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The SHORT WAVE Magazine

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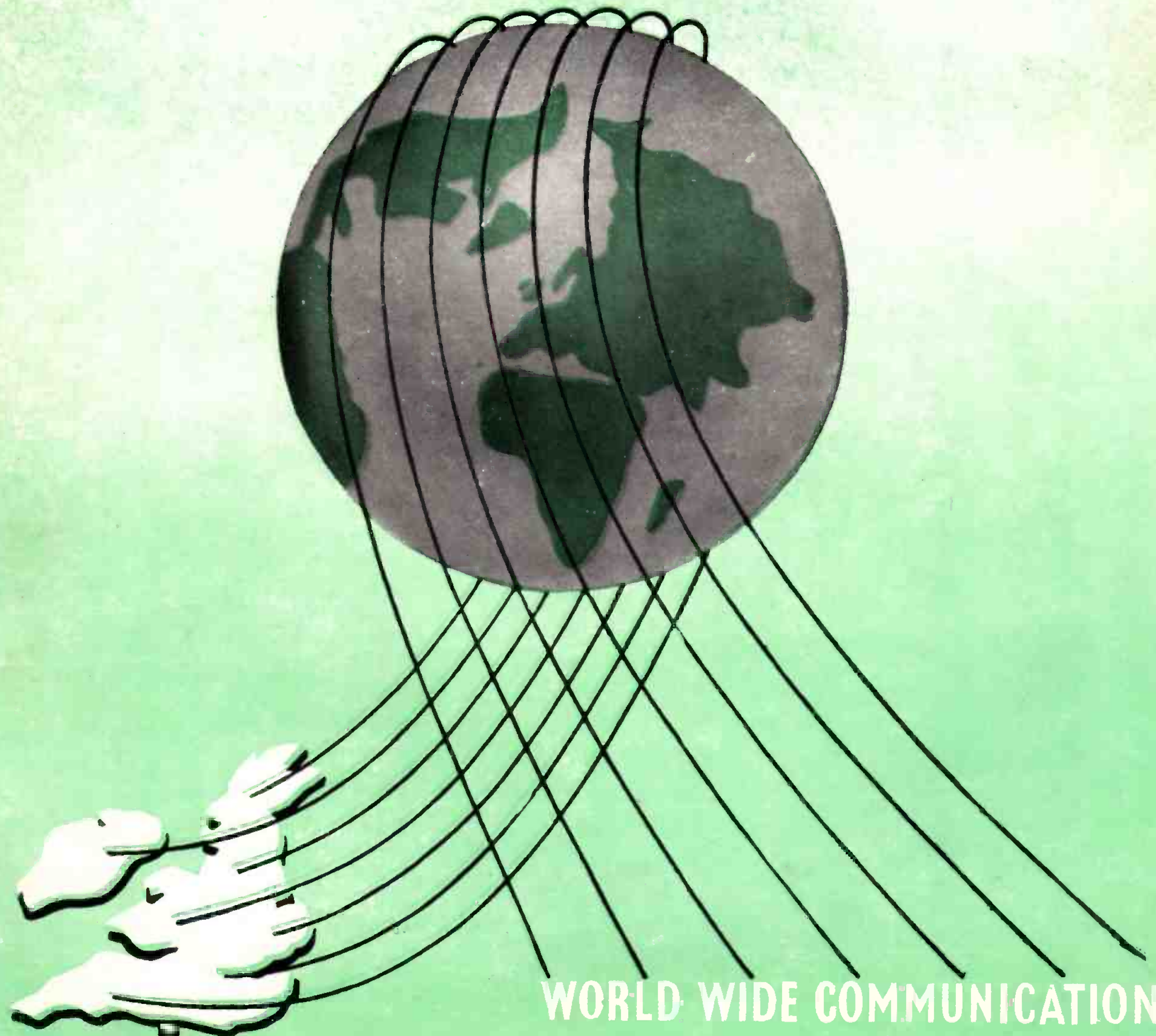

WORLD WIDE COMMUNICATION

SHORT WAVE MAGAZINE

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CONTENTS

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FOR THE EXPERIMENTER AND THE RADIO ENGINEER

The SHORT WAVE Magazine

EDITORIAL

Evolution

Ever since communication by wireless became a practicable proposition, there has always been a strong body of professional opinion — sustained by mathematical argument — holding that wavelengths shorter than those in general use at any given period were suitable only for line-of-sight working. On this assumption, great decisions have been taken, based upon pure theory with no shadow of experimental proof to support it.

This same argument about line-of-sight paths has, in fact, been heard ever since Marconi produced his first results, and he was the first practical radio engineer to challenge it. In our own time, it will be within the recollection of many reading these lines that " wavelengths below 200 metres " were given over to the radio amateurs of the early 1920's because they were considered useless for any commercial purpose. It is well within the knowledge of most readers that even since the last War there has been a general tendency among the professionals to regard the frequencies above about 30 mc as suitable only for local-coverage systems.

In the meantime, amateurs — and in particular British amateurs — were proving that with low power and simple beam systems it was possible to get results, on two metres, over distances of hundreds of miles with fair consistency. The laws governing the mode of propagation by which these results — dependent mainly on the weather — are obtained are now well understood and have been proved almost entirely by amateur effort.

But at the same time, certain British amateurs were able to get on VHF consistent long-range results not altogether explainable by weather effects, while in the States and Canada (where the facilities and opportunities for investigating these phenomena are greater than in this country) it was found by amateurs that VHF DX increased with more power and larger beams with higher gain factors ; moreover, that even on a band like two metres, consistent contact could be made over several hundreds of miles.

All this has been happening, and ideas about it forming, during the last three or four years, during which the phenomenon of VHF DX started to receive increasing attention from professional workers in the field of propagation. In this country, much has been achieved

E D I T O R I A L

under the direction of the Air Ministry, Signals Branch, the head of which is an Assistant Chief of Air Staff. In brief, it is now found that, given sufficient power (one to 10 kW) and a high-gain beam (limited only by mechanical considerations) great ranges, of from 200 to 1,200 miles, can be covered consistently on VHF, irrespective of weather or other conditions, enabling traffic circuits of high capacity and reliability to be established.

The name given to this newly discovered propagation mechanism is Forward Scatter. But let it be said right away that exactly how it is brought about is not yet at all clear. There is, however, no doubt about the results. It is also important to note that while the physical limitations of beam systems naturally tie a communications network to particular frequencies, the phenomenon of Forward Scatter is not itself particularly frequency conscious. Using the techniques so far evolved, much the same results can be obtained on any frequency between about 30 and 3,000 megacycles !

The immediate outcome of this new development, which brings long-range working on VHF into the realms of practical possibility, is that there will be a greatly increased demand for ether space in the hitherto more or less undisturbed VHF regions. Frequencies, and bands of frequencies, will be required urgently, and on the highest priority, to establish communication networks using high power.

For us as amateurs, the significance of it all does not need emphasising in this space. We can take pride in the fact that, once again, radio amateurs are in the forefront of communication development, for it is probable that any VHF operator (and there are many) getting consistent results over 200 miles or more is doing so mainly by Forward Scatter. The efficiency of his equipment is such that he is able to bring, as it were, the mechanism into action — and this quite a number of radio amateurs using the VHF bands have been doing for several years.

Austin Forsyth
G6FO

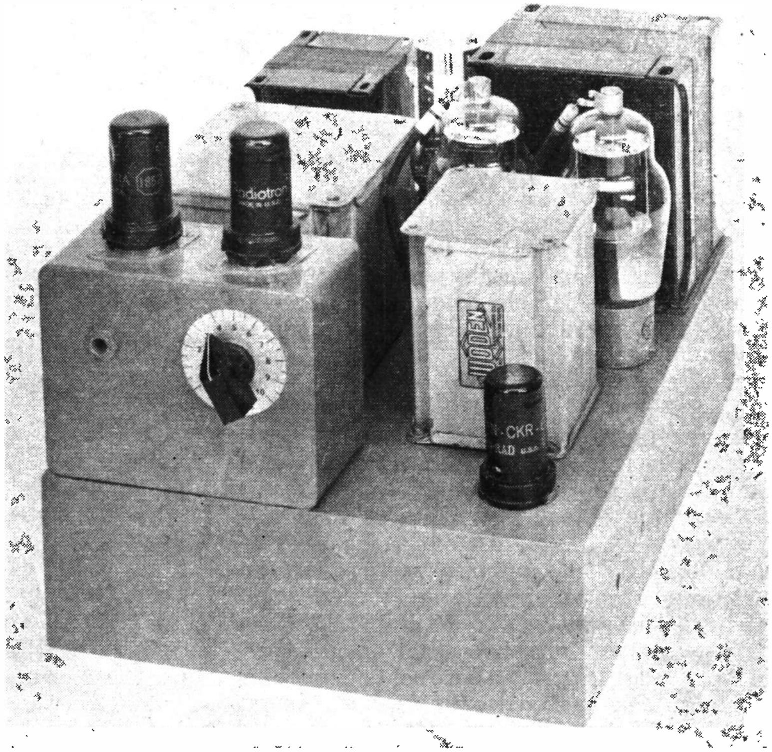
The "Trojan" Modulator

STRAIGHT DESIGN

FOR 25 WATTS

AUDIO OUTPUT

J. N. WALKER (G5JU)



General appearance of the Trojan Modulator, from the front. The speech amplifier section is in the box at the left front, with the microphone jack beside the gain control. For more complete screening of the input, a coaxial connector could be used, or one of the standard screened plug-socket assemblies for audio work. V3 is in the right foreground. As can be seen, this Modulator has its own power pack, and a neat finish is obtained by mounting all the audio components with their connections sub-chassis.

This design will appeal particularly to those who, knowing something of the principles involved, are about to build their first speech amplifier-modulator. Careful consideration has been given to producing a unit which, while being practical, is capable of giving an entirely satisfactory result. By discussing the design stage by stage in some detail, our contributor also makes his article useful reading for those who want general information on the construction of audio equipment for amateur working.—Editor.

WITH the removal of restrictions on telephony operation, many newcomers to the amateur bands will be contemplating occasional activity with voice instead of key. They will be studying both methods of modulation and designs of equipment to meet their particular requirements.

The "*Trojan*" modulator offered here is soundly designed but without frills, is relatively easy to construct and get going, has given excellent results in actual operation and should meet the needs of those wishing to apply modulation to a carrier running between 25 and 50 watts.

The design is based on three main considerations, which are : (*a*) The desirability of commencing operations with straightforward anode modulation (often termed "high level") as distinct from systems calling for more critical adjustment ; (*b*) The attainment of an audio power level suitable for a transmitter running at relatively low DC power input ; and (*c*) The need for flexibility, bearing in mind a possible increase in transmitter power at a later date.

Regarding (*a*), the reader without previous experience of telephony work is strongly recommended to adopt high level modulation at the outset, for two reasons : Successful operation is more likely to ensue from the start, whilst inconvenience to other amateurs, and therefore unpopularity, arising from a badly adjusted transmitter, will be small.

On (*b*), the audio power required, taking into account the inevitable transfer losses, can be obtained without difficulty and without using unduly high voltages, which latter would raise the cost considerably. A governing factor is the choice of modulation transformer and the output level is almost automatically restricted to the categories of the usual commercial transformer. In the present case, the UM1 component, rated to handle a maximum of 30 watts audio power, is the obvious choice. Incidentally, a modulation transformer should never be loaded beyond its ratings—rather the reverse—as considerable distortion is otherwise likely to be introduced, so rendering pointless precautions taken in the earlier stages to keep distortion at a low level.

Flexibility, (*c*), really means two things — arranging the design to suit components which may already be to hand, and making allowance for later raising of the audio output level, without too many components becoming redundant.

Whilst frills and complexities have deliberately been omitted, the design of the *"Trojan"* modulator has not been over-simplified to the point where performance might be affected. In particular, careful precautions have been taken to eliminate those bugbears of many speech amplifier-modulators—to wit, hum and instability. Also, the frequency response has been tailored to some degree to make it suitable for amateur communication work, in which high fidelity is not only extravagant but actually detrimental when it comes to making contacts under difficult conditions. Actual reports on the air indicate that, within its ratings, the modulator gives an excellent performance, with clear speech quality and complete absence of hum.

In fact, whilst primarily designed for the newly-licensed amateur, the "*Trojan*" modulator can be confidently recommended to anyone seeking a suitable design for an output of 20 to 30 watts of audio.

LIST OF PARTS

1	Chassis, aluminium, *Cat. No.* 727	*Eddystone*
1	Diecast Metal Box, *Cat. No.* 650	*Eddystone*
1	Knob and Dial, *Cat. No.* 842	*Eddystone*
2	Lead-through Insulators, *Cat. No.* 695	*Eddystone*
1	Driver Transformer (T1), Type DT1	*Woden*
1	Modulation Transformer (T2), Type UM1	*Woden*
1	Mains Transformer, outputs 300-0-300 volts 150 mA ; 6.3 volts 4 amp. ; 5 volts 3 amp.	
1	Smoothing Choke, 20 H. 50 mA.	
4	Octal Valveholders.	
2	American 5-pin Valveholders.	
1	Valve 6SJ7 or 6AC7 (1852) or 6SK7 (V1).	
2	Valves 6J5 or 6C5 or L63 (V2 and V3)	
2	Valves, Type 807 (V4 and V5)	
1	Valve, Type 5R4Y (V6)	
1	Telephone Jack	*Bulgin or Igranic*
1	Toggle Switch, double pole, single throw.	
2	Top Cap Connectors for 807 valves.	

Table of Values

Figs. 1 and 2. The circuit complete of the "Trojan".

C1, C5, C8	= 5 to 25 μF, 12/15 volts working, electrolytic	R3, R5, R8	= 100,000 ohms, ½ watt
C2	= 0.1 μF, 350 volts working, paper	R4	= 560,000 ohms, ¼ or ½ watt
C3, C6	= .002 μF, moulded mica	R6	= 0.5 megohm potentiometer
C4	= 100 μμF, silver mica	R9	= 220,000 ohms, ¼ or ½ watt
C7	= 0.5 μF, 350 volts working, paper	R10	= 20,000 ohms, ½ or 1 watt
C9, C10	= 8 μF, 350 volts working, electrolytic	R11	= 1,000 ohms, ½ watt
C11, C12	= 16 μF, 500 volts working, electrolytic	R12	= 4,700 ohms, 1 watt
C13, C14	= .01 μF, 1,000 volts working, moulded mica	R13, R14	= 47 ohms, ½ watt
		R15	= 250 ohms, 2 watt
		R16, R17	= 12 ohms, ½ watt
R1	= 1 megohm, ¼ or ½ watt	R18	= 8,200 ohms, 1 watt
R2, R7	= 2,200 ohms, ¼ or ½ watt	R19, R20, R21, R22	= 100 ohms, ½ or 1 watt

The Circuit

There is nothing either new or odd about the circuit, which follows well-tried practice, but some points do call for discussion. It is convenient to deal with them under separate headings.

The Speech Amplifier: The modulator is designed for use with a crystal microphone and the fraction of a volt delivered by such a microphone must receive a great deal of amplification before it reaches a value suitable for driving the power output valves. The early stages are usually referred to as "the speech amplifier" and, because they operate at high gain, they are the more liable to be influenced by external fields — these may be at mains power, audio, or radio frequencies. The more complete the screening, the less the likelihood of hum and instability arising, hence all components associated with the first two valves are housed in a *completely enclosed* metal box. The output is taken by screened coaxial cable right up to the grid of the third valve, and the only possibility of stray pick-up is *via* the microphone. All the care given to the first two stages can be undone if proper attention is not paid to the latter, and more will be said on this point further on.

The adoption of the box to hold the first two stages has other advantages. For one thing, the speech amplifier wiring can be carried out, and the unit tested, as separate operations, which is quite a convenience. For another, the box can be mounted some distance away from the power stages and this may appeal where space at the operating position is restricted. As shown, the box is attached to the floor of the main chassis, but it is possible that, when using bigger transformers to secure a larger output, the "floor space" on the

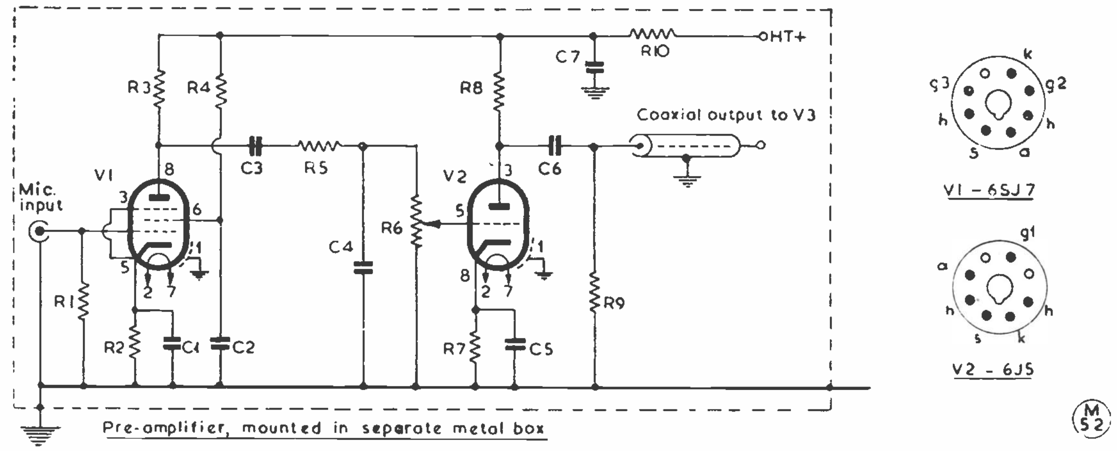


Fig. 1. Circuit of the two-stage pre-amplifier section of the Trojan Modulator. This is constructed as a separate unit, and is mounted in a small box fitted to the chassis. The result is very complete shielding, as regards both RF and hum pick up. Precautions to be taken in the construction of the pre-amplifier are discussed in the text.

chassis will be fully taken up without leaving room for the box; this can then either be bolted to the side of the chassis or fitted away from the main unit.

Those knowing something of high-fidelity equipment (but not of modulators for radio communication work) may be a little surprised at the values selected for the coupling condensers C3 and C6—only ·002 μF as compared to the common value of ·01 μF. The smaller capacity naturally causes a falling off in the low-frequency response, and this is intentional. In fact, in the circuit shown and taking into account the associated impedances, the response at 100 cycles is some 50% down on what it is at 4000 cycles, but this is definitely an advantage. If some readers should have doubts on this score, a value of ·005 μF can be substituted but then almost certainly reports will say "too bassy" or low-pitched, except where the voice is naturally high-pitched.

The condensers C13 and C14 in the main unit act in conjunction with the inductance of the transformer secondary winding to restrict the high frequency response and are most beneficial when the transmitter is to be used on a crowded band. In other circumstances, and when a better-than-usual "top response"

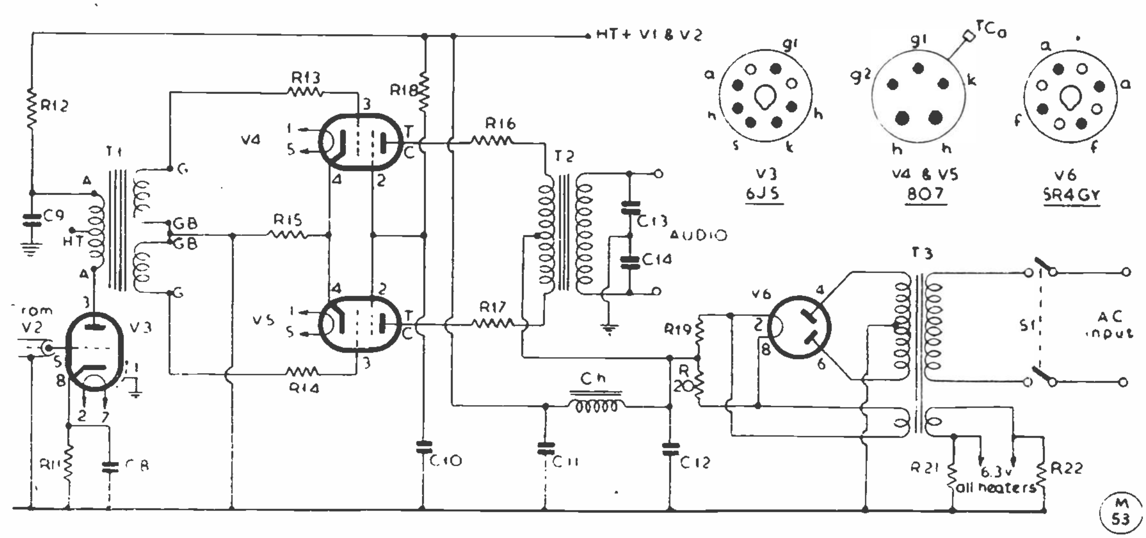


Fig. 2. Circuit of the driver-modulator stages, with the power pack, for the Trojan Modulator. The output across T2 should be about 25 watts audio, ample for any transmitter running 50-60 watts in the PA. It will be noted that the choke Ch. serves only to smooth the supply to the early stages; the plates of the 807's take HT direct from the rectifier. As has been shown by the author in an earlier article ("Points on Power Supplies", August 1955) this is quite permissible. In this circuit, the tap marked "HT" on the primary of the driver transformer T1 is not used, and should be ignored.

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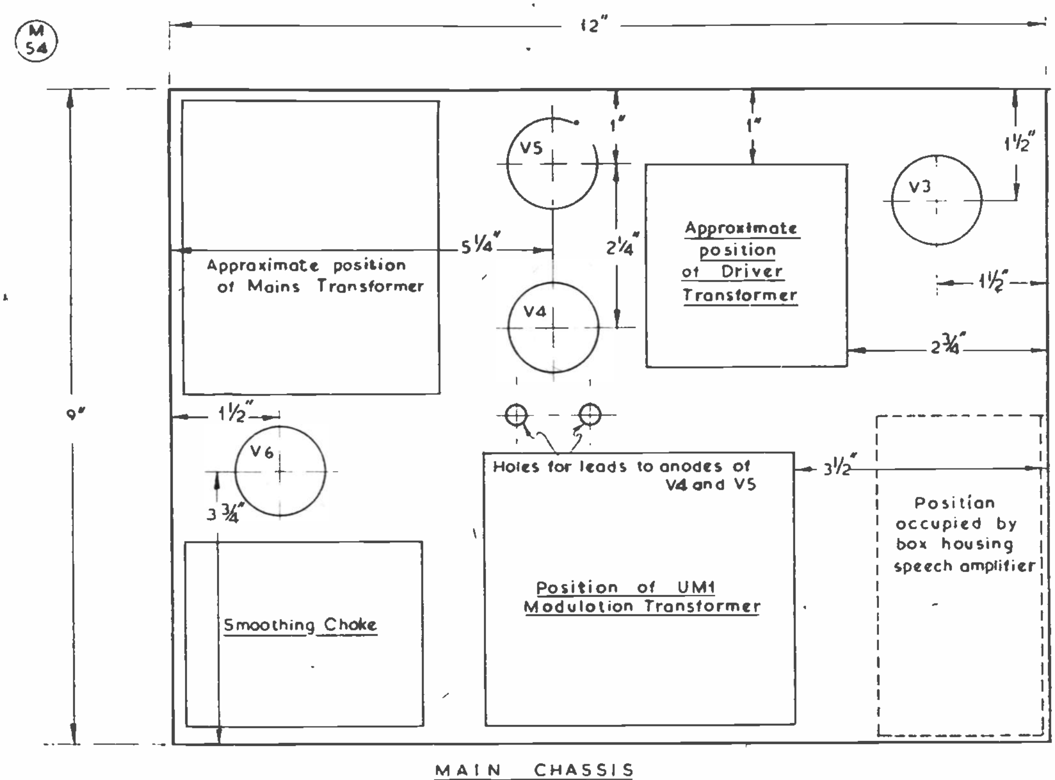
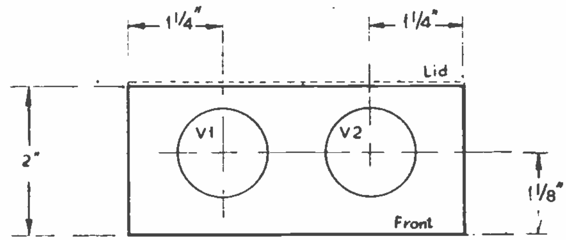




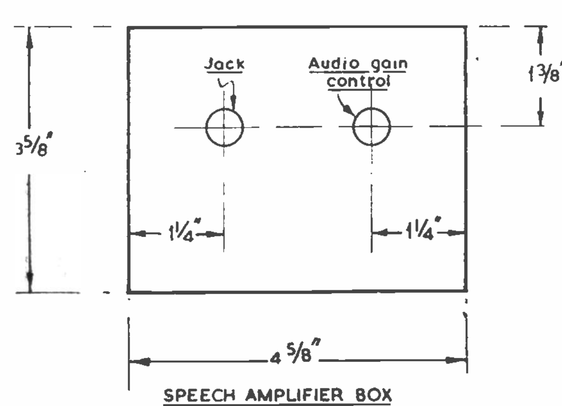
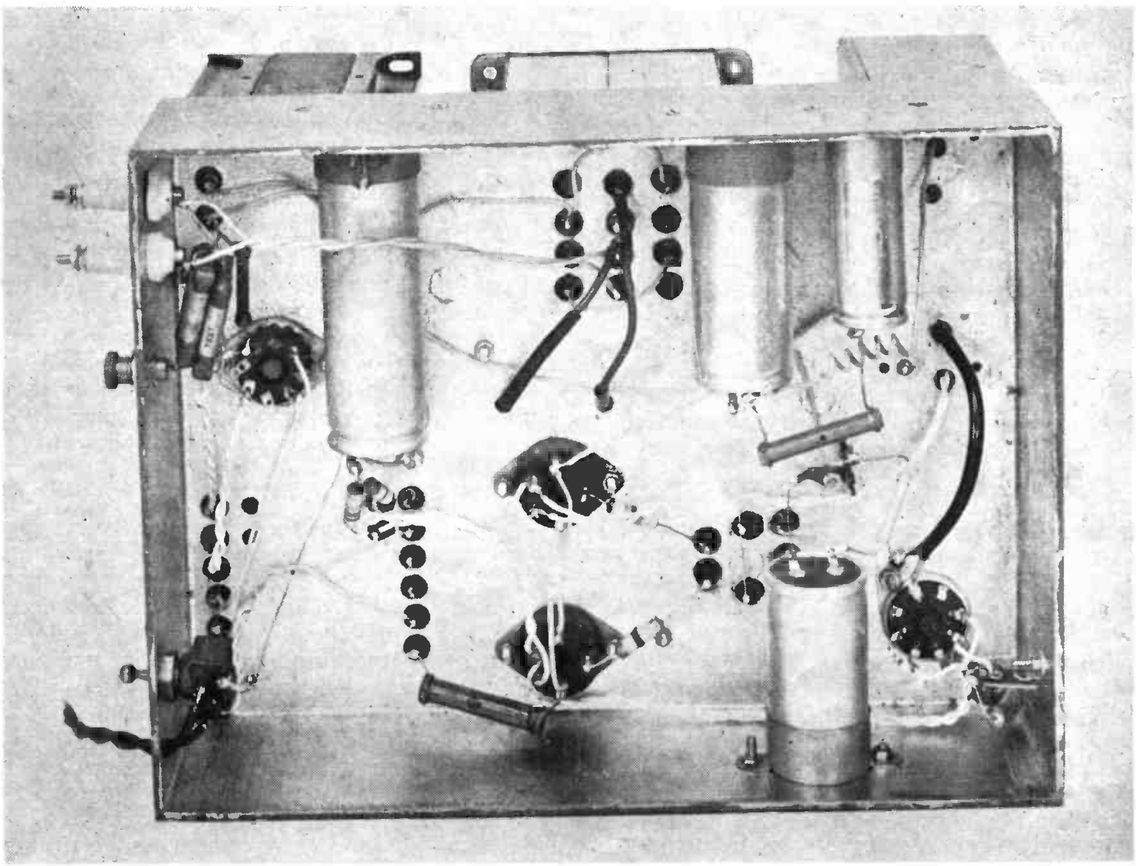


Fig. 3. Drawing detail for the chassis used in the model, as illustrated, for the Trojan Modulator. The speech amplifier box is drilled, wired and fitted as a separate item.

is desired, they can be omitted. Often a single condenser is used for the purpose, but by splitting the component into two parts and earthing the centre, a by-pass path to earth is formed for any RF currents which may be fed back into the modulator along the cable connecting it to the transmitter.

