The SHORT WAVE Magazine

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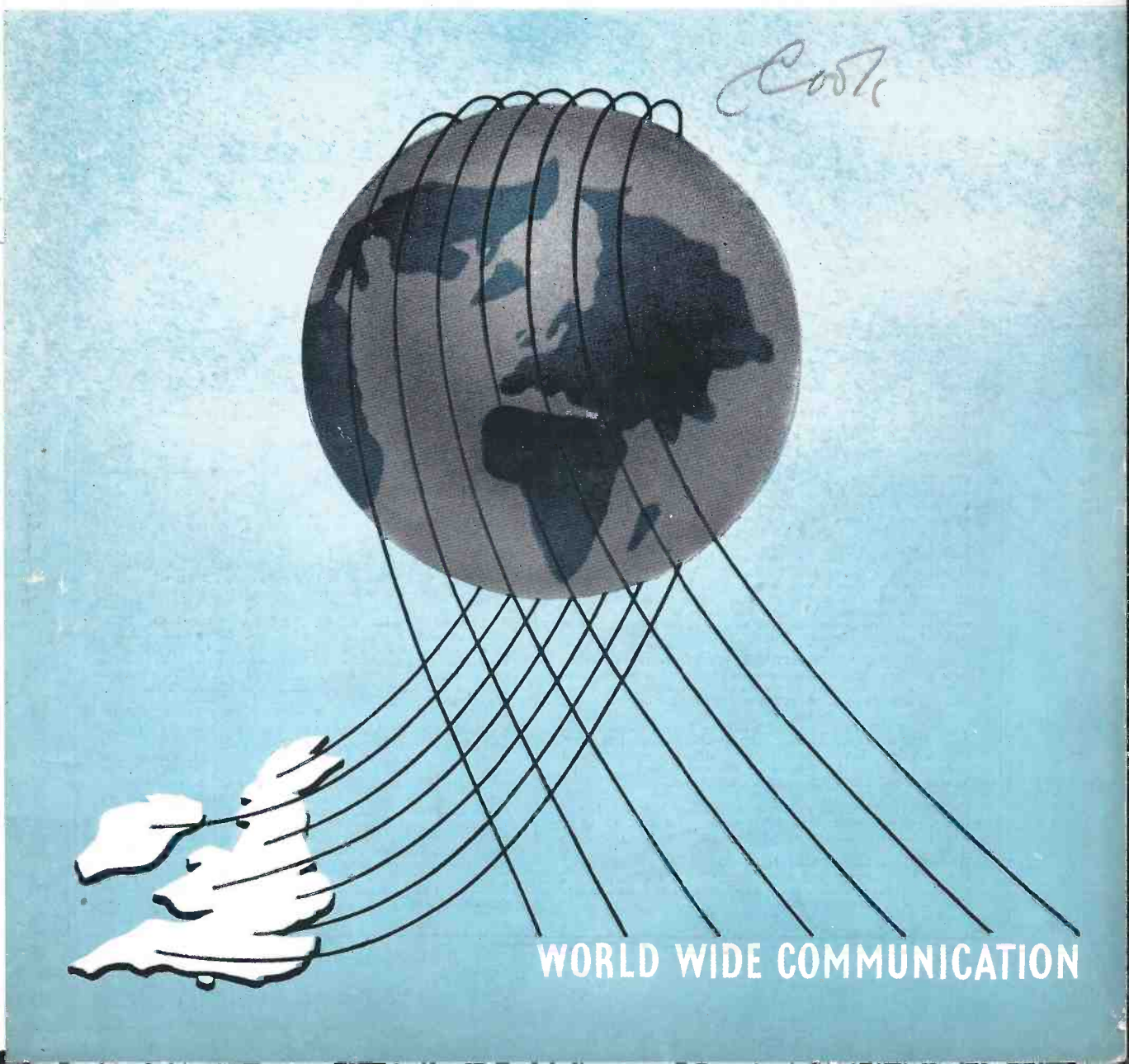
VOL. X SEPTEMBER, 1952 NUMBER 7



WORLD WIDE COMMUNICATION

INDEX TO ADVERTISERS

SHORT WAVE MAGAZINE

VOL X SEPTEMBER 1952 No. 110

CONTENTS

Managing Editor: AUSTIN FORSYTH, O.B.E. (G6FO)

Advertisement Manager: P. H. FALKNER

Assistant Editor: L. H. THOMAS, M.B.E. (G6QB)

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THE *SHORT WAVE LISTENER* ASSOCIATED WITH THIS MAGAZINE IS SPECIALLY FOR THE RECEIVING ENTHUSIAST

FOR THE EXPERIMENTER AND THE RADIO ENGINEER

The SHORT-WAVE Magazine

EDITORIAL

Pressure *The demand for ether space, and therefore the pressure on our bands, keeps on increasing, with new threats to frequency areas which have hitherto been regarded as " exclusively amateur." But the briefest survey will show that in fact we now share with other agencies, officially or unofficially, all our bands from 30 mc down. Starting with met. balloons and radio diathermy at the HF end, we encounter progressively short wave broadcasting and its associated jamming barrage, commercial point-to-point networks, stations of various kinds operated by all three Services, and then the navigational aids and short-range radiophone transmitters which occupy a large part of the 1.7 mc band.*

We have no doubt that encroachments are being strongly resisted and frequently challenged, but the fact remains that they are still there, and that they are increasing in density.

The patient reader may well ask " If all this is true, what is the use of a licence at all ?". The answer is that, like all generalisations, it can be qualified. In the first place, our leading DX operators are still doing exceedingly well on the communication bands. Secondly, we are not all on at once, so there are quite long periods when our bands sound quite quiet by comparison with the turmoil going on immediately above and below them. Thirdly, there is still plenty of room in the cracks on most bands (considered in terms of time, frequency and distance) to accommodate all who want to use them. Fourthly, many non-amateur stations on our LF bands are most active during what for the majority of amateurs are normally the hours of work, so that in this sense some degree of sharing is possible and justified.

But it is still only above 30 mc that calm prevails and comparative peace can be found. We have over the years uttered this same warning—that in the end (which now means within a foreseeable term of years) it will be on the VHF and UHF bands that amateur activity must be concentrated.

And it is for this reason that once again we draw the attention of all amateurs to the opportunities, the possibilities and the delights of VHF exploration.

Austin Forsyth G6FO.

Balance/Unbalance Converters in Theory and Practice

RF TRANSMISSION LINE MATCHING SYSTEMS

N. DAVIS (G6TV)

This interesting discussion is a very valuable contribution on the subject of the matching of RF transmission lines and the feeding of aerial systems, regarding which it will make many things clear. The author deals with a number of important points in detail, and his treatment is lucid, his arguments conclusive and the application is entirely practical.—Editor.

WITH the advent of television and the increased use of the VHF bands by amateurs generally, the significance of balancing as opposed to impedance matching is becoming widely appreciated. The subject has, however, many aspects and in the present article it will only be possible to touch on those that are likely to prove useful to the majority.

Open Wire Lines

The criterion of a good transmission line is its ability to convey RF energy with a minimum of loss and without usurping the functions of the aerial. Radiation from one conductor of an open wire line is cancelled by that from the other (being in opposite phase) provided that the spacing between the lines is an infinitesimal fraction of the wavelength and also that the intensity of the current at corresponding points is equal on the two lines. This will not be the case if the lines are unequally loaded or if the balance of the line has been upset by its mode of erection. In order to ensure that the lines have an equal capacity to ground, attention should be paid to the symmetry of the coupling at the transmitter (or receiver) end in addition to the maintenance of a balanced aerial load at the other. In cases where it is found impossible to instal the transmission line without running one conductor closer than the other to walls, etc., it is usual to arrange for the lines to be crossed over (transposed) at regular intervals.

Asymmetrical Loads

By its very nature, the open wire or ribbon feeder is unsuitable for connection to an unbalanced type of load such as a single end-fed aerial, but when this is unavoidable, the balance can be restored by extending the lines beyond the point of connection to the aerial for a distance of a quarter-wave and short-circuiting them at this point (Fig. 1). The extra quarter wavelength of shorted line does not affect the matching of the aerial, but it distributes the load between both lines and so restores electrical symmetry, thereby reducing line radiation to a minimum.

Coaxial Feeder

Coaxial transmission line is unherently unbalanced due to its outer conductor being "earthy" whilst its inner conductor is completely screened.

Yet it does not radiate when it is terminated by an unbalanced load. The reason for this exemplary behaviour is that the current is confined to the outer surface of the inner conductor and to the inner surface of the outer conductor; thus the fields associated with the wave, being confined within the space between between the two conductors, are unable to radiate.

From the foregoing it is apparent that coaxial cable is quite suitable for driving an end-fed aerial provided that due attention is paid to impedance matching and even this becomes automatic when the aerial is quarter-wave long and connected to a coaxial cable having a characteristic impedance of about 45 ohms. It should be noted, however, that if this latter arrangement (Fig. 2) is to work satisfactorily, the outer conductor of the cable should be effectively earthed at, or very near to, the point of connection of the inner conductor to the aerial.

Coaxial-Fed Dipole

At first sight it would appear reasonable to assume that by virtue of its non-radiating property, a coaxial cable could be connected directly to the centre of a dipole and that all

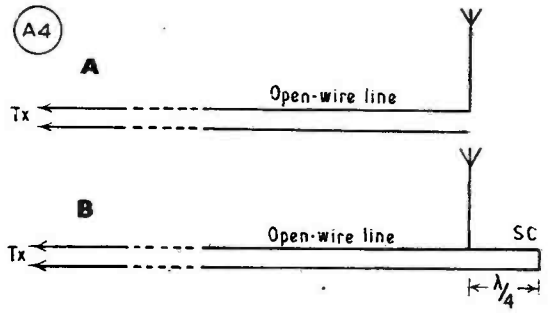


Fig. 1. (A) Line unbalanced by asymmetrical load. In (B) the balance is restored by the addition of a quarter-wave section of short-circuited line.

matching difficulties would disappear if an 80-ohm cable were used. Unfortunately, however, this arrangement would not prove satisfactory because the dipole itself would become electrically unbalanced.

Effects of Unbalance. It was with the object of determining the behaviour of a dipole centre-fed directly through a coaxial feeder and the effect of the latter upon its performance that the writer, some time ago, in conjunction with GM3AFG, undertook an experimental investigation. In the first experiment, a 300 mc oscillator was coupled *via* an 80-ohm coaxial cable to the centre of a horizontal dipole fixed at a height of half a wavelength above an artificial ground to which the outer conductor of the cable was connected. A standing wave detector comprising small pick-up loop, crystal, limiting resistance and microammeter was used to measure the relative current values along the dipole. From the figures thus obtained it could clearly be seen that most of the current flowed in the half of the dipole that was connected to the inner conductor and on transferring the pick-up loop from the dipole to the cable, an appreciable current was detected on the outside of the outer conductor.

This latter observation suggested the possibility of radiation from the cable giving a vertical component to the polarization of the radiated wave and simple tests carried out by means of a receiving dipole showed that

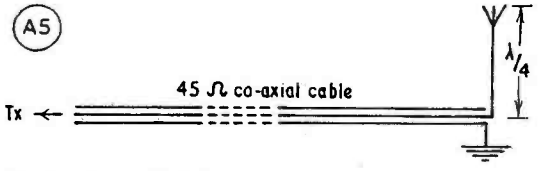


Fig. 2. A coaxial-fed quarter-wave aerial "self matched" by the use of 45-ohm feeder.

the ratio of horizontal to vertical polarization was of the order of 7 : 1. In an endeavour to discover the effect of the unbalance upon the directional properties of the dipole, a horizontal polar diagram was plotted (with horizontally polarised receiving system) at a distance of approximately 3 wavelengths. The result obtained was the normal figure-of-eight with its maxima perpendicular to the direction of the aerial.

Balance to Unbalance Conversion

Standard methods of equalising the current in both halves of the load fed by a coaxial cable achieve their object by one of the following methods: —

(1). Connecting the "earthy" outer conductor of the cable to *both* sides of the load and so restoring the symmetry of the system.
(2). Feeding both halves of the load from the inner conductor of the coaxial cable.
(3). By applying the principle of the quarter-wave short-circuited line to minimise the flow of current down the outside of the cable and so cause it to take the desired path into the load.

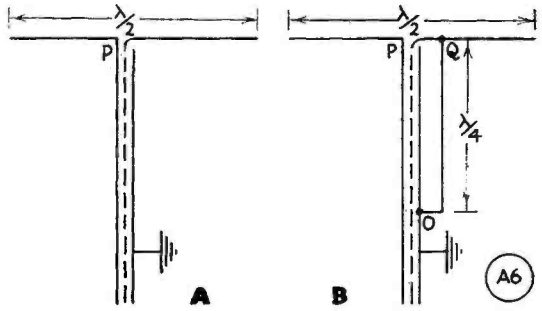


Fig. 3. (A) A dipole unbalanced by connection of coaxial cable at the centre. (B) The balance is restored by the connection of a "Pawsey Stub" OQ. The distance between the Stub and the feeder line should be a very small fraction of the wavelength.

The Pawsey Stub. This employs method No. 1 and can best be understood by referring to Fig. 3 which shows at *(a)* The centre-fed dipole unbalanced by the connection of a coaxial cable with its "earthy" outer conductor taken to the load at point P, and at *(b)* Balance restored by adding the resonant length stub OQ. Since the open-wire line formed by the outer conductor of the coaxial cable OP and the stub OQ is quarter-wave long and shorted at point O, the input impedance at the point of connection to the dipole is very high and does not, therefore, have any material effect upon the impedance matching of the cable to the dipole.

This method has the practical advantage in VHF applications of providing a good mechanical support for the portion of the dipole connected to the inner conductor. For HF work, where the length involved makes the use of a rigid tube impracticable, the stub can take the form of a quarter-wave length of coaxial cable run alongside the feeder and having one end of its inner conductor connected to the outer of the feeder at point O and the other end of its inner to the dipole at point Q. It must be borne in mind, however, that the outers should be in good electrical contact over the whole length of the stub, and furthermore, that the length of the latter will be less than the calculated quarter-wave owing to the reduction in velocity of propagation due to the substitution of the artificial dielectric of the cable for air. A factor of 0.55 is usual for solid dielectric types of cable, but if in any doubt, it should be measured (see *Short Wave Magazine*, March, 1950, page 34).

The Trombone. This depends upon method No. 2 and as will become apparent later, is more suitable for coupling a coaxial cable to an open-wire line than for centre feeding a dipole. The arrangement which is illustrated in Fig. 4 *(a)* comprises an electrical half-wavelength of coaxial line bent into a hairpin shape with the end of the outer conductor connected together and the two ends of the inner connected at X and Y to the balanced output load or open-wire transmission line.

Since both sides of the load are connected to the inner conductor of the cable, the balance of the former is not upset, and by connecting at points spaced half-wave apart, the necessary phase reversal is obtained for energising the open line.

Transformation Ratio of Trombone. The open-wire line connected to terminals X and Y is balanced with respect to ground, therefore its impedance, which we can call Z, will be divided into the two halves X to ground $=Z/2$, and Y to ground $= Z/2$. The load applied to the trombone at point X is, then, $Z/2$, and by the normal action of transmission lines, this is reflected back to point Y, but here also is applied the other half of the balanced load, $Z/2$. This means, therefore, that at point Y, which is the coaxial cable input connection, we have $Z/2$ in parallel with $Z/2$, *i.e.*, an input impedance of $Z/4$ ohms. Obviously then, a cable of $Z_0=75$ ohms will be perfectly matched to a balanced line of characteristic impedance 300 ohms provided, of course, that the latter is correctly terminated.

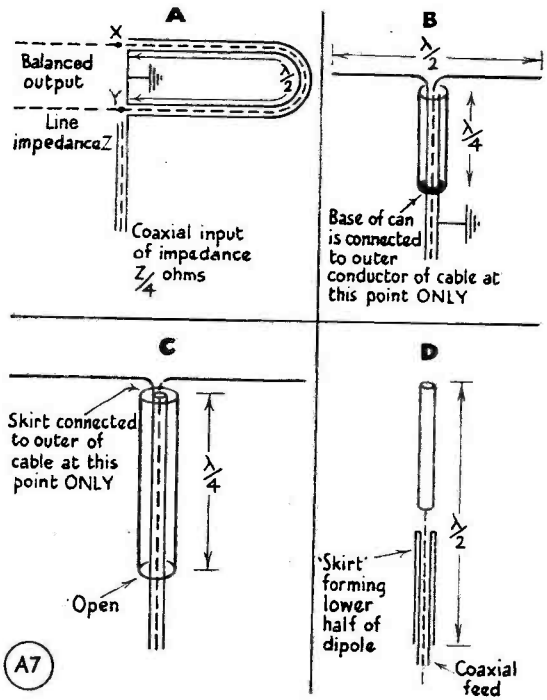


Fig. 4. (A) The "Trombone" balance/unbalance converter. (B) The "Quarter-Wave Can" balancing device; this increases the impedance of the path along the outside of the cable, thus ensuring the flow of current into the load. (C) The "Quarter-Wave Skirt," explained in the text. (D) The "Quarter-Wave Skirt" in another form, as the lower half of a dipole.

The practical points to watch when constructing a trombone are as follows:

(*a*) The length of the trombone must be an *electrical* half wavelength; *i.e.*, the propagation velocity factor must be taken into consideration.

(*b*) The ends of the outer conductor must be carefully connected together by as short a lead as the open wire line spacing will allow.

The Quarter-Wave Can. This popular application of method No. 3, unlike the trombone, has no effect upon the cable to load matching. The Quarter Wave Can which is illustrated in Fig. 4 *(b)*, consists of a hollow metal tube which encloses the coaxial cable without making contact with it except at the end remote from the load. Being carefully connected to the outer conductor of the cable at this point, it forms a new resonant length coaxial line of which the quarter-wave can is the outer conductor and the outer surface of the coaxial cable, the inner conductor. Since this new line is short-circuited at point O, its input impedance at the load end is extremely high, and in consequence, current from the inner wall of the outer conductor of the feeder cable is dis-

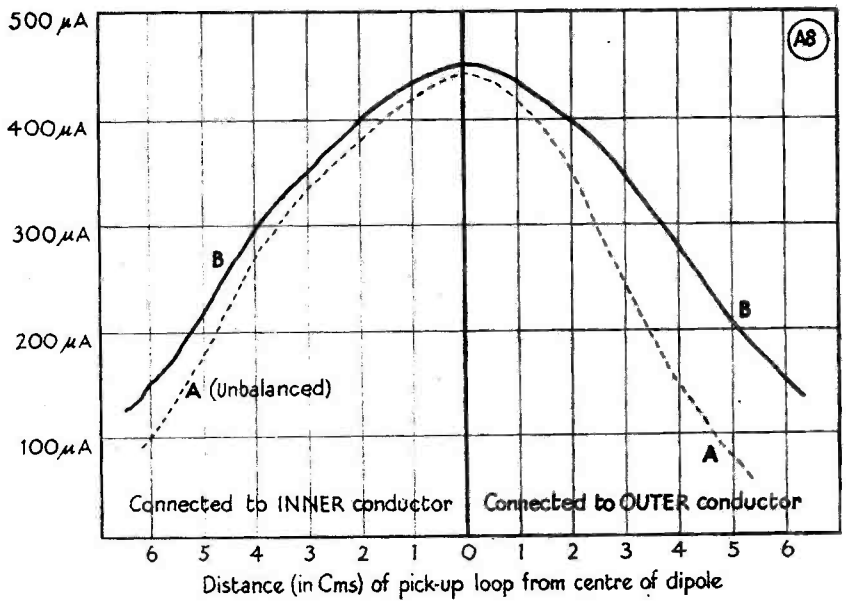


Fig. 5. The curves derived by G6TV and explained in the text.

couraged from taking the otherwise easy path down the outside of the cable to ground and is instead, forced to flow into the load.

This system is easy to construct at VHF as the space between the can and the cable can be left free from artificial dielectric, thus simplifying the evaluation of the "quarter-wave" and the opening at the top may be sealed against weather by a close fitting disc of perspex or similar material. At normal frequencies the Quarter-Wave Can becomes too cumbersome for ease of construction, and in the opinion of the writer, the *Pawsey Stub* is a more attractive proposition.

The Quarter-Wave Skirt. This is an interesting alternative to the Quarter-Wave Can and operates on the same principle. Reference to Fig. 4 *(c)* shows that, whereas the Quarter-wave Can is connected to the outer conductor of the feeder cable at a point quarter-wave from the load, the Quarter-wave Skirt is connected at the load end and is left open at the remote end. Its operation depends upon the fact that current from the aerial end of the outer conductor of the coaxial cable taking the path down the outer surface of the Skirt is reflected from its open end, thus creating a standing wave with a current maximum at the aerial feed point.

Since radiation from the Skirt is undesirable in the case of a centre-fed dipole forming the load, it is common practice in vertical VHF systems to employ one half of the dipole as the Skirt; *i.e.*, to pass the coaxial feeder through the lower half of the tubular dipole as shown in Fig. 4*(d)*.

Balance Restoration by Neutralisation. In the course of further experiments, GM3AFG and the writer decided to investigate the effect of varying the position of the feeder cable with respect to the dipole. The results proved interesting and showed that unbalance could be increased or *decreased* by this means and that when the cable was arranged to make an angle of 30° with the half of the dipole that was connected to the outer conductor, an almost perfect restoration of balance was obtained. Curve "A" in Fig. 5 shows the observed distribution of current along the dipole when the coaxial cable was at right angles to it, whilst curve "B" gives the distribution of current for the case of a 30° angle.

The next step was to discover whether this critical angle varied with the diameter of the dipole element and above all, whether it would hold good for the HF bands. For this purpose a 20 mc horizontal dipole made from 7/22 copper wire was erected and centre fed from an 80-ohm coaxial feeder. The results agreed with those obtained at a frequency of 300 mc and furthermore, relative field strength measurements taken at a distance of several wavelengths indicated a worth-while improvement when the dipole was balanced. The

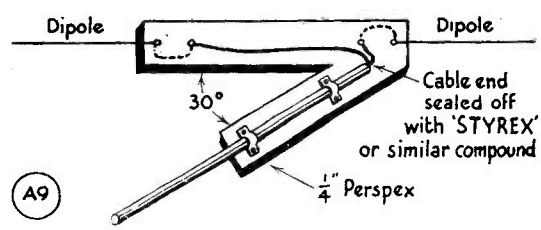


Fig. 6. Detail for making a sound mechanical connection between feeder line and load. The shaped Perspex block will give the necessary strength at the connecting point.

figures in the accompanying table may be of interest.

ANGLE Θ	FIELD STRENGTH	CURRENT RATIO IN HALVES OF DIPOLE
25°	150	37 : 40
30°	165	39 : 40
35°	155	36.5 : 40
40°	142	33.5 : 40
50°	136	32 : 40

This unusual method of balancing has since been employed by the writer with complete success on the 7 and 14 mc amateur bands, and for this purpose, the simple coupling device illustrated in Fig. 6 has proved satisfactory. For the benefit of those wishing to try out this method, it cannot be over-emphasised that the cable must make an angle of 30° with the portion of the dipole that is connected to the *outer* conductor of the cable, for, if reversed, the phase of the feed-back is inverted and the unbalance becomes much more serious than that produced by the usual right angle joint. The length of the feeder cable is not critical provided that it is matched at the load but experience suggests the desirability of its being not less than a half wavelength when neutralisation balancing is used.

The full possibilities of the above system have not been explored by the writer, and it is just possible that it can be applied to certain types of aerial array as well as to the simple dipole.

Conclusion

Reference has been made throughout this article to the "transmission" aspect of balance/unbalance conversion, but it should be appreciated that it is equally important in the case of reception. An unbalanced open-wire line will pick up unwanted signals as it passes through an area of electrical interference and a coaxial cable of which the outer surface is part of the radiating system will do likewise; in addition, by its great length, in comparison with that of the aerial (assuming a VHF or television application) it can often be the cause of IF breakthrough when a superhet type of receiver is employed.

CLASSES FOR THE R.A.E.

We are informed that the following Courses have been arranged for the benefit and the instruction of those who wish to take the Radio Amateurs' Examination next year. All who are within reach of the centres listed should join these classes if they possibly can, as they will be assured of thorough instruction up to (and probably a little beyond) the standard required for the R.A.E.

CHICHESTER. At the Chichester Evening Institute, Lancastrian Boys' School, Orchard Street, on Wednesday evenings, 6.30 — 8.30 p.m., commencing on Wednesday, September 17. The fee for the course is 10s., enrolment on the 15th or 16th in the evening at the School. The instructor will be E. J. Pearcey, G2JU, and the Principal is Mr. D. Hanson.

BRENTFORD. At the Brentford Evening Institute, Boston Manor Road, Wednesdays 7.00—9.00 p.m., fee 10s., instructor Mr. J. R. Hamilton. Application for enrolment should be made to the Principal.

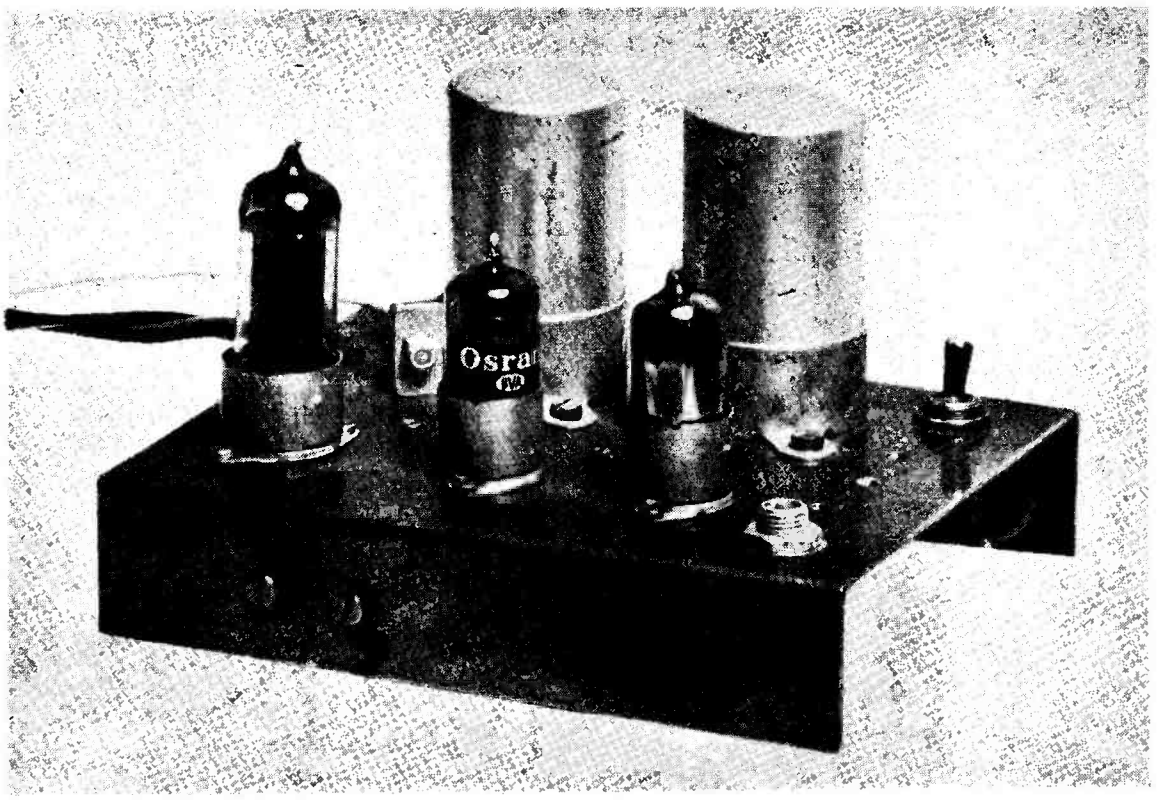
BRIGHTON. At Preston Technical Institute, Preston Road, Brighton, commencing on Monday, September 22, at 6.45 p.m. As in former years, it will be conducted by F. R. Canning, A.M.I.E.E., G6YJ. Applications for enrolment should be made to the Principal at the address given.

ILFORD. At the Ilford Literary Institute, Cranbrook Road, adjacent Gants Hill Station on the Central London Tube. The R.A.E. Course will be on Wednesdays, 7.15—9.15 p.m., with a Morse and Codes of Practice Class on Mondays, 7.15—9.15 p.m. The latter is for those wishing to learn Morse up to GPO requirements for the Amateur Licence, and arrangements have been made for group testing at the college by a representative of the Post Office. There is also an Amateur Radio Refresher Course offered for those who have passed the R.A.E. but are still feeling their feet in the design and construction stage. The fee for either of these three excellent Courses, which have given very successful results in previous years, is 10s. for those who live in the Essex County Council area, and about the same for students from outside Essex who notify their own Education Authority of their desire to attend. Enrolment for these Courses is from 7.0 to 8.30 p.m. on any of the evenings September 8—12.

SUPPRESSING INTERFERENCE

A practical handbook entitled *Radio Interference Suppression* has just made its appearance and will be of great value and interest to those who are concerned with suppression problems of any kind, in the Radio and TV fields. The book is a guide to the subject as a whole, and discusses in detail the origins of electrical interference and the theory of suppression technique. Practical applications are given, and the interfering sources discussed include engine ignition, switches, thermostats and contactors, electric motors and generators, rotary converters, lifts, neon installations, fluorescent and other types of discharge lighting, trams, trolleybuses and electric trains, RF heating apparatus, welding gear, rectifying systems—and TV receivers! Problems of interference elimination on moving vehicles and on board ship are also treated.

Radio Interference Suppression, by G. L. Stephens, A.M.I.E.E., pp. 132, 7 chapters, 4 appendices, bibliography and index, 65 diagrams and photographs, price 10s. 6d. (post 5d.), published by Iliffe & Sons, Ltd., Books Department.



General appearance of the Clamp Modulator described and constructed by G3DZW. It employs negative feed-back, and is capable of good quality.

Clamp Modulation Using NFB

NEW CIRCUIT FOR IMPROVED SCREEN CONTROL

S. T. CHREES (G3DZW)

The modulator described here is an excellent design for the control of an 807 in the Clamp mode. It amounts to improved screen modulation with negative feed-back on the audio side, and should give results much superior to straight Clamp working.—Editor.

