and some resolutions from local groups have been received. All have been noted and the suggestions put forward will be very carefully considered before any final decision is arrived at by Council.

Members are reminded that no change in the present subscription rates can take place until the Articles of Association have been altered. To alter the Articles an Extraordinary General Meeting will be necessary to approve a Special Resolution and the fullest possible information will be given to members when the notice calling the Meeting is circulated.

The Council have taken legal advice and it seems clear that members may vote by proxy at an Extraordinary Meeting.

A.J.H.W.

Silent Key

KENNETH B. WARNER, WIEH

With profound regret we record the death—which took place suddenly on September 2—of Kenneth B. Warner, W1EH, well loved Managing Secretary of the American Radio Relay League, and Secretary of the International Amateur Radio Union.

No man has done more for Amateur Radio. No man understood our great hobby better. His work in the cause will remain a lasting memorial.

To Mrs. Warner and her children, and to our colleagues in the A.R.R.L., we offer our sincere condolences in the great loss they have sustained.

J.C.

Last year just before the Atlantic City Conference opened, Mr. K. B. Warner (*right*) entertained the then President—Mr. S. K. Lewer, G6LJ—and the General Secretary, Mr. John Clarricoats, G6CL, at his home in West Hartford, Conn. W1EH was active on the DX and V.H.F. bands until just before his death.

VK/ZL International DX Contest 1948

THE first post-war combined VK/ZL International DX Contest will take place during October, 1948. The Contest which has been organised by the N.Z.A.R.T. in conjunction with the W.I.A. follows similar lines to the A.R.R.L. Contest and the object is for overseas stations to contact as many VK and ZL call areas as possible.

Dates

12.01 G.M.T., October 1, to 11.59 G.M.T., October 3—C.W. operation.
12.01 G.M.T., October 8, to 11.59 G.M.T., October 10—Phone operation.
12.01 G.M.T., October 15, to 11.59 G.M.T., October 17—C.W. operation.
12.01 G.M.T., October 22, to 11.59 G.M.T., October 24—Phone operation.

Transmitting Contest

Rules

(1) There will be three main sections :—
(*a*) Transmitting C.W.
(*b*) Transmitting Phone.
(*c*) Receiving (Phone and C.W.).

(2) Contestants may compete in the "open" events (*i.e.* all bands) or on one or more individual bands by submitting a log for each individual band.

(3) The Contest will be open to all licensed transmitting amateurs and receiving stations in any part of the world.

(4) Stations entering for both the C.W. and Phone Sections must submit separate logs for Phone and C.W. (see rule 12).

(5) Any licensed frequency band may be used.

(6) Only one contact per band per weekend with any one station will be permitted.

(7) Only one licensed amateur will be permitted to operate any one station.

(8) Each participant will assign to himself a serial number of three figures. This serial number must remain unaltered for Phone and C.W. contacts.

(9) Serial numbers to be exchanged will be as for the A.R.R.L. DX Contest, *i.e.* the personal three figure cypher will be preceded by the signal report, making a six figure serial for C.W. and a five figure serial for phone.

(10) Both the VK/ZL station and the station in the remote locality receive one point when a serial number is acknowledged by the station in the remote locality. Each operator adds two points more when a serial number to the VK/ZL station is acknowledged.

(11) For each band the multiplier will be the number of VK/ZL districts worked on that band. These are VK2, 3, 4, 5, 6, 9 ; ZL1, 2, 3. 4.

(12) (*a*) Logs must show (in this order) date, time (G.M.T.), band used, call of station worked, serial number sent, serial number received, points claimed. (*b*) Each new VK/ZL call area contacted must be underlined in RED ink or pencil. (*c*) A separate log must be submitted for each band. For each band a summary must be given showing (i) list of VK/ZL call areas worked; (ii) total number of contacts made on that band ; (iii) points claimed for that band. (*d*) Summary sheet to show : Call sign of station, name and address of operator, whether entry is for C.W. or phone and whether for a single band or all-band operation, total points claimed, and finally a Declaration that all the contest rules and regulations for Amateur Radio in the entrant's particular country have been observed and that the log is correct and true to the best of the entrant's belief.

(13) The judges reserve the right to disqualify any station for (*a*) consistent tone reports under T8, (*b*) continuing key-clicks, (*c*) phone splatter or excessive modulation, (*d*) off frequency operation.

(14) The Executive Council of the N.Z.A.R.T. shall be the sole adjudicators.

Awards and Entries

A Certificate will be awarded to the station returning the highest score from each participating country.

Entries must reach N.Z.A.R.T., P.O. Box 489, Wellington, New Zealand, by January 14, 1949. Envelopes must be clearly marked "VK/ZL Contest."

Receiving Contest

(1) The rules for the receiving contest are the same as for the transmitting contest. The contest is open to members of any Short-Wave Listeners' Society in the world.

(2) The contest times and logging of stations once in each band per weekend are subject to the same rules as for the transmitting contest.

(3) To count for points, the call sign of the station being called, and the strength and tone of the calling station, together with the serial number sent by the calling station, must be entered in the log. Three points will be claimed for each such entry in the log.

(4) It is not sufficient to log a station calling CQ.

(5) Overseas listeners will enter only VK and ZL stations heard operating in the contest.

(6) The awards for the receiving contest will be similar to those in the transmitting contest.

(7) Receiving logs will be similar to transmitting logs.

THE MONTH ON THE AIR

By A. O. MILNE (G2MI)*

FORTHCOMING R.S.G.B. CONTESTS

Sept. 18–25	Low Power Contest.
Sept. 26	Five Metre Field Day.
Nov. 27–28	Top Band Contest.

Give an Ear!

A WORD to those amongst us who complain so bitterly of poor conditions during cross-town QSO's on the DX bands, thereby QRM'ing the DX which vainly calls and calls. Just such a case occurred recently when one G, sitting right on top of an S7-KG6 loudly complained of the lack of DX. He was talking to another G, less than a mile away, who was blotting out a J9. VS1CB, lately come from Singapore, says it is quite common to hear these British stations coming in at S7–8, but they work locals or Europeans and do not seem to listen for the DX. Recently a GM was heard working a GC, both complained of poor conditions, both were 579 in Malaya. EI9N is the outstanding European station in VS1, yet says VS1CB, "I have never been able to contact him." What is the answer? Is it local QRM or one-way propagation?

Correction

In the July issue, mention was made of ZC1CL being in the Arab Legion. This was a misprint. ZC1CL is an officer in the R.A.F. at Amman. This would normally just be a correction of fact, but it so happens that ZC1CL has received an extremely abusive letter from someone purporting to represent a Jewish organisation, accusing him of being a "hired assassin" and threatening him with unpleasant consequences. We must emphasise, therefore, that ZC1CL is a member of that most honourable company of gentlemen the Royal Air Force; but for whose gallantry, certain people would not now be free to write rude letters or make asses of themselves because of a typographical error!

Notes and News

GW3ZV has worked FI8ZZ. We wonder if this is a genuine FI8? That ZZ looks a bit fishy. MD7QRP says he is an ex-D4 in Cyprus, but sounds as phoney as EZ7CW.