It is intended that no stray radio frequency voltage should reach the speech amplifier circuits, but just in case some small voltage should get through V1 and be amplified, a simple low-pass filter consisting of R5 and C4 is inserted in the coupling between V1 and V2.

There is a choice of valves for the V1 and V2 positions. Standard octal-based types are employed, but miniature types can be substituted if desired, although there will be no real benefit from so doing. To maintain the



Wiring under the main chassis of the Trojan Modulator, as designed and described by G5JU in the accompanying article. Note that the Woden transformers are mounted with the connections sub-chassis, and therefore protected, by drilling out holes large enough for the various tapping points. This enables the component to bolt flat on the chassis, giving the clean appearance shown by the front view photograph. The modulator output is taken from the stand-off insulators on the side chassis drop.

high degree of screening, it is desirable to use metal valves or at least those glass ones which have an internal screen surrounding all electrodes. For the V1 position, the 6SJ7 is the most suitable, the 1852 (6AC7) as good, and the 6SK7 a third choice, but giving somewhat less gain. One point to watch is that this first valve is not inherently microphonic or noisy—even new valves can vary considerably in these respects.

In the V2 position, a 6J5M or 6C5M is recommended, whilst there is the L63 to fall back on if necessary. In all cases, pin 1 should be connected to chassis, to earth the metal envelope. R10 and C7 provide decoupling against audio feedback, and it should be noted that the grid leak for V3 (R9) is included inside the metal box.

Driver Stage: The output from V2 is applied to the grid of the driver valve V3, which is another 6C5 or 6J5, operating under conditions which lead to an output from it of about half-a-watt. If the output valves operated strictly in Class-A or Class-AB1 — that is, without being driven into grid current — high impedance coupling to the grids of V4 and V5 could well be used. However, as it is permissible to allow slight grid current to flow at peaks, it is better to include a standard type of driver transformer, particularly as the latter will in any case be required if modifications are later made to lift the power output level. The whole of the primary winding is used and R12 serves the common purpose of voltage dropping and decoupling resistance.

Power Output Stage: As it stands, the "*Trojan*" modulator delivers an average audio power of twenty watts, but by raising the high tension voltage, something near thirty watts can be made available. There are a number of valves which will work well, including KT66, 6L6, EL37, EL31 and 807. The EL37 has been found very satisfactory in a modulator built several years ago, and if the reader can lay his hands on a pair, it would be well to use them, retaining the resistor values specified. But there is no doubt that the valve most readily obtainable at a reasonable price is the 807, and this type is entirely suitable. It also has the advantage that, if desired, the anode voltage can be raised considerably above that of the prototype version illustrated.

Much could be written on the various modes of operation possible, but actual results are what matter here. Irrespective of the mode, it is a fact that, presuming adequate driving power is available, the power output will depend largely on the HT voltage applied to the anodes of the output valves, with of course the screen voltage adjusted in proportion.

In the prototype modulator illustrated, the HT voltage is 325; with a screen dropper resistor of 8200 ohms the screen voltage is around 270; the cathode bias resistor is 250 ohms, giving a standing bias of 20 volts or slightly more; and the measured power output at low distortion is approximately 20 watts, with a maximum approaching 27 watts. Allowing for a 10% loss in the modulation transformer, the audio energy is sufficient for full modulation of a 36-40 watt (DC input) carrier. In practice, this means there is ample in reserve for modulation of the conventional 25-watt transmitter used by a newly-licensed amateur, and distortion should be non-existent.

It will be noted that self-bias is employed, so cutting out the need for a separate source of bias. With cathode bias, the valves must not be driven hard or distortion will result. If rather more power is required—say up to 25 watts—the anode voltage should be raised to 350 or 360 volts, which simply means using a slightly larger mains transformer with a secondary winding giving 350-0-350 volts. Changes in some resistor values are then necessary, as detailed later.

The output is now reaching nearly the limit of the modulation transformer rating, but if that little extra is required to bring the output up to the full 30 watts, it can readily be achieved by changing over from self-bias to fixed bias. The anode voltage is thereby raised by the amount previously dropped across the cathode resistor (now omitted), whilst the output valves can be driven a little harder.

Alternatively, if the modulator is required for Top Band work only, a smaller mains transformer can be fitted, giving, say, 250 volts HT, with appropriate changes in resistor values.

In all cases the standing anode current of V4 and V5 together should be between 80 and 90 milliamperes, the total static consumption being approximately 100 mA. This will rise considerably when the modulator is delivering power and the mains transformer should be rated to give at least 150 mA.

As described and as confirmed by tests, the output impedance is around the 5000 ohms mark. If the HT voltage is raised to 360, whilst retaining cathode bias, the impedance will rise to about 8000 ohms. When using fixed bias, the figure on which to work is 6600 ohms.

From the foregoing, the reader will begin to appreciate why the design has been labelled flexible and can come to a decision whether to build the modulator exactly as described or whether to make minor modifications.

Power Unit

The previous paragraphs have to some extent covered power supply requirements and there is little more to say. The suggestions made by the writer in an article in the August, 1955, issue of SHORT WAVE MAGAZINE are incorporated, and in fact, the circuit of the power unit is almost the same as Fig. 3 on page 297 of that issue, the only difference being that HT and LT are combined in one transformer. The smoothing choke shown in the upper-view photograph was used because it matches the mains transformer, but its current rating of 100 mA is unnecessarily high and a 50 mA rating is quite suitable.

The rectifier valve should have a reserve of emission to take care of peaks so that, whilst the popular 5Z4G will do for 250-volt operation, it is better on all counts to use a larger valve. A 5R4Y is specified, but the 5Z4 and 5Z3 are equally suitable.

Such refinements as a separate fuse and an indicating lamp have been omitted, but of course can easily be added if wanted.

Construction

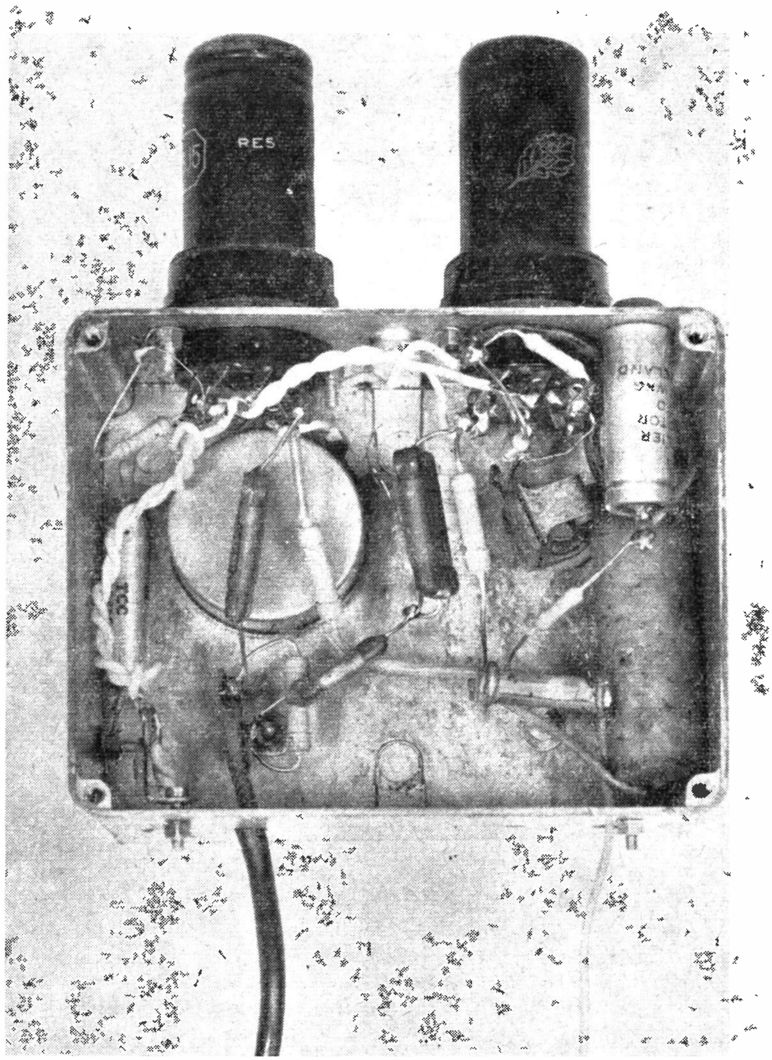
The photographs and drawings provide much of the detail necessary to begin construction. The layout drawing is intended to be treated as a guide only since individual components will probably not fit exactly as shown. However, the general idea should be followed fairly closely, to keep the various stages in proper sequence, and well separated from each other.

It is convenient to commence with the speech amplifier box. The only holes necessary are the large ones for the valveholders, and two of ⅜ in. diameter for the microphone jack and the audio gain potentiometer. In the base are three small holes—one for HT, one for the LT leads and one to take the output cable. Should the box be mounted away from the main unit, the leads can be taken through two holes in the lid, one taking a three-way cable carrying HT and LT, the other for the coaxial cable, the outer of which will serve as earth return.

The cathode bias condensers are shown as 5 μF, but larger ones can be used if on hand and if room can be found for them.

Before fixing in position, the speech amplifier section can be tested independently by supplying LT and HT (200 volts or so will suffice), checking the output across the coaxial cable termination with a pair of high resistance telephones. Using the microphone with which the modulator will be put into service, a loud signal should be obtained in the telephones without advancing the audio gain far.

A good strong chassis is required to take the weight of the four iron-cored components. As usual, all holes should be cut before any components are mounted. A much neater job results, if, as in the illustration, all iron-cored components are inverted and connections made underneath the chassis. But if the amount of drilling thereby involved is to be avoided, the simpler method of mounting the parts with the tag terminals accessible above the chassis can be adopted.



Inside the speech amplifier section, V1-V2 in Fig. 1. Output is by a short length of screened cable, such as coax, into the grid of V3. To maintain stability and eliminate hum, the speech amplifier is built separately into a small metal box bolting on to the main chassis.

It is entirely a matter of choice, but an improved appearance will result if, before anything is mounted, the chassis is given two coats of grey cellulose enamel. This applies also to the metal box.

The large electrolytic condensers are individual units ranged around the sides under the chassis, but dual or triple condensers will simplify matters a little.

The low tension wiring should be kept well away from other wiring, to prevent hum induction effects. The heaters are balanced to earth, and if a centre tap is provided on the 6·3 volt winding, resistors R21 and R22 can be dispensed with. Similarly with R19 and R20, if the rectifier winding is centre tapped, or if a valve of the indirectly heated type is used. In the latter case, care should be taken to earth that side of the heater internally connected to the cathode and usually pin 8 of an octal base.

Anti-parasitic resistors are fitted close up to the anode and grid of each 807 valve. Additional insulation should be provided where the leads from the anodes pass down through the chassis. Ceramic bushed terminals are fitted

Connections for WODEN Types UM.1, UM.2, UM.3 and UM.4 Modulation Transformers

PRIMARY CONNECTIONS FOR MODULATOR VALVES				SECONDARY CONNECTIONS AND IMPEDANCES FOR RF LOAD												
A-to-A Impedance	Audio Valves A	CT	A	Join 9 & 10 conn. to 7 & 12	Join 9 & 10 conn. to 8 & 12	Join 9 & 10 conn. to 8 & 11	Join 8 & 9 conn. to 7 & 12	Join 7 & 9 10 & 12 conn. to 7 & 10	Join 8 & 9 10 & 11 conn. to 8 & 10	Join 3 & 4 conn. to 1 & 6	Join 3 & 4 conn. to 2 & 6	Join 2 & 3 conn. to 1 & 6	Join 3 & 4 conn. to 2 & 5	Join 1 & 3 4 & 6 conn. to 1 & 4	Join 7 & 11 8 & 12 conn. to 7 & 8	Join 1 & 5 2 & 6 conn. to 1 & 2
Ohms.																
2000	2	3—4	5	8600	6350	4300	3620	2150	1070	—	—	—	—	—	200	—
2000	1	2—5	6	15700	11400	7900	6650	3920	1950	—	—	—	—	—	350	—
3000	2	3—4	5	13000	9400	6500	5500	3240	1620	—	—	—	—	—	300	—
3000	1	2—5	6	23500	17000	11800	10000	5900	2950	—	—	—	—	—	520	—
3800	2	3—4	5	16400	12000	8200	7000	4100	2050	—	—	—	—	—	380	—
3800	1	2—5	6	29800	21500	15000	12600	7500	3740	—	—	—	—	—	660	—
4000	2	3—4	5	17400	12500	8650	7300	4300	2160	—	—	—	—	—	400	—
4000	8	9-10	11	—	—	—	—	—	—	5500	3450	2850	1850	1380	—	250
5000	2	3—4	5	21600	15700	10800	9150	5400	2700	—	—	—	—	—	500	—
5000	8	9-10	11	—	—	—	—	—	—	7000	4300	3500	2300	1730	—	300
6000	1	3—4	6	8600	6350	4300	3620	2140	1070	—	—	—	—	—	200	—
6000	8	9-10	11	—	—	—	—	—	—	8300	5150	4250	2750	2180	—	370
6600	1	3—4	6	9500	7000	4750	4000	2350	1180	—	—	—	—	—	220	—
6600	8	9-10	11	—	—	—	—	—	—	9100	5650	4660	3000	2400	—	405
7000	1	3—4	6	10000	7300	5050	4280	2500	1250	—	—	—	—	—	230	—
7000	8	9-10	11	—	—	—	—	—	—	9700	6000	5000	3200	2400	—	430
8000	1	3—4	6	12000	8400	5800	4900	2900	1440	—	—	—	—	—	270	—
8000	8	9-10	11	—	—	—	—	—	—	11000	6900	5650	3700	2760	—	500
9000	1	3—4	6	13000	9400	6500	5500	3200	1620	—	—	—	—	—	300	—
9000	8	9-10	11	—	—	—	—	—	—	12500	7750	6300	4150	3100	—	550
9000	7	9-10	12	—	—	—	—	—	—	6200	3900	3200	2050	1550	—	275
10000	1	3—4	6	14400	10500	7200	6100	3600	1800	—	—	—	—	—	330	—
10000	8	9-10	11	—	—	—	—	—	—	14000	8600	7100	4600	3450	—	600
10000	7	9-10	12	—	—	—	—	—	—	6900	4300	3500	2300	1740	—	310
12000	1	3—4	6	17400	12500	8700	7250	4320	2150	—	—	—	—	—	400	—
12000	7	9-10	12	—	—	—	—	—	—	8300	5150	4250	2750	2070	—	370
14000	7	9-10	12	—	—	—	—	—	—	9700	6000	4900	3200	2440	—	430
16000	7	9-10	12	—	—	—	—	—	—	11000	6900	5600	3700	2789	—	500
18000	7	9-10	12	—	—	—	—	—	—	12500	7750	6300	4150	3140	—	550
Cols. 1	2			3	4	5	6	7	8	9	10	11	12	13	14	15

	Max. Audio Power	DC Input, RF PA	Max. DC Current
TYPE UM. 1.	30 watts.	60 watts.	120 mA
TYPE UM. 2.	60 watts.	120 watts.	200 mA
TYPE UM. 3.	120 watts.	240 watts.	250 mA
TYPE UM. 4.	250 watts.	500 watts.	400 mA

Courtesy Woden Transformer Co., Ltd., Moxley Road Bilston, Staffs.

at the rear of the chassis and are connected to the appropriate output tags on the modulation transformer.

Testing

After buttoning the speech amplifier to the main unit, tests can be made prior to trying out the modulator on the air. The primary and secondary connections to the Woden UM1 modulation transformer will depend on the working impedances (volts/current ratio) of the associated equipments. For example, if the transmitter rating is 400v., 80 mA (equal to an impedance of 5000 ohms): The anodes of V4 and V5 go to taps 2 and 5, whilst 3 and 4 are connected together and taken to maximum HT. Output is taken from taps 7 and 10, with 7 and 9 connected together and also 10 and 12.

But a transmitter running at 500 volts, 50 mA would have an impedance twice as great, *viz.*, 10,000 ohms, and then the appropriate secondary connections would be to tags 8 and 11, with 9 and 10 connected together.

Both when being tested and when put into actual operation, the modulator should be earthed with a short length of heavy cable.

When making tests, it is essential to place some form of load across the modulator output terminals. A mains lamp is not really suitable because the low cold resistance will heavily damp the valves, although a 25-watt lamp will glow fairly brightly if a steady signal from a tone source is applied to the input. It is better to use resistors approximating in value to the normal load impedance. With two resistors in series—say, a 1000 ohm and a 4000 ohm to make up a total of 5000 ohms—a rough check of power output can be made by connecting an AC voltmeter across the resistor of lower value. In the example quoted, one-fifth of the full power will be developed across the 1000-ohm resistor and a voltage rising to 60 or so at peaks should be indicated on the meter, when the audio gain control has been adjusted to give the right amount of gain. This latter will depend largely on the sensitivity of the microphone (different makes vary in this respect), but there is plenty in hand and only with a very insensitive microphone will it be necessary to advance the control beyond the halfway position. If tests are made with a sine wave input, checks should be intermittent or the output valves will overheat.

A Final Word

The inherent stability of the amplifier is high, but it must be emphasised once again that the grid of the first valve is extremely susceptible to stray pick-up and, moreover, this grid is, in effect, connected out from the speech amplifier to the microphone termination. The microphone will be handled by the operator, whose body, in itself, is a high impedance source of hum and noise, as well as being a collector of stray RF energy ! For verification of this statement, one has only to witness the odd waveforms produced on an oscilloscope trace when a finger is placed on the input terminal or lead.

Any likelihood of pick-up from this or other sources must be reduced to an absolute minimum. For instance, the usual type of bakelite shrouded plug terminating the microphone cable leaves a mass of metal unscreened electrically. Metal tape wrapped around the plug and earthed to the cable screen is likely to effect a definite improvement. Another suggestion is to forego the convenience of the telephone plug and jack and use in place a coaxial plug and socket, so making certain of very complete screening. There are also fully screened microphone plug-socket assemblies available for this purpose.

Then there is the microphone itself. If the crystal element is inside a metal case, itself earthed, there will be no difficulty. But some microphones have moulded *plastic* cases and the construction may be such as to leave some "hot" metal—terminals, clips and a length of wire — exposed to stray pick-up. Some ingenuity will then be required to add metallic screening in one form or another, without spoiling the appearance of the microphone. It will be appreciated that these measures, as well as preventing undesirable audio frequencies reaching the grid of the first valve, will also have the effect of greatly reducing the possibility of stray RF reaching the modulator, with the overall result of extremely good stability irrespective of the transmitter frequency.

	250 volts HT	350 volts HT
R12 ...	2,000 ohms	7,500 ohms
R15 ...	150 ohms	300 ohms
R18 ...	1,000 ohms	10,000 ohms

There will be no need to change any of the resistor values in the speech amplifier section with change of HT line voltage. The gain will rise with an increase of HT voltage, but this is a desirable feature. Details of necessary alterations in the values of resistors forming part of the main unit are given above.

(*See over for notes on Table p.632.*)

EDITORIAL NOTE: The most versatile, widely used and readily available modulation transformer is the Woden, made in four power ratings. The Table facing p.633 gives detailed information on the connection sequence—which is the same for all four types—and also the power and current ratings for each size. All four types have a total of 12 tapping points, numbered in the same order for each size.

Interpretation of the Table of Connections is simple. Suppose the modulator consists of a pair of 6L6's in Class-AB2 which (from the data on the application of 6L6's) are shown to have an anode-to-anode load impedance of 6000 ohms; this value is found in the left-hand column (1) of the Table on p.632, with the appropriate connection sequence in the next column. The PA to be modulated might be an 807 running 50 watts DC input at 500 volts. From Ohm's Law, this gives a PA anode impedance of 5000 ohms; looking along the Table, opposite the lower of the two 6000-ohm lines in Col. 1, 5150 ohms is found in Col. 10; this is near enough for a good match, and the connection sequence is read off in the heading to Col. 10. It means that the points numbered "3" and "4" on the transformer are wired together, and that points "2" and "6" are connected in series with the HT supply to the PA.

On the primary side, the anodes of the 6L6's are taken to "8" and "11" respectively, and the HT feed (for the modulator) to the junction of "9" and "10."

In view of the power ratings involved in this example—about 30 watts of audio and 50 watts DC input to the PA—the correct choice of transformer would be the UM.1. But it will be noted that the rating of the UM.2 represents power levels to which most amateurs aspire, and when buying a modulation transformer, it is always a good plan to consider whether the extra expense of the larger transformer might not in the long run be an economy, since it works equally well at any power level up to its full rating.

The N.Z. ZC1 Mk. II for Portable Operation

CIRCUIT DETAILS AND MODIFICATIONS

C. R. PLANT (G5CP)

Many of the mobile signals to be heard on the Top Band and 80 metres emanate from a "surplus" N.Z. ZC1 Mk. II transmitter/receiver assembly, which lends itself admirably to the purpose. However, like all "surplus" equipments operated on our bands, alterations and modifications are called for if the best results are to be obtained. This article discusses the popular Mk. II version of the ZC1, which as it stands covers the HF end of the Top Band, as well as the 80- and 40-metre bands in their entirety. Our contributor is well known as a very successful /M operator and his ideas and suggestions will be of practical value to all who are interested in mobile working.—Editor.

DURING the past two years a large number of New Zealand ZC1 Mark I and II Transmitter-Receivers have been sold on the surplus market. These excellent units have found favour with a number of mobile amateurs and are also installed at many fixed stations.

The ZC1 was designed for the use of the New Zealand Forces as a mobile or fixed unit: it is fully tropicalised, thus making it very suitable for outdoor use.

It is entirely self-contained in a strong metal housing and consists of a five-valve transmitter and a sensitive six-valve receiver, together with a synchronous vibrator pack which supplies the necessary smoothed HT.

The set in its original form can transmit and receive phone, CW or ICW with an RF output of between 1 and 1½ watts. The power supply for the ZC1 is obtained from a 12 volt accumulator, the current consumption for an unmodified Mark II unit being :—

Receiver only	2.8 A.
Receiver and Transmitter Filaments	3.8 A.
Transmitting CW	4.4 A.
Transmitting Phone (or ICW) ...	4.9 A.

Using a 12 foot whip mounted on a car, reliable communication up to 12 miles can be expected; when operating on the 1·8-2·0 mc amateur band this range has on many occasions been considerably increased.