A SIMPLE modulator, of small physical dimensions, was required to amplitude modulate an 807 PA running at approximately 60 watts input.

After surveying the various methods of control, it was decided to develop a circuit to Clamp-tube modulate the screen grid of the 807 PA.

Numerous circuits were tried and used with varying degrees of success, but the present arrangement is one found to be the most satisfactory.

Essentials of Clamp-Tube Modulation

Fig 1(a) shows the basic requirements for clamp-tube modulation. V1 is operated with a small negative grid bias, and the anode current is therefore high. Since this current flows through R1 the voltage drop across it is a maximum, and the PA screen is at a low potential ; hence, the RF output is a minimum. The equivalent circuit of this condition is shown in Fig 1(b). It will be seen that the 807 screen is fed from a potential divider consisting of the screen dropping resistor R1 and the anode impedance of V1 (Ra).

The diode V2 serves the same purpose as a DC restoration diode does in a television receiver.[1] It is there to prevent the grid of V1 being driven positive, with respect to its mean value of grid bias, when a signal is applied.

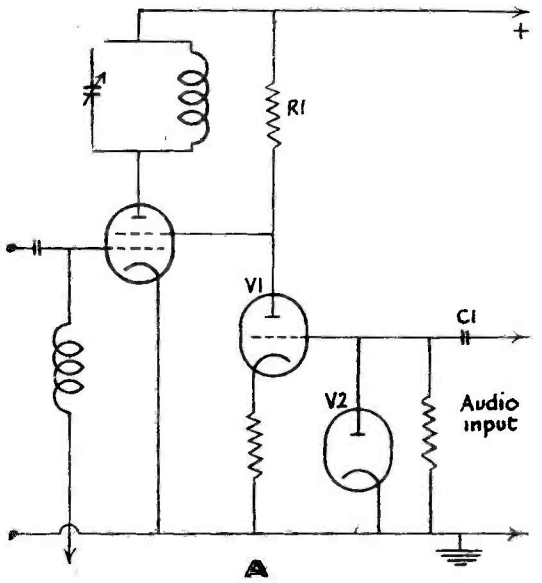


Fig. 1. Essential connections for the Clamp modulation system.

C1 acquires a negative charge, by virtue of the conduction of the diode on positive peaks of signal, and virtually moves the grid operating point in a negative direction. (This is not to be confused with amplitude clipping, since the

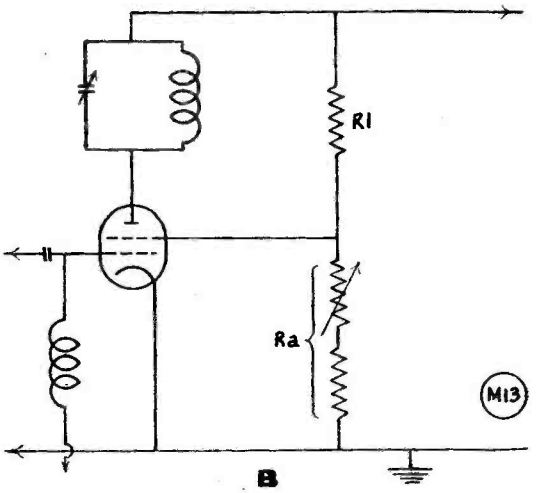


Table of Values

Fig. 2. Circuit of the NFB Clamp Modulator complete

C1	= 68 μμF ceramic	R6	= 1 megohm, ½-w.
C2	= 0.1 μF, 350v.	R7	= 1 megohm, ½-w.
C3	= 16 μF, 450v.	R8	= 330,000 ohms, 1-w.
C4	= 1 μF, 150v.	R9	= 1,000 ohms, ½-w.
C5	= 1 μF, 350v.	R10	= 82,000 ohms, ½-w.
C6	= .001 μF, 350v.	R11	= 330,000 ohms, ½-w.
C7	= .01 μF, 350v.	R12	= 2,700 ohms, 1-w.
C8	= 8 μF, 450v.	R13	= 33 ohms, ½-w.
C9	= .001 μF, 1,000v.	R14	= 47,000 ohms, 1-w.
C10	= 100 μμF, 350v.	S1	= DPST on-off
R1	= 1 megohm, ½-w.	V1, V2	= Osram Z77, Mullard EF91, Brimar 6AM6
R2	= 2,200 ohms, ½-w.	V3	= Mullard EA50
R3	= 1 megohm, ½-w.	V4	= Brimar 5763
R4	= 330,000 ohms, 1-w.		
R5	= 1,500 ohms, ½-w.		

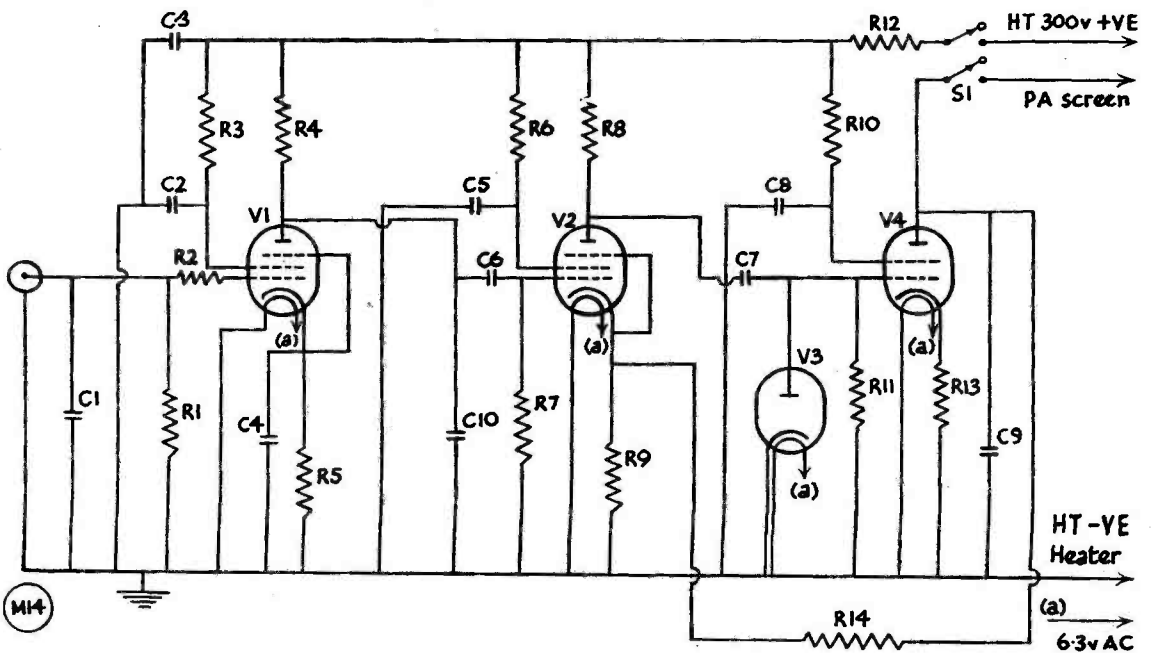
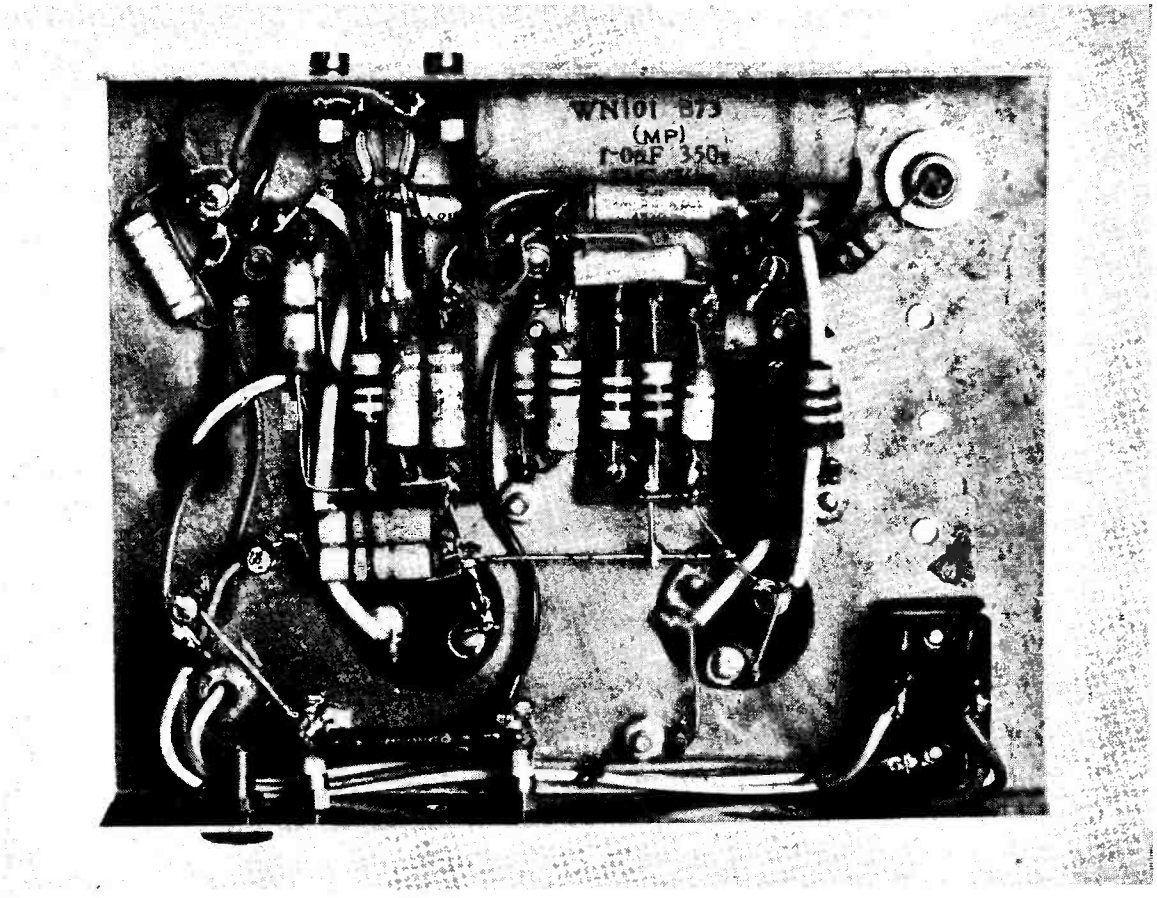


Fig. 2. Circuit of the Clamp Modulator by G3DZW, values for which are given in the table.



Under-chassis layout and wiring of the Clamp control unit.

waveform is preserved.) The anode current swings in V1 vary in sympathy with the applied grid voltage, but always decreasing with respect to the quiescent, or no signal, condition. Hence the potential at the junction of R1 and Ra increases in a like manner. Fig. 1(b) shows this process. In the quiescent condition, Ra is low, and in consequence the PA screen is at a low potential. When a signal is applied to the grid of V1, Ra increases. The PA screen then receives an increase in potential, and the carrier output varies in response to the signal applied to the grid of V1. With this type of modulation it is not possible to overmodulate in the accepted sense, as the "swing" on the PA screen is always in a positive direction *above* the quiescent DC voltage. Therefore, the carrier output can never be completely cut off.

Circuit Description

The circuit finally adopted is shown in Fig 2, and is suitable for use with a D104 crystal microphone. Two stages of AF amplification are provided, using miniature pentodes for V1, V2. The anode of V4, a miniature beam tetrode, is connected to the PA screen grid. A negative feed back loop is connected between the anode of V4 and the cathode of V2. The application of negative feed back, it is thought, is a unique innovation in Clamp tube modulator circuits. Without it considerable distortion was found to exist. This, it seemed, was due to the non-linear load over the cycle of modulation (in the form of the PA screen impedance) presented to the anode of V4. It will be appreciated that, in addition to any other function which V4 performs, it must operate as a linear amplifier if distortion is to be avoided. Results obtained using negative feed back fully justify its existence, and produces an effect which is, to the ear, indistinguishable from linear plate-and-screen modulation.

Operation

With S1 open the 807 PA should be operated, when tuned to resonance, under the following conditions :

Screen dropping resistance	=	20,000 ohms, 2 watts
Grid bias	=	−50 v.
Grid current	=	5 mA
Anode volts	=	800v.
Anode current	=	100 mA

S1 should be closed as soon as the tank circuit has been tuned and the correct loading is established, as under these conditions the plate dissipation is exceeded. When S1 is closed the PA plate current will drop to approximately 30 mA, and will kick up to 70 to 80 mA on peaks of speech. It will not reach 100 mA, as the plate circuit meter will read the average, and not the instantaneous, value of plate current, which will touch 100 mA.

Results

Numerous tests have been carried out on a transmitter working into an artificial load, and found to produce satisfactory results. It has also been used, for some months, by G2AKT on 20-metre phone. Results here show that this system compares favourably with a plate-and-screen modulator used previously. All reports on this band have been good and no difficulties have been encountered in operation. The complete modulator can be made quite small, the one in present use being built on a chassis measuring 6″ x 4″ x 1″ deep. This feature alone recommends the use of this system when space is at a premium.

REFERENCE

[1]*Television Receiving Equipment*, W. T. Cocking, M.I.E.E., Iliffe and Sons., Ltd.

Dual Purpose Quality Amplifier

DESIGN AND CONSTRUCTION

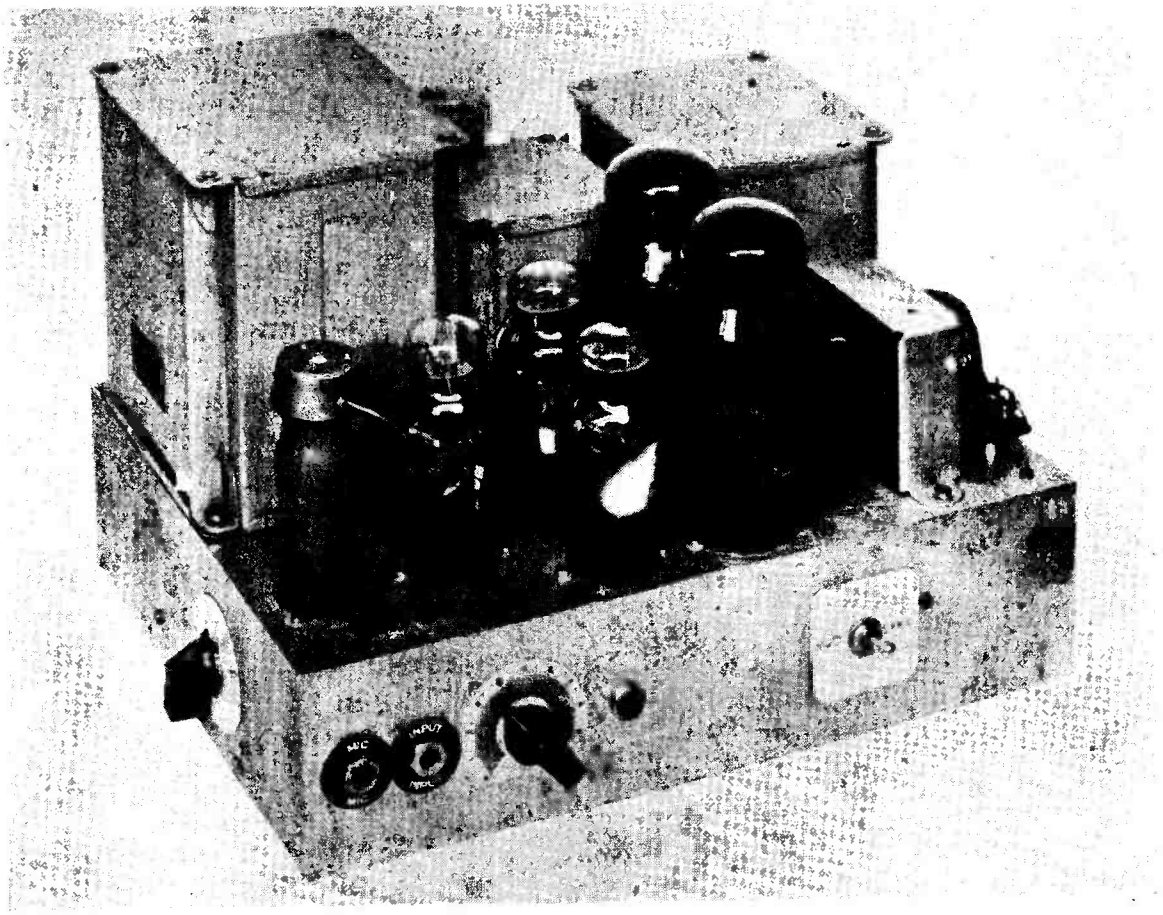
J. N. WALKER (G5JU)

Our contributor has discussed in previous issues the considerations leading up to the design of an audio amplifier capable of giving high-fidelity output over a frequency range within the normal amateur requirement, having in mind also the application of the unit as a low-power speech-amplifier modulator, or as a speech driver for a high-power modulator—though "hi-fi" on the DX bands was not the ultimate objective. This article covers in detail the circuitry, construction, testing and setting up of an amplifier incorporating NFB and tone control, capable of giving a good six watts undistorted power output, level within 1.5 dB over an audio range of 100-15,000 cycles.—Editor.

PREVIOUS issues of *Short Wave Magazine* (March and August, 1952), have contained articles setting out the basic points to be borne in mind when designing and constructing an audio amplifier capable of delivering several watts of power at low distortion and there now follows an actual design which will do everything the majority of readers would expect from this class of equipment. The final amplifier has perhaps turned out to be rather more ambitious in some respects than was originally intended but the results obtained are such that it is well worth while following the design as here set out. For the benefit of those who require something a little simpler, at the conclusion of the article hints are given on modifying the amplifier with a view to cutting down the cost of construction.

Dual Purpose

The original intention was to build an amplifier mainly for radio and record reproduction but, on second thoughts, it seemed a pity not to be able to use it as a modulator with a low power transmitter. Normally, the writer advocates a modulator incorporating speech clipping and filtering, on the ground that a greater degree of intelligibility at long distances is obtained, with less interference caused to others in the same band. However, on the 160- and 2-metre bands, there is little harm and certainly some interest in putting out a high quality telephony signal, particularly when the contact is a local one. Under such circumstances, one can test the relative merits of different types and makes of microphone in a way not possible when the amplifier/modulator has a deliberately restricted frequency response.



Upper chassis layout of the Amplifier complete, as designed and built by G5JU and fully described in his article.

Therefore, two output transformers are fitted—one of the usual type for feeding into a speaker of relatively low impedance, and the other a modulation transformer provided with tappings to enable a correct match to be obtained between amplifier and the PA stage of the transmitter. The throw of a switch transfers the output from one to the other. Negative feedback is applied when using a loudspeaker but is removed on bringing the modulation transformer into circuit. This is just as well as only rarely would the benefit of feedback be discernible over the air, whilst the power output is increased to a worthwhile degree, considering the equipment as a modulator.

General Design

The first valve is a Mullard EF37A, noted for its low noise and non-microphonic properties. It should perhaps be mentioned that both characteristics are partly derived from the use of a top-cap grid connection and the constructor is strongly advised not to be tempted into fitting a single-ended pentode (such as a 6SJ7) because of the slightly greater ease of making connections. Almost certainly, there would then be disappointment through a noticeably increased noise level and microphony would become evident.

The EF37A is operated at full gain and gives an amplification of some 75 to 80 times. Hence it is capable of stepping up the voltage from a very low level source to a value suitable for application to the following stage. The input impedance is high (some two megohms) and permits direct connection of most types of crystal microphones. If a moving coil or other low impedance microphone is employed, a matching transformer is necessary.

The gain of this first valve is generally too great to allow connection of a high output

type of pick-up and a second jack is provided which cuts out the first stage. Between the grid of the second valve and its input, which may be either the voltage from the anode of V1 or from the second jack, is interposed a tone control network, giving three bass boost positions, two treble boost positions and one straight through. The impedance at the second jack is of the order of 100,000 ohms, which is correct for most types of magnetic or crystal pick-up instruments.

The second valve is an Osram L63 triode, with a gain control in its grid circuit. Negative feedback is applied to the cathode from the secondary of the low impedance output transformer, the amount being adjustable to suit individual requirements. Of course, applying feedback to the cathode means it is being applied to the grid of the same valve, but it should be noted that the frequency characteristics of the applied voltage are affected by the tone control circuits *before* it reaches the grid.

One penultimate amplifier is driven directly from V2, whilst the other derives its grid voltage from a voltage divider across the anode load of its opposite number, using the system outlined in a previous article. These two valves are again L63 triodes.

The final valves are Osram KT66 types, connected as triodes, using a common bias resistor. This pre-supposes a pair of fairly well matched valves and the purist may wish to employ separate bias resistors (suitably by-passed with high capacity condensers), adjusting them until the anode currents of the valves are equal. In actual practice, the difference is likely to be so small as to be undetectable to the ear.

Power Supply

As can be seen from the photograph of the amplifier, the power transformer appears to be on the large side. It is rated to give 150 mA, which is just about right, taking into account that it may be required at times to supply power to an auxiliary unit. The voltage is 500, which is excessive, and advantage is taken to use a choke input filter which gives much better regulation than is obtainable from the more conventional condenser input filter. The voltage across C14 is just 400 and it remains absolutely steady under load. It will be noted that C14 is a paper type, much to be preferred in this position where the ripple current may be on the high side. The output valves are supplied from this 400-volt point and although there is some ripple present, it is not passed on to the output because of the cancelling action of the push-pull stage.

The voltage is dropped before being applied to the preceding valves and the dropping resistor R30, of 24,000 ohms, is utilised to provide resistance smoothing. The condenser beyond it (C15) should be as large as is practicable, both to ensure a complete absence of ripple and to present a very low impedance to signal currents, thereby increasing the stability of what is in any case a very stable design of amplifier. Tests with an oscilloscope indicate that the hum voltage beyond R30 is of an extremely low order. This, coupled with the fact that a balanced heater supply is utilised, results in a very small residual hum level—even at full gain it is practically impossible either to hear or to measure any hum in the output.

The rectifier valve is a 5R4GY with ratings in keeping with the requirements. Other suitable rectifiers are the 5U4G and 5Z3. No mains switch is fitted, it being intended that switching be effected at the mains socket. The fuse in the primary of the transformer is a standard type but the one shown in the circuit diagram as being in the centre tap of the high tension secondary is unorthodox—a piece of very thin wire (38 or 40 gauge) is used to make the connection between the tag on the transformer and a chassis point. The purpose is to protect the valve and transformer should C14 break down.

Construction

The amplifier is built on a strong diecast chassis and, as can be seen from the photographs, everything is symmetrically arranged. At the rear are the power transformer, swinging choke, rectifier valve and, at the extreme end, the Woden UM1 modulation transformer. To the front, in proper sequence, are the chain

Dual Purpose Quality Amplifier

LIST OF PARTS

1 Diecast Aluminium Chassis, Cat. No. 727 Eddystone
1 Mains Transformer PTM15A, Outputs :—
500-0-500 volts, 150 mA
6.3 volts, 4 amps
5.0 volts, 3 amps Woden
1 Swinging Choke, 5/25 Henry 150 mA maximum PCS11 Woden
1 Modulation Transformer type UM1 Woden
1 Output Transformer (*see text*)
8 Octal Valveholders type B8/U McMurdo
1 Valve, EF37A (V1) Mullard
3 Valves, L63 (V2, V3, V4) Osram
2 Valves, KT66 (V5, V6) Marconi/Osram
1 Valve, 5R4GY (R7) Brimar
1 Fuseholder (with 1 ampere fuse), L356 Belling-Lee
1 Mains Connector, P31 Bulgin
1 Pilot Lamp Holder, D180 Bulgin
1 Switch, Double-pole, Change-over
2 Telephone Jacks
2 Knobs, Cat. No. 1044 Eddystone
1 Knob, Cat. No. 593 Eddystone
2 Insulators (for modulator output), Cat. No. 1019 Eddystone
Screened top-cap connector, tag strips, etc.

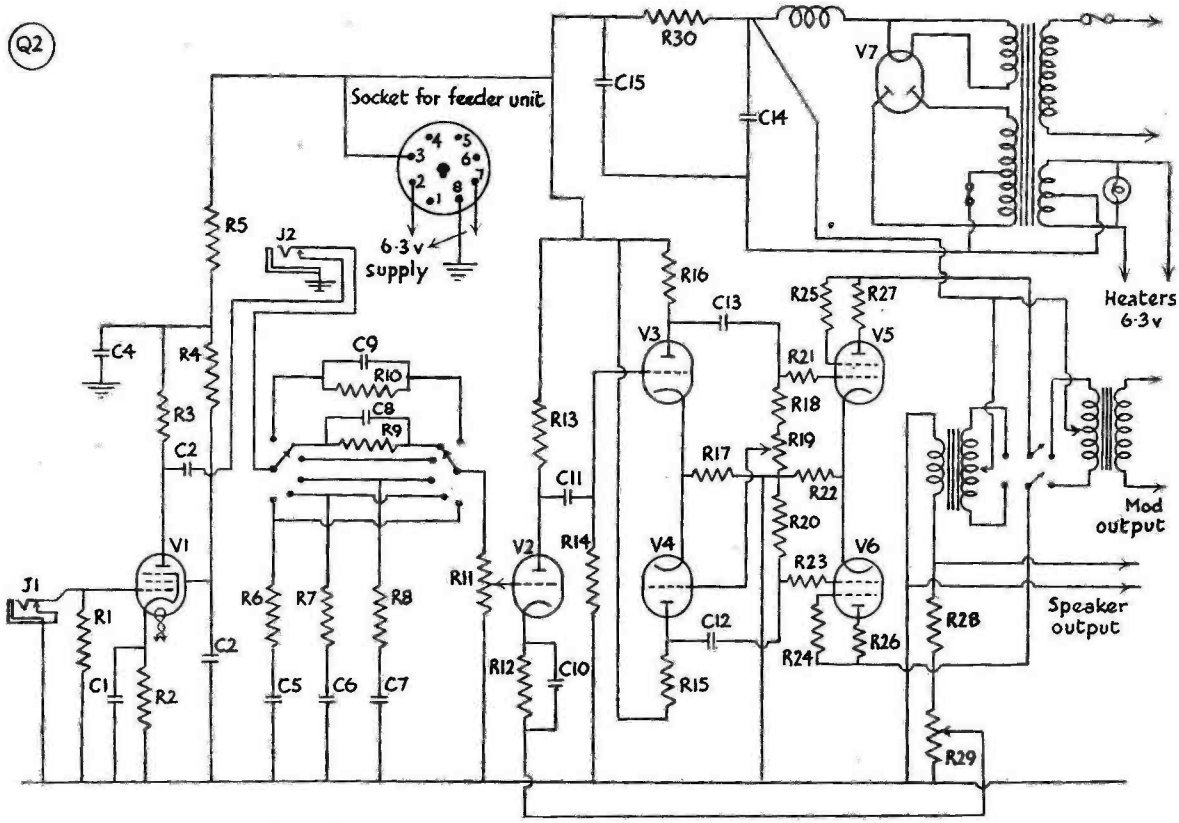


Fig. 1. Circuit complete of the Dual Purpose Amplifier. *[The negative HT line should be shown earthed].*

of amplifying valves and the low impedance (speaker) output transformer. On the front wall of the chassis are the two jacks, the gain control, indicating light and the switch for changing over from low to high impedance output. The rear wall holds the mains plug and insulated terminals for the two outputs. The tone control switch is located on a side wall, in a position which enables the connecting leads to be kept reasonably short. Potentiometer R29, which controls the amount of feedback, is mounted on the rear wall, conveniently near the low impedance output terminals. The balancing potentiometer R19 fits in between the valveholders on the chassis, where it is convenient for wiring although not readily accessible for adjustment. At it does not require touching once correctly set, this inaccessibility is not important. R19 is a miniature 50,000 ohms component but as the actual resistance between the arm and chassis is some 14,000 ohms, adjustment would be less critical if a potentiometer of 25,000 or 20,000 ohms were used here.

Table of Values

Fig. 1. Circuit of 6-watt Quality Amplifier complete

C1, C10 = 30 μF 15 volt (or similar) Electrolytic
C2 = 8 μF 350 volt (or more) wkg. Electrolytic
C3, C5 = .01 μF 350 volt wkg Tubular Paper
C4, C15 = 32 μF (or more) 350 volt wkg Electrolytic
C6 = .005 μF, Paper or Mica
C7 = .002 μF, Moulded Mica
C8 = .001 μF, Moulded Mica
C9 = .0005 μF, Moulded Mica
C11, C12, C13 = .05 μF Tubular Paper, 300 volt AC wkg
C14 = 4 or 8 μF Paper Block (Type 62 T.C.C.)
R1 = 2 megohm
R2 = 3,000 ohm
R3, R8, R13 = 100,000 ohm
R4, R10, R14 = 1 megohm
R5, R7, R15, R16 = 47,000 ohm
R6 = 10,000 ohm
R9 = 470,000 ohm
R11 = 0.5 megohm potentiometer
R12 = 2,700 ohm
R17 = 2,200 ohm
R18, R20 = 220,000 ohm
R19 = 25,000 to 50,000 ohm midget potentiometer
R21, R23, R28 = 1,000 ohm
R22 = 270 ohm, 5 watt wirewound
R24, R25 = 100 ohm
R26, R27 = 12 ohm
R29 = 50 ohm potentiometer
R30 = 24,000 ohm, 3 watt

All resistors ½ watt unless stated otherwise

As regards the placement of parts inside the chassis, the constructor must be guided by the photograph as it is hardly possible to describe this in detail. The electrolytic condenser C2 and the paper smoothing condenser C14 are easily seen. C4 and C15, being of comparatively small physical size, are mounted on top of the chassis near the modulation transformer but if larger sizes are actually used, it may be necessary to mount them also on the inside walls of the chassis, a fair amount of space being available for the purpose.

The tone control components are mounted directly on the switch, a short piece of screened cable being used to make the connection to the second jack. Some of the other small components associated with V1 and V2 are mounted on a tag-board spaced well above the chassis, the remainder being held in the wiring. The output valves have small resistors attached directly to the appropriate tags to prevent parasitic oscillation. The bias resistor R22 is a heavy duty wire-bound type dissipating nearly five watts.

The loose leads on the primary side of the output transformer have been brought to a tag strip below the chassis and the low impedance leads to a similar strip on the upper side, permitting a quick change of tapping should this be necessary at any time, say from 3 ohms to 15 ohms.