Anyone worked OZ7EDR, the Danish Summer Camp, on the Isle of Bjornholm? (Yes—G8TY and others in North London.—ED.).

ZC6XY gives his QTH as c/o U.S. Legation in Jerusalem. The operator is W9HXP. QSL via A.R.R.L.

BRS.16349 draws attention to VK1AA which belongs to the Heard Is. Expedition. This is the only VK1 call in use. Frequencies are 7019, 7027 and 7186 and harmonics thereof.

VU2BX states that all VU licences have been cancelled except for those held by Military and Police personnel.

We understand that VR6AB has now left Pitcairn Is., but as the information was gleaned from a daily newspaper, it is probably incorrect.

Will MD5LR, MD5PC and MD5PS, please send some envelopes to the Bureau.

G5GK, whilst on holiday at LA3G recently, was having a chat with GW4CC, who casually mentioned that he had not heard anything of LA2UA lately. At that moment a station broke in. It was LA2UA operating from a 'plane 8,500 feet above the Mediteranean, bound for Rome. The ensuing three-way QSO lasted for 45 minutes.

G6RH has heard KW6AC/KX6, KX6AF and W4LFI/KX6, all on the same frequency. The former seem to work around 0745 G.M.T., whilst the W4 is more often active about midday. Another interesting one is IIPL/M1 in San Marino, who QSL's.

G5CI reports LU3EL, LU2AO and LU9AX active on 3·5 Mc/s. from September 1 to the end of October, around 0000 G.M.T. They are specially looking for G's.

D2FU has reason to believe that a packet of QSL's confirming QSO's between June and July, 1947, has gone astray. Anyone still needing his card should write to Mr. D. Robinson, Central Office, University of London, Senate House, W.C.1.

AP5B, the Pakistan QSL Manager, once again brings up the question of useless S.W.L. reports. He says they are a real nuisance and that he, for one, will not reply to any more unless either they contain some really useful technical information or at least one reply coupon. He mentions that QSL cards cost £3 per 100 in Lahore.

ST2CH asks us to note that reply coupons are not valid in Sudan. British stamps may be sent to cover return postage, however. BRS and SWL's please note. ST2FT, ST2JT and ST2KP, have now left the territory.

G3ABY's callsign is being pirated on 58 Mc/s. He has a card from I1LQ and wonders if it is intended for someone with a similar callsign.

Best wishes and good luck to G6BW, shortly leaving for New Zealand. He hopes soon to be on the air with a ZL call. His son, Jim Wallich, is VS2CJ.

VQ2JT is shortly returning to the U.K. after having used so many calls we wonder how he remembers them all. Those who have worked him as VQ3JMT, VQ4JTT, 4AWH, ZD3AF, ZD2T, VQ5JMT, to mention just a few, can count on receiving a QSL when he has had time to sort things out.

28 Megs.

The 28 Mc/s. band opened with a bang during the first week in September. No U.S.A. signals but loads of stuff from Africa and Asia. The VQ4's, 5's, ZS's, OQ's and ST's were S9 signals in London for hours on end. G6CL worked three M/M stations during this spell, including W6YTT off Mozambique.

Note to all MD Calls

All cards for MD prefixes will in future be sent to the Central Bureau operated by the Middle East Service Radio Association, G.H.Q., M.E.L.F., from whom they should be collected.

SPECIAL NOTE TO 3.5 Mc/s. TELEPHONY OPERATORS.

Operators of telephony stations are requested to avoid the frequencies 3500 to 3635 kc/s. during the week September 18–25 inclusive, when the Low Power Contest will be taking place.

CQ Magazine Contest

Mr. T. W. Carney, G4QC, 9, Gladeville Road, Aigburth, Liverpool, 7, offers copies of the rules and log sheets for the above contest, on receipt of a stamped addressed envelope.

Return of an Old-Timer

G2PT recently made a contact with G6DY, C. Keith Murray, of Ringwood, Hants, on 3772 kc/s. This was G6DY's first QSO for 16 years. He started radio way back in the first world war as an operator in the Royal Flying Corps. (58293—Blenheim Barracks, Farnborough, 1916.—ED.).

Footnote

We can use quite a lot more letters each month. What about some reports and news, chaps?

Slow Morse Transmissions

Mondays	20.00 B.S.T., 1900 kc/s. .. G2AJU (Stowmarket)
Mondays	20.00 B.S.T., 1800 kc/s. .. G2DJS (Bradford)
Mondays	21.00 B.S.T., 1900 kc/s. .. G3BCN (Bournemouth)
Tuesdays	22.00 B.S.T., 1896 kc/s. .. G8TL (Ilford)
Tuesdays	23.00 B.S.T., 1820 kc/s. .. GM4AN (Kirkcaldy)
Thursdays	22.30 B.S.T., 1803 kc/s. .. G3OB (Manchester)
Fridays	19.00 B.S.T., 1900 kc/s. .. G3BCN (Bournemouth)
Fridays	20.00 B.S.T., 1900 kc/s. .. G2AJU (Stowmarket)
Fridays	20.30 B.S.T., 1868 kc/s. .. G8LZ (Gravesend)
Fridays	23.00 B.S.T., 1820 kc/s. .. GM4AN (Kirkcaldy)

Volunteers for this service are still required as it is desired to cover the whole country. The service is of particular importance to members living in remote areas. Details to Mr. C. H. L. Edwards, G8TL, 10 Chepstow Crescent, Newbury Park, Ilford) Essex.

Congrats

● To Arnold A. H. Moss (G8VF), of Manchester, who was married in Dublin on July 24 to Miss Mary Kenyon. The Rev. N. H. F. Waring (EI8J), the bridegroom's uncle, officiated.

● To Mr. Roth Jones, VK3BG, and his wife, Norma Lesley, of North Balwyn, Victoria, Australia, on the birth of a daughter, Marilyn Lynette.

● To Jack Ridley, G2AJF, and Peggy Suzanne Tucker, who were married at St. Peter's Church, Wolvercot, Oxford, on Saturday, August 28.

29 Kechill Gardens, Hayes, Bromley, Kent.

AROUND THE VHF's

By W. H. ALLEN, M.B.E., G2UJ.*

Conditions on 58·5 Mc/s.

AUGUST 8 was certainly an outstanding day on the 5 metre band, with intense aurora reflection occurring for nearly two hours in the afternoon, and it is fortunate that so many stations in widely separated parts of the British Isles were able to take advantage of the abnormal conditions. These produced a result only comparable to a sporadic E opening confined within a distance of some 400 miles, and with little or no skip-distance effect.

The G-DX record was smashed several times, and finally went to G5MA (Ashstead), and GM2DAU (Cupar), with a distance of 363 miles, beating the contact between G5WP (Woking), and the same Scottish station by a mere mile and a half. While wishing in no way to detract from the performances put up by these stations, we feel that they will be the first to admit that their record was made under more favourable conditions than that fine achievement by G3BLP and GM3OL recorded in our July issue.