There are many modifications which may be carried out to improve the performance of the set. The writer, however, proposes to limit the scope of this article to those which he has

This photograph gives a very good idea of the aerial arrangement used by G5CP, and its scale. The loading coil is the cylindrical fitting on the whip, and notes on the construction of this coil and the adjustment of the aerial itself are given in the text. The car is a Vanguard, and the equipment used is a ZCI Mk. II (carried in the boot) modified as described in the article. G5CP/M can be heard on about 1900 kc.

actually tried, with a passing reference to other possibilities. These suggested changes refer to the ZC1 Mark II Unit, but in some cases they will also be applicable to the Mark I.

To the prospective mobile operator, the first difficulty which will probably present itself is the fact that the ZC1 is designed for use with a *negative* earthed system, whereas the modern car usually employs a positive earth. The easy way out is to provide a separate accumulator and if this is done two advantages result, namely, that:—

(a) Generator and ignition noises are greatly reduced, and

(b) The already heavily loaded car battery is not further taxed!

If, however, the decision is to use the existing positively earthed car battery, the following changes will be necessary:—

(1) Reverse the connections on the battery input socket,

(2) Reverse the HT + and − output from the vibrator unit (these are the two wires which come out of the right-hand rubber washer underneath the vibrator pack),

(3) Reverse connections to smoothing condensers C19A and C19B,

(4) Modify the push-switch on milliammeter, as shown in Fig. 1.

Early reports indicated that the modulation level was rather low. This can be corrected in two ways, the first method being more complicated than the second.

METHOD A.

(1) Remove the first modulator valve V1G and replace with an EF37A.

(2) Increase the heater series resistor R21A to 30 ohms,

(3) Fit a 220,000 ohm anode load resistor at R8D and a 680,000 ohm screen resistor, at R4D,

(4) Increase the cathode by-pass capacity C6D to 25 μF (this modification, whilst increasing gain, may have an effect on the ICW tone and is probably better left out),

(5) Reduce the 6V6 modulator valve, V4B, bias resistor R19A from 500 to 300 ohms.

If, when the above modifications have been carried out, hum is present, the probable cause

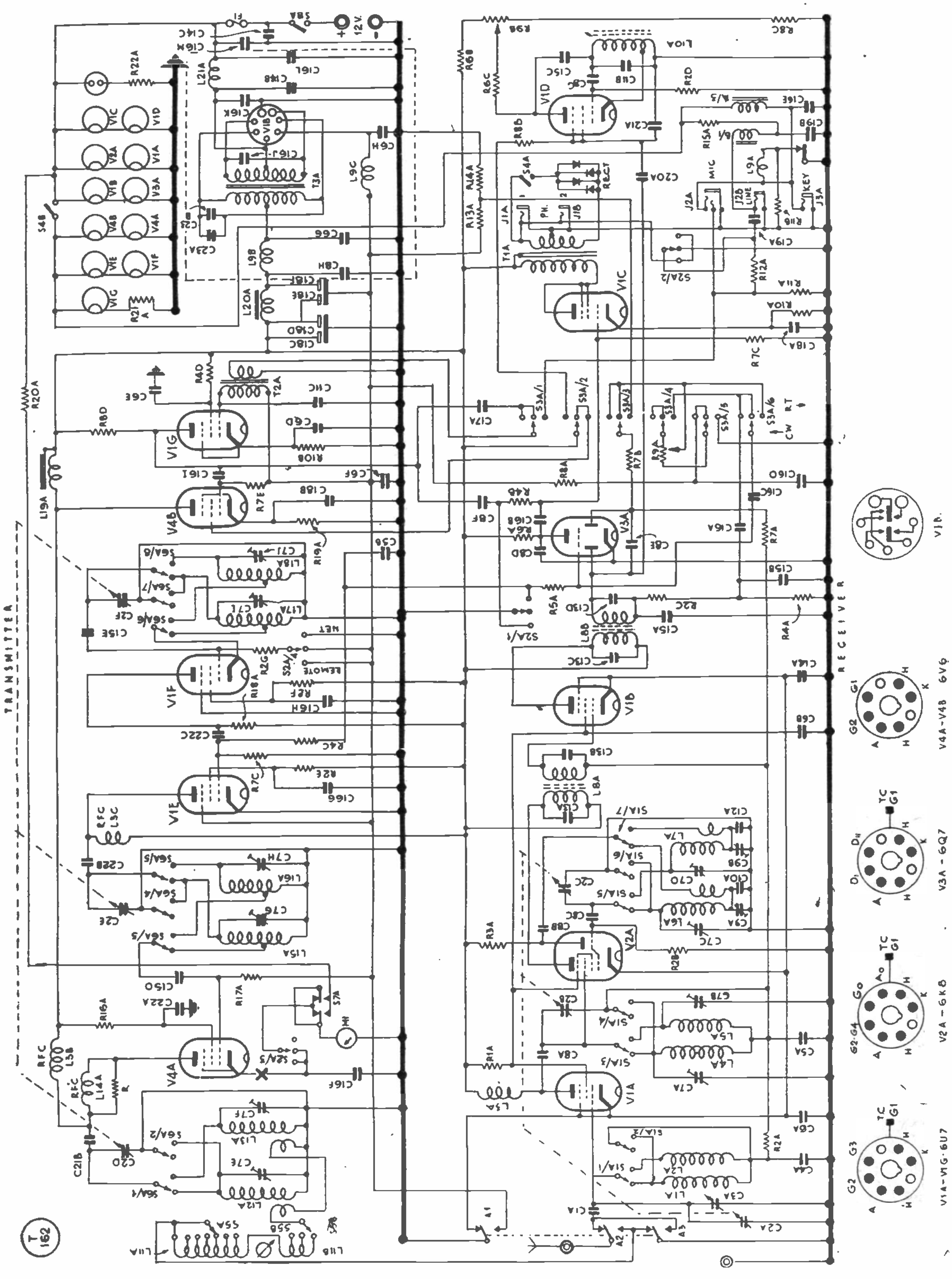

TRANSMITTER
RECEIVER
T 162

Fig. 2. Circuit complete of the N.Z. ZC1 Mk. II equipment, as in the original, is shown on the opposite page, with the circuit values in full in the table. The transmitter RF section is V1F, V1E, V4A, consisting essentially of a VFO-Buffer-PA arrangement, with V4B as modulator and V1G as the single speech amplifier (for a carbon microphone). The receiver section is V1A, V2A, V1B, V3A, V1C, with V1D as BFO. Power is by synchronous vibrator rectifier, and maximum current drain, at 12 volts, is 5 amps. on phone. Change-over control is by a relay system, with switching for CW/phone working and band selection. In the ordinary way, the band switch (shown as for the LF range) would remain as set for 160-metre working.

will be found to be on the microphone side. An examination of the circuit shows that it may be introduced by the relay switch wire, which shares a common earth return with the microphone circuit. The easiest way to correct this is to run a separate wire for the relay control circuit.

METHOD B.

A much quicker method is to substitute a 6K7G for the 6U7G as fitted at V1G without any circuit changes, and to replace the moving coil microphone by a P.O. type carbon inset. In order to energise the microphone it is only necessary to cut the blue lead which runs to the terminal at the top of the handset interior and to pass the two ends through suitable holes drilled in the back of the case to a 1½-volt cell clipped to the case. The energising current will then be switched on and off by the normal send/receive switch already mounted on the handset.

In some instances modulator instability is evident if the microphone energising battery is incorrectly polarised, but it is a simple matter to correct this.

Aerial Arrangement

Attention can next be turned to the aerial. It is possible to radiate a reasonable signal by employing an 8 or 12 foot whip fixed to any convenient part of the car, provided it is well insulated from the metal work. Infinitely improved results can be obtained if the aerial is tuned to a quarter-wave length by means of a loading coil. In the writer's case this is

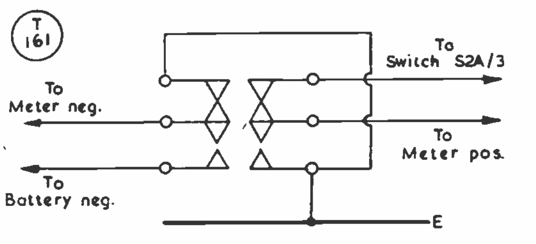


Fig. 1. If the equipment is to be run from the existing car battery — which in the case of most modern cars will be connected with the positive side earthed — the meter switch connections should be altered as shown here. However, to keep the load on the car's own battery within its rating, it is better to use a separate 12-volt accumulator. It would not then be necessary to modify the meter switch, as the battery can be connected with a negative earth.

Table of Values

Fig. 2. Circuit of the ZC1 Mk. II unmodified.

C1A	= 15 μμF silvered mica
C2A-C	= Gang condenser
C2D-F	= Gang condenser
C3A	= 5/35 μμF, variable
C4A	= .02 μF, paper, 400v. wkg.
C5A-B	= .02 μF, paper, 400v. wkg.
C6A-H	= 0.1 μF, paper, 400v. wkg.
C7A-J	= 3-30 μμF, Philips' Trimmer
C8A-1	= .0001 μF, 'Postage Stamp' mica, 400 v. wkg.
C9A-B	= 500-1,200 μμF, semi-fixed
C10A	= .0005 μF, 'Postage Stamp' mica, 400 v. wkg.
C11B-C	= .0005 μF, 'Postage Stamp' mica, 400 v. wkg.
C12A	= .0015 μF, 'Postage Stamp' mica, 400 v. wkg.
C13A-D	= .00008 μF, mica, 400v. wkg.
C14A-C	= 0.25 μF, paper, 400v. wkg.
C15A-E	= .00005 μF, 'Postage Stamp' mica, 400v. wkg.
C16A-M	= .004 μF, 'Postage Stamp' mica, 400 v. wkg.
C17A	= .02 μF, Paper, 400 v. wkg.
C18A-F	= 10 μF, double electrolytic, 450v. wkg.
C19A-B	= 25 μF, electrolytic, 25v. wkg.
C20A	= 5 μμF, silvered mica, 400v. wkg.
C21A-B	= .001 μF, 'Postage Stamp' mica, 400 v. wkg.
C22A-C	= .00025 μF, 'Postage Stamp' mica, 400v. wkg.
C23A-B	= .011 μF, mica, 1800 v. wkg.
R1A	= 20,000 ohms, 2-w.
R2A-G	= 50,000 ohms, ½-w.
R3A	= 25,000 ohms, 2-w.
R4A-D	= 0.5 megohms, ½-w.
R5A	= 10 megohms, ½-w.
R6A-C	= 0.25 megohms, ½-w.
R7A-E	= 1 megohm, ½-w.
R8A-D	= 100,000 ohms, ½-w.
R9A-B	= 0.5 megohm, potentiometer
R10A-B	= 2,000 ohms, ½-w.
R11A-B	= 200 ohms, ½-w.
R12A	= 1,000 ohms, ½-w.
R13A	= 1,400 ohms, 2-w.
R14A	= 55 ohms, ½-w.
R15A	= 50 ohms, ½-w.
R16A	= 15,000 ohms, 1-w.
R17A	= 20,000 ohms, ½-w.
R18A	= 10,000 ohms, ½-w.
R19A	= 500 ohms, 2-w.
R20A	= 200 ohms, 1-w.
R21A	= 20 ohms, 2-w.
R22A	= 100 ohms, 1-w.
V1A-G	= 6U7G
V2A	= 6K8G
V3A	= 6Q7GT
V4A-B	= 6V6GT
VIB	= 12v. synchronous, 7-pin

mounted four feet above the base and consists of 240 turns 18g. enamelled copper wire close wound on a 1½ in. Tufnol former. Tappings are brought out at 5, 10, 15 and 20 turns at the top, and single turns 1—6 at the bottom. This allows selection over a wide range of frequencies and has proved to be adequate for the Top Band frequencies covered by the Mark II set.

An easy way in which to obtain resonance on 3·5 mc is to bring out a tap at the coil centre, but a more efficient result will be obtained if a special coil is used for each band. When using aerial taps it is important to leave all unused turns open-ended otherwise the coil will not tune satisfactorily.

Many experiments have been carried out using a variety of loading coils, and it has been ascertained that when the aerial carries a loading coil at some point above the base (the higher the better) improved efficiency results. In the writer's case, 4 ft. was considered an ideal height in view of the difficulties experienced due to mechanical instability when the heavy coil was elevated still further.

Initial tests were made with the aerial system resonating at half-wave, but it was found that a quarter-wave aerial gave a much improved result.

[over

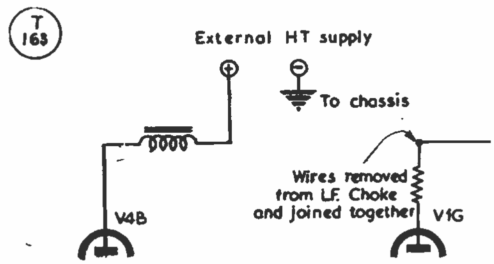


Fig. 3. Connections for an external HT supply for the modulator section V4B, V1G — see Fig. 2.

A simple method to determine whether or not the aerial is tuned quarter-wave is to pass a neon tube over the loading coil from the base to the top of the winding and assuming the system to be a quarter-wave the lamp will increase in brilliance to a maximum at the top of the coil. If the aerial is loaded half-wave the lamp will shine with equal brilliance at both ends of the coil and have reduced brilliance at the centre.

Many operators will wish to increase the RF output, and this may be done by substituting a 6L6 *metal* valve in place of the existing 6V6 at V4A. When this is done it will be necessary either to connect a fixed resistance in parallel with the 6V6 modulator valve heater, V4B, so that the increased current required by the 6L6 heater can be obtained, or (an easier method) to replace both 6V6 valves with 6L6 metal valves; the metal type is specified due to the lack of available space for the glass type.

Transmitter Alterations

These modifications will necessitate an external HT supply which may be brought into

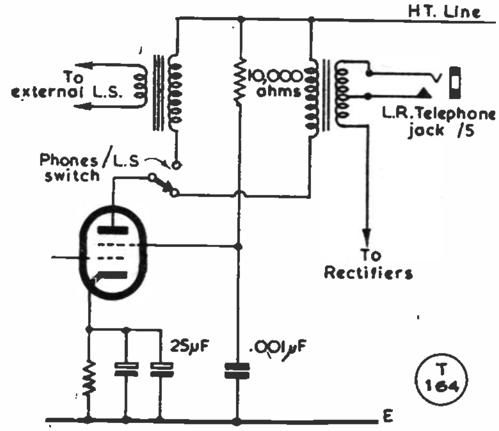


Fig. 4. To operate a speaker in the car, V1C can be replaced by a small pentode, 6F6 or 6V6; circuit alterations needed are explained in the text.

the set, *vide* Fig. 3. This shows that all wiring to the modulation choke L19A is removed, joined together and taped. The external HT supply, 250-300 volts, may then be connected between the modulation choke input and chassis.

When this modification is made, and referring to Fig. 2, the following changes are necessary :

(1) Condenser C21B removed and replaced with a .001 μF mica, 1,000 volt working,
(2) Trimmers C7E/F taken out and replaced with 3-30 μμF variable miniature condensers, wide spacing,
(3) Bias resistor R19A removed and replaced by a 2-watt 200-ohm resistor,
(4) Screen resistor R16A, V4A, replaced by a 2-watt 15,000 ohm resistor.
(5) Screen by-pass condenser C22A removed and replaced by .00025 μF, 1,000 volt working,
(6) Insert a 150-ohm 3-watt resistor in the PA cathode lead at point "X."

The external HT may conveniently be obtained from a 12-volt motor generator; there are many suitable units available from Government surplus stores at very reasonable prices.

The existing PA link circuit is not very efficient and a greater output may be obtained if the two coils are removed and replaced by:

L12A (Top Band) — 7½ turns (20 SWG)
L13A (80-metre band) — 4½ turns (20 SWG)

It will be noted that these coils in the unmodified unit are connected in series, but when this modification is carried out it will be necessary to switch them, utilising spare contacts already existing on the transmitter wavechange switch. This modification is really worth while, an increased output of up to 50% being easily obtained.

Up to now we have dealt with the transmitter section only. Now we turn to the receiver.

Receiver Changes

This is a five-valve superhet with an additional valve V1D which acts as BFO for CW reception and tone generator when transmitting ICW.

It is a highly efficient receiver and requires very little modification. If the output stage is required to work a small loudspeaker it will be necessary to remove valve V1C and to replace it with a small pentode, a 6F6 or 6V6. The following changes will then have to be carried out (shown in Fig. 4).

(1) Valve V1B will need a resistance in parallel with the heater in order to pass the additional heater current required

by the new valve,

(2) R10A should be removed and a 650-ohm, 1-watt resistance substituted,

(3) C18A requires a 25μF electrolytic condenser in parallel,

(4) A screen connection *via* a 10,000-ohm, 1-watt resistance should be taken from the HT side of T1A; and a .001 μF 400v. working fixed condenser connected between the screen and earth,

(5) A miniature pentode output transformer will be required to load the external speaker; this can be wired in circuit together with a selector switch, so that the headphones or, alternatively, the loud speaker, may be switched into circuit.

Some improvement has been found by introducing a tuned circuit between the aerial change-over relay and condenser C1A (*see* Fig. 5). The originator of this was G5GX to whom the writer wishes to acknowledge his indebtedness for having assisted him in the early days when the ZC1 was an "unknown quantity."

Control

The writer has installed the ZC1 Mark II set, modified as outlined in these notes, in the boot of his Vanguard, and can operate on 1900 kc, while the car is in motion. It is possible to tune the receiver portion remotely by means of a flexible drive, but the transmitter section is pretuned and this can only be varied by stopping the car and opening the boot. Two switches and a volume control complete the controls at the driving position, the first switch

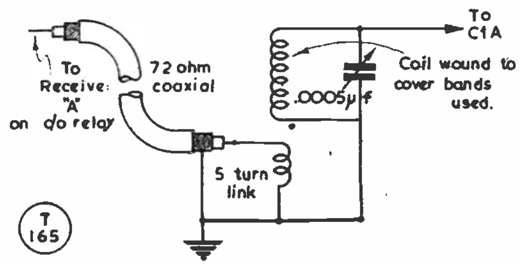


Fig. 5. Circuit arrangement for improving the front end of the ZC1 Mk. II receiver section. The tuning condenser is as fitted in the original.

being of the rotary type, every push operation alternatively either making or breaking the contacts, together with a microphone battery switch.

It is, therefore, a simple matter, having tuned a station, to press the button to "transmit" and then to carry on a QSO with both hands on the wheel—a very important point in these days of traffic congestion.

Using the modified equipment as described, many mobile phone contacts on Top Band have been obtained, with a maximum range of 94 miles mobile to fixed station. The best contact, mobile-to-mobile, was with G3DQ (Flamborough), when in Hunstanton, Norfolk. The best CW contact made whilst mobile was from North Derbyshire to Bognor Regis, Sussex, well over 200 miles.

It is hoped that this article will help to encourage a larger number of amateurs to take up this new and exciting addition to the hobby of Amateur Radio.

SPRING MOBILE RALLY

This is to take place on Sunday, April 8, at Overstone Solarium, 6 miles north-east of Northampton (between the A43 and A45), from 12.00 to 6.00 p.m., with a specially good lunch (8s. 6d.) at one o'clock and tea (2s. 6d.) at 5.0 p.m. Note that meals wanted *must* be booked seven days in advance with the Hon. Secretary, Northampton Short Wave Club, 8 Duke Street, Northampton.

Events scheduled include a mobile treasure hunt (no D/F allowed) and a measured field-strength contest; both with prizes. Talk-in stations will be early on the air, using 1896 kc, 3650 kc and 144.66 mc, under call-signs G2HCG/A and G3GWB/A. Telephone watch will also be kept at Overstone (Northampton/Moulton 324411) for those who get lost or who may fail to make contact over the air.

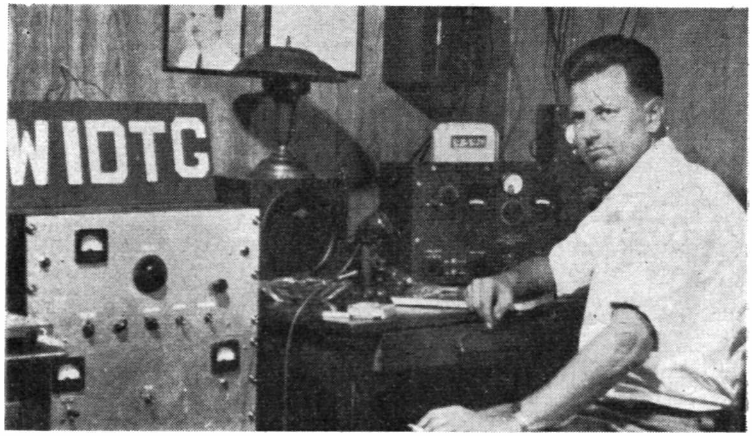
If you are /M or in any way interested in mobile operation—or would just like a family outing which is sure to be interesting—book yourself and party for April 8. Since Overstone Solarium is being opened specially for the occasion, there will be a general entrance fee to the grounds of 6d. a head, payable at the gate. If the weather is fair, this first Mobile Rally of the year should be most enjoyable.

PRICE INCREASE—MARCH ISSUE

The trend of events has caught up with us and we much regret that, effective with the next (March) issue of SHORT WAVE MAGAZINE, we are compelled to increase its cover price to 2s. 6d. Except for one year, the price for the last eight years has been held at 2s. In the circumstances, we feel sure readers will agree that the increase is fair and reasonable. Direct subscribers are not affected until their renewal becomes due, and we are prepared to accept new subscriptions at the present rate of 24s. per annum until March 9, the date of publication of the next issue.

DX COMMENTARY

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



W1DTG

CALLS HEARD, WORKED and QSL'd

WE have a very mixed bag to report this month. After the really wonderful conditions prevailing in November and December, all bands seems to have taken a nasty dip, and activity has fallen off in proportion. This, we rather think, is more seasonal than ionospheric (if one may put it like that). Several times between 1946 and 1953 we note from our log that January was perhaps the worst month on the HF bands, and we feel sure that the DX season everyone is looking forward to will be a good one—and that it will be well under way by the early Spring.

DX *has* been quite good on occasions, but the general level of the bands, at the time of writing, is nothing like it was a month ago. It is also significant that the 160-metre Trans-Atlantics on Sunday mornings have not been up to last year's standard, so far, and that the Top Band DX is (as one would expect) more difficult as the sunspot cycle progresses. We will start at the LF end of our spectrum.

Top Band DX

Lots of G's were active on December 4, but the only one reported on the other side by W1BB was G5JU (Birmingham), who worked W1BB, W1EPE and K2BRW. The North-South path was good, with KP4CC and KZ5PB getting into the States very well.

On December 8 another "first" was chalked up. DL1FF and a few others obtained special permission to use the band, and DL1FF himself worked W1BB, 3FBV, 3RGQ and 8GDQ. W3RGQ was the first to work DL.

December 11 was better. Most of the old-stagers among the G's got across, and four stations—G3IGW, 3JEQ, 3KKP and 5NS—made it for the first time. DL1FF was also working them again.

On December 13 XE2OK showed up on 1822 kc and worked some W's; on the 17th quite a few G's made it. December 18 was another good morning, the principal excitement being provided by YN1AA on 1820 kc. Most of the usual G's were on, also DL1FF, and W1BB reports that some of the G's stayed in until 0825, at which hour G3GGN peaked to 559 and then went out. Another 'first' was made on December 15, when W2QHH worked YN1AA on both phone and CW.

December 25—Christmas morning!—and still a fair amount of activity, but the only European worked by W1BB was G5JU, who was heard from 0500 until 0730 at 449/559. DL1FF and HB9CM were also heard weakly over there. DL1FF, curiously, says that W signals are scarce in Germany and that he hears KP4CC, KZ5PB and YN1AA much better than the W's.

Much of the above information comes from W1BB's excellent bulletins, for which we thank him. British stations seem to be very reticent about their own doings and mostly don't trouble to notify us when they work across the Pond (even for the first time), but we hear about it just the same! This does not mean that we don't want reports from this end—we should like far more of them, *please*.

The report from G5JU is that on Christmas morning the band was noisy, but conditions were not too bad; at any rate, he worked W3EIS, W3FBV, W8ANO and W9PNE, as well as W1BB. On December 27, the noise-level was low, but ship-shore QRM was very troublesome; G5JU worked W2EQS, W3FBV, W3RGQ, W4TZN and W9NPC. He remarks that G3FPQ was evidently getting over well, working W2EQS and being called by W4TZN. January 1st, New Year's morning, was quiet, with few DX signals up, but G5JU managed to raise W1AHX, W1BB and W2QHH. G5JU's opinion is that conditions so far this season have not been too good, though activity is being well maintained by the DX clan.

G3IGW (Halifax) tells us that

on December 18 he heard YN1AA. KZ5PB, sundry W's and SP3CU. He thought the latter was a bit odd, but a later QSO with him on Eighty proved him to be O.K.

G3FPQ (Bordon) spent a long time on finding an aerial which would get him across on Top Band, and tried four in all, including a 900-ft. wire! He finally settled for a 250-ft. centre-fed, 50 feet high. With this he had W1BB back to his CQ call on January 2. Later, on January 8, he raised W1BB, 2EQS, 4TKR, 8ANO and 9PNE—pretty good proof that the new aerial works. W4TKR gave him a report of 579, but other reports averaged S4. W4TKR, by the way, uses only 25 watts himself.

G3JEQ (Great Bookham) raised W1BB and ZB1BJ on December 11, the former for his first Trans-Atlantic DX.