The wiring should be commenced with the heaters, using twisted wire. Then the mains and power circuits should be completed, after which attention can be given to the amplifier circuits, starting at V1 and working through consistently. If desired, the tone control parts can be left to the last.

Initial Setting Up

The ease and accuracy with which the initial adjustments to the amplifier can be made depend on what test equipment is available. An oscilloscope is the ideal as the performance can be studied stage by stage and any lack of balance quickly detected. A valve voltmeter having a high impedance input is the next best thing. Lacking these, recourse must be made to the simple yet effective method outlined previously in which a pair of high resistance telephones is utilised.

Actually, once such things as bias and load resistances have been settled, mainly on the basis of securing the lowest possible distortion, there only remain two final adjustments —balancing the penultimate amplifiers with R19 and setting the degree of feedback with variable R29.

Some sort of signal must be applied to the input and it is probable the constructor will already possess a record-player and pick-up, the output from the latter being plugged into J2. It is not desirable to have the speaker connected and in its place a dummy load should be used—for instance, three 12 ohm resistors or five 22 ohm resistors in parallel. The telephones are connected across R17, interposing a condenser of 0.1 μF (or larger) in one lead to prevent the bias being affected. With a fair amount of gain, it is almost certain the signal will be audible to start with, and R19 is moved until balance is apparently achieved. The gain is then increased somewhat and, if the signal again becomes audible, a final slight adjustment to R19 should remove it. It should perhaps be pointed out that increasing the gain to the point at which overloading occurs will render sound audible again in the telephones but it will be obvious that severe distortion is being introduced. During this test, R29 should be set to cut out feedback. (At this stage it will not be known whether feedback is negative or positive.)

The speaker is now connected up. One side of the speaker transformer secondary is earthed, the other goes to R29 *via* a 1,000 ohm resistor. If feedback is in the correct direction (negative), rotation of R29 will cause a noticeable drop in volume from the speaker. If in the wrong direction, volume will increase, some frequencies will be emphasised and, with R29 well up, a howl may build up. The remedy obviously is to reverse the leads coming from the output transformer secondary.

It is quite permissible to employ the full amount of feedback obtainable with R29 at maximum (some 15 dB) but generally this will cause too great a drop in overall amplification. A good average setting is with the arm of R29 at about 20 ohms from the chassis side, but actual operation will indicate a setting

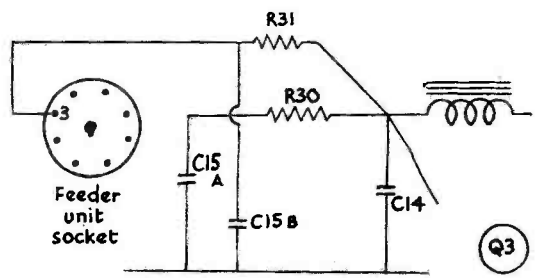


Fig. 2. Alternative circuit for supplying a feeder unit taking more than a few milliamps. R31 should be of a value to drop the voltage, and C15B a 16 or 32 μF electrolytic.

to individual choice. Should any difficulty be experienced in obtaining a low value potentiometer as specified for R29, a 22-ohm fixed resistor could be used instead with generally satisfactory results. In that case, the lead from R12/C10 would go to the junction of the resistor with R28.

Output Impedance

One benefit of using triode output valves is that matching is by no means critical. Actual measurement shows that maximum output is obtained with the load impedance between 6,000 and 8,000 ohms. When operating a speaker it is advisable to take the higher value since distortion is slightly less, and the output transformer should therefore have a ratio of about 52-to-1 with a 3-ohm speaker and 23-to-1 with a 15-ohm speaker. If any variation has to be made, it should be on the higher side.

When using the equipment as a modulator, the impedance can be taken as lying between 6,000 and 7,000 ohms and tappings can be selected on the UM1 transformer from the makers' data sheet. As an example, the valve anodes should be taken (*via* the switch) to taps one and six, and taps three and four, joined together, taken to HT. Then, assuming a 10-watt PA stage running at 300 volts, 33 mA, the output terminals would go to taps seven and twelve, joining together nine and ten. The working impedance of the PA will drop appreciably if the voltage is 250 and the current 40 mA and the secondary taps would then be eight and twelve, still leaving nine and ten joined.

Performance Figures

The performance of an amplifier can be stated in a number of ways and any figures relative to distortion must have regard to the output wattage. Under the conditions the KT66 valves are used here, the valve manufacturers state that a maximum of 14.5 watts are available at a total distortion of 3.5%. Second harmonic distortion is small in a properly adjusted push-pull stage and most of this 3.5% is undoubtedly third and other odd harmonics. The ear is sensitive to third harmonic distortion and 3.5% is too much anyway. Fortunately 14.5 watts will only be required over sustained peaks and rarely then. With an efficient speaker in an ordinary domestic room, half a watt is usually ample; two or three watts is definitely on the loud side and there will probably be requests to "turn it down"!

The amplifier as described gives up to six watts with no perceptible distortion of the applied waveform when studied on an oscilloscope. The writer would not like to say there is absolutely *no* distortion at this six watts level but it must be small (probably well under one per cent.) and, as far as his human ear is concerned, the reproduction sounds extraordinarily good.

Beyond six watts, distortion does become evident, but it is by no means excessive up to 10 watts output. It must be admitted here that the speaker transformer shown in the photograph leaves a lot to be desired, and it cannot be considered a high fidelity type. It adversely affects the overall frequency response and it is very probable the distortion level would be considerably reduced at the higher outputs with a larger transformer.

Turning to the frequency response, with the tone control set for straight through operation and with the recommended degree of negative feedback (naturally the latter has a considerable effect particularly, when the output transformer is none too good), the response is level within 1.5 dB over the range 100 cycles to 15,000 cycles, taking 1,000 cycles as the reference level. The response is down by about 5 dB only at 20,000 cycles. At 50 cycles, it is some 5 dB down and obviously the falling off at this point is more than should be the case. This falling off is definitely attributable to the output transformer and it will be noticed as a matter of interest that the degradation in response is much more severe at the low frequency end than at the high frequency end. The output transformer must possess a high primary inductance and a low leakage reactance if the frequency response is to be well maintained and the constructor is advised to purchase the best type he can possibly afford —the one in the amplifier will not remain there long as it is "spoiling the ship for a ha'porth of tar"!

Performance As Modulator

With the modulation transformer switched into circuit, the overall gain becomes higher because negative feedback is removed but the total output remains much the same. It can be assumed that some 12 watts is available from the secondary (allowing for losses) with a degree of distortion which will be fairly low and probably not noticeable over the air—in fact reports will indicate a quality well above average.

The frequency response is not so good when the equipment is used as a modulator, partly

because of the absence of feedback but mainly because an ordinary commercial modulation transformer has a high leakage reactance (it would otherwise be a very expensive item). The response begins to fall at 100 cycles on the low side, and at 6,000 cycles on the high but this is of little practical account for modulation work since the range of speech frequencies is still more than adequately covered without appreciable loss, whilst most communication receivers would not reproduce the higher frequencies even if they were present.

Effect Of Tone Control

The tone control is provided with one straight-through position, two treble boost, and three bass boost positions, and the steps have been carefully selected to meet normal requirements without giving too drastic a change between one position and the next. Smoother control would be possible if a variable 100,000 ohm resistor were to be used in place of R6, R7 and R8, switching only the condensers, but the three switched steps do all that is required in practice. As explained before, this simple type of tone control works on the basis that some frequencies are attenuated more than others, but of course some loss occurs at all frequencies when any of the five tone control combinations are brought into circuit.

The treble response is so well maintained that it will rarely be necessary to use treble boost, but this may occasionally be found useful when modulating a transmitter, to help counteract to some extent a deep voice. Many will find the straight through position quite satisfactory both for radio and records, but some bass boost—or top cut, which is much the same thing—is generally desirable. The writer's preference is for the second bass boost position, but it is all a matter of personal choice.

Noise and Hum Levels

As mentioned earlier, the hum level is so low as to be difficult to measure—it is only just readable on a power output meter and, at full gain, is something of the order of .01 milliwatt. Again noise is very low. With the first valve out of circuit and with full gain, no noise can be heard or measured. With V1 operative, control grid open except for R1, measured noise is 1.6 milliwatts, at full gain. As only on rare occasions will both V1 and full gain be required, the noise can be considered absolutely negligible.

Practical Use

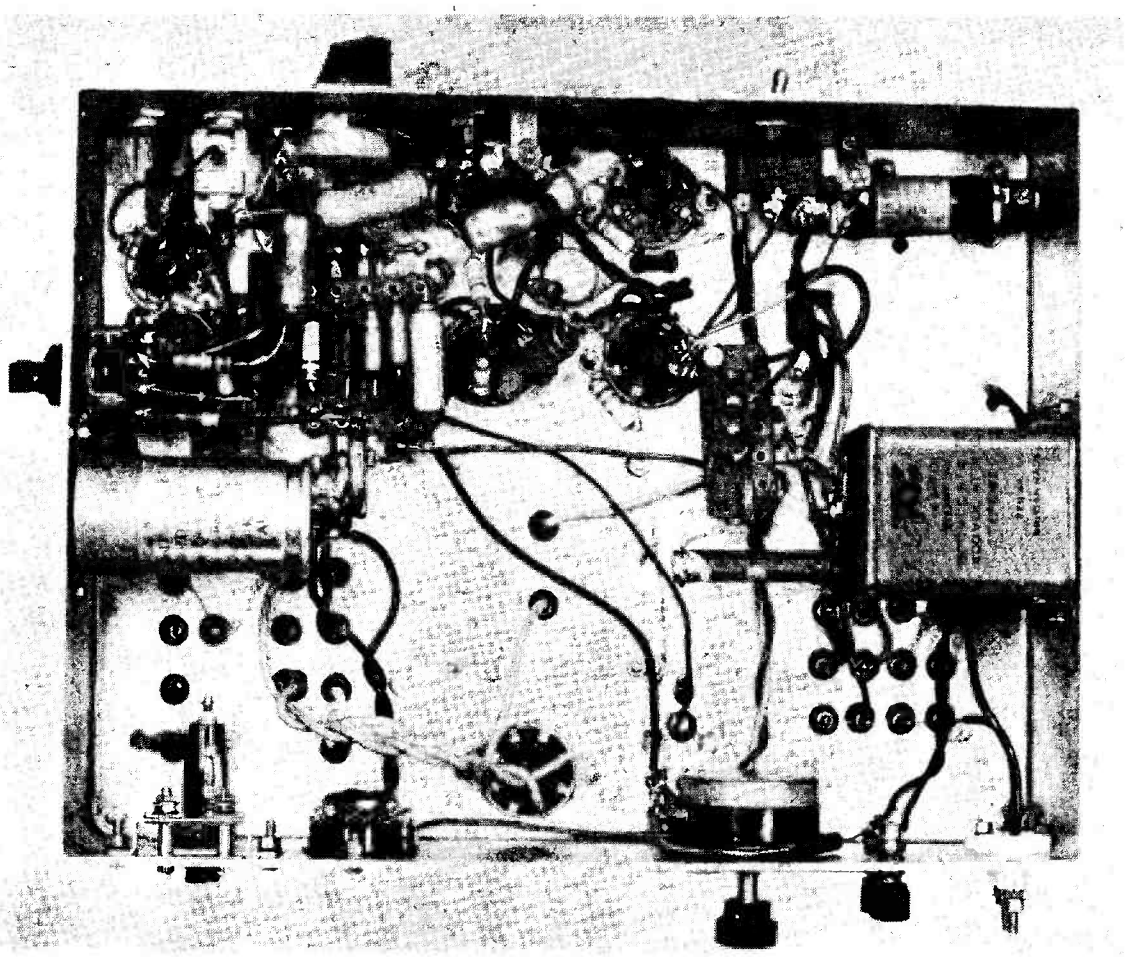
With most radio feeder units and with most types of pick-up, the second jack will be used. It must be emphasised that the high gain of V1 is only required when the applied signal is of very small magnitude, as from a low output microphone or a weak radio signal. At the writer's location, a crystal receiver based on the design published some time ago in the *Wireless World* and pre-tuned to Midland Regional (medium wave) and Droitwich (long wave), is used with the amplifier and the results are a vast improvement over the ordinary domestic broadcast receiver, considered from the standpoints of programme quality and background interference.

There is ample power in reserve to operate a small radio feeder unit and it is suggested this could take the form of a radio frequency stage followed by an infinite impedance detector. The octal socket mounted on the rear wall of the chassis is provided for easy connection. There is just one point here. If the feeder unit consumes more than a few milliamperes (it need not), it will be better practice to arrange a separate HT supply point. That is, instead of taking HT from the end of R30 as drawn in Fig. 1, another resistor should be fitted, of a value which will drop the requisite number of volts, and terminated in a high capacity electrolytic condenser. This is made clear in Fig. 2.

Possible Modifications

Keeping to the design in most respects, the initial cost of construction can be reduced by substituting a smaller mains transformer and a condenser input filter. The transformer should be rated to deliver 400-0-400 volts at 150 mA and the smoothing choke will be of the standard type (not a swinging choke). It is still most desirable to make the reservoir condenser a paper type and the capacity should be 8 μF. The anodes of the output valves can be supplied direct from this condenser, when the smoothing choke can be of a reasonably small size.

Where three or four watts output is adequate, 6V6 valves can be used instead of KT66 valves. The maximum permissible anode voltage is then 285 volts and a transformer with a 300 volt secondary will be required, rated to give 100 mA. The same bias resistor value applies but the wattage can be less. The recommended output load becomes 4,500 ohms. Since there will be practically no voltage to drop, R30 must necessarily



Layout and wiring underneath the chassis of the Dual Purpose Amplifier.

be omitted. Should hum become evident, an additional smoothing choke, of a small compact type, should be inserted in the position occupied by R30.

The Loudspeaker

The figures given earlier were taken with instruments and the effect of translating them into sound will depend largely on the type of speaker connected to the amplifier. It should be of large diameter—at least ten inches—and of a quality type. A small speaker will neither reproduce the wide frequency range nor handle the power the amplifier can develop. To maintain the low frequency response, the speaker should be fitted with a large non-resonant baffle or, better, enclosed in a cabinet of proper acoustic design.

SCHOOL OF ELECTRONICS, MALVERN

It is reported that T. E. Goldup, Esq., M.I.E.E., a Director of Mullard, Ltd., has been appointed chairman of the board of governors of the Ministry of Supply's School of Electronics at Malvern, Worcs., in succession to Prof. W. Jackson of the City and Guilds of London College. Mr. Goldup, who has been with Mullards for nearly 30 years, is also a member of the Radio Research Board, D.S.I.R.

PHOTOCELL PRICE REDUCTIONS

The Communication and Industrial Valve Division of Mullard, Ltd., announce substantial reductions in the price of Mullard Photocells, which are widely used in the engineering industries and in instrument making. Of the range of eight such cells, some examples of the price reductions are: Type 20CG, from 70s. to 35s.; the 58CV, 70s. to 30s.; and the 90CG from 37s. 6d. to 24s.

DX COMMENTARY

L. H. THOMAS, M.B.E. (G6QB)

G3GIR

ON the whole, a pretty dull month again. With conditions at their 1952 level, and down in the summer doldrums at that, enthusiasm has not been exactly terrific. Those who stuck to their posts were rewarded by one or two openings of unusual types, and the DX-pedition of the month, VS5ELA, duly did his stuff for a few days and then melted into silence.

It is still too early in the year to prophesy how the 21-mc band is going to turn out, but indications are fairly hopeful. At least one G station has already made his WAC on the band, and new countries keep on turning up. We feel like taking a chance on it and saying that 21 mc will be a good band this winter. So let us cope with it first of all.

The DX on 21 mc

The credit for being the first to claim a WAC on Fourteen goes to G6GN (Bristol), who is also able to get in with the first VK/G contact on 21 mc. (We are not going to haggle about "firsts," but this is surely a good one.) On July 20 he worked VK2AWU (ex-G3DCU) at 0850 GMT, and the card came through in a few days. 'GN has also worked ZD9AA three times, ZP9AH, ZD6DU and W1, 2, 3, 4, 8 and Ø, and he tells us that ZL1HY was in contact with FA8CR some time recently. Nice work all round!

G8OJ (Manchester) has put his score up to 29 countries, but doesn't tell us who the extra ones were. G3CMH (Yeovil) had one good session between 1955 and 2230, and worked FF8JC, KP4CC, LU's, PY2OE, W4COK and YV5AB. DX was considered much easier on 21 mc than on 14 mc.

CALLS HEARD, WORKED AND QSL'd

G5BZ (Croydon) feels quite differently about the band and considers it a waste of time for those whose spells on the air are limited. He has, however, pushed his score up to 5 continents and 26 countries, new ones being ZD9, LU, FF, ZS, KP4, FA and some Europeans. 'BZ says his 14 mc beam works very well on 21 mc, and it was on his 14 mc groundplane that he raised ZD9AA!

G2BJY (West Bromwich) winkled out SU1XZ, FF8AE, ZS, LU, W, FA and some more Europeans, giving him a total of 25. The Gotaways were VK2AWU, TF3SF, CT3AB and ZD9AA. GC3EML (Jersey) thought it a poor month, although he worked VQ4, KP4, YI, KG4 and the like. He heard LU's, CE and FF8 but didn't raise them.

G3FXB (Hove) says he hasn't the patience to sit on the band much, but Sundays are lively and the evenings best. Catches during the month were FF8, FA8, LU's, SU, ZC4's, ZE's and ZS's. The only Gotaway of note was ZD9AA. G3ABG (Cannock) also worked most of the general run of DX, with a bunch of W's and KZ5WZ included.

ZE3JO (Salisbury, S.R.) has been able to raise fifteen G's as well as GW, HB, PA, DL and ZC4; he can hear the W's out there but they are very weak. Best time for Europe is about 1730-1930. CN2AP (who is old EK1CW) has been on the band and has worked a number of G's, but thinks conditions down there in Tangier have been bad. He has clocked up 25 countries, but is missing on Asia and Oceania, although he has heard 4X4BX and a ZL. 'AP says G6GN is the most consistent G station out there, and comes through at any time.

G3GUM (Formby) considers 21 mc "the big excitement" up North, and thinks the band is

suffering more from lack of activity than from conditions. He asks "What's the good of an opening to ZD9AA (589, and the only signal on the band at 1600) if there's nobody there to work him?" He tells us that G5CP worked a KG6 around 1000 — which probably means another WAC. 'GUM has heard 30 countries on Fourteen and worked 26 of them, and he thinks that is typical of other people's experience.

From all this it rather appears that 21 mc is *not* a cross between 28 and 14 mc, but is rather more like 28 in its general behaviour. Long before 28 mc is due to come back, 21 mc will be established as *the* DX band.

Final query: Who *is* the mysterious X8EE, worked by G3GUM, KV4AA and others? And, by the way, SM4GL (Falun) tells us that the SM's are not yet allowed on the band.

The DX on Twenty

By comparison with the new band, Twenty seems to have been a bit dull lately, although conditions have often been good late at night. G3ABG had one session only, and raised VP4LZ, FQ8AG, YV5FH and an SU — but last month he collected 4W1MY.

G3FPQ (Bordon) is home again, and knocked off FB8ZZ, FP8AP, FQ8AK, KH6IJ and VE8RS; Gotaways, alas, were FN8AB and VS5ELA. G3IGZ (Eltham) found his first VK (at 0015!) and made his WAC therewith. Others were FP8AJ and 8AK, KG4AF, VS6CG and so on, but the choicest were those that were missed, such as C3AR, VS5ELA, VQ8AF and VS9AW. 'IGZ also heard an LA station calling ZD7AB—has anyone any gen. on him?

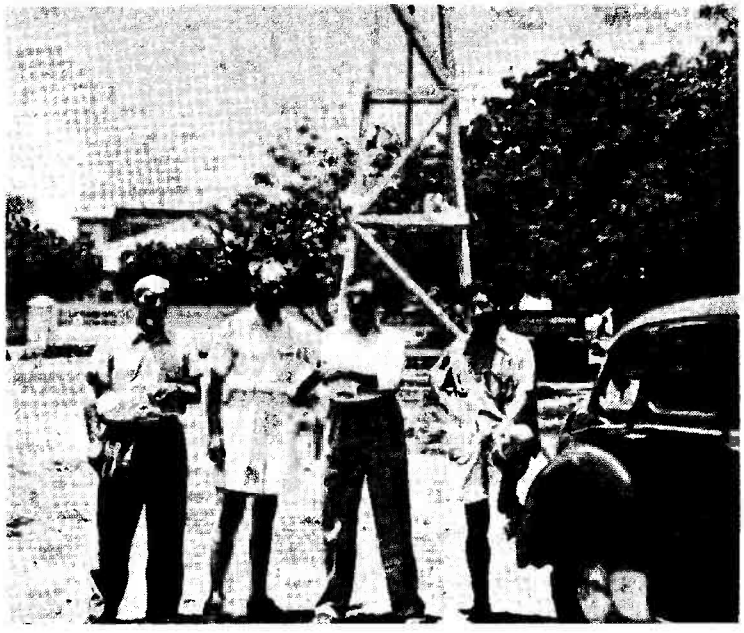
G5BZ's bag includes FB8BB and 8ZZ, ZC2MAC, FL8MY, VS5ELA, VS9AW, *four* FP8's, VP5BH (Caymans), YS1O, CE5AW, PJ2CC—in fact most of what we have been hearing on the band! 'BZ says that by this time last year he had worked 150 countries, and this year the score is 147, so can conditions really have been so bad after all? (It's surely a question of how easy or how difficult it is to get them; when conditions are up to the 1947 level again we shouldn't be surprised if someone worked 150 in two months.)

G2WW (Penzance) returns to the fold with a nice list of DX worked, such as 4W1MY, FL8MY, FI8AC, VS5ELA and VS9AW. Concerning the latter, both 'WW and G5BZ point out that he is in the Sheikdom of Oman, which is quite a different place from either Aden or Trucial Oman, and should certainly count as a country. Personally, we think that is so, and if we were prone to setting up our own country lists we should say "Go ahead." But to keep some semblance of order we have to see what the other parties concerned have to say about these things — so leave that one on the hook just for the present. G2WW adds that he has worked MP2BH in the Sheikdom of Qatar, which ought to be yet another one. (We happen to know that some of the MP4's supposedly on Bahrein Island had their stations actually in Qatar — but they gave their QTH's as Bahrein and weren't keen on setting up a new one.) We await the general decision on both of these. Further reference to this sort of thing in a later paragraph.

G3HDL (Liverpool), working on 14 mc with an indoor aerial, has added OQ5RA, HS1WR, ZE5JP, and VK5HK, the latter giving him his WAC, with which he says he is "ridiculously pleased." Well, you don't need the fingers of two hands to count the indoor-aerial WAC's, we should imagine.

G5XG (South Devon) thinks he can stake a claim for the "further North" phone contact, having worked KL7AGP/MM on "Ice Island, North Pole," 88° 31' N. The KL7 was using a rhombic three feet off the ice! Incidentally, what about this W5AGB/FM on "Fletcher's Ice Island" who has been so active on 14 mc CW? We have heard him a lot, but no one seems to claim to have worked him. Presumably the "FM" means "Floating Mobile?"

The best at G3GUM were ZC2MAC, VS5ELA, DU1MB, HS1WR (all around 1600), FO8AB (0645) and some lesser lights. Other news from 'GUM is that VR3C is said to be on phone,



Group taken on a visit to VU2DZ, Bombay, left to right: DL3ZV (licensed as AP2K), G4GB, AP2N and VU2DZ.

every Thursday at 0600 GMT, and that G3AAT/OX (The British North Greenland Expedition) popped up at 589 one afternoon, worked one station, complained of the wolf-pack tactics and went QRT again. (G3ESY, Hereford, also heard this station, but on 7 mc.)

Some Phone DX

G3TR (Southampton) has found VK and ZL absent, compared with last year, but some of the other DX quite good. The month's bag included ZD2TTE, CR6BX, EL9A, KA8AB, LU5XE and VE8MA, all on phone. 'TR needs only two states in Brazil for his *phone* WAB, which he hopes to get shortly.

GM2DBX (Methilhill) managed to pull in LB6XD, ET3R, CP5EQ, FP8AM and 4W1MY—all phone, which improved his Marathon score quite a lot. Visitors to the shack included VU2JP and C8PX with AP5B.

G3FXB also wielded his 14 mc phone to some effect, and worked FP8AJ, HH3L, HP1LA, LX1BU, OQ5VD, VQ5CY, VU2DZ with a few others. Gotaways on phone were TG9AZ, HR1SO and ZP5DC, which just shows that phone pays dividends if you are searching for some of those elusive ones that you can't find on CW.

G3CMH managed EA9AT, SU5EB and TA2VDR, with FP8AM as a Gotaway.

Other Bands

All the other bands can be lumped together in a very few sentences. Starting with *Top Band*, G2NJ (Peterborough) tells us that G5PP/P, operating from Westmorland, was much sought after by WABC-collectors, and that OH3NY has been a very good signal round about midnight. On *Eighty* G3FPQ worked ZB1BJ for a new one, and G8JR told us in a QSO that he had worked FP8AK and 8AM, PY's, LU's, CE7AA and ZS2HI up there. Look at CE7AA on a map and you'll agree that is is nice going for Eighty.

G3IHI (Swindon) says "Don't knock poor old *Forty* too hard; for the rabid DX man it may be a dead loss, but for the newcomer it's still a darn sight easier to add new countries on 40 than on any other band—especially if the aerial is only a random length of wire." G6TC has been mostly on Forty, where he has worked W1, 2, 3, 4 and 8, ZL2IQ, CO2OK and TF3MB. G3FXB worked W2ESO and changed over to phone for a short time, getting R5 and S7 from him. SM4GL has raised CE4AD, CT2BO, VQ4CM and ZS2HI on *Eighty*, and says that all the DX on that band is worked by EI9J, G3BKF and G8JR!

The Overseas Mail

CN2AP (we previously remarked that he is ex-EK1CW) tells us that the licences have been rationalised at last, and that 24 calls have been issued in the series CN2AA-2AZ. He will be on the LF bands this winter with a better aerial, and hopes for many G contacts on Top Band.

ZE3JO was thrilled to get a call from VS5ELA on 14 mc, but wonders what exotic countries you have to work to get a score anywhere near that of W1FH and the other list headers.

ZL3JW and 3LL notify us that from July 1 the ZL's were licensed for the 11-metre band (26960 — 27230 kc) for both A1 and A3; their 21 mc allocation, from the same date, was 21000—21100 for CW and 21100—21450 for Phone.

VU2DZ (Karachi) tells us that he cannot get an AP call, doubtless due to the fact that he holds a VU! He adds that there is no QSL Bureau for Pakistan, which causes difficulty; even two cards from Bombay, correctly addressed, failed to reach AP2N. A new station active in Karachi is AP2L.

DL2SM is a Club station in BAOR, the organising secretary being DL2TA. Both are active on Forty and Eighty, between 2200 and 0700 GMT for phone, and at various other times for CW. DL2SU also sends a line to say that DX openings on 7 and 14 mc have been excellent, the former in the small hours and the latter in the late afternoons and early evenings. Owing to a very poor aerial, 'SU doesn't have much of a share in it, but he hopes to improve matters soon. He adds that there is a "stupid pirate" in Berlin, using an MI3 call-sign on 7 mc and completely unaware of amateur procedure. He gives his QTH over the air as "Berlin," too!

SU1FX tell us that there has (as one might expect) been a tight clamp-down on amateur operation out there, with the result that comparative silence reigns. The trouble, 'FX says, has been caused by the reckless use of QRO phone by certain stations. One has been using a BC 610 and another a very splattery T. 1154! The situation remains somewhat fluid, so anything might happen.

ZE5JP signs his letter "Sprog

FOUR BAND DX TABLE

POST WAR

Station	Points	3.5 mc	7 mc	14 mc	28 mc	Countries
W2QHH	501	93	92	210	106	210
DL7AA	500	70	123	207	100	214
G6QB	491	51	94	211	135	227
G2AJ	433	42	81	192	118	211
G5BZ	420	54	90	212	64	216
G2VD	405	42	80	175	108	183
G6LX	392	58	56	172	106	194
G2WW	370	21	62	182	105	190
G5FA	365	33	111	148	73	163
G3FXB	344	48	94	163	39	170
G6QX	326	47	82	141	56	160
G6YR	310	19	43	147	101	166
G3ABG	286	35	79	142	30	149
G2BW	262	24	57	144	37	150
G8VG	259	34	76	123	26	140
G2YS	249	40	45	124	40	138
GM2DBX	234	5	31	117	81	137
G3GUM	218	31	38	148	1	159
G6TC	213	17	59	100	27	119
GM3EDU	197	37	41	96	23	116
G3FXA	193	22	46	117	8	124
G2HKU	185	4	48	119	14	129
G3FPQ	170	42	19	102	7	108

A transmitter of this sort was familiar to the two-letter men of 25 years ago. 'Way back in 1929, G5ZN (still of Burnley, Lancs.) ran a Mazda P650 in a 10-watt TP-TG SEO circuit, with its HT from 220-volt DC mains. With this Tx and an O-V-1 receiver, some of the contacts then made are shown by the QSL cards.

Ham," but he is running 50 watts with a beam directed on England, and his main interest is 20 and 40 CW. He has already worked 52 countries and a number of G's . . . when does one stop being a "Sprog?"

MP4KAI (Kuwait) tells us that he is active on 20 CW and phone, using 50 watts. He is ex-ZC6BF and 4X4BF, and anyone short of cards from those stations should write to MP4KAI, Independent Exploration Co. Ltd., c/o Kuwait Oil Co., Mina-al-Ahmadi, Kuwait. The following are active out there —MP4BAV, 4KAC, 4KAE, 4KAF, 4KAH and 4KAI.

DL7AA (Berlin) is a welcome recruit to our Four-Band DX Table, jumping straight into second position on the ladder with his total score of 500. His claim for the Four-Band Award, received this month, consisted of cards concerning only *one-station* Four-Band contacts! Nice ones among them were CE3AG, VK5KO and ZD4AB. Note Rudi's score of 123 countries on 7 mc.