G5WP has furnished us with a most interesting report of his experiences on the "Auroral Eighth" which we propose to quote almost in its entirety. Watch was opened at 14.30 GMT, and the condition was already present. All signals were distorted with 25 to 75 cycle modulation, and even 5MA and 6LK (10 miles east and south respectively) although T9, had T2/T7 "ghosts" of comparable strength superimposed upon them, indicating that very effective reflection was taking place. The area of reflection was on a bearing 355 to 360 degrees from Woking, and showed from the critical setting of the beam that it was either of comparatively small size or situated at a great distance. All signals came in on this bearing. It was noticed that although all signals from Scotland or the north of England were heavily modulated, some D.C. component could be detected on those from Northern Ireland, due no doubt to the less complete reflection undergone by the latter. It has been established that a marked temperature inversion existed over the English/Scottish border at the time, also that electrically charged rain was widespread over England. The opening terminated at 16.15 GMT, so far as identifiable signals were concerned, but weak T2—T4 carriers were audible until 22.30, and at 22.15 GMT GM2DAU heard G5WP in contact with G5BD.

Two days later surges of "hiss" were heard between 17.00 and 18.00 GMT, which DF.'ed on the sun. At 18.40 T2 to T4 signals were received from G2OI, TK, 3CW, 4LX, 8VV, and contact was made with 4LX (Newcastle), and 8VV (Durham). The opening terminated at 19.45 GMT. During this time stations to the north and north-west D.F.'ed correctly, pointing to a reflecting medium situated intermediately, *i.e.*, probably over the Midlands.

GI5SJ (Belfast) did not get on the band until 15.10 GMT on August 8, but in the next hour he worked G3APY, DCV, 6LK, and 6OH. G2KF, 3ALY, CUJ, CYY, 5MA, WP and a Scottish station were heard during the same period, but contact was not effected. Immediately after this two Italian stations were heard S9 on 'phone, but did not remain audible long enough for a QSO to be made. An eventful day ended with a burst of Scottish stations for a few minutes at 22.00 GMT.

GI6VU (Belfast), his beam fixed in a south-easterly direction, was unable to work any G-DX, but heard all the stations reported by GI5SJ with the addition of G2CIW, KG, 3BLP, 5LU, VB, 8JO and 8VV. It is noteworthy that the duration of the auroral opening was substantially the same in Belfast as recorded by G5WP in Woking.

GM2DRD (Forfar), whose portable exploits were mentioned last month, was unable to work any stations on the 8th., as his transmitter was unserviceable, but heard six G stations including 5MA, between 14.00 and 15.15 GMT. All signals had a hollow sound, and were T4/5, but no fading was noticed.

G3AVF, Torquay, worked GC8OK on August 29 to make the first G—GC 58 Mc/s. contact.

In these notes last month mention was made of the first GI/GW contact, and congratulations offered to GI6YW and GW6OK for this achievement. We find, however, that we were some eleven years too late, as the QSO in question took place—with G6OKP—in 1937!

G8JO (South Shields) has worked stations in 14 counties, and mentions G2HLN, 6PB and 8VV as being active in Durham. Those who are restricted in aerial height may take heart from the experience of G2KI (Walton-on-Thames), whose 3-element w.s. beam is only 16 ft. above river level. KI has worked 147 stations in 27 counties post-war, mostly with an input of 8 to 10 watts. GM2CID (Cupar) found DX louder than locals on August 8, and sent a useful list of distant stations heard on his 2-element beam 5 ft. high! GI3ZX was inaudible in the correct direction, but came in at S6 from the N.N.W. GM3BEB is another active Cupar station.

GI5SJ and GI6YW, working portable on August 1, 15 miles S.E. of Belfast, contacted G2ADR, OI, 3BW, 4HM, OS, 5CP, JU, YV, 6CW, MN, and GM3BDA. The latter is claimed as the first GI/GM contact on five. Their 3-element c.s. beam was 15 ft. high on a site only 50 ft. above sea level. The receiver in use was noteworthy in being a Type 26 R.F. unit with a variable I.F. provided by a straight-four battery receiver. SM5VL was worked at S9 both ways for what is thought to be the first GI/SM 5 metre QSO. Other active GI stations are 2FHN, 3ALT and 3BIL.

* *32 Earls Road, Tunbridge Wells, Kent*

420 Mc/s. Released October 1st

Just as this issue was closing for Press news came through that the 420–460 Mc/s. band would be released on October 1. Stations active that day are asked to phone through details to headquarters for a "flash" in the October issue.

* * *

The South London U.H.F. Group intend to exhibit a variety of apparatus for 420 Mc/s. at their meeting at 57 Kingswood Road, Wimbledon, on Sunday, October 17 at 3 p.m. The apparatus, which includes C.C. transmitters, superhet receivers and frequency meters, is constructed from easily obtainable components.

G3CU, writing of his appreciation of G5MQ's article, *Surplus War Equipment for the V.H.F.'s'* which appeared in the July issue of the BULLETIN, suggests the R33/411 as another receiver capable of modification for use on this band. The normal frequency range is in the neighbourhood of 350 Mc/s., and adjustments are, therefore, required to the concentric line in the mixer stage and to the Lecher wire tuned circuit in the oscillator.

465 Mc/s.

Col. P. Northey, G6FQ, and two fellow members of the Slough section of the Society, Mr. Tuckfield, and Mr. Baldwin, operated what is believed to be the first two way U.H.F. telephony circuit to be used at a regatta, at Maidenhead on July 31. From a launch near the starting point, constant contact was maintained with a land station alongside the judges' tent at the far end of the course, and the regatta officials kept fully informed of the progress of the many events. Col. Northey expressed his appreciation of the Post Office in permitting members of the R.S.G.B. to work on this frequency.

2400 Mc/s.

G2AUS (Sanderstead) has a receiver type R.1294 (AB2) which covers from 1000 to 3000 Mc/s., and another made from a Naval radar P24 R.F. head plus the I.F. portion of a further radar receiver, all rack mounted. 3DZD (Warlingham) also has a superhet. receiver with an I.F. amplifier employing six CV138 miniture high-slope pentodes at 30 Mc/s. with a band width of 4 Mc/s. Experiments have been carried out with a crystal mixer in a ¼-wave line circuit, similar to the R.1294 type previously mentioned, and with a "pot" resonator, the latter being preferred. The local oscillator in each case was a klystron CV67, the cavity of which had been enlarged to suit the lower frequency. For the foregoing information we are indebted to *CQ Local*, an interesting publication produced by Mr. C. Newton, G2FKZ, 105 Underhill Road, East Dulwich, the T.R. Members interested in the U.H.F.'s are recommended to get in touch with Mr. Newton for further data.

145 Mc/s. Now Open

Next month we hope to be able to give news of the first three weeks' activity on the 145—146 Mc/s. band, in addition to the usual features, so please send in your reports to reach this address by September 24. Many members, both licenced and listening, will be working on their receivers, and details of regular 2 metre transmissions, together with frequency, will be of great value to them for testing purposes. G2UJ will be operating on 145·5 and 145·8 Mc/s. with about 20 watts to a 3-element beam at various times in the evenings and at week ends, and will welcome reports from any distance. 73, and see you on 2.