Other Top-Band News

HB9T (Zurich) successfully claimed his WABC Certificate—no mean feat for an HB! — and writes: "I am delighted to get this award. It was quite a job to get confirmations from 61 counties, and I am as proud as when I got the WAC, 25 years ago. Though I am very QRL, I shall continue to work on 1.8 mc, trying to get more counties."

G6VC (Northfleet) is not doing much on this band, having lost his half-wave at the beginning of the year. He heard some W's but made no contacts. (Mortality among these very long long-wires was pretty high during the freak gales early in January!)

G3JHH (Hounslow) collected GW3CBX in Pembroke for a new one, and received a long-awaited QSL from Denbigh, so he is now 81/82. He is looking forward to summer and some DX-peditions. Other QSO's were with OK1AEH, GM3JFG (Ross), GM3HZA (Renfrew) and GC3KAV (Guernsey).

Talking of DX-peditions, we are glad to hear from G3IGW that he, in company with G3JML and G3KKP, hopes to do another one this coming Easter. G3IGW says that as all counties have now been represented at some time or other, he wants to find out where the greatest need is. Will those interested therefore please drop him a card and say which odd counties they would most like to work — he and the team will then see what they can do about it. (QTH-R in latest *Call Book*).

G2CZU (Bath) claims his WABC at last . . . he was the chap who could have collected one years back if we hadn't started the thing from the date-line of January 1952! This time he was considerably held up because two contacts in Brecknock didn't produce a QSL between them.

G3FAS (High Wycombe) has returned to his old stamping-ground after a burst of DX on Twenty, and sends along a much-improved score for the Top Band ladder. He was helped up by GM3KHJ (Inverness), GM3AUD (Ross), GD3UB, G2KK and G3KNQ (Leicester) and G3BK (Cambridge).

G3CO (London, S.E.14) says that although the improvement in the HF bands has reduced activity on 160, he thinks a quick WABC is still possible. On January 4, between 2230 and 2300, he logged twenty counties in half an hour. He adds that GM3KHJ always has a queue, that activity from Banff is mighty scarce, and that a station signing DM3XYA showed up and was chased by all and sundry, although no one appeared to have been successful. Was he genuine?

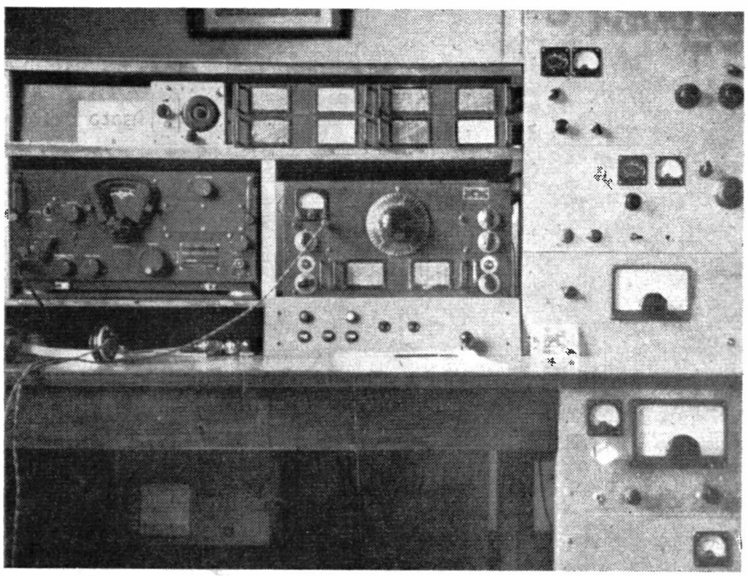
An interesting Top Bander who is genuine was HB1CM/HE (*see* p.541 December), worked by G5JU and others on January 14; there was a heavy pile-up on him, and to make matters even more complicated, he had chosen a Coast station frequency on which to open up HB1CM/HE!

G3JZK (Cambridge) makes it clear that all his Top-Band activity is from GM, where he returns each vacation. This time he put up a 1000-ft. temporary aerial, but continuous thunderstorms spoilt his fun. However, on it he worked G3CHN/A (Devon) at 59 phone, the latter using a ¼-wave vertical! 'JZK then operated from Newtonmore, Inverness-shire, but with a very poor aerial. He says Valencia Radio on 1820 kc (T5) is a new menace.

G3GGS (Preston) raised G3ARS in Rutland for a new one, also GM3DGI in Edinburgh. He missed the HB's but worked OK1AEH, who was 589 and a particularly fine signal.

Eighty and Forty

Very little that happens on



Station of G3GEN, Gloucester, who has gear for 20, 15 and 10 metres, and is also on SSB phone on 80 metres. His receivers are an HRO, a BC-348 with bandspread and a BC-453, and he has a separate Top Band transmitter with a TT11 in the PA.

Eighty (and that includes plenty!) comes under the heading of DX these days, although some of the hardened old 'chasers may be heard working ZL's nearly every morning—and keeping extremely quiet about it. The sad fact is that *Eighty* has deteriorated such a lot in the past five or six years that it takes a real fanatic (or shall we say "devotee") to remain faithful to it.

Herewith are the few items of news from this month's correspondents concerning *Eighty* and *Forty* metres.

TOP BAND COUNTIES LADDER

(Starting Jan. 1, 1952)

Station	Confirmed	Worked
G5JM	97	97
G2NJ	97	97
G3HIS	95	95
GM3EFS	94	94
G3JEQ	93	93
G3JEL	92	94
G3HIW	92	93
G6VC	92	92
G3EUK	91	93
G3CO	91	92
G3GZB	89	91
G3HYJ	84	85
G2AYG	83	84
G3JHH	81	82
G3FAS	80	92
G3BRL	79	80
G3GGS	77	82
G3FTV	74	82
G3JKO	73	85
G3DO	72	72
G3JJZ	71	73
GM3DOD	70	71
G3JBK	69	74
G3KEP	69	74
G3HZM	67	69
G2CGL	63	70
G3JVL	62	77
G3JAM	62	70
G2HKU	62	62
G3AKX	60	71
G3FTV/A	60	69
G3DGN	60	64
GW3HZZ	60	63
G2CZU	60	61
G3FNV	57	71
G8CO	54	66
GM3JZK	46	55
G3HQT	39	41
G3ICH	16	36

G3IGW gave 4X4CJ his first G QSO on Eighty, and also worked 9S4AX, LZ1KDA and plenty of W's and VE's. 4X4CJ wants it known that he will be looking for G's on this band, every day except Saturday, between 0400 and 0445 GMT. He also listens on the Top Band at this time, and can operate cross-band if desired (meaning he transmits on Eighty and listens on One-Sixty, when asked.)

Regarding *Forty*, G3GZJ (London, S.E.23) thinks it is a pretty good band after the BC stations have closed down in the evening. He heard YI2AM fruitlessly calling away, with an S8 signal, too. 'GZJ is going to put up a vertical for Forty, as he thinks it has real possibilities for late-night DX after the other bands have closed.

G2CZU took his 10-watter (CNY-1) off the Top Band and fired it up on Forty. He struck a YU contest and raised five of them straight off the reel.

G3GGS worked CT3AB (589) on Eighty and UC2AA on Forty. G5MP (Hythe) laments the poor conditions on Eighty, but has been working YV, VO, KP4, W8 and 9 as well as CT2 and 3, LZ and 9S4. He has also heard SU and OY, but no West Coast Americans or ZL's lately.

DX on Twenty

Even Twenty seems a little neglected these days. We usually receive more correspondence about Fifteen, so many DX'ers having deserted their old stand-by after squeezing every possible pip out of it—except perhaps ZD9AD, who is now on and workable; G5JU got him on January 1st, with a very good signal. Just let a slight sniff of a DX-pedition filter through, and there are the hounds hot on the trail again.

One of the old reliables who never lets up on Twenty is G5BZ (Croydon). This month he also was rewarded by working ZD9AD (Gough Island), whom he winkled out from right under (*really* under) a pile of W's. Funnily enough, no one else seemed to be bothering about him, except G3HLS, who jumped in on 'BZ's back as he finished. That was on CW, about 14050 kc. Apart from this, G5BZ raised VQ8AG, VS6, CR6, VQ2, KL7, VE8, FK8AO, loads of JA's, PZ1BS, and ZD3BFC on phone. Also X1NP, a ship, but so smothered in QRM that his QTH was lost; can anyone oblige with it? G5BZ thinks he was in quite a rare part of the Pacific.

G3FPQ used the band for phone, and raised CR7CN, ZS's, CO's and 3A2BF. The latter, he says, is on Twenty only at present, but hopes to be on all bands, Eighty to Ten, in a few months' time.

G3GZJ didn't think conditions too good, and finds the band very noisy at the best of times. He raised OX, FA, OQ5, VK, ZL, KP4, YI, CT2 and VE7—also chased after an HH station but with no luck.

G3FAS spent some time going after DX with only 15 watts to a dipole, which brought him QSO's with JA, VE6 and 7, W7 and quite a few other good ones. Then he deserted the band again and is now to be found on One-Sixty, as before!

G3JZK, with his "damp-string" aerial in Cambridge, raised VK3CX—the first VK ever heard! G3GGS collected KP4 and VP5 for new ones, and received a tip from LA5HE to the effect that LA9LD/P will be on Eighty CW from Spitzbergen.

Fifteen Metres

This band was pretty consistent all through December and into early January, after which things fell off quite a lot. Probably by the time this reaches you it will be in good form again.

G6VC raised CR9AH, a VK9 and a VK7, bringing his score up to 45 on the band. G3HIW worked two UB5 stations, and they both promised to QSL *via* DM2ADL—not *via* the famous Box 88.

G2NS (Bournemouth) repeats that if anyone is short of Zone 6 he should hang around at mid-day. XE1PJ is on the band every morning before going to work. We have heard him frequently—always a good signal and usually working G's or Europeans.

Further, according to G2NS, his new QSL is a real beauty.

G3INR (Hereford) joins our Five-Band Table and tells us that this same XE1PJ brought joy into his life by answering a CQ! G3INR is about to take things seriously and build a separate transmitter for 21 and 28 mc.

New countries for G5BZ were provided by VQ6LQ and CR9AH, both on CW. On phone he raised ZL, 3V8, MP4, JA, PY and LU. G3GZJ collected ZL, KZ5 and 4X4.

G5CP (Chesterfield) is running daily skeds with VP6YB on 21200 kc phone. G3FPQ found the band very consistent for VK and ZL phones, and worked many of them. Also on phone he raised CX, KR6, PZ, UQ2, VE8, VS2, YI and 3V8; CW fetched in MP4B, MP4Q, KG6, VQ6 and VU.

GW3AHN (Cardiff) reported just too late for the previous issue, and sent his final score for the 21 mc Marathon, which stood at 137 all-in, 109 on phone (as on December 16).

G3HCU (Chiddingfold) found the band much the same, but laments the chances that a "week-ends only" operator has to miss. However, he worked ST2DB for a new one, as well as CE, CR9, KZ5, OQ, VK, VP6, VQ5, VS2, VS6 and many others. During the first twelve days of 1956 he managed to raise 25 countries to start him off on the 21-28 mc Marathon—all on Phone, as usual.

G3GGS worked some W's and KP4QR, as well as a few new Europeans.

Ten Metres

Quite a lot of activity is stirring up on Ten, though the CW men mostly grumble that there isn't enough for them. Conditions are similar to those on 21 mc, but more so . . . Ten fades out first and comes back last, when conditions take a dip.

G5BZ reports only W's and VE's this month; G3FPQ collected ZS3B and ZD6RM (both phone) for new ones, as well as CN8ES, OH5NQ and YO3FT.

G5CP has been using a new 3-element beam temporarily erected on a pole 15-ft. high. This is tuned to 28.2 mc and he has a 1:1 standing-wave ratio on the feeders with 72-ohm co-ax and a half gamma match; back-front ratio seems to be about 6:1. His first overseas contacts were VK6NF (S6) and VQ2RH (S9)—he is now looking forward to getting it up to the proper height of 30 feet.

W6SUP, Roseville, Calif., is a family station. The boy on the left, W6SUP's son, is K6HLO, who got his licence at the age of ten; the XYL is K6GKR, and also operates the station. Janet, the small girl, is not yet licensed but soon will be, no doubt! At W6SUP, they run a pair of 813's at 500 watts, the receiver is an HQ-120X and the aerial for 14 mc is a two-element beam.

> **TRANS-ATLANTIC TOP-BAND TESTS, 1956**
>
> ***Dates:*** Every Sunday until the end of March.
>
> ***Times:*** No set limits, but peak activity 0500-0800 GMT.
>
> ***Frequencies:*** American stations will be listening for Europe between 1830 and 1870 kc, only. *DO NOT* call W/VE stations on or near their own frequencies, as they will not be listening there.
>
> U.S.A. stations will be mostly on 1800-1825 kc, also 1875-1900 kc (East Central States) and 1900-1925 and 1975-2000 kc (West Coast and West Central States.

G3IDG (London, S.W.12) did a lot of listening on the band, but heard only 25 countries during the month, 15 of them DX. Nice ones among the latter were ZD3, ZD6, ZS3 and VK. QSO's during the month were with UB5KAB, ZB1, OH and W's. Just to confuse the QSL situation (*see* previous note about DM2ADL), UB5KAB said "QSL *via* DL7AA," and others have been heard mentioning Box 27, Stalino.

G3IDG backs up ZE3JO's plea that phone stations should stick to the agreed European Band Plan, which recommends 28000 to 28200 for CW only. This is only one tenth of the band, and yet phones can be heard right down below 28100 kc.

G3GZJ thinks 10 metres is pretty good, since he has been listening on an indoor dipole at ground level and has frequently heard W's and VE's at S9 *plus* in the afternoons.

E. Elsley of Mold, Flintshire, is aboard the tanker *San Florentino.* On his last leave he built himself a TRF receiver, 2-V-1, using 2-volt valves, and with it he has been listening to G phones when around the West Indies and American East Coast. Among the calls mentioned are G3AWZ, GD3GMH, G2YZ, GW3AHN and 3FSP, GD3ENK, G3CS, G6BY, G3IUD, G3PZS (?) and G5BE (?).

Apart from these, he has logged many ZS's and South Americans, plus such miscellaneous DX as VP9HH, VP1EK, I, 'EA, DL, CN and HB. He doesn't bother much about the U.S.A. phone band, finding quite enough to amuse him in the DX section. Most listening is between 1700 and 2000 GMT.

GW3AHN was very active on 10-metre phone during December, and worked XE1FE, YN4CB, TI3LA, HP3FL, HC1KV, PJ2AF and VK6NF.

G3GGS (incidentally, our only correspondent to cover all *six* bands this month!) had some good contacts with East Coast W's and worked 4X4BD for his first Asian on Ten.

G3HCU was on phone and rolled in some nice stuff at the end of 1955, including ZD6RM, a new one, but for the 1956 Marathon he could only raise W and G, and thinks conditions in the New Year have been very poor. Nevertheless, G5JU worked ZD6RM on January 15, with CR6AI a good signal and the band lively with W/VE stations.

News from Overseas

W6AM (Long Beach) puts his scores up to 258 on CW with YA1AM and XW8AB, and 213 on phone with ZC4IP. He tells us that XW8AB was off for some time owing to illness, but is better now and should be pretty active once again.

K6DV (San Jose) says that he and W6DFY answered a CQ from G2FJE/MM on 7012 kc, but there was no come-back. Does anyone know who this is, or where the ship was at the time? K6DV also tells us that he was informed by VK1AC (Macquarie) that they have frequently tried to contact Graham Land, which is straight across the Magnetic Pole from them; they tried to establish regular skeds to study propagation, but conditions were too erratic.

Another letter from W6YY (La Canada), bursting at the seams with DX, as usual. The following items are very much condensed . . . FB8ZZ, Amsterdam Island, on *Twenty* with a buzz-saw note; CN8MM handling all QSL's for them . . . FB8XX (Kerguelen) will have a new op. during January and will probably be on phone . . . AC4NC being worked by Europeans on 14140 kc phone . . . VR6AC still putting out an excellent signal around 0230 GMT on nights when not otherwise occupied . . . The proposed ZL trip to the Kermadec Islands has been cancelled again.

W6YY's own news is that there have been terrific long-path openings to W6 from Europe, Middle East and North Africa, usually between 1630 and 1830 GMT. Many new countries, previously unheard, have been picked up, with the W6 beams pointed between New Zealand and the South Pole.

DU1AZ (lately of Manila, Philippines), name of Wm. Ritter, writes from R.D.2, Bloomsburg, Penna., that now being home again he will be glad to send cards to those G's who may be owed them, covering operation from DU1AZ during 1948-'50; he was not able to keep a record of QSL's sent out, but has his log books to check claims.

Help Wanted!

KV4AA writes on behalf of Danny Weill, VP2VB/P, who is sailing round the world single-handed in the *Yasme* and is now operating from Tahiti as FO8AN. Danny is going well out of his way to visit rare spots for our benefit, and his next call will be at the British Phoenix Islands, where he hopes to obtain a VR1 call-sign.

Expenses are now the trouble, and British amateurs have not been able to assist because of the difficulty in sending money outside the sterling area. The W's are doing everything they can to help things along, but KV4AA suggests that British amateurs might like to send a small contribution to his mother, who has incurred a lot of expense acquiring replacement parts and sending them to Danny by air mail. Her address is Mrs. A. Eccles, 6 Dennistoun Avenue, Somerford, Christchurch, Hants.

(As an example of expenses—petrol in Papeete retails at the equivalent of one U.S. dollar per gallon, and Danny will need 250 gallons before setting out for VR1).

American amateurs and manufacturers have already been very generous; we at home are now in a position to add a little

21-28mc MARATHON, 1956

Station	Total	21 mc.	28 mc.
G3HCU (Phone)	25	25	2
G5BZ	22	22	2

FIVE BAND DX TABLE
(POST-WAR)

Station	Points	3.5 mc	7 mc	14 mc	21 mc	28 mc	Countries
DL7AA	691	99	159	219	109	105	222
G5BZ	621	63	114	235	127	82	239
G6QB	619	52	109	223	100	135	237
G3FXB	538	67	122	189	113	47	196
G4ZU	534	12	45	215	238	124	222
W8KIA	530	55	141	251	4	79	247
G2VD	511	48	94	180	90	109	189
G3DO	487	24	46	204	106	107	225
G2BJY	466	48	78	141	83	116	181
G2YS	427	61	79	146	87	54	161
GM2DBX (Phone)	382	33	31	158	79	81	169
G3FPQ	375	49	51	137	110	28	154
G2BW	368	24	57	144	100	43	165
W6AM	367	23	34	258	39	23	258
G8KU	347	23	52	161	36	75	171
W6AM (Phone)	318	13	32	213	39	21	213
G8VG	284	36	77	124	21	26	141
G6VC	254	26	31	125	45	27	132
G6TC	230	17	61	113	12	27	122
G3INR	227	42	44	95	33	13	104
GM3JDR	211	39	36	101	34	1	108
G3IGW	201	38	50	62	43	8	87
GM3EFS	189	22	39	96	12	20	105
G2DHV	172	19	25	110	6	12	113
GM3DOD	71	10	15	36	9	1	40
G3GZJ	60	18	1	26	14	1	36
G3IDG	44	11	10	6	1	16	26
G3HEV	43	8	19	14	1	1	26

encouragement on our own.

R.E.F. Contest

The R.E.F. notify us that their 1956 Contest will run from March 3, 1200 GMT, to March 4, 2359 GMT (phone section), and from April 14 to 15, similar times (CW section). The code to be interchanged is the RST (CW) or RS (phone) plus the serial number of the QSO. French stations identify their REF Section by figures, and province or country by letters.

This Contest provides a good opportunity for working French Provinces (DPF Award) and French Union Countries (DUF Award). Logs to be sent to REF, Box 42-01, Paris R.P., and will qualify for DPF and DUF counts *without* subsequent forwarding of QSL's.

The WBC Certificate

In December we announced the WBC (Worked British Counties) Certificate (*see* p.541 of that issue) for the benefit of overseas readers who have worked 50 or more British Counties on any band.

Already we have four successful applicants, as follows:

No. 1 : OZ2NU (Aalborg)
,, 2 : F9IL (Aubencheul)
,, 3 : ON4IB (Bruges)
,, 4 : ZB2I (Gibraltar)

Certificates are being despatched to these claimants as soon as they are ready, and we await a spate of further applications.

We are glad to credit OZ2NU with the first one, because he has been asking us for years to produce something of the sort, and it is only fitting that he should reap the earliest possible reward!

DX Strays

The following come from all the usual sources, including the West Gulf DX Club, North and South California DX Clubs, KV4AA and Arabackle Oblifork.

VP1AA is active again after a long spell off the air; look around 14001 kc . . . W4FMK/VP5 is on Caicos Islands . . . AC5PN is still active on CW, 14050 kc . . . AC5PL is also reported, but we understood that 'PN was the only one there.

KG1KK has been causing some momentary heart-flutterings, but of course he is only in OX-land . . . KW6BV is reported on 21070 kc . . . VS5EW sounds good, but is he?

Danny of VP2VB/P (*see* earlier paragraph) is at present FO8AN. He should be on from VR1 in February, after which there is a possibility of operation from Nauru and Timor.

VR2CB has been worked by W's on 7018 kc (1100 GMT) . . . FB8ZZ worked them very frequently, mostly around 1600-1800 GMT, 14030 kc or thereabouts . . . LU3ZY is on the South Sandwich Islands — 14100 and 14060, but call 20 kc below his frequency . . . A new op. at ZS2MI is putting Marion Island back on the air, Tuesdays, Wednesdays and Fridays at 1700 GMT, 14 mc band.

YJ1DL is active again — 14003 kc, right at the edge . . . VS9GV is putting Aden on the *phone* map . . . DU7SV and JA9AA have been active on *Forty* . . . ZC5GN, if you heard him, was genuine — operated by VS1GN during a vacation . . . FP8AK/VP2 will probably be on the air during the first week-end of the ARRL Contest.

VP5DC is on Grand Turk Island, together with VP5GB . . . ex-VP5BM is now VP2LH, St. Lucia (Windward Islands).

Shorts

G5BZ has at last pipped G6QB for second place on the Five-Band Ladder. G6QB plans a three-element rotary for 7 and 3.5 mc to fill in some of the gaps!

Talking of rotaries, the last sentence in G3FPQ's letter is " My beam has just blown down! " Hard luck, but he will be QRT until March in any case, and we foresee a brighter and better one when he returns home then.

G2YS (Filey) tells us that the WAE II, for which he has qualified, brings in *DL QTC* for a year.

Antarctica — and More DX

The U.K. element of the Trans-Antarctic Expedition will use the base station call VRN, on a number of frequencies between 3.5 and 20 mc, running an R.A.F. T.1509 at 350w. input. Two members of the party, including Sgt. Williams, R.A.F., who is i/c the radio side, intend to operate on the amateur bands, calls allocated by the Falkland Islands Govt. being VP8AO and VP8BO. Sgt. Williams (VP8BO) will erect rhombics beamed on Port Stanley, Capetown and, possibly, the U.K., and expects to start up in March or April. The amateur channel will be Twenty (14025 kc) and perhaps 21 mc as well; most of the traffic will, of course, be on " official " bands, amateur operation only being as time permits.

For sledging parties and tracked vehicles operating locally, the Expedition is also provided with Marconi HP31 portable transmitter/receivers, running about 25 watts; these will be identified by the call VRN followed by a number.

Call-signs of the m.v. *Theron*, the Expedition's supply and transport ship, is VGWW. It is probable that the schedule outlined above will be somewhat delayed because, at the moment of writing, the *Theron* is in difficulties in the pack ice, which has already made her some weeks late.

For much of this information we are indebted to G3GYI, to the

ARRL DX COMPETITION

Phone Section: **February 11, 0001 GMT to February 12, 2359 GMT.**
March 10, 0001 GMT to March 11, 2359 GMT.

CW Section: **February 25, 0001 GMT to February 26, 2359 GMT.**
March 24, 0001 GMT to March 25, 2359 GMT.

U.S.A. stations send RST (or RS) report followed by an abbreviated form of their State, *e.g.*, Vt, Vermont; Wva, West Virginia. Other stations send RST (or RS) followed by three figures denoting their input in watts (025 for 25, and so on).

Three points for each complete QSO, multiplier the number of W and VE licensing areas (19 in all) worked on each band. No " quota " for DX stations; U.S.A. and Canadian stations are limited in the number of stations per country that they are allowed to work in each band.

The rules in full appear in the January, 1956, issue of *QST*.

BBC, the Expedition's Hq. near the office and to *QRV* of the R.A.F. Amateur Radio Society, of which VP8BO is a member. Whatever may befall, all who read this will envy VP8AO and VP8BO their opportunity for high adventure. Look out for their calls!

From the American party, also in the Antarctic just now, we expect a spate of activity with the calls KC4USA, 4USB, 4USN and others in this sequence. Incidentally, these very same calls were used by one of the Byrd expeditions before the War — in the mid-thirties, we should say. We well remember hearing KC4USA from Little America on the 14-mc band. The earlier Byrd Expedition, in 1928, made use of the amateur bands for handling traffic back to the States, but we are not sure, at this distance of time, of the call-signs or the frequencies, as our file of *QST* for those years has suffered the depredations of mice in the attic! From what one remembers, the Amateur Radio side of the first Byrd Expedition was not highly organised, but certainly the original KC4USA became very well known — in those days Antarctica was real DX.