General News

We spent two hours on working VS5ELA (118 minutes listening, two minutes transmitting) and had ample time to observe the behaviour of the *genus* Clot. One particular specimen called the VS5 off and on for the whole period, on his frequency, although he wasn't replying to anyone nearer than 5 kc one way or the other. VS5ELA worked stations either above or below his frequency without telling them on which side he was going to listen, and so kept them guessing and kept his own frequency clear except for the antics of the Completely Incurable Clot like the one we have mentioned. The result was that he made 45 QSO's an hour all day long. Other DX stations, be it noted, come on and disappear after a few contacts because they can't take it . . . it proves what we have always said, that it is the DX station who is master of the situation, and what happens is entirely up to him. One or two rare ones pop up now and then, and give it up after three QSO's.

Generally speaking, the trouble in this country over working rare DX comes from three quarters—El Bugg down in the South-West, Ola-Ola to the South-East and Ruddi Karvup further East . . . no need to mention the prefixes. And the reader who suggested that if competition got any fiercer, there would amateur jammers on the air, was nearer the truth than

he realised. Some of these European transmissions *are* just about that and nothing more.

Incidentally, the VS5ELA Expedition did not go as well as was intended. Clyde of WØELA was hoping to run VS5ELA from Brunei (which he did), then transfer to Sarawak and operate as VS5ELZ, finally ending up on Labuan Island as VS4ELA. It appears that the difficulties of getting permission to work from the two last places were too much, and that the Brunei operation was all that was possible. But this was a noble effort, and all the 'chasers will want to thank WØELA for his trouble.

ZA3KAA, giving QTH as Tirana, Albania, is believed to have been a good one, but only the QSL's will show . . . VP5SC, Kingston, Jamaica, is none other than Stan Crow, formerly VQ4SGC . . . KM6AX and KM6BE (formerly W6HQH/KM6) both QSL—cheering news for those who have recently worked either of them and are short of a KM6 card.

DX-Chasers' Forum

As the DX news this month is somewhat reduced in volume, we gladly give space to the more argumentative section of the postbag, which, for once, has been very heavy.

First to arrive was a card from G6LB (Chelmsford), worded thus: "Competition is the greatest curse of Amateur Radio and has done more to tarnish the true spirit of our hobby than any other single factor."

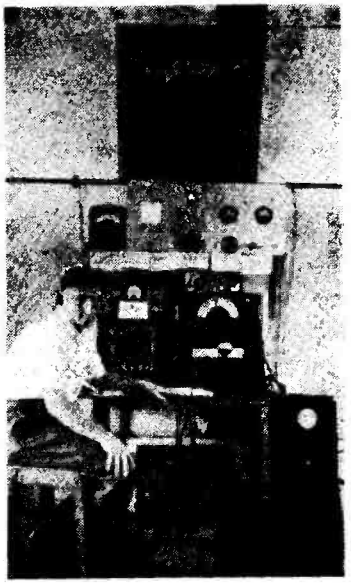
Next came a letter from G2BVN (Romford), who doesn't go quite so far, but says "I agree that competition is a good thing, and that contests and so on are desirable in very small numbers, but I feel that a lot of the shocking behaviour on the DX bands to-day is due to the craze for one more Zone or Country.

"In my humble opinion a number of the QSO's that take place to-day are only a means of adding a further figure to the appropriate total, and the interest and pleasure derived from the actual QSO is only of secondary importance.

"If you must have another competition, let it be for us to find who can be the most well-mannered operator on the bands, and let us not encourage these so-called hams to further and even more revolting habits."

So far, so good. And now comes an even longer and, if anything, more telling one from G6YR—written in Ward 7, Sefton General Hospital, Liverpool, from which we all wish him a very speedy release to better health. Thus says 'YR: "Having plenty of time for meditation on the hobby without the distraction of a rig to hand, one thing that stands out a mile is that on the DX bands, most operators have lost the right perspective. On the face of it, what a glorious opportunity of finding out all sorts of things about other lands—scenery, climate, habits and so on—which one could never learn so realistically without paying personal visits, and of making real friends.

"But in practice, what do we find? 'Ur RST 569, name is Ted, QRU, 73 and DX' — and that's another station come and



ZE5JP is with the R.A.F. at Kumalo, Nr. Byo in Southern Rhodesia, and the main interest is CW on Twenty and Forty, with 50 watts into an 807.

WAZ MARATHON, 1952

Station	Zones	Countries
G5BZ	36	147
G8FC	36	108
G3FXB	34	118
G2VD	34	115
G6QB	34	112
G3FXA	34	95
G2DPY	33	109
G6YR	33	103
G3GUM	32	97
G6QX	32	86
G3FPQ	30	70
GM2DBX (Phone)	29	93
G3DOG	29	75
G3CMN	27	55
G2BW	25	85
G3TR (Phone)	25	74
G3ABG	24	85
G3BDQ	23	66
G5FA	22	68
G3HDL	21	59
G5GK	17	24
G3IGZ	15	49
G2BAM	13	46
G3HZL	13	41
G2CMQ (Phone)	13	34
G6TC	12	37
G3FPK	11	31
G2BJN	10	37
G2VJ (Phone)	8	12
G3IHI	7	29
G4QK	4	7
DL2SU	2	17
G2BP	2	10
G3GVY	2	9

NOTE: New entries in this table must not include QSO's dating back more than two months from the time of entry. Regular reporters should send in their score month by month — three months' failure to do so will be taken to indicate loss of interest and the score will be deleted.

21 MC MARATHON

(Starting July 1, 1952)

STATION	COUNTRIES
G6GN	36
G8KP	33
G8OJ	29
G3GUM	26
G5BZ	26
G2BJY	25
GC3EML	22
G2VD	20
G6QB	20
G3ABG	16
G3FXB	15
G5FA	10

gone, probably never to be worked again unless a contest crops up. This, it seems to me, has to a large extent been brought about by all these competitive stunts, which, in my opinion, are all futile, prove nothing and certainly bring out all that is worst in human nature."

G6YR goes on to say, at some length, that we all know that 150 watts and a decent aerial will put signals anywhere—simply if you have enough time and patience to call the DX more or less on its own frequency, and often enough. And he adds that the "moaners," both on the air and in writing, are just as guilty of sharp practice as the stations that they condemn. (We fully agree with that one — we heard several of them during our two-hour vigil for VS5ELA!)

He quotes one very well-known rare DX station, who has been very rude on occasions to the Spivs and Clots, but who, when *he* managed to find a rare country, proceeded to work him on phone in the CW band without turning a hair. He adds, too, that if HZ1MY in Arabia is easy to work, does it make any difference, really, if he moves a few miles into Yemen? Why should he then be the most sought-after station in the world? Just because of this convention that "Countries" are the collector's-piece in Amateur Radio.

The Other Side

After all these strong and well-reasoned "anti-competitive" views had been received and read, we decided to stay strictly neutral ourselves, and referred the matter to a well-known Old Timer who is active on all bands (including VHF) and is *not* a rabid DX man.

He replies as follows: "A lot could be said on this theme, the main point of course being that amateur *experiment* is virtually dead, and the main focus of Amateur Radio is now on *Communication*. Maybe this calls for competition to sort out the best communicators. You don't have to let the competitive element worry you if you don't want to play. When I have a DX spasm, if somebody else gets the DX I've called, well, he's done better than I have, that's all. I think a lot of these moans are a function of the over-crowding on the DX bands, which is quite another matter. There are so many people on the bands these days that there is bound to be a proportion of black sheep, human nature being what it is. And my bet is that turning off all contests and all competitive interest would not make the slightest difference to operating conditions or behaviour over the air. The theme therefore seems to be 'Take it Easy.'"

Well, friends, there you are. Your Commentator has views, but they are not such as would affect either argument. Suffice it to say that anyone who regards his total of Zones, Countries, Certificates and so on as of paramount importance is welcome to do so, but he is misguided and his views are probably not shared by the majority. At the same time it seems that *some* sort of competitive stimulus is likely to be helpful, even if all that we are doing is to train ourselves (in the phrase quoted above) as "better communicators."

Surely the thing to do is to improve manners and behaviour without any *negative* action, such as cutting out all incentive to compete with the other man?

Views on the subject will of course be welcomed, but not, please, at *too* great a length! We want to keep some space in these columns for the purpose of this feature, which is, after all, intended for those who *are* interested in DX, whether of the competitive kind or not.

Next month's deadline is first post **on September 10** — a very early one, so please make a note of it. For the following month *October 15* will be the day. Address all your DX news, views and comments to: "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. 73, BCNU, and — Behave Yourselves!

SHORT WAVE MAGAZINE CERTIFICATE AWARDS

W.N.A.C.A.

1. **GM3DHD (Edinburgh)**
2. **G8KP (Wakefield)**
3. **G6LX (Croydon)**
4. **G2BXP (Oldbury)**
5. **SM5LL (Enskede)**
6. **G3CVG (Wakefield)**
7. **GW4CX (Flint)**
8. **GI3ACV (Bangor)**
9. **G6BS (Great Shelford)**
10. **G6TC (Wolverhampton)**
11. **G5HS (Thame)**
12. **DL7AA (Berlin)**
13. **G5LH (Horbury)**
14. **G2WW (Penzance)**

F.B.A.

1. **G8KP (Wakefield)**
2. **G2AJ (Biggin Hill)**
3. **DL7AA (Berlin)**

W.F.E.

1. **G3ATU (Roker)**

For general conditions governing the issue of these Certificates, see p. 288 July issue SHORT WAVE MAGAZINE. All claims accepted will be listed in these pages.

The Sixth All-European DX Contest, 1952

This Contest is arranged by our Danish friends of E.D.R. The Rules are as before, except that the bands concerned now include 21 mc.

The CW week-end is from 0001 GMT on December 6, until 2359 GMT on December 7, and the Phone week-end December 13-14.

Serial numbers consist of the RST report (RS on phone) plus a self-assigned three-figure combination which remains unchanged. Three points are awarded for a complete QSO, one for receiving acknowledgment of own number and two on acknowledging the incoming number.

Total points are multiplied by a figure which is the sum of all non-European countries worked on each band, with all U.S. and Canadian districts counting as separate "countries" for the purpose of the multiplier.

Logs and reports go to EDR Contest Committee, Box 335, Aalborg, Denmark.

Taking a B2 to VU

This amusing story shows that it is as well to go abroad armed with all the right papers.—Editor.

S. C. MITCHELL, B.Sc., F.R.I.C. (G3EWG)

IT was recently necessary for me to spend some months at my employer's Indian factory, so I decided to take with me a B.2 and apply for a VU licence. I wrote to the Director of Telecommunications in Delhi—but got no reply before it was time for me to leave.

When I came to go through the Customs at the airport on the outward journey, I realised that I had made no enquiries about whether any special formalities applied to taking transmitting equipment out of the country. It was just after midnight and the Customs officers seemed to be anxious to push everybody through without too much fuss—until they came to the man in front of me. He was an ex-regular officer type from the wide open spaces. Asked if he had anything to declare, he said "Yes—two hundred rounds of live ammunition — .500." The effect on the Customs officer was electric. His expression passed from incredulity to astonishment and thence to pity. Finally, he smiled, "This is, of course, quite impossible." One's mind caught a glimpse of the masses of orders and regulations which covered the export of live ammunition. The passenger, who appeared quite unmoved, had the temerity to ask "Why?" H.M. Customs and Excise obviously thought this question superfluous, but replied, politely, "In the first place, you'd need an Export Licence." The passenger slowly unbuttoned his coat, felt in his breast pocket and drew out a foolscap sheet, which he unfolded with unhurried precision. I was standing *right* behind him and I could see at a glance that this was a valid export licence for the ammunition which he had declared and which lay on the bench in front of us in a rather wicked-looking little box.

The Customs Officer studied this but could find nothing wrong with it. "You would, of course, need, in addition, a supplementary permit for the goods to travel as personal effects." The coat was again unbuttoned, and another document extracted from the breast pocket. It was unfolded with no sense of concern for the queue of passengers or the waiting aircraft. This also appeared to be valid and in order. The Customs Officer now sought the aid of the official book of words, which was ready to hand. After delving among "sub-sections," "paras" and "addenda," he emerged with "Ah, yes—there is the question of the provisions of the Explosives Regulations." As the unbuttoning process started again, there was no real doubt about the outcome. The man literally had *all* the answers!

The Customs Officer gave up and chalked the magic hieroglyphic on the box of ammunition. He had not, however, quite finished. He beckoned to the B.O.A.C. representative and said, "This man has two hundred rounds of live ammunition; as far as Customs are concerned, he's clear, but it is illegal for you to accept explosives as passengers' luggage." More papers were produced from the breast pocket and they appeared to carry the right rubber stamps, for the box was duly carried on to the tarmac.

The Customs Officer's attention was now directed to me: "Have you anything to declare?" "Yes, a radio transmitter." He winced as he clutched the bench for support; but he had obviously had enough for one night, and in *thirty seconds I was away.*

Entry Difficulties

When we got to the other end a couple of days later, my elephant-shooting friend went through with no trouble at all. I declared "One radio set, value £4 10s.." which I considered a fair assessment of its written-down value. There would be a small amount of duty to pay — forms were made out for me to sign. I was then asked directly the very pertinent question: "Is this a radio receiver?" If I said "Yes," it was unlikely that anyone would dispute my answer; on the other hand, I should certainly be having more dealings with Indian officialdom if I were going to get a licence. So, like George Washington, I said "Yes—but it is also a transmitter." That, of course, was different. Senior individuals with more gold braid came forward. They went into a huddle with a large tome and finally decided that the set would be impounded and I should have to deal with Higher Authority in Calcutta.

I got a receipt for one radio receiver and transmitter.

Five days later, an armed police officer was shown into my office and introduced himself as an "Inspector in the Security Police." They had received a report that I had attempted illegally to bring into the country a radio transmitter described as a receiver, an operation of which, I gathered, the Republic of India took a dim view. Fortunately, I had the Customs receipt and the copy of my letter to Delhi announcing my intention to bring in a transmitter, so all was settled very amicably.

Getting the Licence

I now applied to Higher Authority for the release of the B.2, but they refused to let me have it until I could produce a transmitting licence, neither would they be misled by my G licence, which I waved encouragingly.

A week later, business took me to Delhi, so I called to see the Directorate of Telecommunications. My application had been received and was under consideration. Would I get a licence? The official regretted that he could not anticipate the decision of the committee. I assured him this was the last thing I wished him to do—I just wanted him to tell me, Yes or No. He told me it was very unlikely I should get a licence as I was not an Indian national.

To get some more information, I called at the office of the High

Commissioner for the United Kingdom. They told me it took anything up to eighteen months for a British subject to get a licence, so, as my stay was not likely to exceed six months, I gave it up and let my Tx sit in the Custom House until I was ready to leave, and then shipped it home by sea.

Its adventures had not ended, for when the boat arrived in London, there was a dock strike and she went to sea again with my B.2 still in the hold. She then put into Dublin, where the boat caught fire, which resulted in the declaration of a general average. However, the vessel did finally dock at Tilbury and my box was unloaded, none the worse for its adventures.

It seems that newcomers to India will not find it easy to get a licence, and they would certainly not find it easy to pick up gear out there. I came across a certain amount of surplus material, but it was very mixed, of doubtful value and prices were high. I was told stories of huge *caches* of BC348's, BC221's and other treasures, but, on closer investigation, it was always a case of what "A" had been told by "B," who heard it from "C," who had a friend who said he had got it from somebody in the know.

The QTH for VHF

A DISCUSSION ON EFFECTIVE HEIGHT

R. P. HOPE (G3AUS)

This article is a careful exposition of the problem of beam height in relation to effective propagation, taking into account the factor of local topography—so far as that is possible. The main conclusion is that what may appear to be severe local screening can often be overcome by a study of radiation angles. Our contributor also suggests that having regard to local site conditions, a point may be reached where increasing height can give no further effective gain. And in any lofty aerial system, involving long feed lines, the losses in the feeder must also be taken into consideration.—Editor.

MANY amateurs are deterred from the thought of VHF working by a forbidding range of nearby hills without considering the relative heights and distances involved.

In the writer's case, a range of hills more than 100ft. higher than the ground level at his home QTH, at a distance of 850 yds. has proved no serious obstacle.

In considering the problems involved in making the most of one's QTH, three important points arise :—

(1) Terrain.
(2) Slope of ground.
(3) Possible height of antennae.

Terrain

Few amateurs are able or willing to build their houses on tops of mountains. High clear locations, however, are the best for DX working. The height of aerial is then of little importance. For those not so fortunate a good yardstick is to determine the angle that their beam makes with respect to any intervening ground. If this should be less than 1.5°, little or no trouble should be experienced. A rough estimate may be obtained by allowing 1 dB for 0.1°. If however the angle is greater than this, it should be reduced in all practical cases to 2° or less, by raising the height of the aerial. An aerial height of 60ft. is probably the practical maximum from the points of view of expense and feeder losses.

Thickly wooded country or built-up areas have a detrimental effect on propagation to the extent of between 5 and 20 dB. The effective height of the beam system then becomes the height above roof or tree level. Where individual trees or houses are concerned the effects are more problematical. Each tree or house re-radiates, the effect being to build up a field which may add or subtract according to the phase, dependent on the distances and measurements involved. The general loss will probably be between that for built-up and wooded areas, and that for open country.

The effect of shielding of individual trees and houses will be determined by *(a)* Proximity to the aerial, *(b)* The density, and *(c)* Their position.

(a) If the object is within the lobe of the beam and within about 100 yds., the entire radiation pattern may be seriously distorted.

(b) This applies principally to trees, particularly deciduous trees. If these should completely obscure the line of vision from the beam, it will be found that normally the QTH will be approximately 12 dB better in winter than in summer.

(c) Unless the object is within the lobe, it is unlikely that it will have any effect whatever. It is mentioned here, however, since it may affect beam swing tests.

Slope of Ground

This is of prime importance and, if the minimum angle of 1.5° be borne in mind, has far more effect than any other combination of favourable or unfavourable points. The slope of ground should be as great as possible away from the transmitter in the direction in which it is required to work. The slope of ground is a cardinal point in determining the effective height of the beam system above ground. It may be seen that in the case of a dipole the effective height above ground will not be the same as for a stacked array because of the difference in angle of their vertical lobes. The result of ground interference with the pattern is, in all cases, to produce an unwanted, reflected ray which has the effect of tilting the main lobe upward. The greater the effective height, the less the angle that a given power point of the lobe will make with the ground. If the ground is sloping away at an angle greater than that of the vertical downward angle of the edge of the lobe, the effective height becomes the difference between the height of the beam and the ground from which the lowest portion of the lobe is ultimately reflected (assuming that ground to be level).

For example—Station A is at a height of 360ft. above sea level on the side of a hill the downward slope of which is 30° to the horizontal, and is using a stacked beam with lobe 45° wide at an effective height of 360ft., *plus* mast height, above sea level in a seaward direction. In this case it will readily be seen that the effective height of the beam is, from the point of view of increasing mast height, infinite ; and no effective gain will be obtained by increasing mast height.

Unfortunately, the converse of this is also true and, in the writer's case, it is estimated that the loss in changing from a gentle downward slope to a gentle upward slope is approximately 6 dB. Basing assumptions on a theory of natural height, the difference between Station A (in the example above) and Station B, with an effective aerial height of 60ft. above ground (both stations having the same height above sea level) is 12 dB. This closely approximates the difference found in a considerable number of practical experiments at up to 500 miles over a long period. Thus it would appear from this, and numerous other experiments carried out between Stations A, B, the writer's station, and C, a third station whose topography has been carefully worked out, that whether or not these rules-of-thumb embrace all of the mathematical theories involved, their results in practice are sufficiently conclusive to warrant their assumption for amateur use.

Height of Beam

It may be appreciated that in any discussion or article on this subject, the three principal factors involved are so interdependent that it is impossible to deal with each or any without directly involving the other two. In the case of height, however, there are clear-cut theoretical gains. It should be noted before going into these that by height one should always refer to the *effective height* of the aerial above ground. This, as has been shown, may vary with the vertical lobe of the beam and the slope of ground.

In the case of 144 mc, the band with which we are primarily concerned, and 420 mc, to which the same rules apply, assuming at the natural height for each frequency the gain is zero dB, then from Table I :

Table 1

Height	Two-Metres	75 Centimetres
20 feet	—17 dB	—13 dB
30 feet	—15 dB	— 9 dB
40 feet	—12 dB	— 6.5 dB
50 feet	—10.5 dB	— 4.25 dB
60 feet	— 9 dB	— 2 dB
100 feet	— 4 dB	+ 1 dB

it will be seen that the gain for various increases in height is as given in Table 2.

Now from the Height Gain Table (2) it will be seen that in the case of Two Metres where, if efficient feeders are used, a reasonable gain may be expected up to around 60ft., in the case of 75 cm—considering the more complex array that is possible on this band, and the excessive feeder loss—it would not be practicable to increase the height above 40ft., and probably it would be desirable not to exceed 30ft.

Also, at lower heights, beam arrays with narrower vertical lobes are possible and simpler beams at greater heights may not yield greater gains. Feeder losses will also thereby be reduced. This however may not be possible if the angle of 1.5° is to be maintained.

These differences in vertical lobe width should not be confused with free space gain, although the loss due to the upward bending of the main lobe on these frequencies may far exceed gains and losses calculated on the free space pattern.

It should be borne in mind however that these figures relate to the effective height of the aerial system above ground, and do not take into account the terrain. It will be obvious that if an increase of height, say from 60-100ft. on Two Metres, will enable the beam to look over a neighbouring ridge, these gain figures will be very considerably exceeded—although the slope of ground being of necessity upward to the top of the ridge will greatly reduce the gain from what it could have been had the ridge not been there!

Height-Gain Table (2)

From	Two-Metres	75 Centimetres
20- 30 ft.	3 dB	4 dB
30- 40 ft.	3 dB	2.5 dB
40- 50 ft.	2.5 dB	2.25 dB
50- 60 ft.	2.5 dB	2.25 dB
60-100 ft.	5 dB	3 dB

Summary

To sum up : on Two Metres, although the lowest possible main vertical lobe is required, it is possible to get over or around an obstacle which it would be impossible to surmount on 70 cm. In the writer's view this is possibly due to the fact that on 70 cm any obstacle appears to be three times greater than on 2 metres : secondly, the power commonly available in the aerial is usually considerably less ; thirdly, there are apparently at least two methods of propagation on 2 metres (ducting, and reflection or refraction, or what-have-you), whereas on 70 cm it seems probable that a least 90% of DX contacts made are due to ducting, which means reflection from a much lower level and consequently much less latitude in the angle of the downcoming wave.

For Seventycem work, while the writer has no practical experience personally, it would appear that a good, open QTH is desirable, if not essential.

UNITS AND STANDARDS OF MEASUREMENT

Electricity, the third booklet in the series, "Units and Standards of Measurement employed at the National Physical Laboratory," is now published. It deals with current voltage, resistance, power, energy, inductance, capacitance, frequency, and so on.

The booklet gives an account of the history of the subject and of international co-operation to ensure uniformity. It defines the units employed at the N.P.L. for the measurement of electrical quantities and the standards by which these units are determined and preserved. They are made applicable to present-day practice by reference and working standards which can be calibrated to an accuracy of about 1 part per million. Details of these are included.

There is also a section on radio frequency standards. A daily programme of standard frequency transmissions from station MSF at Rugby is monitored by reference standards maintained at the N.P.L.

Units and Standards of Measurement, III, is published for the Department of Scientific and Industrial Research by H.M.S.O., price 9d., by post 10½d. It is obtainable only from the National Physical Laboratory, Teddington, Middlesex.

BROADCAST RECEIVING LICENCES

Approximately 12,646,000 broadcast receiving licences, including 1,487,000 for television, were current in Great Britain and Northern Ireland at the end of April, 1952.

The number of television licences increased by about 30,000 during the month.

New viewers are reminded that they should take out a £2 television licence (which also includes reception of sound programmes) as soon as their television sets have been installed. When a television licence is purchased, a current licence to receive sound programmes only may be surrendered, and a rebate claimed on the unexpired portion.

FOR AR88 USERS

When G2BTY (Earley, Berks.) got tired of lifting round his AR88 every time he wanted to zero the S-meter, he devised a simple extension control consisting of a flexible coupler on the S-meter zero adjuster, with a piece of stiff wire fitted to the coupler and sticking up above the cabinet.

CARDS IN THE BOX

We are without forwarding addresses for the stations listed below, for which we are holding card(s) at the Bureau. Please send a large stamped addressed envelope, with name and call-sign, to: BCM/QSL, London, W.C.1—which is a full and sufficient address from any part of the world, guaranteeing delivery of G and SWL cards. If publication of the call-sign/address is required in our "New QTH" feature, and subsequently in the *Radio Amateur Call Book*, that should be mentioned when claiming the cards. As the G department of our QSL Bureau is cleared at regular fortnightly intervals, there may be a few days' interval before the cards are sent off.

G3GFZ, 3GTK, 3HXS, 3IDV, 3IFS, GM3EDL, GW5JI.

Portable Transmitter/Receiver for Two Metres

SELF CONTAINED CC RECEIVER — CRYSTAL CONTROLLED TRANSMITTER — CW/PHONE OPERATION — CIRCUITS AND CONSTRUCTION

G. M. KING, B.Sc., M.D., D.M.R.T. (G3MY)

This interesting design will meet the requirements of many readers who not only plan to go /P on Two Metres but who wish also to have a miniaturised unit for operation from the home QTH. Designed for working off a vibrator pack, the primary source of power for portable operation can be the car battery, or a small HT/LT unit for QRP work at the fixed location. Dr. King is a well-known designer of equipment of this type, as well as being a keen VHF operator who is compelled to do most of his two-metre work under /P conditions. He discusses the circuits for the Transmitter and Receiver sections in full detail, and the illustrations clarify the construction. The general design can of course be varied to suit individual requirements.—Editor.

FOR the unfortunate amateur who lives in a flat or other dwelling where outside aerials, especially of the impressive rotary beam type, are frowned upon, portable operation offers the main chance of remaining "active" and in touch with one's fellows. Such has been the writer's lot for a number of years and if it had not been for the unit to be described, all contact with the two-metre band would have been lost long ago.

It was decided that a miniaturised Transmitter/Receiver, which could be tucked away in the back of a small car in the 8 h.p. category, and run from a standard car radio type of vibrator power pack, would allow advantage to be taken of favourable portable sites within the 10-mile radius of a /P licence, without having to load up the car with a host of equipment first.

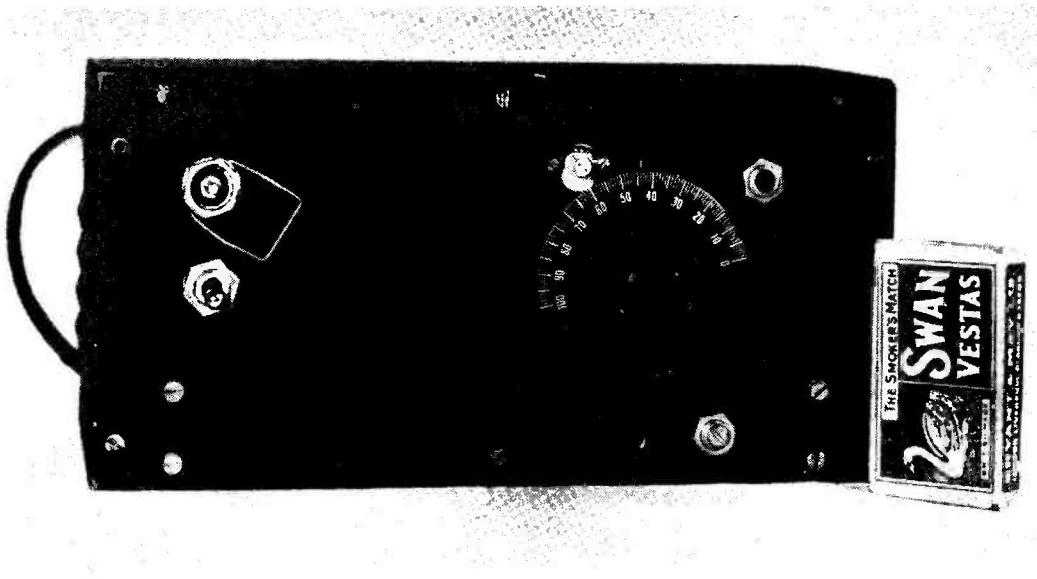
The space available in the glove compartment of the car allowed the use of a cabinet measuring only 10″ x 5″ x 5″, but into this space has been built a crystal-controlled transmitter giving 5 to 8 watts output on CW and 3 watts on phone, whilst the accompanying receiver has a crystal-controlled local oscillator, and a noise factor which will ensure that nothing is missed even when conditions are far from good.

The Transmitter Circuit

It was decided from the outset that the transmitter should be built with standard easily-obtainable valves and components, preferably items available on the surplus market but readily replaceable from commercial stocks, and it was felt that straight-forward, well tried circuits should be employed in preference to some of the more recent designs which are not infrequently critical in adjustment and difficult to get going satisfactorily.

Experience with earlier portable transmitters had shown that the 6AC7 made an excellent crystal oscillator in either the grid-plate, modified Pierce (crystal connected between control and screen grids), or the well known Tri-tet circuits, and whilst a good harmonic output could be obtained from all these, the best was found to be the Tri-tet. At one time this circuit had a bad reputation for cracking crystals, especially in the hands of inexperienced operators, but with a valve such as the 6AC7 or 6AG7—which has a high mutual conductance and almost perfect internal screening—there is no fear of this mishap occurring. In the present unit, the usual coil and variable condenser in the cathode circuit has been replaced by a fixed-tuned combination, thereby eliminating the main source of maladjustment and possible crystal damage.

A high value of grid leak (200,000 ohms) ensures a good harmonic output in the plate circuit, whilst the screen voltage is kept below 150 volts by a series feed resistor of 75,000 ohms, holding crystal current to a low level and thereby minimising frequency drift, which can be quite troublesome when the fundamental frequency is being multiplied 18 or 24 times from an 8 or 6 mc crystal. The combined plate-and-screen current of this stage is only 12mA and adequate output on 24 mc can be obtained with crystals of either frequency



The two-metre portable Transmitter Receiver unit built by G3MY (Sheffield) for his /P operations, with a size comparison.

without any alteration of the cathode circuit tuning.