Late Flash

Midnight on August 31 saw the new 145–146 Mc/s. band spring into activity; as many as 15 stations being logged in South London in the first quarter of an hour. G6VX (Hayes, Kent), contacted G2XC (Portsmouth), and also a station in Swindon, while 6LK (Cranleigh) heard stations in Devon. A GD portable was reported in operation on Snaefel, I.O.M., and G2AJ/P was on Dunstable Downs. Phone stations *please* sign on C.W.—you are missing many useful reports with S3/4 carriers but inaudible modulation.

* * *

On September 6 G2AJ/P (Dunstable Downs) contacted G5MQ (Liverpool)—a distance of about 140 miles. G2AJ's signals were RST579 in Liverpool and the Liverpool station was received at RST 349.

Brentford Evening Institute

The Brentford Evening Institute which last year organised a highly successful course for students taking the Radio Amateurs' Examination, is hoping to form another class during the coming session commencing in September, but requires the assistance of an enthusiastic lecturer on two evenings a week. The remuneration will be on the County Scale of £1 per evening. Offers should be sent to Mr. G. V. Mills, Head of Brentford Evening Institute, Chiswick Polytechnic, Bath Road, London, W.4.

FORTHCOMING EVENTS

REGION 1

Accrington.—October 13, 7.30 p.m., Cambridge Street Schools.
Ashton.—October 3, 3 p.m., New Jerusalem Schools, Katherine Street.
Bolton.—October 5, 8 p.m., Y.M.C.A.
Burnley.—October 6, 7.30 p.m., Mechanics Institute, Manchester Road.
Bury.—September 23, 30, October 7, 7.30 p.m., Club Room, Spring Mills, Tottington, Nr. Bury. October 14, 7.30 p.m., Atheneum, Market Street.
Carlisle.—October 1, 7 p.m., Y.M.C.A., Fisher Street.
Darwen and Blackburn.—October 1, 15, 7.30 p.m., Weavers' Institute, Darwen.
Manchester.—October 4, 7.30 p.m., Reynold's Hall, College of Technology, Sackville Street.
Oldham.—September 29, October 13, 7.30 p.m., Civic Centre, Clegg Street.
Rochdale.—October 3, 3 p.m., Drill Hall, Baron Street.
Whitehaven.—September 18, 6.30 p.m., Kells Miners' Welfare Hall. (G3COV on "Noise.")
Workington.—October 16, 6.30 p.m., St. John's Room.

REGION 2

Barnsley.—September 24, October 8, "King George" Hotel, Peel Street.
Bradford.—September 21 (Annual Meeting), October 5, October 19, 7.30 p.m., Cambridge House, 66 Little Horton Lane.
Catterick.—Tuesdays, 7 p.m., Loos Lines, Catterick Camp.
Doncaster.—Tuesdays and Wednesdays, 7.30 p.m., 73, Hexthorpe Road.
Harrogate.—Wednesdays, 7.30 p.m., Rear of 31 Park Parade.
Huddersfield.—September 22, October 6, October 20, 7.30 p.m., Plough Hotel, Westgate.
Hull.—September 29, 7.30 p.m., Imperial Hotel, Paragon Street.
Leeds.—Fridays, 7 p.m., Swathmore Settlement, Woodhouse Square.
Middlesbrough.—September 27, October 10, 7.30 p.m., Top Floor, 400 Linthorpe Road.
Newcastle-upon-Tyne.—September 27, 8 p.m., British Legion Rooms, 1 Jesmond Road.
Sheffield.—September 22, 8 p.m., "Dog and Partridge," Trippit Lane. October 13, 8 p.m., Albreda Works, Lydgate Lane.
South Shields.—Fridays, 7.30 p.m., Trinity House, Laygate.
Spenborough.—September 29, October 13, 7.30 p.m., Temperance Hall, Cleckheaton.
Sunderland.—Wednesdays and Fridays, 7 p.m., Prospect House, Prospect Row.
York.—Wednesdays, 8 p.m., 29 Victor Street.

REGION 3

South Birmingham.—October 3, 17, Meeting at Stirchley Institute at 10.30 a.m.
Birmingham.—September 21, Imperial Hotel, M.A.R.S. Annual General Meeting. October 5, M.A.R.S. Annual Dinner, 6.45 p.m., Imperial Hotel. Tickets 10s. 6d. from Secretary or Treasurer.

REGION 4

Derby and District A.R.S.—September 29, 7.30 p.m., The Club Room, 67a London Road "Television, Part III." October 13, Sale of equipment. October 27, "Television, Part IV."

REGION 5

Cambridge.—September 17, 7.30 p.m., "Jolly Waterman" (Junk Sale).
Chelmsford.—October 5, 7.30 p.m., 184 Moulsham Street.
Little Hallingbury.—October 3, G6UT's Annual "Ham Party," 2.30 p.m., Normandale, New Barn Lane. Ladies Welcome.
Southend.—September 24, 7.45 p.m., G5VQ, 168 Westbourne Grove, Westcliff.

REGION 6

Bedford.—September 17, 7.45 p.m., The Queen, Preston Road, Queens Park.
Luton.—Every Monday, 7.30 p.m., The Surrey Street Schools.

REGION 7

Barnes and Putney.—September 14, October 12, 7.30 p.m., 28 Nassau Road, S.W.13.
Croydon (Surrey R.C.C.)—October 12, 7.30 p.m., "Blacksmiths Arms." South End.

REGION 7 (*Contd.*)

Bromley and Beckenham.—September 24, Downham Secondary School, Bromley. A.G.M. of the N.W. Kent Amateur Radio Society and R.S.G.B. Discussion on Band Planning.
East London.—September 26, "Micro-waves" by Dr. Lemon, G2GL. October 24, "Harmonic Measurement and Suppression" by R. L. Varley, G5RV; 2.30 p.m., Lambourne Room, Ilford Town Hall.
Enfield.—September 19, October 17, "QTH" to be notified
Edgware and District R.S.—September 15, 22, 29, October 6, 13, 20, 7.30 p.m., Orchard Cafe, Broadway, Mill Hill.
Hoddesdon.—October 7, 8 p.m., "Salisbury Arms," Hotel.
Holloway.—September 17 (thence every Monday, Wednesday and Friday), 7.30 p.m., Grafton Radio Society (G3AFT), Grafton School, Eburne Road, N.7 (alight at Nag's Head).
Peckham.—October 4, 7.30 p.m., "The Kentish Drover," Rye Lane.
Slough.—September 16, "Cathode Ray Technique"—G2HOX. October 14, Grand Junk Sale, 7.30 p.m. Congregational Church Hall, Church Street, Slough.
Southgate.—October 1, 7.30 p.m., "Merry Hills" Hotel (Oakwood).
St. Albans.—October 13, 8 p.m., The Beehive, London Road.
Southall.—October 1, 7.30 p.m., The "Vine," Uxbridge Road, Hillingdon.
Welwyn Garden City.—October 5, 8 p.m., Council Offices.

REGION 8

Bournemouth.—7.30 p.m., "Cricketers Arms", Windham Road.
Guildford.—October 17, 3 p.m., The Cinema Cafe, Woodbridge Road—P.C. to G6NA.
Southampton.—October 2, 7.30 p.m., 22 Anglesea Road, Shirley.