The 1956 Marathon

So far, only two entries are to hand for the 21-28 mc Marathon, but they are sufficient to start it off and we hope to see many more by next month. Simply send in your three figures — countries worked on 21 mc, countries worked on 28 mc, and total number of different countries worked over the two bands.

That seems to cover everything for this month, so we will sign off until we see you again on **February 17**, first post, which is the deadline for the March issue. Will overseas readers please note that it will be *March 16*, for April. Send all your news and comments to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Please be punctual with them — we are suffering from an increasing number of stragglers who just miss the boat each month, and it is not possible to hold copy open a day later than the schedule. Until then, very 73, BCNU and Good Hunting.

REMOTE COMFORT

FRED TRIES IT

By G3COI

THE country was in the grip of winter. It was the coldest that Fred could remember, and, as he sat in his wicker chair dressed like a motor-cyclist, he pondered on his discomfort, whilst wiping from the receiver the steam on the dial caused by his breath. Even with the power amplifier going full blast, the temperature in the roof shack was lethally cold, and a foul-smelling paraffin stove did nothing to relieve the condition. The stove was quite a good one, actually, but suffered from neglect and needed a good cleaning, a new wick and plenty of paraffin. As there was little in the reservoir and the wick was uneven, it emitted visible and powerful fumes which swirled through the atmosphere like mustard gas. Strangely enough, Fred rather liked this, because he had been a D/F operator in the RAF, where many a lonely vigil in a D/F hut had been maintained to the fug from a paraffin stove; in Fred's opinion, once one had been "fumed" to it, one had to keep it up, like a drug addict. He used to tell sprog operators that when they received their Service discharge they would draw one dozen tins of compressed paraffin-stove fumes with which to keep themselves going in the first uncertain days of their return to civilian life, until they could get a stove of their own. All the D/F operators would make a lot of this story (which, we hasten to explain, was only a joke), but many of them, nevertheless, on leaving the Service instinctively plumped for this form of heating when first setting up house, and Fred was no exception. During the long winter months he would keep his going on the minimum of fuel and would never allow the flame to die out. He would make tea on it, putting on the kettle about fourteen hours in advance. He made toast on it—strangely-patterned toast, rock hard in texture, with an unmistakable tang of paraffin. And in the meanwhile, above, below, outside, inside and ubique, as our old-soldier grandfather would say, there hung an abominable stink—a pong that defied description or extinction; a foul scent that would have outlasted Hiroshima. Of course, it impregnated Fred's clothing thoroughly, and although he worked at an office, he "smelt like he worked at a gararge," as our W friends would say. Anyhow, when he retired that freezing night he decided that perhaps there was something to be said for remote control, whereby one could sit by the cheerful glow of one's hearth with the mininum of gear and work DX with one hand whilst eating buttered crumpets with the other *and* keep an eye on the pulchritudinous gyrations of the Television Toppers.

He fell into a pleasant sleep, dreaming about the Television Toppers.

The next evening he collected all his magazines together and set about searching for information on remote control. He found out very little, because it is a subject that has not been covered to any great extent, so perforce he was driven to Evolving an Original Scheme. His first notion was an elaborate one, incorporating small electric motors which would turn the knobs on the receiver, VFO, and so on, but he rejected this, as he had no electric motors. Next, he considered having a friendly short-wave listener who could sit in the shack and receive telephoned instructions to move up and down the band as required. But he could not remember knowing a friendly short-wave listener.

Finally, he hit on the dull and obvious scheme of moving the receiver downstairs, together with a long mike lead, a long VFO switch lead, a long PA HT switch lead, a long exciter HT switch lead and a long AC mains lead, until he had a veritable cascade of cables festooning from the top to the bottom of the house. His mother viewed this activity in hostile silence for a while, then left the house to visit her sister, who had become accustomed to receiving such calls, wherein Amateur Radio and all those engaged in it were torn verbally to shreds.

Fred, inured to such prattle, settled himself down in his armchair by the fire, with the receiver resting on his knees and the various switches adorning his person. He tuned round the eighty-metre phone band looking for his VFO, sorted out the strongest whisker and embarked upon his usual marathon CQ call. It was just after TV had finished, so there were many QSO-starved hams about, and he soon became engaged in combat.

He was thoroughly enjoying himself when, after turning it back to his opponent at the end of a particularly long and boring over, he was annoyed to hear the fellow in contact with a third party, whom he was telling that Fred had inexplicably gone QRT.

Fred hurriedly fumbled his gear to the transmit position and put out a long call. He achieved nothing, so decided to go and investigate. As he pushed open the trap-door to the shack, he was enveloped by a cloud of smoke which could only have come from burning transformer varnish . . . .

The next night, he was back in his wicker chair, dressed like a motor-cyclist, and the weather was colder than ever. We heard him telling G3XIX or some other famous DX man that remote control was

". . . . Dressed like a motor cyclist . . . ."

all right for those who liked to keep the family company, but a true ham missed the friendly glimmer from his rig, the hum from the mighty transformers, and the occasional belt from an unearthed power pack . . . .

NEW YEAR HONOURS

In Her Majesty's New Year Honours List, published on January 2, several distinctions were bestowed in the sphere of radio communication and electronics. Brig. R. Gambier-Parry, retiring director of communications, Foreign Office, is made K.C.M.G. The honour of C.B. goes to A/Cdre. W. E. G. Mann (Signals, R.A.F.), who is now director-general, navigational services, Ministry of Civil Aviation, and to W. J. Richards, Esq., director of the Radar Research Establishment, Ministry of Supply. Capt. C. F. Booth, assistant engineer-in-chief, Post Office, is made C.B.E. The M.B.E's in the List are R. G. Hodges, senior experimental officer, Radar Research Establishment, Ministry of Supply, and G. E. Randall, radio officer, s.s. *Scottish Hawk*.

CALL BOOK, WINTER EDITION

The *Radio Amateur Call Book*, published quarterly, is the only complete directory to the radio amateurs of the world. Recent issues have run to well over 500 pages, in three columns of close print, and the *Call Book* also contains much data of practical value to the DX operator. In the latest (winter) edition, there are 67 columns of U.K. call-sign/addresses, including all those published in our "New QTH" feature up to and including the November 1955 issue of SHORT WAVE MAGAZINE. The *Call Book* is available in two versions—the Full Edition, and the Abridged Edition, the latter omitting only the American listings, which run to approximately 350 pages. The *Radio Amateur Call Book*, in either edition, is available from our Publications Dept., prices as advertised. As we are sole U.K. and European agents for the *Call Book*, orders can usually be filled from stock.

INDEX, VOLUME XIII

As this issues of SHORT WAVE MAGAZINE concludes our 13th volume, a complete Index to it, as a free loose supplement, will be included in every copy of the March issue, which will be No. 1 of Vol. XIV.

RADIO AMATEURS' EXAMINATION — MAY

Those intending to take the next Radio Amateurs' Examination, in May, are reminded that their applications must be in before March 31. Full details can be obtained from the local Technical College or the Education Authority (quoting Subject No. 55 in the City & Guilds Examination Syllabus) or direct from the Superintendent, Dept. of Technology, City & Guilds of London Institute, 31 Brechin Place, London, S.W.7. The examination is arranged to take place at some centre within convenient reach of the candidate's home. The address of the Technical College or Education Authority can be obtained from the local telephone directory.

ADDRESS, PLEASE

If A. H. Parker, G3OV, would get in touch with us (or anybody who knows his whereabouts) he would, as they say, "hear of something to his advantage."

Going After DX

NOTES FOR NOVICES

PART III

By THE OLD TIMER

Previous articles in this short series appeared in our December and January issues. In this concluding instalment, our contributor discusses DX working on the telephony bands. —Editor.

IN this final instalment of our hints to DX-chasers, it is proposed to deal with the methods of the telephony fraternity or voice-men. They have something in common with the CW technique, but not much. For one thing, a DX station, if it has a skilled operator behind it, can read the calls of several CW stations simultaneously—but that is very difficult with phone on account of the multiplicity of heterodynes set up. So it usually happens that the phone DX men spread out rather more and do not usually call right on the DX station's frequency.

This is a good thing, but it poses the main problem — on what frequency *do* we call? Obviously if you are calling a W station you will not go into the U.S.A. phone band to do it—because if he is after DX he won't be listening there, anyway. So the logical thing is to get somewhere near the edge of that band. For instance, a W7 in a State that you have never worked is calling "CQ DX" between 14200 and 14300 kc. Unless he announces otherwise himself, he will probably tune from 14200 downwards to about 14100 kc; so if you find a nice clear spot somewhere around 14190 kc you have a fair chance. Do *not* try to make it right on the band-edge, because that is where the QRM is usually worst of all.

Some of the more enlightened DX types will make it more straightforward for you by announcing "and tuning from 14100 up" or "from 14200 down"—and then your course is clear.

Not Too Near

Now suppose some really rare phone station —a VR5 or a KP6, or someone of that kind— is calling "CQ DX" in the *DX* phone band. Say, somewhere just above 14100 kc, or around 21150 kc. Where do you reply if he gives no indication of his listening methods? The answer is to get somewhere near him, but not *too* near. If you pitch 10 kc away, and the whole of the intervening space turns out to be a mass of phones calling him, you are perhaps more likely to be heard than any of the members of that bunch. It is only natural that the DX station should tune away from his frequency and should stop on the first clearly audible voice that he hears. It *could* be yours. On the other hand, of course, you don't know whether he is in the habit of tuning upwards or downwards from his own frequency, but careful listening to one or more QSO's will probably tell you which he does—or whether he carries them out alternately.

As with CW, it is quite legitimate to listen to one of his contacts, to net *accurately* on the station he is working (not radiating while you do this, naturally!) and to chip in with a brisk call as that station is signing off. But don't try it before that, or you will find yourself on the "black list."

As the foregoing implies locating yourself correctly in the band of your choice, the table herewith shows the main CW/Phone divisions in accepted use at the present time. In the interests of all concerned, it is highly desirable that this segregation should be maintained, as it gives both the CW men and the phone operators the best chance of making the contacts in which they are interested. Straying should be severely discouraged; it would be quite in order to call and warn any phone station heard in a CW band—the CW fraternity do not, as a rule, spill into the phone territory, as there is nothing for them to work there, and interference is more troublesome. To the phone man, however, with his BFO out, a CW band often sounds relatively QRM-free!

Short Calls

On phone, as on CW, short calls pay dividends, and you must have a really quick change-over. Then you can just push the switch, call "KP6ZZ, KP6ZZ, KP6ZZ, this is G3XYZ, G3XYZ, G3XYZ calling—and listening," or some such formula. If there is no reply you can immediately repeat the whole thing, fairly certain that he has not yet replied to someone else. If you make the all-too-common mistake of making your call three times that length, when you go over to receive and hear nothing, you won't know whether he has already acknowledged another station with a quick reply and report.

Short calls, twice or thrice repeated, are infinitely better than one long one, because you are not deaf all the time—you have a chance of a quick listen to see what is going on.

Quality of Signal

As with CW, the quality of your signal matters enormously. And here we should like to say that a dreadful misconception has grown up and spread with the years. Never a day passes without someone being heard saying that "Nice toppy phone cuts through the QRM." And never was anything less true! Most of the audio power is in the lower frequencies, and it is the phone with good beefy bass that wins every time for readability. QRM itself is toppy; and if the crystal filter is in use at the DX end, much of the top is intentionally cut — including, possibly, your "nice toppy phone."

A reasonable amount of "top" — up to 3000 or 4000 cycles—is highly desirable for maximum intelligibility, but it is only appreciated at the other end on a fairly QRM-free QSO. Under the usual conditions of a DX scramble, with maximum selectivity on the receiver, the distant chap won't even know whether you are radiating top or not! If you have what used to be called "nice round phone"—meaning a transmission with its full quota of bass, but not devoid of top to the extent of getting the plum-in-the-mouth effect, you have the best type of phone transmission for working DX.

If anyone tells you that "toppy phone cuts through the QRM," ask them to explain why, and exactly how the "cutting" is done. We have never heard a satisfactory explanation yet, and certainly can't think of one.

Don't Overdo It

Here we should also say that the over-use of phonetics defeats its own object, apart from making everything terribly long-winded. If your DX prize is going to hear you anyway, he will get your "KP6ZZ, this is G3XYZ" just as well as anything you can invent in the way of "King Peter Figure Six Zebra Zebra, this is George Figure Three X-Ray Yokohama Zanzibar." If he hits *that* rigmarole in the middle (and how often is it heard?) he won't even recognise a call-sign, whereas you can say the plain straightforward one three times in the same number of seconds, and it is recognisable at once if your signal is good enough to get there at all. And as for the simpletons who solemnly start up with "Hullo, hullo, hullo" . . . words practically fail us. It occupies time and space, it doesn't give a clue to anybody, and if the DX man does hear it he will probably pass straight on to the next chap, who is giving a call-sign by then. It's like the "Dah-de-dah-de-dah" with which some CW types open every call—means nothing, does nothing and reflects on the intelligence of the person using it.

So go ahead, whether on key or voice, and try your luck. Luck *is* an important factor in all DX working, and you can't have it all the time. When it comes your way, though, make the best of it and help it along with some intelligent operating. The various contests scheduled for the next few months will give you plenty of opportunity of trying out the procedures discussed here.

AMATEUR BAND	KNOWN AS	CW/PHONE DIVISION
3500-3800 kc	*Eighty* 3.5 mc 80 metres	*CW:* 3500-3600 kc Mixed 3600-3700 kc *Phone:* 3700-3800 kc
7000-7300 kc	*Forty* 7 mc 40 metres	*CW:* 7000-7150 kc *Phone:* 7150-7300 kc
14000-14350 kc	*Twenty* 14 mc 20 metres	*CW:* 14000-14100 kc *Phone:* 14100-14350 kc
21000-21450 kc	*Fifteen* 21 mc 15 metres	*CW:* 21000-21150 kc *Phone:* 21150-21450 kc
28000-30000 kc	*Ten* 28 mc 10 metres	*CW:* 28000-28200 kc *Phone:* 28200-30000 kc

NOTE: Agreed American Phone Bands are 3800-4000, 7200-7300, 14200-14300, 21250-21450, and 28500-29700 kc. Hence, G phones (and most others) should operate in the areas 14100-14200, 14300-14350, 21150-21250, and on ten metres, between 28200 and 28500 kc, or in 29700-30000 kc.

PHOTOGRAPHS ALWAYS WANTED

Readers who have good, clear photographs of Amateur Radio interest — either equipment, personalities or stations, particularly overseas — are reminded that we are always in the market for prints suitable for publication. Payment is made, on appearance, for all photographs used.

NOTE TO CONTRIBUTORS

Those who may feel inclined to offer us articles for paid publication are asked to read carefully the summary on the presentation of material, on p.432 of the October 1955 issue of SHORT WAVE MAGAZINE. While it is usually better to write in first, or offer a synopsis of the proposed contribution, the notes referred to give an intending author all the information he requires to produce an article on any subject of Amateur Radio interest.

Adjustment of Overtone Crystal Oscillators

IMPROVED CIRCUIT ARRANGEMENT

J. A. BLADON, B.Sc. (G3FDU)

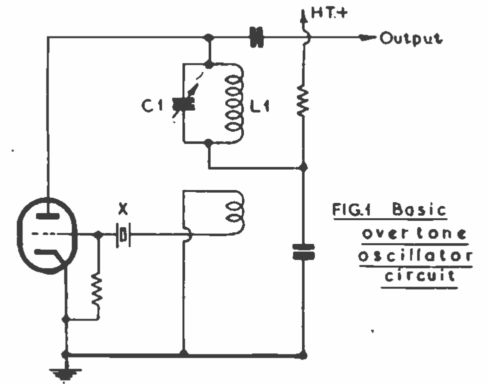
This article describes an original and ingenious approach to the well-known problem of getting crystals off at their overtone frequencies. The writer shows that by using a small variable capacity in series with the feed-back winding—which can thereby be made conveniently larger than the value usually given—it is possible to adjust the excitation very easily and with absolute accuracy. By his method, many crystals normally regarded as inert on their overtone frequencies can be made to control in that mode.—Editor.

WHILST the use of commercial crystals cut for overtone work presents little difficulty in circuit adjustment, considerable trouble is often experienced when a fundamental-mode crystal is tried in an oscillator on its third or fifth overtone frequency. The feedback coupling necessary to produce satisfactory and stable operation on the required frequency is usually very critical. Too much coupling results in oscillation either at the fundamental frequency or at a frequency controlled by the external constants of the circuit. Too little coupling produces no oscillation at all. The adjustment to the happy mean can often be obtained only after long hours of frustrating "cut and try" methods. The purpose of this article is to suggest means by which the necessary "cut and try" can be reduced to a minimum.

One of the earliest and most popular overtone oscillator circuits used by amateurs is that due to Squier (Fig. 1). A triode valve is arranged with a condenser C1 and inductance L1 in the anode circuit tuning at the desired overtone frequency of the crystal. A few turns of wire are closely coupled to L1, one end being earthed and the other connected to the grid of the triode with the crystal in series. If the amount and phase of the coupling are correct, the crystal will be induced to oscillate at the overtone frequency, the tuned circuit in the valve anode acting to prevent feedback at any other frequency. If the coupling turns are increased, a point will be reached at which the coupling through the capacitance of the crystal holder will be sufficient to maintain oscillation at the resonant freqnency of the tuned circuit, even though this may not be at the overtone frequency of the crystal. The range of coupling turns over which correct operating conditions prevail is small and can be very difficult to find, even if a Grid Dip Oscillator is available to set the correct values of C1 and L1, and a receiver is used to listen on the output frequency.

Simplified Procedure

The pains can be taken out of the adjustment procedure if a small preset condenser be connected in series with the crystal and the



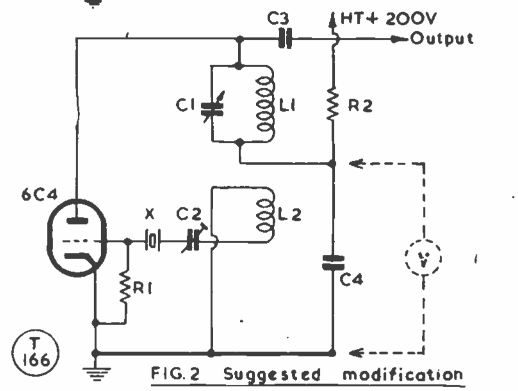


Fig. 1 is the basic Squier circuit, referred to in the text. Fig. 2 is the modification suggested by G3FDU and discussed in his article; it enables the setting for overtone operation to be found much more easily and accurately than by coil tapping.

Table of Values

Fig. 2. Improved Overtone CO Circuit

C1/L1	= To tune to required o/t frequency	L1, L2	= *See text*
C1, C2	= 3-30 $\mu\mu$F trimmer	R1	= 10,000 ohms
C3	= 100 $\mu\mu$F mica	R2	= 47,000 ohms
C4	= .001 μF paper	V	= 0-150v. meter (for test)
		X	= Xtal

feedback winding as shown in Fig. 2. The winding itself should be in the same direction as a continuation of the main winding L1, with the end nearest to L1 taken to earth, the other end being connected to the grid of the triode valve *via* the preset condenser C2 and the crystal, as previously described. The number of turns in the coupling winding should be about one-third the number of turns in the main winding of L1.

Before the oscillator proper is adjusted it is prudent to test the crystal for activity on the required overtone. This is easily carried out with the aid of a Grid Dip Oscillator tuning the required frequency. Three or four turns of wire are wound round the tank coil of the GDO and connected to the terminals of a holder containing the crystal to be tested. As the GDO is tuned through the overtone frequency, a sharp dip should be observed in the grid current, the depth of this dip giving a relative measure of the overtone activity of the crystal. Most 6-9 mc crystals show satisfactory activity on the third overtone when tested in this manner.

The valve is now placed in the oscillator without the crystal and with the coupling condenser C2 at minimum, the tuning condenser C1 is adjusted with the help of a GDO so that the circuit tunes to the correct overtone frequency. The crystal is now placed in the holder, the power supplies connected and after a period of warm-up, the voltage between earth and the anode end of R2 is checked, *i.e.*, across C4, as indicated. Coupling condenser C2 is now carefully increased and a sudden rise in the measured voltage indicates that the valve

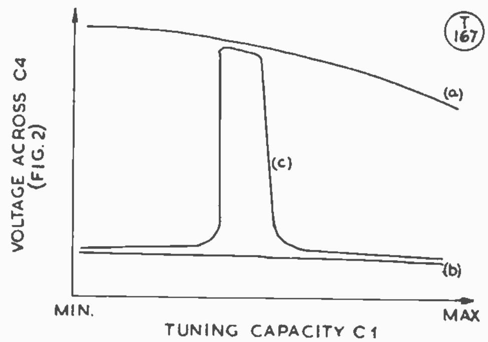


Fig. 3. Diagram showing correct adjustment of coupling condenser C2, as explained by G3FDU. Curve (a) represents uncontrolled oscillation, when C2 is too large; Curve (b) means no oscillation, when C2 is too small; Curve (c) represents correct operation. The readings are in terms of voltage across C4 in Fig. 2.

starts to oscillate. The tuning condenser C1 should now be swung around its original setting, and if oscillation (indicated by the high voltage between earth and the anode end of R2) continues, the coupling condenser C2 should be slightly reduced in setting. The correct operating condition, in which oscillation is maintained over a very small range of setting of C1, is easily found and is indicated in the diagram, Fig. 3.

This method of adjustment has proved successful for many crystals showing activity on their third overtones. It has too often been suggested that operation of fundamental mode crystals on their fifth overtones can only be obtained with difficulty, if at all, but use of the above method of adjustment should make the task considerably easier than before.

MARITIME PROVINCE FLOODS

Serious flooding recently in the Maritime Provinces of Canada, the worst for many years, caused widespread damage throughout Nova Scotia and a failure in communications. The VE1's went into action and in many areas provided the only circuits available to the authorities for rescue and supply work. The Royal Canadian Mounted Police have acknowledged the assistance given by the radio amateurs of Nova Scotia and New Brunswick.

ELECTRICAL ENGINEERS EXHIBITION

This is a specialised exhibition, open only to the trade, and is the industry's shop-window. It takes place at Earls Court, there will be more than 300 exhibitors showing a great range of machinery and electrical equipment, and the opening on March 20 will be performed by the President of the Board of Trade. The general manager of the Electrical Engineers Exhibition is P. A. Thorogood, G4KD.

PRICE INCREASE—MARCH ISSUE

The trend of events has caught up with us and we much regret that, effective with the next (March) issue of SHORT WAVE MAGAZINE, we are compelled to increase its cover price to 2s. 6d. Except for one year, the price for the last eight years has been held at 2s. In the circumstances, we feel sure readers will agree that the increase is fair and reasonable. Direct subscribers are not affected until their renewal becomes due, and we are prepared to accept new subscriptions at the present rate of 24s. per annum until March 9, the date of publication of the next issue.

VHF BANDS

A. J. DEVON

Big DX Opening, January 4/5—

GI3GXP Scores DL & ON "Firsts"—

F8GH-F8OL work 50 miles on 1200 mc Band—

CC Area Proposals for 25 Cm—

Station Reports & News—

MOST of those who are with us this month will not need telling about the extraordinary EDX break on Two Metres during the evenings of January 4/5. Fog, which was particularly dense in the London area, enveloped most of the country; the glass stood high and steady, and it was cold, with a clearing sky above the fog.

The troposphere was in an ideal condition for low-level refraction—so much so, that some remarkable contacts were made. To GI3GXP (Kilkeel, Co. Down) goes the distinction of scoring two brilliant "Firsts," with ON4BX and DL1SE worked on January 5. Many other excellent QSO's were obtained, as there was quite a high level of activity! Conditions on the 4th were probably more "open" than during the next evening, by which time the buzz had gone round, bringing on more stations. The reports seem to suggest that the area of good conditions only just extended into the north of England, as the Lancashire stations were not getting quite the results enjoyed by those further south. On the other hand, the latitude of Kilkeel is approximately that of York, and the path GI3GXP-DL1SE (Nr. Detmold) is right across Lancashire; the line Kilkeel-Brussels runs much more in the southerly direction, over Derbyshire.

Thus we see, once again, that EDX is entirely possible during the winter, and that it always pays to watch the VHF bands, no matter how unpromising the omens. It happened that the opening on January 5 coincided with the London VHF Dinner—owing to the fog, many of those who had intended to be present could not get there; but it is said that the attendance at the Dinner did lessen the QRM in the London area! (*We* are not saying this; it is what we are told by correspondents!).

Note on The Contest

Rules for the U.K. Two-Band VHF Contest in March appeared on pp. 590-591 of our last, and many correspondents have remarked that they intend to be on for it.

Due to a printing error, noticed too late, Rule 4(e) needs to be amended to read "Ten points for all stations worked over 200 miles (E)." Please make the correction on your copy (p. 590, January "VHF Bands") *now*—and then there will be no mistake when you come to tot up those E-distance points!

Other queries on the Rules—What is meant by name? Christian name or surname? *Answer:* Name as usually given over the air in the course of an ordinary QSO—or, if you like, adopt a "name" or *nom-de-plume* for the purpose of the Contest! Is /P operating really allowed? *Answer:* Yes, as implied by Rule 5 any type of amateur VHF operation is permitted "provided only the same callsign is used throughout the Contest."

Your A.J.D. hopes that all is now clear—and that you have amended Rule 4(e) as requested.