The first frequency multiplier stage takes a Loctal-based 7C5, which is the familiar 6V6 with an improved base and internal electrode assembly which make it very suitable for this position. Other valves which have been tried and found to work satisfactorily include the EL91, EF91, 6AG5, 6AQ5, 5763 and N78. High grid bias is developed across the grid leak of 100,000 ohms and the screen voltage is held below 150 volts by a series feed resistor of 75,000 ohms, giving a total current consumption in this stage of 22 mA.

The output from the 7C5 stage on 72 mc is inductively coupled into the grid circuit of the final stage which is an 832 connected as a push-push doubler, with its grids in push-pull and plates in parallel. The limited amount of space beneath the chassis precludes the use of a normal split-stator tuning condenser across the grid coil of the 832, and instead balance to earth has been preserved by means of two small Philips-type trimmers which can be seen quite clearly in the under chassis view of the unit. If these two capacities are adjusted together when tuning up the transmitter so that their values are kept sensibly equal, excellent balance of grid drive to the two sections of the 832 can be achieved without difficulty. Bias for this stage is developed across a resistor of 100,000 ohms which is tapped on to the centre of the grid coil, and the bias voltage is measured with a normal high resistance meter when tuning up the transmitter. This method of measuring grid drive is used in preference to the more usual one of putting a milliammeter in series with the earthy end of the grid leak. The volt meter is connected across the test point *T* in the circuit diagram, the 1,000 ohm resistor R6 serving merely as an RF choke.

The necessary inductive coupling between the plate of the 7C5 stage and the 832 grid coil is achieved by placing the two coils as shown in the under-chassis photograph, and no additional coupling is necessary. With 250 volts on the transmitter, the grid drive to the 832 is 60 to 70 volts as measured at point *T*; this appears to be sufficient for efficient doubling in the final.

The anodes of the 832 are joined together and connected directly to the 144 mc plate coil, which is series tuned. By adopting this method of tuning, nearly twice the output can be obtained as compared with the more conventional parallel tuned circuit and a very good plate current dip occurs when it is resonated to 144 mc. High tension is fed into the low potential part of the coil through a self supporting choke and it should be noted that with this type of tuning this point is very close to the centre of the coil when the effective tuning capacity is about the same as the output capacity of the valve. Keying is obtained by breaking the cathode of the 832 stage and in

this design gives complete cut-off of the carrier without appreciable back wave.

Screen voltage is normally between 150 and 180 volts and it is possible to load the final up to 50 to 55 mA plate current at 250 to 300 volts HT, at which input the measured output is 5 to 8 watts. Satisfactory operation can be obtained with as little as 100 volts when the output is approximately 1 watt.

The Modulator

With the limited space and power available, the modulator obviously had to work on the efficiency principle so that the maximum allowable current output of the vibrator pack should not be exceeded. Clamp tube modulation seemed the natural choice for the purpose and requires a minimum number of components.

The functions of speech amplifier and modulator were combined in one valve of the 6SN7 type. A carbon microphone is connected in the cathode circuit of one of the triodes which works as a grounded grid amplifier, providing the necessary energising voltage and at the same time eliminating the usual microphone transformer. The second triode section acts as a conventional Clamp modulator in the manner which has been thoroughly described and discussed in recent editions of *Short Wave Magazine*.

The modulator is unbiassed and therefore gives a certain amount of controlled carrier effect with modulation, but this is in no way detrimental and helps to conserve battery power.

The modulator is switched in and out of circuit by means of a spare set of contacts on the keying jack. When the key is inserted,

Table of Values

Fig. 1. Circuit of the Transmitter/Modulator section of the VHF Portable

C1	= 100 $\mu\mu$F Ceramic	V1	6AC7
C2, C4,		V2	7C5
C14	= 0.0068 μF mica	V3	832
C3, C6	= 25 $\mu\mu$F APC variable	V4	6SN7
C5, C11,		L1	9 turns, 24 SWG enamelled wire, $\frac{3}{8}$in. diameter, $\frac{1}{2}$in. long
C12, C15	= 500 $\mu\mu$F mica		
C7, C8	= 0.001 μF mica	L2	17 turns, 16 SWG enamelled, $\frac{1}{4}$in. diameter, $1\frac{3}{4}$in. long, self supporting
C9, C10	= 3-30 $\mu\mu$F Philips' trimmer		
C13	= 25 $\mu\mu$F double spaced APC trimmer	L3	7 turns, 18 SWG $\frac{3}{8}$in. diameter, $\frac{3}{4}$in. long
R1	= 200,000 ohms	L4	8 turns, 18 SWG $\frac{3}{8}$in. diameter. 1in. long
R2, R12	= 75,000 ohms, 1 watt		
R3, R5	= 100,000 ohms, 1 watt	L5	4 turns, 12 SWG silver plated copper wire, $\frac{3}{8}$in. diameter, 1in. long, centre tapped.
R4	= 270 ohms		
R6	= 1,000 ohms		
R7	= 47 ohms	L6	1 turn, 16 SWG insulated with polythene and slipped into the centre of L5
R8	= 27,000 ohms, 3 watts		
R9	= 500,000 ohms	T	Test point to measure final grid voltage
R10	= 33,000 ohms		
R11	= 20,000 ohms	J1	Keying jack
All resistors $\frac{1}{2}$ watt except where stated			
RFC	= 20 turns 18 SWG wire, $\frac{3}{8}$in. diameter self supporting.		
M	= GPO carbon microphone		
X	= 8,000 kc crystal		

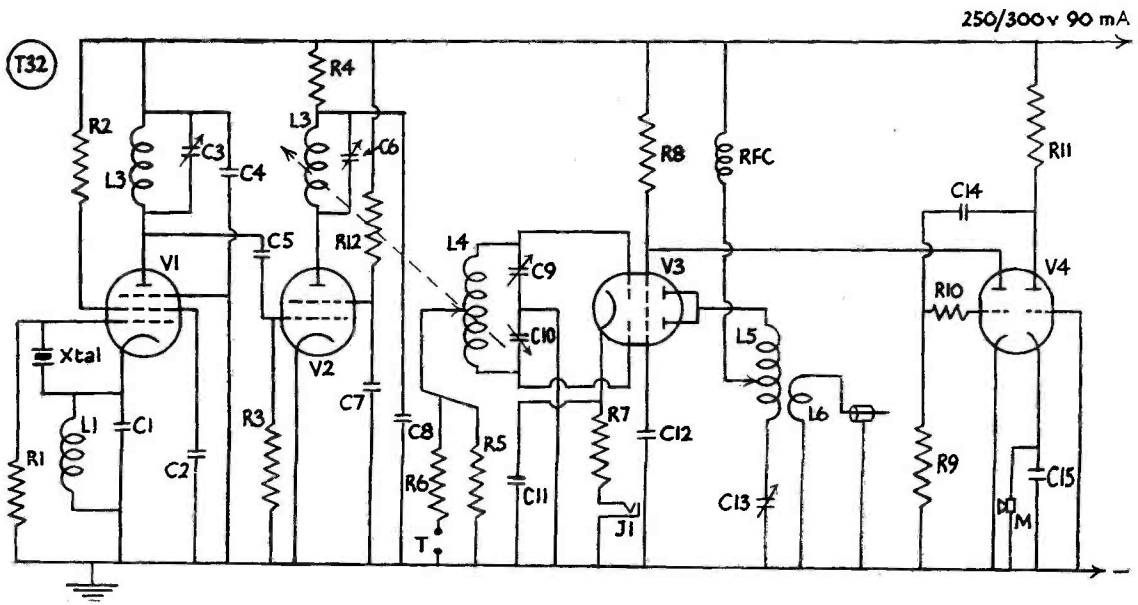
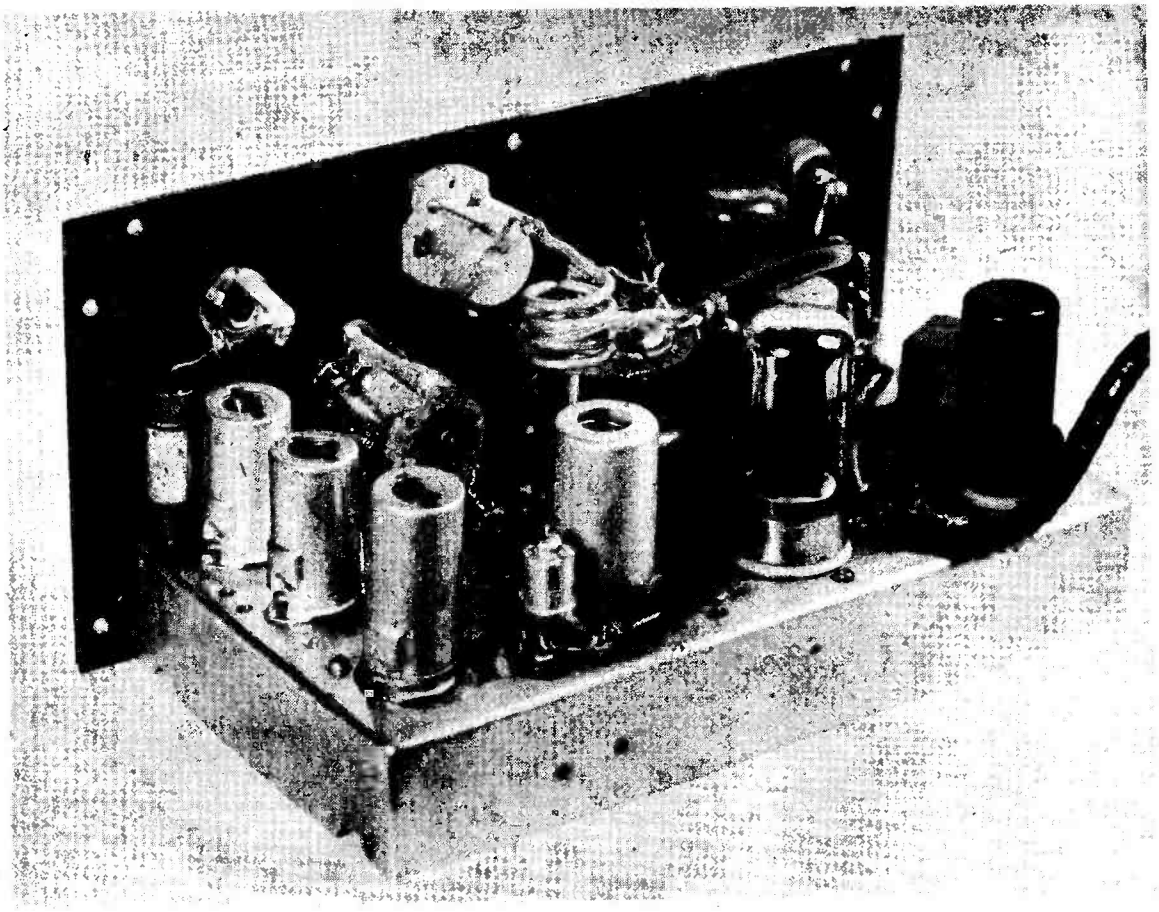


Fig. 1. The Transmitter side of the G3MY VHF Portable. V4 is the two-stage modulator unit ; V3 is keyed for CW.



Arrangement of the parts, and layout and wiring, behind the panel of G3MY's portable station for 144 mc operation. The receiver section is to the left, and the 832 in the output stage of the Tx is behind the PA coil.

the filament supply to the 6SN7 is disconnected, thereby cutting out the speech section of the unit and allowing the screen voltage of the 832 to rise to its full CW level. When the modulator is in circuit, the additional current taken by this stage causes the screen voltage to be reduced to 50 to 60 volts, rising to about 100 to 120 volts on modulation peaks. With the limited carrier controls produced by this simple speech equipment, the maximum modulation depth is only of the order of 50% to 60% ; nevertheless, the inherent compression and clipping which occurs with this circuit when it is driven fairly hard causes the speech on the carrier to have a high average level and so to sound remarkably "loud," whilst the distortion produced by the clipping action is not noticeably above the inherent distortion of the usual type of carbon microphone.

With a screen-grid modulator of this type it is desirable to use rather tighter coupling between the aerial and the final tank circuit than for CW working, in order to obtain the best modulation characteristic. The usual practice is to tune up with the modulator switched off, aerial coupling being gradually increased until the output just begins to fall off : the Clamp tube is then switched on, causing the screen voltage and RF output to fall very appreciably, but good modulation should now be obtained. Under these conditions the output will be in the region of 3 watts, which is still adequate to give good phone contacts over a wide area when operating from a favourable location.

The Receiver Circuit

An earlier Transmitter-Receiver unit built in the same cabinet made use of a straight super-regenerative receiver, with an RF stage to minimise radiation from the oscillating detector. This set worked surprisingly well,

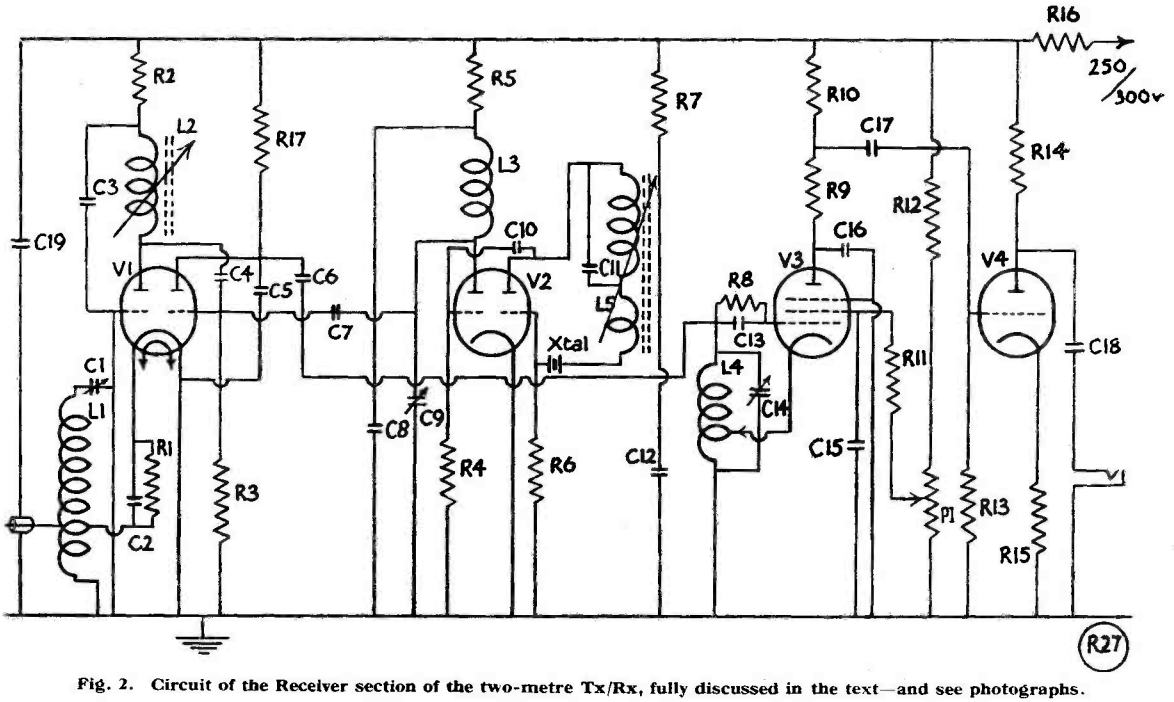


Fig. 2. Circuit of the Receiver section of the two-metre Tx/Rx, fully discussed in the text—and see photographs.

Table of Values

Fig. 2. The Receiver side of the Portable VHF Transmitter/Receiver

C1, C9 = 3-30 μμF Philips' trimmer
C2, C3, C8, C16 = 0.001 μF mica
C4, C5 = 50 μμF Ceramic
C6 = 15 μμF Ceramic
C7 = 1.5 μμF Ceramic
C10 = 10 μμF Ceramic
C11 = 22 μμF Ceramic
C12, C15, C17 = 0.01 μF mica
C13 = 100 μμF Ceramic
C14 = 50 μμF variable
C18 = 0.1 μF paper
C19 = 10 μF electrolytic 350 volt working
R1 = 100 ohms
R2, R5, R6 = 4,700 ohms
R3, R8, R13 = 1.5 megohms
R4, R10 = 220,000 ohms
R7 = 2,200 ohms
R9 = 1,000 ohms
R11 = 20,000 ohms
R12 = 100,000 ohms
R14, R17 = 47,000 ohms
R15 = 270 ohms
P1 = 100,000 ohms Potentiometer
R16 = 10,000 ohms, 3 watts
All resistors ½ watt insulated type

L1 = 4 turns ⅜in. diameter, ¼in. long tapped 1½ turns from earthed end
L2, L3 = 3 turns ⅜in. diameter, ⅜in. long
L4 = 34 turns 24 SWG enamelled wire wound on Alladin ⅜in. diameter slug tuned former, tapped 5 turns from the earthed end
L5 = 15 turns, 24 SWG enamelled wire wound on ¼in. diameter low loss former, tapped 5 turns from grid end. Turns spaced one diameter of wire. Coil slug tuned
L1, L2, L3 = 18 SWG wire
V1 = 12AT7
V2 = 6J6
V3 = 9003
V4 = 6C4
X = 7,500 kc crystal

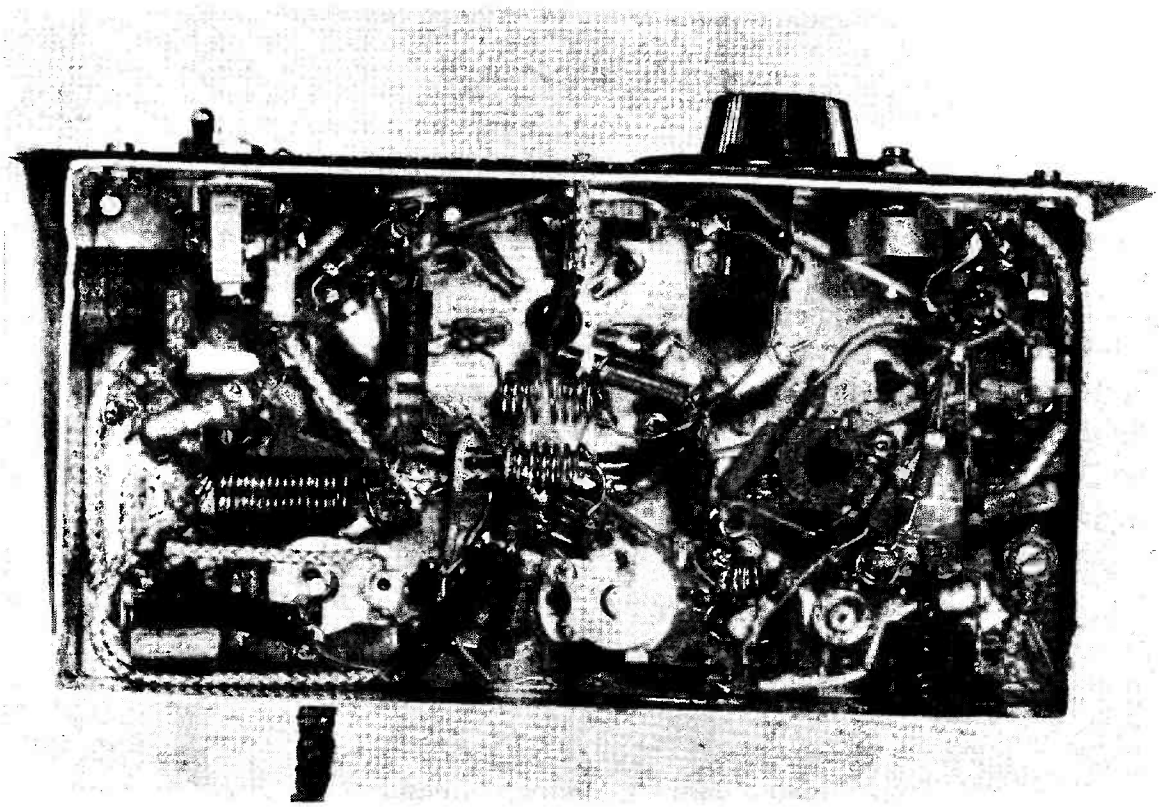
but had the inherent disadvantage of being completely unsuitable for the reception of weak CW signals, and it was obvious that many contacts were being lost because of this.

Much thought and experimental work went into the design of a practical sensitive superhet receiver which could be made to fit into a chassis space of approximately 4" x 3", but the final circuit does just this and can compete with the best converter-communication receiver combinations for stability and sensitivity.

The high frequency front end of the receiver is basically similar to the crystal-controlled converter described by G6VX in *Short Wave Magazine* for February, 1951, and starts off with a 12AT7 which combines the functions of grounded grid RF amplifier and grid leak biassed triode mixer.

The earthed grid stage is quite conventional except that the usual filament chokes have been discarded, the only effect of this being to cause the small cathode-heater capacity of this section of the 12AT7 to appear across the input tuned circuit and the tuning capacity has to be reduced to compensate for this. The plate coil of the RF stage is tuned with the stray capacities in the circuit together with the output capacity of the RF stage and the input capacity of the mixer, and is resonated to 145 mc by squeezing or stretching the coil until maximum signal is obtained.

The RF plate is capacity coupled to the grid of the mixer, which has a grid leak of 1.5 megohms; bias for this stage is developed by the flow of grid current through this resistor, and adjusts itself according to the local oscillator injection voltage, thus making this type of mixer extremely tolerant in this respect. The



Layout and wiring underneath the chassis of the two-metre portable Tx/RX. With the exception of the receiver tuning control, all circuits are pre-set.

50 $\mu\mu$F condenser connected between the plate and cathode of the mixer (C5) performs two important functions: by-passing high frequency currents in the mixer plate to earth and at the same time forming part of the capacity across the second detector tuned circuit. This condenser is connected by the shortest possible leads from the plate to cathode of the mixer so that it may perform its by-passing function as efficiently as possible.

A 6J6 is used as a combined crystal oscillator and frequency multiplier, with a crystal having a fundamental frequency of 7.5 mc, excited on its third overtone by the application of regeneration so that it oscillates very close to 22.5 mc. The second section of the 6J6 multiplies the frequency six times to give output at about 135 mc, and this frequency is coupled into the grid of the mixer through a small Ceramicon condenser of 1.5 $\mu\mu$F (C7), giving ample injection voltage for efficient mixing. With the specified coil and layout, the multiplier plate circuit resonates at 135 mc, with the Philips trimmer about two turns from minimum capacity. As already stated, the RF plate/mixer grid coil is resonated for maximum signal at 145 mc by opening or closing the turns when listening to an incoming signal.

The cathode tuned circuit of the RF stage is likewise tuned to 145 mc, but this must be done either with an incoming signal or with a noise generator, since the small rise in background "sharsh" as the trimmer is rotated is not necessarily the correct setting for optimum noise factor or gain.

The tunable part of the receiver consists of nothing more elaborate than a simple electron coupled regenerative detector to which the mixer output is directly coupled by C6. The plate of the mixer is effectively tapped down on the detector grid coil by being connected to the junction of C5 and C6, which are in series across this coil forming a potential divider and also part of the tuning capacity. By tapping down the detector grid coil in this way, a better impedance match is obtained and

the reduced detector damping by the mixer greatly enhances the smoothness of the regeneration and improves selectivity.

For CW reception, the detector is allowed to oscillate very gently whilst for voice reception it is backed off to just below the point of oscillation. Smooth control of this all-important regeneration is achieved by varying the screen potential by means of potentiometer P1.

A single stage of low frequency amplification using a 6C4 brings the signal strength up to a comfortable level for headphone reception and no doubt, if this valve were replaced by a double triode such as a 12AU7 or 12AT7 acting as two stages of amplification in cascade, the level would then be sufficient to operate a small speaker.

With crystal controlled injection on or near to 135 mc, the regenerative detector must tune from 9 to 11 mc to cover the 144 to 146 mc band.

The change over from transmit to receive is accomplished very simply by means of a double-pole double-throw change over switch of the quick make-and-break type which merely transfers the coaxial feeder and the main high tension leads from one section to the other. The HT for the receiver is smoothed and dropped to approximately 100 to 120 volts by means of R16 and C19.

Conclusion

An ultra compact Transmitter/Receiver unit is thus evolved which can be operated safely and satisfactorily from a 300 volt 100 mA vibrator pack, or from a normal car radio power supply, giving an output of up to 8 watts on CW and about 3 watts on telephony. The crystal controlled receiver combines excellent stability with good sensitivity and low noise factor. So far, using a simple 3-element beam 12 feet high and operating from a good location, CW contacts up to 200 miles have been made under poor conditions, whilst on telephony from the same location contacts up to 60 miles can be made under any conditions.

NINETEENTH NATIONAL RADIO EXHIBITION, 1952

At the moment of writing, the National Radio Show is due to open at Earl's Court, London, on August 27, closing on Saturday, September 6. A very interesting exhibition is promised, covering nearly the whole field of TV, Radio and Electronics. Some of the more unusual exhibits and aspects of the Show will be discussed in our next issue.

F.O.C. MARATHON CONTEST

Their annual event takes place this year during the week October 5—11, and is exclusive to members in that all QSO's to score must be FOC/FOC only. The scoring system has been devised to encourage world-wide working on all bands, and operators taking part are specially requested to call "CQ FOC" when looking for contacts. Though the Contest is to take place over a week, operating periods are restricted to 0900—1700, 1800—2000, 2230—2359 on the Sunday, and 1800—2000, 2230—2359 on the weekdays, all times GMT (which will then be in force).

FOR THOSE WHO THINK THEY CAN COPY

Fedor Roslyakov, operator of the Russian club station UA2KAW, Kalingrad, is the champion high-speed CW operator of the Soviet Union. That is to say, his maximum sending speed is claimed to be 92 w.p.m.—and he is also said to be able to read at this speed. For all we know, it may be quite true. But this high-speed CW business is rather like the Olympic Games—you work out the points to suit your own standard. For the information of Fedor, and the Moscow Academy of Sciences, we reckon "words per minute" at five characters per word, so that 60 characters sent or received in one minute would be 12 w.p.m.

AMATEUR RADIO EXHIBITION FOR THE NORTH

We are informed, and note with great interest, that an exhibition covering all branches of Amateur Radio is to be held at Newcastle (Chronicle Hall, Westgate Road) during the period September 22—27. The times of opening will be 6.0—9.30 p.m., Monday—Friday, and 12.00—9.30 p.m. on Saturday 27th. Admission is 1s., and half that for the youngsters. This ambitious project is being sponsored by four amateur societies operating jointly: North-East Amateur Transmitting Society; Gateshead Radio Club; Sunderland Radio Society; and International Radio-Controlled Model Society. Exhibits will include amateur-built TV and communications equipment, tape recorders, radio controlled models, an electron microscope, and range of test gear—and of course there will be a station in operation throughout the period of the exhibition. We wish those who will be doing a lot of work to make this undertaking a success well in their efforts, and congratulate them on their enterprise.

VHF BANDS

A. J. DEVON

Survey of Conditions, and a Proposed Investigation—

First Leg of the Marathon Contest—

Certificate for Counties Worked—

Individual Reports and Station News—

New European DX Record, F8II/FA9RZ, 696 Miles—

THE survey of conditions for the month just past is interesting in that opinions as to whether they have been good, poor or average is in most cases related with the level of activity noticed by the individual reporting — whether that has been high, low or fair. The broad picture which emerges is that on the whole conditions have been what we expect at this time of year — contacts possible up to 200 miles or so by those who have tried for them— with some very good patches when QSO's all round the country could be obtained. Activity appears to have been rather lower than the general quality of conditions, due probably to two factors: Holiday absences, and few DX openings to the Continent, or over considerable G distances, than obtained for the July period.

On this topic, G3EHY (Banwell) puts it forward that regular working over distances up to about 250 miles should be possible for the greater part of the year, and cites cases from his own experience to support this view. At any rate, he is setting out to try to prove it by maintaining a regular schedule with GI3GQB (Newtonards, Co. Down — 268 miles) and the object of this particular exercise will be a daily QSO. It will be remembered that in previous years G3EHY carried out similar tests with GW2ADZ for the 100-mile path, and with G2CPL (Lowestoft) for the 200-mile distance. In both cases, careful work proved beyond doubt that schedule contacts could be obtained over such distances on a far greater number of occasions than general conditions (judged by the results obtained by other stations) suggested should be possible.

Reliable estimates of conditions can only be obtained by regular observation—and, of course, this is complicated by the fact that most people can only be on for a few hours each week, though there are some operators who can, and do, work practically every evening and are also there most week-ends. This leads on to the obvious suggestion that the best and most effective way of investigating the regularity of working ranges, within the limits of practical possibility, would be to open up a number of 200-250 mile paths in different directions across the country and to establish regular schedule working over these paths. It would involve keeping careful notes at each end as to local cloud, temperature, barometer, noise-level and signal strength of the target station in terms of dB above noise. Correlation of the results obtained after a 12 months' run would certainly produce some exceedingly interesting curves, and might well provide really useful data on the theory of propagation at these frequencies.

To carry out such a programme effectively, stations able and willing to participate would have to (*a*) Be suitably placed geographically, (*b*) Undertake not to make drastic changes to their equipment, (*c*) Be able to keep a short schedule on practically a daily basis, and (*d*) Have a sensitive S-meter on the receiver enabling readings to be taken in dB above noise.

On the equipment side, they would need to be up to, say, the 30C worked standard — this would be a reasonable guarantee as to operating ability, and a measure of the effectiveness of aerial, receiver and transmitter. The keeping of such a schedule is not actually a matter of any great difficulty — over the years, your A.J.D. has done if often on different bands and for various purposes, and so have others. A 5-minute contact, or attempted QSO, would yield all the information required, and it would not even be necessary to have an S-meter calibrated against any particular standard, since readings would be comparative from time to time only. In other words, it would not matter in the least if G9XX's sober S6 became S8 on G9ZZ's optimistic dial, where both readings should be S5 on an agreed signal input — so long as every reading over the 12-month period was taken under the same operating conditions, enabling a *comparative* change in signal level to be obtained from QSO-to-QSO, and related to QSB effects during any particular contact.

Operators who may be keen on following up this suggestion — thereby making a useful contribution to a progressive investigation —are asked to write your A.J.D. who (if stations suitably placed geographically respond) will effect the necessary introductions and help clew up the schedules. It could all be done through this space, so that everyone else would know what is going on, too.

The combined talent on the VHF bands is now very high — certainly as high as anywhere else in the world. Let us endeavour to put it to some good purpose.