REGION 9

Bristol.—October 15, Keens University Cafe, Park Row.
Exeter.—Second Saturday, Y.M.C.A., 41 St. David's Hill.
Plymouth.—Third Saturday, 7 p.m., Tothill Community Centre, Tothill Park, Knighton Road, St. Judes.
Weston-super-Mare.—October 1, 7.30 p.m., Y.M.C.A., 2 Bristol Road.

REGION 11

Rhyl.—No meeting on September 19.

REGION 14

Glasgow.—September 29, 7 p.m., Institute of Engineers and Shipbuilders, 39 Elmbank Crescent.

HIC ET UBIQUE

COUNCIL, 1948

President:
VICTOR M. DESMOND, G5VM.

Executive Vice-President: W. A. Scarr, M.A., G2WS.
Hon. Secretary: K. Morton Evans, O.B.E., G5KJ.
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General Secretary: John Clarricoats, G6CL.

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

Representation

The following are additions to the list of Representatives published as a Supplement to the February issue.

Region 1. Cheshire.
Chester .. .. E. J. Greenwood, G4OS, 78 Hough Green.
Region 2. Co. Durham.
West Hartlepool .. M. Robinson, G3AJA, 34 Sandringham Road.
Region 8. Dorset.
Area of Poole only.. W. F. Crook, BRS.14323, 34 Croft Road, Parkstone.

Vacancies

Mr. F. Boyes (G2HDV) and Mr. E. Rawlings (G5RS) have resigned as C.R. for Cheshire and T.R. for Guildford respectively, whilst the office of T.R. for Sutton and Cheam is vacant due to the death of Mr. B. J. Blount. Nominations submitted in prescribed form should reach the General Secretary by not later than September 30, 1948.

Ballot

Mr. R. R. Waite, G3PZ, 254 Cheltenham Road, Gloucester, and Mr. P. Smith, G3DIB, of 39 Halsbury Road, Bristol, 6, having been nominated for the office of Gloucestershire County Representative, a ballot becomes necessary. Corporate Members resident in Gloucestershire are invited to record their vote in favour of one of the above candidates, and to forward same on a postcard addressed to the General Secretary, by not later than September 30 next.

Service Valve Equivalents

The Third (Revised) Edition of this popular 28 page booklet is now available from Headquarters, price 1/3 post free. Many additional CV types have been tabulated and a comprehensive list of Service-type Cathode Ray Tubes included for the first time.

"Radio News"

The Society is again in a position to accept orders for the monthly publication *Radio News*. Subscription rates are as follows:—

1 year	.. .. ..	£1 5s. 0d.
2 years	.. .. ..	£2 5s. 0d.
3 years	.. .. ..	£3 0s. 0d.

No guarantee can be given that subscriptions will commence with a specific issue.

Surplus Radio Conversion Manual

Editors & Engineers Ltd., 1300 Kenwood Avenue, Santa Barbara, Calif., U.S.A., announce the publication of Vol. I of *Surplus Radio Conversion Manual*. Vol. II is due to appear about October 15. Vol. I deals with the conversion of the BC 221 Frequency Meter, the BC 312, 342, 348 and 946 receivers, the BC 645 Transmitter/Receiver, and a number of other popular items of ex-Government equipment of U.S. manufacture. Vol. II will describe the conversion of the ARC 5 and BC 454 receivers and the GO-9/TBW transmitter for 30 Mc/s. in addition to a number of other conversions. Both manuals may be ordered through Headquarters, price 15s. each, post free, delivery 4-6 weeks.

W.A.C.E. Certificate

The *Radio Club of Chile* has instituted a new certificate which will be awarded to any foreign amateur who has worked at least one station in each of the seven radio districts of Chile. The contacts, either on telephony or telegraphy, must have been effected after November 19, 1945, in any of the amateur bands. Seven QSL cards or other written verifications should be sent to: Radio Club of Chile, P.O. Box 761, Santiago, Chile. There is no fee, and after examination the cards will be returned by registered post.

Catterick Amateur Radio Club

The many service members who find themselves in the vicinity of Catterick Camp should be sure to seek out the new club rooms of the very active radio club. The three 72 foot masts will help to guide strangers to the spot. Meetings are held every Tuesday at 7 p.m., but the Club is open every evening. Recently a welcome was extended to MD5KW and MD5JH. It is hoped that the club station will soon be operating under its own call G3CIO but meanwhile G3AKF/A continues to represent the club on the air.

No. 6 Radio School, R.A.F.

It is proposed to hold in the near future a re-union of former members of the staff of No. 6 Radio School, R.A.F. Bolton. Members interested in this project are invited to communicate with Mr. D. Hamilton, 51 George Road, Chichester, Sussex.

Slough and District Hamfest

A hamfest will be held on October 3 at The Crown Hotel, Slough, at 3 p.m. Members from other areas are cordially invited to attend.

South Birmingham Area

Regular Morse classes are now being held and new members will be welcomed. A visit to the B.B.C. Droitwich transmitter has been arranged for the afternoon of Saturday, November 6. Any member in the Area wishing to attend should communicate with the Area Representative, Mr. T. Higgins, G8JI, 391 Rednal Road, Birmingham 31. Early application is advised due to the limited size of the party.

South London V.H.F. Group

A meeting of the above group will be held at 57 Kingswood Road, Wimbledon, London, S.W.19, on October 17, at 3 p.m. A cordial invitation is extended to members interested in V.H.F. work to attend this meeting.

Hungarian Amateur Society

The official Hungarian Amateur Society—*Magyar Rovidhullamu Radioamatorok Egyesulete* (M.R.R.E.)—has recently been reorganised. The new President is Paul Pamlényi who expresses the hope that by establishing friendly relations with amateur organisations throughout the world the M.R.R.E. will play its part in promoting international goodwill. The League offers to send a copy of its journal *Radiotechnikai Vilag* each month to any member in exchange for copies of a British radio magazine. The address of the Society and QSL Bureau remains unchanged: Postbox 185, Budapest 4.

U.B.A. International Hamfest

To mark the 25th anniversary of the founding of the Belgian Amateur Society, U.B.A. held an International Hamfest in Ostend on August 8. Visitors included PA0NP, Chairman of V.E.R.O.N., and F8BO, Member of the Council of R.E.F. Mr. Deloor—formerly EB1P2 and ON4BK—recalled his earliest contacts whilst ON4UF and ON4EY spoke on the early history of the Belgian Society. After the hamfest a visit was made to OST the 5 kW coast station.

New B.B.C. Transmitter

A site has been chosen for a new B.B.C. transmitter near Norwich, and construction has started. The new station will radiate the Midland Home Service programme with a power of 5 kilowatts on 296·2 metres (1,013 kc/s.). A directional aerial system will be used consisting of two mast radiators, each 126ft. high.

EXPERIMENTAL STANDARD FREQUENCY TRANSMISSIONS

GB1RS

The Headquarters' Station GB1RS transmits daily for 2 minutes at each hour between 0600-2400 G.M.T. (or B.S.T. as in force) on a frequency of

3500·25 kc/s

The following message is sent automatically in Morse Code at a speed of 12 words per minute:

CQ de GB1RS (repeated) QRG 3500·25 kc/s

VA GB1RS (followed by a long dash)

New Books

RADIO MAINS SUPPLY EQUIPMENT. By E. M. Squire. Pitman 182 pp. 166 illustrations. Price 12/6.