New Results on 1200 mc

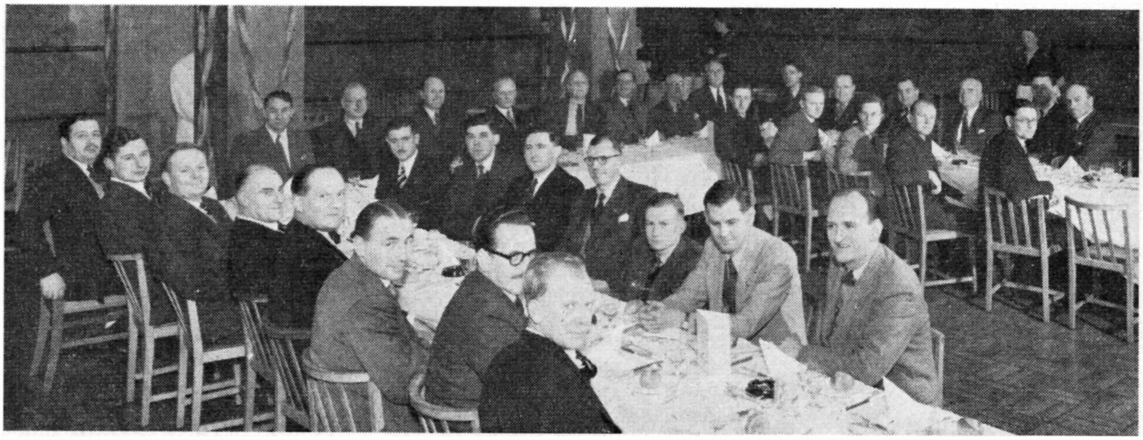
From the December issue of *Radio-REF* we take the news that F8OL and F8GH have made contact on 25 centimetres over a distance, QTH to QTH, of 50 miles; it was actually a cross-band QSO, with F8OL (Meudon, S-et-O) transmitting CW on 1260 mc. His 25-cm output stage is a 2C39A, tripling from the 420 mc crystal controlled transmitter, and gives about 5w. RF out; allowing for feeder loss, this becomes 2.5 watts at the aerial, which is a corner reflector having a gain of 16 dB.

F8GH (Glatigny, Oise) the 25-centimetre receiving arrangement is a coaxial crystal mixer using a 1N21B, with a crystal controlled oscillator-multiplier giving injection 145 mc below signal frequency, enabling the standard two-metre receiver to be tuned as second converter; though the noise factor of the receiving chain complete is given by F8GH as 11 dB, he does not mention exactly how, or with what valve types, the injection frequency is obtained. The receiving aerial at F8GH is the same as that used for transmission at F8OL.

A most important point about this QSO—first effected on September 22 last, and repeated since—is that the path is *not* line of sight, or anything like it; the aerial height at F8GH is 600 feet, and at F8OL 330 feet, but the intervening terrain is higher than this, and otherwise is broken country. Nevertheless, the 25-cm signal at F8GH was read at S8-9—at about the same level as the F8OL signal on two metres—with little fading, and the 2C39A tripler gave a sharp, steady CW note, excellent in every respect.

As F9ND, who contributes the VHF notes to *Radio-REF*, says in his report, these results are extremely encouraging in that they promise the possibility of amateur contact on 25 cm over paths and distances beyond the limit of visibility. It is also significant that F8OL and F8GH have obtained their results using stabilised equipment, and it is probably safe to say that it would not have been possible with SEO gear. (Though this reads like a contradiction of the comment, SEO *v.* CC, in this space last month, the argument still is that while CC equipment should certainly be used on 25 centimetres by those able to do so, the band can be opened for *local* working using simpler gear).

On this side of the Channel, the most active stations on the 1200 mc band known to us are G3CGQ and G3FUL, both of Luton, who



Those who braved the elements to be at the London VHF Dinner on January 5 had a good evening, though there were many empty chairs due to the thick fog that came down that night, which kept people away. However, one result of the Dinner was that the London QRM was much reduced for the EDX opening that also occurred that same evening! Several prominent VHF men can be identified in this photograph.

maintain regular two-way contact on 25 cm at 1830 every evening. Though the distance is quite local, they have been able to carry out a great deal of useful experimental work on receivers and aerials, and G3CGQ is in a position to receive stabilised CW signals. For the moment, activity in other quarters has died down somewhat, but your A.J.D. feels that with the example of F8OL/F8GH before them, those able to obtain 2C39A's will look more seriously at the possibilities of the 1200 mc band.

VHF DX by "Forward Scatter"

The current theory of Forward Scatter, which explains much as regards long-distance working on VHF (though the theory itself is far from being agreed by the pundits) would seem to be beyond the capacity of amateurs to exploit to the full. This is because, on the face of it, high powers and high-gain beams (which mean dishes of anything from 20 to 60 feet in diameter) are needed to bring the Forward Scatter mode of propagation into action.

At the Kingston Blount U.S.A.F. station (nr. Stokenchurch, Oxon.), which works direct to Iceland on VHF over a path-distance of 1,200 miles with 98% reliability, the radiation is directed at a zone in the ionosphere 50 miles above the earth and lying mid-way along the path. It is from this zone that the "forward scatter," or partial reflection, effect is obtained; what is exercising the minds of the physicists at the moment is how exactly this zone, not fully efficient as a reflecting surface for VHF waves but nevertheless usable, is formed. It is because so much signal strength is lost that high power must be used at the originating end, and since it is essential to get the energy into the right area of the ionosphere, beamed transmission is necessary. The whole technique may be described as "brute force," but without the usual concomitant of "blurry ignorance"!

Looking at all this from the amateur view-point, and remembering that a long programme of commercial research and experimental work over the last few years has shown that the Forward Scatter mode of propagation is not much affected by frequency—results over long-distance paths have been obtained on frequencies between 30 and 3000 mc—it is reasonable to suppose that the efficiency of the reflecting zone varies from "very good" to "pretty poor." Now, amateurs do not expect 98% reliability, or anything like it—50% would be quite acceptable; on the 430 mc band, it is possible to build a beam with quite a good gain factor; and on that band, it is also possible to find valves capable of efficient operation at full input.

From this, it would seem well worth while attempting to exploit Forward Scatter on our 70-cm band; the probability is that the zone would be found an effective reflector of *low* power signals often enough to justify the effort—that is to say, when the scatter zone is classified as "very good" for high-powered commercial signals.

It is possible that those amateurs, British and American, who have been obtaining consistent results over distances of from 200 to 500 miles on two metres are being helped by Forward Scatter—in other words, that they already are exploiting the technique without being altogether aware of it. For instance, G2HCG (Northampton), who works PE1PL every mid-day, and G3GPT (Preston, Lancs.) who can always hear the Dutch station, and has often worked him. Such consistent results cannot be explained by tropospheric effects.

What is certain is that it was the amateurs who first began to work, consistently, over distances on the VHF bands previously thought to be impossible, and that it has been the amateurs, more than any other agency, who have developed the VHF bands for communication purposes.

TWO-BAND VHF CONTEST

Takes place March 10-11, rules on pp. 590-591, January "VHF Bands." Please note that Rule 4 (e) should be amended to read ". . . stations worked over *200* miles (E)."

TWO METRES

ALL-TIME COUNTIES WORKED LIST

Starting Figure, 14

From Fixed QTH Only

Worked	Station
75	G5YV
70	G6NB, G6XM
68	G3BW
66	G3IUD (302)
65	G3CCH
64	G5BD (435)
63	EI2W (258), G3GHO
62	G3BLP (630)
60	G2OI (402), G3DMU
59	G2FJR (427), G3EHY, G4SA
58	G8OU
57	G8SB
56	G3WW (770), G5DS (654)
55	G2HDZ, G2HIF, G5BM, GW5MQ
54	G3IOO
53	G2AJ (519), G2HDZ (416), G3FAN, G4CI
52	G2NH, G6RH, G6XX, GW2ADZ
50	G3ABA, G3GSE (518)
49	G3HAZ (358), G5MA
48	G6TA (487)
47	G5ML, G5WP
46	G4HT (476), G5BY, G6YU (205)
45	G2XC, G5JU
44	G3BJQ, G3BK, G3FIH, G8DA
43	G2AHP (500), G3BA, G3COJ, G3HWJ, G4RO, G5DF
42	G2DVD (291), G3BNC, G3DLU*, GM3EGW (146)
41	G2FQP, G3DO, G3HBW, G3WS (255), G6CI (184)
40	G2DDD, G3CGQ, G8KL
39	G2IQ, G3GBO (434), G3VM, G8IL (325)
38	G2FCL (234), G3APY, G8VN (190)
37	G2FNW, G2FZU (180), G3DLU, G3DVK (175), G3IER
36	G2DCI (155), G2HOP (161), G3CXD, G3IIT, G6CB (312), G8IP
35	G3FZL, G3FYY (235), G3HCU (224), G5MR (305)
34	G2CZS (243), G3AEP, G3BKQ, G8IC
33	G3HHY (125), GC3EBK
32	G2FVD, G8QY, G8VR
31	G3HXO, G5RP
30	G2CIW*, G3CKQ (122), G3FRY, G3GOP (208), G3GVF (129), G3IRA, G5NF, GM3DIQ, GW8UH
29	G3AGS, G3AKU, G3FIJ (194)
28	G3ITF, G3JWQ (135), G8DL, GM3BDA
27	G3CVO (231), G3DAH, G3ISA (160), G6GR, GI3GQB, GW3GWA
26	G3CFR (125), G3SM (211), G4LX, G4MR (189)
25	G3JMA, G3JXN (220), G5SK, G6PJ
24	G3FD, G3FXG, G3FXR
23	G3CWW (260), G3HSD, G3JHM (131), G3YH, G5PY
22	G2DRA, G3AGR (135), G3ASG (150), G3BPM, G3HIL, G5AM, G8NM
21	G2AOL (110), G3DVQ, G3IWJ, G6XY
20	G2BRR, G3EYV, G3IOE, GC2FZC
19	G3FEX (118), G3GCX, G5LQ (176)
18	G2AHY, G3DBP, G3JGY, GC2CNC
17	G3EGG
16	G3FRE
15	G3IWA
14	G2DHV, G3CYY

Note: Figures in brackets after call are number of different stations worked on Two Metres. Starting figure for this classification, 100 stations worked. QSL cards are not required to verify for entry into this Table. On working 14C or more, a list showing stations and counties should be sent, and thereafter added to as more counties are worked.

* New QTH

The Station Reports

G3GPT and G6KK (Blackpool) logged a number of EDX stations during January 4/5; those heard at G3GPT included DL1LB, DL1SE, ON4BZ and, of course, PE1PL, who was RS-57 on phone at 1400 on the 5th. G3GPT also had contacts with G5KW/M and G8KW/M while the latter were mobile in Kent.

G5CP (Chesterfield, Derbys.) maintains his regular Sunday morning (0830) schedule with G6XM, who is on 144.5 mc; G5CP is on 144.28 mc, and would like schedules with Bath, Bristol and Cardiff stations at 1800-1900 clock time.

G3KHA (Bristol, 4) is now at 19C in Annual Counties, with 102 different stations worked. G3JWQ (Ripley, Derbys.) says the "Continentals were roaring through" on the evening of January 5, with S9-plus reports handed out all round; he was unlucky enough to miss on DL1LB, but worked a total of 11 Europeans in F, ON and PA; G3JWQ feels that this is not bad for a start, he not having been long on two metres.

G3JXN (London, N.6) was there for January 4/5, but on the first evening his transmitter blew up and it was not until the 5th that he got into the DX, working ten Continentals, including three DL's, mainly on phone; G3JXN was also glad to work G6XM (York) for the first time, and remarks that he is still using 10w. only to an 832 with a 4-ele wide-spaced Yagi and Cascode converter—as described in the March, 1952, issue of SHORT WAVE MAGAZINE—into an S.640. G3JXN has booked in 29 new stations since last reporting here, and mentions that though he is at 220S total worked, is still without the necessary 100 cards for VHFCC; incidentally, his 200th station worked came on November 16, making it just a year since he started on the two-metre band.

G3HAZ (Birmingham, 31) writes to say he is still active on both bands, though somewhat half-heartedly on 70 cm, as the 24-ele stack is indoors temporarily; anent comments on "CC or SEO on 1200 mc," G3HAZ says that anyone coming to 25 cm *via* the other two VHF bands is almost sure to think in terms of CC; on the other hand, he agrees that the SEO approach is the right one to get *activity* on 25 cm. He also suggests 1296-1300 mc as being quite wide enough for a CC area, but points out, also, that with the valves generally available and the techniques at present used, slightly better efficiency, in terms of RF out, would be obtained at the LF end of the 1200 mc band. So why not make the CC area 1215-1220 mc which, as it happens, can be doubled (!) into our next band up, 2430-2440 mc.

While agreeing in general, as most people would, with all this, it still seems to your A.J.D. that the first thing is to get more activity on these bands. The CC practitioners on 25 cm will in any case appear at the HF end because they will do the logical thing by multiplying up from the 430 mc band.

G2DVD (Slinfold) has devoted himself to the design and construction of a new, low power, really efficient *and* TVI-proofed transmitter; operating with 12w. input, results have been very satisfactory. An 829B PA, running 80w. input, is now added, and reports compare very favourably with the 120w. transmitter previously used.

G3IEX (nr. Woodbridge, Suffolk) has yet to work his own county and Norfolk for the Annual, and reports G3JKT/A of Brightlingsea as a new station on for Essex. G3WW (Wimblington), unable to get to Town for the VHF Dinner on January 5 because of the fog, spent the time profitably on the two-metre air, and worked a number of Europeans, DJ1MV being missed after a call from him; on the 4th, DL1SE (who was operating as DL1SE/A for part of the time) was a good contact, and West Country G's were also worked, though G2ADZ could not make himself heard at G3WW, who at the time was a good signal in North Devon. The evening of January 6 produced more G contacts, but by then conditions had reverted to normal, and the EDX was gone.

Meeting of the JA1's who are on VHF, mainly 50 mc (6 metres), photographed recently in Tokyo. On the extreme left is JA1AG, awarded our VHFCC Certificate this month; the first JA to gain it was JA1AN (No. 179), fourth from the left in the front row. It will be noticed that the group is seated at table Japanese fashion, making an unusual picture. In addition to JA1AG and JA1AN, others present are 1AI, 1BB, 1DI, 1DS, 1DW, 1EE, 1FC and 1FL. JA1AG's own caption to this photograph was "JA1's VHF mans, now in boom on 50 and 144 mc." Well, what he meant by that is clear enough.

TWO METRES

COUNTIES WORKED SINCE SEPTEMBER 1, 1955

Starting Figure, 14

From Home QTH only

Worked	Station
38	G3GPT
32	G3JZG
31	G3WW
29	G3IOO, G5BM
28	G3JWQ
26	G2DVD, G3FIH
24	G3DLU
23	G8VN
21	G3CKQ, G3DO, G3JXN
20	G3BJQ, G3HWJ, G5DS
19	G3KHA
18	G3IEX, G3WS
17	G3ITF
16	G3BW
14	G3IRA

This Annual Counties Worked Table opened on September 1st, 1955 and will run for the 12 months to August 31st, 1956. All operators who work 14 or more Counties on Two Metres are eligible for entry in the Table. The first list sent should give stations worked for the counties claimed; thereafter, additional claims need show only counties worked as they accrue. QSL cards are not required for entry in this Table.

VHF Mobile Record

It will already have been inferred from the foregoing that the "KW Twins," G5KW and G8KW, were out mobile on two metres during the period. They worked a number of stations, and had some good DX contacts; of these, the outstanding one is the mobile QSO made by G5KW/M with EI2W in Dublin, when Ken was at Well Hill, Kent, the distance being about 320 miles. This is probably the "world mobile record" for two metres, and was made on the evening of January 4.

G2DDD (Littlehampton, Sx.) reminds us of the third D in his call-sign, often left out of the lists inadvertently because of the slight confusion with that other active call G2DD. G2ADZ (Woolacombe, N. Devon) writes that though he often has to go a week without a QSO, he works a consistent schedule with G3GPT at 195 miles; G2ADZ also keeps a week-end schedule with EI4E, and will resume the GC2FZC regular contact as soon as the latter has finished his rebuild. G2ADZ is there during 1800-2000 clock time every evening—and he is also planning some Trans-Atlantic listening tests on two metres, of which he promises further information when the details are fixed.

G2CIW (Cambridge) has been building for 70 cm, and found time to be on during the evening of January 5; on 430 mc, his receiver is a crystal mixer into an EF91 as IF amplifier, with 24-30 mc tuned on the AR77; the PA is a QQVO3-20 tripler and the beam an 8-ele stack.

G3BA (Sutton Coldfield) mentions a simple and very effective method of neutralising QVO6-20's: A small ¼-in. diam. two-turn coil, wide spaced, connected from screen to earth through a Philips trimmer; a stable neutralising adjustment can be found very quickly. The same method goes for tetrodes such as the 5763. On 70 cm, G3BA has been trying QQVO6-40's and QQVO3-20's, also the CV53 as found in the

Type 105 Unit ; he recommends the latter valve as a very efficient tripler.

Items from Overseas

With his fine GI contact on January 5, ON4BZ not only shares a " First " with GI3GXP, but also goes to 15 in Countries worked ; Guy reports that with him the opening was exceptional, in that not only many G's, but also DL's, were worked " with fantastic QRK's." He says that YU2CF and YU2DV are both active on two metres and can work into Italy, and that they have heard, but not yet worked, the only HA on the 144 mc band ; other interesting Europeans known to be on are OE9BF and 9S4AL in the Saarland.

JA1AN (Tokyo), the first Asian to gain our VHFCC Certificate, sends a photograph of the certificate as framed in his shack, and says that there are about a hundred JA's active on the two-metre band, with the same number on 50 mc (6 metres) ; some of these stations use very high power, up to a kilowatt, though most have an 832A or 829B in the PA ; otherwise, gear is conventional and much as used in this country, with stacked Yagis for beam arrays. Their 6-metre band is 50.0-51.8 mc, and for two metres they have 144-147 mc.

F3SK (Asnieres, Seine) devotes all his attention to the bands 72 to 1260 mc inclusive, and comes down heavily on the side of G3JHM in the discussion (last month) about " putting SEO to rest " and defining a narrow band of frequencies for CC operation on 25 cm ; F3SK says the present situation is " anarchical," with people building gear for 1215, 1250, 1260 and 1296 mc ! While, as F3SK points out, it is easy enough on the transmitter side to choose a frequency and go ahead on it, matters are not so simple in reception, as the receiver can only cover a relatively narrow band effectively.

This is all good argument and the only problem is : Where is the CC band to be ? G3JHM suggested 1296-1300 mc, because of the harmonic relationship with our 432-438 mc area on 70 centimetres. F8OL, in discussion with F3SK, suggests 1260-1262 mc, because its harmonic relationship suits the French band allocations ; and the DL's are said to be considering a narrow band round 1250 mc !

Clearly, whatever the band is to be it should be defined, adopted and adhered to on a European basis — and it wants settling quickly. According to our information, the "European VHF Managers" touched upon, but did not in any way settle, this particular problem during their recent week-end in Brussels.

Incidentally, for the information of those interested, the following F's are on 70 centimetres every Sunday at 1400 GMT, calling CQ on CW and phone, with beams headed N-NW : F3JN, 434.92 ; F3SK, 435.05 ; F8MX, 434.70 *or* 435.25 ; F8OL, 435.00 ; and F3FS, F8LO and F9TV slightly below 435.00 mc.

Another JA1 to claim VHFCC is JA1AG, Kawasaki, whose Certificate will be numbered 191, and whose claim will be discussed in our next, with others received since the last list appeared.

Some SWL Reports

SWL Ball (Hutton, Essex) made the most of the January EDX opening, some of the Europeans and DX G's heard being so strong that he was able to tape-record them (to listen to when the band is dead, no doubt !). SWL Drybrough (Coventry) got his share during the opening, too, and is now giving time to an improved aerial and converter.

From Malvern, SWL Tomlin writes that during his three years of listening on two metres, he has often heard strong signals in the winter from GDX distances, when the temperature was below freezing and the band activity low ; during the last six months of 1955, his log totals, of different stations heard each month, are : July, 124 ; August, 114 ; September, 87 ; October, 82 ; November, 81 ; and December, 55. During the January opening, SWL Tomlin made a personal call on one G station to tell him the band was alive ; said station went on the air and worked three PA's !

SWL Cox (London, S.W.18) agrees that the band is never as dead as it sounds, but says you've got to dig for them, all the same !

Held Over —

With the VHFCC claims are various other items of interest from different sources, which will have to keep till next month. Your A.J.D. has been more than somewhat pressed for this issue, but has, nevertheless, been able to cover all the correspondence.

Don't forget about the Contest week-end, March 10-11, and in the meantime, please let us have all your VHF news and views by **Monday, February 20** certain, addressed : A. J. Devon, " VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. With you again on March 9, which gives us a little more time than we have had the last month or two.

FREQUENCY COVERAGE — N.Z. ZC1 EQUIPMENT

The Mark I version of this equipment—the N.Z. ZC1 Mk. I—covers only the 80-metre amateur band. It is the Mk. II that gives coverage of the three bands 160, 80 and 40 metres, with an LF tuning limit of about 1900 kc. The only meter fitted in the ZC1 equipment is the 0-100 mA in the cathode of the PA, and there is no provision for external metering of any kind.

SPECIALISED TELCON PRODUCTS

In addition to radionic cables of every sort, The Telegraph Construction & Maintenance Co., Ltd., do a wide range of plugs, sockets, terminations and jointing units. Telcon metals include Super-Mumetal, Special Radiometal, HCR Alloy, Permendur, Invar, R.2799, Telcuman, Telconstan, Pyromic, Calomic, Thermostatic Bimetals, Beryllium Copper, Invar and Mumetal. All have specialised applications in the manufacture of radio, television and radar equipment.

AMATEUR RADIO For The Beginner

PART XI

PRINCIPLES OF MODULATION (2)

By A. A. Mawse

IN the January issue of SHORT WAVE MAGAZINE, in the first part of this discussion on the theoretical principles of modulation, terms were defined and the problem of voltage amplification dealt with, leading on to the production of audio power. This brought us to amplitude modulation, with the modulator connected in Class-B and its variants.

There are numerous other methods of effecting amplitude modulation, not all of which are suitable for amateur working. Broadly, they can be divided under two main headings:

Variable Efficiency, or constant input, which includes such systems as Class-B Linear; Control Grid; Screen Grid; Clamp and Suppressor Grid. Collectively, this group can be characterised by the need for only small amounts of audio power and by a reduction in carrier level under quiescent conditions. Such systems cannot utilise the full potential of the RF amplifier valve to which they are connected.

Constant Efficiency or variable input, which includes such systems as Heising Modulation or Choke Control; Class-B plate; Plate-and-Screen; Series and Linear. Such systems require considerable audio power, in the region of 50% of the RF power available, so that the peak radiated power is in excess of the unmodulated carrier power, the mean carrier level remaining constant.

There is a third system known as Cathode Modulation, which is a combination of the two groups.

It is proposed to outline briefly the main features of each system, but to deal somewhat more fully with those more usually adopted in amateur practice.

Class-B Linear. Operates with cut-off bias and low excitation such that the power output under carrier conditions is 25% of the peak power capabilities of the stage. Used mainly in broadcast work and commercial installations, since high anode dissipation figures are called for.

Control Grid. The basic circuit diagram is shown in Fig. 5, from which it will be seen that the output from the speech amplifier or modulator is fed, through a suitable transformer, into the grid circuit of the PA stage; this is adjusted to run in Class-C, and in this system requires about half as much again anode voltage as would be needed if the stage were plate modulated. Less excitation is also called for and, relatively, very little audio power—between 2% and 5% of the power input to the PA. The audio drive must have very good regulation. This system when correctly adjusted can give good results, but adjustment really calls for the use of an oscilloscope, and the system is not, therefore, recommended for the beginner.

Screen Grid. Fig. 6 shows the basic circuit. The screen volts are reduced to between one-half and one-third of the normal value for CW operation, by means of the adjustable resistor R. Under modulation conditions, the audio voltage produced across the output of the transformer T causes the screen volts to fluctuate from approximately zero to the full CW operating point. The system calls for low and rather critical RF excitation, of good regulation. Distortionless modulation is limited to about 80%. Under working conditions the actual carrier level will vary, being at its lowest when modulation is absent, and this can at times be somewhat trying to the distant receiving station, as the noise or "mush" level does not appear constant if the receiver is using automatic gain control. The system, however, has much to commend it, especially if the PA valve is a big one (like an 813) and a reasonably high carrier level can be obtained at low screen voltage. Owing to the relatively small amount of audio required, it is feasible to utilise a low-power modulator for conventional plate-and-screen modulation of a Top Band 10-watt transmitter, and to make use of the same audio equipment to screen-modulate much higher powers on the DX bands. At least one Old Timer known to the writer uses this method with considerable success, the PA valve on the higher frequencies being an 813. In this particular case, the drive to the 813 is set at 2 mA, the static (unmodulated) screen voltage at 200v., the plate voltage at 1200v., and the PA is loaded to draw 100 mA, giving a carrier input of 120 watts. Using screen modulation, 6 watts of audio power is ample to give full modulation of the 120-watt carrier, against the 60

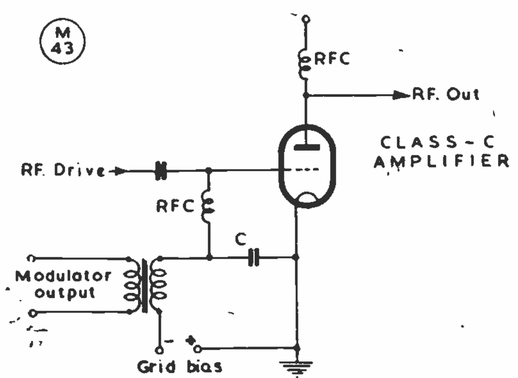


Fig. 5. Control grid modulation. Condenser C should not exceed .002 μF.