New European VHF Record

From the "Chronique du DX" feature in the French *Le Haut-Parleur*, we get it that during the International Contest week-end, July 5/6 last, F8II obtained special permission to work what we would call /P from Mont

Ventoux, which is north-east of Avignon in Southern France; 16 contacts were made, of which the best was with FA9RZ, Oran, Algeria, for a distance of 696 miles. Input was 60 watts to an 815, and the receiver a 6J6 converter. The distance is, of course, a new European record (previously G5YV/F8MG, 620 miles) but, without detracting in any way from the effort for which full credit must go to F8II/FA9RZ, we are bound to point out that these record ground ranges have always previously been allowed only in respect of normal fixed station working, *i.e.*, not /P operation from exceptionally elevated sites specially picked for long distance working and occupied for a few hours only. In this sense, it was established years ago that an SEO Tx, operated from the summit of Snowdon, could smear a signal over the whole country on five metres, and with a squish receiver, produce contacts over great ranges. It has long since been accepted that the objective for VHF working must be operation QTH-to-QTH, or point-to-point, or home station to home station, if the bands are to be of any use for regular communication purposes.

It is for this reason that we do not accept new-record claims, or counties worked, in respect of G stations operated /P, and our portable men (keen on /P working for many reasons quite unconnected with scoring) have always accepted this ruling for the reasons already stated.

We do not yet know how far our French friends would agree with us on this. In the meantime, while noting the claim made on behalf of the two French operators concerned, we draw their attention to the fact that the 620-mile QSO, a distance of almost exactly 1,000 kilometres, between G5YV and F8MG on October 9, 1951, was made station-to-station, in the sense that both operators were working from their usual fixed locations.

Marathon Contest—First Leg

This was played off over the week-end July 19/20, under average to poor conditions, and with considerably less than the hoped-for level of activity; as it was only the first session, that does not matter a great deal. A good marathon often does start rather slowly!

The results achieved are set out in the accompanying Table, and the totals claimed by the two leading stations show just what was possible in the way of GDX working — even though activity did not appear high — while the scores lower down make it plain that there was a marked shortage of 50-100 mile contacts, in the local - station category. This, though rather disappointing, does not perturb your A.J.D., as there will still be two legs of the Marathon to go after this appears in print. (At the moment of writing, we do not know how things went for the second session on August 23/24.)

The logs sent in make very interesting reading, and there is a great deal to be learnt from them. Taking the leaders first, we find that G3EHY made two very fine QSO's, with GM3BDA (325

TWO-METRE ACTIVITY REPORT

G3WW, Wimblington, Cambs.

WORKED: DL3QA, 3VJ/P, 6ER, 6SV, EI2W, F8GH, G2AHP, 2AIW, 2AJ, 2AOK/A, 2FCL, 2FJR, 2FNW, 2FO, 2FQP, 2FTS, 2FVD, 2FZU, 2HCG, 2HCJ/P, 2HDZ, 2HIF, 2HOP, 2OI, 2UQ, 2XC, 2XV/P, 2YB, 3AGS, 3AUS, 3BCY, 3BK, 3BNC, 3BW, 3CC, 3CFK, 3CFR, 3CGQ, 3CHY, 3CJY, 3DUP, 3EGW/P, 3EHY, 3FAN, 3FD, 3FFV, 3FIJ, 3FMI, 3GBO, 3GDR, 3GGJ, 3GHI, 3GOP, 3GZM, 3HAB, 3HCK, 3HVO, 3HZF, 3HXO, 3IIT, 3IWA, 3VM, 4DC, 4GR, 4JJ/P, 4KD, 4MW, 4RO, 5BD, 5DS, 5GX, 5JO, 5JU, 5MQ, 5MR, 5SZ, 5VM, 5VN/A, 5WP, 5YV, 6LI, 6NB/P, 6PJ, 6RH, 6UH, 6UJ, 8DA, 8OU, 8SY, GM3BDA, 3EGW, GW2ADZ, 3ENY, 8UH, ON4HC, OZ2FR, 3WS, PA0RA. (*July* 18 *to* 27)

G2OI, Winton, Eccles, Lancs. NGR 33/993753.

WORKED: EI2W, G2AJ, 2CBR, 2FCV, 2FVD, 2FZU, 2HIF, 2JT, 3ABH, 3AGS, 3AOO, 3AYT, 3BCY, 3BW, 3CHY, 3DA, 3DA/P, 3EHY, 3FAN, 3FMI, 3FZU, 3GMX, 3GZM, 3HII, 4RO, 5BM, 5JU, 5YV, 6QT, 8DA, 8GL, 8HK, G12FHN, 3BIL, GW2ADZ, 3ENY, 3FYR, 5MQ, 8UH.

HEARD: G2BAT, 2DKH/P, 2PU, 3AUH, 3AVS, 3BHS, 3BLP, 3CCH, 3DUP, 3DVK, 3EDD, 3FIH, 3FUL, 3GGU, 3GHO, 3GUU, 3JJ, 3MA, 4CI, 4DC, 5BY, 5SK, 6MI, 6XM, 6XX, 8AO/MM. (*July* 12 *to* 28).

G2DHV, London, S.E.13. NGR 51/384776.

WORKED: G2AHP, 2AJ, 2BRR, 2FKZ, 2FVD, 2MV, 3BPM, 3CWW, 3DT, 3FD, 3GBO, 3GDR, 3HBW, 3IIR, 4DC, 5DS, 6TA.

HEARD: G2AVR, 2BN, 2FTL, 2FWO, 2HDZ, 2HGR, 2JGT, 2IO, 3AUK, 3BCY, 3BW, 3CGQ, 3CVO, 3ECA, 3EYV, 3FAN, 3FIJ, 3FSG, 3HAB, 3ISA, 3VM, 4RA, 5YV, 6AG, 6QN, 6RH, 8AO/MA, 8HK, GW2ADZ, 8UH.

GM3DIQ, Stevenston, Ayrshire.

WORKED: G2DKH/P, 2FO, 3BW, 3CYY, 4LX, GM2DRD, 3BA, 3BDA, 3DDE, 3EGW, 3ENJ, 3FVX, 4HX, 6WL, 6ZV.

HEARD: G5YV, 6LI

G4RO, St. Albans, Herts. NGR 52/147075.

WORKED: G2AIW, 2AJ, 2BN, 2BRR, 2DTO, 2HDZ, 2HIF, 2MQ, 2MV, 2OI, 2XC, 2YB, 2YC, 3AGA, 3ASG, 3AUS, 3BCY, 3BMI, 3BPM, 3CAT, 3CFR, 3CGQ, 3CVO, 3CWW, 3DUP, 3ECA, 3EHY, 3FAN, 3FD, 3FFV, 3FQS, 3FSG, 3FVD, 3FXG, 3GDR, 3GHI, 3GHO, 3HAB, 3HSC, 3HXO, 3HXS, 3ISA, 3WW, 4DC, 4GR, 4KD, 4MR, 5DS, 5GX, 5JU, 5LK, 5LQ, 5PY, 5QL, 5SK, 5SZ, 5UF, 5UM, 5YV, 6CB, 6FO, 6JP, 6LI, 6QN, 6RH, 6TA, 6UH, 6YP, 8LN, 8PX, GW2ADZ, 8UH.

HEARD: G2AHP, 2BAT, 2CD, 2FKZ, 2FMI, 2IQ, 2XS, 3BLP, 3HCK, 4FB, 4JJ/P, 6LL, 6XM, 8CK, 8DM, 8TL, 8AO/MM. (*July* 19 *to* 27).

G2XC, Portsmouth, Hants. NGR 41/670069.

WORKED: G2AHP, 2AJ, 2FVD, 2HCG, 2HIF, 3ARL, 3AUS, 3BNC, 3BPM, 3CGQ, 3FAN, 3HBW, 3IBY, 3WW, 4DC, 4RO, 5BM, 6XM, 8DV/A, 8OU.

HEARD: G2IQ, 3CFR, 3GOP, 3HVO, 4SA, 5ML, 5YV, 6RH, 8II, 8SY, GW2ADZ. (*July* 19 *to August* 13).

G3IBY, Lancing, Sussex. NGR 51/186060.

WORKED: F8GH, 9JY, G2AJ, 2AVR, 2DGB, 2DSP, 2DSW, 2FTS, 2XC, 3AGA, 3ARL, 3AUS, 3BEX, 3BEX/P, 3BHS, 3BNC, 3CFR, 3FAN, 3FRG, 3GOP, 3HVO, 5LK, 8DV/A, 8OO.

HEARD: G2BAT, 2HDZ, 2UN, 3DIV, 3FIH, 3GAO, 3HCK, 4MW, 5DS, 8II.

G3HBW, Wembley, Middlesex.

WORKED: G2AHP, 2AJ, 2ANT/A, 2BAT, 2BCB, 2BRR, 2CD, 2DHV, 2FFG, 2FTS, 2FZU, 2HDZ, 2HIF, 2IQ, 2KI, 2PU, 2XC, 2YB, 3AEX, 3AUS, 3BCY, 3BLP, 3BPM, 3CAT, 3CFR, 3DUK, 3ECA, 3ENI, 3FAN, 3FD, 3GBO, 3GHI, 3HCK, 3HSD, 3HVO, 3HXJ, 3HXO, 3HZK, 3ISA, 4JJ/P, 4MR, 5DS, 5MR, 5UM, 5YV, 6FO, 6YP, 8AO/MM, GW2ADZ, 8UH, ON4BZ.

HEARD: EI2W, F8GH, G2DUS, 3ANB, 3CC, 3EHB, 3FFV, 3GMX, 3VM, 3WW, 4MW, 5BD, 5JU, 6XX, 8IC. (*June* 23 *to August* 4).

G3ISA, Beckenham, Kent. NGR 51/388681.

WORKED: G2AJ, 2BRR, 2DGY, 2FKZ, 2KI, 2UJ, 2YB, 3ASG, 3BCY, 3BEX/P, 3BPM, 3CWW, 3DAH, 3DQC, 3EHY, 3FD, 3GDR, 3HBW, 3HVO/A, 3HZK, 3IIR, 3MI, 4CG, 4DC, 4RO, 5DS, 5HN, 5LK, 5LQ, 5QL, 6QW, 6TA, 6UH, 6XM, 8DV/A, 8PX, GW2ADZ. (*July* 15 *to August* 13).

G2HIF, Wantage, Berks. NGR 41/404885.

WORKED: EI2W, G2AJ, 2AK, 2ANT/A, 2AOK/A, 2BCB, 2FJR, 2FKZ, 2FXK, 2HDZ, 2HGR, 2OI, 2XC, 2YB, 3APP, 3AUS, 3BCY, 3BJQ, 3BLP, 3BW, 3BVU, 3CFR, 3CGQ, 3CJY, 3DQC, 3DKZ, 3EUP, 3FAN, 3FD, 3FIJ, 3FSD, 3FUM, 3GHI, 3GHO, 3GMX, 3GOP, 3GZM, 3HBW, 3HWF, 3HWJ, 3IWA, 3MI, 3WW, 4MR, 4RO, 4SA, 5DF, 5DS, 5JU, 5LJ, 5MA, 5UM, 5YV, 6LI, 6TA, 6UH, 6XX, 6YP, 6YU, 8DA, 8DM, 8IK, 8MZ, 8PX, 8SB, 8SC, 8SY, 8YP, 8VZ, GM3BDA, GW2ADZ, ON4BZ, 4HN.

G2FVD, Morden Park, Surrey.

WORKED: G2AJ, 2BN, 2DHV, 2HDZ, 2OI, 3ANB, 3ASG, 3AUS, 3GBO, 3GHO, 3HAB, 3HCK, 3WW, 4CG, 4RO, 5DS, 5UM.

HEARD: G3BW, 3DVK, 3EHY, 3FAN, 3HZK, 3VM, 5BM, 5YV, GW3FYR. (*July* 20 *to* 27 *inclusive*).

miles) and GI3GQB (268 miles), and to get his total of 633 points he put in only 9 hours' operating. G3EHY reports that with him conditions were "poor to fair with some good patches." Well, he certainly seems to have found them all right. In six operating spells to make up his nine hours, Louis worked 20 counties, with G3BW, G3EGW/P and G3VM for 25-point QSO's in addition to his GI/GM contacts. He says he is looking forward to the sessions to come, and hopes that activity will be as high in the London and Home Counties area as it was in the North for the first leg.

G5YV (Leeds), who is still spreading his mantle over the whole of the southern part of the country, worked 23 counties with G3HCK (Hurst Green, Sussex) as best DX; he had fifteen 20-point QSO's, of which the more interesting were GI3BIL, GM3BDA, G2AIW (Twickenham) and G3FIJ (Colchester). G5YV put in four operating spells totalling 11½ hours and made 37 contacts, or an average of three QSO's an hour—a rate of scoring which just about represents the general level of activity. On the other hand, it is extremely interesting to see that G3EHY worked 12 stations not found at all by G5YV, who himself raised 14 other stations which do not appear in Louis' log — and in neither case were these all locals. This suggests that even with careful searching under Contest conditions, QSO's can be missed, and also shows that there were far more stations on than indicated by the logs or the volume of entries in them.

From further down the list, G2BAT (Falmouth) made a gallant effort, working six counties and getting three 20-point QSO's with no locals at all in his log—and he was available when both G3EHY and G5YV were on.

For his 392 points, G3VM (Norwich) made 27 contacts in 9¼ hours' operating, and he would probably agree that G4GR (Marshfield, Mon.) was his best QSO for 25 points; sixteen counties were worked and the G3VM log also contains several stations not entered by others. For G3BW (Whitehaven), who worked 14 counties, the high-scoring QSO's were with G2AIW and G2AJ. Over in Wimblington, Cambs., G3WW put in about 9½ hours for 29 contacts, the best being with G3BW, and here again the log shows some callsigns not otherwise mentioned. G4RO (St. Albans), who we are glad to see back again, got a very nice one in G3AGA (Penrhyn, Cornwall) for 25 points, at 2320 on July 19. Just about this time, G3BW was working G2OI, G5YV was in contact with G5DF—and G3WW was looking for a QSO!

Down in Monmouthshire, G4GR (whose location, incidentally, is about mid-way between Newport and Cardiff) worked 12 counties; but like G2BAT, had no locals at all in his log. Apart from G3VM for 25, he made two 20-point contacts with G3WW and the rest were 10's and 5's, a good one for 10 being G2BAT.

G3GHO and G5DS each worked 11 counties, but the G5DS log contains four not claimed by G3GHO — yet their operating periods were almost identical. And though G5DS had a completely blank spell from 1840 to 2215 on the Sunday, G3GHO in that particular period worked four stations, two of which (G3HXS and G4MR) do not show at all in G5DS's log!

So it is easy enough to miss the stations that are on — and, indeed, that may be said to be the main conclusion to be drawn from this brief analysis of the first leg of the Marathon. (It also supports the argument, put forward in this space last month, on the subject of activity generally). Of course, everybody cannot expect, or be expected, to find and work everyone else. But nevertheless it is extraordinary to see how many more stations could have been worked by almost all those who have so far put in entries. Two particularly interesting possibilities were GW6NB/P

MARATHON VHF CONTEST

FIRST LEG RESULTS

(July 19-20)

Station	Location	Score	Aerial	Input	Converter	Zone
G3EHY	Banwell, Soms.	633	8-ele Stack	120/85	4RF-M-Osc	I
G5YV	Leeds, Yorks.	543	4-ele Yagi	65	6J6/S.640	C
G3VM	Norwich, Norfolk	392	4/4 Yagi	90	3RF/TCS	G
G3BW	Whitehaven, Cumb.	387	16-ele Stack	60	6J6/AR88	C
G3WW	Wimblington, Cambs.	335	5/5 Yagi	140	6J6/BC348	G
G4RO	St. Albans, Herts.	230	5-ele Yagi	25	4RF-M-Osc /BC348	G
G4GR	Marshfield, Mon.	205	16-ele Stack	100	3RF-M-Osc /AR88	I
G3HVO	Parkstone, Dorset	196	5-ele Yagi	20	3-stage/HRO	H
G3GHO	Roade, Northants	139	12-ele Turnstile	30	3-stage/1155	G
G5DS	Surbiton, Surrey	130	16-ele Stack	65	6J6	I
G2BAT	Falmouth, Cornwall	125	16-ele Stack	100	6J6/AR77	I
G8DA	Gloucester	109	5-ele Yagi	25	2RF-M-Osc /S.640	H
G3GDR	Watford, Herts.	99	12-ele Stack	20	2RF-6J6	G
G2DHV	London	37	4-ele Yagi	18	5-stage /FBXA	J
G6PJ	Sheffield, Yorks.	20	3/3 Yagi	50	6J6	C

TWO METRES

ALL-TIME COUNTIES WORKED LIST

Starting Figure 14

From Fixed QTH Only

Worked	Station
59	G3BW
57	G2OI(347)
56	G3BLP (567), G3EHY (365), G8SB
54	G6NB, GW5MQ (188)
53	G2AJ (519), G5YV (364)
49	G3WW
47	G2NH, G5WP
46	G3ABA (274), G4CI, G4HT (476), G5BY, G5MA
45	EI2W (126), G5BM, G5DS (370), G6XM (356), G6YU (183)
44	G2HDZ (307), G2XC
43	G2HIF (176), G3COJ, G5DF
42	G3BK, G4SA, G5BD
41	G2FQP, G3BA, G3DMU
40	G3CGQ, G3FAN (264), G8OU
39	G2IQ
38	G3APY, G3VM (208), G4RO
37	G2FNW, G8IL
36	G3CXD, G6CB (312), G8IP
35	G2FZU (118)
34	G2AHP (295), G3AVO/A, G3HAZ (113), G5JU
33	G3FZL, G3GHO, G3HBW
32	G6CI (117), G8IC, G8QY
31	G5ML (126), G5RP
30	G2FCL, G2FVD, G5NF
28	G3FIJ (140), GM3BDA
27	G2FJR, G3AGS, G3BNC, G3DAH, G3GSE, G3HCU (152), G6GR
26	G3CFR (125), G3F1H, G3GBO (268), G4MR (170), G6TA (162)
25	G5SK, G8VR
24	G3BJQ, G3FD, G3FXG, G8KL
23	G5PY
22	G3AEP, G3BPM, G3CWW (221), G3GOP (100), G3HII, GM3EGW
21	G5MR (115), G6XY
20	G2HOP, G3EYV, G4LX
19	G3SM, G5LQ (176)
17	GM3DIQ
16	G2AOL, G3FEX, G3FRE, GC2CNC
15	G2DVD, G3IWA
14	G3CYY, G3ISA

Note: Figures in brackets after call are number of different stations worked on Two Metres. Starting figure for this classification, 100 stations worked.

at Whitton, Radnorshire—worked in the Contest only by G3BW, G3EHY and G8DA — and G3EGW/P, who was at Troutbeck, Westmorland.

Anway, there you have the story on the first leg of the Marathon, and no doubt succeeding sessions will be not less interesting. Our thanks to all those who sent in logs (especially the low scorers), and we hope for many more entries for the Marathon sessions that remain to be worked off. The Final Table is the thing, and in that all operators who enter will appear, even if they only came on for one leg.

The next Marathon session is September 27/28, for which logs are wanted by October 8. And don't forget to call "CQ MVC," so that we all know where we are and who is in for what.

The Tables

All who are interested in the Counties Tables — about 100 operators who have worked 14 or more—will give a cheer for Bill G3BW who, having squeezed another one out of GW6NB/P, goes to 59C in the All-Time and so keeps his lead of two over all comers. A very fine performance, which has meant much hard work, steady application and some disappointments in the early days—we can remember entering G3BW on the lowest rung, remarking then that it was pretty good going for a station located in Cumberland to get into the Table at all! Since then, many things have happened—for one thing, Two Metres has been opened up in the North, where the level of activity is as high now as in the South—and it all adds up to Progress.

It is fair to say that anyone with 40 or more counties All-Time has not only done extremely well in the operating sense, but must know his stuff technically. So to them all we raise our broad sombrero . . . and it is to them that we look for further contributions to the art.

In the annual Counties Table, September 1, 1951, to August 31, 1952, more than 40 operators have been featured, and next month we shall print the final placings for the year—for which movements must be received by September 12. This table is in itself a marathon, in which everyone starts level from September 1st each year, and we hope that all who are "open" on Two (and especially those who have recently become active) will start now working the counties, letting us know, with a check list, as soon as they hit 14C. Last year's winner was G2AJ with 45, and the year before it was a dead heat between G3BLP and G6NB with 43 each. This year, obviously, we are going to do much better than that.

Certificate For It

On this theme of Counties Worked, your A.J.D. has been discussing with the Editor the question of a Certificate of some sort to tie up on Counties Worked. The tentative suggestion is that we give a parchment to all who work 40C or more for the year now commencing — from September 1st, 1952—on Two Metres only, with endorsements for each additional 10C over the basic forty. The lead operators should be able to start staking their claims in about three months from now, but anyone who can prove 40C worked in twelve months on Two will be doing pretty well, and such a Certificate, while being within reach, will not be easy to get.

There will be those who will say that this will only inflame the competitive frenzy. But we say it is there for those who may like to claim it, and if in the process of trying to qualify for it, a few more QSO's are made and a few more cards are exchanged, that will all help to maintain interest and activity. Let us face it—there is really no great difficulty in getting the gear together for Two Metres, and getting it working. There are plenty of operators now equipped for the band who are quite content to work loud locals and never feature in tables or contests, and would never think of sending anybody a report on their activities. Your earnest precentor could name a dozen such known to him personally, quite apart from what he hears going on over the air. They are the beneficiaries of the process of competitive selection,

MARATHON VHF CONTEST
THIRD LEG
Week End September 27-28
See Rules pp. 296-297 July Issue
Logs by October 8 for Third
Table in November Issue

for they gain so much from the knowledge and experience of others who seek constantly to improve their equipment and their techniques in order to stand high in the tables. Looked at in another way, a sprog VHF operator is quite unable to judge the effectiveness of his gear or his own operating ability unless he has some yardstick by which to measure them. This yardstick is the annual Counties Worked Table, which month by month shows just what is reasonably possible, given the know-how and the right sort of equipment. It does not matter if he himself does not send in an entry to claim a place; what he knows is that if neighbouring G9XX can work 40 counties, there must be something not quite up to the mark either with him or his gear if he can only work fifteen. And so, being like most of us a reasonable chap, he either accepts it that he is not as clever as G9XX, or he proceeds to improve his equipment in order to try to get the results which he knows are possible. Hence progress.

Because of all this, we do not feel that any bones should be broken if we offer the Forty-County Certificate on an annual basis. In due time, it will become the hall-mark of the proficient VHF operator, the standard to which all can aspire. We are open to accept claims, backed by QSL cards to prove contacts, with effect from now, the starting date being September 1st, 1952.

VHFCC Elections

This month, six more operators qualify for election to the VHF Century Club. Certificate Nos. 118-123, have been awarded, in that order, to: G3DAH (Manby); G3BWS (Gillingham); G3FUL (Luton); G2HIF (Wantage); G3FIJ (Colchester); G5HN (Caversham). The claim from G3BWS staggered us — *all* the cards he sent were for contacts on the old 5-metre band! Apparently, he has been intending to send them in for some time!! Of the batch from G5HN, 57 were in respect of QSO's made on Five, and thus are more than four years old.

Any operator holding 100 or more cards for stations worked on the VHF bands is entitled to claim VHFCC membership; cards should be sent registered, with a check list, and the Certificate will be issued and the cards returned within a few days of receipt.

More on the Zone Plan

Several correspondents have endorsed the general feeling regarding the British VHF Zone Plan, as stated in this space last month, and we are very glad to hear from EI2W that both GI2FHN and GI3GQB are also to change frequency into the Zone D (All-Ireland) area. Their new operating frequencies will be notified as soon as known.

As mentioned here last time, EI2W of Dublin himself will be on his new frequency of 145.810 mc with effect from September 15, and all stations looking for a contact with EI on and after that date should search at the HF end of the two-metre band. This will just about coincide with the opening of the Annual Counties Worked Table, and it should be noted in this connection that EI contacts score as counties.

Individual Reports

G5BM (Cheltenham) is on 145.35 mc and draws attention to it. He finds that a great many operators fail to tune above about 145 mc, as proven by the fact that a change to 145.166 mc (outside his Zone frequency area) often produces a contact with a station which he has been calling fruitlessly on the higher frequency. This is one of the things which the Zone Plan is designed to prevent, of course—but it does mean that operators must search the whole band. It is equally obvious that the QLH, QLM, QML, QMH calling procedure should be used as a matter of course when putting out CQ's — and not always QLM either! G5BM hopes shortly to change the present 6-ele Yagi to a 5-over-5 at 55 feet, and for the information of the keen county men, he also tells us he will be operating as GW5BM/P from Clyro Hill, Radnorshire, on September 21, accompanied by G3FRY and G8ML. We shall be very interested to hear of results, and wish them well.

TWO METRES
COUNTIES WORKED SINCE SEPTEMBER 1, 1951
Starting Figure, 14

Worked	Station
51	G3EHY, G5YV
49	GW5MQ
47	G3WW
44	G2OI
43	G6YU
42	G5DS
41	G2HDZ, G3BK, G3BW, G5MA
38	G3FAN
37	G4SA
36	G4HT, G4RO
35	G2FQP, G2XC
32	G2NH
31	G8IL
30	G2FCL
29	G2AHP, G2FVD
28	G5ML
27	G2FJR, G2FNW, G3VM
26	G3AVO/A, G6TA
23	G3BJQ, G6CI
22	G3FIH, GM3EGW
21	G3BNC, G3GHO, G3HII, G6CB
20	G3FIJ, G4MR
19	G3CWW, G3HCU
18	G8VR
15	G3GOP, G3IWA
14	G3ISA, GM3DIQ

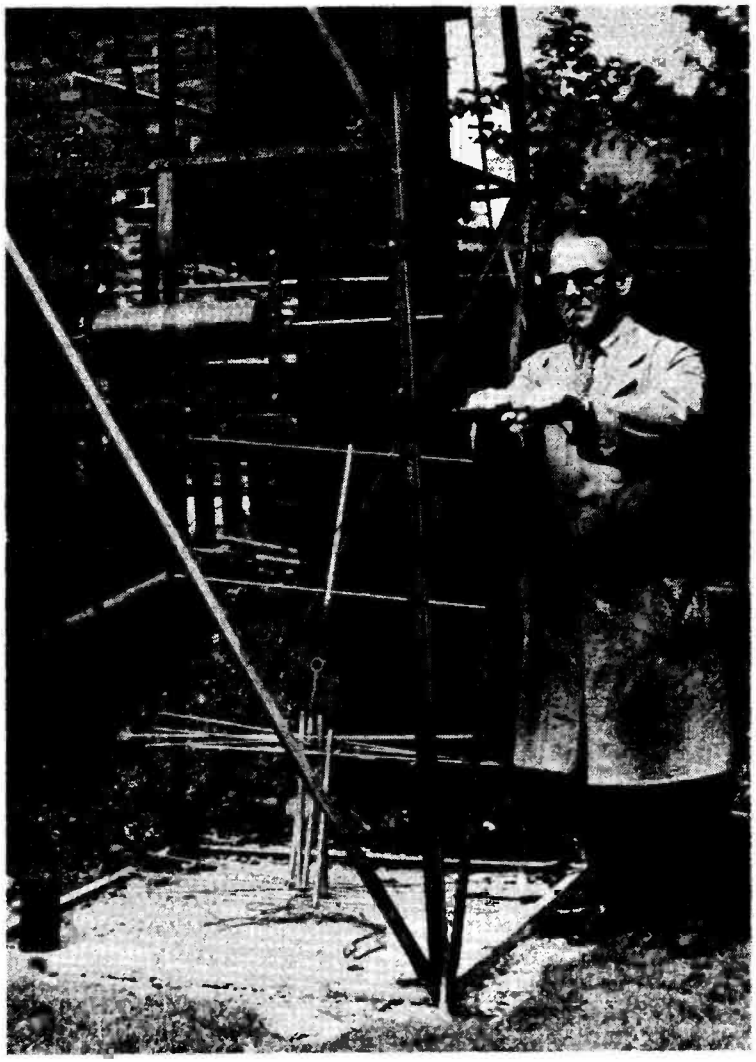
Note: This Table was closed for the year 1951-2 on August 31st. All movements to August 31st must be notified by September 12th and the final Table for the year will appear in the October issue. The Table for 1952-53 re-opened with effect from September 1st, and operators are asked to claim placings for the new annual Table as they work 14 or more counties.

G8IC (Doncaster) goes up in the Tables with two new counties, and is building himself a 70-centimetre converter. G4SA (Drayton, Berks.) is looking for another new country to get into that Table, and during the month worked 19 stations on Two.

From Sutton Bridge, Lincs., G2FJR (who "Flies the Jolly Roger") writes in for the first time to claim his places in the Tables, and has a word or two to say about those who are still owing him QSL cards—if he had them all for every contact, it could be VHFCC. G2FJR has a stacked array with plane reflector on test, with which he hopes for great things when it is properly erected.

G3FIJ (Colchester) is one of those few, nowadays, still afflicted with DC mains; to get AC he runs a small rotary converter, with all low-power stages supplied direct from the mains. But being on the "wrong" side of the three-wire feeder, he has a positive earth, so G3FIJ and all his gear are always 200v. above earth potential! Recent first-time contacts have included G2YB for Berkshire and G6FO for Buckinghamshire, and best DX at G3FIJ is OZ2FR, with DL3QA also worked; no less than nine Belgian and twelve Dutch stations figure in the log, with 7 countries worked.

G2AJ (Biggin Hill) is to move into the Cheltenham area before long, and so will have to start scoring all over again from the new location! Raymond has got himself going on 70 cm and has already had a very good contact with G6NB (Aylesbury, 54 miles). He still hopes to make the projected /P excursion, but arrangements previously made have miscarried for one reason or another. G2HIF (Wantage) remarks on a welcome increase in the number of new two-metre stations heard or worked; his best QSO of the month was with GM3BDA, and he had 12 other contacts well beyond the 100-mile mark, all with only 20 watts. G2HIF puts a lot of this down to his 5-over-5, which he finds has accounted for 95% of his score since it went up last September. His QSL returns are 99%, incidentally! Remarking on the consistency of EI2W, G2HIF says that he is having no luck at all with the GI's, and hopes that they will aim a bit further east to try for the Berkshire stations.