Describes, in ten well-illustrated chapters, the principles and operation of mains-supply equipment. A most useful text book for the practical radio man, be he service engineer or amateur. Chapter IX (Voltage and Current Stabilisers) will interest all who seek information on the provision of a known and constant supply.

ELEMENTS OF RADIO. By Abraham & William Marcus. Edited by R. E. Horton. Allen & Unwin. 334 pp. Profusely illustrated. Price 12/6.

This is a reprint of the first volume of *Elements of Radio*, the original edition of which contained two volumes in one binding. Vol. I is complete in itself. The book is devoted entirely to the receiver and does not contain a single formula, the authors believe it is better to explain than to substitute a formula.

Vol. I embraces 28 Chapters ranging from a History of Communication to Radio Direction Finders. A Summary is included at the end of each Chapter followed by a series of Questions and Problems.

The book was originally published during the war and at a time when the authors were engaged in teaching the elements of radio to American Services personnel. It has lost none of its value with a change-over to peace-time conditions. The diagrams are excellent and the text neatly presented. Exceptionally good value for money.

THE SHORT WAVE LISTENERS ANNUAL SECOND EDITION. Amalgamated Short Wave Press Ltd. 112 pp. Price 3/6 (by post 3/9).

The new edition of this Annual includes revised lists of Countries and Amateur Prefixes as well as an up-to-date list of broadcast station addresses. The News Bulletin table has been enlarged. New features include the listing of the "CQ" W.A.Z. system, a list of QSL Bureaux, data on WWV standard-frequency transmissions and postal information.

The enthusiastic listener, as well as the transmitting amateur, will find much of real value in this well-produced and nicely illustrated publication.

Around the Trade

A most useful pamphlet on suppressors for the elimination of ignition interference has recently been prepared by *Erie Resistor Ltd.*, Carlisle Road, The Hyde, Hendon, London, N.W.9. Some account is given of the severe tests which have been devised to overcome the falling-off of suppression efficiency after a few thousand miles of use. The modern suppressor unit—capable of withstanding extremes of heat and shock—represents a great improvement over the earlier types both in mechanical design and electrical efficiency.

* * *

Of interest to both transmitting amateurs and short-wave listeners, are the new record cards produced by *Amalgamated Short Wave Press, Ltd.*, 57 Maida Vale, Paddington, London W.9. The Amateur Record Cards (4s. 6d. per 100) enable the methodical transmitting amateur to compile a card index of stations worked complete with details of up to 12 contacts as well as technical and QSL notes. The effects of experimental changes in equipment can thus be seen at a glance. The Broadcast Record Cards (4s. per 100) should prove equally useful to the ardent S.W. broadcast listener.

* * *

Covering nearly every requirement of the radio enthusiast, whether his interest lies in transmission, reception, or quality reproduction of broadcast programmes and records, the catalogue recently published by *Messrs. Webb's Radio*, 14 Soho Street, London, W.1, makes most interesting reading, and can be recommended for members' attention. The price is 6d. from the above address.

* * *

Rummery & Co. (*Electronics*), Austin House Chambers, North Street, G.P.O. Box 9, Guildford, Surrey, have devised an ingenious Ohm's Law Reference Chart to provide a quick reference to Ohm's Law formulæ. The Chart gives an instant indication of the calculation required to find the "unknown" quantity by simple applied mathematics.

The chart is 5in. in diameter, printed in four colours on a stiff card, and sells at 1/–, post free.

Brans' Radio Valve Vade-Mecum

Mr. P. Armstrong (BRS.6487), 136, Bickenhall Mansions, Gloucester Place, London, W.1, advises us that he is in a position to accept orders for the 1948 edition of this publication which lists over 10,000 types. Only one copy may be sent to a specific address. The price is 18s., and cash must accompany all orders. Copies will be mailed direct from Belgium. Non-receipt within 30 days should be notified to Mr. Armstrong.

This publication is not being handled by the Society.

Stray

Mr. D. R. Cocking, G3WF of Headless Cross, near Redditch, has found one way of solving the television interference problem—he has just finished building a television receiver! Although almost 110 miles from Alexandra Palace excellent pictures are received on a 5" diameter cathode ray tube.

Can You Help ?

Mr. H. Benson, G8NF, "Langdale," Dartmouth Street, Slaithwaite, Huddersfield, is anxious to obtain a circuit diagram and servicing instructions for the BC-1032-B Panadaptor.

* * *

Mr. I. W. Hughes, BRS5995, 40 King Street South, Rochdale, is in need of an instruction manual for the *Hallicrafters* SX28 receiver and for any type of Panadaptor. Also the English manual for the AR88D entitled "Engineering Instructions. Telecommunications GY622."

* * *

Mr. C. W. B. Stimpson, G3APX, 267 Hainton Avenue, Grimsby, Lincs., would appreciate information on the BC-433-G Radio Compass, the SCR-522 and the Test Unit I.135.

* * *

Mr. E. R. Crane, BRS.13336, 29 Seymour Buildings, Seymour Place, London, W.1, wishes to acquire information on the A.M. receiver type R1426.

* * *

Sgt. J. A. Elliott, ex-D21W, R.A.F. Ballykelly, near Limavady, Co. Derry, would appreciate details to help in modification and realignment of the 18-valve French receiver type RDK2, manufactured by *Le Paute* of Paris.

* * *

Mr. P. C. Swann, BRS.17270, "Vale Mount," Langham Road, Bowdon, Cheshire, seeks details and circuit diagrams of the A.M. crystal monitor type 2, U.S. Navy MD-5C/APS-3 and the U.S. Army Modulator BC-456-E. He can supply information concerning the *Bendix* TA-12 series of aircraft transmitters.

Offers

H. P. Radio Services Ltd., 55 County Road, Liverpool, 4, offer to supply to members, free of cost, reprints of an article from the August, 1945, issue of *Wireless World*, giving full information on the Army Set type R107.

Silent Keys

It is with deep regret that we record the death, in tragic circumstances, of Major H. M. R. Hodgeman, VS6AS, of Hong Kong. When returning from a holiday flight from Macao, the aircraft in which he and his wife were flying was the victim of an attempted piracy, probably the first in aviation history. The plane crashed into the sea and, with the exception of one of the Chinese pirates, all 27 occupants were killed.

* * *

We record with deep regret the passing of Catherine Myler, B.E.M., G3GH. Mrs. Myler, whose home was in Braunton, was a first-class operator in every way, and her war services were recognised by the award of the British Empire Medal. She had a fund of good humour, was of a most generous nature, and a great friend to all members in the North Devon area. Her passing will be mourned by her many amateur friends at home and abroad.

* * *

The death is also reported, at the age of 52, of Mr. Howard K. Love, VK3KU. Howard was first Federal President of the Wireless Institute of Australia and a well-known DX man. Our sincere sympathies are offered to his relatives and friends.

* * *

It is also our sad duty to record the passing of Mr. B. J. Blount (BRS7605) of Cheam, who died on August 21 last.