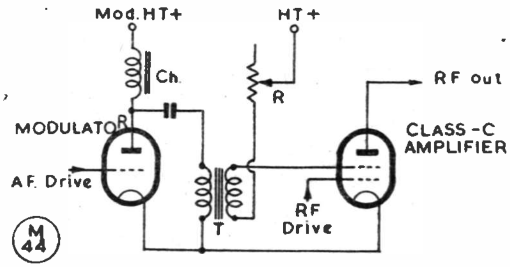


Fig. 6. Essential circuit for screen grid modulation, effective when a large PA valve is available.

watts of audio that would be required using conventional plate-and-screen control. Of course, it is only with valves like the 813, that can be run under such conditions, that a system like this is worth setting up; an 807 with low drive and less than half its rated screen voltage would not produce enough carrier to make screen modulation worth while.

Clamp Modulation. A modification of the system just described is known as Clamp and is illustrated in Fig. 8. In this form, output from the speech amplifier is rectified by a diode which serves to control the degree of negative bias on the Clamp valve, which is generally a pentode. The anode of the Clamp and the screen of the PA valves are in parallel and together fed by HT through a suitable dropping resistor. Under quiescent conditions the circuit constants are so adjusted that the Clamp valve draws a relatively heavy current. This causes a drop in volts across the series resistor, so that the voltage on the PA screen is correspondingly reduced and the power output of the PA likewise. With the application of modulation, the diode causes varying degrees of negative bias to be applied to the Clamp grid, thus reducing the current drain and hence the voltage drop across the resistor, thereby allowing the screen volts on the PA to rise. The adjustment of this circuit is, perhaps, a little more critical than the more straightforward Screen method previously described, but excellent results can be obtained with very little audio, and ordinary receiving valves are quite suitable for controlling carriers well up to the legal limit. The HT supply should be about 50% higher than would normally be used under CW

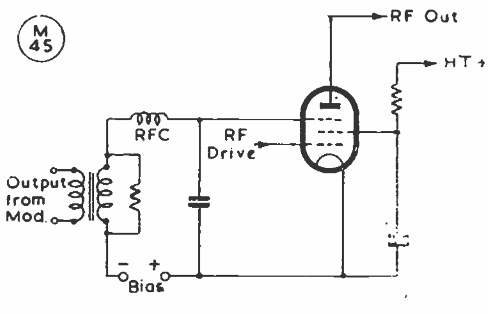


Fig. 7. Suppressor grid modulation. A way of doing it not much used nowadays unless the requirement is for local working.

conditions, and carrier fluctuation occurs in the same manner as in Screen modulation.

Suppressor Grid. This is the last method to be described under the general heading of Variable Efficiency systems. As will be seen from Fig. 7, this system requires a pentode in the PA stage, the suppressor grid of which, instead of being earthed, as is normally the case, is excited at audio frequencies by the alternating voltage appearing across the output of the modulation transformer, and is biassed negatively from an external source to about 50% plate efficiency, as compared with the maximum normally obtainable. About the same degree of RF excitation is required as for CW working, and the adjustment is not critical but the regulation should be good. About 90 to 95% modulation is obtainable with good linearity. Audio power required is in the region of 15-20% of the RF input. One rather interesting feature of suppressor grid modulation is

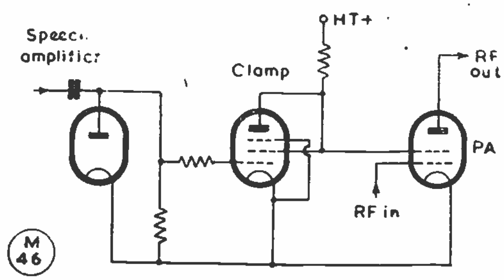


Fig. 8. Clamp modulation, which has frequently been discussed in "Short Wave Magazine."

that the PA can be operated quite effectively as a doubler. The efficiency is, of course, somewhat lower, but speech quality will not suffer appreciably.

Before turning to the **Constant Efficiency** systems, it would, perhaps, be as well to explain that all the diagrams given to illustrate these various methods are in basic outline only and, except where otherwise called for, triodes are shown for the sake of simplicity; in most instances, tetrodes or pentodes could be utilised in the same circuit. Also, for the sake of simplicity, the RF circuitry is omitted.

Heising Modulation, or Choke Control

This is, perhaps, the oldest system of amplitude modulation in existence, still used in many quarters and capable of giving excellent results. It has a special application in portable and mobile work, and in simple low-power transmitters. Fig 9 illustrates the essential circuit. The modulator valve is usually adjusted to operate in Class-A, and the DC anode voltage and current of the RF stage must be set to the correct value, by the resistor R, until the impedance of this stage matches that of the modulator, since the modulation choke gives a 1-to-1 coupling ratio; this is the condition if 100% modulation is to be obtained. The resistor must be by-passed for audio frequencies by means of the condenser C, and the choke has to be capable of passing the DC current for both stages without saturation, *i.e.* losing its inductance.

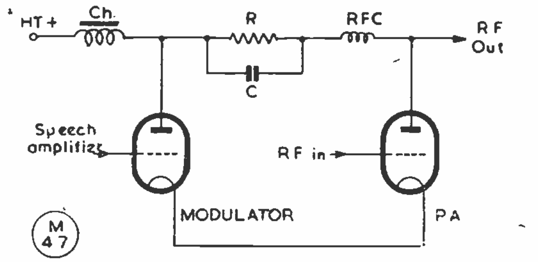


Fig. 9. Heising modulation, or choke control, probably the oldest, and simplest, method of amplitude modulation, and still very effective for low power working. Ch. must be an LF choke of at least 10 Henrys inductance, capable of carrying the plate current both for the modulator and the PA stages without saturating.

Class-B Plate

This system calls for a Class-B modulator, the output from which is fed through a modulation transformer which matches the impedance of the modulator to that of the PA, whether it be a single-ended or push-pull stage. About 50% of the RF power is required in terms of audio output to achieve 100% modulation, *e.g.* 50 watts of audio for a 100-watt carrier. The system is easy to adjust, but, compared with other methods described, somewhat costly as regards the audio equipment.

Class-B, Plate-and-Screen

Illustrated in Fig. 10 and somewhat similar to the above system. A pair of Class-B modulator valves provide audio output into the modulation transformer, which produces the correct impedance match to the PA valve or valves. In order to obtain distortionless, high percentage plate modulation of the screen grid valve, it is necessary that the screen be modulated in phase with the anode. The condenser across the screen-dropping resistor is so adjusted in value as to prevent the by-pass condenser from screen to earth causing excessive phase shift and attenuation at the higher audio frequencies. The system can be applied equally well to single-ended or push-pull RF stages, and the same power requirements are called for in relation to the amount of RF power. Plate-and-screen modulation is probably the system most used in amateur circles because, in spite of the somewhat heavy initial outlay in modulation equipment, it has been proved over the years to yield

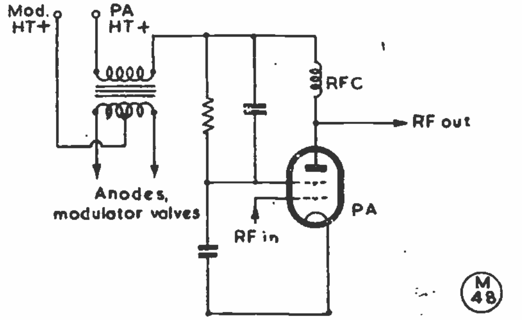


Fig. 10. The well-known Class-B plate-and-screen modulation system, widely used in amateur band telephony transmitters.

Readers building the VFO in the December issue are asked to note that in the circuit on p.532, grid condenser C4 (given in the Table of Values) was omitted — it goes in the grid line to V1A, between the top ends of C3 and R1.

the most consistent results. Under normal conditions when a plate, or plate-and-screen, modulated RF amplifier is working correctly, a meter placed in the HT supply to this stage should give a perfectly steady reading. Under certain conditions, what is known as decrement modulation occurs—that is to say, the meter shows downward kicks when modulation takes place. There may be a number of reasons for this: The excitation to the grid of the modulated valve may be inadequate or the amount of grid bias insufficient; the load impedance of the RF stage may be incorrect; there may be poor regulation of the power supply feeding the audio stages, or of both if they are supplied from the same source; and finally, heavy over-loading of the RF stage. Conversely, upward

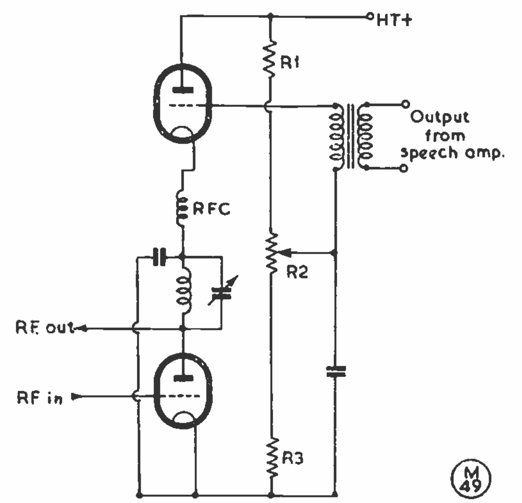


Fig. 11. Series modulation, another method discussed in the text, in which the modulator and modulated stages are in series across a common HT supply.

kicks of the meter may be attributed to too much audio power, causing over-modulation, to indifferent neutralisation of the RF stage or parasitic oscillations in this stage. By and large, however, the system is relatively easy to adjust and get working.

Series Modulation

One quite interesting but little-used system is series modulation, which is shown in Fig. 11, and so-called because the modulator valve is in series with the RF amplifier. Since both valves are in series, they must, of necessity, take the same anode current, so that it is necessary to adjust bias, drive and loading on the PA until the voltage across the modulator is higher than that across the PA. Modulator bias is controlled by means of the voltage divider chain R1, R2 and R3 in the circuit diagram. Approximately *twice* the normal HT volage is

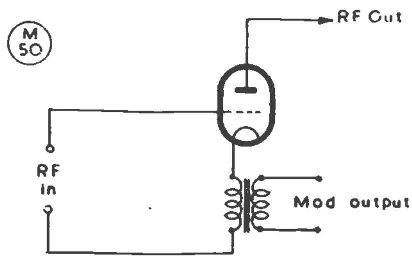


Fig. 12. Cathode modulation, which is capable of giving good results and is one of the simpler systems.

required from the power pack and, of course, it is necessary to make sure that the insulation of the heater winding on the transformer supplying the modulator valve is adequate, since it is nearly half the HT supply voltage above earth. The system is, perhaps, worth while considering if one has the ingredients for putting together the necessary high-voltage power supply.

Cathode Modulation

It was mentioned earlier that this system is really a cross between the two main groups, Variable Efficiency and Constant Efficiency. The basic circuit is shown in Fig. 12 and, in brief, the system operates as follows: On one half-cycle of the modulating voltage the audio volts produced across the secondary of the modulation transformer will *add* to the HT voltage, thereby causing a rise in power output. At the same moment the polarity of the audio volts will cause a *drop* in grid bias, thus increasing the power output still further. On the opposite half-cycle the reverse will occur, the nett HT volts will be reduced and the grid bias increased. In general, cathode modulation requires a larger RF amplifier valve with greater anode dissipation, but substantially less audio power and a smaller modulation transformer. In like manner, a larger RF power supply will be needed, but a smaller AF power unit with a lower voltage output can be used. The system requires some care in setting up, and, like the grid modulation system already described, really needs the aid of an oscilloscope to obtain best results.

Summing Up

We have now reviewed, if somewhat briefly, most of the systems likely to be encountered in amateur circles. Although the reader will appreciate that, in an article of this nature, much, of necessity, has been left unsaid, it is to be hoped that this general survey will be of assistance to the beginner in obtaining a working understanding of the meaning of modulation and how it may be obtained, and will help him to decide for himself which particular system will suit his own circumstances. It is hoped, in a later article, to give constructional details of an all-purpose speech amplifier and modulator which will be suitable for operating a number of the systems which have just been outlined.

Phase Inverters

A few words on this subject would not be out of place. In speech amplifier design, it is generally necessary to go from a single-ended stage into a push-pull output stage or a push-pull driver stage for a pair of Class-B modulators. A conventional way of achieving this is by means of a suitable transformer, but such transformers can be rather

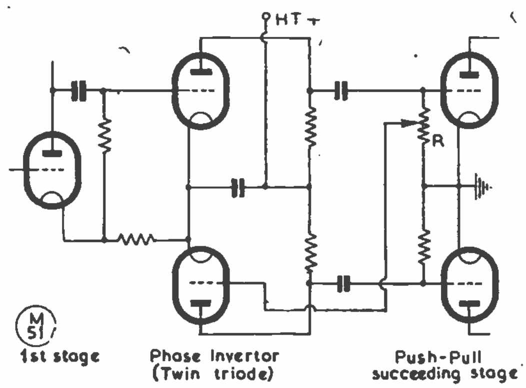


Fig. 13. A phase inverting circuit, eliminating the need for a driver transformer.

expensive and, moreover, they can be the cause of hum trouble. The 180° out-of-phase voltages necessary for driving the grids of the succeeding stage can be obtained more cheaply by making use of a pair of triodes (or a twin-triode) and a resistance-capacity network, as shown in Fig. 13. Adjustment of the potentiometer (R in the diagram) is made until balanced excitation is provided at the grids of the succeeding stage. There are a number of variations of this idea, but the object remains the same—to provide balanced, out-of-phase voltages, for driving the grids of the succeeding push-pull stage.

Next Month: **Choke Control Modulator for the Beginner's Transmitter.**

CLEANING SWITCHES

The cleaning *and* proper lubrication of switches and other similar moving parts in radionic apparatus calls for more than usual care if full operating efficiency is to be obtained without detriment to the switch contacts themselves by the use of some improper lubricant.

All this is taken care of by the Contact Maintenance Kit produced by Painton & Co., Ltd., Kingsthorpe, Northampton, the well-known manufacturers of resistors and switches. Consisting of a special non-corrosive cleaner and a lubricant of the correct chemical composition, made up in such a way that only the right amount of lubricant can be applied, the Painton Contact Maintenance Kit costs 11s. 6d. and can be recommended as the solution to any radio switch-cleaning problem. Clean switches, properly lubricated, can very often effect a remarkable improvement in general results.

The Low-C Colpitts Oscillator

AN IMPROVED VFO CIRCUIT

F. W. V. BUCKLAND, A.M.Brit.I.R.E. (G3DIR)

This is an interesting article dealing with the evolution of a stable drive oscillator using normal supply voltages. The writer proves his results by figures showing exceptional freedom from frequency variation under wide changes of HT and LT supply voltages.—Editor.

THE writer was seeking for a good oscillator which was to have little drift, with good stability on a varying supply of heater and high tension voltage. In the course of searching for a suitable circuit, that of the Low-C Colpitts mentioned in an earlier volume of *Short Wave Magazine* (1) was found, and after studying it, it was decided to try it out.

Circuit Details

Variations in frequency due to the valve can arise from either changes in the inter-electrode capacities, or changes in loading. The loading problem can be dealt with by loose coupling (which demands high output from the oscillator for good results) or by isolating the resultant valve changes from the frequency determining circuit. The variations in the valve capacities can either be isolated from the tuned circuit or can be swamped.

The standard Colpitts has some disadvantages in the method adopted in reducing the effects of the valve on the oscillating circuit. The grid coupling condenser can be reduced, minimising the effect by the series-C argument, and the remaining variations are swamped by the large-C tuning condenser. Some of this large-C can be fixed, thus providing for a cathode tap, and the remainder is then made variable, allowing for bandspread, but a small inductance is necessary for any given frequency, as the whole of the capacity is in the tuning circuit. This results in a small output, for the RF volts are developed across the inductance of a circuit.

But by moving the grid condenser C3 to the position indicated in the diagram, the best of both worlds is obtained. The high C can be made much higher than in a normal Colpitts, and thus it swamps variations in the valve capacities more effectively. The grid C reduces the remaining variations, and the low-C tuning condenser requires a large L for any given frequency, allowing good output which is reasonably constant over the tuning range.

In theory then, here are the foundations of a good oscillator, which is not unlike the Clapp oscillator, well known for its stability.

Table of Values

Low-C Colpitts circuit suggested by G3DIR

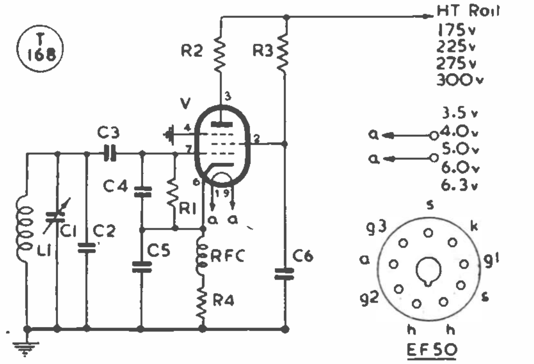
C1 = 30 μμF, variable	R2 = 15,000 ohms
C2 = 30 μμF, NTC.	R3 = 33,000 ohms
C3 = 100 μμF	R4 = 50 ohms
C4, C5 = .001 μF	RFC = 2.5 mH RF choke
C6 = .01 μF	V = EF50
R1 = 10,000 ohms	

Construction

To begin with, for the purposes of testing, materials from the junk box were used in the construction of this oscillator. While care was taken to ensure that the best available components were used, it is stressed that only material to hand was employed, and this eventually resulted in a circuit which went off at a frequency about 9 mc. This was considered to be a good thing, for what would work at 9 mc should surely work even better at lower frequencies.

To obtain best results, all the usual precautions should be taken when building up any circuit, and a very good article on this subject appeared recently in *Short Wave Magazine* (2).

When power was applied oscillation occurred immediately, with a good clean note, but drift due to temperature change was apparent. This is inevitable in *any* oscillator during the first few minutes after switching, and can continue unless suitable precautions are taken. The fitting of a negative temperature co-efficient condenser caused a drift in the opposite direc-



The circuit discussed by G3DIR, using an EF50; with 6.3v. on the heater and 175v. HT, the cathode current in oscillation is 6 mA. At 3.5v. heater voltage, cathode current is 4.5 mA; with 3.2v. on the heater, oscillation ceased. The significance of this circuit lies in the condenser C3, as explained in the text.

TABLE 1

Oscillator Frequency 9 mc approximately	
Change in HT Volts	Change in Frequency
175v. to 225v.	70 cycles.
225v. to 275v.	80 cycles.
275v. to 300v.	30 cycles.

tion, so it is apparent that such drift can be eliminated by choice of a suitable condenser. Each oscillator will require its own individual treatment with NTC condensers, and in this case, having made a reasonable adjustment, the matter was not pursued further, as final adjustment would be made in the production model—should the circuit prove satisfactory. So the circuit was allowed to warm up and become reasonably stable before carrying out the tests which follow.

Testing

Signals from the oscillator were picked up on a CR-100 receiver, and a beat note obtained by injecting simultaneously the signal from a crystal oscillator operating on about 9 mc. It was found that the output from the variable oscillator was enough to require the RF gain control of the receiver to be backed off, thus eliminating outside interference, and the audio output was sufficient for testing with the AF gain control almost at minimum. A check showed that the output was reasonably constant over the tuning range, which incidentally, in the circuit as shown, was from about 7 mc to just over 9 mc.

The changes in frequency were measured by beating the resultant from the variable and the crystal oscillators with an audio oscillator.

As the oscillator was to operate from an unstabilised supply the first check was to determine the frequency change due to changes in HT voltage. The supply in use was capable of being switched in steps which gave 175v., 225v., 275v. and 300v. The oscillator was running on the 175v. tap, and when this was switched to the 225v. position there was remarkably little change in frequency. This led to the other voltages being applied in turn, and the results are given in Table 1.

The next check was to be variations in frequency due to changes in the heater supply voltage. Such variations are a source of frequency change which are seldom dealt with but which, nevertheless, are a cause of considerable trouble. It was found that the EF50 valve oscillated quite well with only 3·5v. on the heater, but it ceased to function when the heater supply was reduced to 3·2v. The 3·5v. position was the one used as the minimum in the tests. The oscillator was run at the lower voltage, and when steady, the heater supply was quickly increased to 6v., and the frequency change measured when it had become steady again. The results, tabulated in Table 2, show that the oscillator is quite stable, and that normal heater voltage variations should have little or no effect.

The larger change in frequency when increasing from 4v. to 6v. was investigated, and it was found that as the voltage was raised *gradually* from 3·5v., so the frequency moved first in one direction, and then swung to the other direction. It was at a maximum in the first direction when the heater voltage was about 4v., and this accounts for the larger change obtained, and shown in the Table. When increased to 6v. from voltages above 4v. the frequency change was always in the same direction.

TABLE 2

Oscillator Frequency 9 mc approximately	
Change in Heater Volts	Change in Frequency
3.5v. to 6v.	120 cycles.
4.0v. to 6v.	200 cycles.
5.0v. to 6v.	85 cycles.

The loading by a subsequent circuit was not checked, as it did not enter into the particular problem involved, but it would seem that if the output was taken from the anode of the valve the loading circuit would be sufficiently isolated from the tuned circuit as to cause little trouble. The grid coupling condenser might be reduced from the 100 $\mu\mu$F fitted to provide further isolation, if it were felt to be necessary.

The results obtained detailed above were so surprising that they were repeated the following day in the presence of an independent observer, and similar figures were obtained. These figures are given as they were taken, and a full check was made to ensure that there was no mistake.

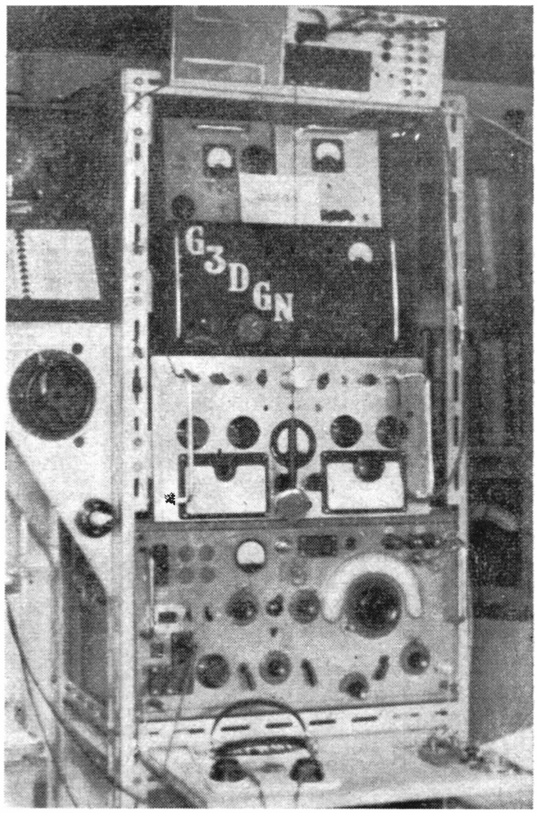
REFERENCES

(1) "Improving the Colpitts," Williams.
(2) "Approach to VFO Design," Walker. *Short Wave Magazine*, April, 1955; December, 1955.

There is no doubt that by connecting the grid coupling condenser adjacent to the tuning circuit, and the large swamping condenser remote from this circuit, an oscillator can be produced which although nominally a Colpitts, is a considerable improvement on the normal method of connection. The series-tuned version, popular for a long time now as the Clapp, is also an improvement on the original Colpitts design, but suffers from a falling output towards one end of the tuning range. This parallel tuned version appears to have overcome this latter disadvantage, and is therefore, providing the stabilities are at least equal, a better oscillator. Should it be used for a VFO it is suggested that a later stage be keyed.

THE OTHER MAN'S STATION

G3DGN



ANOTHER photograph of the station of G3DGN —owned and operated by G. I. Turner, Deegeen, Clifford Road, New Barnet, Herts. — appeared on p.247 of the July issue of SHORT WAVE MAGAZINE. A point of particular interest about G3DGN is that the station is accommodated in the living space of a five-room caravan on a semi-permanent site. It is also the twelfth installation under the call since the G licence was issued—for G3DGN actually started in Ceylon as VS7IT in 1946. From VS7, 98 countries were worked during eight months' activity on the 7, 14 and 28 mc bands, with a total of 1,100 contacts, using 300 watts on phone and 700w. CW. VS7IT that-was returned to England in late '47, and the present licence was issued in February 1948.

G3DGN is an all-round station, operated on CW and phone on most bands, with a general interest in everything that goes on, as well as in QSO'ing for its own sake. A compact filing system is maintained to keep track of contacts, which by now total some 1,500 different stations worked. The main receiver is the well-known ex-Service type R.107, with a separate transmitter for One-Sixty; the No. 2 set is for the HF bands and runs a pair of 807's at 110 watts. A third transmitter is for two metres, with an 829 in the PA. The BC-221 frequency meter is used not only for its intended purpose, but also, on occasions, as a VFO. Other equipment includes an Avo, a megger and what G3DGN describes as "a set of wavemeters." However, he finds one of the most useful items in the test equipment category to be a neon tube mounted on a jack-plug!

Because the whole G3DGN family is interested in the station and G3DGN-jr. is not yet three, safety precautions are stringent; a foot switch within easy reach cuts mains power to everything, and a leakage trip likewise switches off the mains if more than a few mA pass between the live side and earth on the AC supply. No HT points are exposed, and all units are boxed and earthed.