G5YV (Leeds) at the winding end of his high level telescopic beam support. The adjustable height range is 62 to 90 feet.

G2DKH (Stanley, Co. Durham) has worked DL3QA from his portable site, and is now at the point where he can hear a lot of stations which do not respond to calls from him, notably G3EHY. Like G4JJ/P, he has been involved with the local bluebottles when out /P, though much worse an experience was being assailed one dark night by a farmer who said G2DKH/P was "interfering" with his cows and the bull fifty yards away in the byre—type and nature of this QRM not clearly specified, but G2DKH calls it CBI!

G3IBY (Lancing, Sussex) was pleased about a 220-mile contact with G3AGA (Falmouth) on July 26, with G2BAT heard and F8GH also worked; with him, G3AUS (Torquay) is most consistent, coming through when little else can be heard. Conditions were good again on August 12,

when F9JY of Cherbourg was worked. Up in Whitehaven, G3BW has found the band very variable, with G3ABH (Poole, Dorset) worked as best contact for the period, and G3EHY the most consistent GDX signal. G3BW is now on phone, and looks forward to some new QSO's; he reports that G3BJD, also of Whitehaven, makes the second Cumberland station regularly on the band. G3BJD has a 12-element stack, a G2IQ converter and runs 20 watts to a TT15; he has already worked GW5MQ and others up there, and hopes for a call from all who may hear him.

G3HBW (Wembley) only posted part of his letter, apparently, but in the bit we did get he makes the very sound and interesting observation that "Reports of reception or contact at 200 miles or so is no evidence at all to prove that propagation at the time was above normal." Let us see what our proposed Investigation into Propagation Conditions discloses in this respect. G4RO (St. Albans) sends an analysis of activity, as seen at his station, for the two recent contests, and new claims for the Tables. G8IL (Salisbury) is on again after a long break, and has pushed his 4-over-4 up to 54 feet, so pivoted and balanced that it can be raised or lowered single - handed; previously, this operation called for the united efforts of seven determined men! He finds that the extra height is helping to get signals out better to the North; the relatively distant hills to the South have never been much of an obstacle — but in that direction the only station for him has been GC2CNC. A consistent signal with G8IL is G2BAT (Falmouth, 160 miles), and other stations noted as active are G2DSP (Bognor), G3DDD in Littlehampton (who did a great deal of useful work as 2DDD in pre-war days), G3HWF of R.A.F., Yatesbury, G3FKF of the Salisbury Club, and G2BUJ of Swindon, on again after a long absence.

G6YU (Coventry) pulled himself up with four new counties, and hopes to be on more regularly now that holidays have been taken. Also reporting from Coventry is old-timer Freddy Miles, G5ML, who is as active as ever and climbing well in the Counties Tables; but he is still looking for Devon and Cornwall (for this year), nor have the Continentals been showing up at G5ML. His gear is a Cascode with a noise figure of 4 dB, into a Commander tuning 28-30 mc, the aerial a 16-element stack, and the transmitter runs an 832A in the PA with but 18w. input. The total of stations worked is now 126, all QSL'd, but only 76 cards have come in so far. G5ML will henceforth be there 1830-2000 clock time most evenings (he does not do much late night operating, anyway) and will be looking for contacts at all distances and in every direction. Some /P work is also planned, with the assistance of SWL Bastin, who is the active second operator at G5ML. Yet another steady OT from Warwickshire is G6CI (Kenilworth), who is just about level-pegging with Freddy in the scoring.

From Scotland, GM3DIQ (Stevenston) reports that up there they had a week of very good conditions July 13/20, when several new southerly stations were found, and G2DKH/P, G2FO, G3CYY and G4LX worked for new counties. G5YV was being very well received at GM3DIQ during this period, and was frequently called—but no joy. GM3FVX (Auchinleck) is also on, and GM3AUQ of Largs is expected shortly. Incidentally, GM3DIQ is making progress with his 70-centimetre equipment, and will be looking for schedules on that band.

G3ISA (Beckenham) started up on the two-metre band on June 27, with 3½ watts into a QQVO4/7 as a power doubler, since when another such valve has been added as a straight PA at 10 watts input. The receiver is a G2IQ converter, into an HRO at 6.5 mc, the aerial a 3-element Yagi "perched precariously on a crooked pole," the operating frequency 145.12 mc, and the location 220 ft. a.s.l., good for all directions except the South. More than 60 stations have already been worked from G3ISA using this modest equipment, with G3EHY and GW2ADZ for 100-mile-plus contacts, and G3ISA goes into

TWO METRES

COUNTRIES WORKED

Starting Figure, 8

12	**G3BLP** (DL, EI, F, G, GC, GD, GI, GM, GW, ON, OZ, PA). **G5YV** (DL, EI, F, G, GD, GI, GM, GW, ON, OZ, PA, SM).
11	**G2AJ, G6NB.**
10	**G2FQP, G2HDZ, G3WW, G5DS, G6LI, GW5MQ.**
9	**G3ABA, G5BD, G6XM, G8IC.**
8	**G2AHP, G2HIF, G2XC, G3BK, G3EHY, G3VM, G5BY, G5MA, G5UD, G8SB.**

Counties Worked at the bottom rung — all of which is not at all bad for two months only on the band.

A very interesting comment on conditions and activity is given by the mute witness of G3WW's log — he worked a total of 98 different stations in 9 countries in the week July 18-27 alone, including five DL's, two OZ's, four GW's and GM3BDA. Excluding the Continentals, the county coverage for that single period totalled no less than 38. This is by far the best activity list we have seen for a long time, and suggests that there is a lot of new magic being brewed at Wimblington—actually, it is the mixture as previously prescribed, except that a 5-over-5 Yagi array has replaced the slot system. Some 10 new stations have been worked, as well as the three who have recently been /P in Westmorland. G3WW remarks that it is an easy feat for Cambridgeshire stations to be reported heard in GI or GM—but to hear *them* when they call Cambridge stations is another matter altogether!

G2FVD (Morden Park) has been able to raise Derbyshire at last, with G2FZU, and has heard what for him would be three new counties in the shape of G3BW, G5BM and GW3FYR. The new ones worked include G3HCK, G2OI, G6FO and G8AO/MM when off the Suffolk coast.

It is with pleasure that we report Ted G2XC as active again, though he has not been able to join in on the late-night sessions. He thinks that if the weather this autumn turns out as it did last year, we should see some excellent

DX openings for the last leg of the Marathon.

G3AGS (Manchester) writes again after a long interval and reports himself as being on 144.39 mc most evenings. Allowing for missed openings to the Continent, he has not found conditions as good this year as last—and the QSL position is not so good either; G3AGS says it looks as if he will have to work 200 stations to get 100 cards, and is now sending direct. His new Tx runs EF50-5763-5763-832, and he mentions G3WW and G6NB as his most consistent GDX signals.

G3GHO (Roade, Northants.) got himself into the new QTH in time for the first leg of the Marathon, and having missed a call from G3BW, made up for it by working G2HCG/P in Rutland on August 9. While on holiday, he visited GW3ENY of Llandudno—and as a result says he will never again grouse about "a poor QTH." GW3ENY, it seems, is not only hemmed in by hills, but also stupified by car ignition—all very difficult, but all credit to him for trying.

From Leeds, G5YV reports that "Conditions have been well below average," and with him, so has the activity. He is trying a 4-over-4 in place of the single 4-element Yagi pictured in our last, and so far there does not seem to be much to choose between them. G5YV is of the opinion that, taking into account the extra weight and the increased windage of a big array — as he must, of course! — most people would find a single well constructed Yagi, properly matched and raised above surrounding obstructions, giving them results quite as good as a multi-element beam.

Reporting on conditions and results in his careful way, G3EHY (Banwell) says that they were much better for the last two weeks in July than for the first ten days in August, when stations were apparently discouraged from trying their luck by the stormy weather. Anyway, it did not deter Louis; as EI2W has not been on so much lately, G3EHY had a look a bit further North, and now has GI3GQB as a regular contact! They have QSO'd on numerous occasions and, as mentioned earlier, a regular schedule has been laid on to test the reliability of the path.

GC2CNC (Jersey, C.I.) writes to put us right on one point—he has *not* given up VHF, and wants to be kept in the Tables; in fact, as he says himself, he "Expects to be polluting the VHF ether from September onwards, so the bods who want GC can start swinging their beams." Next year, GC2CNC intends to operate almost exclusively on VHF, and to get higher in frequency.

MARATHON VHF CONTEST
THIRD LEG
Week End September 27-28
See Rules pp. 296-297 July Issue
Logs by October 8 for Third Table in November Issue

New Irish Organisation

Under this head, on p. 304 of July "VHF Bands," we mentioned the move being made by EI2W to form The VHF Research Society of Ireland. Thanks to his efforts, this is now taking good shape, and as at the middle of August, the membership had reached the very encouraging—and, to many people, probably the quite surprising—figure of 42! Of this total, no less than 20 are EI's, with 22 from Northern Ireland. This is a most inspiring start, more particularly as active interest in VHF is a condition for membership. In the lists sent us by EI2W, we see a number of callsigns known to us as having been on either Five or Two at some time or other in the last five years.

In his notes, EI2W remarks that he has found a lot of VHF equipment under construction in various parts of the country, and that it would surprise us over here to know how VHF is taking on in the EI/GI areas. Well, this is all very good news, and we are pretty sure that the ultimate success of all these plans and efforts will depend largely upon EI2W himself. Meetings are to be held at suitable centres, lectures arranged, and a bulletin is in course of preparation for circulation to all members.

Something about QSL's

Unquestionably, this is still a burning topic on the VHF bands, and nearly all correspondents this month have again mentioned it. In every case, it is a matter of waiting for cards long expected from other people. Now, if everyone is more or less in the same bother (as in fact seems to be the case) then it must be a gum-up in the QSL bureaux. So far as we know, our own is blameless in this matter, being organised to clear all cards as rapidly as possible. (It is not suggested that we are unique in this respect, but long experience of the management of a QSL Bureau proves that the weakness in the IARU system is waiting for envelopes in which to send off the cards.)

As so many people have asked us to say that they will gladly QSL again to those who may be waiting for cards from *them*, we suggest that where a reasonable time has elapsed all outstandings be re-QSL'd direct, and that those who know they owe cards should get them off as soon as possible. Actually, there seems to be only one effective answer — to QSL direct, and to write out the card either while in QSO or immediately afterwards, and then remember to post it within a day or two. It is also quite a reasonable tactic to wait until the other man's card comes in—if he says he wants your card, you having promised to QSL but not being particularly interested in QSL's as such—and then to post yours off direct as soon as you get his.

If everyone were to work more or less to these principles, the the QSL position would very soon look much tidier—and we should have a lot more VHF Century Club certificates to issue!

Line of Thought

Before winding up for this month, your A.J.D. would like to throw out, as a strong suggestion, something which he has been nurturing in his bosom for a very long time. It is not at all a new idea, and has already been tried with the expected (very good) results. It is this:

Why not put the receiver, as a CC converter with an IF amplifier, right in the eye of the beam, feeding HT/LT up and the IF down, using the link - coupled method with flat-tuned circuits at each end? The difficulties are not great — amounting only to weather-proofing the box and having matters so arranged that inspection and maintenance can be carried out fairly easily. The advantages are obvious — feeder losses eliminated, and the converter working under such conditions as to make the most of all the gain of which the beam might be capable.

And if the receiving side can be handled in this way, why not the transmitter as well? It could either go up there complete, needing power and keying (or modulation) supply leads only, or an exciter, giving a little more output than is usually wanted, arranged to feed drive from the bench at, say, 72 mc, to a buffer-doubler-PA unit at the beam end.

One obvious snag would be change-over. But if the boxes could be made sufficiently compact, this could be done through a multi-contact relay, switching power and swinging the beam from one unit to the other through a few *inches* of feeder. Alternatively, two identical beams, mounted side-by-side, could be installed, one to carry the Rx and the other the Tx. Change-over would then be by HT switching, only, at the operating position, and if built on the same framework, the beams would always aim at the same target.

It seems to your A.J.D. that some practical work along these lines would not only be interesting, but would also be well worth while in terms of results obtained. Anyway, there it is for anyone to try, and no particular claims made for what may seem to some to be an original idea.

Conclusion

And that seems to be it for this month. Our thanks for another heavy mail, our apologies if anybody has not been quoted in detail, and our good wishes for the next two Marathon sessions. Please come on, and please put in a score (*see* pp. 296-297 July)—and please remember that, if we do not get an entry from you it might wash out a few points for somebody.

The dead-line for the October issue must be **September 12 certain,** but for the month after it will be a bit easier—*October 17*. Address it all to A. J. Devon, "VHF Bands," Short Wave Magazine, 55 Victoria Street, London, S.W.1. With you again on October 3, all being well.

Simplified Two-Metre TX Circuits

AND A ONE-VALVE CC TRANSMITTER

M. W. S. BARLOW (G3CVO)

This interesting discussion shows how valves such as the 6J6, Z77 and 12AT7 can be made to operate as frequency multipliers well above the usually accepted order of harmonics. In fact, the author proves that it is possible to get into the two-metre band from an 8 mc crystal using a single 12AT7! From this, it is easy to visualise a 144 mc transmitter, with straight-driven PA running 50 watts or more, consisting of three valves only. In fact, once one gets accustomed to the frequency, equipment for VHF becomes simpler and cheaper than the installation found at many stations for operation on the communication bands.—Editor.

THE writer has always been impressed by the number of multiplier stages involved in the average two-metre transmitter, and also by the very good results obtained by certain operators running at low power, of the order of 10-15 watts or so. Under these conditions, sufficient drive can be obtained with far fewer multiplier stages. The units to be described, in fact, have a power output at 145 mc of the order of less than 1 watt, but this is usually only one or two S-points down on the 20 watts available from an SCR522, and the DC consumption is about 20 mA at 250v, compared with several hundred milliamps required in the usual two-metre driver unit.

The basic circuit was suggested by G3FIY, and consists of an overtone oscillator with output at 72 mc driving a doubler stage. The circuit is shown in Fig. 1. Neglecting the crystal and the 72 mc tuned circuit for the moment, the 6J6 is shown to be a cathode coupled oscillator, running at a frequency determined by the tuning of the first triode anode circuit, *i.e.*, 24 mc. The size of the cathode resistor determines the feedback, and the value is fairly critical; it must, of course, be un-bypassed. The crystal locks the oscillator to its third overtone, and the second triode is used mainly as a trebler stage to 72 mc. With a 6J6 as shown, over 1 mA of drive can be put into the next stage grid.

The second valve is a normal power doubler stage. Using a Z77, reports on 2 metres of 589 were received where 599 is usual on the SCR522; the estimated output is about 1/5th of a watt! In an effort to obtain more output, various other valves were tried in this position without much improvement, including another

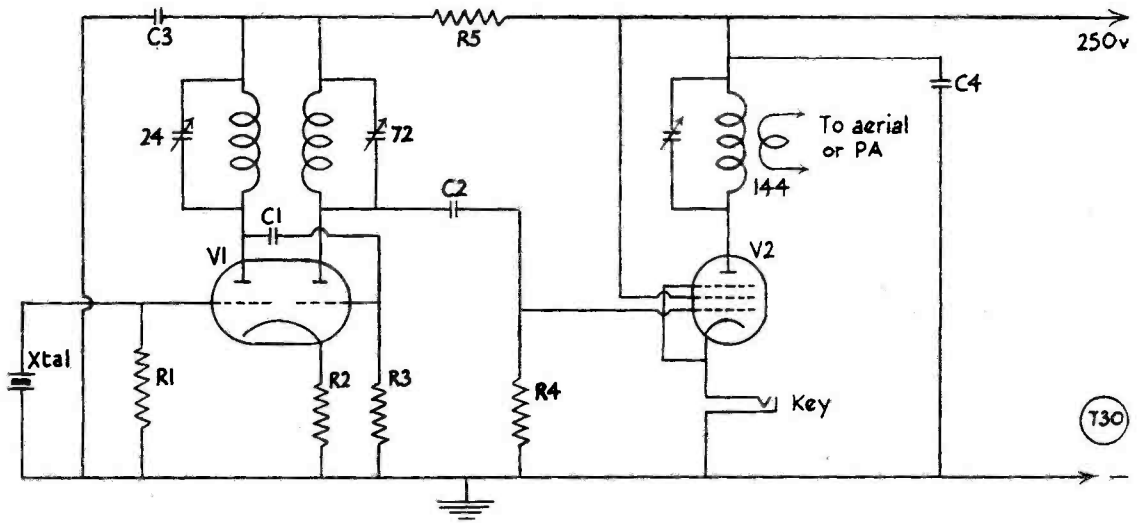


Fig. 1. Circuit of a two-valve transmitter for Two Metres, as described by G3CVO. Output at 144 mc is obtained from an 8 mc crystal. The coil/condenser values are given in the table.

Table of Values

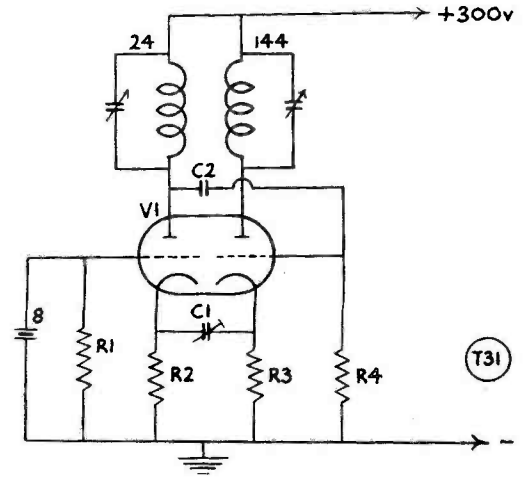
Fig. 1. Circuit of Two-Valve 144 mc Transmitter

C1, C2 = 50 $\mu\mu$F
C3, C4 = .001 μF
R1 = 20,000 ohms
R2 = 300 ohms
R3 = 100,000 ohms
R4 = 6,800 ohms
R5 = 2,700 ohms
V1 = 6J6
V2 = Osram Z77
Xtal = 8 mc, multiplying into appropriate Zone
24 mc Tank = 18 turns, 3/8-in. dia. enam., close-spaced, with 25$\mu\mu$F air-spaced trimmer
72 mc Tank = 3½ turns ½-in. dia. 18 SWG, spaced wire dia., with 15 $\mu\mu$F trimmer
144 mc Tank = 2 turns ½-in. dia., 1-in. long, 18 SWG tinned copper, with 15 $\mu\mu$F air-spaced trimmer.

Table of Values

Fig. 2. Single-Valve 2-Metre Transmitter

C1 = 50 $\mu\mu$F variable
C2 = 50 $\mu\mu$F
R1 = 20,000 ohms
R2, R3 = 200 ohms
R4 = 100,000 ohms
V1 = Brimar 12AT7



6J6, a 6C4 and a TT11. Running at 250v, the current taken by the whole transmitter is about 28 mA.

One-Valve Two-Metre Transmitter

Encouraged by these results, and acting on a suggestion of G2DD, it was decided to try a 12AT7 in the oscillator position, *tuning the second anode to* 145 *mc directly*. The data given by G2DD showed that one watt of output should be given on the *fifteenth* harmonic of the crystal, but at the author's QTH it is necessary to use the 18th from an 8 mc crystal. The circuit first tried was exactly the same as that used for the 6J6, but with the cathode resistor dropped to 180 ohms. The same "PA" coil covered the band nicely, and a fair amount of RF was developed. It should be emphasised that the dips observed in anode current on resonance are very slight, in the order of one or two milliamps only. Nevertheless, 2mA of grid current could be obtained through the 4,700 ohms grid resistor of a Z77 used merely as a diode. The first anode draws some 10 mA, and the second is driven to about 5 mA, representing 1.25 watts input.

Some experiments have been done using different multiplication ratios without much increase in developed power, and also chokes have been inserted in the filament leads, grid returns, and so on without giving much increase. It is most important to have the HT

Fig. 2. Getting on to 144 mc with a single valve (12AT7) as shown by G3CVO. C1 is the feed-back control capacity and is adjusted as described.

G3DVQ

The Other Man's Station

WAY back in 1932, R. H. Pounder, Fair Wind, Hartley Hill, Purley, Surrey, built himself a radio receiver — actually a crystal set. That started it! An 0-V-1 followed, on which he found the amateurs on the 40-metre band, and this inspired (as it nearly always did in such cases) his early interest in Amateur Radio. The war prevented the logical sequence, and it was not until 1948 that SWL Pounder became G3DVQ.

The gear shown in the photograph includes equipment for operation on the 1.7, 3.5, 14 and 144 mc bands, with CW as the preference and LF band working the first choice. The Top Band transmitter is VFO-6V6-6L6, and on Eighty a Wilcox-Gay VFO drives an 807. The Tx for Twenty is 6AG7-6V6-807, and for Two Metres it is 6AG7-VT501-VT501-832. The modulator for 160-metre phone is 6J7-6L6, with a carbon microphone.

On the receiver side, the main unit is a much-modified R.107, which has been fitted with an S-meter, among other things. For reception on Twenty an RF-27 has been modified to cover that band, and the converter for Two Metres is to G2IQ's 6J6 design. A Class-D Wavemeter is also incorporated in the receiving installation, and in addition there are a number of items of test equipment.

The main aerial is an 85-ft. end-fed long-wire, matched in by a pi-section coupler for the LF bands, with a separate aerial tuning unit for twenty metres. The two-metre aerial system includes a 2-over-2 and a 4-element Yagi.

As to results, in view of the accent on LF and VHF operation, stations worked have been mainly Europeans. But when conditions improve on Twenty, G3DVQ is going to try to raise some of the more exotic stuff in order to have a ready answer for those non-radio friends (trying to be interested) who always ask the same question: "And what is the longest distance you have worked?" G3DVQ is a member of our Fiveband Club, has been a reader of *Short Wave Magazine* since the beginning, and still possesses a copy of our No. 1 issue pre-war. And that was fifteen years ago.

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line fully decoupled, however, and having built up the unit—it will fit on a chassis 1½" square! —a bit of prodding with a 0.001 μF condenser will often improve matters considerably. The alternative circuit of Fig. 2 gives much the same results; feedback is controlled by adjusting C1.

Although not actually intended to be more than a driver unit for a PA, this design makes a very useful QRP rig for the VHF bands, and is extremely economical in power consumption, weight and space. It is hoped that its simplicity will encourage others to have a go on the 145 mc band. The author wishes to thank G2DD and G3FIY for their advice and encouragement with this project.

Random Jottings by the Old Timer

EXPERIENCED amateurs are, I find, often a little disdainful about the activities of their local Club or Clubs. Maybe the lectures are too elementary, the discussions a little futile, or the method of conducting the business slack. This is where some experience could be of great use to the community; but only too often the old hands either keep in the background or stay away altogether. They should reflect that the most important person in the entire Amateur Radio movement is that youngster who is just taking his R.A.E. and hopefully awaiting his ticket. Without a constant influx of new blood, the movement would have died long ago; and the local Clubs do more to foster the up-and-coming types than anyone else. Old Timers ought to regard it as a duty and a privilege to help the local Club with its affairs, giving the benefit of their experience when it is needed, but keeping quiet when it isn't!

THE HAM

Readers cannot have failed to notice that the word "Ham" appears extremely seldom in this publication. One of the reasons, no doubt, is that there is certainly a lack of dignity about that slang appellation, and its traditional meaning is completely lost on the uninitiated, who regard a "Ham" in radio as being rather like a "Ham" in the acting profession. I am very strongly of the opinion that we should make more use of the term, but only in very privileged cases. "Ham spirit" used to be proverbial, embodying all that was best and friendliest in Amateur Radio. Much of the traditional Ham Spirit, alas, has now been lost. As a start towards reviving it, I feel that only the very best of amateurs should be honoured by the term "Ham," which should imply that a person so designated is one of the real Good Types. Most of us are only *amateurs* in Amateur Radio, but a Ham has progressed beyond this stage; he gives his help in every way he can, his behaviour at all times is faultless, he never radiates a bad signal, and he never makes a nuisance of himself in any way. There are very few of him about—are *you* one?

PIONEERS?

In the old days of radio, every amateur was a pioneer. Practically every contact made on the air was a "first," and very seldom did a week pass without a new discovery being made, either in the station or over the air. New wave-bands were being explored, new circuits tried out, new types of valve being tested—everything was exciting. Where are the pioneers today? There is only one answer—on the VHF bands. Nowhere else is there very much chance of discovering new techniques or new properties; but on the VHF bands one always feels that one is on the verge of exciting happenings. On Two Metres and Seventy Cms. one is still at the mercy of "conditions," but on the much higher frequencies one can at least experiment over short distances without wondering what the ionosphere is going to say about it, and one still feels that the discovery of new techniques is possible.

HOLIDAYS

The subject of holidays reminds me that I know of very few things more pleasant than to land in a holiday resort armed with a *Call Book* and to look up a few local amateurs. Of course, if one knows them over the air the pleasure is doubled. When I have worked a station several times, I find that I want to know what the station looks like, what the operator looks like, and what makes the whole combination work like it does. One can answer this question for oneself by paying a visit, and one often meets with a very cheering display of Ham Spirit—see two paragraphs back! And yet very little of this personal visiting appears to go on. Perhaps wives and families take up all the available time on holidays; perhaps, even, some amateurs are really glad to get away from radio for a fortnight—although I find that difficult to believe. At all events, if you check up with amateurs living in places like Brighton, Blackpool and Bournemouth you will find that they see surprisingly few visitors during the holiday season.

THE OFF-SEASON

All of us have our off-season in radio. It is not necessarily connected with a long spell of bad conditions, or even with one of summer weather. No, it is just a period when one feels that the most exciting happenings on the air would not induce one to sit in front of the rig and concentrate for more than ten minutes or so. We all have it, and all at different times. The longest "off spell" I ever had lasted two years, but I have known of Old Timers who gave up the hobby in the early 'thirties and then returned to it, as keen as mustard, after the war. The fact is, I suppose, that running a station (particularly one of the DX-chasing variety) entails an intensity of concentration that not many other hobbies call for. Working in a contest is harder work, mentally, than most of the participants would care to do for their living, at almost *any* salary level—but they cheerfully do it for nothing over several periods throughout the year. No wonder they need a holiday now and then.

NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. callsigns, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the quarterly issue of the " RADIO AMATEUR CALL BOOK " in preparation. QTH's are inserted as they are received, up to the limit of the space allowance each month. Please write clearly and address on a separate slip to QTH Section.

EI4E, T. A. Gallivan, Avenue House, Countess Road, Killarney, Co. Kerry.

G2DIP, T. Stabler. 52 Glentower Grove, Seaton Carew, West Hartlepool, Co. Durham.

G3AMC, H. D. Curran, 12 Rivers Street, Bath, Somerset.

GD3GQX, W. P. Waid, 1, Mount William, Summer Hill, Douglas.

G3GWB, The Northampton Short Wave Radio Club, c/o Allen's Pram Works, 8 Duke Street, Northampton.

G3HMO, J. M. Osborne, The Mount, Buckingham.

GI3HND, G. S. Beamish *(ex-MB9BL),* 4 Edenvale Park, Belmont, Belfast.

G3HOI, H. B. Heath, No. 6 A.M.Q. (P), R.A.F. Station, Compton Bassett, Calne, Wilts.

G3HQK, E. Dales, 4 Addison Grove, Chiswick, London, W.4.

G3HUO, K. J. J. Young, 95 Longfleet Road, Poole, Dorset.

G3HWX, B. J. Whitty, 46 Argo Road, Waterloo, Liverpool, 22.

G3HZL, D. Walmsley, 36 Woodstock Avenue, Isleworth, Middlesex.

GM3HZN, G. A. Wright, 90 Old Inverkip Road, Greenock, Renfrewshire.

GM3IAZ, A. H. Wickham, 46 Greenhill Road, Rutherglen, Glasgow.

G3IBT, W. Pratt, 57 Ramsden Street, Huddersfield, Yorkshire.

GM3IBV, J. M. W. Sutherland, 57 Hareleeshill Road, Larkhall, Lanarkshire.

G3ICZ, 5 Tanners Road, Carmountside, Abbey Hulton, Stoke-on-Trent, Staffs.

G3IED, G. H. M. Yule, 70 Aylesbury Street, Neasden, London, N.W.10.

G3IEL, F. W. Tandy, 13 Orchard Avenue, Broadway, Worcs.

G3IEV, D. C. E. Harrison, Windlesham, Crowborough, Sussex. *(Tel.: Crowborough 766).*

G3IGJ, G. T. Brown, 2 Lansdown Road, Saltford, Bristol. *(Tel.: Saltford 3189).*

GM3IGY, W. A. P. Dellar, No. 7 Married Quarters, Carlingnose Barracks, North Queensferry, Fife.

G3IHM, N. Ratcliffe, 67 Higher Croft Road, Lower Darwen, Lancs.

G3IHR, H. R. Henly, 113 Birdham Road, East Moulescomb, Brighton, 7, Sussex.

G3IHZ, Foxhills Secondary Modern School Radio Club, Foxhills Road, Scunthorpe, Lincs.

GI3IIF, A. McAlpine, 61 Graymount Drive, Belfast.

G3IIO, D. R. Harriott, Leaside, Hurst Green, Sussex.

G3IIT, J. B. Foster, 145 Cambridge Road, Trumpington, Cambridge. *(Tel.: Trumpington 2235).*

GI3IJD, B. Johnston, 19 Coronation Street, Portadown, Co. Armagh.

G3IJI, A. Rhodes, 11 Park Bottom, Carn Brea, Redruth, Cornwall.

G3IJK, B. G. Mays, 17 Lambert House, Beckenham Hill Road, London, S.E.6.

G3IJL, A. F. Sephton, 16 Bloemfontein Avenue, Shepherds Bush, London, W.12.

G3IJO, N. E. Wicks *(ex-DL2PA/DL2PG),* 76 Riversley Road, Gloucester. *(Tel.: Gloucester 20815).*

G3IJU, Sgt. E. Briggs, 1 Dragon Junction, Harrogate, Yorkshire.

G3IKC, G. A. Leicester, 37 Barrowgate Road, Chiswick, London, W.4.

G3INN, N. S. Lilley, 66 High Street, Harrold, Bedford.

G3ITB, T. H. Bartlett, Hanborough, South Street, Sheringham, Norfolk.