Bernard will long be remembered for his unceasing enthusiasm in the interests of Amateur Radio in the Sutton and Cheam district. In 1946 he realized the need for bringing together R.S.G.B. members in the district, and by dint of much perseverance, he eventually co-ordinated the first meeting, which took place at "The Red Lion," Cheam, on October 1. Later the group became known as The Sutton & Cheam Radio Society, with Bernard acting as its Chairman until April, 1948, when, owing to failing health, he relinquished this arduous office to become the Society's Secretary. The success of his venture is evidenced by the healthy condition of the Society to-day which, due entirely to his untiring efforts, now boasts more than sixty members. Apart from founding and carrying on his good work with the Society, he also ably filled the office of Town Representative for Sutton & Cheam.

An enthusiast himself of some twenty years standing, he keenly anticipated getting his ticket, and in fact took his G.P.O. Morse test only a few weeks before his illness.

The funeral was attended on behalf of the Society by Mr. S. Vanstone, G2AYC, Mr. J. Maitland-Edwards, G2GS, and Mr. L. Seaton, BRS16360.

All who were fortunate in counting Bernard among their friends will particularly cherish his memory, for his pleasant and cheerful personality, which never left him even during his illness. Out deepest sympathies go to his widow, daughter and two sons in their great loss. L.S.

BOOK REVIEWS

RADIO RECEIVERS AND TRANSMITTERS. By Amos and Kellaway. Published by Chapman & Hall, Ltd. Price 25/-. 356 pages, 210 diagrams and numerous plates.

This is the second edition of a book which has already established itself as an important addition to contemporary literature. The original sections on Negative Feedback, Microphones, and Leaky Grid Detectors have been expanded and additional information added to other sections. As the book is not designed for the beginner, the authors have been able to assume some elementary knowledge of radio, electricity and mathematics.

Unfortunately, from the point of view of the Radio Amateur only passing reference is made to recent developments such as television and frequency modulation, and only one chapter (the last) is devoted to transmitters. The remaining nine deal in great detail with basic principles, reception and aerial systems. This criticism apart, the book can be strongly recommended to every serious radio student.

RADIO'S CONQUEST OF SPACE. By Donald McNichol. Published in Great Britain by Chapman & Hall, Ltd. Price 18/-. 374 pages, 53 diagrams.

An unusual book—almost a history—written by a past-president of the I.R.E. His story should jog the memories of the oldtimers and inspire the newcomers to even greater achievements. The author pays a well-deserved tribute to the amateurs of America who, by pioneering the short waves helped to open the door to vast new developments. It is, however, disappointing to find only scant reference to the original Trans-Atlantic tests and none to the work of Marcuse, Goyder, Simmonds and other British experimenters.

For the student of radio, for the lecturer and the enthusiastic amateur *Radio's Conquest of Space* provides a veritable gold mine of information.

RADIO LABORATORY HANDBOOK. (4th edition.) By M. G. Scroggie, B.Sc., M.I.E.E. Published by Iliffe & Sons, Ltd. 430 pages. Illustrated with 170 diagrams and 46 photographs. Price 12/6, postage 5d. extra.

In this handbook the author, who has had a long and varied professional experience of radio, shows the methods available for carrying out tests, and measurements, either with commercial instruments or with improvised equipment.

The subject matter covers not only the principal sources of power and signals, types of indicators, comparison methods of measurement such as bridges and their application in measurements on components and on complete amplifiers and receivers, but there is much useful advice on the plotting and interpretation of results.

The present edition has been revised and extended to include laboratory techniques for V.H.F. work. There is an appendix dealing with the rationalised M.K.S. system of units, and another giving constructional information on bridges. A most useful chapter of general information on such varied subjects as musical scales, decibels, wire gauges, etc., is included.

For the experimentally-minded radio amateur this handbook is a "must."

LETTERS TO THE EDITOR

The 8PO Aerial again

DEAR SIR,—Further to the letter in your August issue from 3JR—whose remarks I heartily endorse—I feel that a particular aspect of this aerial system is being overlooked by the critics. G8PO claimed an exceptionally high figure for the front to back ratio, and in our district this figure was taken with a large pinch of salt, in view of the theoretical layout of the system depicted by 8PO. 2HDU ably showed that under those circumstances the high F/B ratio claimed was not possible. I confirmed a figure near 8PO's by setting up an identical system, and deduced that phase relationships shown in Fig. 2 of his article were not accurate in the actual aerial system due to the fact that the supposedly $\frac{1}{4}\lambda$ delay section was quite a bit more than an electrical $\frac{1}{4}\lambda$ in addition to which the standing wave ratio in 8PO's system must have been very high, a combination of these evils produced the high F/B ratio even though the system was fed "in phase." To secure a high F/B ratio and assuming equal currents the phase relationship in $\frac{1}{4}\lambda$ spaced system must be in the region of 135°. So it is quite feasible, that some folks are feeding their system out of phase and securing the high F/B ratio by virtue of the fact that in one direction the waves are 180° out of phase. Whilst, of course, such a phase relationship will produce negligible if any forward gain over a half wave it is reasonable to assume that the F/B ratio will be better than from a parasitic array because the currents are equal in the driven array and thus complete cancellation is nearly achieved. The loss in energy off the back of the aerial is contributed to radiation at vertical angles and again I think it is reasonable to assume that this effective increase in total radiation from the vertical to the horizontal of the desired direction accounts for 8PO's good reports from VK.

Yours faithfully,
V. J. COPLEY-MAY (G3AAG).

* * *

DEAR SIR,—Perhaps I may be allowed a word on the discussion of practical results obtained with this type of aerial. In my view it is often very misleading for two stations using different aerials to carry out tests together with a DX station or for one station to use one aerial over a period of weeks and on replacing this with another aerial try to judge results over the next few weeks.

In an attempt to obtain more accurate practical results I operated for some weeks using a ground-plane aerial and a simple properly matched dipole running NNE/SSW. The aerial change-over was made rapidly a number of times with a DX station during a QSO. The dipole was on the average 4db up in strength on the ground plane for stations in VK and W. I then replaced the dipole with an 8PO aerial at the same height and in the same plane. It was constructed on the folded dipole principle with 300 ohm ribbon the radiators being spaced 7' 2" apart. The delay section was approx 7' long and its length does not appear to be critical. I then compared results on the ground-plane with the 8PO and found that it was 8db up in strength on the ground-plane. Reversing the beam reduced signal strength by 10db. Practical tests here therefore show that the 8PO aerial gives 4db forward gain over a dipole and 10db front to back ratio. The feeders were out-of-phase, of course. In-phase the results are similar to those obtained by 3JR.

I tested the dipole and 8PO aerial against a ground-plane because I assumed that the radiation patterns would interfere little with each other. This was certainly found to be so in practice.

Yours faithfully,
R. T. REED (G2RX).
14(b) Belsize Lane, Hampstead, N.W. 3.

* * *

DEAR SIR,—May I refer again to the G8PO aerial? In his article in the July issue of the BULLETIN, Mr. Cundy, G2MQ, states that the case of two aerials spaced $\frac{\lambda}{8}$ and 135° (*i.e.* $\frac{3}{8}\lambda$) out of phase is the aerial described by G8PO. In actual fact it is not, although mentioned in his article. The G8PO aerial, as shown in Fig. 2 of his article in the November, 1947, issue is the case of two aerials spaced $\frac{\lambda}{8}$ but only 45° (*i.e.* $\frac{\lambda}{8}$) out of phase, and it is in this fact that the whole controversy has arisen.