That G3DGN himself is a man of parts is instanced by the fact that not only is he keen on all aspects of Amateur Radio, including Club activities, but he is also interested in sailing and—cooking! Dexterity with the fry-pan must be a great help (or is it!) to his XYL, who herself takes a keen interest in the operation of the station. A happy family in their hide-out in Hadley Woods.

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.

G2HGT, W. T. Black, 9 Nursery Street, Tottenham, London, N.17.

G3AFN, W. E. Brown, 53 St. Winifred's Road, Teddington, Middlesex.

GI3EYQ, A. E. Donegan, 67 Antrim Street, Lisburn, Co. Antrim.

GM3HZA, R. M. Corcoran, 37 Kilmacolm Road, Greenock, Renfrewshire.

G3KKF, J. Court, 85 Clarendon Street, Dover, Kent.

G3KNW, J. S. Watt, 30 Tattenhoe Lane, Bletchley, Bucks.

G3KPJ, A. W. Butcher, Rectory Cottage, West Hanningfield, nr. Chelmsford, Essex.

G3KPS, F. A. Smith, 5 Shelley Avenue, Boldon Colliery, Co. Durham.

G3KQH, J. R. Hunt, 47 Hill Street, Wellingborough, Northants.

G3KQQ, C. A. Mattacks, 307 Compton Buildings, Goswell Road, London, E.C.1.

G3KRC, K. R. Clarke, 24 Galley Lane, Barnet, Herts.

G3KRL, J. Schofield, 21 Princess Street, Batley, Yorkshire.

G3KRP, E. G. Powell, 169 Dominion Road, Glenfield, Leicester.

G3KSL, D. G. Quarrington, 69 Pennant Road, Rochester, Kent.

GW3KSQ, C. T. Jay, 40 Abbots Close, Margam, Port Talbot, Glam.

G3KTI, M. V. Rees, 4 Valley Road, Lydney, Glos.

CHANGE OF ADDRESS

G2AOZ, G. W. F. Ashford, 18 Gipsy Lane, Attleborough, Nuneaton, Warks.

G2DNY, C. A. Wheaton, No. 2 Police House, Whitchurch Road, Tavistock, Devon.

G2DQ, H. G. Collin, Tudor House, Penny Royal Road, Danbury Common, Chelmsford, Essex.

G2KB, L. I. Sidwell, 53 King Edward's Road, Ware, Herts.

G3ABA, L. J. Kennard, c/o 14 Norfolk Road, Thornton Heath, Surrey.

G3AIM, L. S. Wright, 29 Lovel Road, Speke, Liverpool, 19.

G3ANJ, A. J. Wall, 161 Monyhull Hall Road, Kings Norton, Birmingham, 30. *(Tel.: Kings Norton 3629).*

G3APL, J. Russon, 59 Ridge Road, Kingswinford, Brierley Hill, Staffs.

G3CEB, P. M. Scadden, c/o J. Holt & Co., Lagos, Nigeria.

G3CVG, S. Jackson, 22 Brook Road, Morecambe, W.E., Lancs. *(Tel.: Morecambe 1189).*

G3DQO, A. L. Cawley, 6 Newton Road, Urmston, nr. Manchester, Lancs.

G3DXJ, T. Holbert *(ex-VS6CQ),* 52b M.S.Q., Arborfield, Berks.

G3DZX, F. C. Bailey, 360 Ridgacre Road, Quinton, Birmingham, 32. *(Tel.: Woodgate 2011).*

G3EKJ, H. F. Mattacks, 43 Prendergast Road, Blackheath, London, S.E.3.

G3EPV, R. D. Emes, 142 Sussex Road, Harrow, Middlesex.

G3FIQ, A. W. H. Cox, 17 Kensington Church Street, Kensington, London, W.8. *(Tel.: WEStern 1994).*

GI3GQA, W. P. Hewitt, 36 Sicily Park, Finaghy, Belfast.

G3GVV, R. J. Hughes, 24 Campden Road, Tuffley, Gloucester.

G3HZP, H. D. James, 77 Fleetwood Road, Dollis Hill, London, N.W.10.

G3IAZ, A. H. Wickham, 18 Carmel Gardens, Darlington, Co. Durham.

G3IKN, Cpl. Stagg, V. A., 59 A.M.Q., R.A.F. Station, Marham, Kings Lynn, Norfolk.

G3INU, R. J. Appleby, 91 Tewkesbury Road, Clacton-on-Sea, Essex.

GW3ISJ, J. J. Caulfield, 34 Greenmeadow Drive, Tongwynlais, Cardiff, Glam.

G3IZ, C. H. Thorpe, 40 Bellars Lane, Malvern, Worcs.

G3JBL, G. A. Millray, 6 Durham Avenue, Scotforth, Lancaster.

G3JED, G. A. Cunningham, 17 Meads Cottages, Mansion Lane, Iver, Bucks.

G3JFN, C. Sonley, 5 St. Nicholas Gardens, Hessle High Road, Hull, Yorkshire. *(Tel.: Central 55748).*

G3JQG, T. Seatter, B.E.M., 122 Birch Road, Ambrosden, Bicester, Oxon.

G3KAW, J. W. Maddison, 23 Mayfield Avenue, Dover, Kent.

GM4HR, S. Ramsay, 5 Balunie Place, Douglas and Angus, Dundee, Angus.

CORRECTION

G3CWZ, D. R. Layzell, Sunningdale, Cann, Shaftesbury, Dorset. *(Tel.: Shaftesbury 2164).*

GM3HGU, D. Melville, c/o Anderson, 48 Sythrum Crescent, Glenrothes, Fife.

G3KLM, P. J. Le Moine, The Crab and Lobster Inn, Mill Hamlet, Sidlesham, Chichester, Sussex.

THE MONTH WITH THE CLUBS

By *"Club Secretary"*

(Dead-line for March Issue : FEBRUARY 17)

BACK to work, and into the 1956 season! MCC is over, the Christmas break is past us, New Year celebrations dead and gone, and there's nothing for it but to get along with some good solid work on behalf of the Club. Apart from the winter routine of lectures and discussions, it isn't too early to think of the renovations necessary in the Clubroom, or even the overhaul of the aerial system—or even the building of that mobile for the summer, which is never quite so far away as you think it is.

Successful Christmas Parties are reported by many Clubs—mostly the larger ones, for it seems that the social angle varies in direct ratio to the size of the Club.

Cardiff report a fair number of new faces, most of them wishing to take the RAE, and a Morse class is being formed to help in this direction. On February 13 GW3HJR will "ramble" on How to Make and Do, Some Fiddles, and Hints and Kinks. This will take place at the British Volunteer, The Hayes, Cardiff. On March 12 there will be a lecture on Electronics by Mr. J. J. Richardson.

Clifton had no less than 17 stations in their Christmas morning Club Net on the Top Band. On February 3 and 17 they hold Constructional Evenings and Ragchews; on the 10th a Quiz; and on the 24th a Junk Sale. Meetings every Friday, 7.30 p.m. at 225 New Cross Road, London, S.E.14.

Coventry are to hear G5GR on Aerials and Switches on February 13; they have a Junk Sale on the 27th, and due warning is also given of their Annual Dinner, at the Barras House Hotel, on April 7.

Lothians are to have a talk by Mr. W. T. Bell of the GPO Engineering Department on February 9. The subject—Radio and Television Interference and the Radio Amateur! On February 23 they will hear a talk on Police Radio by Chief Inspector Bruce. All very official! Meetings are at 25 Charlotte Square, Edinburgh, 7.30 p.m.

Midland heard a talk, on January 24, on "A Ham on the Siam Railroad," by G3BA.

Wellingborough held their AGM on January 5, and the Secretary announced the Club call-sign—G3KSX. Meetings are held every Thursday at the Co-operative Offices, Silver Street, and a full programme up to the end of April has been arranged.

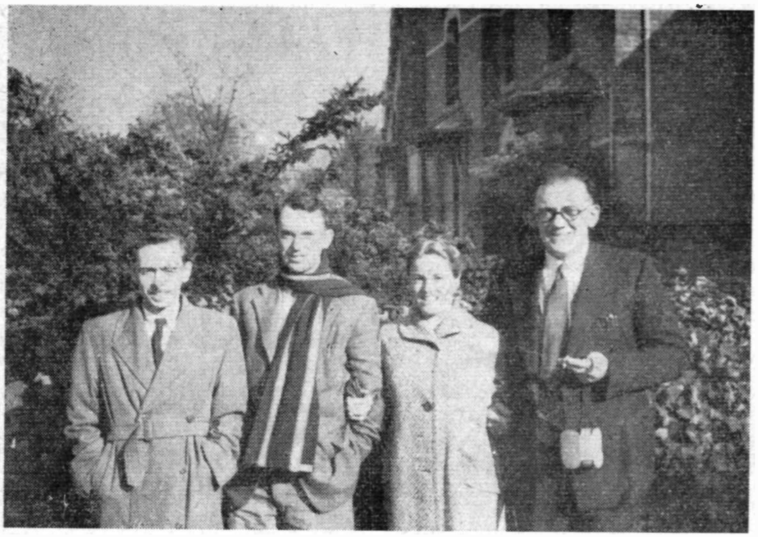
Ripley (Derby) report for the first time. They were formed last September and already have over 40 members. During the past three months they have held lectures, demonstrations and film shows, and it was hoped to enter for MCC, until accommodation difficulties "put paid" to this. An aerial demonstration and a Hi-Fi demonstration are planned for the future. Meetings take place at Shirley Road Schools, Ripley, every Tuesday at 7 p.m.

Slade announce the following events: February 3, Talk by G3BA; February 17, Junk Sale; March 2, Talk on Rectifiers (Standard Telephones and Cables); March 16, Talk on Electronic Musical Instruments.

South Manchester will be hearing a lecture on Radar and its Applications on February 10, and they hold a Hot-Pot Supper on February 17. The latter will take place at the Wellington Hotel, Manchester, and reservations may be made at 5s. 6d. The RAE Course is well under way on Monday evenings at 8 p.m., in the Club HQ at Ladybarn House, 17 Mauldeth Road, Manchester 20.

Surrey (Croydon) held their Annual Dinner on January 27 at the Greyhound, when, no doubt, a

Presentation of the "G2AK Silver Jubilee Shield" to G3JEF and G3HKC by the president, Mr. W. E. Chilvers, at the Slade Radio Society's annual dinner recently.



At the British Amateur Television Club's meeting in Birmingham among those present were, left to right: G3KBA/T, G3CVO/T, XYL G3CVO, and G3EJO. A group of the BATC has been formed in Birmingham.

certain amount of celebration of their resounding success in MCC was permitted! The judging in their own Constructional Contest will take place at their February meeting.

East Kent continues to meet at The Two Brothers, Northgate Street, Canterbury, and there was a turn-out of 28 for the AGM. They hope to move into permanent headquarters in three weeks or so, and also to have about four D-F sets in action this year. VS1HD is joining the Club when he returns home. New members will be welcomed, also any visitors in the district.

Edgware moved their headquarters on January 18, and are now to be found at Cannons Park Community Centre, Merrion Avenue, Stanmore, where they meet every Wednesday at 8 p.m. *See* panel for Secretary's QTH.

The QRP Society report that their 1955 Kaleveld Cup Contest was won by their President, GC2CNC—his third consecutive win. During the contest he worked 226 stations in 40 countries, running 5 watts to a single tri-tet 6V6. GC2CNC has now been presented with the Kaleveld Cup outright. Membership of the QRP Society is open to both licensed amateurs and SWL's, the only requirement being a genuine interest in low-power work.

Sutton and Cheam ran their Christmas Junk Sale on December 20, and an enormous amount of gear changed hands at ridiculous prices. The meeting on February 21 will be a film show, and on March 10 the Annual Dinner and Ladies' Festival will be held—details from the Hon. Sec. Visitors and prospective members are always welcome at the Harrow Inn, Cheam Village — 7.30 for 8 p.m.

The **Crystal Palace** and District Radio Club has just been formed to widen the scope of the activities of the Norwood and district group, which will continue to be catered for within the structure of the new Club. Meetings are held in Windermere House, Westow Street, Crystal Palace, at 8 p.m. on the third Saturday. The Secretary (*see* panel for QTH) will be glad to hear from interested persons or prospective members.

Stoke-on-Trent continues to meet every Thursday evening at the Club HQ. Morse lessons are being given from 7.30 to 8 p.m. each week, and one of the members recently passed the Morse test with flying colours; this gave a great fillip to all concerned. A series of lectures covering the RAE syllabus has also just begun.

North Kent held their AGM on January 12 and elected G2YZ president, Mr. Gemmell chairman, G3KLI secretary and G3JBK assistant secretary. During 1956 they will meet on the second and fourth Thursdays at the Congregational Hall, Clock Tower, Bexleyheath, and new members and visitors will be welcome.

The **Army Wireless Reserve** Amateur Radio Society has been formed to assist serving and former members of the Army and its Reserves, who are interested in Amateur Radio. Most of the founder members belong to the AWRS of the Army Emergency Reserve (the doings of the AWRS have been

NAMES AND ADDRESSES OF CLUB SECRETARIES REPORTING IN THIS ISSUE:

ARMY WIRELESS RESERVE: J. A. Bladon, G3FDU, Madresfield, Jack Lane, Davenham, Northwich, Cheshire.
CARDIFF: R. Morris, GW3HJR, The Shack, St. Cenydd Road, Caerphilly, Glam.
CHESTER: N. Richardson, 23, St. Mary's Road, Dodleston, near Chester.
CLIFTON: C. H. Bullivant, G3DIC, 25 St. Fillans Road, London, S.E.6.
COVENTRY: J. H. Whitby, G3HDB, 24 Thornby Avenue, Kenilworth.
CRYSTAL PALACE: G. M. C. Stone, G3FZL, 10 Liphook Crescent, London, S.E.23.
EAST KENT: D. Williams, Llandogo, Bridge, near Canterbury.
EDGWARE: E. W. Taylor, G3GRT, 99 Portland Crescent, Stanmore, Middx.
LOTHIANS: J. Good, GM3EWL, 24 Mansionhouse Road, Edinburgh 9.
MIDLAND: C. J. Haycock, G3JDJ, 360 Portland Road, Birmingham 17.
NORTH KENT: F. Beadle, G3KLI, 56 Balliol Road, Welling.
QRP SOCIETY: J. Whitehead, 92 Ryden's Avenue, Walton-on-Thames.
RIPLEY: T. Darn, G3FGY, 42 Laurel Avenue, Ripley, Derby.
SHEFFORD: G. R. Cobb, G3IKG, Lilac Cottage, 7 Hitchin Road, Shefford, Beds.
SLADE: C. N. Smart, 110 Woolmore Road, Birmingham 23.
SOUTH MANCHESTER: M. Barnsley, G3HZM, 17 Score Street, Bradford, Manchester 11.
STOKE-ON-TRENT: A. Rowley, G3JWZ, 37 Leveson Road, Hanford, Stoke-on-Trent.
SURREY (CROYDON): S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon.
SUTTON AND CHEAM: F. J. Harris, G2BOF, 143 Collingwood Road, Sutton.
WELLINGBOROUGH: K. R. Fulbrook, G3KRF, 2 Kent Road, Wellingborough.

reported in previous issues), but membership is open to any serving or past member of AWRS; any serving or past member of any other Royal Signals unit; or any serving member of any non-Signals unit. Club activities will be entirely *non*-military in character, and a programme is being drawn up for the coming year. Full details from the Chairman, G8PG, or the Secretary, G3FDU (*see* panel for QTH).

Shefford meet each Friday at Digswell House, their Hq., and cover all electronic and allied subjects; the amateur call is G3FJE, and refreshments are available on the premises. The next meetings are on February 17 (Technical lecture) and 24 (Film show).

Club reports are welcome for this feature, and should be addressed to "Club Secretary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1, to arrive by February 17 latest for the next issue.

NUTS ON DX

"QSL THROUGH BOX 88"

SOME years ago it was the custom for a gentleman with the improbable but nevertheless genuine name of Arabackle Oblifork to make spasmodic incursions into the columns of "DX Commentary." Like everyone else, we were highly sceptical about his authenticity, but we identified him as the composer of an extremely obscure piece of music which actually appeared in print—just a week before the publishers went out of business.

All communication ceased abruptly until the arrival of a recent letter which, presumably, is intended to put us in the picture (as they laughingly describe it); though what the picture *is*, we still do not know. Suffice it to say that the voice of Arabackle has been heard again, telling an even more incredible story than we should have expected from him.

It seems that he was unable to qualify for a transmitting licence for many years, for the reason that no one would believe that he was a British citizen, once they had deciphered his signature and found that his name really was what it looked like. In fact, the general tendency was to disbelieve in his existence altogether, and the G.P.O. rightly pointed out that the granting of a licence to a myth would set an awkward precedent. However, he seemed to have a friend (since departed) at the Foreign Office or some other august institution, and eventually things were sorted out. Arabackle was no fool—he passed the Morse test and the Examination without the slightest trouble, once the examiners had been revived after deciphering his signature.

Then, trading on the initial doubts as to his nationality, he prevailed upon the authorities to give him a distinctive call-sign; in fact, he demanded no fewer than three of them—one for mobile, one for fixed, and the other for some experiments that he claimed would enable him to radiate in the fourth dimension. Such was his pull in high places that he was actually allocated the three calls GB2BA, GB4BA and GB6BA (hence the title of this article).

All would have been well had he not fallen among political fanatics. He always chose peculiar company, but these friends of his own choosing simply brain-washed him, and he emerged badly shrivelled, slightly cross-eyed, and convinced that he could not use the prefix GB, or even G, because he was firmly indoctrinated with the guilty feeling that even to *think* the word "Great" in connection with his mother-country was immoral. He was willing, however, to settle for the United Kingdom, and so he changed his prefix, without warning or permission, and signed himself as UK2BA, UK4BA and UK6BA.

Arabackle's chief object in life was to show up all these holders of a mere eighty or ninety certificates as cissies, and you can imagine his delight at the greatly increased turnover of DX that resulted from his unauthorised change of prefix. His undoing was his own ridiculous sense of independence (or, as he preferred to call it, his "apartness"), which forbade him either to give his QTH or to have his calls published in any book. Further, he looked on QSL Bureaux as ridiculous manifestations of officialdom for pandering to the herd. He therefore can only have had himself to blame for the fact that all his DX cards eventually found their way to Box 88, Moscow, leading to a nation-wide search (including Uzbek, Azerbaijan and Kazakhistan) for a highly illegal transmitter.

The non-arrival of his cards thwarted his trophy-hunting obsession, and it seemed that the only logical way (to him) of righting matters was to embark on a personal search for them. His characteristically thorough study of the Russian language cost him nearly three years off the air, and by the time he felt he was competent enough to set out on the Great Adventure another fifty-six certificates had been announced. So he set to again, working All Brazilian YL's, All Costa Rican Peanut Sellers, All Siamese Trapeze Artists and most of the other awards with which our readers are already doubtless familiar. (He nearly came to grief trying to acquire All Psychiatrists in London, W.1, but when he adopted the technique of saying "My sigs are RST 599—how are yours?" they recognised a kindred spirit and obliged.)

The delay was most regrettable, however, because at the time of writing he had only just made arrangements to depart (through the usual channels) in search of Box 88. He is confident of success, since, as he says with no assumption of false modesty, "If Box 88 has all my cards in it, it's a Pretty Big Box and should be easy enough to locate."

We hope to hear more from him in due course, but readers might care to note that the business of calling at 55 Victoria Street and asking for Mr. Oblifork has been a little overdone. The one-time typist who said, without blinking, that he didn't usually come in on Tuesdays is now happily married and living in a detached villa in Surrey. *L.H.T.*

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6A7G	8/6	6H6M	5/-	12K7GT	8/6	856A	12/6	KTW62	7/6	Y63	8/6
6A6	10/-	6K8GT	9/-	12AH7GT	8/6	872A	21/-	KTW63	7/6	TZ40	35/-
6C6	6/6	6L6G	10/-	12K8GT	8/6	9001/2/3	6/-	KT33C	10/-	R3	8/6
6D6	6/6	1622 (6L6)	11/-	12Q7GT	8/6	9004	6/-	KT61	10/-	OZ4	7/-
6AC7	6/6	6L7M	8/6	12SA7GT	8/6	9006	5/-	KT65	12/6	OZ4A	7/-
6AG7	10/-	6N7GT	7/6	12SQ7GT	8/6	954	5/-	KT2	5/-	GL466A	25/-
6BB	7/6	6Q7GT	8/6	12SG7	8/6	956/7	6/-	PEN25	6/6	OD3/W	8/6

SPECIAL REDUCTION FOR SETS OF VALVES

1A7GT, 1N5GT, 1H5GT, 1A5GT (or 1Q5GT or 3Q5GT)	40/-	Set
10 EF50 (Ex-Brand New Units) 5/- each	45/-	,,
10 EF50 (Red Sylvania ex-new units) 6/- each	55/-	,,
6K6G, 6K7G, 6Q7G, 5Z4G, 6V6G ..	37/6	,,
1R5, 1S5, 1T4, 1S4 or (354 or 3V4) ..	27/6	,,
DK96, DF96, DAF96, DL96	37/6	,,
6K8G, 6K7G, 6Q7G, 25A6G, 25Z5 (or 25Z6G)	37/6	,,
12K8GT, 12K7GT, 12Q7GT, 35Z4GT, 35L6GT (or 50L6GT)	37/6	,,
12SA7GT, 12SK7GT, 12SQ7GT, 35Z4GT, 35L6GT or 50L6GT	37/6	,,

62A INDICATOR UNIT

Containing VCR97 with Mu-Metal Screen 21 valves :—12EF50, 4-SP61, 3-EA50. 2-EB34, Plus Pots., Switches, H.V. Cond., Resistors, Muirhead S/M Dial, Double Deck Chassis and Crystal. BRAND NEW ORIGINAL CASES, 67/6. Carr. 7/6.

INDICATOR UNIT TYPE 182A

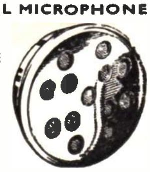
Unit contains VCR517 Cathode Ray 6in. tube, complete with Mu-metal screen 3 EF50, 4 SP61, and 1 5U4G valves, 9 wire-wound volume controls and quantity of resistors and condensers. Offered BRAND NEW (less relay) at 67/6. Plus 7/6 carr. "Radio-Constructor" 'scope circuit included.

OBSOLETE TYPES (Available from Stock)

LP2	3/6	VP2	8/6	TDD2A	8/6	U10	8/6	PENDD4020	12/6	MH4	5/-
210LF	3/6	SP2	8/6	FC13S/C	10/-	DDL4	4/-	354V	5/-	2D4A	4/-
P2	4/-	VP2B	8/6	FC13C	10/-	42SPT	6/-	ML4	7/6	1626	7/6
215SG	4/-	TP22	8/-	MS/PEN	7/6					1629	8/6

CRYSTAL MICROPHONE INSERTS

POST FREE **5/-** Ex-Units



POST FREE **8/6** Brand New & Boxed

Ideal for tape recording and amplifiers. No matching transformer required.

LATEST TYPES NOW IN STOCK

EBC41	10/-	UCH42	12/6	PL82	10/-	12AT7	9/-	EF89	10/-	DF96	10/-
EY51	12/-	UBC41	10/-	PY81	10/-	12AU6	9/-	ECF82	15/-	ECC84	15/-
EF41	11/-	DK40	10/-	EM80	10/-	12BA6	9/-	PABC80	15/-	6AQ5	10/-
EL41	11/-	EF80	10/6	6X4	8/-	12BE6	10/-	6AU6	9/6	PCL82	12/6
EZ40	10/-	EABC80	10/-	PY82	10/-	12AH8	12/6	117Z3	8/6		
EM34	10/-	ECC85	10/-	PCCB4	12/6	35W4	8/6	12AX7	10/-		
UL41	11/-	EF80	10/-	PCF82	12/6	PCF80	15/-	DK96	10/-		
UY41	11/-	ECL80	12/6	12AU7	9/-	EBF80	11/6	DL96	10/-		
UF41	11/-	PL81	12/6	12AT6	8/-	EF85	10/6	DAF96	10/-		

CATHODE RAY TUBES

VCR138A (with screen)	35/-
VCR139A. 2½in. C/R Tube. Brand new in original cartons (carr. free)..	£1.15.0
VCR97. Guaranteed full T/V picture (carr. 2/-)	£2.0.0
VCR517C. Guaranteed full T/V picture	£1.15.0
MU-METAL SCREENS for VCR97 or 517. P.P. 1/6	10.0
6in. ENLARGER for VCR97 or 517. P.P. 1/6..........................	17.6
VCR97. Slight cut-off. Carr. 2/-.....	15.0
3BP1 Brand new	£1.10.0

AN/APA-1 CATHODE RAY INDICATOR AMPLIFIER UNIT.

Complete. comprising 3BP1 C.R.T., 7-6SN7gts, 1-6H6, 1-6G6, 1-2X2, 1-6X5, valves. Brand new. £4/19/6 plus carr. 7/6.

MINIATURE I.F. STRIP TYE "373" 9.72 M/C's

Brand new miniature I.F. Strip, size 10¾in. x 2½in. x 3in. high. Valve line-up : 2 EF92, 3 EF91 and EB91. Band width 180 kcs. Ideal for F.M. circuit supplied., 15/-.

HENRY'S RADIO Ltd

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