G3IVW, Vickers-Armstrongs Ltd. (Weybridge), Social and Athletic Club (Electronics Section), The Sports Ground, Kings Head Lane, Byfleet, Surrey. Hon. Sec.:— A. W. Warner, Sales Accounts Dept., Vickers-Armstrongs Ltd., Weybridge, Surrey.

CHANGE OF ADDRESS

EI2B, H. L. Wilson, The Limes, Plunkett Avenue, Foxrock, Co. Dublin.

EI9S, Lt. T. J. Sheerin, 13 Farmhill Estate, Goatstown Road, Dublin.

G2HBA, C. H. Spencer, 7 Coniston Road, Coulsdon, Surrey.

G2OF, W. G. D'Arcy, 29 Adelphi Crescent, Hayes, Middlesex.

G3BSO, C. L. Turville, 272 London Road, Northampton.

G3DQT, J. Ayres, 7 Berrylands Road, Surbiton, Surrey.

G3EMW, R. D. J. Leslie, 7 Woodcroft Crescent, Hillingdon, Uxbridge, Middlesex.

G3GJX, E. B. Grist, 102 Cowley Road, Oxford.

GI3GTR, R. B. McKinty, 1 Abbey Park, Whitehouse, Belfast, Co. Antrim.

G3HN, J. W. W. Cock *(ex-VP1HN / VP5HN),* 40 Haig Road, Catterick Camp, Yorkshire.

GI3IGB, G. T. Rylatt, 31 Nelson Drive, Londonderry.

CANCELLATION

G3HAW/A, Station dismantled. (Any QSL cards outstanding to be sent to:—*GW3HAW, E. W. Jones, Lamorna, Westbourne Road, Penarth, Glam.*)

The Month With the Clubs

Many Clubs have closed down for the holiday season, which doubtless accounts for the smaller total of 22 Clubs reporting this month. A fair amount of inter-Club visiting goes on at this season, and individual members who find themselves in a town with an active Society invariably find themselves made welcome at meetings.

We have to acknowledge receipt of News Letters and broadsheets from the following: S.R.C.C. Monthly News (Surrey Contact); News Letter (Purley); News Letter (BTH Recreation Club); Monthly Newsletter (Clifton). At the risk of wearisome repetition, may we once again ask for good photographs of Club interest, for illustration of this feature? Pictures of meetings, Club shacks, equipment, Field Days or groups of members are all acceptable, and all that are used are paid for at our usual rates.

Rules for the Seventh MCC (November 15-22) will be circulated to all Club Secretaries, probably by the time this appears in print, or very soon after.

Next month's deadline is FIRST POST ON SEPTEMBER 10 and, for the following month, first post on October 15. All Club reports and other matter for this space should be addressed "Club Secretary," SHORT WAVE MAGAZINE, 55 Victoria Street, London, S.W.1.

Cambridge & District Amateur Radio Club

The September meeting will be held on the 26th at the Jolly Waterman, Cambridge, at 8 p.m. G4MW will talk on the subject of VHF Converters. Members are reminded that there is a "Twelve Best" contest running, also one for mechanical skill. The recent picnic at the "Gogs" was a very enjoyable outing, at which G2XV made a number of two-metre contacts with his portable outfit.

Chester & District Amateur Radio Society

Three members were successful in the recent R.A.E. The society is arranging a display in the local Electricity Showrooms, for one week commencing on September 10. G3GIZ/P, the Club call, will be "QRPP" on September 7, on the LF bands.

Association of North Western Radio Societies

Representatives from eight societies now attend the quarterly meeting of the Association, at which discussions range from local publicity to regional contests and TVI. Ideas for lectures are also circulated.

Eastbourne & District Radio Group

At the meeting on July 31, G5LC, on holiday in the district, gave an informal talk. Arrangements for two forthcoming Field Days were made, and discussions were held concerning next year's "Bucket and Spade" party. Next meeting after publication is on September 25, at Swallow Cafe, 333 Seaside Road.

Edinburgh Amateur Radio Club

Next regular meeting is on September 3, with the AGM on September 17. Club meetings are held in Unity House, 4 Hillside Crescent, Edinburgh, at 7.30 p.m. A visit to the BBC Station at Falkirk has been arranged for September 6, and any wishing to go at the last moment should contact GM3DVX at 81 Parkhead Loan, Edinburgh 11.

Edinburgh (Lothians) Radio Society

The opening meeting of the new season will be held on September 18, 7.30 p.m., at 25 Charlotte Square, Edinburgh. On October 2 there will be a talk on Modulators, and thereafter the meetings will continue at fortnightly intervals. Classes for R.A.E. will be held at each meeting, and Morse code instruction will also be given. New members will be heartily welcomed.

Southend & District Radio Society

The Club station G5QK/A was active from the International Boy Scouts' Jamboree at Belchamps from August 9-16, and on August 10 the Australian Broadcasting Commission sent greetings to the Jamboree. On August 17 the Medway Club paid a visit. There is no other meeting until late September, but there is to be a Committee meeting on Wednesday, September 10, at 8 p.m.

Wanstead & Woodford Radio Society

The shack has now been cleaned up and the station can be operated in comfort, but better attendances, both of old and new members, would be welcomed. On September 9 the subject of the talk is "Mathematics is Easy," and on September 16, "Measuring Low Resistances."

Warrington & District Radio Society

Recent activities have included a social outing for members and families to the North Wales Coast, a lecture on Valve Types for Two Metres, and the usual business and ragchew meetings. They are held on the first and third Tuesdays at the Kings Head Hotel, Warrington. The Hon. Sec. will be glad to hear from prospective members.

Worthing & District Amateur Radio Club

The A.G.M. will be held on Monday, September 8, at 8 p.m., in the Adult Education Centre, Union Place, Worthing. It is hoped that all members will make a special effort to attend.

Bournemouth Radio & Television Society

Forthcoming events as follows: September 26, Visit to the School

of Air Traffic, Hurn Airport; October 3, General Meeting. At the end of the month a visit is being paid, jointly with the Dorchester Radio Society, to Dorchester Radio. November 21 is the closing date for entries in the Home-Constructed Gear competition. New members and holiday visitors will be welcomed on the first and third Fridays at the Cricketers' Arms, Windham Road, Bournemouth, at 7.45 p.m.

Brighton & District Radio Club

After an informal August, when Tuesday evenings were spent "ragchewing" and practising Morse, the Club starts its autumn programme this month. On September 16 there is a lecture by F. R. Canning, G6YJ; on September 30, G2DRP and G2DBP talk on Tape Recorders; on October 14, Dr. Alexander of the BBC will lecture on Studio Acoustics, Microphones and so on. Intermediate weeks will be informal evenings.

Portsmouth & District Radio Society

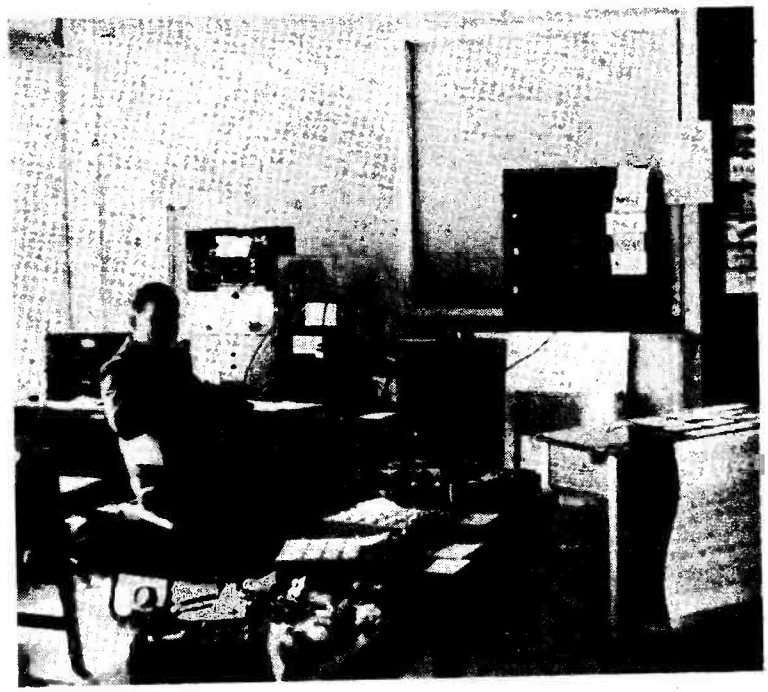
During the past month the Club has visited the local power station and has heard a talk by G3BDV on 70-cm. gear, as well as various discussions. Meetings continue on Tuesdays at 7.30 p.m., at the Signal School, R.M. Barracks, Portsmouth.

Spen Valley Radio & Television Society

This Club closed down on August 13 (for the present session) after two interesting lectures on TVI and BCI by a GPO Official. The next session begins on September 24, and details of next year's programme will be sent to anyone who applies to the Hon. Sec. for them.

Surrey Radio Contact Club (Croydon)

Recent meetings have included a discussion on Aerials, at which ZS5NJ was a welcome visitor, and a programme of travel films in colour. The September meeting will, as usual, take the form of a Junk Sale, traditionally held in March and September with record attendances. Enrolment for the RAE Course at the Croydon Polytechnic takes place on September 15, 16 and 17.



G3BRX of the Wanstead and Woodford Radio Society had a fine display of apparatus at a recent Exhibition locally. In this view, G3DWI is in the chair.

Sutton & Cheam Radio Society

This Club's winter programme begins with a lecture by Mr. C. W. Cobb (GPO) on TVI and its Suppression. The meeting will be on September 16, 8 p.m. at the Club's HQ, The Harrow, Cheam. Meetings are held on the third Tuesday of each month.

West Lancs. Radio Society

After running a station at a local Model Exhibition (in spite of intense QRN from the models) this Club has made its plans for the autumn session. Morse and Technical classes have been arranged, and the fact that five members were successful in the last RAE should encourage the waverers.

Purley & District Radio Club

Meetings continue on the fourth Thursday, 7.30 p.m. at the Railway Hotel. At the last meeting G2IM spoke on "25 Years of Amateur Radio." On October 12 and 19, two parties of members are visiting the BBC Receiving Station at Tatsfield. Next regular meeting is on September 25.

Slade Radio Society

At the next Meeting (September 12) the subject will be Cathode Ray Oscilloscopes, and on September 26 G5JU will talk on Two - Metre Equipment. On October 2, 3 and 4 the Club, together with MARS, will be in evidence at a model engineering exhibition at The Church House, High Street, Erdington. A station will be operated, and a wide range of equipment will be on display.

W.F.S.R.A. ("Bedfast Club")

Two of the Club's activities are particularly stressed this month. Firstly, although more than 1,000 books and periodicals have been distributed, an appeal is made for still more reading matter of every kind. It should be sent to John Gill, 30 Sholebroke View, Leeds 7. Secondly, the Command type re-

ceivers (BC 454 and so on) are most suitable for conversion or modification for use by "hospitalised" members, and anyone with any of these for sale or disposal is asked to get into touch with D. Auton (G3IHI), 36 Elborough Road, Moredon, Swindon.

Torbay
Amateur Radio Society

At a recent meeting G3JD gave an interesting talk on Radio in the Last War. The Club is looking forward to MCC, and it is hoped that ex-VS7BJ will give a talk on D-F at the September meeting—the third Saturday, 7.30 p.m. at Torquay YMCA.

Norwich & District
Radio Club

This Club, formed last April, has steadily expanded, and a winter programme has been arranged with the Clubroom (Cherry Tree Inn, Pitt Street) open every Friday from October 3. Novice Nights and Club Nights will be held alternately. Coming events are Part II of a talk on Aerials and Feeders by G8QR, demonstrations of commercial equipment, and a Film Show. Visitors from other Clubs will be especially welcome.

NAMES AND ADDRESSES OF SECRETARIES REPORTING IN THIS ISSUE

BOURNEMOUTH: J. Ashford, 3, Stevenson Court, 57 Alum Chine Road, Bournemouth.
BRIGHTON: R. T. Parsons, 14 Carlyle Avenue, Brighton 7.
CAMBRIDGE: T. A. T. Davies, G2ALL, Meadow Side, Comberton, Cambridge.
CHESTER: W. Lloyd, 124 Tarvin Road, Chester.
EASTBOURNE: W. A. Allwright, G2AON, 333 Seaside, Eastbourne.
EDINBURGH: C. L. Patrick, 19 Montgomery Street, Edinburgh.
EDINBURGH (Lothians): I. Mackenzie, GM3FGJ, 41 Easter Drylaw Drive, Edinburgh 4.
NORWICH: D. Youngs, 53 Salisbury Road, Norwich.
PORTSMOUTH: M. W. Pearce, G3BSR, 58 Hollam Road, Milton, Portsmouth.
PURLEY: A. Frost, G3FTQ, 18 Beechwood Avenue, Thornton Heath, Surrey.
SLADE: C. N. Smart, 110 Woolmore Road, Birmingham 23.
SOUTHEND: G. Chapman, B.E.M., 20 Leigh Hill, Leigh-on-Sea, Essex.
SPEN VALLEY: N. Pride, 100 Raikes Lane, Birstall, nr. Leeds.
SURREY (Croydon): S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon.
SUTTON & CHEAM: F. J. Harris, 143 Collingwood Road, Sutton.
TORBAY: L. D. Webber (G3GDW), 43 Lime Tree Walk, Newton Abbot.
WANSTEAD: C. Stevenson, 45 Dacre Road, London, E.13.
WARRINGTON: S. Wood, G3EZX, 12 Thelwell Lane, Latchford, Warrington.
WEST LANCS.: S. M. Sugden, G3GSS, 44 Gores Lane, Formby, Liverpool.
W.F.S.R.A. (Bedfast Club): J. Beavan, G3GBL, 296 Fore Street, Edmonton, London, N.9.
WORTHING: F. N. Bettelley, 42 Annweir Avenue, Lancing, Sussex.
ASSOCIATION of NORTH-WESTERN RADIO SOCIETIES: W. Lloyd, 124 Tarvin Road, Chester.

LICENCE AMENDMENTS, /A, /P OR /T

We are informed by the General Post Office that licensed operators may obtain a permit for /T (temporary address) working for a period up to one month at a charge of 10s. This licence is intended for those who wish to operate when away from home, or on holiday. The /A and /P permits will continue to be available, at a charge of 10s. per annum, but their scope will be extended to allow (*a*) Occasional operation /T, and (*b*) Operation /P within 5 miles of a notified point, in both cases for a period up to 48 hours, *provided* the GPO Engineering Department is informed in advance, by registered letter or telegram, of the address or location from which operation is intended. In this connection, /P working on certain inland waters is also allowed.

EXCHANGING CRYSTALS

The panel headed "Xtal Xchange" was first instituted some years ago to assist those who wished to exchange crystals in order to be able to fall in with the Band Plans. As time went on, it became a convenient means of exchanging crystals for general purposes. And so it remains. Insertions in the "Xtal Xchange" space are free, but are confined to exchanges only. Notices should be made out on a separate slip, headed "Xtal Xchange — Free Insertion" in the form which can be seen by reference to recent listings under this heading.

THE USE OF BCM/QSL

The full advantage of our QSL Bureau—its use both ways, that is—can be obtained only by those who are direct subscribers to *Short Wave Magazine*. This entitles them to send and receive cards through the Bureau. Anyone reading this may already be *receiving* cards from our Bureau, even though not a subscriber. The reason for that is because we accept cards *for* all G stations from those who are entitled to send us their QSL's for distribution.

CALL BOOK PRICE INCREASE

The heavy and increasing cost of production has necessitated the price of single copies of the *Radio Amateur Call Book* to be advanced to 25s., post free, effective with the Autumn issue. The *Call Book* now contains a great many more amateur QTH's and is a complete guide and directory to the amateur stations of the world.

NEW QTH's

All readers are reminded that the issue of a new transmitting licence, or the change of address of a station already licensed, should be notified to us immediately for the "New QTH" feature in *Short Wave Magazine* and for Publication in the *Radio Amateur Call Book*, for which we are sole agents for the United Kingdom and Europe.

SMALL ADVERTISEMENTS

9d. per word, minimum charge 12/-. No series discount; all charges payable with order. Insertions of radio interest only accepted. Add 25% for Bold Face (Heavy Type). No responsibility accepted for errors. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, S.W.1.

TRADE

QSL's and LOGS by MINERVA. The best there are.—Samples from Minerva Press, 46 Queen's Road, Brentwood, Essex.

WANTED: RCA 4331 Transmitters. — P.C.A. Radio, Cambridge Grove, Hammersmith, W.6 *(Telephone Riverside 3279)*.

QSL CARDS AND LOG BOOKS: APPROVED G.P.O. SAMPLES FREE. — ATKINSON BROS., PRINTERS, ELLAND, YORKS.

WANTED: VALVES, SMALL OR LARGE QUANTITIES; 6K8, 6V6, 5Z4, 6AC7, IR5, IS5, FW4/500, 6Q7, 12K8, 80, VU39, EBC33, 3S4, etc., etc. PROMPT CASH.—WM. CARVIS, 103 NORTH STREET, LEEDS 7.

AMATEUR ENTHUSIASTS. Short Wave or Television: Send for free list components, meters, valves, speakers, etc.—The Radio Equipment Company (S.W. Dept.), Castor Road, Brixham, Devon.

ATTRACTIVE QSL'S at reasonable prices; also Club headings; samples.—A. Rowe, 101 Fawnbrake Avenue, Herne Hill, S.E.24.

SMALL ADVERTISEMENTS, TRADE—*continued*

TRANSMITTERS. BC610, ET4336; Receivers AR88, BC348, SX24, etc. Frequency meters, test sets, etc., wanted urgently; we pay high prices instantly.—Write/Phone: Pype-Hayes Radio, 606 Kingsbury Road, Erdington, Birmingham 24 *(Erdington 4942)*.

VALVE WITH MANY USES; RK34/2C34 TWIN-TRIODE: USEFUL AS AF OUTPUT, MODULATOR, ETC.; GENERATES 16 WATTS AT 250 mc. SEND 12/11d. FOR SAMPLE HALF-DOZEN. CANADIAN C43 TRANSMITTER WITH P/PACK, £45.—ELECTRONIX, 220b CANTERBURY STREET, GILLINGHAM, KENT. *(PHONE 59203)*.

16-ELEMENT two-metre arrays, £11 10s. 0d. Send for brochure. — J. & D. Stackpole, 80 Woodcote Road, Wallington, Surrey.

45/- EACH offered for new boxed 813's. Manufacturers' and ex-Gov. valves purchased for cash.—Details to Box 1130.

VALVES WANTED: Types 805, 807, 813, 829B, 832, 866A, 931A, 100TH, 250TH, TZ40, 7223A/B, 2K33, 2C43, CV129, CV323. Quantity and price, please, to: Pype-Hayes Radio, 606 Kingsbury road, Birmingham 24. *(Phone Erdington 4942)*.

SITUATIONS VACANT

THREE VACANCIES for (1) Television Engineer, (2) Radio Engineer, (3) Chassis assembler and wiring. Open to keen amateurs.—Harmony House, 116 Cambridge Road, Southport.

MINISTRY OF CIVIL AVIATION. — Radio Mechanics are required at aerodromes and radio stations in various parts of the United Kingdom. Special training courses provided for keen mechanics with basic qualifications. Very interesting work now in progress providing electronic aids to navigation. Prospect of permanent pensionable posts for keen and efficient mechanics. Rates of pay (London) range from 109/- per week at age 19 to 143/- at age 25, and rise, subject to qualifying test, to 173/- plus a pay addition of 10%. Candidates, aged 19 or over with practical experience in the maintenance of radio or radar equipment, should apply to any Employment Exchange, quoting Order No.: Kings Cross 576.

READERS' ADVERTISEMENTS

3d. per word, min. charge 5/-, payable with order. Box Numbers 1/6 extra. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, S.W.1.

EXCHANGE mains BC-348 receiver, plus 20-watt Xtal and VFO Tx, 20-40 metres. Built commercial pattern 5-valve modulation Amp., 500c. Tx Power Pack, stabilised VFO Power Pack, Crystal Mike. All going order, for Tape Recorder in fair working condition. "Clifton" preferred. — *(Phone: Renown 2612)*. John Bunn, 3 Hurlingham Gardens, Fulham, London, S.W.6.

WANTED by Ham: AR88 or HRO; also S27 and BC221; or would consider complete station. Will collect.—Box No. 1116.

SMALL ADVERTISEMENTS. READERS—*continued*

650-650 TRANSFORMER. 250 mA, 5v, 6.3 seven times, £1 10s.; B2 T/R, complete with P/Pack, £10; Crystal Calibrator, AM Type 18, with 100 kc crystal, £1 10s.; Valves, unused 826 with base, 15s.; TZ 40, 15s.; 811, 10s.; slight used HK54, 15s.; Woden Transformer 1250-1250, tapped at 600v./300 mA, £2 10s.; ET4332 spares; aerial tuning network (requires attention), £1 10s.; Phone/CW switch, 15s.; meters, 5s.; PA Roller Coil, 1 kW, 15s.; CO coil, 7s. 6d.; aerial coupling coil, 7s. 6d.; filament transformer, £1. S.A.E. for further spares. Carriage, please.—Box 1127.

522 Tx complete, crackle panel, £5; Rx ditto, 50s.; 74 Test Set, no case, spare CRT, 90s.; 808 (2), 25s.; QRO Coil Formers and Condensers, 25s. WANTED: UMZ, B2 Tx and P/P.—Burke, 116 Bedford Court Mansions, London, W.C.1.

BC455, 6-9 mc, modified-IF regeneration and AC power unit, 65/-; as BC455 but 1.5-3 mc with AR88 NL; separate AC power unit, 65/-. —G8TS, 80 Byworth Estate, Farnham, Surrey.

SURPLUS to requirements: U12, 6L6, 6V6, 2050, 6SN7, 6SL7, R10, at 7/6 each; 6N7, 6X5, 6K7, 5U4G, 1mA meter rectifier, 5/- each; SP41, SP61, EF50, 6SH7, VP41, 6H6, 3/- each; RK34, 7193, VR54, 1/6 each; 5CP1, VCR97, 15/- each; 250-volt, 60 mA metal rectifiers, 2/- each.—Whitby, Neuadd, Menai Ville Terrace, Menai Bridge, Anglesey.

AMATEUR MOVING: EC52's, 5/-; ECC32's, 5/6; S130's, 5/-; 6K8's, 10/-. New, guaranteed.—G3DSK, Oakfield Cottage, Moat Road, East Grinstead.

BC312 RECEIVER, incorporating mains power pack, good condition, £10. Buyer collects.—23, Old Manor Drive, Isleworth, Middx.

50 MISCS. RADIO MAGAZINES, 1949-1951: *Surplus Radio Conversion Manuals*, Vols. 1 and 2; *Introduction to Valves; Radio Handbook Supplement; Practical Radio Reference Book; Radio Receiver Circuit Handbook; ARRL Handbook, 1949; Radio Data Charts*, 46 Miscs.; Crystals and 19 Miscs. Coils for BC611 (SCR536), 813 (2); 829 B (4); Instruments Testing No. 1. Offers or Exchange for Transmitting Equipment. WANTED: Stancor transformer, Type A3871.—Box 1129.

QRT 25-watt phone Tx, complete, £12; SCR522 Tx, £1; another, 30s., with valves £4; R1116A Rx with eliminator, £6; home-built 14/28 mc Superhet, £3; R-3084A Rx, 50/-; 500-0-500 Partridge transformer, £2; Class C Wavemeter, 30/-; CAY (F) Tuning Unit, with case, £1; Aerial Coupling Unit, 10/-; 813 (2), 30/-; 832 (3), 20/-; Many other items.—Enquiries (S.A.E.), G3BUB, 61 Broomleaf Road, Farnham, Surrey. (*Farnham 6562*).

FOR SALE: The station of the late G6XS; 50-watt Tx; AR77 Rx, new, with manual; BC221 Freqn. Meter. Assortment of useful equipment. What offers?—Write (seen by appointment) Mrs. F. Cropper, Garth, King's Road, Ashton-under-Lyne, Lancs.

SMALL ADVERTISEMENTS, READERS—*continued*

BC 348, 230-volt AC, excellent condition, £16 10s.; T48 Walkie-Talkie, complete Rx/Tx, 7 mc, spare set valves, dynamotor, batteries, mint condition, £16 10s.—G3DUV, 64 Belvedere Road, Erdington, Birmingham.

WANTED URGENTLY: Class D Wavemeter, good condition and state lowest price.—G6TC, Lynton House, Black Halve Lane, Wednesfield, Wolverhampton.

R107 with S-Meter; excellent condition, but too large for flat dweller. Exchange for S.640 or similar. (London area).—Box 1131.

FOR SALE: R1155 Ex-A.M. Receiver, as new; also power pack and output stage for same; £11 all.—Cornerways, Exeter Road, Honiton.

FOR SALE: BC454 with mains pack, £3; R1294 UHF Receivers, 10-60 Centimetres, £8; Xtals, 3/6. Various valves. WANTED: 2-metre Converter and 832's.—Armstrong, 40 The Oval, Mirehouse, Whitehaven.

NC200 NATIONAL RECEIVER, £40; S-27C, £45; S-27, £32; quantity of American components; S.A.E. List.—Harris, The Huon, Bournemouth, Hants.

TYPE 145 VFO, complete with 392 Power Pack, £6; Type 45 Power Pack, complete, 1200-volt at 200 mA, £4 10s.; Auto Transformer 230/190/150/110 at 8 amps., £2; Top Band Tx in TU5B, £2 10s.; suitable Power Pack, £2; Mains Transformer, 350-volt at 175 mA, and 700-volt at 150 mA, 5v, 5 amps, (twice), £2. Chokes and condensers for above transformer, £1. FL8A Audio Filter, 10/-; Valves at 7/6 each: 807 (6), PT15 (6), 5R4GY (4), FW4/500 (2), 5U4G (3), 6SG7 (2), STV280/40 (1). Valves at 5/- each: 717A (3), VR105 (2), VR150 (2), VS70 (2), 6SH7 (3). All postage extra.—S.A.E. for full list and details, G6AD, 91 King's Road, Melton Mowbray, Leics.

COMPLETE STATION for Sale. One Transmitter, 150w, 35T's, in push-pull; TZ40's in the Modulator; professionally built; covers 10, 20, 40 and 80, has worked the world. Also AR88D Receiver, and BC221 with stabilised power pack; £95 the lot (Buyer collects). Seen working 82 Framingham Road, Brooklands, Manchester. *(Telephone Sale 3803* between 5 p.m. and 9 p.m.).

PANORAMOSCOPE, Model SA.1, 5" screen, 100 kc sweep, 240v.; offers over £15? Also AR77, offers over £15? — G3BXN(121 Kingshill Drive, Harrow. *(Wordsworth 3853).*

RADIOVISION Pre-selector: Two stage, 3-30 mc, five bands, self-contained P/Pack. Just realigned by makers. Immaculate. £10 or nearest.—G. Moses, 65, Railton Avenue, Crewe, Cheshire.

COLLINS TCS9 Receiver, new condition, £9; Command BC458A Tx, complete with valves, unmodified, £4.—Styler, 15 Dalkeith Avenue, Old Bilton, Rugby.

EDDYSTONE 740, excellent condition with speaker and R9'er, little used, nearest £24, buyer collects. — F. Fletcher, 80 Naunton Lane, Cheltenham, Glos.

SMALL ADVERTISEMENTS, READERS—*continued*

CANADIAN C43 Transmitter; output 175w. phone, 300w. CW; complete with valves, power pack, instruction book. Offers.—Box 1133.

TRANSMITTER for Sale. Large rack Tx, commercially built, totally enclosed; four bands on Phone/CW, switched; 150/250 watts, 913 in PA, Class-B TZ40 in Mod.; perfect working order; guaranteed. Cost over £125; accept best offer over £50 for quick sale. B2 complete. P/P, etc., £15 (or offers?)—S.A.E. for details to G8VB, 124 Carr Road, Greenford, Middx.

FOR DISPOSAL: Tape recorder in Console cabinet. WANTED: Test gear, BC221 or what-have-you?—G3AUZ, 32 Harstoft Avenue, Worksop.

EVERSHED Vignoles Bridge Megger-Series 2, as new; range on bridge .01 ohms to 999900 ohms; on megger 10,000 ohms to 50 Meg., £15. Also 8 type PT 15 valves at 10/- each; sold separately. — Clapshaw, 369 Alexandra Road, London, N.10 (*'Phone: Tudor 7394*).

COMMUNICATIONS Receiver RME 69, in full working order, 230 volts, 50 cycle supply; what offers?—Box 1134.

FOR SALE: LM10 Frequency Meter, complete with manual, spares, waterproof cover; very good condition; £25.—Box 1132.

ANY PRICE given for Control Boxes and circuits for MN-26-C, BC-733-D, and RT-7/APN-1.—Box 1128.

EDDYSTONE 32-inch rack, complete with four chassis, panels, brackets. RF Meter and two Eddystone Tx condensers, £5; Taylor, Model 400, 50 microammeter, 4in. scale, as new, £4; handy utility electric ¼" drill, as new, £5. VCR97 and quantity EF50 wanted in exchange for other valves. S.A.E. list.—Box No. 1138.

£60 OFFERED for unmodified AR88D in mint condition only. Write giving full particulars. Also required Parmeko 620v 200mA, 376v 250mA, 5v twice, Mains Transformer; and one each of 6AS7, 6AL7 valves in good condition. Offers for FL8A Filters (2), 1147B VHF Rx, 76 Rx.—Box No. 1135.

WANTED: Two Command Receivers; BC454, range 3-6 mc; with or without valves.—Ritson, Red Lion House, Hexham, Northumberland.

WANTED: Army 19 Set, in good condition; Canadian Mark 111 preferred but not essential.—G3GIP, 123 Hamil Road, Burslem, Staffs.

VALVES. Guaranteed. 832 12/6d. each; 5U4G 6V6G, 5/6d. each; VR91, 4/- each; 7MC Xtals complete, 5/-; 8 MC 4/-.—Box No. 1137.

FOR SALE: AR88D in perfect condition; also set spare valves, £55.—Box No. 1136.

AR 88D WANTED: Preferably one not modified, in fairly good condition; also required 3 AC/DC 24 volt prop-pitch motors. — Offers to G3HLS, Kenwood, 21 Park Avenue, Farnborough Park, Kent. Telephone: *Greenwich 0051* (day), *Farnborough 2470* (evening).

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