Mr. Cundy is quite correct in stating that the first case (135° phase difference) gives a very high back/front ratio, and that the second case (45° phase difference—*i.e.* the G8PO aerial) cannot possibly give a high back/front ratio.

I suggest that the solution of the apparent contradictory statements is that G8PO unfortunately erred in stating (p. 87 of November, 1947, BULLETIN): "It is essential that the dipoles be paralleled in phase," and that in fact they ought to be crossed, thus giving a phase difference of 180°–45°, *i.e.* 135°. This is confirmed by the excellent series of polar diagrams given on p. 804 (section 11, paragraph 14) of Terman's *Radio Engineers' Handbook*, from which it will also be seen that the gain (as well as back/front ratio) of the 45° out-of-phase case is very much less than that of the 135° case. Incidentally the gain to be expected from the latter is of the order of 4 db and a back/front ratio of 18db has been achieved by a colleague of the writer's without much trouble, and even better ratios could, I am certain, be achieved with careful adjustment of the phasing. An improved match to 70-ohm feeder can be obtained by making the elements folded dipoles (the two sections of each folded dipole being of the same diameter conductor) as, due to the close proximity of the two radiators, as originally described, their centre impedance falls very low, which apart from mis-match losses means that the actual ohmic resistance of the aerial becomes appreciable in comparison with its radiation resistance.

Finally, Sir, and quite irrelevantly, may I offer my congratulations on the new cover of the BULLETIN, which I think the best I have seen in sixteen years membership?

Yours faithfully,
E. H. JONES, B.Sc., Grad.I.E.E. (G3CJ).
37 Canterbury Road, Farnborough, Hants.

(Correspondence on the G8PO Aerial system has been very protracted. It must now be concluded.—Ed.)

Ambassadors of the Air

Under the title "Ambassadors of the Air," the August 1 issue of *Illustrated Weekly of India* contains one of the most complete reviews of Amateur Radio that has yet appeared in a national magazine. An impressive survey of the services rendered by amateurs in times of emergency is followed by an interesting account of the progress of the amateur movement in India. The article is profusely illustrated with views of several Bombay stations, including that of Gerry Ballantine, VU2GB, Hon. Secretary of the Indian Radio Amateurs' League. A number of QSL cards are reproduced in full colour. In view of the difficulties now being experienced over the issue of licences in India, this sympathetic review has appeared at a most appropriate time.

EXCHANGE AND MART SECTION

Due to paper restrictions advertisements are only accepted "for insertion when space is available." No advertisement must exceed 50 words. Rates: Members Private Advertisements 2d. per word, minimum charge 3/-. Trade, 6d. per word, minimum charge 9/-. Use of Box number 1/6 extra. Send copy and payment to Parrs Advertising Ltd., 121 Kingsway, London, W.C.2.

ABSOLUTE Bargain.—Portable 25 w. 160–20 m. 12A6–1625 antenna coupler meters and sidetone, 10" × 8" × 5", £7 10s. 0d.; 3–4 Mc. 1626MO pair 1625's PA ganged calibrated with antenna coupler, 12" × 5" × 7", £7 10s. 0d.; Superhet 7Q7–7H7–7H7 3·5–7 Mc. 9" × 4" × 3", £5; transformers 230 v. 30-0-300 v. 100 mA. 6·3, 5, 228, 6d.; 465 Midgets, iron cored, 12s. pair.—G3VB, 20 West Street, Haslemere. [310

ABSURDLY Cheap.—H.R.O. Senior, crystal, coils 1·7–14 Mc/s., £25 (less power pack, speaker, £23). Would exchange for 35 mm. camera.—67 Sussex Road, Harrow. [276

ACORNS 954, 955, 956, 3s. 6d.; sockets, 1s.; SP61's, 2s.; 5R4GY's, 8s. 6d.; 811, 25s.; 284D, 7s. 6d.; modulation transformers, 150 W shrouded, C.T. both sides, Parmeko 1.23·1, 15s.; U.S.A. 1.13–1, 12s. 6d.; 1 K.v.a., cased core, 10s.; relay rack 63 in., offers; converters, 24–25, 10s.; Testset 74, £4 10s. 0d.; spare tube, 15s.—G2ACT, 2 Richmond Terrace, Barrow-in Furness. [265

ALL New, unused, 1T4, 1L4, 3A4, 9001, 9002, 5s. 6d.; 7H7, 7Q7, 7R7, 4s. 6d.; RL18/EC53, 7D9, 6s. 6d.; PT15, 10s.; 829, 19s. 6d.; 5 in. C.R.T., 19s.; Ferranti 30 watt modulation transformer, 9s. 6d.; Midget crystal phones, 10s. pr.; P.M. speakers, 5 in., 10s. 6d.; 6½ in., 11s. 6d.; 8 in., 12s. 6d.; Marconi midget RX 3–9 Mc., 20s. Many other bargains.—G2DJA, 13, Randall Avenue, London, N.W.2. [284

AMATEUR must sell up.—Genuinely good gear going for a song. H.R.O. 25 watt modulator, high voltage power pack parts; valves include 813, 807, 832, PT15, ML6, 866, and numerous 6·3 volt receiving types; meters and numerous components. Send S.A.E. stating brief requirements—Box 277, Parrs, 121 Kingsway, London, W.C.2. [277

AR77 and RAF 1155 (fully converted), both very good condition, any reasonable offer accepted.—Box 272, Parrs, 121 Kingsway, London, W.C.2. [272

AR77 in good condition, completely aligned by R.S.S. Ltd., £37.—68A Park Road, London, N.8. MOU. 5533. [305

AR88 Receiver, new, perfect working order. What offers?—Box 262, Parrs, 121 Kingsway, London, W.C.2. [262

ATTENTION.—Modulator, commercially built, 6SK7–6C5–6J5–p.p., 807's, complete, perfect, £8 10s.; transformer, 2·5 v., 6 amp., 6·3 v., 8 amp., 17s. 6d.; 10 v., 8 amp., 19s. 6d. Power crystals in British holders, ¾ in. pins: 7002, 7005, 7014, 7085, 7118, £1. Lots new useful Transmitting gear, big valves, guaranteed perfect. Send for list.—G8UA, 406 Higher Brunshaw, Burnley. [287

BARGAIN, lots No. 19 Transreceivers, new, complete station in sealed carton, £17. Indicator No. 62, 17 tubes, 5 in. CRT, lots of parts, sold elsewhere £4 4s. 0d., our price 45s. GU50 in stock, new, 25s.—MAXWELL'S RADIO, 321 Argyle Street, Glasgow.

BARGAIN.—Eddystone 640 Receiver, brand new and unused, surplus to requirements as dismantling station, £24 10s. 0d. Also few Eidson crystals 7 Mc/s. range, new and unwrapped, 14s. 6d. each.—G3AMR, 70 Friar's Street, Sudbury, Norfolk. [293

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